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CHAPTER 2

# Introduction to Information, Information Science, and Information Systems

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## Objectives

1. Reflect on the progression from data to information to knowledge.
2. Describe the term *information.*
3. Assess how information is acquired.
4. Explore the characteristics of quality information.
5. Describe an information system.
6. Explore data acquisition or input and processing or retrieval, analysis, and synthesis of data.
7. Assess output or reports, documents, summaries alerts, and outcomes.
8. Describe information dissemination and feedback.
9. Define information science.
10. Assess how information is processed.
11. Explore how knowledge is generated in information science.

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## Key Terms

WWW

Acquisition
Alerts
Analysis
Chief information officer
Chief technical officer
Chief technology officer
Cloud computing
Cognitive science
Communication science
Computer-based information system
Computer science
Consolidated health informatics
Data
Dissemination
Document
Electronic health record
Federal Health Information Exchange
Feedback
Health information exchange
Health Level Seven
Indiana Health Information Exchange
Information
Information science

Continues

## INTRODUCTION

This chapter explores information, **information systems** (IS), and information science. The key word is information. Healthcare professionals are **knowledge workers**, and deal with information on a daily basis. There are many concerns and issues that arise with healthcare information, such as ownership, access, disclosure, exchange, security, privacy, disposal, and dissemination. With the gauntlet of an **electronic health record** being set, public and private sector stakeholders have been collaborating on a wide-ranging variety of healthcare information solutions. These initiatives include **Health Level Seven** (HL7), **Consolidated Health Informatics's** (CHI's) eGov initiative, the **National Health Information Infrastructure** (NHII), the **National Health Information**

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**Key Terms** Continued

- Information system
- Information technology
- Input
- Interface
- Internet2
- Knowledge
- Knowledge worker
- Library science
- Massachusetts Health Data Consortium
- National Health Information Infrastructure
- National Health Information Network
- New England Health EDI Network
- Next-Generation Internet
- Outcome
- Output
- Processing
- Rapid Syndromic Validation Project
- Report
- Social sciences
- Stakeholder
- Summaries
- Synthesis
- Telecommunications

**Network** (NHIN), **Next-Generation Internet** (NGI), **Internet2**, and iHealth record. There are also **health information exchange** (HIE) systems, such as Connecting for Health, the eHealth initiative, the **Federal Health Information Exchange** (FHIE), the **Indiana Health Information Exchange** (IHIE), the **Massachusetts Health Data Consortium** (MHDC), the **New England Health EDI Network** (NEHEN), the State of New Mexico **Rapid Syndromic Validation Project** (RSVP), the Southeast Michigan e-Prescribing Initiative, and the Tennessee Volunteer eHealth Initiative (Goldstein, Groen, Ponkshe, & Wine, 2007). The most recent initiative, the HITECH Act, has set 2014 as the deadline for electronic health records (see Chapter 10). It is quite evident from the previous brief listing that there is a need to remedy healthcare **information technology** concerns, challenges, and issues faced today. One of the main issues deals with how healthcare information is managed to make it meaningful. It is important to understand how people obtain, manipulate, use, share, and dispose of information. This chapter deals with the information piece of this complex puzzle.

## INFORMATION

Suppose someone states the number 99.5. What does that mean? It could be a radio station or a score on a test. Now, if someone says that Ms. Howsunny's temperature is 99.5°F, what does that convey? It is then known that 99.5 is a person's temperature. The data (99.5) were processed to the information that 99.5° is a specific person's temperature. **Data** are raw facts. Information is processed data that has meaning. Healthcare professionals constantly process data and information to provide the best care possible for their patients.

There are many types of data, such as alpha, numeric, audio, image, and video data. Alpha data refers to letters and numeric refers to numbers, and alphanumeric data includes both letters and numbers. This includes all text and the numeric outputs of digital monitors. Some of the alphanumeric data encountered by healthcare professionals are in the form of patients' names, identification numbers, or medical record numbers. Audio data refer to sounds, noises, or tones. There are monitor alerts or alarms, taped or recorded messages, and other sounds. Image data include graphics and pictures, such as graphic monitor displays or recorded electrocardiograms, radiographs, MRIs, and CT scans. Video data refer to animations, moving pictures, or moving graphics. One may review the ultrasound of a pregnant patient; examine a patient's echocardiogram; watch an animated video for professional development; or learn how to operate a new technology tool, such as a pump or monitoring system.

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The integrity and quality of the data, rather than the form, are what matter. Integrity refers to whole, complete, correct, and consistent data. Data integrity can be compromised through human error; viruses, worms, other bugs; hardware failures or crashes; transmission errors; or hackers entering the system. Information technologies help to decrease these errors by putting into place safeguards, such as backing up files on a routine basis, error detection for transmissions, and developing user **interfaces** that help people enter the data correctly. High-quality data are relevant and accurately represent their corresponding concepts. Data are dirty when there are errors in the database, such as duplicate, incomplete, or outdated records. One author (D.M.) found 50 cases of tongue cancer in a database she examined for data quality. When the records were tracked down and analyzed, and the dirty data were removed, there was only one case of tongue cancer. The same person had been entered erroneously 49 times. The major problem was with the patient's identification number and name. The numbers were changed or his name was misspelled repeatedly. If researchers had just taken the number of cases in that defined population as 50, they would have concluded it was an epidemic, resulting in flawed information that is not meaningful. Therefore, it is imperative that data be clean if the goal is quality information. The data that are processed into information must be of high quality and integrity to create meaning to inform assessments and decision making.

To be valuable and meaningful, information must be of good quality. Characteristics of valuable, quality information include accessibility, security, timeliness, accuracy, relevancy, completeness, flexibility, reliability, objectivity, utility, transparency, verifiability, and reproducibility. Accessibility is a must; the right user must be able to have the right information at the right time and in the right format to meet his or her needs. Getting meaningful information to the right user at the right time is as vital as generating the information in the first place. The *right user* refers to an authorized user who has the right to obtain the data and information he or she is seeking. Security is a major challenge because unauthorized users must be blocked while the right user is provided with open, easy access (see Chapter 15). Timely information means that it is available when it is needed for the right purpose and at the right time. Knowing who won the lottery last week does not help one to know if he or she won it today. Accurate information means that there are no errors in the data and information. Relevant information is subjective in the fact that the user must have information that is relevant or applicable to his or her needs. If one is trying to decide whether or not a patient needs insulin and only the patient's CT scan information is available, this information is not relevant for that current need. However, if one needed information about the CT scan, then the information is relevant. Complete information contains all of the necessary essential data. If one needs to contact the only relative listed for the

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patient and his or her contact information is listed but the approval for them to be a contact is missing, this information is considered incomplete. Flexible information means that it can be used for a variety of purposes. Information concerning the inventory of supplies on a nursing unit can be used by nurses who need to know if an item is available for use for a patient. The nurse manager accesses this information to help decide what supplies need to be ordered and to determine what items are used often and to do an economic assessment of any waste. Reliable information comes from reliable or clean data and authoritative and credible sources. Objective information is as close to the truth as one can get. It is not subjective or biased but rather is factual and impartial. If someone states something, it must be determined if that person is reliable and if what he or she is stating is objective or tainted by his or her own perspective. Utility refers to the ability to provide the right information at the right time to the right person for the right purpose. Transparency allows users to apply their intellect to accomplish their tasks while the tools housing the information disappear. Verifiable information means that one can check to verify or prove that it is correct. Reproducibility refers to the ability to produce the same information again. The value relates directly to how the information informs decision making.

Information is acquired either by actively looking for it or by having it conveyed by the environment. All of the senses (vision, hearing, touch, smell, and taste) are used to gather input from the surrounding world, and as technologies mature, there will be more and more **input** through the senses. Currently, people receive information from computers (output), through vision, hearing, or touch (input), and the response (output) to the computer (input) is the interface with technology. Gesture recognition is increasing and interfaces that incorporate it will change the way people become informed (see Box 2-1). Many people access the Internet on a daily basis seeking information or imparting information. One is constantly becoming informed, discovering, or learning; becoming reinformed, rediscovering, or relearning; and purging what has been acquired. The information acquired is added to the knowledge base. **Knowledge** is the awareness and understanding of a set of information and ways that information can be made useful to support a specific task or arrive at a decision. This knowledge building is an ongoing process engaged in while one is conscious and going about his or her normal daily activities.

## INFORMATION SCIENCE

Information science has evolved over the last 50 some years as a field of scientific inquiry and professional practice. Information science can be thought of as the science of information, studying the application and usage of information and

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BOX 2-1

## Gesture Recognition in Surface and iTable Computing

These surfaces are multitouch, gesture recognition interfaces that interpret human gestures by means of mathematical algorithms to manipulate digital content for one or multiple users.

According to McGonigle (2009), one should not get too attached to the mouse and keyboard, because they are going to be outdated soon if Microsoft and PQ Labs have their way. Microsoft has introduced the Surface and PQ Labs is building custom iTables (Kumparak, 2009). Have you ever thought of digital information you can touch and grab? Microsoft and PQ Labs are leading us into the next generation of computing, surface or table computing.

Surface or table computing consists of a multitouch, multiuser interface that allows one to "grab" digital information, collaborate, share, and store without using a mouse or keyboard, just the hands and fingers and such devices as a digital camera and PDA. This interface generally rests on top of a table and is so advanced that it can actually sense objects, touch, and gestures from many users (Microsoft, 2008).

Imagine entering a restaurant and interacting with the menu through the surface. Once you have completed your order you can begin computing by using the capabilities built into the surface or using your own device, such as a PDA. For example, one could set the PDA on the surface and download images, graphics, and text to the surface. You could even communicate using full audio and video with others while waiting for the order. When finished eating, set your credit card on the surface where it is automatically charged, and pick up your credit card and leave. That is a different kind of eating experience, but one that will become commonplace for the next generation of users.

This new age of computing is currently available in Las Vegas and in select casinos, banks, restaurants, and hotels throughout the United States and Canada.

Explore this new interface, which will forever change how people interact and compute. Think of the ramifications for health care....

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knowledge in organizations and the interface or interaction between people, organizations, and IS. It is an extensive, interdisciplinary science that integrates features from **cognitive science**, **communication science**, **computer science**, **library science**, and **social sciences**. Information science is primarily concerned with the input, processing, output, and feedback of data and information through technology integration with a focus on comprehending the perspective of the **stakeholders** involved and then applying information technology as needed. It is systemically based, dealing with the big picture rather than individual pieces of technology. Information science can be related to determinism. It is a response to technologic determinism, the belief that technology develops by its own laws, that it realizes its own potential, limited only by the material resources available, and must therefore be regarded as an autonomous system controlling and ultimately permeating all other subsystems of society (Web Dictionary of Cybernetics and Systems, 2007, para. 1).

This approach sets the tone for the study of information as it applies to itself, the people, the technology, and the varied sciences that are contextually related depending on the needs of the setting or organization; what is important is the interface between the stakeholders and their systems and how they generate, use, and locate information. According to Cornell University (2010), "Information Science brings together faculty, students and researchers who share an interest in combining computer science with the social sciences of how people and society interact with information" (para. 1). Information science is an interdisciplinary, people-oriented field that explores and enhances the interchange of information to transform society, communication science, computer science, cognitive science, library science, and the social sciences. Society is dominated by the need for information, and knowledge and information science focuses on systems and individual users fostering user-centered approaches that enhance society's information capabilities, effectively and efficiently linking people, information, and technology. This impacts the configuration and mix of organizations and influences the nature of work or how knowledge workers interact with and produce meaningful information and knowledge.

## INFORMATION PROCESSING

Claude E. Shannon is considered the father of information theory (Horgan, 1990) and thought of information processing as the conversion of latent information into manifest information. Latent information is that which is not yet realized or apparent, whereas manifest information is obvious or clearly apparent. According to O'Connor and Robertson (2005), "Shannon believed that information was no different than any other quantity and therefore could be manipulated by a machine" (para. 13).

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**Information science** enables the processing of information. This processing links people and technology. Humans are organic ISs, constantly acquiring, processing, and generating information or knowledge in their professional and personal lives. It is a high degree of knowledge that characterizes humans as extremely intelligent organic machines. The premise of this book revolves around this concept and is organized on the basis of the Foundation of Knowledge model: knowledge **acquisition**, knowledge processing, knowledge generation, and knowledge dissemination.

Information is data that are processed using knowledge. For information to be valuable or meaningful, it must be accessible, accurate, timely, complete, cost effective, flexible, reliable, relevant, simple, verifiable, and secure. Knowledge is the awareness and understanding of an information set and ways that information can be made useful to support a specific task or arrive at a decision. As an example, if one were going to design a building, part of the knowledge necessary for developing a new building is understanding how the building will be used, how large of a building is needed compared to the available building space, and how many people will have or need access to this building. Therefore, the work of choosing or rejecting facts based on their significance or relevance to a particular task, such as designing a building, is also based on a type of knowledge used in the process of converting data into information. Information can then be considered data made functional through the application of knowledge. The knowledge used to develop and glean knowledge from valuable information is generative (having the ability to originate and produce or generate) in nature. Knowledge must be viable. Knowledge viability refers to applications that offer easily accessible, accurate, and timely information obtained from a variety of resources and methods and presented in a manner so as to provide the necessary elements to generate knowledge.

Information science and computational tools are extremely important in enabling the processing of data, information, and knowledge in health care. The hardware, software, networking, algorithms, and human organic ISs work together to create meaningful information and generate knowledge. The links between information processing and scientific discovery are paramount. However, without the ability to generate practical results that can be disseminated, the processing of data, information, and knowledge is for naught. It is the ability of machines (inorganic ISs) to support and facilitate the functioning of people (human organic ISs) that refines, enhances, and evolves nursing practice by generating knowledge. This knowledge represents five rights: the right information, accessible by the right people in the right settings, applied the right way at the right time. It is also the struggle to integrate new knowledge and old knowledge to enhance wisdom. Wisdom is the ability to act; it assumes actions directed by one's own wisdom. Wisdom uses knowledge and experience to heighten common sense, and

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insight to exercise sound judgment in practical matters. It is developed through knowledge, experience, insight, and reflection. Wisdom is sometimes thought of as the highest form of common sense resulting from accumulated knowledge or erudition (deep, thorough learning) or enlightenment (education that results in understanding and the dissemination of knowledge). It is the ability to apply valuable and viable knowledge, experience, understanding, and insight while being prudent and sensible. Knowledge and wisdom are not synonymous because knowledge abounds with others' thoughts and information, whereas wisdom is focused on one's own mind and the synthesis of one's own experience, insight, understanding, and knowledge. If clinicians are inundated with data without the ability to process it, the situation results in too much data and too little wisdom. That is why it is crucial that clinicians have viable ISs at their fingertips to facilitate the acquisition, sharing, and use of knowledge while maturing wisdom; it is a process of empowerment.

## INFORMATION SCIENCE AND THE FOUNDATION OF KNOWLEDGE

Information science is a multidisciplinary science that involves aspects from computer science, cognitive science, social science, communication science, and library science to deal with obtaining, gathering, organizing, manipulating, managing, storing, retrieving, recapturing, disposing of, distributing, or broadcasting information. Information science studies everything that deals with information and can be defined as the study of ISs. This science originated as a subdiscipline of computer science, to understand and rationalize the management of technology within organizations. It has matured into a major field of management; is an important area of research in management studies; and has expanded to examine the human–computer interaction, interfacing, and interaction of people, ISs, and corporations. It is taught at all major universities and business schools worldwide. Organizations have become intensely aware of the fact that information and knowledge are potent resources that must be cultivated and honed to meet their needs. Thus, information science or the study of ISs, the application and usage of knowledge, focuses on why and how technology can be put to best use to serve the information flow within an organization.

Information science impacts information interfacing, influencing how people interact with information and subsequently develop and use knowledge. The information one acquires is added to one's knowledge base. Knowledge is the awareness and understanding of an information set and ways that information can be made useful to support a specific task or arrive at a decision.

Healthcare organizations are affected by and rely on the evolution of information science to enhance the recording and processing of routine and intimate

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information while facilitating human-to-human and human-to-systems communications, delivery of healthcare products, dissemination of information, and enhancement of the organization's business transactions. The benefits and enhancements of information science technologies have also brought risks, such as glitches and loss of information and hackers who can steal identities and information. Solid leadership, guidance, and vision are vital to the maintenance of cost-effective business performance and cutting-edge, safe information technologies for the organization. This field studies all facets of the building and use of information. The emergence of information science and its impact on information has also influenced how people acquire and use knowledge.

Information science has had a tremendous impact on society and will expand its sphere of influence as it continues to evolve and innovate human activities at all levels. What visionaries only dreamed of is now possible and part of reality. The future has yet to unfold in this important arena.

## INTRODUCTION TO INFORMATION SYSTEMS

Consider the following scenario. You have just been hired by a large healthcare facility. You enter the personnel office and are told that you will have to learn a new language to work on the unit where you have been assigned. This language is just used on this unit. If you had been assigned to a different unit, you would have to learn another language that is specific to that unit, and so on. Therefore, interdepartmental sharing and information exchange (known as interoperability) is severely hindered. This is how workers used to operate in health care—in silos. There was a system for the laboratory, one for finance, one for clinical departments, and so on. Learning the importance of communication, tracking, and research, there are now integrated ISs that handle the needs of the entire organization.

Information and information technology have become major resources for organizations, and health care is no exception (see Box 2-2). Information technologies help to shape a healthcare organization, in conjunction with personnel, money, materials, and equipment. Many healthcare facilities have hired **chief information officers** (CIOs) or **chief technical officers** (CTOs), also known as **chief technology officers**. The CIO is involved with the information technology **infrastructure** and this role is sometimes expanded to chief knowledge officer. The CTO is focused on organizationally based scientific and technical issues and is responsible for technologic research and development as part of the organization's products and services. The CTO and CIO must be visionary leaders for the organization, because so much of the business of health care relies on solid infrastructures that generate potent and timely information and knowledge. The CTO and CIO are sometimes interchangeable positions, but in some organizations the CTO reports to the CIO. These positions will become paramount as companies

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BOX 2-2

## Examples of Information Systems

| Information System | How It Is Used |
|---|---|
| Clinical Information System (CIS) | Comprehensive and integrative systems that manage the administrative, financial, and clinical aspects of a clinical facility; it should help to link financial and clinical outcomes. One example is the electronic health record (EHR). |
| Decision Support System (DSS) | Organizes and analyzes information to help decision makers formulate decisions when they are unsure of their decision's possible outcomes. After gathering relevant and useful information, develops "What-If" models to analyze the options or choices and alternatives. |
| Executive Support System | Collects, organizes, analyzes, and summarizes vital information to help executives or senior management with strategic decision making. Provides a quick view of all strategic business activities. |
| Geographic Information System (GIS) | Collects, manipulates, analyzes, and generates information related to geographic locations or the surface of the earth; provides output in the form of virtual models, maps, or lists. |
| Management Information Systems (MIS) | Provides summaries of internal sources of information, such as information from the transaction processing system and develops a series of routine reports for decision making. |
| Office Systems | Facilitates communication and enhances the productivity of users needing to process data and information. |
| Transaction Processing System (TPS) | Processes and records routine business transactions, such as billing systems that create and send invoices to customers, and payroll that generates employee's pay stubs and wage checks and calculates tax payments. |
| Hospital Information System (HIS) | Manages the administrative, financial, and clinical aspects of a hospital enterprise. It should help to link financial and clinical outcomes. |

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continue to shift from being product oriented to knowledge oriented and as they begin emphasizing the production process itself rather than the product. In health care, ISs must be able to handle the volume of data and information necessary to generate the needed information and knowledge for best practices, because the goal is to provide the highest quality of patient care.

## INFORMATION SYSTEMS

ISs can be manually based, but for the purposes of this text, the term refers to **computer-based information systems** (CBISs). According to Jessup and Valacich (2008), computer-based ISs "are combinations of hardware, software and telecommunications networks that people build and use to collect, create, and distribute useful data, typically in organizational settings" (p. 10). Along those lines, ISs are also defined as "a set of interrelated components that collect, manipulate, store and disseminate data and information and provide a feedback mechanism to meet an objective" (Stair & Reynolds, 2008, p. 4). ISs are designed for specific purposes within organizations. They are only as functional as the decision-making, problem-solving skills, and programming potency built in and the quality of data and information inputted (see Chapter 12). The capability of the IS to disseminate, provide feedback, and adjust the data and information based on these dynamic processes is what sets them apart. The IS should be a user-friendly entity that provides the right information at the right time and in the right place.

An IS acquires data or inputs; processes data that consists of the retrieval, **analysis**, or **synthesis** of data; disseminates or outputs in the form of reports, documents, summaries, alerts, prompts, or outcomes; and provides for responses or feedback. Input or data acquisition is the activity of collecting and acquiring raw data. Input devices are combinations of hardware, software, and **telecommunications** and include keyboards, light pens, touch screens, mice or other pointing devices, automatic scanners, and machines that can read magnetic ink characters or lettering. In receiving a pay-per-view movie, the viewer must input the chosen movie, verify the purchase, and have a payment method approved by the vendor. The IS must acquire this information before one can receive the movie.

**Processing**, the retrieval, analysis, or synthesis of data refers to the alteration and transformation of the data into helpful or useful information and outputs. The processing of data can range from storing it for future use to comparing the data, making calculations, or applying formulas, to taking selective actions. Processing devices are combinations of hardware, software, and telecommunications and include processing chips where the central processing unit (CPU) and main memory are housed. According to Schupak (2005), the bunny chip could save the pharmaceutical industry money while sparing "millions of furry creatures, with a chip that mimics a living organism" (para. 1). The HμREL Corporation has developed

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environments or biologic ISs that reside on chips and actually mimic the functioning of the human body. Therefore, researchers can test for both the harmful and beneficial effects of drugs, including those that are considered experimental and that could be harmful if used in human and animal testing. These chips also allow researchers to monitor the drug's toxicity to the liver and other organs.

A patented HμREL microfluidic "biochip" comprises an arrangement of separate but fluidically interconnected "organ" or "tissue" compartments. Each compartment contains a culture of living cells drawn from, or engineered to mimic primary functions of the respective organ or tissue of a living animal. Microfluidic channels permit a culture medium that serves as a "blood surrogate" to recirculate as in a living system, driven by a microfluidic pump. The geometry and fluidics of the device are fashioned to simulate the values of certain related physiologic parameters found in the living creature. Drug candidates or other substrates of interest are added to the culture medium and allowed to recirculate through the device. The effects of drug compounds and their metabolites on the cells within each respective organ compartment are detected by measuring or monitoring key physiologic events. The cell types used may be derived from either standard cell culture lines or primary tissues (HμREL Corporation, 2010, para. 2-3). As these new technologies continue to evolve, more and more robust ISs that can handle a variety of biological and clinical applications will be seen.

In the movie rental example, the IS must verify the data entered and then process the request by following the steps necessary to provide access to the movie that was ordered. This processing must be instantaneous in today's world where everyone wants it now. After the data is processed, it is stored. In this case, the rental must also be processed so the vendor receives payment for the movie, whether electronically, via a credit card or checking account withdrawal, or by generating a bill for payment.

Output or **dissemination** produces helpful or useful information that can be in the form of reports, documents, summaries, alerts, or outcomes. **Reports** are designed to inform and are generally tailored to the context of a given situation or user or user group. Reports may include charts, figures, tables, graphics, pictures, hyperlinks, references, or other documentation necessary to meet the needs of the user. **Documents** represent information that can be printed, saved, e-mailed or shared, or displayed. **Summaries** are condensed versions of the original designed to highlight the major points. **Alerts** are warnings, feedback, or additional information necessary to assist the user in interacting with the system. **Outcomes** are the expected results of input and processing. **Output** devices are combinations of hardware, software, and telecommunications and include sound and speech syn-

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thesis outputs, printers, and monitors. Continuing with the movie rental example, the IS must be able to provide the consumer with the movie ordered when it is wanted and somehow notify the purchaser that he or she has indeed purchased the movie and is granted access. The IS must also be able to generate payment either electronically or by generating a bill, and storing the transactional record for future use.

**Feedback** or responses are reactions to the inputting, processing, and outputs. In ISs, feedback refers to information from the system that is used to make modifications in the input, processing actions, or outputs. In the movie rental example, what if the consumer accidentally entered the same movie order three times and only wanted to order the movie once? The IS would determine that more than one movie order is out of range for the same movie order at the same time and provide feedback. The feedback is used to verify and correct the input. If undetected, this error would result in an erroneous bill and decreased customer satisfaction while creating more work for the vendor, who would have to deal with the customer to resolve this problem. Section IV of this book provides detailed descriptions of clinical ISs that operate on these same principles to support healthcare delivery.

## SUMMARY

ISs deal with the development, use, and management of an organization's information technology (IT) infrastructure. An IS acquires data or inputs; processes data that consist of the retrieval, analysis, or synthesis of data; disseminates or outputs in the form of reports, documents, summaries, alerts, or outcomes; and provides for responses or feedback. Quality decision-making and problem-solving skills are vital to the development of effective, valuable ISs. Organizations are recognizing that their most precious asset is their information, represented by their employees, experience, competence or know-how, and innovative or novel approaches, all of which are dependent on a robust information network that encompasses the information technology infrastructure.

In an ideal world, one would see ISs that are fluid in their ability to adapt to any and all users' needs. They would be Internet oriented and global, where resources are available to everyone. Think of **cloud computing**; this is just a beginning point from which ISs will expand and grow in their ability to provide meaningful information to their users. As technologies advance, so will the skills and capabilities to comprehend and realize what ISs can become.

It is important to continue to develop and refine functional, robust, visionary ISs that meet the current meaningful information needs while evolving to handle future information and knowledge needs of the healthcare industry.

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## THOUGHT-PROVOKING Questions

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1. How do you acquire information? Choose 2 hours out of your busy day and try to take note of all of the information that you receive from your environment. Keep diaries denoting where the information came from and how you knew it was information and not data.
2. Reflect on an IS that you are familiar with, such as the automatic banking machine. How does this IS function? What are the advantages of using this system (i.e., why not use a bank teller instead)? What are the disadvantages? Are there enhancements that you would add to this system?
3. In health care, think about a typical day of practice and describe the setting. How many times does the nurse interact with ISs? What are the ISs that we interact with, and how do we access them? Are they at the bedside, handheld, or station based? How does their location and ease of access impact nursing care?
4. Briefly describe an organization and discuss how our need for information and knowledge impacts the configuration and mix of that organization with other organizations. Also discuss how the need for information and knowledge influences the nature of work or how knowledge workers interact with and produce information and knowledge in this organization.
5. If you could only meet four of the rights discussed in this chapter, which one would you omit and why? Also, provide your rationale for each right you chose to meet.

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