GLOBAL EDITION

Management Information Systems

Managing the Digital Firm

THIRTEENTH EDITION

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ALWAYS LEARNING

PEARSON

BUSINESS CASES AND INTERACTIVE SESSIONS

Here are some of the business firms you will find described in the cases and Interactive Sessions of this book:

Chapter 1: Information Systems in Global Business Today

Efficiency in Wood Harvesting with Information Systems
Running the Business from the Palm of Your Hand
UPS Competes Globally with Information Technology
Mashaweer

Chapter 2: Global E-Business and Collaboration

Telus Embraces Social Learning
Schiphol International Hub
Piloting Procter & Gamble from Decision Cockpits
Modernization of NTUC Income

Chapter 3: Information Systems, Organizations, and Strategy

Will Sears's Technology Strategy Work This Time?
Technology Helps Starbucks Find New Ways to Compete
Automakers Become Software Companies
Can This Bookstore Be Saved?

Chapter 4: Ethical and Social Issues in Information Systems

Ethical Issues Facing the use of Technologies for the Aged Community
Life on the Grid: iPhone Becomes iTrack
Monitoring in the Workplace
Facebook: It's About the Money

Chapter 5: IT Infrastructure and Emerging Technologies

Reforming the Regulatory System for Construction Permits
Should You Use Your iPhone for Work?
Nordea Goes Green with IT
Should Businesses Move to the Cloud?

Chapter 6: Foundations of Business Intelligence: Databases and Information Management

BAE Systems
Big Data, Big Rewards
Controversy Whirls Around the Consumer Product Safety Database
Lego: Embracing Change by Combining BI with a Flexible Information System

Chapter 7: Telecommunications, the Internet and Wireless Technology

RFID and Wireless Technology Speed Up Production at Continental Tires
The Battle Over Net Neutrality
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PART ONE

Organizations, Management, and the Networked Enterprise

Part One introduces the major themes of this book, raising a series of important questions: What is an information system and what are its management, organization, and technology dimensions? Why are information systems so essential in businesses today? Why are systems for collaboration and social business so important? How can information systems help businesses become more competitive? What broader ethical and social issues are raised by widespread use of information systems?

Chapter 1

Information Systems in Global Business Today

LEARNING OBJECTIVES

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

1. How are information systems transforming business, and what is their relationship to globalization?
2. Why are information systems so essential for running and managing a business today?
3. What exactly is an information system? How does it work? What are its management, organization, and technology components?
4. What are complementary assets? Why are complementary assets essential for ensuring that information systems provide genuine value for an organization?
5. What academic disciplines are used to study information systems? How does each contribute to an understanding of information systems? What is a sociotechnical systems perspective?

Interactive Sessions:

Running the Business from the Palm of Your Hand

UPS Competes Globally with Information Technology

CHAPTER OUTLINE

EFFICIENCY IN WOOD HARVESTING WITH INFORMATION SYSTEMS

Finland is a leader in the timber machine industry. The Finnish company Ponsse is one of the largest manufacturers of rubber-wheel cut-to-length forest machines. The timber industry uses two cutting methods: the cut-to-length method and the tree-length method. With the cut-to-length method, tree trunks are cut in the forest into various sized logs for different uses, such as saw logs or pulpwood. With the tree-length method, trunks are cut in the forest and transported to the mill whole or almost whole. At the mill, trunk pieces are separated according to use. Approximately 45 percent of the world's harvest is harvested with cut-to-length machines, like those produced by Ponsse, and 35 percent of this yield is harvested using the cut-to-length method.

Ponsse's main products are harvesters, harvester cutting heads, forwarders, and cranes. A harvester is a tractor-like machine used for cutting logs. It has a crane with a cutting head, which grasps the tree at the stem and uses its saw to make the first cut. Then the head moves the cut tree trunk in its "jaws" and finds the next cutting points. During the movement, the cutting head removes the branches of the tree. A forwarder is a special forest tractor with a crane that is designed for efficient trunk collection and transportation.

Ponsse also offers its clients an integrated set of sophisticated information systems. "Ponsse wants to know the business of its clients, because it sells forest machines and information systems to all partners in the logistic chain," says Information Systems Product Manager Hanna Vilkman. These information systems support the entire wood procurement chain. The first step in this chain is to estimate the demand for different types and sizes of timber. Typically, this is done in the field office of a wood purchasing organization. With the help of information systems, a cutting plan is created that will optimize the cutting yield for a particular logging area. Data on similar areas that were logged previously are used in order to optimize the cutting plan. A map of the logging area is also produced, as well as working instructions for the harvester driver. The map describes the borders of the logging area as well as areas to be protected. Should a single tree need to be left uncut, it is marked manually with a plastic stripe.

© Ponsse

The harvester driver gets the map and working instructions via a dedicated e-mail system that transfers data between the harvester's information system and the wood purchase organization. Instructions and maps are presented on a display located in the harvester cabin. A special feature in the harvester's information system enables it to optimize the cutting of a log into pieces during the cutting process. This means that the system is able to calculate the optimal cutting places when the log is moving through the cutting head, after being first cut from the stem. After the trees have been cut according to the instructions, the driver sends the harvest information to the field office via a dedicated e-mail system. The assortment typically contains 10 different types of cut logs of five different

lengths. The harvester marks each type with a different color spot in order to help the forwarder to sort each log into its correct pile.

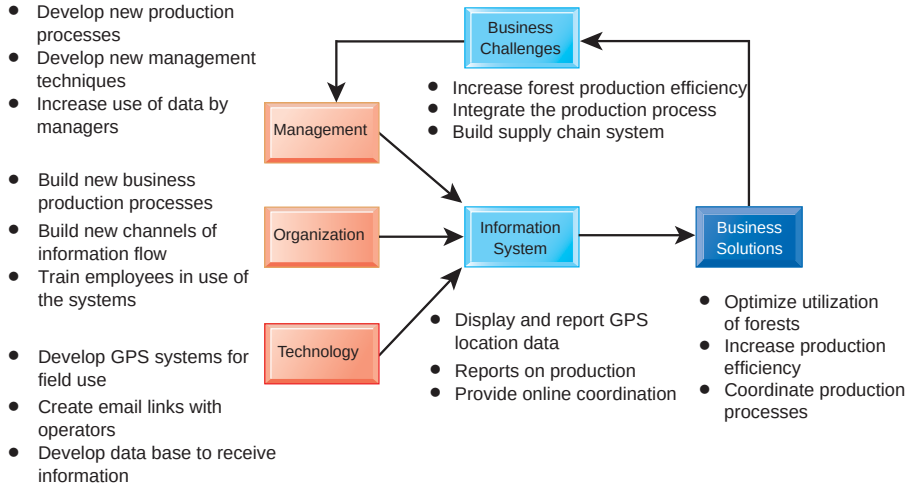
Forwarders (special forest tractors) use a map application and GPS positioning to transport the cut logs from the forest to the roadside. This facilitates work and improves safety, because the system warns the operator when the machine is approaching dangerous hazards, such as power lines. Piles of cut logs are then transported from the roadside to factories by trucks that also use information systems, for example, to find optimal routes.

Drivers of harvesters and foresters can learn the skills required to operate their machines by using 3D simulators that simulate real-world conditions. A driver can sit in a simulated machine and control the machine using the levers, just like they would in the field. The forest landscape is reflected as a 3D image on a canvas, and the operator can move freely within the harvesting area and view the forest from different angles.

Sources: Quotes and other information from interview with Simo Tauriainen, 2010, Software Chief Designer, Ponsse, www.ponsse.com.

Case contributed by Ari Heiskanen, University of Oulu

Ponsse has well-functioning, cooperative information systems that link together the various parties of the wood production and procurement chain, such as the forest owner, the wood-purchasing organization, the forest machine owner and operator, and the manufacturing plant that uses the wood cut from the forest. The systems benefit all parties. Some of the information systems provided by Ponsse are integral parts of forest machinery, like those embedded in harvesters and forwarders; others are products that can be purchased. Information flows between these parties automatically. The availability of these kinds of information systems boosts the selling of Ponsse's main products, the forest machines. The harvester information system guides the machine and gathers exact information on how the machine is being operated and the details of the yield. The company that owns the forest machine can monitor the machine's utilization and the distribution of working hours and sequences, for example. The harvester driver can adjust the harvester operating settings according to his or her own preferences. The forest field office gets information from several sources, such as harvester operations in the forest, the trucks, or the factory. All of this makes the management of the various phases of the wood procurement chain more efficient. Harvester and forwarder information systems also enhance the ecological treatment of forests by highlighting areas to be avoided.



1.1 The Role of Information Systems in Business Today

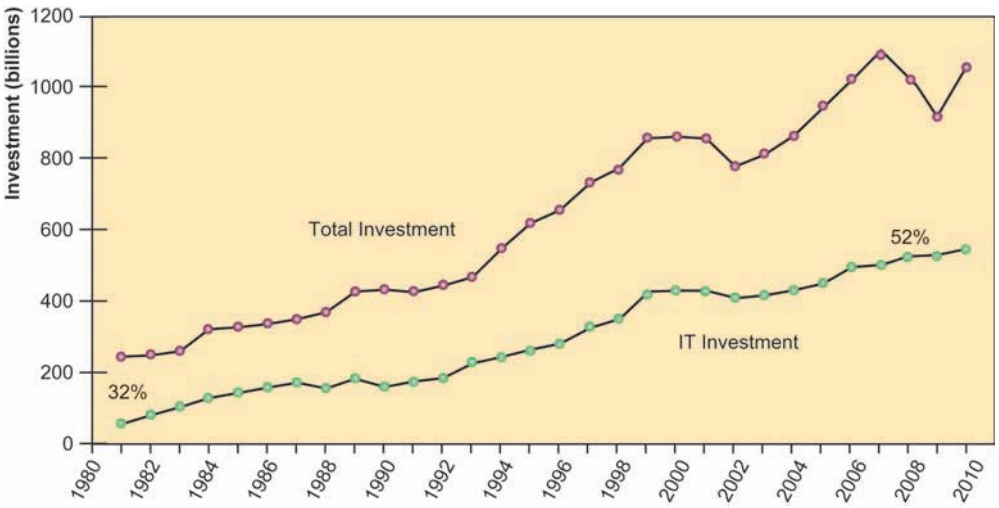
It's not business as usual in America anymore, or the rest of the global economy. In 2012, American businesses will spend over $540 billion on information systems hardware, software, and telecommunications equipment. In addition, they will spend another $650 billion on business and management consulting and services—much of which involves redesigning firms' business operations to take advantage of these new technologies. Figure 1.1 shows that between 1980 and 2011, private business investment in information technology consisting of hardware, software, and communications equipment grew from 32 percent to 52 percent of all invested capital.

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.

HOW INFORMATION SYSTEMS ARE TRANSFORMING BUSINESS

You can see the results of this massive spending around you every day by observing how people conduct business. More wireless cell phone accounts were opened in 2012 than telephone landlines installed. Smartphones, texting, e-mail, and online conferencing have all become essential tools of business. One hundred twenty-two million people in the United States access the Internet using mobile devices in 2012, which is half of the total Internet user population

FIGURE 1.1 INFORMATION TECHNOLOGY CAPITAL INVESTMENT



Information technology capital investment, defined as hardware, software, and communications equipment, grew from 32 percent to 52 percent of all invested capital between 1980 and 2011.

Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, *National Income and Product Accounts,* 2012.

(eMarketer, 2010). There are 242 million cell phone subscribers in the United States, and nearly 5 billion worldwide (ITU, 2011).

By June 2012, more than 104 million businesses worldwide had dot-com Internet sites registered (Whois, 2012). Today, 184 million Americans shop online, and 150 million have purchased online. Every day about 67 million Americans go online to research a product or service.

In 2012, FedEx moved over 9 million packages daily worldwide (6 million in the United States), mostly overnight, and the United Parcel Service (UPS) moved over 15 million packages daily worldwide. Businesses sought to sense and respond to rapidly changing customer demand, reduce inventories to the lowest possible levels, and achieve higher levels of operational efficiency. Supply chains have become more fast-paced, with companies of all sizes depending on just-in-time inventory to reduce their overhead costs and get to market faster.

As newspaper readership continues to decline, more than 150 million people read a newspaper online, and millions more read other news sites. About 67 million people watch a video online every day, 76 million read a blog, and 26 million post to blogs, creating an explosion of new writers and new forms of customer feedback that did not exist five years ago (Pew, 2012). Social networking site Facebook attracted 162 million monthly visitors in 2012 in the United States, and over 900 million worldwide. Google+ has attracted over 100 million users in the United States. Businesses are starting to use social networking tools to connect their employees, customers, and managers worldwide. Many Fortune 500 companies now have Facebook pages, Twitter accounts, and Tumblr sites.

Despite the economic slowdown, e-commerce and Internet advertising continue to expand. Google's online ad revenues surpassed $36 billion in 2011, and Internet advertising continues to grow at more than 10 percent a year, reaching more than $39.5 billion in revenues in 2012.

New federal security and accounting laws, requiring many businesses to keep e-mail messages for five years, coupled with existing occupational and health laws requiring firms to store employee chemical exposure data for up to 60 years, are spurring the annual growth of digital information at the estimated rate of 5 exabytes annually, equivalent to 37,000 new Libraries of Congress.

WHAT'S NEW IN MANAGEMENT INFORMATION SYSTEMS?

Lots! What makes management information systems the most exciting topic in business is the continual change in technology, management use of the technology, and the impact on business success. New businesses and industries appear, old ones decline, and successful firms are those that learn how to use the new technologies. Table 1.1 summarizes the major new themes in business uses of information systems. These themes will appear throughout the book in all the chapters, so it might be a good idea to take some time now and discuss these with your professor and other students.

There are three interrelated changes in the technology area: (1) the emerging mobile digital platform, (2) the growing business use of "big data," and (3) the growth in "cloud computing," where more and more business software runs over the Internet.

IPhones, iPads, BlackBerrys, and Android tablets and smartphones are not just gadgets or entertainment outlets. They represent new emerging computing platforms based on an array of new hardware and software technologies.

TABLE 1.1 WHAT'S NEW IN MIS

CHANGE	BUSINESS IMPACT
TECHNOLOGY	
Cloud computing platform emerges as a major business area of innovation	A flexible collection of computers on the Internet begins to perform tasks traditionally performed on corporate computers. Major business applications are delivered online as an Internet service (Software as a Service, or SaaS).
Big data	Businesses look for insights from huge volumes of data from Web traffic, e-mail messages, social media content, and machines (sensors) that require new data management tools to capture, store, and analyze.
A mobile digital platform emerges to compete with the PC as a business system	The Apple iPhone and Android mobile devices are able to download hundreds of thousands of applications to support collaboration, location-based services, and communication with colleagues. Small tablet computers, including the iPad, Google Nexus, and Kindle Fire, challenge conventional laptops as platforms for consumer and corporate computing.
MANAGEMENT	
Managers adopt online collaboration and social networking software to improve coordination, collaboration, and knowledge sharing	Google Apps, Google Sites, Microsoft Windows SharePoint Services, and IBM Lotus Connections are used by over 100 million business professionals worldwide to support blogs, project management, online meetings, personal profiles, social bookmarks, and online communities.
Business intelligence applications accelerate	More powerful data analytics and interactive dashboards provide real-time performance information to managers to enhance decision making.
Virtual meetings proliferate	Managers adopt telepresence videoconferencing and Web conferencing technologies to reduce travel time, and cost, while improving collaboration and decision making.
ORGANIZATIONS	
Social business	Businesses use social networking platforms, including Facebook, Twitter, and internal corporate social tools, to deepen interactions with employees, customers, and suppliers. Employees use blogs, wikis, e-mail texting, and messaging to interact in online communities.
Telework gains momentum in the workplace	The Internet, wireless laptops, smartphones, and tablet computers make it possible for growing numbers of people to work away from the traditional office. Fifty-five percent of U.S. businesses have some form of remote work program.
Co-creation of business value	Sources of business value shift from products to solutions and experiences, and from internal sources to networks of suppliers and collaboration with customers. Supply chains and product development become more global and collaborative; customer interactions help firms define new products and services.

More and more business computing is moving from PCs and desktop machines to these mobile devices. Managers are increasingly using these devices to coordinate work, communicate with employees, and provide information for decision making. We call these developments the "emerging mobile digital platform."

Managers routinely use online collaboration and social technologies in order to make better, faster decisions. As management behavior changes, how work gets organized, coordinated, and measured also changes. By connecting employees working on teams and projects, the social network is where works gets done, where plans are executed, and where managers manage. Collaboration spaces are where employees meet one another—even when they are separated by continents and time zones.

The strength of cloud computing and the growth of the mobile digital platform allow organizations to rely more on telework, remote work, and distributed decision making. This same platform means firms can outsource more work, and rely on markets (rather than employees) to build value. It also means that firms can collaborate with suppliers and customers to create new products, or make existing products more efficiently.

You can see some of these trends at work in the Interactive Session on Management. Millions of managers rely heavily on the mobile digital platform to coordinate suppliers and shipments, satisfy customers, and manage their employees. A business day without these mobile devices or Internet access would be unthinkable. As you read this case, note how the emerging mobile platform greatly enhances the accuracy, speed, and richness of decision making.

GLOBALIZATION CHALLENGES AND OPPORTUNITIES: A FLATTENED WORLD

In 1492, Columbus reaffirmed what astronomers were long saying: the world was round and the seas could be safely sailed. As it turned out, the world was populated by peoples and languages living in isolation from one another, with great disparities in economic and scientific development. The world trade that ensued after Columbus's voyages has brought these peoples and cultures closer. The "industrial revolution" was really a world-wide phenomenon energized by expansion of trade among nations.

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 reduced the economic and cultural advantages of developed countries. Friedman argued that the U.S. and European countries were in a fight for their economic lives, 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 both challenges and opportunities for business firms

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 2012, more than 33 percent of the U.S. economy resulted from foreign trade, both imports and exports. In Europe and Asia, the number exceeded 50 percent. Many Fortune 500 U.S. firms derive half their revenues from foreign operations. For instance, 85 percent of Intel's revenues in 2011 came from overseas sales of its microprocessors. Eighty percent of the toys sold in the United States are manufactured in China, while about 90 percent of the PCs manufactured in China use American-made Intel or Advanced Micro Design (AMD) chips.

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. In the past decade, the United States lost several million manufacturing jobs to offshore, low-wage

INTERACTIVE SESSION: MANAGEMENT

RUNNING THE BUSINESS FROM THE PALM OF YOUR HAND

Can you run your company from the palm of your hand? Perhaps not entirely, but there are many functions today that can be performed using an iPhone, iPad, BlackBerry, or other mobile handheld device.

The BlackBerry used to be the favorite mobile handheld for business because it was optimized for e-mail and messaging, with strong security and tools for accessing internal corporate systems. Now that's changing. Companies large and small are starting to deploy Apple's iPhone and iPad as well as Android mobile devices to conduct more of their work. They are enhancing their security systems so that mobile users can remotely accessing proprietary corporate resources with confidence.

For some, these handhelds have become indispensible. Eric Jackson is a champion kayaker who spends half of each year following competitions and events throughout North America. He's also president of Jackson Kayak, the leading whitewater kayak manufacturer. It's essential that he participate in athletic events, monitor industry trends in the field, and meet directly with dealers and customers. Jackson's strong customer focus has helped the company expand successfully worldwide, with distributors on six continents. With the iPhone and iPad, Jackson claims he can run the entire 120-person company from afar.

Jackson's Wi-Fi-equipped RV connects wirelessly to the company headquarters in Sparta, Tennessee. When Jackson's not on Wi-Fi, he uses his iPad 3G cellular connection. The iPad gives him instant access to his entire operation, so he can analyze customer data, refresh Web site content, or approve new designs. Jackson's iPad includes calendars, e-mail, contact management, and the ability to create and edit documents, spreadsheets, and presentations—all the tools this executive needs to communicate with the home office, dealers, and customers.

Back at the shop, Jackson Kayak's managers and employees find iPad and iPhone equally invaluable. In the factory, Chief Operations Officer John Ratliff can compare Jackson Kayak's manufacturing equipment side-by-side with images of replacement parts on the iPad to make sure he's getting the correct pieces. The iPhone and iPad have become so indispensable that the company outfitted its entire workforce, from customer service, to design, to quality control, with iPhones. Many have iPads as well.

Using handhelds to run the business is not limited to small companies. General Electric (GE) is one of the world's largest companies, producing aircraft engines, locomotives and other transportation equipment, kitchen and laundry appliances, lighting, electric distribution and control equipment, generators and turbines, and medical imaging equipment. GE is also a leading provider of financial services, aviation, clean energy, media, and health care technology. This giant multinational was an early adopter of mobile technology. GE employees use their iPads to access e-mail, contacts, documents, and electronic presentations. GE's Mobile Center of Excellence has developed dozens of iPhone and iPad applications, including industry-specific diagnostic and monitoring tools and business intelligence tools that help decision makers find patterns and trends in large volumes of data. The company's Transformer Monitoring app helps manage gas turbine inventory and electronic transformers throughout the world, with the ability to zoom in from a global map to a specific transformer and read all of the key performance indicators. A PDS Movement Planner lets service personnel monitor railway tracks and obtain diagnostic information on locomotives.

With operations in 60 countries, Dow Corning offers more than 7,000 products and services for consumer and industrial applications, from adhesives to lubricants, delivered as fluids, solids, gels, and powders. The Roambi Visualizer app lets Dow Corning executives use their iPhones to quickly view and analyze real-time data from their core corporate system, including sales figures, trends, and projections. It presents managers with simple, intuitive dashboards of complex data. According to Executive Vice President and Chief Financial Officer Don Sheets, in 15 seconds he can get a sense of whether there's a financial performance issue he needs to get involved with.

Dow Corning's Analytics App for the iPhone monitors Web site traffic and online sales for the company's XIAMETER brand of standard silicone products. Analytics App interfaces with Google Analytics. When Dow Corning rolls out XIAMETER Web sites across the globe, executives can monitor

what content is and isn't being used whether they are home, traveling, or at the office.

Sunbelt Rentals, based in Fort Mill, South Carolina, is one of the largest equipment rental companies in the United States, with a $2 billion inventory of rental equipment. More than 1,200 company employees, including sales staff, field personnel, and executives, are equipped with iPhones to interact with contacts and stay abreast of calendar events. In addition to using iPhones for e-mail, scheduling, and contact management, Sunbelt deployed a custom application called Mobile SalesPro, which ties multiple systems and databases into a single package for the sales team. This application connects the corporate point-of-sale system, inventory control and management system, and enterprise system, which integrates data from many different business functions. Users are able to share sales quotes based on the most up-to-date information on rental rates and equipment availability. With this application, Sunbelt's sales team can respond immediately to customer requests while they are at a job site.

Sources: "Apple IPhone in Business" and "Apple iPad in Business," www.apple.com, accessed September 6, 2012; Erik Eckel, "What the IPhone5 Will Offer Business Users," *TechRepublic*, September 5, 2012; and Doug Henschen, "Mobilizing Enterprise Apps: The Next Big Leap," *Information Week*, February 12, 2011.

CASE STUDY QUESTIONS

1. What kinds of applications are described here? What business functions do they support? How do they improve operational efficiency and decision making?
2. Identify the problems that businesses in this case study solved by using mobile digital devices.
3. What kinds of businesses are most likely to benefit from equipping their employees with mobile digital devices such as iPhones and iPads?
4. One company deploying iPhones has said: The iPhone is not a game changer, it's an industry changer. It changes the way that you can interact with your customers and with your suppliers. Discuss the implications of this statement.

iPhone and iPad Business Applications:

1. Salesforce Mobile
2. Cisco WebEx
3. iSchedule
4. iWork
5. Documents To Go
6. PDF Reader Pro
7. BizXpenseTracker
8. Dropbox

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Whether it's attending an online meeting, checking orders, working with files and documents, or obtaining business intelligence, Apple's iPhone and iPad offer unlimited possibilities for business users. Both devices have a stunning multitouch display, full Internet browsing, digital camera, and capabilities for messaging, voice transmission, and document management. These features make each an all-purpose platform for mobile computing.

producers. But manufacturing is now a very small part of U.S. employment (less than 12 percent and declining). In a normal year, about 300,000 service jobs move offshore to lower wage countries. Many of the jobs are in less-skilled information system occupations, but some are "tradable service" jobs in architecture, financial services, customer call centers, consulting, engineering, and even radiology.

On the plus side, the U.S. economy creates over 3.5 million new jobs in a normal, non-recessionary year. However, only 1.1 million private sector jobs were created due to slow recovery in 2011. Employment in information systems and the other service occupations is expanding, and wages are stable. Outsourcing has actually accelerated the development of new systems in the United States and worldwide.

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 Falls, 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. Half of the revenue of eBay (as well as General Motors) in 2011 will originate outside the United States. 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 IBM, 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. Many firms, for example, are replacing traditional face-to-face meetings with "virtual" meetings using videoconferencing and Web conferencing technology. (See Chapter 2.)

STRATEGIC BUSINESS OBJECTIVES OF INFORMATION SYSTEMS

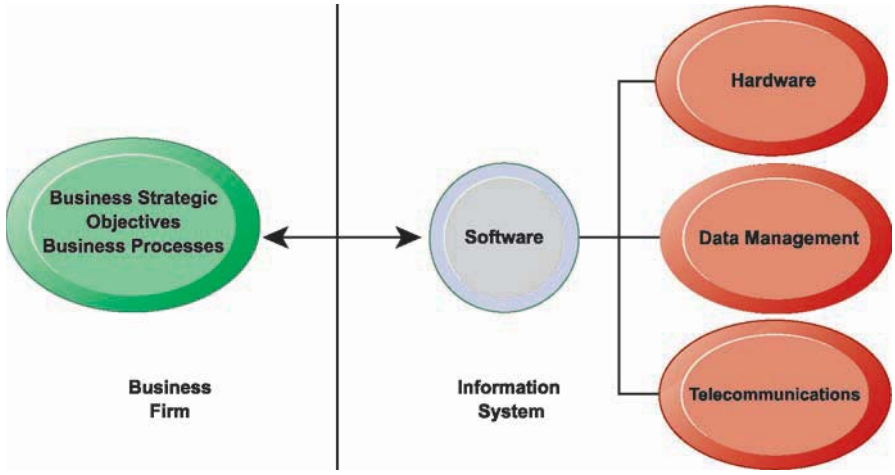
What makes information systems so essential today? Why are businesses investing so much in information systems and technologies? In the United States, more than 21 million managers and 154 million workers in the labor force rely on information systems to conduct business. Information systems are essential for conducting day-to-day business in the United States and most other 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 Sears and manufacturing firms such as General Motors and General Electric 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.

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.

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 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 brilliant business practices and supportive management to achieve world-class operational efficiency. In fiscal year 2012, Walmart achieved $460 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, achieving sales of more than $28 per square foot, compared to its closest competitor, Target, at $23 a square foot. Other retail firms producing less than $12 a square foot.

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 iPod technology platform. Apple has prospered from a continuing stream of iPod 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.

The Mandarin Oriental in Manhattan and other high-end hotels 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 or 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.

JCPenney exemplifies the benefits of information systems-enabled supplier intimacy. Every time a dress shirt is bought at a JCPenney store in the United States, the record of the sale appears immediately on computers in Hong Kong at the TAL Apparel Ltd. supplier, a contract manufacturer that produces one in eight 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 JCPenney store, bypassing completely the retailer's warehouses. In other words, JCPenney's shirt inventory is near zero, as is the cost of storing it.

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, Verizon Corporation, one of the largest telecommunication companies in the United States, uses a Web-based digital dashboard to provide managers with precise real-time information on customer complaints, network performance for each locality served, and line outages or storm-damaged lines. Using this information, managers can immediately allocate repair resources to affected areas, inform consumers of repair efforts, and restore service fast.

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 Citibank introduced the first automated teller machines (ATMs) in the New York region in 1977 to attract customers through higher service levels, its competitors rushed to provide ATMs to their customers to keep up with Citibank. Today, virtually all banks in the United States have regional ATMs and link to national and international ATM networks, such as CIRRUS. Providing ATM services to retail banking customers is simply a requirement of being in and surviving in the retail banking business.

There are many federal and state statutes and regulations that create a legal duty for companies and their employees to retain records, including digital records. For instance, the Toxic Substances Control Act (1976), which regulates the exposure of U.S. workers to more than 75,000 toxic chemicals, requires firms to retain records on employee exposure for 30 years. The Sarbanes-Oxley Act (2002), which was intended to improve the accountability of public firms and their auditors, requires certified public accounting firms that audit public companies to retain audit working papers and records, including all e-mails, for five years. Many other pieces of federal and state legislation in health care, financial services, education, and privacy protection impose significant information retention and reporting requirements on U.S. businesses. Firms turn to information systems and technologies to provide the capability to respond to these challenges.

1.2 Perspectives on Information Systems

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 be 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

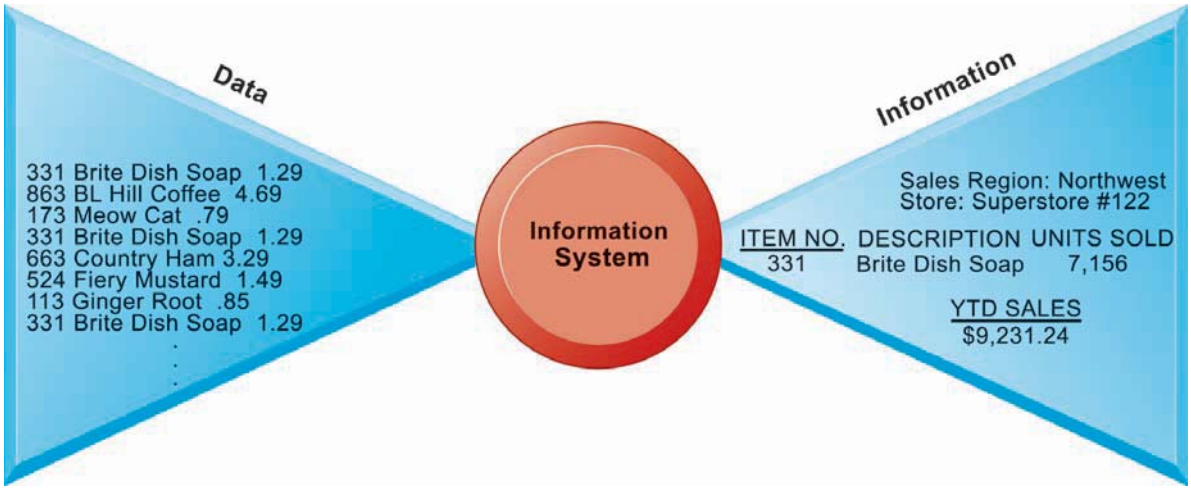
facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use.

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.

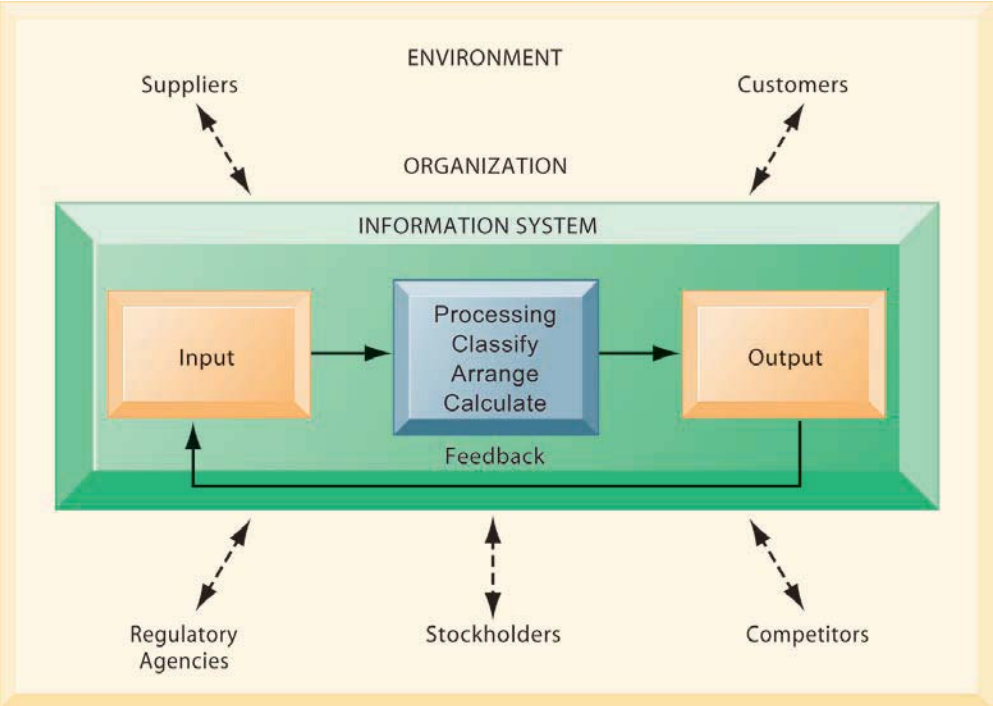
For example, in Disney World's systems for controlling crowds, the raw input consists of data from airline bookings and hotel reservations, satellite weather data, historic attendance data for the date being analyzed, and images of crowds from video cameras stationed at key locations throughout the park. Computers store these data and process them to calculate projected total attendance for a specific date as well as attendance figures and wait times for each ride and restaurant at various times during the day. The systems indicate which rides or attractions are too overcrowded, which have spare capacity, and which can add capacity. The system provides meaningful information such as the number of

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.

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.

guests attending on a particular day or time period, the average wait time per ride, the average number of restaurant and shop visits, the average number of rides guests squeezed into a single day's visit, and the average amount spent per customer during a specific time period. Such information helps Disney management gauge the theme park's overall efficiency and profitability.

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. Electronic 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 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 these 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.

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.

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.

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.

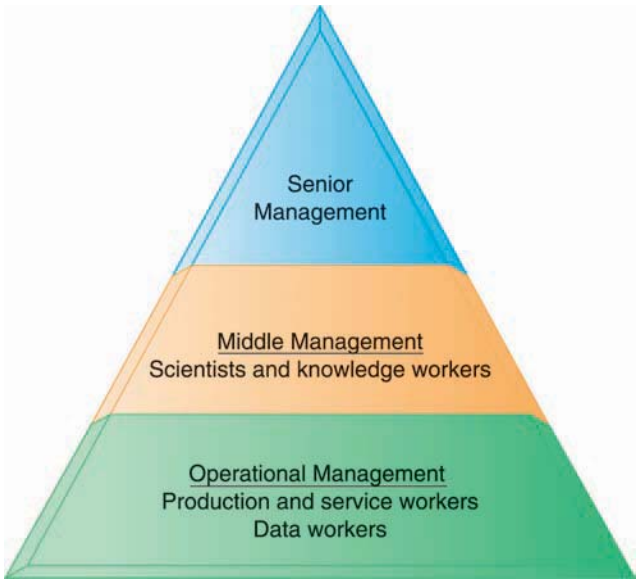
Senior management makes long-range strategic decisions about products and services as well as ensures financial performance of the firm. **Middle management** carries out the programs and plans of senior management, and **operational management** is responsible for monitoring the daily activities of 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 1.2). 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, which are logically related tasks and behaviors for accomplishing work. Developing a new product, fulfilling an order, and hiring a new employee are examples of business processes.

Most organizations' business processes include formal rules that 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

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.

TABLE 1.2 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

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, the reasons 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 later in this section.

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 different networks with nearly 2.3 billion users in over 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 in the following Interactive Session.

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 of the typical technologies used in computer-based information systems today. 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 we have just described. 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 Web site.

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 World Wide 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.

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 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 on page 46 can increase firm profitability by helping managers make better decisions as to which products to stock and promote in retail supermarkets.

INTERACTIVE SESSION: TECHNOLOGY

UPS COMPETES GLOBALLY WITH INFORMATION TECHNOLOGY

United Parcel Service (UPS) started out in 1907 in a closet-sized basement office. Jim Casey and Claude Ryan—two teenagers from Seattle with two bicycles and one phone—promised the "best service and lowest rates." UPS has used this formula successfully for more than a century to become the world's largest ground and air package-delivery company. It's a global enterprise with over 400,000 employees, 93,000 vehicles, and the world's ninth largest airline.

UPS delivers 15.6 million packages and documents each day in the United States and more than 220 other countries and territories. The firm has been able to maintain leadership in small-package delivery services despite stiff competition from FedEx and Airborne Express by investing heavily in advanced information technology. UPS spends more than $1 billion each year to maintain a high level of customer service while keeping costs low and streamlining its overall operations.

It all starts with the scannable bar-coded label attached to a package, which contains detailed information about the sender, the destination, and when the package should arrive. Customers can download and print their own labels using special software provided by UPS or by accessing the UPS Web site. Before the package is even picked up, information from the "smart" label is transmitted to one of UPS's computer centers in Mahwah, New Jersey, or Alpharetta, Georgia, and sent to the distribution center nearest its final destination.

Dispatchers at this center download the label data and use special software to create the most efficient delivery route for each driver that considers traffic, weather conditions, and the location of each stop. UPS estimates its delivery trucks save 28 million miles and burn 3 million fewer gallons of fuel each year as a result of using this technology. To further increase cost savings and safety, drivers are trained to use "340 Methods" developed by industrial engineers to optimize the performance of every task from lifting and loading boxes to selecting a package from a shelf in the truck.

The first thing a UPS driver picks up each day is a handheld computer called a Delivery Information Acquisition Device (DIAD), which can access a wireless cell phone network. As soon as the driver logs on, his or her day's route is downloaded onto the handheld. The DIAD also automatically captures customers' signatures along with pickup and delivery information. Package tracking information is then transmitted to UPS's computer network for storage and processing. From there, the information can be accessed worldwide to provide proof of delivery to customers or to respond to customer queries. It usually takes less than 60 seconds from the time a driver presses "complete" on the DIAD for the new information to be available on the Web.

Through its automated package tracking system, UPS can monitor and even re-route packages throughout the delivery process. At various points along the route from sender to receiver, bar code devices scan shipping information on the package label and feed data about the progress of the package into the central computer. Customer service representatives are able to check the status of any package from desktop computers linked to the central computers and respond immediately to inquiries from customers. UPS customers can also access this information from the company's Web site using their own computers or mobile phones. UPS now has mobile apps and a mobile Web site for iPhone, BlackBerry, and Android smartphone users.

Anyone with a package to ship can access the UPS Web site to track packages, check delivery routes, calculate shipping rates, determine time in transit, print labels, and schedule a pickup. The data collected at the UPS Web site are transmitted to the UPS central computer and then back to the customer after processing. UPS also provides tools that enable customers, such Cisco Systems, to embed UPS functions, such as tracking and cost calculations, into their own Web sites so that they can track shipments without visiting the UPS site.

A Web-based Post Sales Order Management System (OMS) manages global service orders and inventory for critical parts fulfillment. The system enables high-tech electronics, aerospace, medical equipment, and other companies anywhere in the world that ship critical parts to quickly assess their critical parts inventory, determine the most optimal routing strategy to meet customer needs, place orders online, and track parts from the warehouse to the end user. An automated e-mail or fax feature keeps customers informed of each shipping milestone and can provide notification of any changes to flight schedules for commercial airlines carrying their parts.

UPS is now leveraging its decades of expertise managing its own global delivery network to manage logistics and supply chain activities for other companies. It created a UPS Supply Chain Solutions division that provides a complete bundle of standardized services to subscribing companies at a fraction of what it would cost to build their own systems and infrastructure. These services include supply chain design and management, freight forwarding, customs brokerage, mail services, multimodal transportation, and financial services, in addition to logistics services.

In 2006, UPS started running the supply chains of medical device and pharmaceutical companies. For example, at UPS headquarters in Louisville, Kentucky, company pharmacists fill 4,000 orders a day for insulin pumps and other supplies from customers of Medtronic Inc., the Minneapolis-based medical-device company. UPS pharmacists in Louisville log into Medtronic's system, fill the orders with devices stocked on site, and arrange for UPS to ship them to patients. UPS's service has allowed Medtronic to close its own distribution warehouse and significantly reduce the costs of processing each order. UPS and other parcel delivery companies are investing in giant warehouses that service multiple pharmaceutical companies at once, with freezers for medicines and high-security vaults for controlled substances.

UPS has partnered with Pratt & Whitney, a world leader in the design, manufacture, and service of aircraft engines, space propulsion systems, and industrial gas turbines, to run its Georgia Distribution Center, which processes 98 percent of the parts used to overhaul Pratt & Whitney jet engines for shipment around the world. UPS and Pratt & Whitney employees together keep track of about 25,000 different kinds of parts and fulfill up to 1,400 complex orders each day—ranging from a few nuts and bolts to kits comprising all the parts needed to build an entire engine. On the receiving side of the 250,000-square-foot building, UPS quality inspectors check newly arrived parts against blueprints.

Sources: Jennifer Levitz and Timothy W. Martin, "UPS, Other Big Shippers, Carve Health Care Niches," *The Wall Street Journal*, June 27, 2012; "Logistics in action: At Pratt & Whitney Facility, Silence Is Golden," *UPS Compass*, August 2012; Bob DuBois, "UPS Mobile Goes Global," *UPS Compass*, January 27, 2011; Jennifer Levitz, "UPS Thinks Out of the Box on Driver Training," *The Wall Street Journal*, April 6, 2010; Agam Shah, "UPS Invests $1 Billion in Technology to Cut Costs," *Bloomberg Businessweek*, March 25, 2010.

CASE STUDY QUESTIONS

1. What are the inputs, processing, and outputs of UPS's package tracking system?
2. What technologies are used by UPS? How are these technologies related to UPS's business strategy?
3. What strategic business objectives do UPS's information systems address?
4. What would happen if UPS's information systems were not available?

Using a handheld computer called a Delivery Information Acquisition Device (DIAD), UPS drivers automatically capture customers' signatures along with pickup, delivery, and time card information. UPS information systems use these data to track packages while they are being transported.

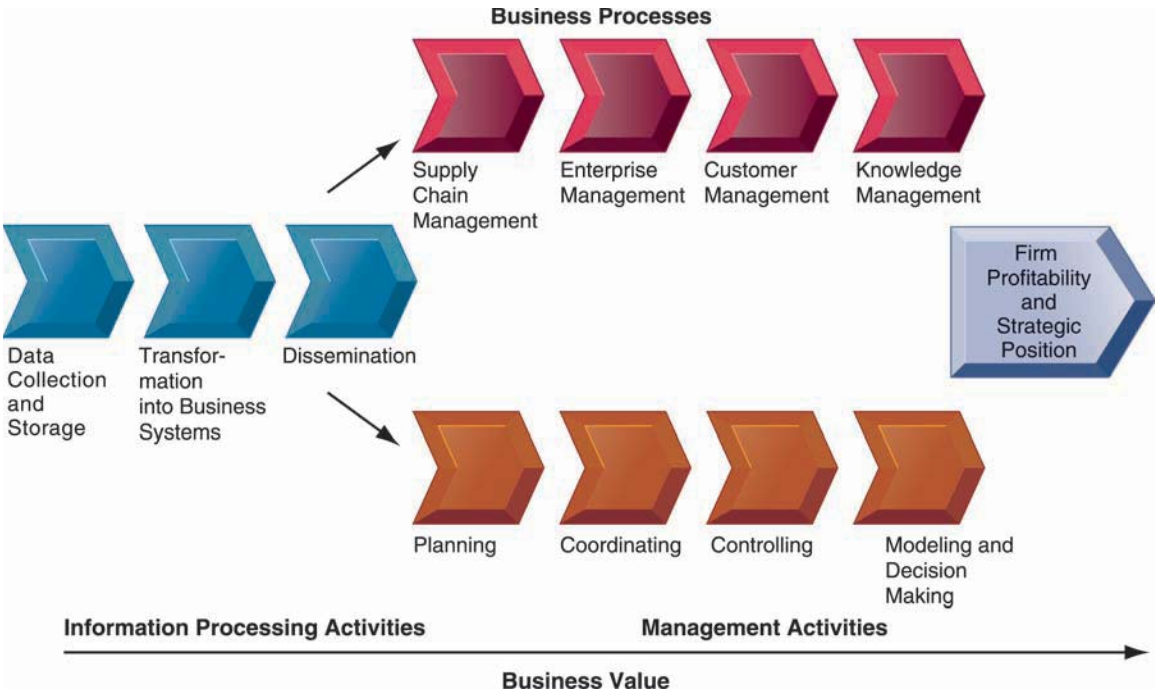
Every business has an information value chain, illustrated in Figure 1.7, in which raw information is systematically acquired and then transformed through various stages that add value to that information. The value of an information system to a business, as well as the decision to invest in any new 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 firm profitability. Although there are other reasons why systems are built, their primary purpose is to contribute to corporate value.

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.

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 Ponsse wood production firm systems solved the business problem presented by the need to integrate its production and manufacturing processes.

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.

These systems provide a solution that takes advantage of new interactive digital technology and opportunities created by a host of technologies such as GPS. The firm developed new ways to coordinate production, manufacturing, and sales. The diagram also illustrates how management, technology, and organizational elements work together to create system solutions.

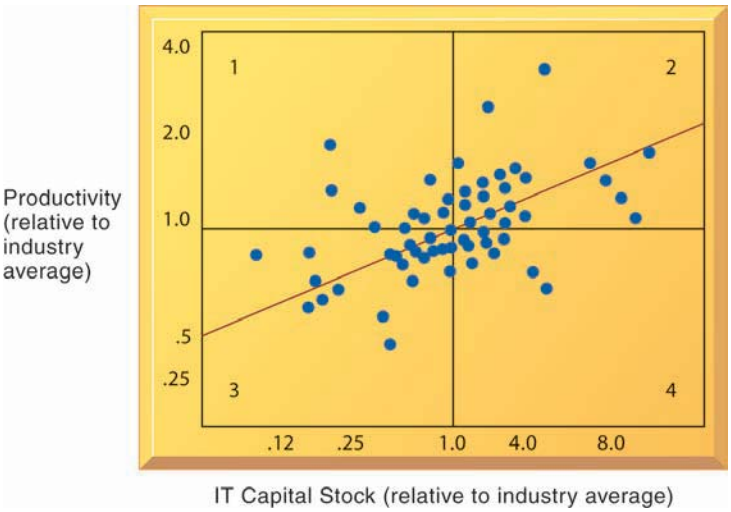
COMPLEMENTARY ASSETS: ORGANIZATIONAL CAPITAL AND THE RIGHT BUSINESS MODEL

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 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 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.

Some firms fail to adopt the right business model that suits the new technology, or seek to preserve an old business model that is doomed by new technology. For instance, recording label companies refused to change their

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: Based on Brynjolfsson and Hitt (2000).

old business model, which was based on physical music stores for distribution rather than adopt a new online distribution model. As a result, online legal music sales are dominated not by record companies but by a technology company called Apple Computer.

Complementary assets are those assets required to derive value from a primary investment (Teece, 1988). 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, 2003; Brynjolfsson and Hitt, 2000; Davern and Kauffman, 2000; Laudon, 1974). These investments in organization and management are also known as **organizational and management capital**.

Table 1.3 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.

TABLE 1.3 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

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 Contemporary Approaches to 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

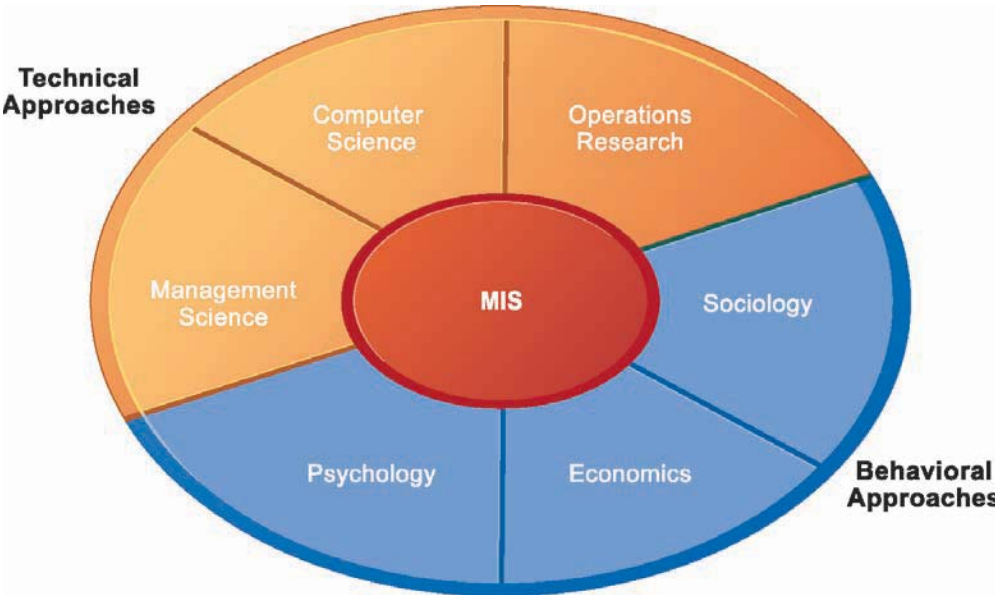
The technical approach to information systems emphasizes mathematically based models to study information systems, as well as the physical technology and formal capabilities of these systems. The disciplines that contribute to the technical approach are computer science, management science, and operations 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, utilization, and management cannot be explored usefully with the models used

FIGURE 1.9 CONTEMPORARY APPROACHES TO INFORMATION SYSTEMS



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

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.

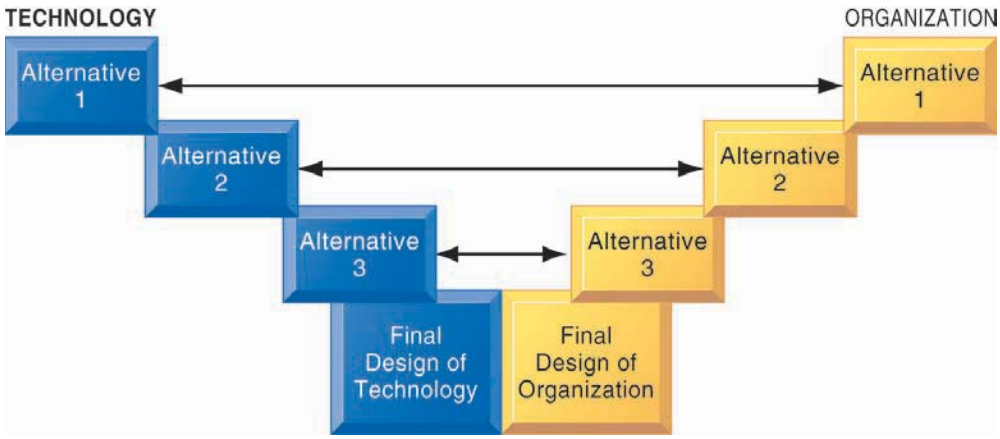
Our experience as academics and practitioners leads us to believe that no single approach effectively captures the reality of information systems. The successes and failures of information are rarely all technical or all behavioral. Our best advice to students is to understand the perspectives of many disciplines. Indeed, the challenge and excitement of the information systems field is 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 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 with user expectations. Organizations and individuals must also be changed through training,

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.

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.

Learning Track Modules

The following Learning Tracks provide content relevant to topics covered in this chapter:

1. How Much Does IT Matter?
2. Information Systems and Your Career
3. The Mobile Digital Platform

Review Summary

1. *How are information systems transforming business, and what is their relationship to globalization?*

E-mail, online conferencing, smartphones, and tablet computers have become essential tools for conducting business. Information systems are the foundation of fast-paced supply chains. The Internet allows many businesses to buy, sell, advertise, and solicit customer feedback online. 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, online software as a service, and cloud computing.

2. *Why are information systems so essential for running and managing a business today?*

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.

3. *What exactly is an information system? How does it work? What are its management, organization, and technology components?*

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.

4. *What are complementary assets? Why are complementary assets essential for ensuring that information systems provide genuine value for an organization?*

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, 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.

5. *What academic disciplines are used to study information systems? How does each contribute to an understanding of information systems? What is a sociotechnical systems perspective?*

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, 43
Business processes, 41
Complementary assets, 57
Computer hardware, 51
Computer literacy, 48
Computer software, 51
Culture, 50
Data, 45
Data management technology, 51
Data workers, 49
Digital firm, 41
Extranets, 51
Feedback, 46
Information, 45
Information system, 45
Information systems literacy, 48
Information technology (IT), 45
Information technology (IT) infrastructure, 51
Input, 46
Internet, 51
Intranets, 51
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, 46
Processing, 46
Production or service workers, 49
Senior management, 49
Sociotechnical view, 60
World Wide Web, 51

Review Questions

1. How are information systems transforming business, and what is their relationship to globalization?
   - 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.
2. Why are information systems so essential for running and managing a business today?
   - List and describe six reasons why information systems are so important for business today.
3. What exactly is an information system? How does it work? What are its management, organization, and technology components?
   - Define an information system and describe the activities it performs.
   - List and describe the organizational, management, and technology dimensions of information systems.
   - Distinguish between data and information and between information systems literacy and computer literacy.
   - Explain how the Internet and the World Wide Web are related to the other technology components of information systems.
4. What are complementary assets? Why are complementary assets essential for ensuring that information systems provide genuine value for an organization?
   - Define complementary assets and describe their relationship to information technology.
   - Describe the complementary social, managerial, and organizational assets required to optimize returns from information technology investments.
5. What academic disciplines are used to study information systems? How does each contribute to an understanding of information systems? What is a sociotechnical systems perspective?
   - 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. Information systems are too important to be left to computer specialists. Do you agree? Why or why not?
2. If you were setting up the Web site for Disney World visitors, what management, organization, and technology issues might you encounter?
3. 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.

Management Decision Problems

1. Snyders of Hanover, which sells about 80 million bags of pretzels, snack chips, and organic snack items each year, had its financial department use spreadsheets and manual processes for much of its data gathering and reporting. Hanover's financial analyst would spend the entire final week of every month collecting spreadsheets from the heads of more than 50 departments worldwide. She would then consolidate and re-enter all the data into another spreadsheet, which would serve as the company's monthly profit-and-loss statement. If a department needed to update its data after submitting the spreadsheet to the main office, the analyst had to return the original spreadsheet, then wait for the department to re-submit its data before finally submitting the updated data in the consolidated document. Assess the impact of this situation on business performance and management decision making.
2. Dollar General Corporation operates deep-discount stores offering housewares, cleaning supplies, clothing, health and beauty aids, and packaged food, with most items selling for $1. 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 over 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

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 MyMISLab, 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

Visit a job-posting Web site such as Monster.com. 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.

Video Cases

Video Cases and Instructional Videos illustrating some of the concepts in this chapter are available. Contact your instructor to access these videos.

Collaboration and Teamwork Project

In MyMISLab, you will find a Collaboration and Teamwork Project dealing with the concepts in this chapter. You will be able to use Google Sites, Google Docs, and other open-source collaboration tools to complete the assignment.

Mashaweer
CASE STUDY

Mashaweer is the first personal service company in Egypt. It's purely dedicated to saving its clients' time and effort acting as a personal assistant 24 hours a day. The personal assistant is a rider with a motorcycle who runs any errands for individual clients or corporations at any given time. The most common service they provide is buying groceries or other goods from stores, paying bills, and acting as a courier. Mashaweer's success relies heavily on their flexibility, and they have often received unusual requests that they have fulfilled in order to gain customer loyalty – including: going to the gym to tell someone to turn on the phone as someone is trying to reach them, delivering presents to a client's fiancée every 15 minutes, and carrying a client's shopping bags from the car to the house.

Mashaweer is an essential service for the Egyptians because traffic is a problem that everyone in Egypt faces, making it difficult for an individual to get a couple of errands done on the same day. Mashaweer's service has achieved such success in Alexandria and Cairo, where traffic is an issue, saving people one of the most valuable commodities out there; time. The service is able to give people more quality time to spend with family or friends, instead of taking care of the daily errands that usually take up half of one's day. They also act as a security or safety measure as they perform people's errands in unsafe times, such as the period after the revolution or simply late at night. Most individuals cannot afford having a full time assistant to perform their errands whenever needed. Mashaweer's agents act as full time assistants for every individual at a part time cost.

Since starting the company in Alexandria in 2010, Mashaweer has since expanded to Cairo and operates around 600 orders per day. They plan to expand even further geographically within Egypt and to other countries in the region as well as enhancing and increasing the services they provide.

The idea of Mashaweer was created by Mohamed Wahid (24 years old) and then co-founded with his partners, Ahmed El Kordy (25 years old) and Aly El Shazly (27 years old). They were all born and raised in Alexandria. Ahmed El Kordy and Mohamed Wahid met when they both transferred from different schools to IGCSE Academy (AAST) for high school. Ahmed El Kordy finished high school in 2 years and went on to achieve his bachelor's degree in industrial engineering from The Arab Academy of Science and Technology (AAST), graduating in 2008. Part of his undergraduate degree was spent doing a year abroad in Carleton University in Ottawa, Canada. During the summers of his undergraduate years, Ahmed completed several internships in the United Kingdom and Ireland. Mohamed Wahid also went to AAST graduating in 2009 with a bachelor's degree in construction engineering. Aly El Shazly attended St. Marks School for his entire school career, he then went on to Alexandria University where he studied business and graduated in 2007. After college, Ahmed El Kordy went on to work at his father's import/export business. Mohamed Wahid went on to establish a company called X-trade for trade and contracting, followed by a marketing and advertising company called Green Media. Currently, he's a main shareholder in both, in addition to being the vice-chairman of Green Towers, a real estate company with a net worth of about $16 million.

Wahid thought of the idea of establishing Mashaweer while he was preparing for his wedding. His bride-to-be was overwhelmed with errands that she had to get done within a few days and he started wondering what she would have done if she couldn't afford having a full time driver who did all of her errands for her. While on his honeymoon, he kept thinking about this idea and how much time people could save and what a valuable service it could be, so he decided to call his friends to start transforming the idea into an actual business plan. After developing a business plan, the three entrepreneurs decided to go into the implementation phase and actually build this business. They started small and grew organically as the demand for the service increased. Each of the three entrepreneurs invested $5,000 into the project to total a starting capital of $15,000. They started with only 3 motorcycles, 6 riders, and a hotline.

As the three friends realized they had actually succeeded in Alexandria, they decided they wanted to move to the next phase by establishing Mashaweer in Cairo. When they decided to expand to Cairo, they decided to adopt a completely different strategy. They wanted to be able to cover all of Greater Cairo, as a whole, and not just specific areas, from the very beginning. During the Revolution in January 2011 they started gathering market research to expand in Cairo and started investing heavily. Since business

all over the country had come to a standstill, they made several large purchases such as motorcycles and advertising space for fractions of the price. When others saw it as a time to slow down, the entrepreneurs saw it as an opportunity to start marketing for their business. By March they realized that they needed to increase the original investment so that they can grow large enough to capture the market in Cairo. To do so, they brought in other investors, mainly from their friends and family, to raise the capital investment up to $1.67 million. They planned to enter Cairo with full force so that there would be a high barrier of entry for any competitor they decided that their competitive advantage would have to be in investing in technology. They wanted to get an ERP (Enterprise Resource Planning) system but found quotations to be too high. To fix this they started their own information technology company, Innov8 (innovate), where they created a customized ERP system, which they then connected to their customized PDAs (Personal Digital Assistants) through a cloud computing system that was made by LinkDotNet and Mobinil. Each rider receives tasks one at a time on the PDA, which also includes a GPS to provide detailed directions. The GPS monitors the rider's location.

To reduce cost and ensure quality, Mashaweer does not rely on outsourcing in any of its stages as long as it can do the work with the same or better quality. This explains why Mashaweer founded Innov8 in order to build its system and manage its technical work. Now, Mashaweer only owns part of this company and is one of its numerous clients. One further example of Mashaweer's in house capabilities is its call center. The company preferred to have an internal call center after rejecting a number of offers for an outsourced one. The reason for this was to be able to monitor the performance of the agents and always work on improving the quality of their customer service. Investing in an innovative contact center and using CISCO, which supports up to 300IP phones, a reporting module and a recording system made it much easier for Mashaweer to track its received calls and work on any problems that might face its customer service agents.

Software components developed by Innov8 include the Mashaweer Server, Mashaweer API (Application Programmers' Interface), and Mashaweer PDA client.

The Mashaweer Server is a centralized application that manages the following elements:

- Orders (placement, editing, pricing, review, tracking and reports)
- Routes management and optimization
- Clients (management, reports, discounts)
- Packages tracking
- Contracts
- Call center
- Satellite offices
- Representatives
- Cash transactions and expenses tracking for representatives and satellite offices
- Asset tracking of vehicles, PDAs and mobile printers
- Management reports

The API is a method of integrating Mashaweer ordering system with third parties. This allows third parties to automate their delivery system and integrate Mashaweer into their existing CRM/dispatching systems, opening a wide opportunity for business expansion.

The Mashaweer PDA application is installed on each representative PDA and manages the following elements:

- Order items progress tracking
- Collection of order fees and other costs, against a printed invoice
- Package handling (barcode scanning and destinations)
- Messaging
- Cash and expenses tracking
- Synchronizing data periodically and at the beginning of each shift

When Mashaweer was first introduced in Egypt, it captured 100 percent of market share for such a service, because it was the first and only company of its nature. However, the market was not aware or used to such a service, so it started growing slowly in Alexandria until people grasped the idea and got accustomed to the fact that there is a company that can take over your errands. In contrast, when the company started operating in Cairo, it grew at surprisingly fast pace. There are several factors are expected to affect the target market and make it easier for Mashaweer to penetrate it aggressively.

At the beginning, people's assumption is that using Mashaweer is too luxurious and costly. When they use it for the first couple of times, this perception changes and they begin to rely on this convenient service. As more and more people get accustomed with the service, it creates a cultural change that significantly affects the demand on the service.

Another factor that is expected to facilitate working conditions and reduce costs is the technological advances that occur every day. Mashaweer heavily depends on technological tools, and would benefit from the advancements and price reductions that continuously take place. As a result, Mashaweer's total

costs will decrease, enabling it to decrease its prices and further improve its quality to become even more convenient for a larger number of people.

Mashaweer is the only company of its kind in Egypt that operates on this scale. However, there is a company called Wassaly that was established in Cairo after Mashaweer's success in Alexandria. This company operates on a much smaller scale. Their indirect competitors include other courier services (e.g. DHL, UPS, TNT, and FedEx). However, they have positioned themselves as the flexible courier in contrast to the couriers available in the market today; they offer same day delivery rather than next day delivery. Mashaweer has several other advantages that make it very hard for others to compete:

- Database of thousands of loyal clients.
- Self-investment is manageable.
- Highly qualified and carefully selected riders due to the high salaries compared to the delivery sector in the Egypt.
- Various revenue streams.
- Being the owner of the IT company Innov8 fosters technology integration in Mashaweer.

Mashaweer has several unique selling propositions. The main two aspects are being the first in the market, and the only of its kind. Also the most important differentiator is the flexibility of their service, which addresses all of their customer's needs and requests.

Unlike new entrants or copycats in the market, Mashaweer have invested highly in the systems they use. They invested in PDAs to enable the operations process to be monitored accurately since it provides data like GPS tracking to track each order and the location or stage the messenger is located. Through this technology, Mashaweer decreases the amount of errors due to the fact that the messenger is tied to an automated process where he receives his tasks through the PDA handheld. Meanwhile, a SCADA (Supervisory Control and Data Acquisition) system presented on a big screen will be available at Mashaweer headquarters to monitor all live orders and measure the traffic in case of rush hours, thus enabling the operation team to react and try a preventive and corrective action.

Mashaweer's infrastructures includes the following.

Equipment: 130 motorcycles units and 10 cars.

Software: A logistics management solution system was developed specifically for Mashaweer, and served from a cloud-hosted server. The solution consists of a web-based portal where call center agents, logistics, and managers can add, edit, track, and view reports.

PDA: A PDA client was developed to connect to the server in order to allow Mashaweer representatives to view and update their assigned orders via an XML-based web service. Except for the PDA client, the solution is based on open source technologies (PHP, CodeIgniter, MySQL, jQuery, Ubuntu Linux). The PDA devices will be a main factor in integrating the operational team with the fleet of riders.

Hardware: Windows Mobile PDAs were used for viewing and updating orders on the move. Each PDA is paired to a Bluetooth mobile printer for printing receipts. The printer is also equipped with a swipe card reader module so that it can be used in the future for credit card payment collection, and for promotion cards. Mashaweer server is a Linux VM hosted on a cloud solution provided by Innov8, the sister company that developed the entire information technology system.

Head Quarters: The decision was made to buy a new headquarters instead of renting an existing one.

Mashaweer's future strategy is as follows:

Mashaweer Market: Mashaweer Market is an online supermarket that will enable people to do their grocery shopping through Mashaweer's website and get it delivered by its representatives within 30 minutes of placing the order. This will be made possible by having access to a large number of supermarkets around Cairo and Alexandria, so that representatives can pick the order from the closest outlet and deliver it to the customer as quickly as possible. All products will be displayed on the website.

Mashaweer is hoping to reach an average of 4000 orders daily in return for a delivery charge of 5 Egyptian pounds per order.

Call center: Mashaweer's call center is expected to make up an important revenue stream for the company in the near future, as the company starts introducing marketing campaigns. In addition, Mashaweer is planning to expand its call center to include other companies other than Mashaweer.

Geographical Expansion: Using the technology they have invested in building their infrastructure, Mashaweer now has the potential to easily enter and penetrate other markets in different regions at a very low initiation cost. They plan to expand to other regions within Egypt, in addition to expanding to other countries within the Middle East. In October 2013 they will open their first franchise in Beirut, Lebanon. They are also looking to expand to several countries in the Gulf.

Sources: Mashaweer web site, http://www.mashaweeronline.com/, accessed Novemeber 2012; interviews with Mashaweer owners, conducted November 2012.

CASE STUDY QUESTIONS

1. What kinds of applications are described in this case? What business functions do they support?
2. What are the benefits from equipping their riders with PDAs?
3. Was it a good decision to expand the business to Cairo? What are the implications of information systems?
4. Do you think that Mashaweer will be able to accomplish their future strategy and sustain its market share?
5. Do you think in near future, the competition between Mashaweer and Wassaly will be aggressive? Why?

Case contributed by Niveen Ezzat, Cairo University