

NINTH EDITION

FUNDAMENTALS OF
Information Systems



RALPH M. STAIR

GEORGE W. REYNOLDS

Ninth Edition



Fundamentals of Information Systems

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For Lila and Leslie
—RMS

To my grandchildren: Michael, Jacob, Jared, Fievel,
Aubrey, Elijah, Abrielle, Sofia, Elliot, Serina, and Kendall
—GWR

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As organizations and entrepreneurs continue to operate in an increasingly competitive and global marketplace, workers in all business areas including accounting, customer service, distribution, finance, human resources, information systems, logistics, marketing, manufacturing, research and development, and sales must be well prepared to make the significant contributions required for success. Regardless of your future role, even if you are an entrepreneur, you need to understand what information systems can and cannot do and be able to use them to help you achieve personal and organizational goals. You will be expected to discover opportunities to use information systems and to participate in the design and implementation of solutions to business problems employing information systems. To be successful, you must be able to view information systems from the perspective of business and organizational needs. For your solutions to be accepted, you must recognize and address their impact on coworkers, customers, suppliers, and other key business partners. For these reasons, a course in information systems is essential for students in today's high-tech world.

Fundamentals of Information Systems, Ninth Edition, continues the tradition and approach of previous editions. Our primary objective is to provide the best information systems text and accompanying materials for the first information systems course required for all business students. We want you to learn to use information systems to ensure your personal success in your current or future role and to improve the success of your organization. Through surveys, questionnaires, focus groups, and feedback that we have received from current and past adopters, as well as others who teach in the field, we have been able to develop the highest-quality set of teaching materials available to help you achieve these goals.

Fundamentals of Information Systems, Ninth Edition, stands proudly at the beginning of the IS curriculum and remains unchallenged in its position as the only IS principles text offering basic IS concepts that every business student must learn to be successful. Instructors of the introductory course faced a dilemma. On one hand, experience in business organizations allows students to grasp the complexities underlying important IS concepts. For this reason, many schools delayed presenting these concepts until students completed a large portion of their core business requirements. On the other hand, delaying the presentation of IS concepts until students have matured within the business curriculum often forces the one or two required introductory IS courses to focus only on personal computing software tools and, at best, merely to introduce computer concepts.

This text has been written specifically for the introductory course in the IS curriculum. *Fundamentals of Information Systems, Ninth Edition*, addresses the appropriate computer and IS concepts while also providing a strong managerial emphasis on meeting business and organizational needs.

Approach of This Text

Fundamentals of Information Systems, Ninth Edition, offers the traditional coverage of computer concepts, but places the material within the context of meeting business and organizational needs. Placing information systems concepts within this context and taking a management perspective has always set this text apart from other computer texts, thus making it appealing not only to MIS majors but also to students from other fields of study. The text is not overly technical, but rather deals with the role that information systems play in an organization and the key principles a manager or technology specialist needs to grasp to be successful. The principles of IS are brought together and presented in a way that is understandable, relevant, and interesting. In addition, the text offers an overview of the entire IS discipline, while giving students a solid foundation for further study in more advanced IS courses such as programming, systems analysis and design, project management, database management, data communications, Web site design and development, information system security, big data and analytics, electronic and mobile commerce, and informatics. As such, it serves the needs of both general business managers and those who aspire to become IS professionals.

The overall vision, framework, and pedagogy that made the previous editions so popular have been retained in the Ninth Edition, offering a number of benefits to students and instructors. While the fundamental vision of this market-leading text remains unchanged, the Ninth Edition more clearly highlights established principles and draws on new ones that have emerged as a result of business, organizational, technological, and societal changes.

IS Principles First, Where They Belong

Exposing students to basic IS principles is an advantage even for those students who take no IS courses beyond the introductory IS course. Since most functional areas of the business rely on information systems, an understanding of IS principles helps students in their other course work. In addition, introducing students to the principles of information systems helps future business managers and entrepreneurs employ information systems successfully and avoid mishaps that often result in unfortunate consequences. Furthermore, presenting IS concepts at the introductory level creates interest among students who may later choose information systems as their field of concentration.

Author Team

Ralph Stair and George Reynolds have decades of academic and industrial experience. Ralph Stair brings years of writing, teaching, and academic experience to this text. He wrote numerous books and a large number of articles while at Florida State University. George Reynolds brings a wealth of information systems and business experience to the project, with more than 30 years of experience working in government, institutional, and commercial IS organizations. He has written numerous IS texts and has taught the introductory IS course at the University of Cincinnati, Mount St. Joseph University, and Strayer University. The Stair and Reynolds team presents a solid conceptual foundation and practical IS experience to students.

Goals of This Text

Because *Fundamentals of Information Systems, Ninth Edition*, is written for business majors, we believe that it is important not only to present a realistic perspective on IS in business but also to provide students with the skills they can use to be effective business leaders in their organizations. To that end, *Fundamentals of Information Systems, Ninth Edition*, has three main goals:

1. To provide a set of core IS principles that prepare students to function more efficiently and effectively as workers, managers, decision makers, and organizational leaders
2. To provide insights into the challenging and changing role of the IS professional so that students can better appreciate the role of this key individual
3. To show the value of the IS discipline as an attractive field of specialization so that students can evaluate this as a potential career path

IS Principles

Fundamentals of Information Systems, Ninth Edition, although comprehensive, cannot cover every aspect of the rapidly changing IS discipline. The authors, having recognized this, provide students with an essential core of guiding IS principles to use as they strive to use IS systems in their academic and work environment. Think of principles as basic truths or rules that remain constant regardless of the situation. As such, they provide strong guidance for tough decision making. A set of IS principles is highlighted at the beginning of each chapter. The use of these principles to solve real-world problems is driven home from the opening examples of cutting edge applications to the dozens of real-world examples of organizations applying these principles interspersed throughout each chapter to the interesting and diverse end-of-chapter material. The ultimate goal of *Fundamentals of Information Systems, Ninth Edition*, is to develop effective, thinking, action-oriented students by instilling them with principles to help guide their decision making and actions.

Survey of the IS Discipline

Fundamentals of Information Systems, Ninth Edition, not only offers the traditional coverage of computer concepts but also provides a broad framework to impart students with a solid grounding in the business uses of technology, the challenges of successful implementation, the necessity for gaining broad adoption of information systems, and the potential ethical and societal issues that may arise. In addition to serving general business students, this book offers an overview of the entire IS discipline and solidly prepares future IS professionals for advanced IS courses and careers in the rapidly changing IS discipline.

Changing Role of the IS Professional

As business and the IS discipline have changed, so too has the role of the IS professional. Once considered a technical specialist, today the IS professional operates as an internal consultant to all functional areas of the organization, being knowledgeable about their needs and competent in bringing the power of information systems to bear throughout the entire organization. The IS professional must view issues through a global perspective that encompasses the entire enterprise and the broader industry and business environment in which it operates.

The scope of responsibilities of an IS professional today is not confined to just his or her organization but encompasses the entire ecosystem of

employees, contractors, suppliers, customers, competitors, regulatory agencies, and other entities, no matter where they are located. This broad scope of responsibilities creates a new challenge: how to help an organization survive in our highly interconnected, highly competitive global environment. In accepting that challenge, the IS professional plays a pivotal role in shaping the business itself and ensuring its success. To survive, businesses must strive for the highest level of customer satisfaction and loyalty through innovative products and services, competitive prices, and ever-improving product and service quality. The IS professional assumes a critical role in determining the organization's approach to both overall cost and quality performance and therefore plays an important role in the ongoing growth of the organization. This new duality in the role of the IS worker—a professional who exercises a specialist's skills with a generalist's perspective—is reflected throughout *Fundamentals of Information Systems, Ninth Edition*.

IS as a Field of Study

Computer science and business were ranked #1 and #4, respectively, in the 2016 Princeton Review list of top 10 college majors based on research covering job prospects, alumni salaries, and popularity. A 2016 U.S. News & World Report study placed computer systems analyst, software developer, and Web developer as three of the top 20 best jobs for 2016 based on hiring demand, median salary, employment rate, future job prospects, stress level, and work-life balance. The U.S. Bureau of Labor Statistics identified software developers, computer systems analysts, and computer support specialists as among the fastest growing occupations for the period 2012 and 2022. Clearly, the long-term job prospects for skilled and business-savvy information systems professionals is good. Employment of such workers is expected to grow faster than the average for all occupations through the year 2022. Upon graduation, IS graduates at many schools are among the highest paid of all business graduates.

A career in IS can be exciting, challenging, and rewarding! Today, perhaps more than ever before, the IS professional must be able to align IS and organizational goals and to ensure that IS investments are justified from a business perspective. The need to draw bright and interested students into the IS discipline is part of our ongoing responsibility. Throughout this text, the many challenges and opportunities available to IS professionals are highlighted and emphasized.

Changes in the Ninth Edition

A number of exciting changes have been made to the text based on user feedback on how to align the text even more closely with changing IS needs and capabilities of organizations. Here is a summary of those changes:

- **Did You Know?** Each chapter begins with two or three examples of cutting edge applications illustrating the concepts covered in the chapter.
- **Critical Thinking Exercises.** Each exercise features a scenario followed by two review and two critical thinking questions. Placed at the end of each major section of each chapter, these exercises test the student's grasp of the material just read. Students must analyze a real-life scenario and synthesize the information provided to develop a recommendation of what needs to be done. The exercises can also be used to stimulate class discussion or as additional "mini cases" that may be assigned as individual or team exercises.

- **Updated case studies.** Two end-of-chapter case studies for each chapter provide a wealth of practical information for students and instructors. Each case explores a chapter concept or problem that a real-world organization has faced. The cases can be assigned as individual or team homework exercises or serve as the basis for class discussion.
- **Updated summary linked to objectives.** Each chapter includes a detailed summary, with each section of the summary updated as needed and tied to an associated information system principle.
- **Updated end-of-the chapter questions and exercises.** More than half of the extensive end-of-chapter exercises (Self-Assessment Test, Review Questions, Discussion Questions, Problem-Solving Exercises, Team Activities, Web Exercises, and Career Exercises) are new.
- **New chapters covering the latest IS developments.** New chapters include Database Systems and Big Data, Business Intelligence and Analytics, System Acquisition and Development, and Cybercrime and Information System Security. These chapters cover important topics such as data governance, Hadoop, NoSQL databases, Cross-Industry Process for Data Mining, various business analytics techniques, self-service analytics, agile development, DevOps, extreme programming, Pareto principle, advanced persistent threat, cyberterrorism, next-generation firewall, risk assessment, and zero-day attack.
- **Extensive changes and updates in each chapter.** The remaining chapters in the text have all been extensively updated to provide the latest information available on a wide range of IS-related topics including hundreds of new and current examples of organizations and individuals illustrating the principles presented in the text. In addition, a strong effort was made to update the art work and figures with over 50 new figures and images.

Online Solutions

MindTap™

MindTap for Stair/Reynolds *Fundamentals of Information Systems, Ninth Edition*, is a truly innovative reading experience with assignments that guide students to analyze, apply, and improve thinking! Relevant readings, multimedia, and activities are designed to move students up the levels of learning, from basic knowledge and comprehension to application, analysis, synthesis, and evaluation. Embedded within the eReader, ConceptClips focus on the challenge of understanding complicated IS terminology and concepts. Student-tested and approved, the videos are quick, entertaining, and memorable visual and auditory representations of challenging topics.

MindTap allows instructors to measure skills and outcomes with ease. Personalized teaching becomes yours through a Learning Path built with key student objectives and the ability to control what students see and when they see it. Analytics and reports provide a snapshot of class progress, time in course, engagement, and completion rates.

ConceptClips

ConceptClip videos help students learn and comprehend intro-level information systems terminology by introducing new terms in a friendly and memorable way. Thirteen new concept clips have been created for a total of 41 concept clips.

Adaptive Test Prep

This application allows students to take sample tests designed specifically to mimic the test bank question instructors use to build real exams. Over 540 questions are included.

Student Resources

Accessible through CengageBrain.com, the student companion Web site contains the following study tools (and more!) to enhance one's learning experience:

PowerPoint Slides

Direct access is offered to the book's PowerPoint presentations that cover the key points of each chapter.

Classic Cases

A frequent request from adopters is that they'd like a broader selection of cases to choose from. To meet this need, a set of over 50 cases from the previous two editions of the text are included here. These are the author's choices of the "best cases" from these editions and span a broad range of profit, non-profit, small, medium, and large organizations in a broad range of industries.

Instructor Resources

Instructor Companion Site

As always, we are committed to providing the best teaching resource packages available in this market. All instructor materials can be found on the password-protected Web site at <http://login.cengage.com>. Here you will find the following resources:

- **Instructor's Manual** The comprehensive manual provides valuable chapter overviews; highlights key principles and critical concepts; offers sample syllabi, learning objectives, and discussion topics; and features possible essay topics, further readings, cases, and solutions to all of the end-of-chapter questions and problems, as well as suggestions for conducting the team activities. Additional end-of-chapter questions are also included.
- **Sample Syllabus** A sample syllabus for both a quarter and semester length course is provided with sample course outlines to make planning your course that much easier.
- **PowerPoint Presentations** A set of impressive Microsoft PowerPoint slides is available for each chapter. These slides are included to serve as a teaching aid for classroom presentation, to make available to students on the network for chapter review, or to be printed for classroom distribution. The goal of the presentations is to help students focus on the main topics of each chapter, take better notes, and prepare for examinations. Instructors can add their own slides for additional topics they introduce to the class.
- **Figure Files** Figure files allow instructors to create their own presentations using figures taken directly from the text.

Test Bank and Cengage Learning Testing Powered by Cognero

Cognero is a full-featured, online-assessment system that allows instructors to manage test bank content, quickly create multiple test versions, deliver tests in several forms including from an LMS, and create test banks anywhere with Internet access!

To access Cognero, log into your Cengage Learning instructor account at <http://login.cengage.com>. Add this title to the bookshelf. Once the title is properly added to the bookshelf, a link to access Cognero will appear alongside the link to the instructor companion site. Technical questions, guides, and tutorials are hosted on Cengage Learning Technical Support Web site—<http://support.cengage.com>.

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Our Commitment

We are committed to listening to our adopters and readers in order to develop creative solutions to meet their needs. The field of IS continually evolves, and we strongly encourage your participation in helping us provide the freshest, most relevant information possible.

We welcome your input and feedback. If you have any questions or comments regarding *Fundamentals of Information Systems, Ninth Edition*, please contact us through your local representative.

PART 1

Information Systems in Perspective

Chapter 1 An Introduction to Information Systems in Organizations



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CHAPTER

1

An Introduction to Information Systems in Organizations



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Did You Know?

- A significant contributor to project failures is overlooking the need to address employee adoption and resistance jointly. One resource claims that 30 to 70 percent of large information systems projects fail, at least in part, due to a failure to prepare the business users for the actual change to come.
- Technology is one of the fastest-growing areas in the U.S. economy, and information systems professionals such as software developers, computer systems analysts, and computer support specialists are in high demand.

Principles

- The value of information is directly linked to how it helps decision makers achieve the organization's goals.
- Information systems are composed of fundamental components that must be carefully assembled and integrated to work well together.
- Managers have an essential role to play in the successful implementation and use of information systems—that role changes depending on which type of IS system is being implemented.
- Information systems must be implemented in such a manner that they are accepted and work well within the context of an organization and support its fundamental business goals and strategies.
- The information system worker functions at the intersection of business and technology and designs, builds, and implements solutions that allow organizations to effectively leverage information technology systems.

Learning Objectives

- Distinguish data from information and knowledge, and describe the characteristics of quality data.
- Identify the fundamental components of an information system and describe their function.
- Identify the three fundamental information system types and explain what organizational complements must be in place to ensure successful implementation and use of the system.
- Define the term “the soft side of implementing change,” and explain why it is a critical factor in the successful adoption of any major change.
- Identify and briefly describe five change models that can be used to increase the likelihood of successfully introducing a new information system into an organization.
- Define the types of roles, functions, and careers available in the field of information systems.

Why Learn about Information Systems?

We live in an information economy. Information itself has real value, and in order to stay competitive, organizations require a steady flow of information about their business partners, competitors, customers, employees, markets, and suppliers. Information systems are increasingly being used to gather, store, digest, analyze, and make sense out of all this information. Indeed, information systems are even embedded in and control many of the products we use on a daily basis. Using information systems, individuals communicate instantaneously with one another; consumers make purchases online using mobile devices; project members dispersed globally and across multiple organizations collaborate effectively; financial institutions manage billions of dollars in assets around the world; and manufacturers partner with suppliers and customers to track inventory, order supplies, and distribute goods faster than ever before.

Information systems will continue to change businesses and the way we live. Indeed, many corporate leaders are using technology to rework every aspect of their organization from product and service creation through production, delivery, and customer service. To prepare to participate in and lead these innovations, you must be familiar with fundamental information concepts. Regardless of your college major or chosen career, knowledge of information systems is indispensable in helping you land your first job. The ability to recognize and capitalize on information system opportunities can make you an even more valuable member of your organization and will ultimately help advance your career.

As you read this chapter, consider the following:

- How are organizations using information systems to accomplish their objectives and meet ever-changing business needs?
- What role might you have in identifying the need for, acquiring, or using such systems?

An Introduction to Information Systems

Information is a central concept of this book. The term is used in the title of the book, in this section, and in every chapter. To be an effective manager in any area of business, you need to understand that information is one of an organization's most valuable resources. Information is not the same thing as data, and knowledge is different from both data and information. These concepts will now be explained.

Data, Information, and Knowledge

data: Raw facts such as an employee number or total hours worked in a week.

information: A collection of data organized and processed so that it has additional value beyond the value of the individual facts.

Data consists of raw facts, such as an employee number, total hours worked in a week, an inventory part number, or the number of units produced on a production line. As shown in Table 1.1, several types of data can represent these facts. **Information** is a collection of data organized and processed so that it has additional value beyond the value of the individual facts. For example, a sales manager may want individual sales data summarized so it shows the total sales for the month. Providing information to customers can also help companies increase revenues and profits. For example, social shopping Web site Kaboodle brings

TABLE 1.1 Types of data

Data	Represented By
Alphanumeric data	Numbers, letters, and other characters
Audio data	Sounds, noises, or tones
Image data	Graphic images and pictures
Video data	Moving images or pictures

shoppers and sellers together electronically so they can share information and make recommendations while shopping online. The free exchange of information stimulates sales and helps ensure shoppers find better values.

Another way to appreciate the difference between data and information is to think of data as the individual items in a grocery list—crackers, bread, soup, cereal, coffee, dishwashing soap, and so on. The grocery list becomes much more valuable if the items in the list are arranged in order by the aisle in which they are found in the store—bread and cereal in aisle 1, crackers and soup in aisle 2, and so on. Data and information work the same way. Rules and relationships can be set up to organize data so it becomes useful, valuable information.

The value of the information created depends on the relationships defined among existing data. For instance, you could add specific identifiers to the items in the list to ensure that the shopper brings home the correct item—whole wheat bread and Kashi cereal in aisle 1, saltine crackers and chicken noodle soup in aisle 2, and so on. By doing so, you create a more useful grocery list.

Turning data into information is a **process**, or a set of logically related tasks performed to achieve a defined outcome. The process of defining relationships among data to create useful information requires **knowledge**, which is the awareness and understanding of a set of information and the ways in which that information can be made useful to support a specific task or reach a decision. In other words, information is essentially data made more useful through the application of knowledge. For instance, there are many brands and varieties of most items on a typical grocery list. To shop effectively, the grocery shopper needs to have an understanding of the needs and desires of those being shopped for so that he knows to purchase one can of Campbell's (not the store brand!) low-sodium chicken noodle soup for the family member who is diabetic along with two cans of Campbell's regular chicken noodle soup for everyone else.

In some cases, people organize or process data mentally or manually. In other cases, they use a computer. This transformation process is shown in Figure 1.1.

process: A set of logically related tasks performed to achieve a defined outcome.

knowledge: The awareness and understanding of a set of information and the ways that information can be made useful to support a specific task or reach a decision.

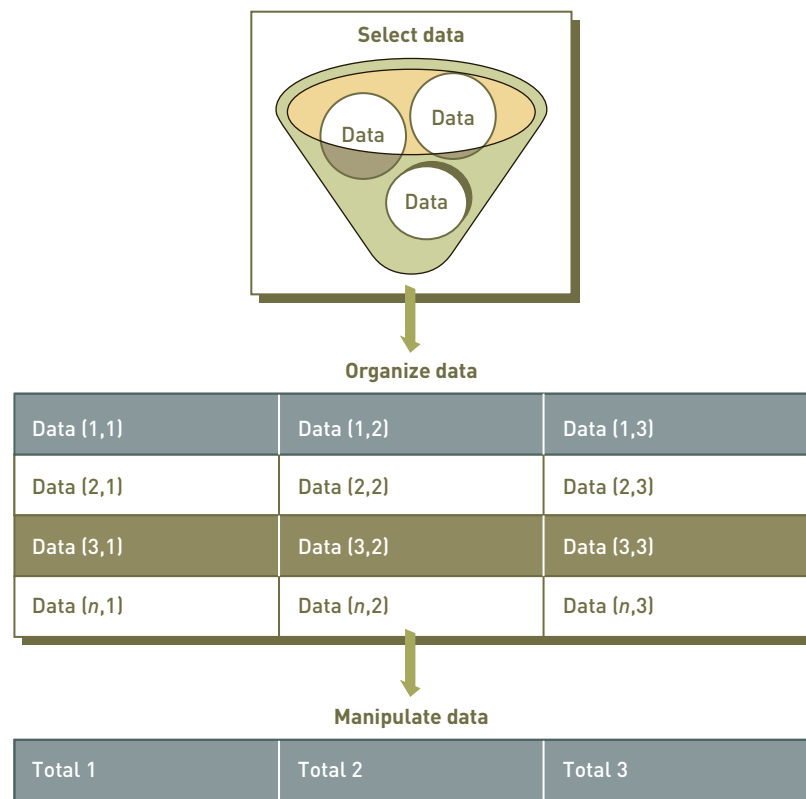


FIGURE 1.1
Process of transforming data into information

Transforming data into information starts by selecting data, then organizing it, and finally manipulating the data.

The Value of Information

The value of information is directly linked to how it helps decision makers achieve their organization's goals. Valuable information can help people perform tasks more efficiently and effectively. Many businesses assume that reports are based on correct, quality information, but, unfortunately, that is not always true. For example, Experian (a global information services firm that provides credit services, marketing services, decision analytics, and consumer services) estimates that on average, 22 percent of an organization's customer contact data is wrong.¹ Companies can easily waste over \$100 per inaccurate customer contact data record on direct-mail marketing sent to wrong addresses and the inability to properly track leads. For example, an organization with 100,000 customers and a 22 percent error rate projects to a loss of \$2.2 million.²

Characteristics of Quality Information

Fundamental to the quality of a decision is the quality of the information used to reach that decision. Any organization that stresses the use of advanced information systems and sophisticated data analysis before information quality is doomed to make many wrong decisions. Table 1.2 lists the characteristics that determine the quality of information. The importance of each of these characteristics varies depending on the situation and the kind of decision you are trying to make. For example, with market intelligence data, some inaccuracy and incompleteness is acceptable, but timeliness is essential. Market intelligence data may alert you that a competitor is about to make a major price cut. The exact details and timing of the price cut may not be as important as being

TABLE 1.2 Characteristics of quality information

Characteristic	Definition
Accessible	Information should be easily accessible by authorized users so they can obtain it in the right format and at the right time to meet their needs.
Accurate	Accurate information is error free. In some cases, inaccurate information is generated because inaccurate data is fed into the transformation process. This is commonly called garbage in, garbage out.
Complete	Complete information contains all the important facts. For example, an investment report that does not include all important costs is not complete.
Economical	Information should also be relatively economical to produce. Decision makers must always balance the value of information with the cost of producing it.
Flexible	Flexible information can be used for a variety of purposes. For example, information on how much inventory is on hand for a particular part can be used by a sales representative in closing a sale, by a production manager to determine whether more inventory is needed, and by a financial executive to determine the amount of money the company has invested in inventory.
Relevant	Relevant information is important to the decision maker. Information showing that lumber prices might drop is probably not relevant to a computer chip manufacturer.
Reliable	Reliable information can be trusted by users. In many cases, the reliability of the information depends on the reliability of the data-collection method. In other instances, reliability depends on the source of the information. A rumor from an unknown source that oil prices might go up may not be reliable.
Secure	Information should be secure from access by unauthorized users.
Simple	Information should be simple, not complex. Sophisticated and detailed information might not be needed. In fact, too much information can cause information overload, whereby a decision maker has too much information and is unable to determine what is really important.
Timely	Timely information is delivered when it is needed. Knowing last week's weather conditions will not help when trying to decide what coat to wear today.
Verifiable	Information should be verifiable. This means that you can check it to make sure it is correct, perhaps by checking many sources for the same information.

warned far enough in advance to plan how to react. On the other hand, accuracy and completeness are critical for data used in accounting for the management of company assets, such as cash, inventory, and equipment.

What Is an Information System?

Another central concept of this book is that of an information system. People and organizations use information systems every day. An **information system (IS)** is a set of interrelated components that collect, process, store, and disseminate data and information; an information system provides a feedback mechanism to monitor and control its operation to make sure it continues to meet its goals and objectives. The feedback mechanism is critical to helping organizations achieve their goals, such as increasing profits or improving customer service.

information system (IS): A set of interrelated components that collect, process, store, and disseminate data and information; an information system provides a feedback mechanism to monitor and control its operation to make sure it continues to meet its goals and objectives.

computer-based information system (CBIS): A single set of hardware, software, databases, networks, people, and procedures that are configured to collect, manipulate, store, and process data into information.

technology infrastructure: All the hardware, software, databases, networks, people, and procedures that are configured to collect, manipulate, store, and process data into information.

A **computer-based information system (CBIS)** is a single set of hardware, software, databases, networks, people, and procedures that are configured to collect, manipulate, store, and process data into information. Increasingly, companies are incorporating computer-based information systems into their products and services. Investment companies offer their customers a wide range of powerful investment tools, including access to extensive online research. Automobiles are available with advanced navigation systems that not only guide you to your destination but also incorporate information regarding the latest weather and traffic conditions to help you avoid congestion and traffic delays. Watches, digital cameras, mobile phones, music players, and other devices rely on CBIS to bring their users the latest and greatest features.

The components of a CBIS are illustrated in Figure 1.2. An organization's **technology infrastructure** includes all the hardware, software, databases, networks, people, and procedures that are configured to collect, manipulate,

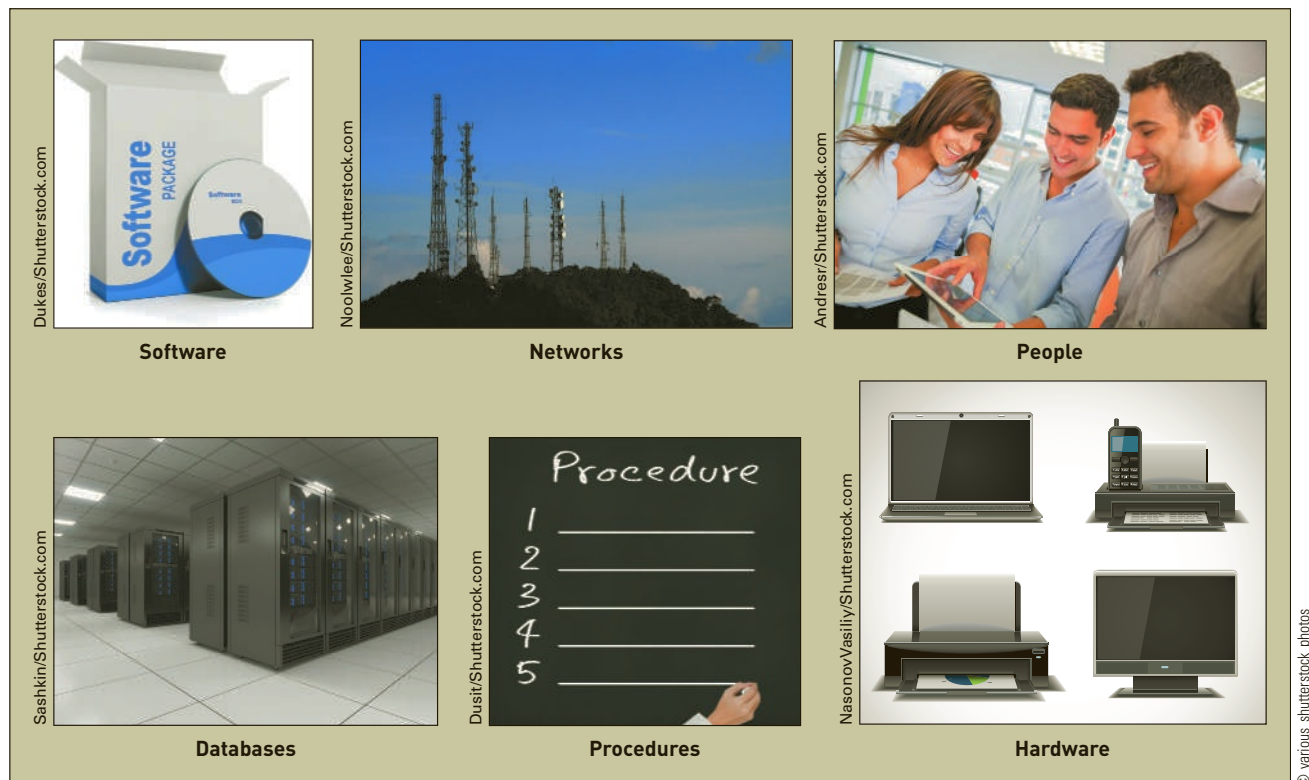


FIGURE 1.2

Components of a computer-based information system

Hardware, software, networks, people, and procedures are part of a business's technology infrastructure.

store, and process data into information. The technology infrastructure is a set of shared IS resources that form the foundation of each computer-based information system.

People make the difference between success and failure in all organizations. Jim Collins, in his book, *Good to Great*, said, “Those who build great companies understand that the ultimate throttle on growth for any great company is not markets, or technology, or competition, or products. It is one thing above all others: the ability to get and keep enough of the right people.”³ Thus, it comes as no surprise that people are the most important element in computer-based information systems.

Good systems can enable people to produce extraordinary results. They can also boost job satisfaction and worker productivity.⁴ Information systems personnel include all the people who manage, run, program, and maintain the system, including the chief information officer (CIO), who leads the IS organization. End users are people who work directly with information systems to get results. They include financial executives, marketing representatives, and manufacturing line operators.

A **procedure** defines the steps to follow to achieve a specific end result, such as enter a customer order, pay a supplier invoice, or request a current inventory report. Good procedures describe how to achieve the desired end result, who does what and when, and what to do in the event something goes wrong. When people are well trained and follow effective procedures, they can get work done faster, cut costs, make better use of resources, and more easily adapt to change. When procedures are well documented, they can greatly reduce training costs and shorten the learning curve.

Using a CBIS involves setting and following many procedures, including those for the operation, maintenance, and security of the system. For example, some procedures describe how to gain access to the system through the use of some log-on procedure and a password. Others describe who can access facts in the database or what to do if a disaster, such as a fire, earthquake, or hurricane, renders the CBIS unusable. Good procedures can help companies take advantage of new opportunities and avoid lengthy business disruptions in the event of natural disasters. Poorly developed and inadequately implemented procedures, however, can cause people to waste their time on useless rules or result in inadequate responses to disasters.

Three Fundamental Types of Information Systems

Most organizations have a number of different information systems. When considering the role of business managers in working with IS, it is useful to divide information systems into three types: personal IS, group IS, and enterprise IS.

Personal IS includes information systems that improve the productivity of individual users in performing stand-alone tasks. Examples include personal productivity software, such as word-processing, presentation, and spreadsheet software.

In today’s fast-moving, global work environment, success depends on our ability to communicate and collaborate with others, including colleagues, clients, and customers. **Group IS** includes information systems that improve communications and supports collaboration among members of a workgroup. Examples include Web conferencing software, wikis, and electronic corporate directories.

Enterprise IS includes information systems that organizations use to define structured interactions among their own employees and/or with external customers, suppliers, government agencies, and other business partners. Successful implementation of these systems often requires the radical redesign of fundamental work processes and the automation of new processes. Target

procedure: A set of steps that need to be followed to achieve a specific end result, such as enter a customer order, pay a supplier invoice, or request a current inventory report.

personal IS: An information system that improves the productivity of individual users in performing stand-alone tasks.

group IS: An information system that improves communications and supports collaboration among members of a workgroup.

enterprise IS: An information system that an organization uses to define structured interactions among its own employees and/or with external customers, suppliers, government agencies, and other business partners.

processes may include purely internal activities within the organization (such as payroll) or those that support activities with external customers and suppliers (order processing and purchasing). Three examples of enterprise IT are transaction processing, enterprise, and interorganizational systems.

organizational complement: A key component that must be in place to ensure successful implementation and use of an information system.

For each type of IS, certain key **organizational complements** must be in place to ensure successful implementation and use of the system. These complements include:

- **Well-trained workers.** Employees must be well trained and understand the need for the new system, what their role is in using or operating the system, and how to get the results they need from the system.
- **System support.** Trained and experienced users who can show others how to gain value from the system and overcome start-up problems.
- **Better teamwork.** Employees must understand and be motivated to work together to achieve the anticipated benefits of the system.
- **Redesigned processes.** New systems often require radical redesign of existing work processes as well as the automation of new processes.
- **New decision rights.** Employees must understand and accept their new roles and responsibilities including who is responsible for making what decisions. Roles and responsibilities often change with introduction of a new system.

Managers have an essential role to play in the successful implementation and use of information systems. That role changes depending on which type of IS system is being implemented, as shown in Table 1.3, which also highlights other characteristics and provides examples of each type.

TABLE 1.3 Examples and characteristics of each type of information system

	Personal IS	Group IS	Enterprise IS
Examples	Personal productivity software, decision-support system	Email, instant messaging, project management software	Transaction processing systems, enterprise systems, interorganizational systems
Benefits	Improved productivity	Increased collaboration	Increased standardization and ability to monitor work
Organizational complements (including well-trained workers, system support, better teamwork, redesigned processes, and new decision rights)	Does not bring complements with it Partial benefits can be achieved without all complements being in place	At least some complements must be in place when IS “goes live” Allows users to implement and modify complements over time	Full complements must be in place when IS “goes live”
Manager’s role	Ensure that employees understand and connect to the change Encourage use Challenge workers to find new uses	Demonstrate how technology can be used Set norms for participation	Identify and put into place the full set of organizational complements prior to adoption Intervene forcefully and continually to ensure adoption



Critical Thinking Exercise

Kroger’s QueVision System Improves Customer Service

Kroger has annual sales in excess of \$100 billion and operates stores across the United States under various names, including Kroger’s, Ralph’s, and Harris Teeter.