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Information Systems in Global Business Today

LEARNING OBJECTIVES

After reading this chapter, you will be able to answer the following questions:

- 1-1** How are information systems transforming business, and why are they so essential for running and managing a business today?
- 1-2** What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?
- 1-3** What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?
- 1-4** How will MIS help my career?

CHAPTER CASES

Smart Stores Reinvent the Retail Space
Will the Coronavirus Pandemic Make Working from Home the New Normal?
Digital Transformation of Healthcare at Singapore's Jurong Health Services
Changes in the Financial Industry: Adyen and Fintech

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Business in the Cloud: Facebook, Google, and eBay Data Centers
UPS Global Operations with the DIAD and Worldport

Instructional Video:
Tour IBM's Raleigh Data Center

MyLab MIS

Discussion Questions: 1-4, 1-5, 1-6; Hands-On MIS Projects: 1-7, 1-8, 1-9, 1-10;
eText with Conceptual Animations

Smart Stores Reinvent the Retail Space

Although there has been an upsurge in online shopping, retail stores are not going away. Some traditional retailers are fighting back by using information technology to provide new ways to bring people into physical stores or enhance their in-store experiences, even with new requirements for social distancing.

Acrelec, a French digital signage company, is piloting technology to help retailers manage store curbside pickups by customers placing orders online. Customers can use a retailer's smartphone app to indicate they are coming to pick up an order, and the Acrelec system will estimate when a customer will arrive at a particular store. Object-recognition cameras identify exactly when a customer's car arrives and where it is parked. Acrelec is especially useful for big-box retailers, grocery stores, and home-improvement stores.

Shelves have become more than just a surface for storing and displaying objects. New systems for "smart" shelves use proximity sensors, 3D cameras, microphones, RFID readers, and weight sensors to enable interactions between shoppers in physical stores and the shelves they're standing in front of. These systems can create a highly personalized shopping experience that fundamentally improves the way shoppers move inside physical stores.

Brands and retailers such as Pepsi, Walmart, and Albertsons are starting to use Smart Shelf by AWM to replicate the benefits of the online experience in physical retail environments. Using super-wide-angle low-light HD cameras, retailers deploying Smart Shelf are able to view and track their products in real-time. The solution improves operational efficiencies by highlighting specific shelves that need product stocking and allows for real-time on-shelf marketing to consumers. When retailers connect Smart Shelf to their mobile apps, they can help shoppers locate products themselves through their smartphones and tablets.

AWM Frictionless is a walk-in, walk-out solution enabling customers to shop as normal and check out by simply exiting the store. The system uses digital shelving and object-recognition cameras to keep track of which customers leave with which items. When customers enter a store, they are required to have mobile device and facial recognition scans, which allow the system to charge their digital accounts when they leave with purchases and receive a receipt via email or text message.



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In March 2020 AWM opened a low-contact cashierless micromarket called QuickEats at a luxury apartment community owned by Greenwood & McKenzie in Santa Ana California. QuickEats utilizes AWM Frictionless and features grab-and-go products such as sodas, water, juice drinks, sandwiches, cheese plates, fruit, and household cleaning items.

AWM Smart Shelf is able to personalize shoppers' experiences when they are in stores based on the items they pick up, even if they don't purchase them. For example, if a customer picks up a box of cookies and then puts it back, the retailer can use the system to offer a discount on the shelf beneath that item the next time the shopper encounters it in the store. Cofounder Kurtis Van Horn believes that Smart Shelf can provide the same level of customization and personalization as found in online shopping to brick-and-mortar stores.

AWM also offers an anonymous consumer behavior tracking application that can direct customers to other parts of a store using digital signage, enabling up-to-the-minute advertising and pricing. AWM solutions can be implemented in a wide range of store sizes and formats, from micromarkets, to convenience stores, to larger-format retailers. Technology is redefining the role of the shelf in retail marketing.

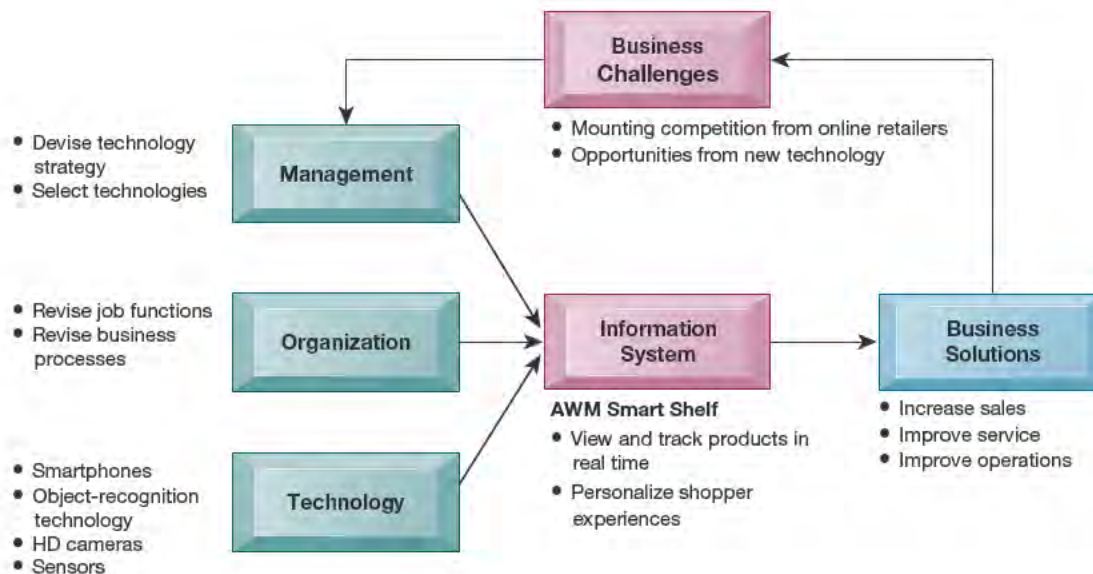
Sources: www.smartshelf.com, accessed April 29, 2020; AWM SmartShelf Launches Southern California's First Autonomous Micromarket in Santa Ana's Nineteen01 Community," Businesswire, March 24, 2020; Jared Council, "Retailers Hope In-Store Tech Will Keep Shoppers in Stores," *Wall Street Journal*, January 15, 2020.

The companies and technologies described here show how essential information systems are today. Today, retail stores are struggling to stay alive and relevant as more shoppers gravitate to online shopping and the Internet. One solution is to use leading-edge innovative information technology to provide new ways of drawing buyers into physical stores and making the in-store buying experience more efficient, safe, and pleasant. The information flows that drive these reimaged retail businesses have become much more digital, making use of mobile tools and object-recognition technology.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. To compete more effectively against online retailers and take advantage of new technology solutions, brick-and-mortar retail stores are using innovative systems based on object-recognition technology, sensors, and smartphones. The use of leading-edge digital technologies to drive business operations and management decisions is a key topic today in the MIS world and will be discussed throughout this text.

It is also important to note that deploying information technology has changed the way customers of Acrelec and AWM Smart Shelf run their businesses. To effectively use new digital tools, these companies had to redesign jobs and procedures for gathering, inputting, and accessing information. These changes had to be carefully planned to make sure they enhanced efficiency, service, and profitability.

Here are some questions to think about: How do Acrelec's and AWM's systems change retail operations? How do they improve the customer experience?



1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

It's not business as usual in the global economy anymore. Information systems and technologies are transforming the global business environment. In 2019, global spending on information technology (IT) and IT services was nearly \$3.8 trillion (Gartner, 2019). In addition, firms spent another \$160 billion on management consulting and services—much of which involves redesigning firms' business operations to take advantage of these new technologies (Statista, 2020). In fact, most of the business value of IT investment derives from these organizational, management, and cultural changes inside firms (Saunders and Brynjolfsson, 2016). Figure 1.1 shows that between 1999 and 2019, capital investment in information technology consisting of IT equipment, software, and research and development (R&D) accounted for over 40 percent of US total capital spending. A similar pattern has occurred globally.

As managers, most of you will work for firms that are intensively using information systems and making large investments in information technology. You will certainly want to know how to invest this money wisely. If you make wise choices, your firm can outperform competitors. If you make poor choices, you will be wasting valuable capital. This book is dedicated to helping you make wise decisions about information technology and information systems.

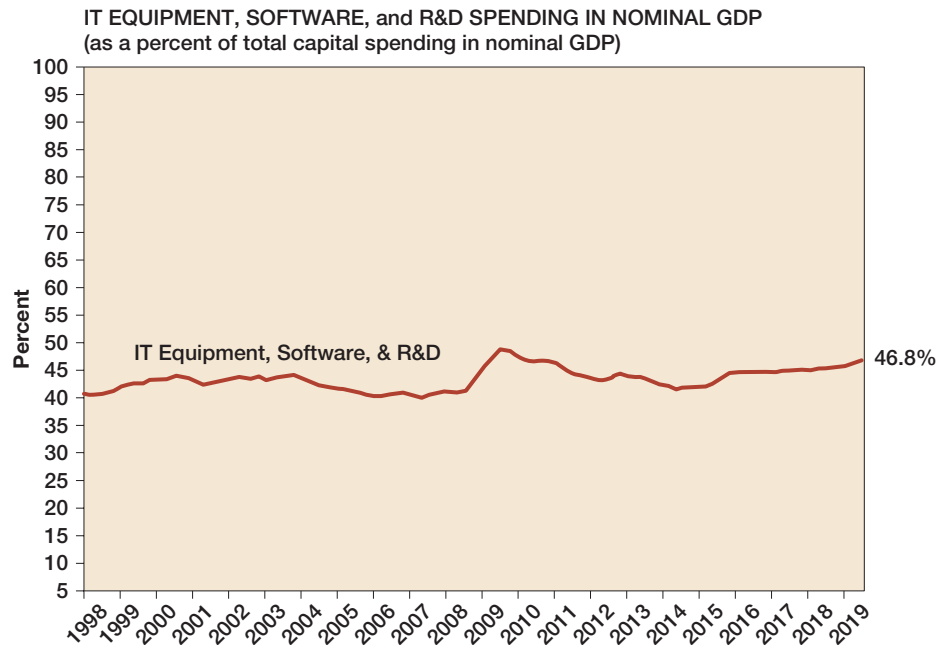
What's New in Management Information Systems?

Plenty. In fact, there's a whole new world of doing business using new technologies for managing and organizing. What makes the MIS field the most exciting area of study in schools of business is the continuous change in technology, management, and business processes. Five changes are of paramount importance.

FIGURE 1.1 INFORMATION TECHNOLOGY CAPITAL INVESTMENT

Information technology capital investment, defined as IT equipment, software and research and development (R&D) spending, amounted to over 40 percent of total US capital spending (in nominal GDP) between 1999 and 2019. A similar pattern has occurred globally.

Source: US Bureau of Economic Analysis.



IT Innovations A continuing stream of information technology innovations is transforming the traditional business world. Examples include the emergence of cloud computing, the growth of a mobile digital business platform based on smartphones and tablet computers, big data and the Internet of Things (IoT), business analytics, machine learning systems, and the use of social networks by managers to achieve business objectives. Most of these changes have occurred in the past few years. These innovations are enabling entrepreneurs and innovative traditional firms to create new products and services, develop new business models, and transform the day-to-day conduct of business. In the process, some old businesses, even industries, are being destroyed while new businesses are springing up.

New Business Models For instance, the emergence of online video services for streaming or downloading, such as Netflix, Apple TV Channels, and Amazon, has forever changed how premium video is distributed and even created. Netflix by early 2020 had attracted more than 167 million subscribers worldwide to what it calls the “Internet TV revolution.” Netflix has moved into premium TV show production with nearly 1,200 original shows in 2019, such as *American Vandal*, *Suburra*, *The Crown*, *Friends From College*, *House of Cards*, and *Orange Is the New Black*, challenging cable and broadcast producers of TV shows, and potentially disrupting cable network dominance of TV show production. Apple has struck deals with major Hollywood studios for recent movies and TV shows. A growing trickle of viewers are unplugging from cable and using only the Internet for entertainment.

E-commerce Expansion E-commerce sales worldwide amounted to nearly \$3.6 trillion in 2019 and are expected to approach \$5 trillion by 2021 (Lipsman, 2019). E-commerce is changing how firms design, produce, and deliver their products and services. E-commerce has reinvented itself again, disrupting the traditional marketing and advertising industry and putting major media and content firms

in jeopardy. Facebook and other social networking sites such as YouTube, Twitter, and Tumblr, along with Netflix, Apple Music, and many other media firms, exemplify the new face of e-commerce in the twenty-first century. They sell services. When we think of e-commerce, we tend to think of selling physical products. While this iconic vision of e-commerce is still very powerful and the fastest-growing form of retail worldwide, growing up alongside is a whole new value stream based on selling services, not goods. It's a services model of e-commerce. Growth in social commerce is spurred by powerful growth of the mobile platform: 98 percent of Facebook's users access the service from mobile phones and tablets. Information systems and technologies are the foundation of this new services-based e-commerce. Mobile retail e-commerce worldwide approached \$2.55 billion in 2020 (and is growing at almost 20 percent a year) (eMarketer, 2020).

Management Changes The management of business firms has changed: With new mobile smartphones, high-speed wireless Wi-Fi networks, and tablets, remote salespeople on the road are only seconds away from their managers' questions and oversight. Management is going mobile. Managers on the move are in direct, continuous contact with their employees. The growth of enterprise-wide information systems with extraordinarily rich data means that managers no longer operate in a fog of confusion but instead have online, nearly instant access to the really important information they need for accurate and timely decisions. In addition to their public uses on the web, social networking tools, wikis, and blogs are becoming important corporate tools for communication, collaboration, and information sharing.

Changes in Firms and Organizations Compared to industrial organizations of the previous century, new fast-growing twenty-first-century business firms put less emphasis on hierarchy and structure and more emphasis on employees taking on multiple roles and tasks and collaborating with others on a team. They put greater emphasis on competency and skills rather than position in the hierarchy. They emphasize higher-speed and more-accurate decision making based on data and analysis. They are more aware of changes in technology, consumer attitudes, and culture. They use social media to enter into conversations with consumers and demonstrate a greater willingness to listen to consumers, in part because they have no choice. They show better understanding of the importance of information technology in creating and managing business firms and other organizations. To the extent organizations and business firms demonstrate these characteristics, they are twenty-first-century digital firms.

You can see some of these trends at work in the Interactive Session on Organizations, which examines the impact on work and management as many companies had their employees work remotely during the coronavirus pandemic of 2020.

Globalization Challenges and Opportunities: A Flattened World

Prior to AD 1500, there was no truly global economic system of trade that connected all the continents on earth although there were active regional trade markets. After the sixteenth century, a global trading system began to emerge based on advances in navigation and ship technology. The world trade that ensued after these developments has brought the peoples and cultures of the world much closer together. The Industrial Revolution was really a worldwide phenomenon energized by expansion of trade among nations, making nations both competitors and collaborators in business. The Internet has greatly heightened the competitive tensions among nations as global trade expands

INTERACTIVE SESSION ORGANIZATIONS

Will the Coronavirus Pandemic Make Working from Home the New Normal?

As COVID-19 continued to spread around the globe, companies large and small started to make changes to the way they work, shuttering their offices and requiring most or all of their employees to work remotely from their homes.

- During the pandemic, ClearRisk, which offers integrated, cloud-based software solutions for claims, fleet, incident, and insurance certificate management had its entire staff working from home.
- Many large law firms, including Reed Smith, Baker McKenzie, and Nixon Peabody, closed offices and required work at home during the pandemic. The law firms emphasized that they could continue to serve clients despite office closings and remote work.
- OpenText Corp., a Canadian provider of enterprise information management products, plans to eliminate more than half of its 120 offices globally, with 2000 of its 15,000-person workforce working from home permanently.
- In mid-May 2020, Twitter Inc. notified employees that most of them could work from home indefinitely.

According to a recent MIT report, 34 percent of Americans who previously commuted to work stated that they were working from home by the first week of April 2020 due to the coronavirus outbreak. Prior to the pandemic, the number of people regularly working from home remained in the single digits, with only about 4 percent of the US workforce working from home at least half the time. However, the trend of working from home had been slowly gaining momentum thanks to advances in information technology for remote work and changes in corporate work culture. The coronavirus pandemic may mark a tipping point.

It's likely that many people who started working from home for the first time during the pandemic will continue to do so thereafter. New health guidelines about distancing will require some workplaces to expand to accommodate all their employees or to have a significant percentage of employees work permanently from home.

Information technologies driving these changes include broadband high-speed Internet connections,

laptop computers, tablets, smartphones, email, messaging, and videoconferencing tools. As companies shift their work from face-to-face to remote, video conferencing is becoming the new normal for meetings. People are trying to have good conversations, share critical information, generate new ideas, reach consensus, and make decisions quickly on this platform.

Although less than ideal for face-to-face interactions, videoconferencing is becoming more powerful and affordable. There are many options, including Skype, Skype for Business, Zoom, Microsoft Teams, Amazon Chime, BlueJeans, Cisco's WebEx, GoToMeeting, and Google Meet. Some business people are using the same tools they do in their personal communications, such as FaceTime and Facebook Messenger. (FaceTime now supports group video chat with up to 32 people.)

Video conference software such as WebEx and BlueJeans appears designed for more corporate uses. Other software such as Microsoft's Skype and Zoom feels more consumer-friendly and easier to set up, with free or low-cost versions suitable for smaller businesses. Skype works for video chats, calls, and instant messaging and can handle up to 50 people in a single video call. Skype allows calls to be recorded in case someone misses a meeting. Skype also provides file-sharing capabilities, caller ID, voicemail, a split view mode to keep conversations separate, and screen share on mobile devices.

Up to 1,000 users can participate in a single Zoom video call, and 49 videos can appear on the screen at once. Zoom includes collaboration tools like simultaneous screen-sharing and co-annotation, and the ability to record meetings and generate transcripts. Users can adjust meeting times, select multiple hosts, and communicate via chat if microphones and cameras are turned off.

There are definite benefits to remote work: lower overhead, more flexible schedules, reductions in employee commuting time and attrition rates, and increases in productivity. (Many companies reported that productivity did not suffer when employees worked at home during the pandemic.) According to Global Workplace Analytics, a typical company saves about \$11,000 per half-time telecommuter per year. Working remotely also poses challenges.

Not all employees have access to the Internet at home, and many work in industries that require on-site work. About 80 percent of American adults have high-speed broadband Internet service at home. However, according to a Pew Research Center study, racial minorities, older adults, rural residents, and people with lower levels of education and income are less likely to have in-home broadband service. In addition, one in five American adults access the Internet only through their smartphones. Employees with little children or small apartments find working at home more difficult.

Full-time employees are four times more likely to have remote work options than part-time employees. According to Global Workplace Analytics, a typical remote worker is college-educated, at least 45 years old, and earns an annual salary of \$58,000 while working for a company with more than 100 employees.

Although email and text messaging are very useful, they are not effective tools for communication compared to the information exchange and personal

connection of face-to-face conversations. Remote work also inhibits the creativity and innovative thinking that take place when people interact with each other face-to-face, and videoconferencing is only a partial solution. Studies have found that people working together in the same room tend to solve problems more quickly than remote collaborators, and that team cohesion suffers when members work remotely.

Sources: Dana Mattioli and Konrad Putzier, "The End of the Office," *Wall Street Journal*, May 16-17, 2020; Rani Molla, "This Is the End of the Office as We Know It," *Vox*, April 14, 2020; Josh Lowy, "Overcoming Remote Work Challenges," *MIT Sloan Management Review*, April 9, 2020; Cate Pye, "Coronavirus: What Does the 'New Normal' Mean for How We Work?" *Computer Weekly*, April 3, 2020; Lindsey Jacobson, "As Coronavirus Forces Millions to Work Remotely, the US Economy May Have Reached a 'Tipping Point' in Favor of Working from Home," *CNBC*, March 23, 2020; Derek Thompson, "The Coronavirus Is Creating a Huge, Stressful Experiment in Working from Home," *The Atlantic*, March 13, 2020; Kevin Roose, "Sorry, but Working from Home Is Overrated," *New York Times*, March 10, 2020.

CASE STUDY QUESTIONS

1. Define the problem described in this case. What are the management, organization, and technology issues raised by this problem?
2. Identify the information technologies used to provide a solution to this problem. Was this a successful solution? Why or why not?
3. Will working from home become the dominant way of working in the future? Why or why not?

and strengthened the benefits that flow from trade, and also created significant dislocations in labor markets.

In 2005, journalist Thomas Friedman wrote an influential book declaring the world was now flat, by which he meant that the Internet and global communications had greatly expanded the opportunities for people to communicate with one another and reduced the economic and cultural advantages of developed countries. The United States and European countries were in a fight for their economic lives, according to Friedman, competing for jobs, markets, resources, and even ideas with highly educated, motivated populations in low-wage areas in the less developed world (Friedman, 2007). This globalization presents you and your business with both challenges and opportunities.

A growing percentage of the economy of the United States and other advanced industrial countries in Europe and Asia depends on imports and exports. In 2019, an estimated 30 percent of the world economy resulted from foreign trade of goods and services, both imports and exports. Half of *Fortune* 500 US firms obtain nearly 50 percent of their revenue from foreign operations. For instance, more than 50 percent of Intel's revenues in 2019 came from overseas sales of its microprocessors.

It's not just goods that move across borders. So too do jobs, some of them high-level jobs that pay well and require a college degree. For instance, since 2000, the United States has lost an estimated 5 million manufacturing jobs to offshore, low-wage producers, so manufacturing is now a small part of US employment (less than 9 percent). In a normal year, about 300,000 service jobs move offshore to lower-wage countries, many of them in less-skilled information system occupations but also in tradable service jobs in architecture, financial services, customer call centers, consulting, engineering, and even radiology.

On the plus side, the US economy created 2.6 million new jobs in 2018. Employment in information systems and the other service occupations listed previously has rapidly expanded in sheer numbers, wages, productivity, and quality of work. Outsourcing has actually accelerated the development of new systems in the United States and worldwide by reducing the cost of building and maintaining them. In 2019 job openings in information systems and technologies far exceeded the supply of applicants.

The challenge for you as a business student is to develop high-level skills through education and on-the-job experience that cannot be outsourced. The challenge for your business is to avoid markets for goods and services that can be produced offshore much less expensively. The opportunities are equally immense. Throughout this book you will find examples of companies and individuals who either failed or succeeded in using information systems to adapt to this new global environment.

What does globalization have to do with management information systems? That's simple: everything. The emergence of the Internet into a full-blown international communications system has drastically reduced the costs of operating and transacting on a global scale. Communication between a factory floor in Shanghai and a distribution center in Rapid City, South Dakota, is now instant and virtually free. Customers can now shop in a worldwide marketplace, obtaining price and quality information reliably 24 hours a day. Firms producing goods and services on a global scale achieve extraordinary cost reductions by finding low-cost suppliers and managing production facilities in other countries. Internet service firms, such as Google and eBay, are able to replicate their business models and services in multiple countries without having to redesign their expensive fixed-cost information systems infrastructure. Briefly, information systems enable globalization.

The Emerging Digital Firm

All of the changes we have just described, coupled with equally significant organizational redesign, have created the conditions for a fully digital firm. A digital firm can be defined along several dimensions. A **digital firm** is one in which nearly all of the organization's *significant business relationships* with customers, suppliers, and employees are digitally enabled and mediated. *Core business processes* are accomplished through digital networks spanning the entire organization or linking multiple organizations.

Business processes refer to the set of logically related tasks and behaviors that organizations develop over time to produce specific business results and the unique manner in which these activities are organized and coordinated. Developing a new product, generating and fulfilling an order, creating a marketing plan, and hiring an employee are examples of business processes, and the ways organizations accomplish their business processes can be a source of competitive strength. (A detailed discussion of business processes can be found in Chapter 2.)

Key corporate assets—intellectual property, core competencies, and financial and human assets—are managed through digital means. In a digital firm, any piece of information required to support key business decisions is available at any time and anywhere in the firm.

Digital firms sense and respond to their environments far more rapidly than traditional firms, giving them more flexibility to survive in turbulent times. Digital firms offer extraordinary opportunities for more-flexible global organization and management. In digital firms, both time shifting and space shifting are the norm. *Time shifting* refers to business being conducted continuously, 24/7, rather than in narrow “work day” time bands of 9 a.m. to 5 p.m. *Space shifting* means that work takes place in a global workshop as well as within national boundaries. Work is accomplished physically wherever in the world it is best accomplished.

Many firms, such as Cisco Systems, 3M, and GE, are close to becoming digital firms, using the Internet to drive every aspect of their business. Most other companies are not fully digital, but they are moving toward close digital integration with suppliers, customers, and employees.

Strategic Business Objectives of Information Systems

What makes information systems so essential today? Why are businesses investing so much in information systems and technologies? In the United States, more than 25 million business and financial managers, and 36 million professional workers in the labor force rely on information systems to conduct business. Information systems are essential for conducting day-to-day business in most advanced countries as well as achieving strategic business objectives.

Entire sectors of the economy are nearly inconceivable without substantial investments in information systems. E-commerce firms such as Amazon, eBay, Google, and E*Trade simply would not exist. Today's service industries—finance, insurance, and real estate as well as personal services such as travel, medicine, and education—could not operate without information systems. Similarly, retail firms such as Walmart and Tesco and manufacturing firms such as General Motors and Siemens require information systems to survive and prosper. Just as offices, telephones, filing cabinets, and efficient tall buildings with elevators were once the foundations of business in the twentieth century, information technology is a foundation for business in the twenty-first century.

There is a growing interdependence between a firm's ability to use information technology and its ability to implement corporate strategies and achieve corporate goals (see Figure 1.2). What a business would like to do in five years often depends on what its systems will be able to do. Increasing market share, becoming the high-quality or low-cost producer, developing new products, and increasing employee productivity depend more and more on the kinds and quality of information systems in the organization. The more you understand about this relationship, the more valuable you will be as a manager.

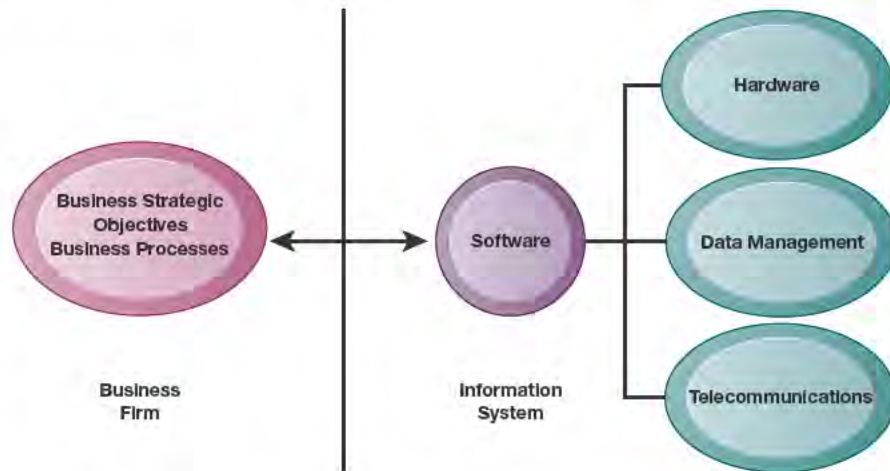
Specifically, business firms invest heavily in information systems to achieve six strategic business objectives: operational excellence; new products, services, and business models; customer and supplier intimacy; improved decision making; competitive advantage; and survival.

Operational Excellence

Businesses continuously seek to improve the efficiency of their operations in order to achieve higher profitability. Information systems and technologies are some of the most important tools available to managers for achieving higher

FIGURE 1.2 THE INTERDEPENDENCE BETWEEN ORGANIZATIONS AND INFORMATION SYSTEMS

In contemporary systems, there is a growing interdependence between a firm's information systems and its business capabilities. Changes in strategy, rules, and business processes increasingly require changes in hardware, software, databases, and telecommunications. Often, what the organization would like to do depends on what its systems will permit it to do.



levels of efficiency and productivity in business operations, especially when coupled with changes in business practices and management behavior.

Walmart, the largest retailer on earth, exemplifies the power of information systems coupled with state-of-the-art business practices and supportive management to achieve world-class operational efficiency. In fiscal year 2019, Walmart achieved \$524 billion in sales—nearly one-tenth of retail sales in the United States—in large part because of its Retail Link system, which digitally links its suppliers to every one of Walmart's stores. As soon as a customer purchases an item, the supplier monitoring the item knows to ship a replacement to the shelf. Walmart is the most efficient retail store in the industry.

New Products, Services, and Business Models

Information systems and technologies are a major enabling tool for firms to create new products and services as well as entirely new business models. A **business model** describes how a company produces, delivers, and sells a product or service to create wealth.

Today's music industry is vastly different from the industry a decade ago. Apple Inc. transformed an old business model of music distribution based on vinyl records, tapes, and CDs into an online, legal distribution model based on its own technology platform. Apple has prospered from a continuing stream of innovations, including the iTunes music service, the iPad, and the iPhone.

Customer and Supplier Intimacy

When a business really knows its customers and serves them well, the customers generally respond by returning and purchasing more. This raises revenues and profits. Likewise with suppliers—the more a business engages its suppliers, the better the suppliers can provide vital inputs. This lowers costs. How to really know your customers or suppliers is a central problem for businesses with millions of offline and online customers.

High-end hotels, such as the Mandarin Oriental hotel group, which operates hotels in Asia, Europe, and the Americas, exemplify the use of information

systems and technologies to achieve customer intimacy. These hotels use computers to keep track of guests' preferences, such as their preferred room temperature, check-in time, frequently dialed telephone numbers, and television programs, and store these data in a large data repository. Individual rooms in the hotels are networked to a central network server computer so that they can be remotely monitored and controlled. When a customer arrives at one of these hotels, the system automatically changes the room conditions, such as dimming the lights, setting the room temperature, or selecting appropriate music, based on the customer's digital profile. The hotels also analyze their customer data to identify their best customers and to develop individualized marketing campaigns based on customers' preferences.

Charles Tyrwhitt, a UK retailer specializing in dress shirts, and JCPenney, a US department store chain, exemplify the use of information systems to enable supplier and customer intimacy. Every time a dress shirt is bought one of their stores, the record of the sale appears immediately on computers in Hong Kong at their supplier. TAL Apparel, a contract manufacturer that produces one in six dress shirts sold in the United States. TAL runs the numbers through a computer model it developed and then decides how many replacement shirts to make and in what styles, colors, and sizes. TAL then sends the shirts to each store, bypassing the retailer's warehouses. These systems reduce inventory costs and ensure that what customers want are actually on the shelves.

Improved Decision Making

Many business managers operate in an information fog bank, never really having the right information at the right time to make an informed decision. Instead, managers rely on forecasts, best guesses, and luck. The result is over- or underproduction of goods and services, misallocation of resources, and poor response times. These poor outcomes raise costs and lose customers. In the past decade, information systems and technologies have made it possible for managers to use real-time data from the marketplace when making decisions.

For instance, Privi Organics Ltd., a leading Indian company that manufactures, supplies, and exports aroma chemical products worldwide, uses the Oracle Human Capital Management system for real-time insight into individual employee information—including performance rating and compensation history. The system helps managers make faster human resource decisions, such as promotions or transfers, by integrating all employee records across the organization. Managers are able to quickly review employee performance ratings for the previous three years and drill down into more details. A digital dashboard helps management view and monitor hiring status in multiple locations, such as the number of open positions and the time taken to fill these positions.

Competitive Advantage

When firms achieve one or more of these business objectives—operational excellence; new products, services, and business models; customer/supplier intimacy; and improved decision making—chances are they have already achieved a competitive advantage. Doing things better than your competitors, charging less for superior products, and responding to customers and suppliers in real time all add up to higher sales and higher profits that your competitors cannot match. Apple Inc., Walmart, and UPS, described later in this chapter, are industry leaders because they know how to use information systems for this purpose.

Survival

Business firms also invest in information systems and technologies because they are necessities of doing business. Sometimes these “necessities” are driven by industry-level changes. For instance, after Barclays Bank introduced the first automated teller machines (ATMs) in London in 1967, its competitors rushed to provide ATMs to their customers to keep up. Today, virtually all large banks around the world have regional ATMs and link to national and international ATM networks, such as Cirrus. Providing ATM services to retail banking customers is simply required in the retail banking business.

Most nations have statutes and regulations that create a legal duty for companies and their employees to retain records, including digital records. For instance, the European Council’s Regulation on Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) and the U.S. Toxic Substances Control Act (1976), which regulates the exposure of employees to toxic chemicals, require firms to retain records on employee exposure for a certain period of time. Many other pieces of national and regional legislation impose significant information retention and reporting requirements on US businesses. Firms turn to information systems to provide the capability to respond to these record management requirements.

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

So far we’ve used *information systems* and *technologies* informally without defining the terms. **Information technology (IT)** consists of all the hardware and software that a firm needs to use in order to achieve its business objectives. This includes not only computer machines, storage devices, and handheld mobile devices but also software, such as the Windows or Linux operating systems, the Microsoft Office desktop productivity suite, and the many thousands of computer programs that can be found in a typical large firm. “Information systems” are more complex and can be best understood by looking at them from both a technology and a business perspective.

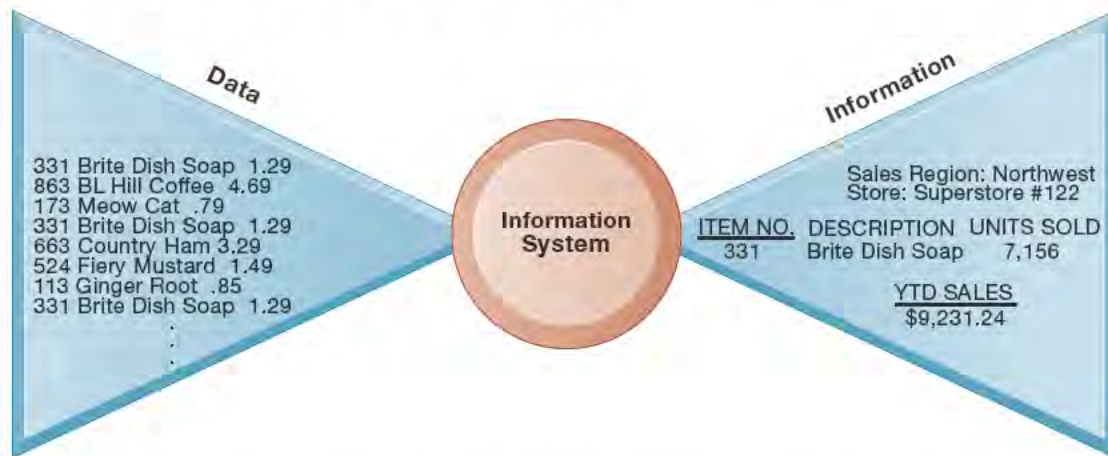
What Is an Information System?

An **information system** can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products.

Information systems contain information about significant people, places, and things within the organization or in the environment surrounding it. By **information** we mean data that have been shaped into a form that is meaningful and useful to human beings. **Data**, in contrast, are streams of raw facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use.

FIGURE 1.3 DATA AND INFORMATION

Raw data from a supermarket checkout counter can be processed and organized to produce meaningful information, such as the total unit sales of dish detergent or the total sales revenue from dish detergent for a specific store or sales territory.



A brief example contrasting information and data may prove useful. Supermarket checkout counters scan millions of pieces of data from bar codes, which describe each product. Such pieces of data can be totaled and analyzed to provide meaningful information, such as the total number of bottles of dish detergent sold at a particular store, which brands of dish detergent were selling the most rapidly at that store or sales territory, or the total amount spent on that brand of dish detergent at that store or sales region (see Figure 1.3).

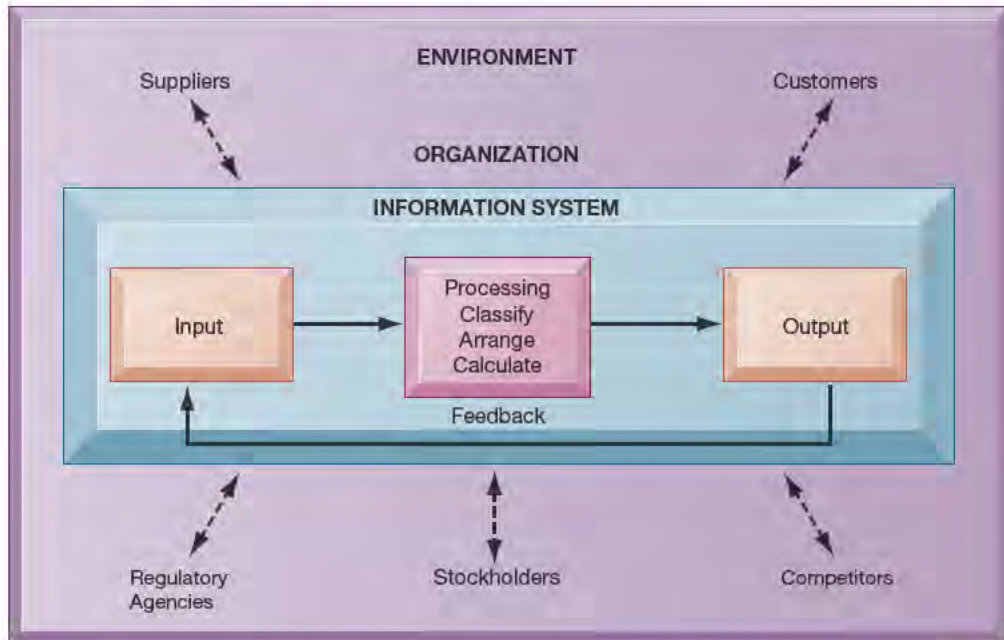
Three activities in an information system produce the information that organizations need to make decisions, control operations, analyze problems, and create new products or services. These activities are input, processing, and output (see Figure 1.4). **Input** captures or collects raw data from within the organization or from its external environment. **Processing** converts this raw input into a meaningful form. **Output** transfers the processed information to the people who will use it or to the activities for which it will be used. Information systems also require **feedback**, which is output that is returned to appropriate members of the organization to help them evaluate or correct the input stage.

In the AWM Smart Shelf system, input includes the digital results from scanning on-shelf products and store shelf identification codes, along with scanned images of items customers have selected for purchase. Computers store and process these data to keep track of the items on each shelf, the items each customer purchases or examines, and a history of the customer's purchases and items of interest. The system then determines what items on what shelves need restocking, and what items should be recommended to each customer. The system provides meaningful information such as all the items sold in a particular store or on a particular store shelf on a specific day, what items have been purchased by a specific customer, and which items need restocking.

Although computer-based information systems use computer technology to process raw data into meaningful information, there is a sharp distinction between a computer and a computer program on the one hand and an information system on the other. Computers and related software programs are the technical foundation, the tools and materials, of modern information systems. Computers provide the equipment for storing and processing information. Computer programs, or software, are sets of operating instructions that direct and control computer processing. Knowing how computers and computer

FIGURE 1.4 FUNCTIONS OF AN INFORMATION SYSTEM

An information system contains information about an organization and its surrounding environment. Three basic activities—input, processing, and output—produce the information organizations need. Feedback is output returned to appropriate people or activities in the organization to evaluate and refine the input. Environmental actors, such as customers, suppliers, competitors, stockholders, and regulatory agencies, interact with the organization and its information systems.



programs work is important in designing solutions to organizational problems, but computers are only part of an information system.

A house is an appropriate analogy. Houses are built with hammers, nails, and wood, but these do not make a house. The architecture, design, setting, landscaping, and all of the decisions that lead to the creation of these features are part of the house and are crucial for solving the problem of putting a roof over one's head. Computers and programs are the hammers, nails, and lumber of computer-based information systems, but alone they cannot produce the information a particular organization needs. To understand information systems, you must understand the problems they are designed to solve, their architectural and design elements, and the organizational processes that lead to the solutions.

Dimensions of Information Systems

To fully understand information systems, you must understand the broader organization, management, and information technology dimensions of systems (see Figure 1.5) and their power to provide solutions to challenges and problems in the business environment. We refer to this broader understanding of information systems, which encompasses an understanding of the management and organizational dimensions of systems as well as the technical dimensions of systems, as **information systems literacy**. **Computer literacy**, in contrast, focuses primarily on knowledge of information technology.

The field of **management information systems (MIS)** tries to achieve this broader information systems literacy. MIS deals with behavioral issues as well as technical issues surrounding the development, use, and impact of information systems used by managers and employees in the firm.

FIGURE 1.5 INFORMATION SYSTEMS ARE MORE THAN COMPUTERS

Using information systems effectively requires an understanding of the organization, management, and information technology shaping the systems. An information system creates value for the firm as an organizational and management solution to challenges posed by the environment.



Let's examine each of the dimensions of information systems—organizations, management, and information technology.

Organizations

Information systems are an integral part of organizations. Indeed, for some companies, such as credit reporting firms, there would be no business without an information system. The key elements of an organization are its people, structure, business processes, politics, and culture. We introduce these components of organizations here and describe them in greater detail in Chapters 2 and 3.

Organizations have a structure that is composed of different levels and specialties. Their structures reveal a clear-cut division of labor. Authority and responsibility in a business firm are organized as a hierarchy, or a pyramid structure. The upper levels of the hierarchy consist of managerial, professional, and technical employees, whereas the lower levels consist of operational personnel.

Senior management makes long-range strategic decisions about products and services as well as ensures financial performance of the firm. **Middle management** carries out the programs and plans of senior management, and **operational management** is responsible for monitoring the daily activities of the business. **Knowledge workers**, such as engineers, scientists, or architects, design products or services and create new knowledge for the firm, whereas **data workers**, such as secretaries or clerks, assist with scheduling and communications at all levels of the firm. **Production or service workers** actually produce the product and deliver the service (see Figure 1.6).

Experts are employed and trained for different business functions. The major **business functions**, or specialized tasks performed by business organizations, consist of sales and marketing, manufacturing and production, finance and accounting, and human resources (see Table 1.1). Chapter 2 provides more detail on these business functions and the ways in which they are supported by information systems.

An organization coordinates work through its hierarchy and through its *business processes*. Most organizations' business processes include formal rules that

TABLE 1.1 MAJOR BUSINESS FUNCTIONS

FUNCTION	PURPOSE
Sales and marketing	Selling the organization's products and services
Manufacturing and production	Producing and delivering products and services
Finance and accounting	Managing the organization's financial assets and maintaining the organization's financial records
Human resources	Attracting, developing, and maintaining the organization's labor force; maintaining employee records

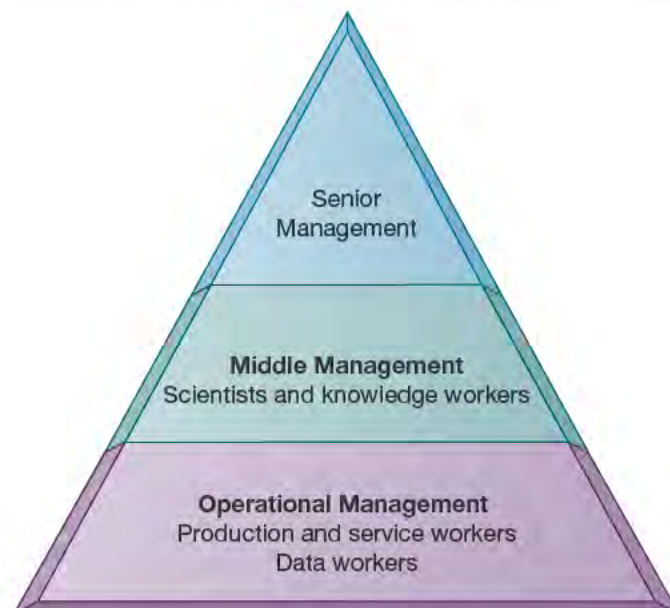
have been developed over a long time for accomplishing tasks. These rules guide employees in a variety of procedures, from writing an invoice to responding to customer complaints. Some of these business processes have been written down, but others are informal work practices, such as a requirement to return telephone calls from coworkers or customers, that are not formally documented. Information systems automate many business processes. For instance, how a customer receives credit or how a customer is billed is often determined by an information system that incorporates a set of formal business processes.

Each organization has a unique **culture**, or fundamental set of assumptions, values, and ways of doing things, that has been accepted by most of its members. You can see organizational culture at work by looking around your university or college. Some bedrock assumptions of university life are that professors know more than students, that the reason students attend college is to learn, and that classes follow a regular schedule.

Parts of an organization's culture can always be found embedded in its information systems. For instance, UPS's first priority is customer service, which is an aspect of its organizational culture that can be found in the company's package tracking systems, which we describe in this section.

FIGURE 1.6 LEVELS IN A FIRM

Business organizations are hierarchies consisting of three principal levels: senior management, middle management, and operational management. Information systems serve each of these levels. Scientists and knowledge workers often work with middle management.



Different levels and specialties in an organization create different interests and points of view. These views often conflict over how the company should be run and how resources and rewards should be distributed. Conflict is the basis for organizational politics. Information systems come out of this cauldron of differing perspectives, conflicts, compromises, and agreements that are a natural part of all organizations. In Chapter 3, we examine these features of organizations and their role in the development of information systems in greater detail.

Management

Management's job is to make sense out of the many situations faced by organizations, make decisions, and formulate action plans to solve organizational problems. Managers perceive business challenges in the environment, they set the organizational strategy for responding to those challenges, and they allocate the human and financial resources to coordinate the work and achieve success. Throughout, they must exercise responsible leadership. The business information systems described in this book reflect the hopes, dreams, and realities of real-world managers.

But managers must do more than manage what already exists. They must also create new products and services and even re-create the organization from time to time. A substantial part of management responsibility is creative work driven by new knowledge and information. Information technology can play a powerful role in helping managers design and deliver new products and services and redirecting and redesigning their organizations. Chapter 12 treats management decision making in detail.

Information Technology

Information technology is one of many tools managers use to cope with change.

Computer hardware is the physical equipment used for input, processing, and output activities in an information system. It consists of the following: computers of various sizes and shapes (including mobile handheld devices); various input, output, and storage devices; and telecommunications devices that link computers together.

Computer software consists of the detailed, preprogrammed instructions that control and coordinate the computer hardware components in an information system. Chapter 5 describes the contemporary software and hardware platforms used by firms today in greater detail.

Data management technology consists of the software governing the organization of data on physical storage media. More detail on data organization and access methods can be found in Chapter 6.

Networking and telecommunications technology, consisting of both physical devices and software, links the various pieces of hardware and transfers data from one physical location to another. Computers and communications equipment can be connected in networks for sharing voice, data, images, sound, and video. A **network** links two or more computers to share data or resources, such as a printer.

The world's largest and most widely used network is the **Internet**. The Internet is a global "network of networks" that uses universal standards (described in Chapter 7) to connect millions of networks in more than 230 countries around the world.

The Internet has created a new "universal" technology platform on which to build new products, services, strategies, and business models. This same technology platform has internal uses, providing the connectivity to link different systems and networks within the firm. Internal corporate networks based on Internet

technology are called **intranets**. Private intranets extended to authorized users outside the organization are called **extranets**, and firms use such networks to coordinate their activities with other firms for making purchases, collaborating on design, and other interorganizational work. For most business firms today, using Internet technology is both a business necessity and a competitive advantage.

The **World Wide Web** is a service provided by the Internet that uses universally accepted standards for storing, retrieving, formatting, and displaying information in a page format on the Internet. Web pages contain text, graphics, animations, sound, and video and are linked to other web pages. By clicking on highlighted words or buttons on a web page, you can link to related pages to find additional information and links to other locations on the web. The web can serve as the foundation for new kinds of information systems such as UPS's web-based package tracking system described below.

All of these technologies, along with the people required to run and manage them, represent resources that can be shared throughout the organization and constitute the firm's **information technology (IT) infrastructure**. The IT infrastructure provides the foundation, or *platform*, on which the firm can build its specific information systems. Each organization must carefully design and manage its IT infrastructure so that it has the set of technology services it needs for the work it wants to accomplish with information systems. Chapters 5 through 8 of this book examine each major technology component of information technology infrastructure and show how they all work together to create the technology platform for the organization. The Interactive Session on Technology describes some examples of the technologies used in computer-based information systems today.

UPS's global delivery system provides another example. UPS invests heavily in information systems technology to make its business more efficient and customer oriented. It uses an array of information technologies, including bar code scanning systems, wireless networks, large mainframe computers, handheld computers, the Internet, and many different pieces of software for tracking packages, calculating fees, maintaining customer accounts, and managing logistics.

Let's identify the organization, management, and technology elements in the UPS package tracking system. The organization element anchors the package tracking system in UPS's sales and production functions (the main product of UPS is a service—package delivery). It specifies the required procedures for identifying packages with both sender and recipient information, taking inventory, tracking the packages en route, and providing package status reports for UPS customers and customer service representatives.

The system must also provide information to satisfy the needs of managers and workers. UPS drivers need to be trained in both package pickup and delivery procedures and in how to use the package tracking system so that they can work efficiently and effectively. UPS customers may need some training to use UPS in-house package tracking software or the UPS website.

UPS's management is responsible for monitoring service levels and costs and for promoting the company's strategy of combining low cost and superior service. Management decided to use computer systems to increase the ease of sending a package using UPS and of checking its delivery status, thereby reducing delivery costs and increasing sales revenues.

The technology supporting this system consists of handheld computers, bar code scanners, desktop computers, wired and wireless communications networks, UPS's data center, storage technology for the package delivery data, UPS in-house package tracking software, and software to access the web. The result is an information system solution to the business challenge of providing a high level of service with low prices in the face of mounting competition.

INTERACTIVE SESSION TECHNOLOGY

Digital Transformation of Healthcare at Singapore's Jurong Health Services

Jurong Health Services (JurongHealth) is one of Singapore's six public healthcare clusters. Healthcare clusters provide holistic and integrated care when patients move from one care setting, like a clinic, to another, like a hospital. JurongHealth primarily manages the 700-bed Ng Teng Fong General Hospital, the 400-bed Jurong Community Hospital, and the Jurong Medical Center, all of which are located in western Singapore.

JurongHealth's goal is to provide transformative medical care for its patients through the use of innovative information technologies. Underscoring this commitment, in 2016 JurongHealth's Ng Teng Fong General Hospital became the first hospital in Singapore and the ASEAN region, and fifth in Asia-Pacific, to receive the highest level of the Healthcare Information and Management Systems Society (HIMSS) Electronic Medical Record Adoption Model Award, which measures a hospital's implementation of IT systems.

JurongHealth has integrated more than 50 healthcare IT systems as part of the Project OneCare initiative. The systems' implementation and integration took four years and has enabled the hospital to become paperless, chartless, and filmless. For instance, self-service kiosks now enable patients to register themselves merely by scanning their national identification cards and obtaining a queue number generated by the Enterprise Queue Management System. This unique number is used throughout the patient's visit for all service itineraries in the hospital. Patients refer to live screens located in the waiting areas that display a real-time queue status showing their turn. This system has not only helped JurongHealth to cut down on expenses but also to improve efficiency, as patients do not need different numbers for different services. It reduces waiting time and increases patient satisfaction.

Similarly, the Visitor Management System self-service kiosks enable visitors to scan their identification cards and register themselves to gain access to hospital wards. Visitors can also register themselves and obtain an e-pass from the Visitor Registration counters. The identification card or e-pass is scanned at the gantry when entering and leaving the ward. The gantry not only logs visitor information but also tracks staff, who must also use the same gantries to enter the wards. The Visitor Management

System enables the hospital to both control access to the wards and track or contact visitors and staff if necessary.

Another IT system implemented is the Warehouse Management System, which eliminates the tedious process of manually counting inventory. The system uses passive radio frequency identification (RFID) technology and a two-bin shelving system to automate inventory top-up requests and improve inventory management. Once the primary compartment of the storage bin is empty, the clinical staff transfers the relevant RFID tag into a drop-box, where the reader automatically sends a request for drug replenishment, thus avoiding stock-outs.

JurongHealth has also implemented a Real-Time Location Tracking System to automatically track patients and medical equipment using Wi-Fi triangulation, low frequency excitors, and about 6,000 active RFID tags attached to patients or medical equipment. These tags continuously communicate with the low frequency excitors to transmit data to the backend system for processing, allowing hospital staff to precisely locate patients and equipment, thus eliminating the need for tedious manual searching.

JurongHealth made a conscious effort to ensure that the different IT systems would not be stand-alone. The hospital thus implemented an integrated Electronic Medical Record (EMR) system that combines all the functional modules of the hospital in addition to being interfaced with 140 medical devices and equipment. Using the vendor-neutral Medical Devices Middleware Integration System, data from these medical devices is directly uploaded into the EMR system, so that the clinical staff no longer has to manually enter such readings, reducing the likelihood of charting errors. Being vendor-neutral also means the freedom to adopt best-of-breed individual modules as well as a lack of reliance on a single vendor.

Since the implementation of the EMR system, JurongHealth has continued to move forward, particularly in response to the COVID-19 pandemic. In September 2020, the hospital introduced a series of measures to make the facilities more secure and infection-free. For instance, they deployed a security robot to patrol the grounds and a second "Kenobi" (a security and concierge robot) to carry out thermal scanning of visitors. Drones have also been deployed

to carry out inspections and surveillance. In addition, as an immediate response to the pandemic, and as a longer-term solution to infection control, new touch-free technology has been introduced to operate patient and visitor lifts.

IT has played a key role in enabling JurongHealth to achieve its mission of providing world-class medical care at an affordable cost. As a result, JurongHealth has developed a reputation as a leading technology-driven healthcare provider as well as a role model not only in Singapore but also the entire region. This is also evident from its many accolades, which include awards for IT-driven transformation and for overall organizational transformation.

CASE STUDY QUESTIONS

1. What technologies are used by JurongHealth? What purpose do they serve?
2. Search the web for RFID. Suggest an example of how RFID can be used for locating and tracking people.

*Case contributed by Neerja Sethi and Vijay Sethi,
Nanyang Technological University*

Sources: "Combating Covid-19: A Birth of Innovations," The Straits Times, September 29, 2020; Salma Khalik, "Singapore on Track to Have One of World's Most IT-enabled Healthcare Systems," The Straits Times, June 2, 2017; JurongHealth, "Awards & Accolades," www.juronghealth.com.sg, accessed January 5, 2017; P. Bhunia, "The JurongHealth IT Journey—Integrating IT from the Ground-Up into a New Digital Hospital," opengovasia.com, November 13, 2016; IHIS, "Ng Teng Fong General Hospital Becomes First in Singapore and ASEAN to Achieve HIMSS Analytics EMRAM Stage 7 Award," Press Release, www.ihis.com, October 7, 2016; "Our Milestones," www.juronghealth.com.sg, October 2016; Ai Lei Tao, "Singapore's Jurong Health Services: Transforming Healthcare Through Data Technologies," computerweekly.com, April 16, 2016; A. Shukla, "Singapore Hospitals Deliver Enhanced Care to Patients by Integrating Their IT Systems," www.cio-asia.com, March 17, 2016; IHIS, "Integrated Healthcare IT Systems at Ng Teng Fong General Hospital and Jurong Community Hospital Win the Project of the Year Award at the SPMI Symposium 2016," Press Release, www.ihis.com, March 14, 2016; J. Kelleher, "JurongHealth Services CIO Discusses the Fully Integrated EMR Suite, Hospital ICT Systems and Achieving HIMSS EMRAM Stage 6," opengovasia.com, February 18, 2016.

3. What information systems are implemented by JurongHealth? Describe the input, processing, and output of any one such system.
4. Why are information systems important for JurongHealth?

It Isn't Just Technology: A Business Perspective on Information Systems

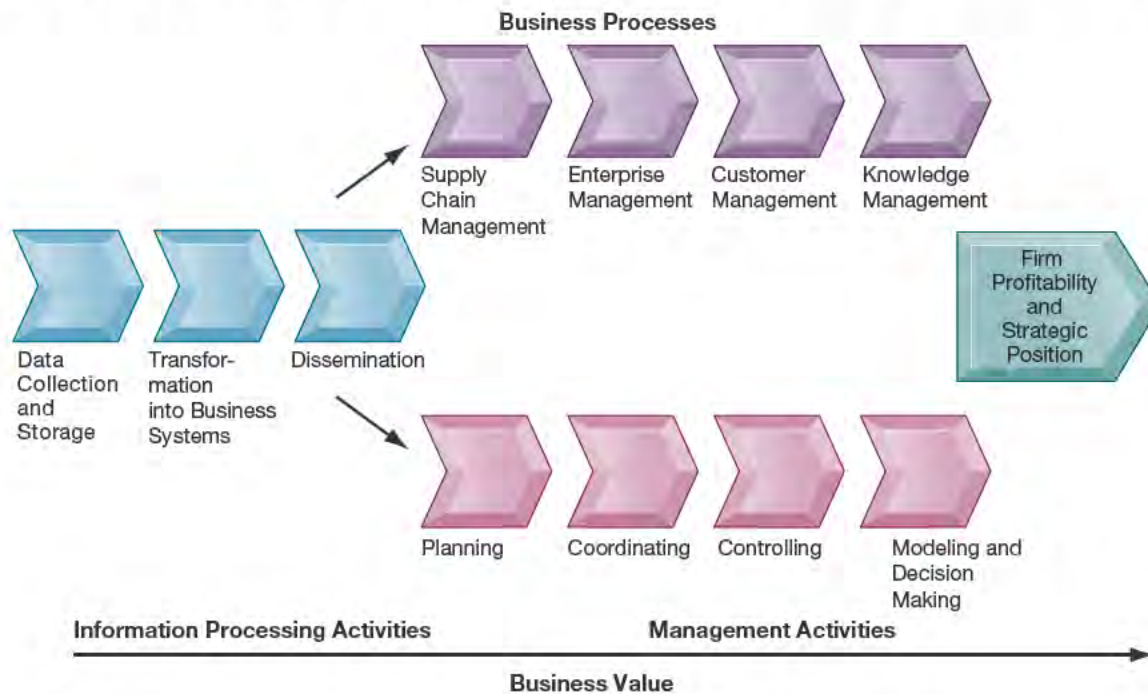
Managers and business firms invest in information technology and systems because they provide real economic value to the business. The decision to build or maintain an information system assumes that the returns on this investment will be superior to other investments in buildings, machines, or other assets. These superior returns will be expressed as increases in productivity, as increases in revenues (which will increase the firm's stock market value), or perhaps as superior long-term strategic positioning of the firm in certain markets (which will produce superior revenues in the future).

We can see that from a business perspective, an information system is an important instrument for creating value for the firm. Information systems enable the firm to increase its revenue or decrease its costs by providing information that helps managers make better decisions or that improves the execution of business processes. For example, the information system for analyzing supermarket checkout data illustrated in Figure 1.3 can increase firm profitability by helping managers make better decisions as to which products to stock and promote in retail supermarkets.

Every business has an information value chain, illustrated in Figure 1.7, in which raw information is systematically acquired and then transformed through various stages that add value to that information. The value of an information system to a business, as well as the decision to invest in any new information system, is, in large part, determined by the extent to which the system will lead to better management decisions, more efficient business processes, and higher

FIGURE 1.7 THE BUSINESS INFORMATION VALUE CHAIN

From a business perspective, information systems are part of a series of value-adding activities for acquiring, transforming, and distributing information that managers can use to improve decision making, enhance organizational performance, and, ultimately, increase firm profitability.



firm profitability. Although there are other reasons why systems are built, their primary purpose is to contribute to corporate value.

The business perspective calls attention to the organizational and managerial nature of information systems. An information system represents an organizational and management solution, based on information technology, to a challenge or problem posed by the environment. Every chapter in this book begins with a short case study that illustrates this concept. A diagram at the beginning of each chapter illustrates the relationship between a business challenge and resulting management and organizational decisions to use IT as a solution to challenges generated by the business environment. You can use this diagram as a starting point for analyzing any information system or information system problem you encounter.

Review the diagram at the beginning of this chapter. The diagram shows how the AWM Smart Shelf system helps solve the business problem of brick-and-mortar stores losing market share to online retailers. This system provides a solution that takes advantage of opportunities provided by new object-recognition and wireless digital technology.

AWM Smart Shelf digitally enables key business processes for inventory management, sales, and marketing, helping retailers improve their overall business performance. The diagram also illustrates how management, technology, and organizational elements work together to create the systems.

Complementary Assets: Organizational Capital and the Right Business Model

Awareness of the organizational and managerial dimensions of information systems can help us understand why some firms achieve better results from their information systems than others. Studies of returns from information

TABLE 1.2 COMPLEMENTARY SOCIAL, MANAGERIAL, AND ORGANIZATIONAL ASSETS REQUIRED TO OPTIMIZE RETURNS FROM INFORMATION TECHNOLOGY INVESTMENTS

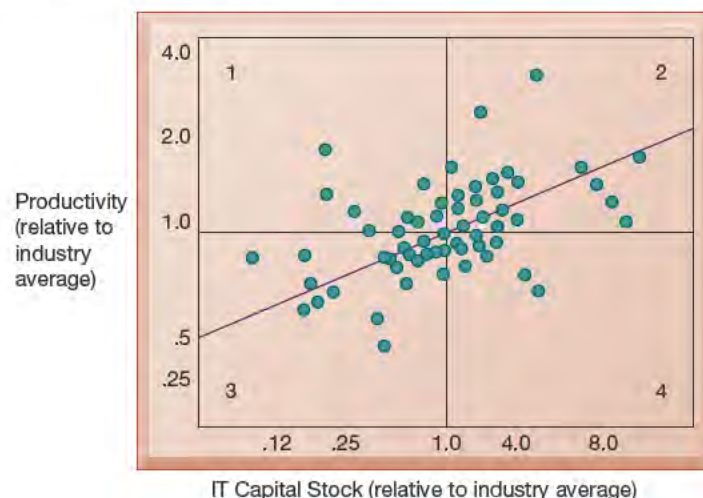
Organizational assets	Supportive organizational culture that values efficiency and effectiveness Appropriate business model Efficient business processes Decentralized authority Distributed decision-making rights Strong IS development team
Managerial assets	Strong senior management support for technology investment and change Incentives for management innovation Teamwork and collaborative work environments Training programs to enhance management decision skills Management culture that values flexibility and knowledge-based decision making
Social assets	The Internet and telecommunications infrastructure IT-enriched educational programs raising labor force computer literacy Standards (both government and private sector) Laws and regulations creating fair, stable market environments Technology and service firms in adjacent markets to assist implementation

technology investments show that there is considerable variation in the returns firms receive (see Figure 1.8). Some firms invest a great deal and receive a great deal (quadrant 2); others invest an equal amount and receive few returns (quadrant 4). Still other firms invest little and receive much (quadrant 1), whereas

FIGURE 1.8 VARIATION IN RETURNS ON INFORMATION TECHNOLOGY INVESTMENT

Although, on average, investments in information technology produce returns far above those returned by other investments, there is considerable variation across firms.

Source: Brynjolfsson, Erik, and Lorin M. Hitt. "Beyond Computation: Information Technology, Organizational Transformation, and Business Performance." *Journal of Economic Perspectives* 14, No. 4 (2000).



others invest little and receive little (quadrant 3). This suggests that investing in information technology does not by itself guarantee good returns. What accounts for this variation among firms?

The answer lies in the concept of complementary assets. Information technology investments alone cannot make organizations and managers more effective unless they are accompanied by supportive values, structures, and behavior patterns in the organization and other complementary assets. Business firms need to change how they do business before they can really reap the advantages of new information technologies.

Complementary assets are those assets required to derive value from a primary investment (Teece, 1998). For instance, to realize value from automobiles requires substantial complementary investments in highways, roads, gasoline stations, repair facilities, and a legal regulatory structure to set standards and control drivers.

Research indicates that firms that support their technology investments with investments in complementary assets, such as new business models, new business processes, management behavior, organizational culture, or training, receive superior returns, whereas those firms failing to make these complementary investments receive less or no returns on their information technology investments (Brynjolfsson, 2005; Brynjolfsson and Hitt, 2000; Laudon, 1974). These investments in organization and management are also known as **organizational and management capital**.

Table 1.2 lists the major complementary investments that firms need to make to realize value from their information technology investments. Some of this investment involves tangible assets, such as buildings, machinery, and tools. However, the value of investments in information technology depends to a large extent on complementary investments in management and organization.

Key organizational complementary investments are a supportive business culture that values efficiency and effectiveness, an appropriate business model, efficient business processes, decentralization of authority, highly distributed decision rights, and a strong information system (IS) development team.

Important managerial complementary assets are strong senior management support for change, incentive systems that monitor and reward individual innovation, an emphasis on teamwork and collaboration, training programs, and a management culture that values flexibility and knowledge.

Important social investments (not made by the firm but by the society at large, other firms, governments, and other key market actors) are the Internet and the supporting Internet culture, educational systems, network and computing standards, regulations and laws, and the presence of technology and service firms.

Throughout the book, we emphasize a framework of analysis that considers technology, management, and organizational assets and their interactions. Perhaps the single most important theme in the book, reflected in case studies and exercises, is that managers need to consider the broader organization and management dimensions of information systems to understand current problems as well as to derive substantial above-average returns from their information technology investments. As you will see throughout the text, firms that can address these related dimensions of the IT investment are, on average, richly rewarded.

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

The study of information systems is a multidisciplinary field. No single theory or perspective dominates. Figure 1.9 illustrates the major disciplines that contribute problems, issues, and solutions in the study of information systems. In general, the field can be divided into technical and behavioral approaches. Information systems are sociotechnical systems. Though they are composed of machines, devices, and “hard” physical technology, they require substantial social, organizational, and intellectual investments to make them work properly.

Technical Approach

The technical approach to information systems emphasizes mathematically based models to study information systems as well as the physical technology and formal capabilities of these systems. The disciplines that contribute to the technical approach are computer science, management science, and operations research.

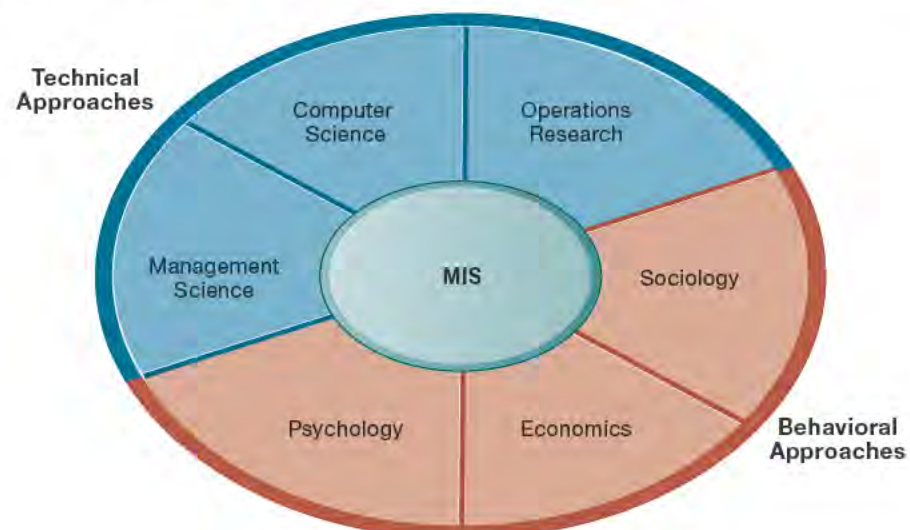
Computer science is concerned with establishing theories of computability, methods of computation, and methods of efficient data storage and access. Management science emphasizes the development of models for decision-making and management practices. Operations research focuses on mathematical techniques for optimizing selected parameters of organizations, such as transportation, inventory control, and transaction costs.

Behavioral Approach

An important part of the information systems field is concerned with behavioral issues that arise in the development and long-term maintenance of information systems. Issues such as strategic business integration, design, implementation,

FIGURE 1.9 CONTEMPORARY APPROACHES TO INFORMATION SYSTEMS

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines.



utilization, and management cannot be explored usefully with the models used in the technical approach. Other behavioral disciplines contribute important concepts and methods.

For instance, sociologists study information systems with an eye toward how groups and organizations shape the development of systems and also how systems affect individuals, groups, and organizations. Psychologists study information systems with an interest in how human decision makers perceive and use formal information. Economists study information systems with an interest in understanding the production of digital goods, the dynamics of digital markets, and how new information systems change the control and cost structures within the firm.

The behavioral approach does not ignore technology. Indeed, information systems technology is often the stimulus for a behavioral problem or issue. But the focus of this approach is generally not on technical solutions. Instead, it concentrates on changes in attitudes, management and organizational policy, and behavior.

Approach of This Text: Sociotechnical Systems

Throughout this book, you will find a rich story with four main actors: suppliers of hardware and software (the technologists); business firms making investments and seeking to obtain value from the technology; managers and employees seeking to achieve business value (and other goals); and the contemporary legal, social, and cultural context (the firm's environment). Together these actors produce what we call *management information systems*.

The study of management information systems (MIS) arose to focus on the use of computer-based information systems in business firms and government agencies. MIS combines the work of computer science, management science, and operations research with a practical orientation toward developing system solutions to real-world problems and managing information technology resources. It is also concerned with behavioral issues surrounding the development, use, and impact of information systems, which are typically discussed in the fields of sociology, economics, and psychology.

Our experience as academics and practitioners leads us to believe that no single approach effectively captures the reality of information systems. The successes and failures of information systems are rarely all technical or all behavioral. Our best advice to students is to understand the perspectives of many disciplines. Indeed, the challenge and excitement of the information systems field are that it requires an appreciation and tolerance of many different approaches.

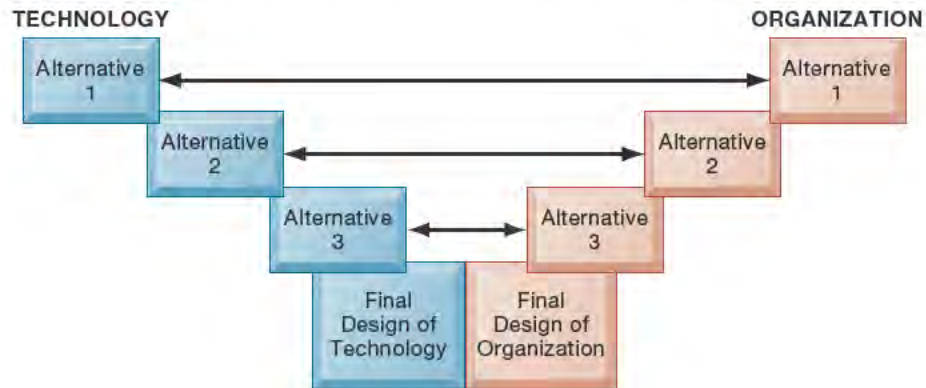
The view we adopt in this book is best characterized as the **sociotechnical view** of systems. In this view, optimal organizational performance is achieved by jointly optimizing both the social and technical systems used in production.

Adopting a sociotechnical systems perspective helps to avoid a purely technological approach to information systems. For instance, the fact that information technology is rapidly declining in cost and growing in power does not necessarily or easily translate into productivity enhancement or bottom-line profits. The fact that a firm has recently installed an enterprise-wide financial reporting system does not necessarily mean that it will be used, or used effectively. Likewise, the fact that a firm has recently introduced new business procedures and processes does not necessarily mean employees will be more productive in the absence of investments in new information systems to enable those processes.

In this book, we stress the need to optimize the firm's performance as a whole. Both the technical and behavioral components need attention. This means that technology must be changed and designed in such a way as to fit

FIGURE 1.10 A SOCIOTECHNICAL PERSPECTIVE ON INFORMATION SYSTEMS

In a sociotechnical perspective, the performance of a system is optimized when both the technology and the organization mutually adjust to one another until a satisfactory fit is obtained.



organizational and individual needs. Sometimes, the technology may have to be “de-optimized” to accomplish this fit. For instance, mobile phone users adapt this technology to their personal needs, and as a result manufacturers quickly seek to adjust the technology to conform to user expectations. Organizations and individuals must also be changed through training, learning, and planned organizational change to allow the technology to operate and prosper. Figure 1.10 illustrates this process of mutual adjustment in a sociotechnical system.



1-4 How will MIS help my career?

Here is how Chapter 1 and this text can help you find an entry-level job as a financial client support and sales assistant.

The Company

Power Financial Analytics Data Services, a data and software company serving the financial industry with offices in London, New York, Sydney, and Singapore, is looking to fill an entry-level position for a financial client support and sales assistant. The company has 1,600 employees, many of whom are consultants showing clients how to work with its powerful financial analytics software and data products.

Position Description

The financial client support and sales assistant will be part of a team in the company's consulting services. Consulting teams combine a thorough understanding of finance and technology with specific expertise in Power Financial Analytics Data Services software and assist clients in a variety of ways. The

company provides on-the-job training in its software and consulting methods.

Job responsibilities include:

- Supporting Financial Analytics Data Services applications.
- Helping the team create custom models and screens.
- Training clients in their offices and at seminars.
- Providing expert consultation to clients by telephone and on-site.

Job Requirements

- Recent college graduate or investment professional with one to two years of experience. Applicants with backgrounds in finance, MIS, economics, accounting, business administration, and mathematics are preferred
- Knowledge of or interest in learning about financial markets
- Sound working knowledge of spreadsheets
- Very strong communication and interpersonal skills
- Strong desire to learn in rapidly changing environment

Interview Questions

1. What is your background in finance? What courses did you take? Have you ever worked in the financial industry? What did you do there?
2. What is your proficiency level with spreadsheet software? What work have you done with Excel spreadsheets? Can you show examples of your work?
3. Are you able to discuss current trends in the financial industry and how they impact Power Financial's business model and client base?
4. Did you ever work with clients? Can you give examples of how you provided client service or support?
5. Can you give us an example of a finance-related problem or other business problem that you helped solve? Did you do any writing and analysis? Can you provide examples?

Author Tips

1. Use the web to learn about financial markets and the financial industry.
2. Use the web to research the company, its financial products, and the tools and services it offers customers. Learn what you can about its consulting services. Additionally, examine the company's social medial channels, such as LinkedIn and Facebook, for trends and themes.
3. Inquire exactly how you would be using spreadsheets for this job. Provide examples of how you used spreadsheets to solve problems in the classroom or for a job assignment. Show the spreadsheet work you did in finance.
4. Bring examples of your writing (including some from your Digital Portfolio described in MyLab MIS) demonstrating your analytical skills and project experience. Be prepared to discuss how you helped customers solve a business problem or the business problem solving you did for your courses.

REVIEW SUMMARY

1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

Organizations are trying to become more competitive and efficient by digitally enabling their core business processes and evolving into digital firms. The Internet has stimulated globalization by dramatically reducing the costs of producing, buying, and selling goods on a global scale. New information system trends include the emerging mobile digital platform, big data (including IoT), more remote management, democratization of decision making, machine learning systems, and the growing use of social media in business.

Information systems are a foundation for conducting business today. In many industries, survival and the ability to achieve strategic business goals are difficult without extensive use of information technology. Businesses today use information systems to achieve six major objectives: operational excellence; new products, services, and business models; customer/supplier intimacy; improved decision making; competitive advantage; and day-to-day survival.

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

From a technical perspective, an information system collects, stores, and disseminates information from an organization's environment and internal operations to support organizational functions and decision making, communication, coordination, control, analysis, and visualization. Information systems transform raw data into useful information through three basic activities: input, processing, and output.

From a business perspective, an information system provides a solution to a problem or challenge facing a firm and represents a combination of management, organization, and technology elements. The management dimension of information systems involves issues such as leadership, strategy, and management behavior. The technology dimension consists of computer hardware, software, data management technology, and networking/telecommunications technology (including the Internet). The organization dimension of information systems involves issues such as the organization's hierarchy, functional specialties, business processes, culture, and political interest groups.

In order to obtain meaningful value from information systems, organizations must support their technology investments with appropriate complementary investments in organizations and management. These complementary assets include new business models and business processes, supportive organizational culture and management behavior, and appropriate technology standards, regulations, and laws. New information technology investments are unlikely to produce high returns unless businesses make the appropriate managerial and organizational changes to support the technology.

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines. The disciplines that contribute to the technical approach focusing on formal models and capabilities of systems are computer science, management science, and operations research. The disciplines contributing to the behavioral approach focusing on the design, implementation, management, and business impact of systems are psychology, sociology, and economics. A sociotechnical view of systems considers both technical and social features of systems and solutions that represent the best fit between them.

Key Terms

- Business functions*, 49
- Business model*, 44
- Business processes*, 42
- Complementary assets*, 57
- Computer hardware*, 51
- Computer literacy*, 48
- Computer software*, 51
- Culture*, 50
- Data*, 46
- Data management technology*, 51
- Data workers*, 49
- Digital firm*, 42
- Extranets*, 52
- Feedback*, 47
- Information*, 46
- Information system*, 46
- Information systems literacy*, 48
- Information technology (IT)*, 46
- Information technology (IT) infrastructure*, 52
- Input*, 47
- Internet*, 51
- Intranets*, 52
- Knowledge workers*, 49
- Management information systems (MIS)*, 48
- Middle management*, 49
- Network*, 51
- Networking and telecommunications technology*, 51
- Operational management*, 49
- Organizational and management capital*, 57
- Output*, 47
- Processing*, 47
- Production or service workers*, 49
- Senior management*, 49
- Sociotechnical view*, 59
- World Wide Web*, 52

MyLab MIS

To complete the problems with MyLab MIS, go to the EOC Discussion Questions in MyLab MIS.

Review Questions

1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

- Describe how information systems have changed the way businesses operate and their products and services.
- Identify three major new information system trends.
- Describe the characteristics of a digital firm.
- Describe the challenges and opportunities of globalization in a “flattened” world.
- List and describe six reasons why information systems are so important for business today.

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

- Explain the differences between information and data. Why is the former essential to the latter?
- Describe the three activities in an information system that produce the information that organizations need.

- Explain why organizations have a structure composed of different levels and specialties.
- Describe how the parts of an organization's culture can be found embedded in its information systems.
- Describe the features of an organization's information value chain.
- Based on what you have read, identify the key elements of organizational and management capital.

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

- List and describe each discipline that contributes to a technical approach to information systems.
- List and describe each discipline that contributes to a behavioral approach to information systems.
- Describe the sociotechnical perspective on information systems.

Discussion Questions

1-4 MyLab MIS Information systems are too important to be left to computer specialists. Do you agree? Why or why not?

1-5 MyLab MIS If you were setting up the website for a professional football team, what management, organization, and technology issues might you encounter?

1-6 MyLab MIS What are some of the organizational, managerial, and social complementary assets that help make UPS's information systems so successful?

Hands-On MIS Projects

The projects in this section give you hands-on experience in analyzing financial reporting and inventory management problems, using data management software to improve management decision making about increasing sales, and using Internet software for researching job requirements. Visit MyLab MIS to access this chapter's Hands-On MIS Projects.

Management Decision Problems

- 1-7** Magical Toys is a South African toy store chain. The toys are sold in their five stores and from their own web shop. Each Tuesday, management needs sales reports from last week's activities. Work at the stores is hectic, so usually at least one store fails to deliver the report, making it impossible to sum up the previous week's sales. The reports, sent by email as spreadsheets, sometimes have inconclusive or erroneous data, and following up means that employees are unable to give their full focus to the customers. Some errors in the spreadsheets may also cause the purchasing manager to place unnecessary purchase orders. What are the main issues that Magical Toys faces in the absence of an information system? How could an information system be of help, and what issues can an information system not solve?
- 1-8** Diskonto operates deep-discount stores in Estonia offering housewares, cleaning supplies, clothing, health and beauty aids, and packaged food, with most items selling for a very low price. Its business model calls for keeping costs as low as possible. The company has no automated method for keeping track of inventory at each store. Managers know approximately how many cases of a particular product the store is supposed to receive when a delivery truck arrives, but the stores lack technology for scanning the cases or verifying the item count inside the cases. Merchandise losses from theft or other mishaps have been rising and now represent more than 3 percent of total sales. What decisions have to be made before investing in an information system solution?

Improving Decision Making: Using Databases to Analyze Sales Trends

Software skills: Database querying and reporting

Business skills: Sales trend analysis

- 1-9** In this project, you will start out with raw transactional sales data and use Microsoft Access database software to develop queries and reports that help managers make better decisions about product pricing, sales promotions, and inventory replenishment. In MyLab MIS, you can find a Store and Regional Sales Database developed in Microsoft Access. The database contains raw data on weekly store sales of computer equipment in various sales regions. The database includes fields for store identification number, sales region, item number, item description, unit price, units sold, and the weekly sales period when the sales were made. Use Access to develop some reports and queries to make this information more useful for running the business. Sales and production managers want answers to the following questions:
- Which products should be restocked?
 - Which stores and sales regions would benefit from a promotional campaign and additional marketing?
 - When (what time of year) should products be offered at full price, and when should discounts be used?
- You can easily modify the database table to find and report your answers. Print your reports and results of queries.

Improving Decision Making: Using the Internet to Locate Jobs Requiring Information Systems Knowledge

Software skills: Internet-based software

Business skills: Job searching

- 1-10** Visit a job-posting website such as EURES, the European Job Mobility Portal run by the European Commission. Spend some time at the site examining jobs for accounting, finance, sales, marketing, and human resources. Find two or three descriptions of jobs that require some information systems knowledge. What information systems knowledge do these jobs require? What do you need to do to prepare for these jobs? Write a one- to two-page report summarizing your findings.

Collaboration and Teamwork Project

Selecting Team Collaboration Tools

- 1-11** Form a team with three or four classmates and review the capabilities of Google Drive and Google Sites for your team collaboration work. Compare the capabilities of these two tools for storing team documents, project announcements, source materials, work assignments, illustrations, electronic presentations, and web pages of interest. Learn how each works with Google Docs. Explain why Google Drive or Google Sites is more appropriate for your team. If possible, use Google Docs to brainstorm and develop a presentation of your findings for the class. Organize and store your presentation using the Google tool you have selected.

Changes in the Financial Industry: Adyen and Fintech

CASE STUDY

Although 2020 was a very difficult year for many companies, it was a very successful one for Adyen, a Dutch company that mostly focuses on processing Internet payments. As the COVID-19 pandemic boosted the volume of online payments, business soared. Adyen announced in November 2020 that it was expanding in the Middle East, opening a new office in Dubai. Earlier that year, Internet retailer Zalando chose Adyen to process its credit card payments in all European markets. Raffles Hotel Singapore selected Adyen as its preferred payment provider to offer a seamless and more customer-centric digital payment experience across all of the hotel's touchpoints. The company also signed a new agreement with Microsoft, expanding and deepening their cooperation on payments processing. These are just the latest in a long series of successes for Adyen. In 2018, American Internet giant eBay announced that Adyen would become eBay's primary payments provider. This was significant for two reasons. First, eBay is, of course, a huge company: in 2019, the value of goods sold on the platform amounted to a staggering \$90.2 billion. For Adyen, this meant a huge increase of its business. Second, and perhaps more importantly, eBay gave preference to Adyen over PayPal, which is very often the first choice of online companies. For a startup like Adyen to beat a market leader like PayPal was remarkable.

As a result of all these successes, Adyen has been the star of the Amsterdam stock exchange for several years. In 2018, Adyen had a very successful initial public offering (IPO) and its shares, which were priced at €240, nearly doubled in price during the first trading day. Since then Adyen's share price has continued to increase, reaching over €740 by the end of 2019. Then the coronavirus crisis broke and more and more people started to shop online and make payments through Adyen. The company's share price more than doubled over the following months and by December 11, 2020, it had risen to €1834.50.

What explains Adyen's success? The answer to that rests primarily in the technology it uses. To put it simply, Adyen makes payment transactions easier. Making payments on the Internet is a much more complicated business than many people think it is,

and requires several companies to work together to ensure that the payment is successful. To start with, there is, of course, the merchant, but there are also companies providing a gateway for the payments, assessing the risk, and so on. Because of this crowded field of facilitators, many things can go wrong. For instance, software may be outdated, or programs used by one provider may be incompatible with those of another.

According to Forrester, a market research firm that focuses on information technology, around 10 percent of all payments fail for "technical" reasons. Adyen is reducing this performance gap by integrating several components of the payment chain (such as the gateway, risk assessment, and processing) into one platform. It has thus been successful in ensuring a higher success rate in its payments chain than other facilitators.

Adyen's second advantage is that its payments platform is connected to most payment systems being used in the world. Payment systems can differ greatly from country to country. In the Netherlands, for instance, most online payments are done through the iDEAL system, which links payments to checking accounts. In other countries, most payments are done through credit cards or debit cards like Visa or Mastercard. When it comes to processing payments, this variety of methods complicates things enormously, as the payment processors need to have several platforms. Adyen, however, has one integrated platform that can link with most payment methods being used all over the world. This is, of course, an attractive option for merchants or online companies that sell their goods worldwide. When eBay decided to work with Adyen, it gave two reasons for its decision: Adyen processes payments more cheaply and gives more control to merchants that use the platform.

Adyen is a good example of a company that works in the field of fintech (financial technology). Companies that use technology to facilitate financial transactions have been highly successful over the last decade. Founded in 2006, Adyen is relatively old for a fintech company, but it has grown enormously—in 2019 it had €240 billion in processed volume. Remarkable as Adyen's case is, it is definitely not unique; other firms have used technology to find a

new niche in the international payments universe. The company TransferWise (which was founded in Estonia but now mostly operates from the United Kingdom) is another example: it facilitates money transfers from Country A to Country B while avoiding currency conversion.

Initially, traditional banks found it hard to compete with companies like Adyen. It is in the DNA of fintech companies to develop and focus on state-of-the-art information systems. Traditional banks are very different; they tend to value direct, physical contact with the customer and often have branches in various countries that function more or less independently. Their IT staff often has a supporting role and not, as in the case of Adyen, a guiding one. Traditional banks use IT systems to facilitate business operations, not to compete with other financial providers. Their IT systems are usually at the national level and may differ from country to country. The heart of Adyen is its technical platform, and the IT staff works continuously to make it cheaper and more user-friendly. The data received on this platform are analyzed and used to upgrade and update it. The data that Adyen gets are global (the platform processes payments from all over the world) and highly diverse (from payment transactions on the Internet as well as transactions performed in physical shops). This wealth of data ensures that Adyen has better opportunities to analyze the market of payment transactions and its developments than traditional banks do.

Fintech is a good example of what economists call “creative destruction.” This term, originally coined by the Austrian economist Joseph Schumpeter, describes the influence of technology on the economy. According to his theory, new technologies inevitably result in winners and in losers. One famous example of a disruption is the Spinning Jenny, a device invented in Britain during the eighteenth century. The Spinning Jenny made the production of cloth more efficient, cheaper, and—critically—reduced the number of laborers needed in the textiles industry. Over the last 30 years, the Internet has had the same effect: some jobs have disappeared, and others have come into existence. A good example is travel agencies. Forty years ago, there was a travel agency on every high street, but today, the vast majority of travel is booked online. Likewise, traditional hotels now have to compete with sites like Airbnb.

Creative destruction comes in waves, and the banking industry is now in the frontline of change because of the emergence of fintech companies. Adyen has

incorporated many stages of the payment chain, and traditional companies that used to provide, for instance, risk assessment now have to either make their business model more efficient or face the very real possibility of going out of business. The German firm N26 is also a good example of how fintech is changing the banking industry. This company provides payment services just like a normal bank does, but it does not have physical locations where customer agents give advice to the customers; everything is online. In 2020, N26 had over 5 million customers in 25 markets. One of its founders, Maximilian Tayenthal, remarked that traditional banks had not taken N26 seriously when the company was launched. See the Chapter 3 opening case for more information on N26.

Fintech companies that make online banking much easier have already had a huge impact on the physical presence of banks in many countries. The number of bank branches in Europe has declined dramatically, from 240,000 a decade ago to around 165,000 in 2020. In the Netherlands, the digital banking experience progressed so rapidly that the Dutch government felt it necessary to make it clear that it would not allow the loss of cash payments from the Dutch High Streets as this would severely limit the participation in society of vulnerable groups such as the elderly.

According to experts, the next wave of technology will be even more disruptive. In 2018, Antony Jenkins, who ran Barclays from 2012 to 2015, told the BBC that in the coming years around 50 percent of all jobs in banking (including those of middle managers and customer agents) would be replaced by some kind of artificial intelligence. Andy Haldane, the chief economist of the Bank of England, warned in the same year of a fourth industrial revolution that would cause severe disruptions in the job market, and at the heart of it would be artificial intelligence—a modern counterpart to the Spinning Jenny.

This does not mean that success is automatically guaranteed for new companies like Adyen and TransferWise. Research shows that around 90 percent of new fintech companies go bankrupt without ever having been profitable. Many require large investments of capital before they can generate profits. Even when they generate profits, these are often, for a time at least, rather small. Fintech companies are now also being challenged by the major traditional banks, who are rapidly developing their own versions of online payment systems, from peer-to-peer payments for retail customers, to highly automated online payment and billing systems for global businesses.

As consumers and firms have moved towards mobile and online payments, many traditional banks have invested heavily in new technologies in part using the funds saved by closing down traditional physical bank branches. Where in-house innovation has not worked, the large banks have purchased fintech firms and folded them into their existing business and technology platforms. Traditional banks have a decided advantage over fintech startups: extraordinary cash flow and tens of millions of loyal customers and firms. In this scenario, fintech firms have been early to the party but typically do not survive to the end of the party, at least not as independent firms.

Adyen's founders were very experienced entrepreneurs when they started their company. They had already created another company, Bibit, which they sold to The Royal Bank of Scotland for €100 million. Indeed, the word adyen means "again" in a language from Surinam, meaning that Adyen is their second endeavor in the field of financial technology. Adyen appears likely to be one of the survivors. The volume of payments it processes has grown from €32 billion in 2015 to €240 billion in 2019. Adyen's revenues during this time period have also grown, from €98.5 billion in 2015 to almost €500 billion by 2019. Unlike many fintech company, Adyen has also been able to show a profit, with net income rising from €131 million in 2018 to €204 million in 2019, up 56 percent, and with

expectations that it will surpass all of those benchmarks for 2020. Adyen illustrates how fintech startups are changing the traditional bank and payment systems using new technologies and business models.

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CASE STUDY QUESTIONS

- 1-12** According to Adyen, the payments platform has two advantages compared to other payment platforms. Describe these advantages in your own words.
- 1-13** Many fintech companies are very valuable on the stock exchange even though they make little or no profit. Explain this situation. Why

do investors pay so much for shares of companies that hardly make any profits?

- 1-14** Explain the term "creative destruction." Is the German bank N26 destroying jobs or creating new jobs?
- 1-15** Explain why such a high percentage of fintech startups go bankrupt before making any profits at all.

Case contributed by Bernard Bouwman

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