Introduction to Information Systems

CHAPTER OUTLINE	LEARNING OBJECTIVES
1.1 Why Should I Study Information Systems?	**1.1** Identify the reasons why being an informed user of information systems is important in today's world.
1.2 Overview of Computer-Based Information Systems	**1.2** Describe the various types of computer-based information systems in an organization.
1.3 How Does IT Impact Organizations?	**1.3** Discuss ways in which information technology can affect managers and non-managerial workers.
1.4 Importance of Information Systems to Society	**1.4** Identify positive and negative societal effects of the increased use of information technology.

Opening Case

MKT Plus-Size Clothing Ads on Social Media

Social media are websites and mobile applications that let users create and share content for the purpose of social networking. Given the vast numbers of users, many networks end up being used as platforms for promoting products, ideas, businesses, political agendas, opinions, humour, and much more. TikTok is an extremely popular social media platform that allows users to post short videos and to like, comment on, and follow other users. It has become an ideal medium for videos to go viral, reaching millions of users. In fact, it can literally make a person a superstar overnight. The platform is now available in more than 150 markets worldwide in 75 languages.

As of January 2023, TikTok has over 1.5 billion users, 1 billion of whom are active monthly users. TikTok is especially popular among younger generations: more than 35 percent of its users are under 35 years old. These characteristics have made TikTok a popular platform for e-commerce brands (we will discuss e-commerce in more detail in Chapter 7). Penningtons, a Canadian fashion brand that specializes in plus-size women's clothing, is one such brand.

As a designer and producer of plus-size fashion, Penningtons advocates for body diversity and size inclusivity and strives to empower women to embrace fashion as a form of self-celebration. In 2021, Penningtons worked closely with Alicia Mccarvell, a Canadian content creator, to raise the profile of the brand's newest line of swimwear while remaining true to Mccarvell's style. This type of advertising—where the ad is in the form of normal, regular content—is called native advertising.

To promote Penningtons' swimwear, Mccarvell, a plus-size model, was captured trying on various pieces of swimwear while sharing her story of how she became confident enough to appear publicly in swimwear. Her powerful message of self-love combined with creativity made Mccarvell a great ambassador for Penningtons' new swimwear line. By partnering with an influencer who aligned with their values, Penningtons saw more positive sentiment in the comments section, which indicated that brand perception had improved; in addition, brand engagement increased, as did swimwear sales. Furthermore, the content on TikTok received 53 percent more comments, 18 percent more likes, and 55 percent more views than the company's content on other platforms.

Since this successful experience, Penningtons has partnered with several other plus-size content creators who are advocates of self-love, such as Mélissa Bédard and Stephanie Valentine (aka glamzilla) as well as Inuk, an Inuvialuit social media influencer. While sharing their stories about their personal journeys, these influencers also promote Penningtons' different products.

However, the landscape is not all rosy. Many plus-size content creators have described negative experiences with social

media because their content has been censored for being against the media's "community standards." These standards are rooted in the widespread stereotypes established in many countries about people with higher body weight or larger body size, known as weight stigma. In fact, a 2021 international study with almost 14,000 participants across six different countries found that 58 percent of participants had experienced weight stigma.

While sources of such stigma have traditionally been families, friends, workplaces, schools, and health care settings, social media have made it even more possible for plus-size individuals to experience weight stigma, not only by receiving hurtful comments from the public but also by feeling discriminated against when their content is removed by the platforms. In December 2019, TikTok admitted to suppressing the reach of some contents that the platform found "vulnerable to cyberbullying." Examples of such content include people with facial disfigurements, autism, Down's syndrome, and disabilities. This admission was made after Netzpolitik, a German news website on digital rights and digital culture, reported that TikTok moderators were asked to watch short videos and decide if the creator could be at risk for cyberbullying. While the team at TikTok that developed this policy might have believed that they were developing safeguards against bullying, they were in fact adding to the problem, as not only does online harassment remain an ongoing problem, but the policy led to discriminatory behaviour against vulnerable individuals.

Although more frequently reported about TikTok, this issue has been observed on other social media platforms too. For instance, Facebook has been blamed for removing pictures of an amputee model and Instagram has been reported to remove content from plus-size creators. Meta, Instagram's and Facebook's parent company, has responded to the concerns by saying that it is always possible to appeal post removals or account takedowns. On the other hand, influencers argue that removing or restricting the audience of their posts by social media platforms affects their business as they cannot fulfill their promises to brands with whom they have signed agreements. In fact, censoring by social media platforms denies vulnerable people their personal, economic, and even cultural and political opportunities and in that sense can be considered discriminatory.

Questions

1. **Identify and discuss three ways in which social media can help plus-size clothing brands achieve success.**
2. **Identify and discuss three ways in which social media can create challenges for plus-size clothing brands.**
3. **Identify and discuss ways in which social media can impact body size inclusivity positively or negatively.**

Sources: Compiled from "Inuvialuit Social Media Influencer Breaks Mold with Penningtons Fashion Teamup," *CBC News*, October 17, 2022; J. Chaney, "In 2022, It's Still Impossibly Hard to Be a Fat Content Creator Online," *Allure*, May 4, 2022; M. Cyca, "23 Important TikTok Stats Marketers Need to Know in 2023," *Hootsuite*, March 9, 2022; R. Puhl, "Weight Stigma Study in the U.S. and 5 Other Nations Shows the Worldwide Problem of Such Prejudice," *The Washington Post*, June 12, 2021; J. Rodríguez, "TikTok's Success and Controversies," *LatinAmerican Post*, April 4, 2020; R. Perper, "TikTok Admits It Hid Disabled Users' Videos Appearing on the App's Main Feed, Claiming the 'Blunt' Policy Was Used to Prevent Bullying," *Business Insider*, December 3, 2019; E. Botella, "TikTok Admits It Suppressed Videos by Disabled, Queer, and Fat Creators," *Slate*, December 4, 2019; C. Köver and M. Reuter, "TikTok Curbed Reach for People with Disabilities," *Netzpolitik*, February 12, 2019; "Celebrating Self-Love through Sleek Swimwear," *TikTok for Business*, https://www.tiktok.com/business/en-CA/inspiration/penningtons-404, accessed on March 15, 2023; A. Ishmael, "Plus-Size Creators Are Fed Up with TikTok's Community Guidelines," *Grazia*, https://graziamagazine.com/us/articles/plus-size-creators-tiktok/, accessed on March 12, 2023.

Introduction

Information technology (IT) refers to any computer-based tool that people use to work with information and support an organization's information and information-processing needs. IT has far-reaching effects on individuals, organizations, and our planet. Although this text is largely devoted to the many ways in which IT is transforming modern organizations, you will also learn about the significant impacts of IT on individuals and societies, the global economy, and our physical environment. IT is making our world smaller, enabling more and more people to communicate, collaborate, and compete, thereby levelling the playing field.

The COVID-19 pandemic forced people to depend on IT in new ways and demonstrated how far-reaching technology can be. Specifically, IT has come to the forefront of electronic commerce, distance education, and even health care. As you will see, in this course, we draw attention to IT's impact on the pandemic, and vice versa, quite extensively.

This text focuses on the successful applications of IT in organizations; that is, how organizations can use IT to solve business problems and achieve competitive advantage in the marketplace. However, not all business problems can be solved with IT. Therefore, you must continue to develop your business skills!

When you graduate, either you 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 which area of business you major in, which 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!

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 personally will have to make effective use of IT.

Accordingly, this chapter begins with a discussion of three reasons why you should become knowledgeable about IT. Next, it 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?

LEARNING OBJECTIVE

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

No doubt, you have noticed that the title of this book is about information systems. Although information systems, is a term that relates to information technology closely, it is not interchangeable with it. So, before we proceed, we will differentiate information technology from information systems. As previously defined, **information technology (IT)** refers to any computer-based tool that people use to work with information and support an organization's information and information-processing needs. An **information system (IS)** collects, processes, stores, analyzes, and disseminates information for a specific purpose. While we will discuss IT, the primary purpose of this text is to build your knowledge of the ways that modern organizations make use of IT and IS in their daily operations.

Your use of IT makes you 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 you 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 university student just 20 years ago.

Essentially, you practise *continuous computing*, surrounded by a movable information network. This network is created by constant communication among the digital devices you carry and wear (e.g., laptops, tablets, smartphones, and wearables); 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 smartphone: register for classes; take classes (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 purchase products from companies and 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 videos to it; design your own page on Facebook and LinkedIn; make and upload videos to YouTube and TikTok; take, edit, and share your own digital photographs; stream music and movies to your personal libraries; use RSS feeds to create your personal electronic newspaper; text and Tweet your friends and family throughout your day; send Snaps; order a ride from

Uber or Lyft; track the location and arrival time of the next campus bus; select a place or room to rent on Airbnb; 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.)

Let's put the preceding paragraph in perspective. What would a typical day for you be like if you had no access to computing devices of any kind, including your phone? This scenario also means that you have no access to the internet.

The Informed User—You!

So, the question is: Why should you learn about information systems and information technology? After all, you can comfortably use a computer (or other electronic devices) to perform many activities, you have been surfing the Web for your entire life (or a good part of it), and you feel confident that you can manage any IT application that your organization's MIS department installs. Let's look at three reasons why you should learn about ISs and IT.

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

MIS The first reason to learn about information systems and information technology is to become an **informed user**; that is, a person knowledgeable about ISs and IT. In general, informed users obtain greater value from whichever 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 aware of potential security issues and be more prepared to avoid them. IT's About Business 1.1 presents a scenario where social engineering was used to hack Uber in 2022. An informed user should not have made this mistake.
- Even as a new graduate, you will quickly be in a position to recommend—and perhaps to help select—which IT applications your organization will use. In essence, you will enhance the quality of your organization's IT applications with your input.

Stawomir Fajer/Adobe Stock

FIGURE 1.1 MIS provides what users see and use on their computers.

- 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 regarding 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 to utilize IT when you start your own business.

IT's About Business 1.1

MIS Informed Users Are an Important Part of Security

Every organization is vulnerable to attack. In some ways, vulnerability is a business requirement because employees need access to data to do their jobs. Anytime access is granted, however, there is an opportunity for an unauthorized party to access those data and use them for malicious purposes.

But an organization's data assets are protected behind passwords, multifactor authentication, and other security protocols, right? (You will learn more about these topics in Chapter 4: Information Security.) Of course, they are protected! Unfortunately, sometimes it takes only a little old-fashioned trickery to access these assets. In the IT world, we refer to this trickery as social engineering.

Social engineering is an attempt to gain access that has not been granted to you. Specifically, social engineering techniques are intended to manipulate authorized employees into providing unauthorized parties with access to private information; for example, by sharing their passwords. These actions are the digital equivalent of stealing a master key from a security guard. You now have access, but it is not legal access. At this point, you can go anywhere with the keys, and you don't even have to break in.

Social engineering has been used to carry out several high-profile hacks in recent years. In 2020 alone, more than 100 prominent Twitter accounts—including Elon Musk, Barack Obama, Bill Gates, and Michael Bloomberg—were hacked and used to promote a Bitcoin scam. These hacks were the work of teenagers who gained access to Twitter's internal networks by targeting just a few employees. Significantly, social engineering doesn't require access to everything. Rather, just one open door is often sufficient.

Social engineering is one of the easier ways to hack an organization. If a hacker wants in, it is easier if someone hands over a password. Many experts believe that humans are the "weakest link" in cybersecurity because they can be easily deceived. That is why there has been a sharp rise in social engineering attacks. The Canadian Anti-Fraud Centre (CAFC) reported that in 2021 Canadians lost over CAD $100 million to online fraud. According to CAFC's report, 42 percent of Canadians were subjects of cybersecurity incidents during the first several months of the COVID-19 pandemic in 2020. During this six-month period, 14 percent of CAFC's survey respondents reported having received fake (i.e., phishing) emails related to COVID-19 test results. The following case explains how Uber was subject to an online cybersecurity attack.

Uber Under Attack

In September 2022, Uber announced that its systems had been hacked. In response, it shut down several internal information systems until it could verify that the systems had not been compromised. A hacker socially engineered an Uber employee after discovering the employee's WhatsApp number. The employee was tricked into logging in to a fake Uber site that captured their username and password, giving the hacker access to the genuine Uber site.

However, simply obtaining the password was not sufficient. Uber also employs multifactor authentication, or MFA, which requires both a password and an "approval" on another device. In this case, the employee was prompted to push a button on a smartphone to verify that the login was legitimate. One attempt was not enough. So, the hacker repeatedly logged the credentials into the site, repeatedly prompting the driver to approve the MFA. Finally, the employee, confused or tired, approved the login. Now, the attacker was inside the gates.

Once inside Uber's system, the intruder uncovered administrative credentials that gave access to some of Uber's network resources. Uber reacted by quickly shutting down some of its internal systems while it determined how much the intruder had been able to access.

How Should Companies Prevent Social Engineering?

Companies can employ multiple strategies to prevent social engineering attacks. The first and most important strategy is to train your employees to become informed users of information technologies. Some experts recommend that organizations think beyond generic training and focus on training that is more specific to each user. For example, the riskiest employees—those with the most access—should receive more in-depth training to match the nature of their access rights. Specifically, they should be informed of the social engineering techniques they are most likely to encounter and what steps they should take in case something suspicious occurs.

One widely accepted best practice is to limit access privileges to those that employees actually need to fulfill their job duties. This practice seems logical and straightforward to implement. Keep in mind, however, that it is common for employees' roles to change, or for employees to change jobs completely, requiring different levels of access. If access rights are not continuously updated to reflect these changes, then employees can access data they do not need. Furthermore, implementing this strategy can be challenging due to the number of identities, assets, and access privileges, not to mention the identity and access management (IAM) structures each app and service uses.

Limiting privileges cannot prevent social engineering. However, it can minimize the damage because the employee has access only to limited data.

Additionally, outside contractors and consultants who do not work for an organization often have access to its data. Permissions granted to these external parties should be strictly limited to the data they need to fulfill their responsibilities. Further, they should be removed as soon as access is no longer needed.

Uber's Results

After it investigated the September 2022 breach, Uber reported it found "no evidence" that users' private information had been compromised. The company quickly restored all services including Uber, Uber Eats, Uber Freight, and the Uber Driver app. It also brought back all the internal software tools it had taken down as a precaution following the attack.

Conclusions

According to a 2022 report, attacks that utilize insider threats and compromise user credentials continue to grow by 47 percent each year. Organizations must manage this risk through regular training, security awareness sessions, and cybersecurity techniques.

Human error and failure to follow best practices will always exist. Security experts must bear in mind that most employees of an organization don't have the focus on preventing security breaches that the experts would like them to have. Ultimately, informed users, who can recognize and spot a trick, are your best defence.

Questions

1. **How did a hacker gain access to Uber's systems?**
2. **Define and discuss social engineering.**
3. **What steps should organizations take to better secure their systems against social engineering attacks?**

Sources: Compiled from A. O'Driscoll, "Canada Cyber Security and Cyber Crime Statistics (2020-2022)," Camparitech, February 9, 2023; R. Turner, "Meaningful Learnings from the Uber Breach," *Infosecurity Magazine*, September 27, 2022; S. Vaughan-Nichols, "Uber Hack: It's the Simple Things That Kill Your Security," *The New Stack*, September 27, 2022; B. Schneier, "The Uber Hack Exposes More Than Failed Data Security," *The New York Times*, September 26, 2022; S. Sabin, "Uber Hack Challenges Popular Login Security Practices," *axios.com*, September 23, 2022; D. Winder, "Likely Uber Hacking Suspect, 17, Arrested By City of London Police," *Forbes*, September 23, 2022; S. Ray, "Social Engineering: How A Teen Hacker Allegedly Managed To Breach Both Uber and Rockstar Games," *Forbes*, September 20, 2022; E. Gately, "Latest Uber Data Breach Caused by Hacker Tricking Worker," *Data Center Knowledge*, September 20, 2022; G. Avner, "3 Tips for Mitigating the Uber Hack," *Security Boulevard*, September 19, 2022; R. Lakshmanan, "Uber Claims No Sensitive Data Exposed in Latest Breach... But There's More to This," *The Hacker News*, September 17, 2022; D. Goodin, "Uber Was Breached to Its Core, Purportedly by an 18-Year-Old. Here's What's Known," *arstechnica .com*, September 16, 2022; F. Siddiqui, and J. Menn, "Uber Suffers Computer System Breach, Alerts Authorities," *The Washington Post*, September 16, 2022.

The second reason to learn about IS and IT is that the organization you join will undoubtedly be undergoing a digital transformation. In fact, digital transformation has become one of the most important strategies for organizations. A December 2019 survey by *Forbes* magazine noted that 70 percent of companies surveyed had a digital transformation strategy in place or were working on such a strategy, and 27 percent of companies stated that digital transformation was a matter of survival.

digital transformation The business strategy that leverages IT to dramatically improve employee, customer, and business partner relationships; support continuous improvement in business operations and business processes; and develop new business models and businesses.

Digital transformation is the business strategy that leverages IT to dramatically improve employee, customer, and business partner relationships; to support continuous improvement in business operations and business processes; and to develop new business models and businesses. The information technologies that drive digital transformation include:

- Big Data (see Chapter 5);
- Business Analytics (see Chapter 12);
- Broadband Internet access (see Chapter 6);
- Mobile Computing (see Chapter 8);
- The Internet of Things (see Chapter 8);
- Social Computing (see Chapter 9);
- Agile Systems Development methods (see Chapter 13);
- Cloud Computing (see Technology Guide 3);
- Artificial Intelligence (see Chapter 14);

The third reason to learn about ISs and IT is that 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, our 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.

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 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.linkedin.com**, **www.computerworld.com/category/careers/**, and **www.monster.ca**.

Career opportunities in IS are strong and are projected to remain strong over the next 10 years. In fact, Randstad (**www.randstad.ca**), a leading provider of human resources solutions, recently announced the top 15 jobs in Canada for 2023, while LinkedIn listed 20 of the fastest-growing job titles over the past five years in Canada. Let's take a look at these rankings. (Note that the rankings differ because these two organizations 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 Centre Manager	Manages IS services such as help desks, hotlines, training, and consulting
Applications Development Manager	Coordinates and manages new systems development projects
Project Manager	Manages a particular new systems development project
Systems Analyst	Interfaces between users and programmers; determines information requirements and technical specifications for new applications
Operations Manager	Supervises the day-to-day operations of the data and/or computer centre
Programming Manager	Coordinates all applications programming efforts
Social Media Manager	Coordinates all social media development efforts and all social media monitoring and response efforts
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 website
Web Designer	Creates websites and pages

research.) As you can see, jobs suited for MIS majors appear in both lists, many of them quite high. The job rankings are as follows:

***Randstad's list of top jobs in Canada* (out of 15)**

#1 Software developer

#12 Business systems analyst

#14 Digital marketing coordinator

***LinkedIn's list of fastest-growing job titles over the past five years in Canada* (out of 20)**

#4 Technical program manager

#8 Information technology associate

#9 Site reliability engineer

#13 Security engineer

#14 Data engineer

#15 E-commerce coordinator

#16 Technical product manager

#17 Cyber security specialist

Not only do IS careers offer strong job growth, but the pay is excellent as well. Indeed (**www.indeed.ca**) released a list of the 15 highest-paying jobs in Canada in 2023. These jobs include:

Job	National Average Salary
#9 Software engineer manager	$143,044
#10 Director of information technology	$117,890
#11 Software architect	$119,021
#12 Enterprise architect	$110,083
#15 Data scientist	$84,630

According to CIO ITBrew.com, a July 2022 Gartner survey of 128 CFOs and CEOs indicates that technology spending will remain strong, even if the economy does not. The survey found that 41 percent of respondents would cut mergers and acquisitions first, followed by sustainability, workforce training and talent development, capital expenditure for physical network expansion, and product innovation. The item "improvements in technology for improved efficiency and scalability" was in last place for cuts, with only 23 percent of respondents identifying it as a top area for belt-tightening. In fact, around 45 percent of the executives identified the category as the last place they would seek cuts. This is great news for students looking for strong job opportunities.

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 of 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.

MIS 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.

MIS 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 co-operation.

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.

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 adviser.

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 centre
• 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 and requirements 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 these tasks.
• 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 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.

(continued)

TABLE 1.2 The Changing Role of the Information Systems Department *(continued)*

New (Consultative) Functions of the MIS Department
• Educating the MIS staff about the business ▪ Communication between the MIS department and business units is a two-way street. You will be responsible for educating the MIS staff on your business, its needs and requirements, 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. • 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 and security. • Proactively using business and technical knowledge to see innovative ideas about using IT ▪ Your business needs will often 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 adviser on various issues, including hardware and software compatibility, implementing extranets, communications, and security.

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.

1.2 Overview of Computer-Based Information Systems

LEARNING OBJECTIVE

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

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 support the information and information-processing needs of an organization.

information technology (IT) Any computer-based tool that people use to work with information and support an organization's information and information-processing needs.

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**).

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

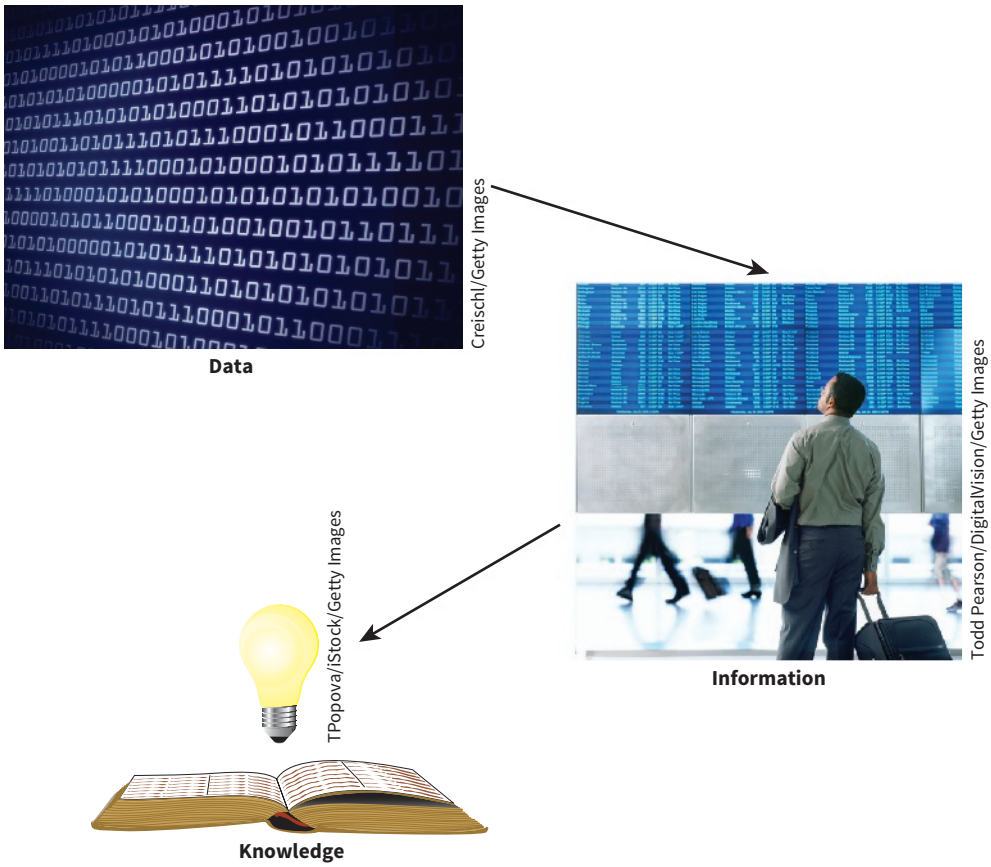

FIGURE 1.2 **Data, information, and knowledge.**

Data items refer to elementary descriptions 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 their GPA is information. The recipient interprets the meaning and draws 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 is 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 items Elementary descriptions of things, events, activities, and transactions that are recorded, classified, and stored but are not organized to convey any specific meaning.

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

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.

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 + Corey Kluber = ERA	
2.92	2.92 + Chris Sale = ERA	* Keep pitcher, trade pitcher, or send pitcher to minor leagues
1.39	1.39 + Clayton Kershaw = ERA	* Salary/contract negotiations
3.95	3.95 + Shane Bieber = 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.

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

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

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

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

database A collection of related files or tables containing data.

You see that the same data items with no context can have entirely different meanings 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.

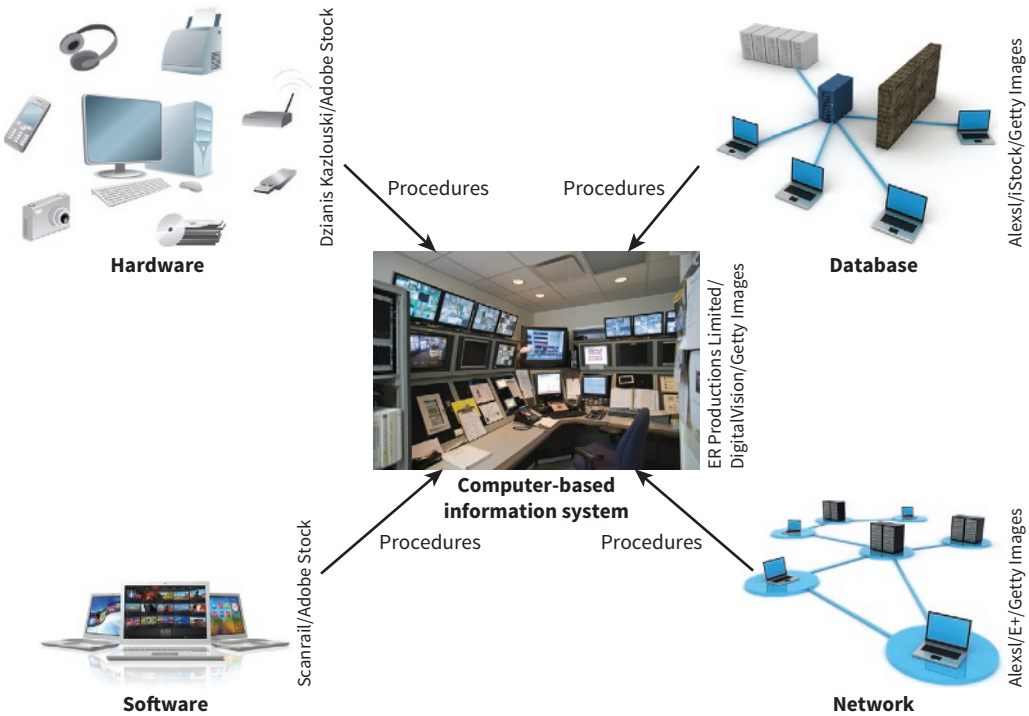

FIGURE 1.3 **Computer-based information systems consist of hardware, software, databases, networks, procedures, and people.**

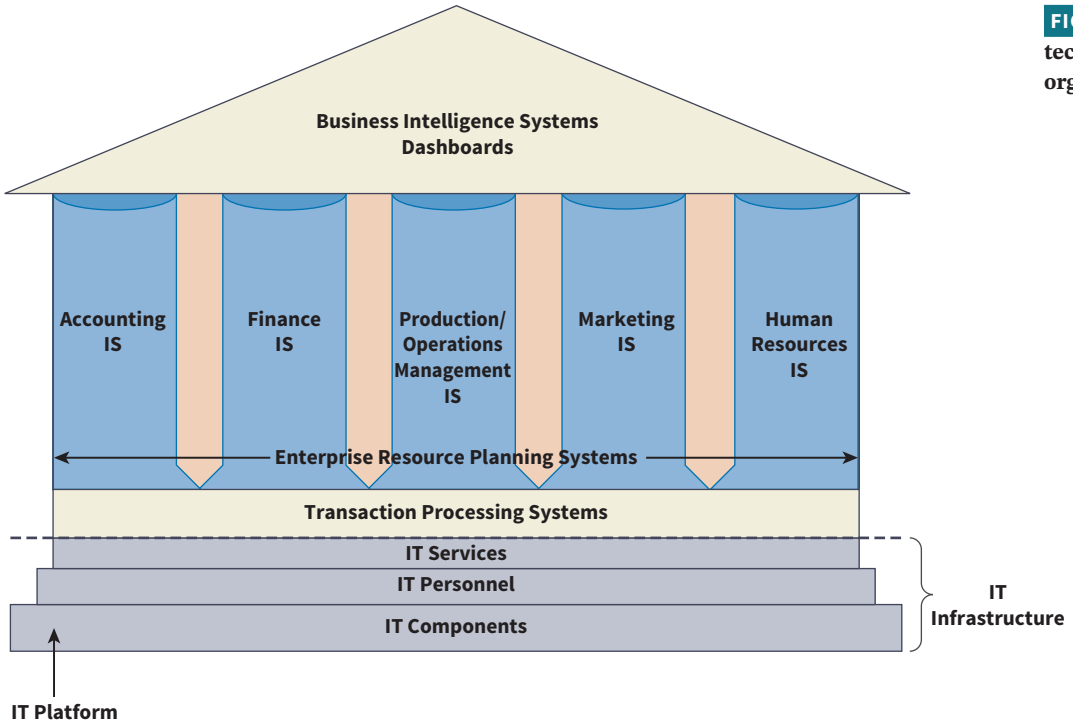

FIGURE 1.4 **Information technology inside your organization.**

- A **network** is a connecting system (wireline or wireless) that enables multiple 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.

network A connecting system (wireline or wireless) that enables multiple 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.

information technology platform The name given to the combination of the IT components of hardware, software, networks (wireline and wireless), and databases.

information technology services Activities performed by IT personnel using IT components; specifically, developing information systems, overseeing security and risk, and managing data.

information technology infrastructure IT components plus IT services.

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

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 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

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.

departmental information system The business strategy that leverages IT to dramatically improve employee, customer, and business partner relationships; support continuous improvement in business operations and business processes; and develop new business models and businesses.

a single department is usually referred to as a **departmental information system** (also known as a functional area information system (FAIS)). 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 10. You will learn about both customer relationship management (CRM) systems and supply chain management (SCM) systems in Chapter 11.

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 are the 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.

ACCT FIN 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, to determine the best sources and uses of funds, and to perform audits to

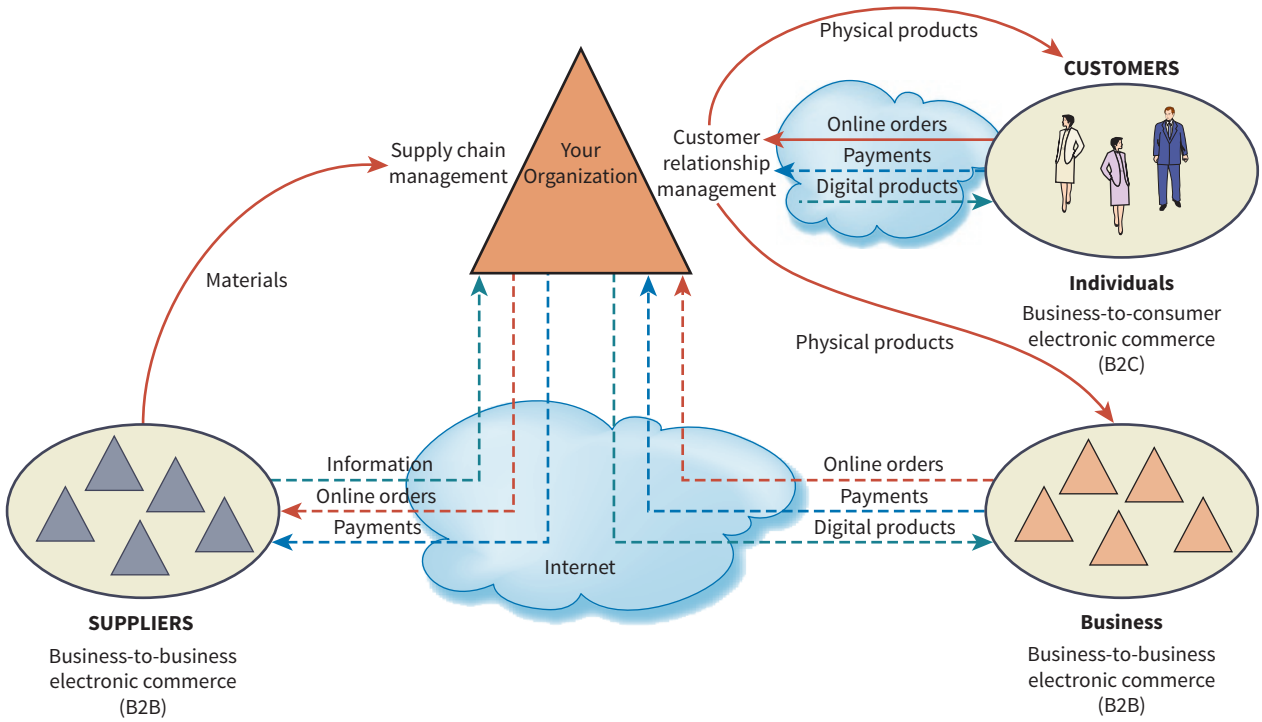

FIGURE 1.5 **Information systems that function among multiple organizations.**

ensure that the organization is fundamentally sound and that all financial reports and documents are accurate.

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

- *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.

POM 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)*.

HRM 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.

Two information systems that support the entire organization, enterprise resource planning (ERP) 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 organizations often developed the various functional area ISs as stand-alone systems that 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 will study both TPSs and ERP systems in detail in Chapter 10.

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 11.)

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.

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. 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 1.2 presents the case of lululemon, a pioneer in the athleisure industry, which turned the threat of the COVID-19 pandemic into an opportunity to grow and enhance its e-commerce strategies and channels.

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.

IT's About Business 1.2

MKT MIS lululemon's Success During and Despite the COVID-19 Pandemic

lululemon athletica, headquartered in Vancouver, BC, is a Canadian athletic apparel brand that has more than 490 stores worldwide. At first glance, Lululemon seemed like a business that would be especially vulnerable to the disruptions caused by the COVID-19 pandemic because not only was it forced to close its shops, like many other retail companies, but the brand is also tied to in-person fitness activities, which took a hit due to lockdowns and restrictions.

However, to many people's surprise, not only did lululemon manage to survive the pandemic but it actually prospered. The brand reported that its revenue for the second quarter of 2021 increased by 61 percent compared to the previous year. Overall, lululemon's annual revenue in 2020, 2021, and 2022 grew by 21 percent, 11 percent, and 42 percent, respectively. How did lululemon manage to achieve such astonishing results? Here we review some of the contributing success factors.

By March 2020, lululemon already had a strong online presence with its e-commerce website. Additionally, it had already invested in RFID technology (see Chapter 5). This combination enabled it to have accurate real-time store inventory visibility and thus to offer its customers the option to buy online, pick up in store (BOPIS). lululemon also invested in a new mobile point-of-sale system, which made it possible to conduct transactions like purchases of gift cards, returns, and exchanges just outside of the store.

In addition, in April 2020, lululemon introduced a unique feature for its customers, who were locked down at home at the time. The live video-chat shopping experience was a game-changer that enabled customers to schedule one-on-one video chats with lululemon experts to discuss sizing, recommendations, etc.

During the COVID-19 pandemic, although consumers were stuck at home, many wanted to keep fit and continue doing some physical activities. So, lululemon jumped on this trend and responded to the change in consumers' habits by introducing online sport challenges like "move and stay connected," which was based on spending 20 minutes a day, five days a week, moving. To further encourage its consumers, lululemon posted daily streams with its brand ambassadors via Instagram. These daily sessions not only increased consumers' engagement with the brand but also helped them build a new lifestyle in the new reality.

lululemon also invested in *paid search*, which is a type of digital marketing where search engines such as Google show ads on their results pages. Paid searches drive traffic to the advertised websites through ads that are relevant to the key terms used to search the web. Paid search helped lululemon to increase its brand awareness, generate extra sales, and attract a new audience.

During the pandemic, lululemon observed an unprecedented volume of sales through its online channels. To make this happen, according to its CEO, Calvin McDonald, lululemon "had to pull forward almost three years' worth of investments in capital expenditure to build upon its digital infrastructure—years ahead of schedule." As a result of its investments, efforts, and dedication, the brand managed to achieve its goal of doubling 2018 e-commerce revenue three years early.

Questions

1. **What other digital initiatives could lululemon employ on its website to enhance its revenue from online sales?**
2. **How can lululemon better employ social media platforms to increase brand awareness and/or customer satisfaction?**

Sources: Compiled from J. Park, "Leading in Crisis: How the Pandemic Shaped lululemon CEO Calvin McDonald's (Executive MBA '00) View on Leadership," *Rotman*, May 17, 2022; M. Fool, "Here's How Lululemon Plans to Double Revenue by 2026," *The Globe and Mail*, May 10, 2022; E. Mixon, "Lululemon Bet Big on Digital Technology and Won, Here's How," *Intelligent Automation Network*, January 4, 2022; Y. Pan, "Lululemon Provides Better Customer Services through Digital Ecosystem," *Highlights in Business, Economics and Management,* Volume 1, 2022; S. Kohan, "Lululemon Sales Surge Despite Supply Chain Issues," *Forbes*, September 8, 2021; S. Lauchlan, "Champagne for Lululemon! Athleisure Wear Retailer Reaps the Omni-Channel Benefits of a Locked Down Customer Base," *Diginomica*, April 1, 2021; L. Johnston, "Lululemon Will Open More Stores as Digital Investments Drive Growth," *RIS News*, March 30, 2021; V. Kurichenko, "How Lululemon Increased Their Brand Value by 40% in 2020," *Medium*, June 17, 2020; L. Dignan, "Lululemon Steps Up Digital Efforts, E-Commerce as Physical Stores Closed Due to COVID-19," *ZDNET*, March 30, 2020; "Lululemon Boosts Digital Sales 30% through Global Focus," *BrainStation*, December 16, 2019.

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 advisers to middle managers and executives. Finally, *executives* make decisions that deal with situations that can significantly change the manner in which business is conducted. Examples of executive decisions are introducing a new product line, acquiring other businesses, and relocating operations to a foreign country.

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

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 analytics (BA) systems (also known as **business intelligence (BI) systems**) provide computer-based support for complex, nonroutine 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 will learn about BA systems in Chapter 12.

Business analytics (BA) systems See **business intelligence systems**.

business intelligence (BI) systems Systems that 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. 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 Chapter 14.

Expert systems (ESs) Systems that attempt to duplicate the work of human experts by applying reasoning capabilities, knowledge, and expertise within a specific domain.

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 12 provides a thorough discussion of dashboards.

dashboard A business analytics presentation tool that provides rapid access to timely information and direct access to management reports.

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
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
Functional area IS	Supports the activities within a specific functional area	System for processing payroll
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
Dashboards	Present 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?

1.3 How Does IT Impact Organizations?

LEARNING OBJECTIVE

Discuss ways in which information technology can affect managers and non-managerial workers.

Throughout this text, you will encounter numerous examples of how IT affects various types of organizations. These examples will make you aware of just how important IT actually is to organizations. In fact, for the vast majority of organizations, if their information systems fail, then they cease operations until the problems are found and fixed. Consider the following examples.

On December 18, 2022, a leading Canadian pediatric hospital, Toronto-based SickKids, was hit by a cyberattack. The attack caused several network systems to go down. Specifically, SickKids' website, phone lines, and some clinical and corporate systems were affected by the attack for two weeks. According to the hospital, the medical equipment and services remained functional; however, clinical teams experienced delays in receiving lab and imaging results, which caused patients and families to suffer from longer than usual waiting times. The attack was executed by the LockBit ransomware group. The group made an official apology later for having attacked a health care organization.

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

IT Impacts Entire Industries

As of mid-2022, 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 start-ups without investing in new infrastructure or training new employees. For example, in 2000, operating a basic internet application cost businesses approximately CAD $200,000 per month. By mid-2022, operating that same application in Amazon's cloud could cost as little as CAD $140 per month, depending on the amount of data traffic to and from the website. (We discuss cloud computing in Technology Guide 3.)

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 In early-2023, the largest book bookseller in the world was 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 e-books.

The revenue in the e-book segment of the worldwide book market is projected to reach US $14.21 billion in 2023, while revenue for the physical books segment is projected to reach US $68.08 billion. So, the revenue from the sales of e-books will account for more than 17 percent of total revenue from book sales. Given that the average revenue per user for e-books and physical books is estimated to be US $14.46 and US $37.41, respectively, the number of e-books expected to be sold in 2023 accounts for 35 percent of the total books sold in the market.

According to the 2018 Academic Student eBook Experience Survey, 74 percent of respondents said that they preferred print books when reading for pleasure. Furthermore, 68 percent said that they preferred print books for assigned readings. In 2022, e-book sales were down 12 percent compared to the previous year. While some of this is attributed to the world reopening after the COVID-19 pandemic, the future is unknown and continuous disruption is affecting the book industry.

The Music Industry Dramatic changes in the music industry resulted from the emergence of digital music-streaming platforms such as Spotify (**www.spotify.com**), Apple Music (**www.apple.com/ca/apple-music/**), and Amazon Prime (**www.amazon.ca**), which generally charge CAD $9 to CAD $12 per month for unlimited access to millions of songs. Even though the record labels receive only about 0.3–0.5 cents each time a song is streamed, these small amounts are significant. In 2021, the global record industry reported revenues of US $25.9 billion (up from $20.2 billion in 2019), with streaming generating US $16.9 billion (up from $11.4 billion in 2019).

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**). By the first quarter, 2021, Netflix had the largest global subscriber base of any video service, with more than 200 million 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—for example, Salesforce (**www.salesforce.com**) and Android, an open-source operating system. (We discuss operating systems in **Technology Guide 2** and SaaS in **Technology Guide 3**.)

The Video Game Industry Today, the fastest growing entertainment companies are video game 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 Software disrupted this industry 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 Instagram (**www.instagram.com**), Shutterfly (**www.shutterfly.com**), Snapfish (**www.snapfish.com**), and Flickr (**www.flickr.com**). Meanwhile, Kodak, the long-time market leader—whose name was almost synonymous with cameras—declared bankruptcy in January 2012.

MKT The Marketing Industry Some of today's largest direct marketing companies include Facebook (**www.facebook.com**), Google (**www.google.com**), and Amazon (**www.amazon.com**). All of these companies are using software to disrupt the retail marketing industry.

HRM 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 résumés on a publicly accessible website that interested parties can search in real time.

FIN 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. In fact, an entirely new name has been given to the merging of technology and financial services, FinTech (Financial Technologies). Also, many of the leading innovators in financial services are software companies. See our discussion of FinTech in Chapter 7.

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 **Technology Guide 1**).

Consider DreamWorks Animation (**www.dreamworks.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 **Technology Guide 1**) 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 engine, controlling safety features, entertaining passengers, guiding drivers (and in some cases, fully automatous driving) to their destinations, and connecting the car to mobile, satellite, and GPS networks. Other software functions include Wi-Fi receivers, which turn your car into a mobile hot spot; software that 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: driverless cars. Google, Tesla (**www.tesla.com**), Apple, and all of the major automobile companies are now developing driverless vehicles.
- *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 (GPS) and software. *Precision agriculture* is an approach to farm management that uses information technology to ensure that crops receive exactly what they need—for example, water, fertilizer, and pesticides—for optimum health and productivity.
- *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 website.
- *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 US $100,000. That company estimated that the process would have cost US $1.5 million had it been performed by lawyers.

  Law firms are now also using new artificial intelligence software packages such as Casetext (**www.casetext.com**) that augment lawyers' cognitive abilities.

IT Reduces the Number of Middle Managers

HRM IT makes managers more productive and increases the number of employees who can report to a single manager. Thus, IT ultimately decreases the number of managers and experts required. 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 they make their decisions. In this way, IT has ultimately changed managers' jobs.

IT often provides managers with near-real-time information, meaning that they 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 6) 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 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.

HRM 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 computers and television. Encouraging people to work and shop from their living rooms could produce some unfortunate psychological effects, such as depression and loneliness.

HRM 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. In fact, the average Canadian worker spends 6 hours and 45 minutes per day in front of some type of screen (consider laptops, tablets, smartphones, computers, and televisions). Let's consider two issues associated with IT: job stress and long-term use of the keyboard.

An increase in an employee's workload and/or responsibilities can trigger *job stress*. Although computerization has benefited organizations by increasing productivity, it has

also 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.

HRM 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 computer functionality to the way it was before GUIs became 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.


Andrey Popov/Adobe Stock


Media Bakery


Media Bakery


Media Bakery

FIGURE 1.6 Ergonomic products protect computer users.

Before you go on…

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

1.4 Importance of Information Systems to Society

LEARNING OBJECTIVE

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

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 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. Online meetings are now a fixture in our business life. These meetings have many advantages (easier to share documents, less travel, time savings). However, there are also many disadvantages when they are not coordinated properly. The Closing Case for this chapter discusses online and hybrid meetings and presents strategies to help them be successful.

While IT does make significant improvements to quality of life, 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. Going further, the majority of respondents did some work while vacationing, and almost all of them checked their email regularly. Boundaries are more important than ever because IT has made it easy to blur those lines.

The Robot Revolution Is Here Now

Once restricted largely to science fiction, robots that can perform practical tasks are now a reality. Two major types of robots are industrial robots and collaborative robots, or cobots.

An *industrial robot* is an automated, programmable machine used in manufacturing operations. Applications for industrial robots include welding, painting, assembly, disassembly, packaging and labelling, palletizing, and many others. *Collaborative robots*, or *cobots*, are machines designed to be used in collaborative applications where there are interactions with humans within a shared space. Applications for cobots include providing information in public spaces, transporting materials and products within a building, inspection of goods, patrolling perimeters, securing facilities, and many others. Now let's look at the differences between the two types.

POM **Industrial Robots versus Cobots** Cobots are designed to work alongside human employees, while industrial robots perform work in place of those employees. A cobot

can assist employees with work that may be too dangerous, strenuous, or tedious for them to accomplish on their own. This assistance can create a safer, more efficient workplace without eliminating factory jobs. In contrast, industrial robots are used to automate the manufacturing process almost entirely without human help on the manufacturing floor. This process can free employees for more meaningful tasks that are less mundane and less prone to repetitive-motion injuries.

Cobots are also more easily programmable than industrial robots because they are capable of "learning" on the job. A factory worker can reprogram a cobot simply by moving the cobot's arms along a desired path. At that point, the cobot will "remember" the new movement and be able to repeat it on its own. Industrial robots cannot be so easily reprogrammed and require an engineer to write new software for any changes in the process that the robot is to perform.

Industrial robots are designed for heavy manufacturing, while cobots are designed for light manufacturing. Industrial robots require safety cages to keep humans out of the workspace, while cobots are safe enough to function around people and do not require the same type of safety infrastructure as industrial robots. Last but certainly not least, industrial robots are much more expensive (US $100,000 to US $150,000) than cobots (US $35,000 to US $50,000).

Cobots have become increasingly common on factory floors, in hospital corridors, and in farm fields. Amazon Robotics is an excellent example of cobots in a distribution centre. Traditionally, companies moved goods around their distribution centres with human-operated conveyors or with human-operated machines such as forklifts. That is, orders would enter the distribution centre and humans would locate, pick, and pack the items for shipment.

Amazon Robotics, formerly Kiva Systems, reversed the process with cobots. In the new approach, the company stores items on portable storage units. When an order enters the company database, software locates the closest cobot to the item and directs it to retrieve that item. The cobots navigate around the distribution centre by following bar code stickers on the floor. Each cobot has sensors that read the bar codes and prevent collisions. When the cobot reaches the correct storage unit, it slides underneath it and lifts it off the ground with a corkscrew action. The cobot then carries the storage unit to a human operator who picks the item(s).

The bottom line with this system is that, rather than humans going to the items, the cobots bring the items to the humans. The system is much more efficient and accurate than the traditional one.

Drones A *drone* is an unmanned aerial vehicle (UAV) (a flying robot, if you will) that either is controlled by pilots from the ground or autonomously follows a preprogrammed mission. Commercial drones function in a variety of business purposes, in contrast to drones used by hobbyists for recreational purposes.

An interesting use of drones is in the fight against deforestation. A good example of this process is in Yangon, Myanmar, where Dendra Systems (**www.dendra.io**) is working with a non-profit organization called Worldview International Foundation (**http://wif.foundation**) to plant mangrove saplings. Dendra, formerly BioCarbon Engineering, is a start-up company that makes drones to plant trees and grasses.

Drones first fly over the area to be planted, map it, and collect data about the topography and soil conditions. Dendra integrates these data with satellite data on the area and determines the best locations to plant seeds. Once the company analyzes the data, drones fire biodegradable pods filled with germinated seeds and nutrients into the ground at the preselected locations. Over the next months, drones fly over the planted areas and monitor how the mangroves are growing.

Autonomous Vehicles An autonomous, or self-driving, car (essentially a robot car) is a vehicle that is capable of sensing its environment and moving safely to its destination with little or no human input. When you think about autonomous vehicles, consider these statistics:

- Human error accounts for more than 90 percent of automobile accidents.
- Each year more than 6 million vehicle accidents are reported to law enforcement.
- In 2020, a total of 1,745 Canadians died in automobile accidents. According to the World Health Organization, each year, approximately 1.35 million people die worldwide in road accidents.

These statistics offer compelling reasons for autonomous vehicles, and the development of these vehicles is proceeding rapidly. Leading autonomous vehicle companies are Tesla (**www.tesla.com**), Waymo (**www.waymo.com**), GM Cruise (**https://getcruise.com**), and Ford Autonomous (**www.ford.com**).

There is some bad news, however. Several fatalities have been reported with Tesla automobiles on full autopilot (self-driving mode). Whether these deaths were caused by the automobiles is under investigation.

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.

The Emergence of Cognitive Computing: IBM Watson

MIS IBM Watson (**www.ibm.com/watson**) is a suite of enterprise-ready artificial intelligence services, applications, and software tools. Watson integrates advanced natural language processing, information retrieval, knowledge representation and reasoning, and machine learning technologies in order to answer open-domain (general) questions. IBM has labelled the type of processing demonstrated by Watson as *cognitive computing*. Watson has four primary capabilities:

- The ability to understand human language, with all of its nuance and ambiguity;
- The ability to learn and absorb information;
- The ability to formulate hypotheses;
- The ability to understand the context of a question.

By mid-2022, organizations in at least 20 industries were using Watson in a variety of applications. Some of these applications end up being sold to firms who can take these technical capabilities and refine and develop them for a specific industry. For example, in June 2022, IBM sold Watson's health division to Francisco Partners, a firm that specializes in health care technology and plans to establish a new company, Merative, that will invest heavily in the continued development of this tool. Merative's products will be organized into six product families to provide a variety of artificial intelligence insights to physicians and health care administrators. The opening case for Chapter 5, Data and Knowledge Management, presents a more detailed overview of the story of Watson Health.

IT Impacts Health Care

IT has brought about major improvements in health care delivery. Medical personnel use IT to make better and faster diagnoses and to monitor critically ill patients more accurately. IT has also 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 health care. Among the thousands of other health care applications, administrative systems are critically important. These systems perform functions ranging from detecting insurance fraud to creating nursing schedules to performing financial and marketing management.

The internet contains vast amounts of useful medical information. However, even though this information exists on the internet, physicians caution against self-diagnosis. Rather, people should use diagnostic information obtained from Google and medical websites such as WebMD (**www.webmd.com**) only to ask questions of their physicians.

One of the earliest applications of IBM Watson was in the field of medicine. Watson is able to analyze vast amounts of medical data and provide insights.

Although some health data are structured—for example, blood pressure readings and cholesterol counts—the vast majority are unstructured. These data include textbooks, medical journals, patient records, and nurse and physician notes. In fact, modern medicine entails so much unstructured data that their rapid growth has surpassed the ability of health care practitioners to keep up. IBM emphasizes that Watson is *not* intended to replace health care professionals. Rather, its purpose is to assist them in avoiding medical errors and fine-tuning their medical diagnoses.

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. How do you think robotics will affect your life in the future?
3. Explain how IT has improved health care practices. Has the application of IT to health care created any problems or challenges? If so, explain and provide examples.

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

1.1 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" them.
- You will be able to provide input into your organization's IT applications, thus improving their quality.
- You will quickly be in a position to recommend or to 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 ones.
- You will understand the potential impacts that "new and improved" technologies will have on your organization. Consequently, you 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 better employ IT if you decide to start your own business.

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

- Transaction processing systems (TPSs) 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).
- 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.

1.3 Discuss ways in which information technology can affect managers and non-managerial 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 they 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 non-managerial 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.

1.4 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 health care.

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.

Key Terms

Discussion Questions

1. Would your university be a good candidate for digital transformation? Why or why not? Support your answer.

2. If you responded yes, then what types of digital initiatives should your university undertake to transform itself?

3. 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.

4. Your university wants to recruit high-quality high school students from your province. 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.

5. Can the terms *data, information,* and *knowledge* have different meanings for different people? Support your answer with examples.

6. 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).

7. 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?

8. Is it possible to endanger yourself by accessing too much medical information on the Web? Why or why not? Support your answer.

9. Describe other potential impacts of IT on societies as a whole.

10. What are the major reasons why it is important for employees in all functional areas to become familiar with IT?

11. Given that information technology is impacting every industry, what does this mean for a company's employees? Provide specific examples to support your answer.

12. Given that information technology is impacting every industry, what does this mean for students attending a business school? Provide specific examples to support your answer.

13. 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

1. Visit some websites that offer employment opportunities in IT. Prominent examples are: **www.linkedin.com**, **www.dice.com**, **www.monster.ca**, **www.collegerecruiter.com**, **www.careerbuilder.ca**, **www.jobbank.gc.ca**, **www.simplyhired.ca**, and **www.indeed.ca**. Compare 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.

2. Explore the role of the CIO in today's business world. Access **www.cio.com** and search through the resources listed under careers. What opportunities are available if you were graduating today?

3. Go to **www.canadapost.ca**.

a. Find out what information is available to customers before they send a package.

b. Find out about the "package tracking" system.

c. Compute the cost of delivering a 25 cm × 50 cm × 38 cm box, weighing 18 kg, from your hometown to Montreal, Quebec (or to Vancouver, British Columbia, if you live in or near Montreal). Compare the fastest delivery against the least cost. How long did this process take? Look into the business services offered by Canada Post. How do they make this process easier when you are a business customer?

4. Surf the internet for information about the federal government agency Public Safety Canada. Examine the available information and comment on the role of information technologies in the department.

5. Go to **Twitter.com**. Note the number of people on the platform daily and the number of tweets or posts in a 24-hour period. Check out your favorite clothing company and see how many of their customers are using the platform.

6. Access **www.edu.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

MIS POM Hybrid Work Means Hybrid Meetings

In the early months of the pandemic, most business meetings were entirely virtual. This reality created a level playing field when it came to virtual meetings in that everyone had to contend with the same videoconferencing issues. But since everyone was online, each participant had a similar meeting experience.

As the world adjusts to a new normal after the pandemic, it is clear that many people prefer hybrid work structures. In a 2021 Accenture Future of Work Study that surveyed over 9,000 workers from 11 countries and 13 industries, 83 percent of respondents said that a hybrid set-up would be optimal for them. Hybrid work allows worker's flexibility in setting their in-person hours, leaving scheduled meetings with a mix of some participants who are attending in person while others are online, creating a hybrid meeting.

A *hybrid meeting* is an online meeting in which some participants attend from home and others from a conference room. This set-up introduces various issues. For example, participants who are not in the office will likely feel left out. In addition, organizations need to ensure that their meetings are productive and beneficial for as many workers as possible, not just those in the office. Organizations want to empower staff to engage in every meeting. Yet, data show that roughly 70 percent of people who dial into meetings remotely feel disengaged.

Connected and Disconnected Participants

A 2022 study revealed that more than 50 percent of remote workers become distracted by emails or social media during meetings. Further, more than 20 percent have even brought virtual meetings to bed. Finally, 10 percent admitted to coming up with fake excuses to leave meetings early. Overall, remote participants seem disconnected despite being directly connected to the meeting.

The key issue appears to be a real human connection. When asked about building rapport, 54 percent of respondents claimed they had fewer opportunities when they attended a meeting virtually. An additional 39 percent felt that their input would have greater value if they had participated in person. Finally, roughly 70 percent of respondents stated that collaboration between in-office and remote workers is challenging. Significantly, current IT

tools—virtual meetings, group messaging, and file sharing—are intended to enhance productivity. However, these tools do not promote collaboration and connection.

In addition to these issues, there are the unintended consequences of hybrid meetings; for example, when people in the office focus on each other and fail to remember that there is an "invisible" person online, or the online person fails to mute their microphone, creating a feedback problem for everyone in person. As another example, if the in-office microphone isn't sufficient to pick up everyone's voice, then online participants will miss out.

Solutions

Given all of these problems, we might ask, can we make hybrid meetings work? Fortunately, the answer is yes. Below we present several recommendations on how to help make hybrid meetings successful.

Focus on collaboration, not just sharing. Although screen sharing is an effective strategy for conveying information, it does not promote knowledge sharing or collaboration. One study identified digital whiteboard tools as a potential solution that would be more collaborative and build team camaraderie.

Have everyone participate online through their laptop. To create equity, require that both in-person and remote participants use a computer with a webcam. Everyone is then visible through a webcam, everyone can chat, and everyone can contribute to the digital experience. This requirement effectively makes the hybrid meeting a "fully online" experience while enabling some participants to build face-to-face relationships. One key suggestion: In-person participants in the same room should join the meeting audio through a single connection. Otherwise, the feedback will be terrible for the online participants.

Install multiple cameras in the conference room. One problem with using your laptop's webcam in the conference room is that you don't know where to look. At the webcam? At your colleague across the table, which gives everyone at home a nice view of your nostrils? At the wall? Installing multiple cameras around the conference room can eliminate this problem. You can look at and speak directly to your colleagues, the screen, and your notes. Today, the most popular videoconferencing platforms, including Zoom, Google Meet, and Microsoft Teams, use artificial intelligence (AI, see Chapter 14) to identify who is speaking and change camera views accordingly. These systems are more costly, but they are effective.

Set up high-quality audio for the in-person room. Ensure that the in-person meeting room is equipped with enough high-quality microphones so remote participants can hear everyone in the room. One microphone—or one cellphone set to speakerphone—in the middle of the room is insufficient. Online participants will not be able to hear everyone. Also, remind all participants to be aware of unnecessary noises. Opening a soda, typing loudly on the computer, and opening a piece of candy all create unnecessary noises and the microphone hears everything.

Use extra-large screens to display online participants. An organization can set up a large screen in the middle of a room and then two additional large monitors on each side of the room to display near-life-sized views of the remote participants. This practice can help to give online participants equal status.

Go all virtual into the metaverse. Virtual reality is creating new possibilities. Companies like Spatial (**www.spatial.io**) offer software that enables users to develop near-real-life avatars. These avatars, driven by participants, sit around virtual tables, sip virtual coffees, and share information on virtual whiteboards. Although metaverse meetings currently are highly technical, the possibilities are endless. Moreover, they can make the meeting less expensive because the meeting "hardware"—think whiteboard—is simply computer code. There is no need for expensive cameras, microphones, or physical spaces. Rather, everything is contained in a virtual space that leaders can modify without expensive renovation.

Make use of AI. Cisco's Webex platform now uses AI to translate people's natural and nonverbal gestures into animated images. This technology enables users to perform simple actions like raising their hands or giving a thumbs-up without clicking a button. In addition, Webex features real-time closed-captioning and translation capabilities in more than 100 languages. Advanced noise cancellation features can filter out distracting environmental noises, especially during calls in shared spaces or home offices.

Conclusion

Hybrid meetings will remain a part of the working environment for the foreseeable future. Therefore, companies must continue to invest in solutions that work for all staff—regardless of whether they are in the office or hundreds of kilometres away. Maintaining employee engagement involves making everyone feel seen and heard in meetings. To accomplish this goal, organizations must consider the combination of behaviours and technologies that will create a healthy hybrid environment. When employees are committed and connected, then the entire business will benefit.

Questions

1. **What complications arise when some participants attend in person and others remotely?**
2. **What role might AI play in making meetings more productive?**
3. **How can you use your computer to be better prepared for online meetings?**

Sources: Compiled from Staff Writer, "Cisco Tackles Video-Meeting Fatigue to Empower the Hybrid Work Model," *Tech Financials*, October 3, 2022; E. Roethler, "Yes, the Hybrid Workplace Can Work," *builtinchicago.com*, September 27, 2022; T. Bishop, "GeekWire Podcast: The New World of Hybrid Work, and the Next Generation of Smartphone Users," *GeekWire*, September 24, 2022; K. Errick, "Collaborative Tools Are More Needed Than Performance Tech in Remote Work, Study Says," *Nextgov.com*, September 23, 2022; J. McKendrick, "Remote and In-Person Work Balance Is Key, Even at the Most Virtual of Virtual Companies," *Forbes*, September 23, 2022; G. Kyvik, "Tackling Inequity in Hybrid Meetings: How Can Remote Workers Feel Seen and Heard?" *Telecom Reseller*, September 22, 2022; D. Martinus, "Over 50 Percent of Remote Workers Get Distracted by Emails or Social Media during Meetings," *Mashable SE Asia*, September 21, 2022; P. Goldstein, "How to Fine-Tune Meetings for Hybrid Work Settings," *BizTech*, September 20, 2022; L. Kolondy, "Tesla Struggles with Elon Musk's Strict Return-to-Office Policy," *CNBC.com*, September 14, 2022; S. Stern, "Hybrid Working: Why the Office-Home Balance Is Still a Challenge," *Financial Times*, September 4, 2022; B. Lovejoy, "Apple Return-to-Office Argument Rejected by Apple Together as It Petitions for Flexibility," *9to5Mac.com*, August 22, 2022; J. Stern, "Hybrid Work Meetings Are Hell. Tech Is Trying to Fix Them." *The Wall Street Journal*, June 15, 2022; https://www.accenture.com/us-en/insightsnew/future-workforce-index, accessed October 4, 2022.