Solutions for Management Information Systems 17th Edition by Laudon

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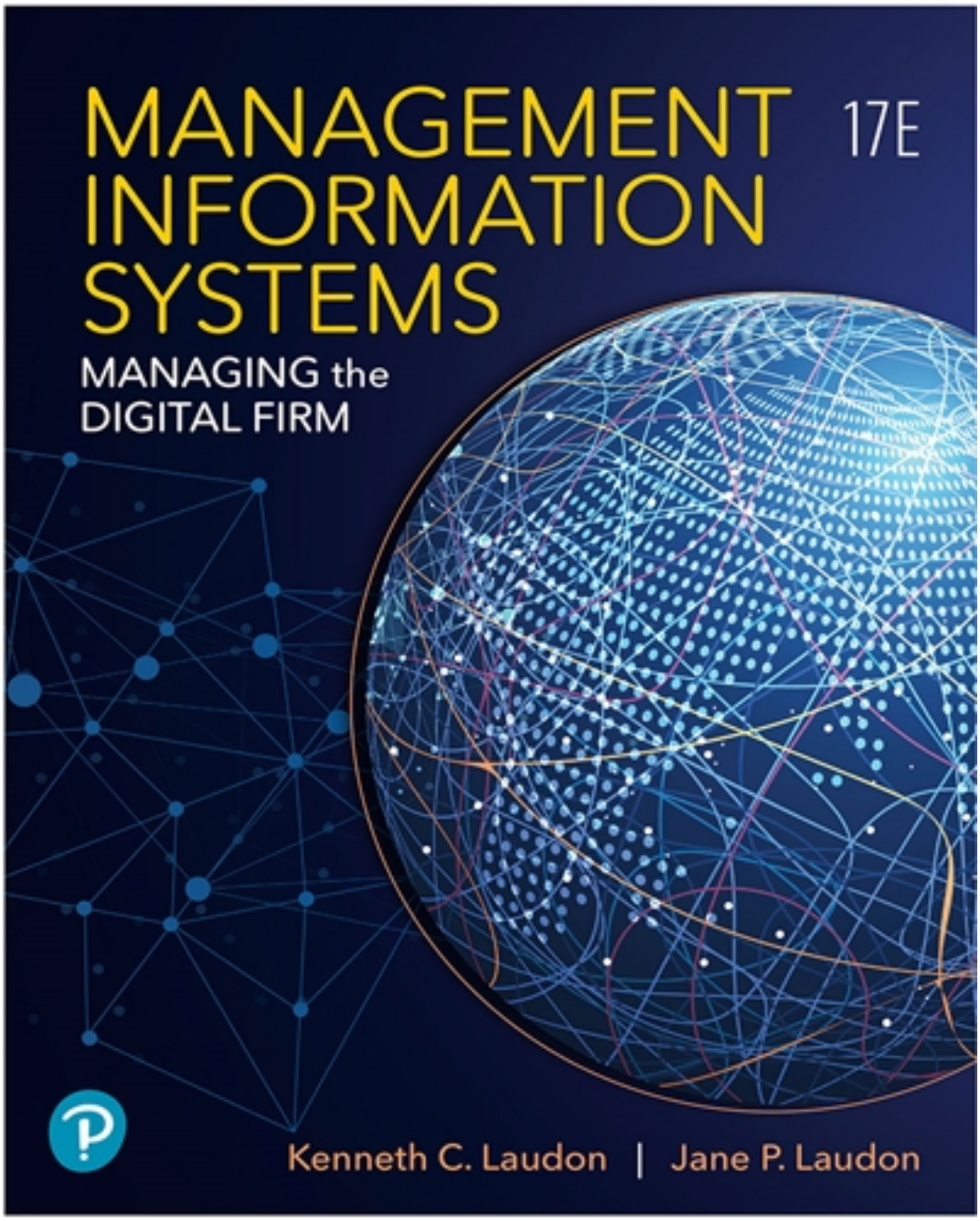

Solutions

Chapter 1 Hands-on MIS Application Software Exercise Solution

This exercise helps students understand how a raw file of sales transactions can be analyzed using database software to produce valuable information for managers. The solutions provided here were created using the query wizard and report wizard capabilities of Access. Students can of course create more sophisticated reports if they wish, but much valuable information can be obtained from simple query and reporting functions. The main challenge is to get students to ask the right questions about the information.

Chapter 1
Information Systems in Global Business Today

Student Learning Objectives

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

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

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

1-4 How will MIS help my career?

Key Terms

The following alphabetical list identifies the key terms discussed in this chapter. The page number for each key term is provided.

Business functions, 17
Business model, 12
Business processes, 10
Complementary assets, 25
Computer hardware, 19
Computer literacy, 16
Computer software, 19
Culture, 18
Data, 14
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Data workers, 17
Digital firm, 10
Extranets, 20
Feedback, 15
Information, 14
Information system, 14
Information systems literacy, 16
Information technology (IT), 14
Information technology (IT) infrastructure, 20
Input, 15
Internet, 19
Intranets, 20
Knowledge workers, 17
Management information systems (MIS), 16
Middle management, 17
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Operational management, 17
Organizational and management capital, 25
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World Wide Web, 20

Teaching Suggestions

You are probably meeting in the first class session to introduce yourself, the course, and to meet the students. It is good to get to the classroom early and meet the students as they come in. Learn a few names as the students enter.

After going over requirements for the course, give an overview of the course stressing this is not a technical course. Typically, you cannot do enough to put non-technical types at ease.

The opening case, "Smart Stores Reinvent the Retail Space," shows students that even the most successful businesses must continually embrace technology upgrades and improvements as a way to enhance customer value and increase a business's competitive advantage. Students will become familiar with the idea that different kinds of businesses have had to change the way they operate.

Acrelec, a French digital signage company, is piloting technology to help retailers manage store curbside pickups by customers placing orders online. Customers can use a retailer's smartphone app to indicate they are coming to pick up an order, and the Acrelec system will estimate when a customer will arrive at a particular store. Object-recognition cameras identify exactly when a customer's car arrives and where it is parked. Acrelec is especially useful for big-box retailers, grocery stores, and home-improvement stores. Shelves have become more than just a surface for storing and displaying objects. New systems for "smart" shelves use proximity sensors, 3D cameras, microphones, RFID readers, and weight sensors to enable interactions between shoppers in physical stores and the shelves they are standing in front of. These systems can create a highly personalized shopping experience that fundamentally improves the way shoppers move inside physical stores.

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

Section 1-1, "How are information systems transforming business and why are they so essential for running and managing a business today?" gives students a feel for the importance of information systems in business today and how they have transformed businesses on the world stage. A good discussion of the six important business objectives outlined in this section allows the instructor and students to discuss why businesses have become so dependent on information systems today and the importance of these systems for the survival of a firm. Stress to students that information systems are not a luxury. In most businesses they are the core of survival. This would be a good time to ask students

to discuss how their own schools are using information systems to enhance their product offering.

Globalization is affecting virtually every country in the world. As technology becomes more pervasive and, in some cases easier to use, globalization will continue its steady march. In 2019, an estimated 30 percent of the world economy resulted from foreign trade of goods and services, both imports and exports. Half of Fortune 500 US firms obtain nearly 50 percent of their revenue from foreign operations. For instance, more than 50 percent of Intel's revenues in 2019 came from overseas sales of its microprocessors.

Ask students to provide examples of truly digital firms (Cisco Systems and GE) as opposed to those businesses (local mom-and-pop stores or a local doctor's office) that still perform many business processes outside of integrated information systems.

Review the six strategic business objectives: operational excellence; new products, services, and business models; customer and supplier intimacy; improved decision making; competitive advantage; and survival. The rest of the text will continually refer to these six objectives as reasons why firms should incorporate and integrate business processes with information systems.

Interactive Session: Organizations: Will the Coronavirus Pandemic Make Working from Home the New Normal?

Case Study Questions

1. **Define the problem described in this case. What are the management, organization, and technology issues raised by this problem?**

   Not all employees have access to the Internet at home, and many work in industries that require on-site work. About 80 percent of American adults have high-speed broadband Internet service at home. Although email and text messaging are very useful, they are not effective tools for communication compared to the information exchange and personal connection of face-to-face conversations. Remote work also inhibits the creativity and innovative thinking that take place when people interact with each other face-to-face, and videoconferencing is only a partial solution.

2. **Identify the information technologies used to provide a solution to this problem. Was this a successful solution? Why or why not?**

   Information technologies driving these changes include broadband high-speed Internet connections, laptop computers, tablets, smartphones, email, messaging, and videoconferencing tools. As companies shift their work from face-to-face to remote, video conferencing is becoming the new normal for meetings. There are definite benefits to remote work: lower overhead, more flexible schedules, reductions in employee commuting time and attrition rates, and increases in productivity. (Many companies reported that productivity did not suffer when employees worked at home

during the pandemic.) According to Global Workplace Analytics, a typical company saves about $11,000 per half-time telecommuter per year.

3. **Will working from home become the dominant way of working in the future? Why or why not?**

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

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

Section 1-2, "What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?" gives students the facts and definitions that underpin information systems and allow students to knowledgeably discuss information systems. Students do not need the knowledge of a technical person, but they do need to understand the role of information technology and how it must support the organization's business strategy. They must also understand how information technology can be used to help transform a business. Note that the chapter's definitions and terms help prepare students to discuss information systems as an intricate part of business systems. Encourage students to see that technology is subordinate to the organization and its purposes.

This is also a good place to reinforce the differences between information systems literacy and computer literacy. When asked to describe company information systems, students often depict information systems in terms of technology. It is important to stress that information systems are more than just technology, and that they have management, organization, and technology dimensions. Figure 1-5 and the diagram at the beginning of the chapter can be used to illustrate this point.

Ask students why some companies can achieve much better results using information systems while others cannot. That will help them understand the concept of complementary assets and show that there is much more to building a digital firm than simply buying the latest, greatest hardware and software. It will also help them understand the delicate relationship between technology, management, and organizations assets.

Interactive Session: Technology: UPS Competes Globally with Information Technology

Case Study Questions

1. **What are the inputs, processing, and outputs of UPS's package tracking system?**

   Inputs: The inputs include package information, customer signature, pickup, delivery, time-card data, current location (while en route), and billing and customer clearance documentation.

   Processing: The data are transmitted to a central computer and stored for retrieval. Data are also reorganized so that they can be tracked by customer account, date, driver, and other criteria.

   Outputs: The outputs include pickup and delivery times, location while en route, and package recipient. The outputs also include various reports, such as all packages for a specific account or a specific driver or route, as well as summary reports for management.

2. **What technologies are used by UPS? How are these technologies related to UPS's business strategy?**

   Technologies include handheld computers (DIADs), bar code scanning systems, wired and wireless communications networks, desktop computers, UPS's central computer (large mainframe computers), and storage technology for the package delivery data. UPS also uses telecommunication technologies for transmitting data through pagers and cellular phone networks. The company uses in-house software for tracking packages, calculating fees, maintaining customer accounts and managing logistics, as well as software to access the World Wide Web.

   UPS has used the same strategy for over 90 years. Its strategy is to provide the "best service and lowest rates." One of the most visible aspects of technology is the customer's ability to track his/her package via the UPS website. However, technology also enables data to seamlessly flow throughout UPS and helps streamline the workflow at UPS. Thus, the technology described in the scenario enables UPS to be more competitive, efficient, and profitable. 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.

3. **What strategic business objectives do UPS's information systems address?**

   Operational excellence: UPS has maintained leadership in small-package delivery services despite stiff competition from FedEx and the U.S. Postal System by investing heavily in advanced information technology.

New products, services, and business models: 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.

Customer and supplier intimacy: Customers can download and print their own labels using special software provided by UPS or by accessing the UPS website. 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.

Improved decision making: Special software creates the most efficient delivery route for each driver that considers traffic, weather conditions, and the location of each stop. In a network with 55,000 routes in the United States alone, shaving even one mile off each driver's daily route translates into big savings in time, fuel consumption, miles driven, and carbon emissions—as much as $50 million per year.

Competitive advantage: UPS is leveraging its decades of expertise managing its own global delivery network to manage logistics and supply chain activities for other companies. Its Supply Chain Solutions division 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. In this manner UPS provides a highly differentiated product that its competitors cannot easily duplicate.

4. What would happen if UPS's information systems were not available?

Arguably, UPS would not be able to compete effectively without technology. UPS could not provide the same level of services to its customers at reasonable prices. From the customers' perspective, these technologies provide value because they help customers complete their tasks more efficiently. Customers view UPS's technology as value-added services as opposed to increasing the cost of sending packages.

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

Too often, information systems are thought to be all about hardware and software. Issues that focus on human behavioral aspects of information systems are overlooked or minimized. That can lead to disaster. Figure 1-9 may help you explain contemporary approaches to information systems.

After contrasting the technical and behavioral approaches, you should stress to your students that the sociotechnical approach does not ignore the technical but considers it as a part of the organization.

Section 1-4, "How will MIS help my career?" addresses how the chapter's elements and information can help in securing a good job as a financial client support and sales assistant. These types of jobs are becoming more popular as information technology becomes more important in the workplace.

Review Questions

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

Identify three major new information system trends.

Three information system trends that are influencing the way businesses interact with employees, customers, suppliers, and business partners include IT innovations, new business models, e-commerce expansion, management changes, and changes in firms and organizations. (Learning Objective 1-1: How are information systems transforming business and why are they so essential for running and managing a business today? AACSB: Application of knowledge.)

Describe the characteristics of a digital firm.

- 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.
- Key corporate assets—intellectual property, core competencies, and financial and human assets—are managed through digital means.
- They sense and respond to their environments far more rapidly than traditional firms.
- They offer extraordinary opportunities for more flexible global organization and management, practicing time-shifting and space-shifting. (Learning Objective 1-1: How are information systems transforming business and why are they so essential for running and managing a business today? AACSB: Application of knowledge.)

Describe the challenges and opportunities of globalization in a "flattened" world.

Customers no longer need to rely on local businesses for products and services. They can shop 24/7 for virtually anything and have it delivered to their door or desktop. Companies can operate 24/7 from any geographic location around the world. Jobs can just as easily move across the state or across the ocean. Employees must continually develop high-level skills through education and on-the-job experience that cannot be outsourced. Business must avoid markets for goods and services that can be produced

offshore much cheaper. The emergence of the Internet into a full-blown international communications system has drastically reduced the costs of operating and transacting business on a global scale. (Learning Objective 1-1: How are information systems transforming business and why are they so essential for running and managing a business today? AACSB: Application of knowledge.)

List and describe six reasons why information systems are so important for business today.

Six reasons why information systems are so important for business today include:

(1) Operational excellence

(2) New products, services, and business models

(3) Customer and supplier intimacy

(4) Improved decision making

(5) Competitive advantage

(6) Survival

Information systems are the foundation for conducting business today. In many industries, survival and even existence without extensive use of IT is inconceivable, and IT plays a critical role in increasing productivity. Although information technology has become more of a commodity, when coupled with complementary changes in organization and management, it can provide the foundation for new products, services, and ways of conducting business that provide firms with a strategic advantage. (Learning Objective 1-1: How are information systems transforming business and why are they so essential for running and managing a business today? AACSB: Application of knowledge.)

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

Define an information system and describe the activities it performs.

An information system is a set of interrelated components that work together to collect, process, store, and disseminate information to support decision making, coordination, control, analysis, and visualization in an organization. In addition to supporting decision making, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products. (Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Application of knowledge.)

List and describe the organizational, management, and technology dimensions of information systems.

- **Organization:** The organization dimension of information systems involves issues such as the organization's hierarchy, functional specialties, business processes, culture, and political interest groups.
- **Management:** The management dimension of information systems involves setting organizational strategies, allocating human and financial resources, creating new products and services and re-creating the organization if necessary.
- **Technology:** The technology dimension consists of computer hardware, software, data management technology, and networking/telecommunications technology. (Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Application of knowledge.)

Distinguish between data and information and between information systems literacy and computer literacy.

- Data 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.
- Information is data that have been shaped into a form that is meaningful and useful to human beings.
- Information systems literacy is a broad-based understanding of information systems. It includes a behavioral as well as a technical approach to studying information systems.
- In contrast, computer literacy focuses primarily on knowledge of information technology. It is limited to understanding how computer hardware and software works. (Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Analytical thinking.)

Explain how the Internet and the World Wide Web are related to the other technology components of information systems.

The Internet and World Wide Web have had a tremendous impact on the role that information systems play in organizations. These two tools are responsible for the increased connectivity and collaboration within and outside the organization. The Internet, World Wide Web, and other technologies have led to the redesign and reshaping of organizations. They have helped transform the organization's structure, scope of operations, reporting and control mechanisms, work practices, work flows, and products and services. (Learning Objective 1-2: What is an information system?

How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Analytical thinking.)

Define complementary assets and describe their relationship to information technology.

Complementary assets are those assets required to derive value from a primary investment. Firms must rely on supportive values, structures, and behavior patterns to obtain a greater value from their IT investments. Value must be added through complementary assets such as new business processes, management behavior, organizational culture, and training. (Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Application of knowledge.)

Describe the complementary social, managerial, and organizational assets required to optimize returns from information technology investments.

Table 1-2 lists the complementary social, managerial, and organization assets required to optimize returns from information technology investments. Here are a few of them:

Organizational assets:

- Supportive culture that values efficiency and effectiveness
- Appropriate business model
- Efficient business processes
- Decentralized authority

Managerial assets:

- Strong senior management support for technology investment and change
- Incentives for management innovation
- Teamwork and collaborative work environments

Social assets:

- The Internet and telecommunications infrastructure
- IT-enriched educational programs raising labor force computer literacy
- Standards (both government and private sector) (Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Application of knowledge.)

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

List and describe each discipline that contributes to a technical approach to information systems.

A technical approach to information systems emphasizes mathematically-based models to study information systems and the physical technology and formal capabilities of information systems. Students should know the differences between computer science (theories of computability, computation methods, and data storage and access methods), management science (development of models for decision making and managerial practice), and operations research (mathematical techniques for optimizing organizational parameters such as transportation, inventory control, and transaction costs). (Learning Objective 1-3: What academic disciplines are used to study information systems and how does each contribute to an understanding of information systems? AACSB: Application of knowledge.)

List and describe each discipline that contributes to a behavioral approach to information systems.

A behavioral approach to information systems focuses on questions such as strategic business integration, behavioral problems of systems utilization, system design and implementation, social and organizational impacts of information systems, political impacts of information systems, and individual responses to information systems. Solutions to problems created by information technology are primarily changes in attitudes, management, organizational policy, and behavior. (Learning Objective 1-3: What academic disciplines are used to study information systems and how does each contribute to an understanding of information systems? AACSB: Application of knowledge.)

Describe the sociotechnical perspective on information systems.

A sociotechnical perspective combines the technical approach and behavioral approach to achieve optimal organizational performance. Technology must be changed and designed to fit organizational and individual needs and not the other way around. Organizations and individuals must also change through training, learning, and allowing technology to operate and prosper. (Learning Objective 1-3: What academic disciplines are used to study information systems and how does each contribute to an understanding of information systems? AACSB: Application of knowledge.)

Discussion Questions

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

Student answers to this question will vary.

1-5 If you were setting up the website for a Major League Baseball team, what management, organization, and technology issues might you encounter?

Student answers to this question will vary.

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

Student answers to this question will vary.

Hands-On MIS Projects

This section gives students an opportunity to analyze real world information systems needs and requirements. It provides several exercises you can use to determine if students are grasping the material in the chapter.

Management Decision Problems

1-7 Snyder's of Hanover: The financial department uses spreadsheets and manual processes for much of its data gathering and reporting. Assess the impact of this situation on business performance and management decision making.

- Data entry errors from repetitive entry
- No information available on-demand
- Late reporting of critical decision-making information
- Time consuming

(Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Analytical thinking.)

1-8 Dollar General Corporation: Wants to keep costs as low as possible so it does not use an automated method for keeping track of inventory at each store. What decisions have to be made before investing in an information system solution?

- Determine business problems—mismanagement of inventory, too little or too much inventory, no ability to track inventory.

- Lack of an information system to manage inventory is actually increasing costs rather than decreasing them.
- What is the exact problem the company wants to solve—reduce costs.

(Learning Objective 1-1: How are information systems transforming business and why are they so essential for running and managing a business today? AACSB: Analytical thinking, Application of knowledge.)

Improving Decision Making: Using Databases to Analyze Sales Trends:

Software skills: Database querying and reporting
Business skills: Sales trend analysis

1-9 This exercise helps students understand how they can use database software to produce valuable information from raw data. The solutions provided here were created using the query wizard and report wizard capabilities of Microsoft Access. Students can, of course, create more sophisticated reports if they wish, but most information can be obtained from simple query and reporting functions. The main challenge is to get students to ask the right questions about the information.

- Which products should be restocked?
- Which stores and sales regions would benefit from a promotional campaign and additional marketing?
- When (what time of the year) should products be offered at full price, and when should discounts be used?

The answers to these questions can be found in the Microsoft Access File named: MIS16ch01_solutionfile.mdb

(Learning Objective 1-2: What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? AACSB: Analytical thinking.)

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

Software skills: Internet-based software
Business skills: Job searching

1-10 In addition to having students research jobs in their chosen career field, it may be quite interesting to have them research jobs in other career fields so they can see that virtually every job and/or career requires information systems skills.

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

AACSB: Written and oral communication, Analytical thinking, Reflective thinking, Application of knowledge.)

Collaboration and Teamwork Project

1-11 In MyLab MIS, you will find a Collaboration and Teamwork Project dealing with the concepts in this chapter. You will be able to use Google Drive, Google Docs, Google Sites, to complete the assignment.

Case Study: *New Technology at UPS Clashes with Outdated Ways of Working*

1-12 Identify the problem faced by UPS. Was it a technology problem, an organizational problem, or a management problem? Explain your answer.

The major challenge faced by UPS is staying competitive with new rivals such as Amazon.com and appropriately updating investments in information technology. The problem encompasses problems at the people, organizational, and managerial levels:

- Outdated equipment required more employee 'touch points' at the sorting centers. Each additional 'touch point' introduces additional possibility for error, even with well-qualified workers.
- At the organization level, errors were adding up to missorted packages which can add a day to deliveries, and degrading customer service.
- At the managerial level, managers were working with historical data to make decisions regarding undeliverable packages. With new technology, they now have access to real-time data to help make actual decisions (i.e., staffing) versus estimating.

(Learning Objective 1: Why are information systems so essential for running and managing a business today? AACSB: Analytical thinking, Reflective thinking.)

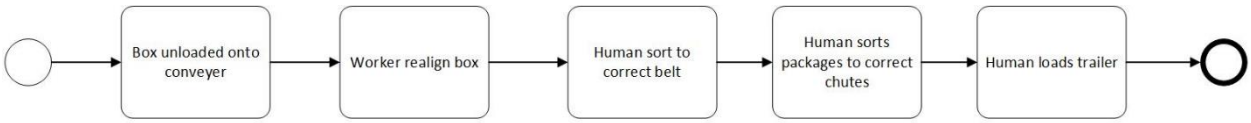
1-13 Describe the solution to this problem pursued by UPS? Is this a successful solution? Why or why not?

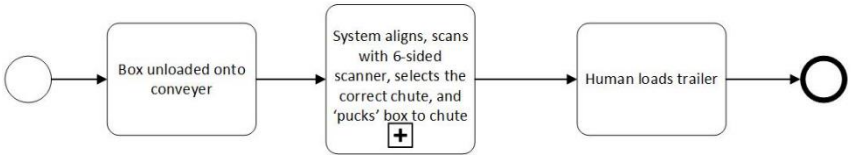
The primary solution being integrated by UPS is the automation of older facilities to reduce the number of human touch points. This investment, including super hubs, can now sort packages 30 percent more efficiently, and with far fewer errors. In another example, an upgraded facility with 750 workers were able to process the same number of packages as an older facility with 1,170 workers. By all accounts, the upgrades have been very successful.

(Learning Objective 2: What is an information system? How does it work? What are its people, organizational, and technology components? AACSB: Analytical thinking, Reflective thinking, Application of knowledge.)

1-14 Diagram the package sorting process at UPS before and after automation.

Using Business Process Model and Notation (BPMN), the following two diagrams illustrate the packing sorting process before and after automation.





(Learning Objective 2: What is an information system? How does it work? What are its people, organizational, and technology components? AACSB: Analytical thinking, Reflective thinking, Application of knowledge.)

1-15 How did automated package sorting change operations and decision making at UPS?

The automated package sorting improved operations by requiring fewer human touch points and automating most of the process with the exception unloading and loading boxes onto a trailer. In some instances, new automated facilities provided additional jobs.

Based on IT innovations including Bluetooth enhancements providing real-time information to managers, decisions can be made using actual data rather than historical data requiring estimating. This improvement allows for better allocation of resources and increased efficiency with fewer errors. (Learning Objective 1: How are information systems transforming business and why are they so essential for running and managing a business today? AACSB: Analytical thinking, Reflective thinking, Application of knowledge.)

Management Information Systems, 17E

Laudon & Laudon

Lecture Files

Chapter 1 Information Systems in Global Business Today

Computers are changing every aspect of our lives from entertainment to shopping, from the work we do and where we do it, to how we communicate with friends and relatives. Networking technologies pervade almost everything we do professionally, socially, and recreationally. As you can see from the opening case in the text, many retail companies are remodeling their businesses and information systems to dynamically change the shopping experience using the latest technologies. It has become more important than ever for you to understand not just how technology works but also how current and future advances affect your work life.

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

Ask managers to describe their most important resources and they'll list money, equipment, materials, and people—not necessarily in that order. It's very unusual for managers to consider information an important resource, and yet it is. As electronic business and electronic commerce grow in popularity and more firms digitize their operations, having useful information is becoming even more important to the global business community.

This chapter gives you an overview of many of the subjects we'll touch on in this course. It will help you understand how all firms today, large and small, local and global, use information systems to achieve important business objectives, such as operational excellence, customer and supplier intimacy, improved decision making, competitive advantage, day-to-day survival, and new products and services.

What's New in Management Information Systems?

It seems that changes in technology are never-ending. The use of technology now extends far beyond the simple desktop computer, especially in the business world. As the text points out, five interrelated changes are of paramount importance:

- Information technology innovations driving changes in business processes
- New business models made possible by IT innovations
- Ever-expanding e-commerce, social commerce, and mobile retail e-commerce
- Changes in the way managers operate in conjunction with their employees
- Changes in the way companies and businesses are structured

All of these changes will affect you now and in the future as technology continues to grow and evolve.

Interactive Session: Organizations: Will the Coronavirus Pandemic Make Working from Home the New Normal? (see page 8 of the text) Addresses the way businesses have changed the way their employees work and interact with each other due to the coronavirus pandemic, including the technologies that are needed to do this effectively.

Globalization Challenges and Opportunities: A Flattened World

Next time you purchase a product, any product, look at the fine print and see where it's made. It could be China, or the Philippines, or a South American company, or even in the United States. You can disagree with the fact that many manufacturing jobs have moved from the United States to foreign countries, but look at the vast number of jobs that are being created in this country. Employment in information systems and the other service occupations listed previously has rapidly expanded in sheer numbers, wages, productivity, and quality of work. Outsourcing has actually accelerated the development of new systems in the United States and worldwide by reducing the cost of building and maintaining them. In 2019 job openings in information systems and technologies far exceeded the supply of applicants. The global economy Laudon & Laudon talk about is being made possible by technology, and that's why it's so important that you understand how to use information systems technology instead of just computer technology. There's a big difference between the two, and we'll talk about it more.

The Emerging Digital Firm

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 key corporate assets are managed through digital means.

When a firm goes digital, it's not about just adding a computer system to the mix. Throwing a computer system at outdated **business processes** is exactly the wrong thing to do. A truly digital firm has several characteristics that distinguish it from most of the firms claiming to be digitized:

- Significant business relationships with customers, suppliers, and employees are digitally enabled and mediated.
- Core business processes are accomplished through digital networks and span the entire organization or link multiple organizations.
- Key corporate assets—intellectual property, core competencies, and financial and human assets—are managed through digital means.
- Challenges and problems in internal and external environments are quickly recognized and solutions developed.
- Time and space shifting are embraced throughout company operations.

And the number one reason digital firms experience greater opportunities for success and profits is because they view information technology as the core of the business and a primary management tool.

Strategic Business Objectives of Information Systems

Although many managers are familiar with the reasons why managing their typical resources such as equipment and people are important, it is worthwhile to take a moment to examine the growing interdependence between a firm's ability to use information technology and its ability to implement corporate strategies and achieve

corporate goals. Specifically, business firms invest heavily in information to achieve six strategic business objectives:

- Operational excellence
- New products, services, and business models
- Customer and supplier intimacy
- Improved decision making
- Competitive advantage
- Survival

Operational Excellence

Businesses continuously seek to improve the efficiency of their operations in order to achieve higher profitability. Information systems and technologies are some of the most important tools available to managers for achieving higher levels of efficiency and productivity in business operations, especially when coupled with changes in business practices and management behavior.

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. Apple has prospered from a continuing stream of innovations, including the iTunes music service, the iPad, and the iPhone.

Customer and Supplier Intimacy

When a business really knows its customers, and serves them well, the way they want to be served, customers generally respond by returning and purchasing more. The result is increased revenues and profits. Likewise with suppliers: the more a business engages its suppliers, the better the suppliers can provide vital inputs. The result is a lower cost of doing business. JC Penney is an excellent example of how the use of information systems and technologies are extensively used to better serve suppliers and retail customers. Its information system digitally links the supplier to each of its stores worldwide. Suppliers are able to ensure the continuous flow of products to the stores in order to satisfy customer demands.

Improved Decision Making

Information systems and technologies have made it possible for managers to use real-time data from the marketplace when making decisions. Previously, managers did not have access to accurate and current data and as such relied on forecasts, best guesses, and luck. The inability to make informed decisions resulted in underproduction of goods and services, misallocation of resources, and poor response times.

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 are industry leaders because they know how to use information systems for this purpose.

Survival

Firms also invest in information systems and technologies because they are necessities for doing business. Information systems are not a luxury. In most businesses, information systems and technology are the core to survival. In the text, the Laudons discuss how Citibank was the first banking firm to introduce ATMs. In doing so, they had a major competitive advantage over their competitors. In order to remain and survive in the retail banking industry, other banks had no choice but to provide ATM services to banking customers.

New federal and state statutes and regulations have resulted in giving firms no choice but to turn to information systems and technologies in order to comply with the new requirements.

Bottom Line: Information systems do matter because of the increased need for capital management, the increased productivity that arises from their use, the strategic opportunities and advantages they offer, and because they are becoming the foundation of doing business around the world.

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

Information technology (IT) consists of all the hardware and software that a firm needs to use in order to achieve its business objectives.

What Is an Information System?

Too often you hear someone say, “Oh yeah, I know how to use a computer. I can surf the web with the best of them and I can play online games with people all over the world for hours. I’m really good at computers.”

Okay. So that person can pound a keyboard, use a mouse at lightning speed, and has a list of favorite websites a mile long. But the real question becomes: “Is that person information literate?” Just because you can pound the keyboard doesn’t necessarily mean you can leverage the technology to your advantage or to the advantage of your organization. An organization can gather and keep all the data on its customers that a hard drive can hold. You can get all the output reports that one desk can physically hold. You can have the fastest Internet connection created to date. But if the organization doesn’t take advantage of customer **data** to create new opportunities, then all it has is useless information. If the output report doesn’t tell management that it has a serious problem on the factory floor, then all that’s been accomplished is to kill a few more trees. If you don’t know how to analyze the **information** from a website to take advantage of new sales leads, then what have you really done for yourself today?

Most of us think only of hardware and software when we think of an **information system.** 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.

In this section of the text, Laudon & Laudon discuss the components of an information system. They talk about the **input, processing, output,** and **feedback** processes. 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.

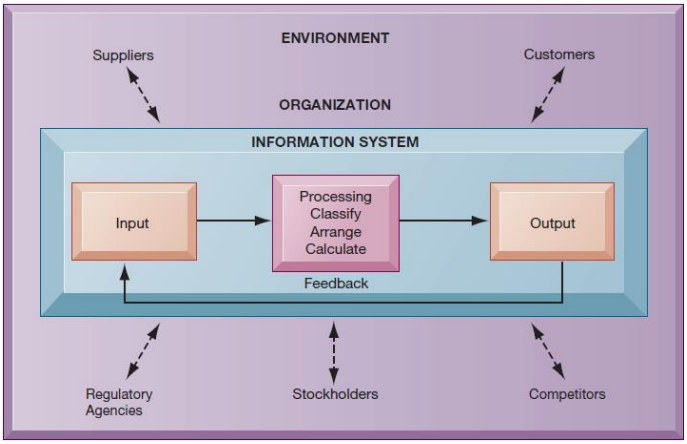


Fig 1.4 Functions of an Information System

Figure 1-4 shows how using feedback completes the information processing loop. To be a good information systems manager, however, you must bring into that loop far more than just computer data. For instance, your information system reports that you produced 100,000 widgets last week with a "throwback" rate of 10 percent. The feedback loop tells you that the throwback rate has fallen 2 percent in the last month. Wow, you say, that's a pretty good improvement. So far, so good! But if you put that information into the broader context of the organization, you're still costing the organization a huge sum of money because each percentage point on the throwback rate averages $100,000. And when you bring in available external environmental information, your company is 5 percent above the industry norm. Now that's information you can use—to your advantage or disadvantage!

Dimensions of Information Systems

There is a distinct difference between possessing **information systems literacy** and simple **computer literacy.** If you can combine information from internal sources and external environments, if you can use data to help you make better decisions, if you can use information to help you improve your organization, you can consider yourself "information literate."

Management information systems (MIS) deal 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. As such, MIS is defined as the study of information systems focusing on their use in business and management.

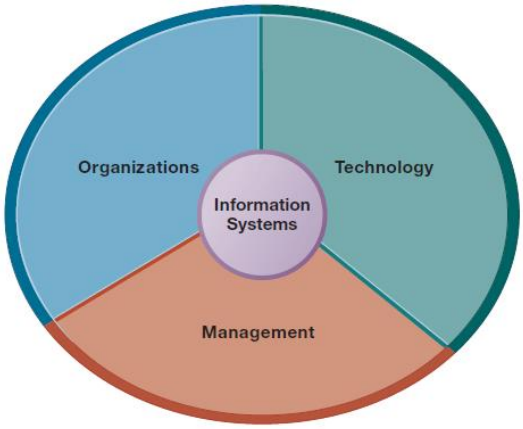


Fig 1.5 Information Systems Are More than Computers

Organizations

Organizations are funny things. Each one tends to have its own individual personality and yet shares many things in common with other organizations. Look at some of the organizations you may be associated with—a softball team, fraternity/sorority, health club, or a child's soccer team. See, organizations exist everywhere, and each has its own structure, just as workplace organizations have structures and personalities to fit their needs, or in some cases, their old habits.

The key elements of an organization are its:

- People
- Structure
- Business processes
- Politics
- Culture

In every organization you'll find **senior management** making long-range strategic decisions, **middle management** carrying out the plans and goals set by senior managers, and **operational management** handling the day-to-day operations of the company. As we'll see, information systems output must be geared to each of these levels of management.

Just as every baseball team needs good players at different positions, a business organization requires different employees to help it succeed. **Knowledge workers** help create new knowledge for the organization and **data workers** help process the paperwork necessary to keep an organization functioning. Without **production or service workers,** how would the company get its products and services to the customer?

A baseball team needs talented, well-trained players at different positions. Sometimes, the success of the team depends on a good, well-informed coach or manager—so, too, with the workplace organization. Business organizations have their major **business functions,** which need many kinds of players with various talents, who are well-trained and well-informed, in order to succeed.

The larger the organization, the more formal the management structure, including the need for standardized business processes. Most of these business processes have been developed over time and help managers and employees properly complete their tasks in a more efficient manner. Many companies now integrate these

business processes into their information systems to ensure uniformity, consistency, and compliance. As we'll see in upcoming chapters, many companies are even incorporating informal work processes into their information systems in an effort to capture as much corporate knowledge as possible.

An organization's **culture** is often an integral part of its information system. UPS's culture focuses on customer service while Walmart's culture is centered on being a low-cost retailer. Each company builds its information system differently to incorporate those organizational ideals.

Management

Every good organization needs good managers—pretty simple, pretty reasonable. Take professional baseball managers. They don't actually play the game; they don't hit the home run, catch the fly ball for the last out, or hang every decoration for the celebration party. They stay on the sidelines during the game. Their real role is to develop the game plan by analyzing their team's strengths and weaknesses. But that's not all; they also determine the competition's strengths and weaknesses. Every good manager has a game plan before the team even comes out of the locker room. That plan may change as the game progresses, but managers pretty much know what they're going to do if they are losing or if they are winning.

Information Technology

Do you own an Internet-enabled refrigerator? (Yes, they really do exist.) Probably not, since they've only been on the market for a short time. How old is your car or truck? Manufacturers are constantly offering us new vehicles, yet we tend to upgrade only every few years. Your personal computer may be a year old or three years old. Do you have all the latest gadgets? Chances are you don't. Face it, you just can't keep up with all the new **computer hardware**. No one can.

Think about how hard, not to mention expensive, it is for an individual to acquire each new **computer software** program introduced to the marketplace. Think how difficult it sometimes is to learn how to use every feature of all those new products.

No matter how big your storage technology device seems to be, you're constantly running out of room to store all the new software programs and all the data you create. In order to keep track of all of the information you have stored, you will need **data management** software that is designed to organize the information so that you can readily retrieve what you are looking for.

As the products and services on **networks** expand every day, your need for new **networking and telecommunications technology** links just seems to grow and grow.

The fastest and biggest change in modern computing is the **Internet**. To say that the Internet is transforming the way we live, work, and play is probably the greatest understatement in years. Businesses can create new opportunities, but they can also lose opportunities just as quickly. Now an organization has to design new systems, or transform old ones, with not just the company in mind, but millions of other users of the Internet, **extranets,** and **intranets.** They have to decide how much or how little information to provide, in what way, with what level of access, and how best to present it. It's a huge job!

The **World Wide Web** allows big companies to act "small," and small companies to act "big." It has leveled the playing field so entrepreneurs can break into markets previously closed to them. A website, consisting of a few pages or hundreds of pages, enables businesses to get close and stay close to their customers in new ways. It is truly a revolution in our global economy.

Now put these thoughts into a much larger context of an organization's **information technology (IT) infrastructure.** Yes, it would be nice if your company could purchase new computers every three months so you could have the fastest, best technology on the market. But it can't. Not only is it expensive to buy the hardware and the software, but the costs of installing, maintaining, updating, integrating, and training must all be taken into account. 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.

Interactive Session: Technology: UPS Competes Globally with Information Technology (see page 21 of the textbook) describes how this giant company has transformed itself over the years by using technology to increase its competitive advantage.

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

From a business perspective, an information system provides a solution to a problem or challenge facing a firm and provides 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:

- Increased productivity
- Increased revenues
- Superior long-term strategic positioning

There are three ways an information system can add value to a business:

- Help managers make better decisions
- Help make business processes more efficient
- Increase profitability

Figure 1-7 diagrams the business information value chain. We'll examine the elements of this figure in more detail throughout this text.

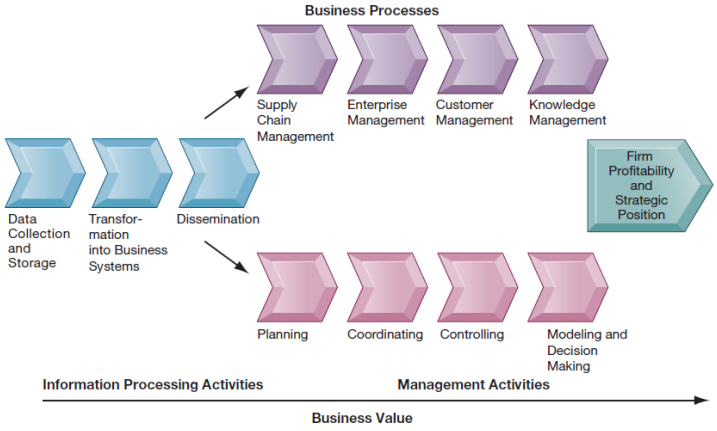


Figure 1-7 The Business Information Value Chain

Complementary Assets: Organizational Capital and the Right Business Model

Once technology was considered "too technical" for the rest of us to understand. Computers were relegated to the back room with a few technicians running around in white coats. No one else understood what these people did or how they did it. It was a whole different world and actually seemed disconnected from the mainstream operations of the company.

Technology and its associated information systems are now integrated throughout the organization. Everyone is concerned about its role and impact on their work activities. End users take on greater responsibility for the success of the information systems and are actually doing a lot of the work that belonged to the techies. Even the executive levels of an organization can no longer ignore the technology as they realize the importance of managing their **organizational and management capital**.

As a firm becomes more digital, its information system continues to extend beyond the traditional role of serving the employees. Investing in **complementary assets** associated with the information systems such as new business models and processes, management behavior, organizational culture, and training leads to superior returns based on research.

But the plain fact is that organizations, especially larger ones, just can't change as fast as the technology. Companies make huge investments not just in hardware and software, but also in people. Training people, building new operating procedures around technology, and changing work processes take far longer than the technological pace will allow.

Bottom Line: Information literacy is more than just clicking a mouse, pounding the computer keyboard, or surfing the web. It's about integrating the various elements of an organization, technical and nontechnical, into a successful enterprise. As a successful manager you must concentrate on all of the elements of the information system and integrate them into a single, cohesive system that serves the needs of the organization, the wants of the customer, and the desires of the employees; the more complex the system, the harder to manage, but the greater the payoff. Complementary assets comprise the organization, managerial, and social assets of a firm.

1.3 What academic disciplines are used to study information systems and how does each contribute to an understanding of information systems?

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines. The disciplines that contribute to the technical approach are computer science, management science, and operations research. The disciplines contributing to the behavioral approach are psychology, sociology, and economics.

Technical Approach

Think of this analogy: A "techie" looks at most things associated with computing as a series of zeroes or ones. After all, everything in a computer is ultimately reduced to a zero or a one. So, using the technical approach, you could say that 2 + 2 = 4.

Behavioral Approach

The behavioral approach, on the other hand, takes into account the very nature of human beings. Nothing is totally black and white. Therefore, the behavioral approach to the same equation would be "2 + 2 = maybe 4 or perhaps 3.5 to 5.5, but we'll have to put it before the committee and see what the last quarter's figures say." Neither approach is better than the other, depending on the situation. Neither approach is righter than the other, depending on the situation.

Approach of This Text: Sociotechnical Systems

An organization can't afford to view its information resources as belonging to either the techies (technical approach) or the non-techies (behavioral approach). Responsibility for information belongs to everyone in the organization. This is the **sociotechnical** approach—a combination of the two approaches. Everyone has to work together to ensure that information systems serve the entire organization.

To help you understand the importance of viewing management information systems using the sociotechnical approach, consider this: David Haskin, writing in the April 1999 issue of *Windows Magazine*, quotes Steve Roberts, vice president of information technology for Mind Spring Enterprises, an Atlanta-based Internet service provider: "The gap in understanding between technical and nontechnical people is the biggest challenge I've seen." Haskin goes on to say, "Because technology is the bedrock on which successful businesses are built, the stakes in making this relationship work are high. Failing to use the correct technology can put you at a competitive disadvantage, and glitches in existing technologies can bring a business to a grinding halt."

Even though Roberts made his statement just over 20 years ago, his insight into the challenges of managing information systems hasn't changed much.

Bottom Line: Information systems and the use of technology belong to *everyone* in an organization. This concept is best carried out through a sociotechnical approach to viewing information systems, which allows both the technical and behavioral approaches to be combined for the good of the organization.

1.4 How will MIS help my career?

The chapter's elements and information can help in securing a good job as a financial client support and sales assistant. These types of jobs are becoming more popular as information technology becomes more important in the workplace.

Discussion Questions:

1. Why is it important to understand the difference between computer literacy and information literacy?

2. Discuss the differences between information and data. How are they different? Give an example of how they might relate to each other.

3. Discuss how complementary social, managerial, and organizational assets help optimize returns from information technology investments.

4. Discuss the changes in the business environment brought about by technology in the last five years. Use your own personal experiences to formulate your answer.

5. Describe why it's becoming increasingly important to view information systems and technology from a sociotechnical aspect.

Answers to Discussion Questions:

1. Information literacy is more concerned with creating information useful to an organization and its employees, whereas computer literacy focuses mainly on how computer hardware and software work. As technology uses spread beyond traditional computers, information literacy enables employees and organizations to gain an edge over their competition.

2. Data 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. Information is data that have been shaped into a form that is meaningful and useful to human beings. Examples will vary.

3. Table 1-2 (page 24) lists the organizational, managerial, and social assets required to optimize returns from information technology investments. Investing in information technology like new hardware or software, is not enough to ensure an organization's success. Supportive values, structures, and behavior patterns must accompany the technological changes or improvements in order for a company to realize the maximum value from its investments in organizational and management capital.

4. Answers should include references to the growing dependence on Internet technologies in the workplace, increased use of mobile hand-held computing devices, increased globalization of businesses, 24/7 availability of many business processes to the customer, and the rise of the information economy.

5. The technical approach to information systems emphasizes the "hard" side of technology. The behavioral approach to information systems emphasizes the "soft" side of technology. As technology plays an increasing role in a business's success or failure, it's important to mesh both sides. Adopting a sociotechnical systems perspective helps avoid a purely technological approach to information systems. Organizations can achieve more efficient and effective organizational performance by jointly optimizing both the social and technical systems.

Chapter 1 Running Case Assignment: Understanding Information System Requirements
Software skills: Presentation software
Business skills: Management analysis and information system recommendations

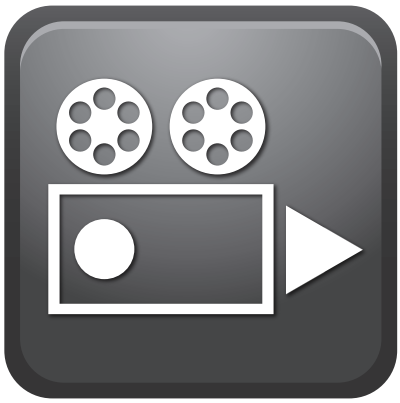
How do you know what information systems are really needed by a business and which are the most important? How should a company's structure or culture affect the building and use of information systems?

Dirt Bikes's management has asked you to prepare a management analysis of the company to help it assess the firm's current situation and future plans. Review Dirt Bikes's company history, organization chart, products and services, and sales and marketing in the Introduction to Dirt Bikes. Then prepare a report that addresses these questions:

- What are the company's goals and culture?
- What products and services does Dirt Bikes U.S.A. provide? How many types of products and services are available to customers? How does Dirt Bikes sell its products?
- How many employees are managers, production workers, or knowledge or information workers? Are there levels of management?
- What kinds of information systems and technologies would be the most important for a company such as Dirt Bikes?
- (Optional) Use electronic presentation software to summarize for management your analysis of Dirt Bikes's performance.

CHAPTER 1 INFORMATION SYSTEMS IN GLOBAL BUSINESS TODAY

CASE 1 Business in the Cloud: Facebook, Google, and eBay Data Centers



(a) Facebook Data Center

URL https://www.youtube.com/watch?v=_r97qdyQtlk; L=8:20

(b) Google Data Center Efficiency Best Practices: Power Efficiency

URL http://www.youtube.com/watch?v=voOK-1DLr00; L=10:00

(c) Dell Titon Cooling Unveiled

URL https://www.youtube.com/watch?v=HcD47Y-TQQw; L=5:22

SUMMARY Businesses today run on the Internet, and the Internet runs on data centers. Today, data centers might be more accurately called business centers. Data centers drive nearly every aspect of many businesses, especially ones with a significant online presence like Facebook, Google, and eBay. But data centers are significant users of expensive electricity to cool their servers, and they make a significant contribution to pollution and global warming. Cloud data center operators are using a variety of new techniques to become more efficient in their use of electricity.

continued

CASE Consumers of technology constantly demand devices that are smaller, more efficient, and more powerful than the ones they have. But most consumers don't understand the massive back-end infrastructure that powers their "front end" devices, like mobile phones, smartphones, tablets, and desktop computers.

Take, for example, smartphones and tablet computers. iPhones, Androids, iPads, and other tablets represent a trend in all forms of mobile technology towards smaller devices that perform an increasingly large number of functions. But every time a smartphone or tablet user connects to the Internet, places a call, or sends an instant message, it uses power not only on their phone, but at every step of the infrastructure used to perform that function. More often than not, data centers are intimately involved in any Internet-based communication.

In 2020, there were over 7 million data centers of all sizes worldwide. IDC estimates that the number of data centers will eventually decline due to the growth of very large cloud mega-data centers. Because most data centers use air conditioning of one sort or another to keep operating temperatures of microprocessor chips within a safe range, they are significant contributors to pollution and global warming. Many data centers do not practice effective energy management and waste billions of kilowatt hours annually. The growth of cloud computing, in particular streaming of music, television, and movies, is expected to accelerate data center power consumption in the next ten years even as the number of data centers declines.

Data centers are growing not only in number, but also in sheer size. For instance, Facebook has a data center which covers approximately 1.1 million square feet and contains thousands of servers. The cost of running large data centers is a significant component of the overall IT budget of firms. There are two components to the energy cost of data centers: the cost of running the computers, and the cost of cooling them. For this reason, large-scale data center operators are seeking a variety of new ways to cool their servers.

Of all the websites in the world, Google and YouTube may get the most hits per day, but no site can top Facebook as far as raw traffic. Facebook is by far the "stickiest" of the top sites, meaning its users spend more time per visit there, so it's reasonable to argue that no site has a greater need for a robust infrastructure than the social networking giant. With a mind-boggling 2.7 billion monthly active users as of 2020, Facebook faces computing demands that no other company has ever faced. Not only is their site traffic unparalleled, but users are contributing 100s of petabytes of photos and videos on Facebook each day, and that data requires storage.

To manage this demand, Facebook has 17 data centers around the world. They also lease server space across the United States and worldwide. Facebook has chosen locations that allow them to use environmental factors (such as cooling water from

continued

rivers, and cooler northern climates) to reduce the costs of cooling computers, and to minimize their carbon footprint. Each location consumes roughly 30 megawatts of electricity. To ensure 100 percent uptime of the flagship Facebook site, each site has backup power. For example, the Oregon location has 14 diesel generators capable of 3 megawatts apiece in case of a power generation failure.

A widely used method for assessing data center efficiency is Power Usage Effectiveness (PUE). PUE measures the ratio of total facility energy divided by IT equipment energy in watts. IT equipment refers to the computers and hard drives used in the facility. Total facility power would include lighting, and cooling the computer equipment, a major cost. PUE measures the energy used to power and cool a data center. In 2012, a typical data center consumed 2 watts of total facility power to support 1 watt of IT equipment. Today the number is much closer to 1.6 because of changes in IT equipment, and changes in facility power management. The ideal is a PUE of 1, in which case all power was being used to simply operate the IT equipment and no other significant support power for cooling is being used.

Other large tech companies like eBay are developing their own techniques and methods to better evaluate the business impact of their power consumption. The auction giant has revamped the way it views its infrastructure efficiency, using the concept of Digital Service Efficiency (DSE). DSE is like a miles-per-gallon metric used to measure how effectively its power consumption is driving its business. Instead of miles, eBay charts revenue (or other business measure), and instead of gallons, eBay charts kilowatt hours. For instance, eBay is able to understand how many kilowatts it takes to process customer transactions, and what is the carbon emission impact of its data centers. eBay managers chart the efficiency of its data center operations using a dashboard.

Digital Service Efficiency (DSE) helps eBay to see the full cost, business impact, power efficiency (PUE), and environmental impact of customer buy and sell transactions. The dashboard combines PUE with other DSE measures of data center performance. Today, many data centers use both PUE and DSE.

eBay operates one of the largest data center networks in the world, and it has begun to shift from air to water for its data center cooling needs using a new cooling technology from Dell called Triton. In large data centers, temperatures can reach 120 degrees in just two minutes if the cooling system became disabled. At this temperature, processors and hard drives begin to malfunction. The traditional method of using air cooling has become increasingly expensive as data centers continue to grow. eBay has begun reconfiguring its server cooling from air to liquid cooling using water which is a more expensive, but also a far more effective process for removing heat. The company already boasts some of the best power usage effectiveness (PUE) ratings in the industry.

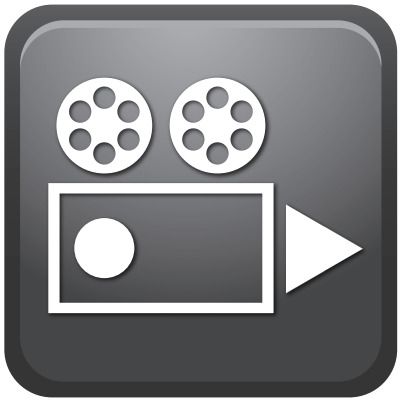
continued

VIDEO CASE QUESTIONS

1. Why does Facebook's data center specialist argue that "The Internet is not a cloud?"
2. What are some of the techniques Facebook uses to cool its data centers?
3. Describe the five methods recommended by Google for reducing power consumption.
4. Based on the Google video, how much of the world's global greenhouse gases are the result of computing?
5. What are some of the benefits of using Dell's Triton water cooling technology?

CHAPTER 1 INFORMATION SYSTEMS IN GLOBAL BUSINESS TODAY

CASE 2 UPS Global Operations with DIAD and Worldport



(a) UPS Package Flow Technology—DIAD

URL https://www.youtube.com/watch?v=aS97ypMwAgg; L=1:21

(b) DIAD V

URL https://www.youtube.com/watch?v=mPyh1zedjt8; L=3:22

(c) UPS Tour—That's UPS

URL https://www.youtube.com/watch?v=YVLHEN1-jN8; L=4:58

SUMMARY Using smart people and smart technology, in 2019 UPS, the largest package delivery firm in the world, delivered almost 22 million packages daily to 220 countries and territories, requiring the talents of thousands of drivers who are wirelessly connected to UPS main databases. This case describes the information systems and technologies used to manage the flow of UPS packages. At the customer-facing, front end of the process is the UPS DIAD technology platform which drivers use when interacting with customers, both when picking up and dropping off packages. Behind the scenes supporting the drivers is the UPS Worldport Airhub in Louisville, Kentucky, that processes the data generated by DIAD and coordinates the flow of physical packages to their destinations. Although commonly thought of as a package delivery company, UPS is also an information technology company, and an example of a digital firm.

continued

CASE United Parcel Service's global operations are driven by its information systems technology. What UPS can do is largely a function of its information technology investments. Beginning as a local delivery service in 1907, UPS expanded on the West coast initially, reached New York in the 1930s, and went international in the 1970s. Today, UPS delivers almost 22 million packages daily to 220 countries and territories, requiring the talents of thousands of drivers who are wirelessly connected to UPS databases located in seventeen major data centers throughout the world. UPS maintains a fleet of 125,000 delivery vehicles, and over 560 owned or leased aircraft worldwide.

A multiyear, multi-billion-dollar investment in technology has driven the growth of UPS over the last thirty years, beginning in 1990. This investment enabled the development of the DIAD, the Delivery Information Acquisition Device, now in its fifth generation. The DIAD has been a key element in UPS's business technology platform because it connects the drivers to UPS central systems for tracking and delivering packages. UPS was the first firm to use mobile wireless technology for day-to-day operations, and it achieved this distinction twenty years before the iPhone and other smartphones. The DIAD V performs all the functions of the previous models, but adds additional functionality, better hardware and software, resulting in an ergonomically superior fit for drivers, as well as advances in productivity. For customers, the DIAD platform ensures their packages are tracked in real time from pickup to delivery.

DIAD V

The DIAD V takes full advantage of newer consumer technologies with this version's touchscreen, camera, speedy processor, and 1 GB of memory, at half the size of its predecessor.

DIAD V was developed with Honeywell International Inc. and it is the first in the industry to leverage Gobi radio technology that allows instant switching of cellular carriers if one carrier's signal is lost, ensuring the device stays connected to the UPS network throughout the day. The new DIAD V also has a color camera that could be used to enhance proof-of-delivery information. It also has a color display and microprocessor with expanded memory to support driver training and future applications including navigation. For example, the DIAD V could be used to enable maps to help a driver avoid a traffic jam.

Here's a look at the features of the DIAD V:

Roaming: The DIAD V monitors wireless performance and can switch automatically to the strongest carrier signal. The cell connection is vital to the system because it enables continuous reporting to the data center on the progress of packages through the system, and provides customers with instant online access to their package location. The new roaming software also means that UPS can choose to use the least expensive cell service for any given service area assuming signal strength is the same for each carrier.

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Touchscreen: The DIAD V has a touchscreen that will likely boost driver productivity. UPS puts the devices through a gauntlet of tests like drops from six feet, heat, cold, and torrential rain that would kill most smartphones.

New Hardware: The DIAD V weighs in at about half the size and weight of the DIAD IV (about 1.5 lbs). It has 1 GB of flash memory, with a micro-SD slot that lets it expand to 32 GB (compared to the older DIAD IV with 128 megabytes of storage). Its 1 GHz processor means it can run much more powerful apps than the previous version, apps that integrate via the wireless connection with server-side systems. That computer power will let UPS offer more personalized services, building on the My Choice service it launched last year, which lets customers create personalized delivery options, such as leaving packages with a particular neighbor if they're not home.

Camera: A small camera of 3 megapixels has been added to the DIAD V although it has not yet been enabled. In the future UPS plans to use the camera to document proof of delivery and the extent of damage to packages. The images are uploaded over the company Wi-Fi networks when the trucks are parked for the night.

Navigation: The DIAD V lets UPS upload the route information a driver needs to go from site to site throughout the day. Like the DIAD IV, the DIAD V has GPS, so UPS knows where the driver is at any time and provides real-time navigation, telling drivers the best way to get to their next destination.

UPS Worldport

The information provided by the mobile DIAD devices is fed into local and regional data centers, and from there to UPS Worldport, the largest automated package handling facility in the world. It is also one of the largest data centers in the United States. Located in Lexington, Kentucky, Worldport occupies over 5 million square feet (about 90 football fields), and can sort over 400,000 packages an hour. UPS started building Worldport in 2000, and has continuously expanded the facility to handle hundreds of thousands of packages generated everyday by customers ordering online. UPS is by far the largest package delivery service for e-commerce packages. Without UPS, it is doubtful that e-commerce could have grown so rapidly.

Outside of FedEx, UPS has no competitors of equal scale and IT sophistication. But this situation could change in the future as Amazon considers developing its own package delivery fleet of trucks, planes, and drones. Uber is considering creating a same-day delivery service using its on-demand services business model, and relying on private contractors who own their own vehicles to deliver packages. And the United States Post Office has extended its traditional package delivery service into a highly automated system with over 140,000 collection boxes, 200,000 vehicles, and 70,000 drivers. USPS already delivers one-third of all the packages delivered in the United States.

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UPS faces a number of challenges keeping up with mobile technology. The pace of technological change is arguably faster now than in the past. It took UPS seven years after deployment of DIAD IV to deploy the DIAD V. If UPS waits this long again, it's possible another competitor will be faster to market with a superior technology platform.

VIDEO CASE QUESTIONS

1. How does the DIAD help drivers deliver packages?
2. What improvements were made in the DIAD V?
3. How many times are packages handled by humans once they reach Worldport? Why is this important?
4. What are "end of runway" facilities?
5. What kinds of information technologies do you see being used by UPS in this video?
6. Why doesn't UPS use much more powerful and smaller smartphones like the iPhone or Android?
7. How does UPS's investment in IT help it achieve the strategic business objectives described in Chapter 1?
8. Why does UPS serve as an example of a "Digital firm" as described in Chapter 1?

Chapter 1 Running Case Solution Description

1. What are the company goals and culture?
Dirt Bikes appears to have a very democratic, employee-friendly culture, emphasizing ongoing learning, quality, attention to detail, and employee contributions.

2 What products and services does Dirt Bikes USA provide? How many types of products and services are available to customers? How does Dirt Bikes sell its products?
Dirt Bikes specializes in off-road and motocross motorcycles that emphasize racing performance, styling, and best quality parts sourced from all over the world. It is a small company producing only 4 models. Dirt Bikes sells through a network of authorized dealers. Its sales department is responsible for working with these distributors and finding ways to promote Dirt Bikes.

3. How many employees are managers, production workers, or knowledge or information workers? Are there levels of management?
The company is very small and not very hierarchical. Most of the employees are in production. Many of its departments have less than 10 people. Production is probably the only department that warrants more than 1 manager. One might expect to see separate managers for Service, Shipping & Receiving, Parts, and Design and Engineering and perhaps several additional managers for Manufacturing.

4. What kinds of information systems and technologies would be the most important for a company such as Dirt Bikes?
One would expect to see information systems supporting manufacturing and production and sales and marketing being the most important for this company. Such systems would help the company monitor work on the assembly line, obtain parts from suppliers, monitor orders from distributors, and provide parts and servicing information. A company website to publicize the unique features of this brand and its connection to motorcycle racing events would also be very valuable.