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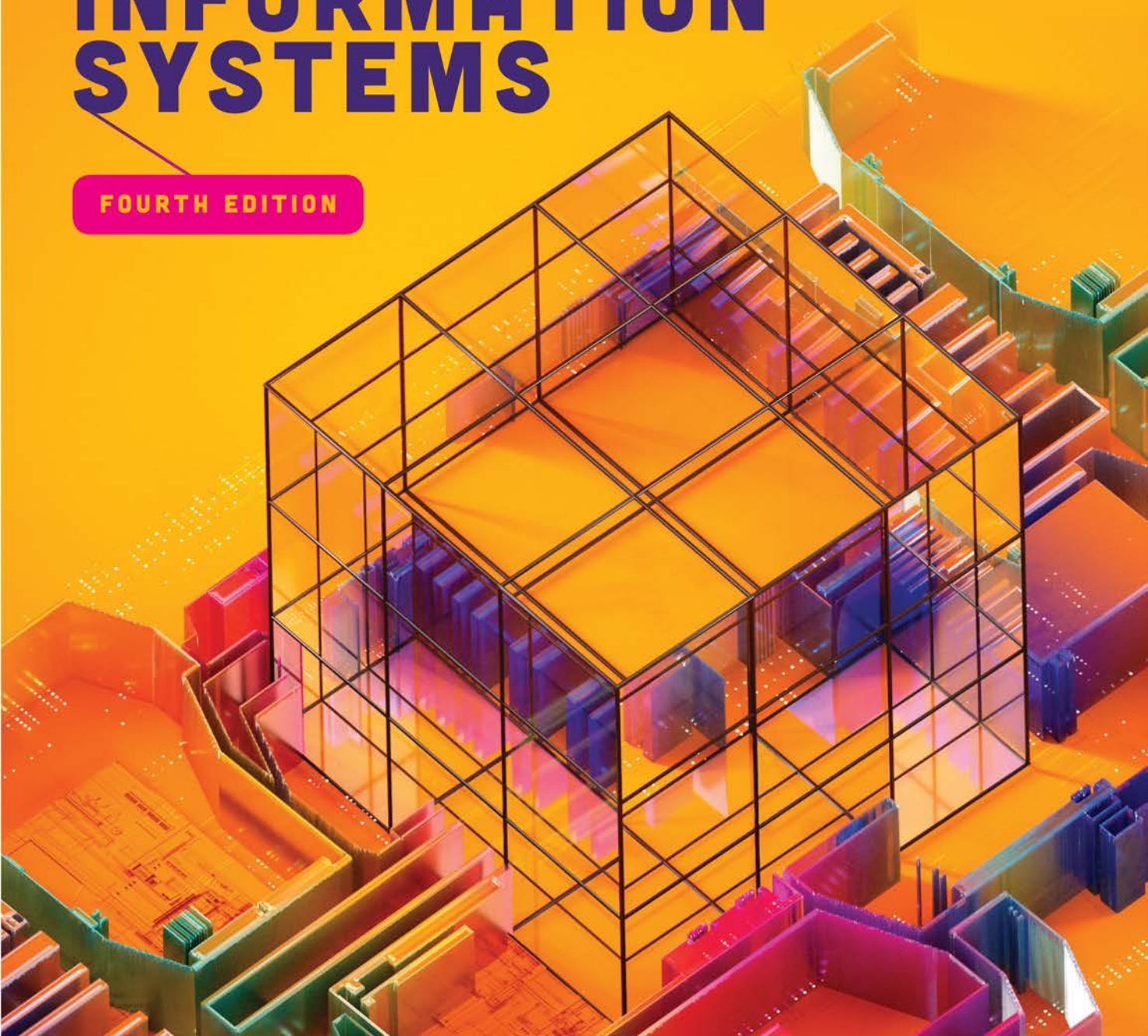
RALPH STAIR

GEORGE REYNOLDS

THOMAS CHESNEY

PRINCIPLES OF BUSINESS INFORMATION SYSTEMS

FOURTH EDITION



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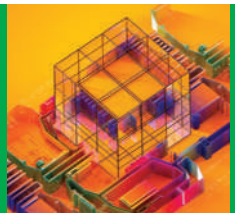

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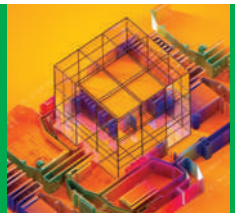

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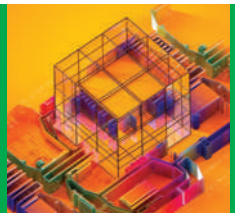
Preface



As organizations continue to operate in an increasingly competitive and global marketplace, workers in all areas of business including accounting, finance, human resources, marketing, operations management and production must be well prepared to make the significant contributions required for success. Regardless of your future role, you will need to understand what information systems can and cannot do and be able to use them to help you accomplish your work. You will be expected to discover opportunities to use information systems and to participate in the design of solutions to business problems employing information systems. You will be challenged to identify and evaluate information systems options. 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 fellow workers, 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.

The primary objective of *Principles of Business Information Systems fourth edition* is to provide the best information systems text and accompanying materials for the first information technology course required of all business students. We want you to learn to use information technology to ensure your personal success in your current or future job and to improve the success of your organization. *Principles of Business Information Systems* stands proudly at the beginning of the information systems (IS) curriculum and remains unchallenged in its position as the only IS principles text offering the basic IS concepts that every business student must learn to be successful.

This text has been written specifically for the introductory course in the IS curriculum. *Principles of Business Information Systems* treats the appropriate computer and IS concepts together with a strong managerial emphasis on meeting business and organizational needs.

Approach of the Text

Principles of Business Information Systems offers the traditional coverage of computer concepts, but it places the material within the context of meeting business and organizational needs. Placing IS concepts in this context and taking a general management perspective sets the text apart from general computer books thus making it appealing not only to those studying for IS degrees but also to students from other fields of study. The text isn't overly technical, but rather deals with the role that information systems play in an organization and the key principles a manager needs to grasp to be successful. These principles of IS are brought together and presented in a way that is both understandable and relevant. In addition, this book offers an overview of the entire IS discipline, while giving students a solid foundation for further study in advanced IS courses such as programming, systems analysis and design, project management, database management, data communications, website and systems development, electronic commerce and mobile commerce applications, and decision support. As such, it serves the needs of both general business students and those who will become IS professionals.

IS Principles First, Where They Belong

Exposing students to fundamental IS principles is an advantage for students who do not later return to the discipline for advanced courses. Since most functional areas in business rely on information systems, an understanding of IS principles helps students in other course work. In addition, introducing students to the principles of IS helps future business function managers employ information systems successfully and avoid mishaps that often result in unfortunate consequences. Furthermore, presenting IS concepts at the introductory level creates interest among general business students who may later choose IS as a field of concentration.

Goals of this Text

Principles of Business Information Systems has four main goals:

1. To provide a core of IS principles with which every business student should be familiar.
2. To offer a survey of the IS discipline that will enable all business students to understand the relationship of IS courses to their curriculum as a whole.
3. To present the changing role of the IS professional.
4. To show the value of the discipline as an attractive field of specialization.

By achieving these goals, *Principles of Business Information Systems* will enable students to understand and use fundamental IS principles so that they can function more efficiently and effectively as workers, managers, decision makers and organizational leaders.

IS Principles

Principles of Business Information Systems, 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 face career challenges ahead. Think of principles as basic truths or rules that remain constant regardless of the situation. As such, they provide strong guidance in the face of tough decisions. A set of IS principles is highlighted at the beginning of each chapter. The ultimate goal of *Principles of Business Information Systems* is to develop effective, thinking, action-oriented employees by instilling them with principles to help guide their decision making and actions.

Survey of the IS Discipline

This text 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. 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 their 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 IS to bear throughout the organization. The IS

professional views issues through a global perspective that encompasses the entire organization and the broader industry and business environment in which it operates.

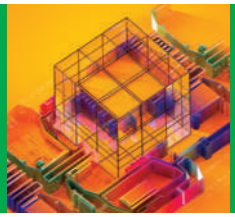
The scope of responsibilities of an IS professional today is not confined to just his or her employer but encompasses the entire interconnected network of employees, suppliers, customers, competitors, regulatory agencies and other entities, no matter where they are located. This broad scope of responsibilities creates a new challenge: how to help an organization survive in a 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 now strive for the highest level of customer satisfaction and loyalty through competitive prices and ever-improving product and service quality. The IS professional assumes the critical responsibility of determining the organization's approach to both overall cost and quality performance and therefore plays an important role in the ongoing survival of the organization. This new duality in the role of the IS employee – a professional who exercises a specialist's skills with a generalist's perspective – is reflected throughout the book.

IS as a Field for Further Study

Employment of computer and IS managers is expected to grow much faster than the average for all occupations. Technological advancements will boost the employment of computer-related workers; in turn, this will boost the demand for managers to direct these workers. In addition, job openings will result from the need to replace managers who retire or move into other occupations.

A career in IS can be exciting, challenging and rewarding! It is important to show the value of the discipline as an appealing field of study and that the IS graduate is no longer a technical recluse. Today, perhaps more than ever before, the IS professional must be able to align IS and organizational goals and 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. Upon graduation, IS graduates at many schools are among the highest paid of all business graduates. Throughout this text, the many challenges and opportunities available to IS professionals are highlighted and emphasized.

Changes to the Fourth Edition



Principles of Business Information Systems is an adaptation of the popular US textbook *Principles of Information Systems*, now in its fourteenth edition. With a more international outlook, this book is suitable for students in the UK, Europe, the Middle East and South Africa on introductory BIS or MIS courses. The new edition reflects the fact that this book has boosted its business emphasis but retained its technology focus.

Continuing to present IS concepts with a managerial emphasis, this edition retains the overall vision, framework and pedagogy that made the previous US editions so popular:

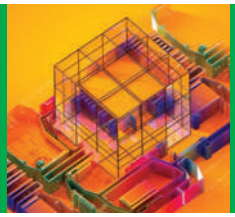
- *Principles of Business Information Systems* keeps the same five-part structure, is packed with new real world examples and business cases, and highlights ethical issues throughout.
- It is still an IS text aimed at those studying business and management.

However, in order to increase its international relevance, we have made a number of changes. The main improvements are:

- Cases are more international in flavour, including examples from South Africa, Australia and Europe, and have a broader sector spread reflecting a wider variety of business types (including SMEs).
- The book has been brought completely up to date in terms of innovations in IT.
- Legal and ethical issues in IT have been made more international.
- A chapter on pervasive computing reflects the move of the computer away from the desktop to enter almost every aspect of our lives.
- Separate information systems are still discussed in Chapters 7, 8, 9 and 10 (all of Part 3) but we recognize that many large – and some small – companies take a more integrated approach and this is covered at the start of Part 3.

We want to note that at the time of this fourth EMEA edition going to press, the global COVID-19 pandemic is still at large worldwide. For the past few months governments across the world have introduced a range of social distancing, isolation and quarantine methods to help control the pandemic which has impacted businesses and their information systems worldwide. It is too early to tell what the full effects of this pandemic will be on business information systems, but references to and examples of effects there have been to date, are included in the new edition.

Structure of the Text



Principles of Business Information Systems is organized into five parts – an overview of information systems, an introduction to information technology concepts, an examination of different classes of business information systems, a study of systems development and a focus on information systems in business and the wider society.

The content of each chapter is as follows:

Chapter 1 An Introduction to Information Systems

Chapter 1 creates a framework for the entire book. Major sections in this chapter become entire chapters in the text. This chapter describes the components of an information system and introduces major classes of business information systems. It offers an overview of systems development and outlines some major challenges that IS professionals face.

Chapter 2 Information Systems in Organizations

Chapter 2 gives an overview of business organizations and presents a foundation for the effective and efficient use of IS in a business environment. We have stressed that the traditional mission of IS is to deliver the right information to the right person at the right time. In the section on virtual organizational structure, we discuss that virtual organizational structures allow work to be separated from location and time. Work can be done anywhere, anytime. The concept of business process reengineering (BPR) is introduced and competitive advantage is examined – higher quality products, better customer service and lower costs.

Chapter 3 Hardware: Input, Processing, Output and Storage Devices

This chapter concentrates on the hardware component of a computer-based information system (CBIS) and reflects the latest equipment and computer capabilities. Computer memory is explained and a variety of hardware platforms are discussed including mobile technology.

Chapter 4 Software: Systems and Application Software

You cannot come into contact with a computer without coming into contact with software. This chapter examines a wide range of software and related issues including operating systems and application software, open-source and proprietary software, software for mobile devices and copyrights and licenses.

Chapter 5 Organizing and Storing Data

Databases are the heart of almost all IS. A huge amount of data is entered into computer systems every day. Chapter 5 examines database management systems and how they can help businesses. The chapter includes a brief overview of how to organize data in a database, a look at database administration and discusses how data can be used competitively by examining both data mining and business intelligence.

Chapter 6 Computer Networks

The power of information technology greatly increases when devices are linked or networked, which is the subject of this chapter. Today's decision makers need to access data wherever it resides. They must be able to establish fast, reliable connections to exchange messages, upload and download data and software, route business transactions to processors, connect to databases and network services, and send output to printers. This chapter examines the hardware involved and examines the world's biggest computer network, the Internet.

Chapter 7 Operational Systems

Operational systems, such as transaction processing systems, allow firms to buy and sell. Without systems to perform these functions, firms could not operate. Organizations today are moving from a collection of non-integrated transaction processing systems to highly integrated enterprise resource planning systems to perform routine business processes and maintain records about them. These systems support a wide range of business activities associated with supply chain management and customer relationship management. This chapter examines transaction processing systems and enterprise resource planning systems.

Chapter 8 Management Information and Decision Support Systems

This chapter begins with a discussion of decision making and examines the decision-making process. Both management information systems and decision support systems are examined in detail. Their ability to help managers make better decisions is emphasized.

Chapter 9 Knowledge Management and Specialized Information Systems

A discussion of knowledge management leads onto a discussion of some of the special-purpose systems discussed in the chapter, including expert and knowledge-based systems. The other topics discussed include robotics, vision systems, virtual reality and a variety of other special-purpose systems. We discuss embedded artificial intelligence, where artificial intelligence capabilities and applications are placed inside products and services.

Chapter 10 Pervasive Computing

The move of information systems to leave the office desktop and enter every aspect of our lives is well underway. Many businesses are exploiting this to their advantage, as are their customers. This chapter examines some of the technologies that are enabling all of this to happen. New ones are being introduced almost every month. It is important that businesses understand the potential benefits they can bring.

Chapter 11 Systems Analysis

This chapter and the next examine where information systems come from. Systems investigation and systems analysis, the first two steps of the systems development, are discussed. This chapter provides specific examples of how new or modified systems are initiated and analyzed in a number of industries. This chapter emphasizes how a project can be planned, aligned with corporate goals and rapidly developed.

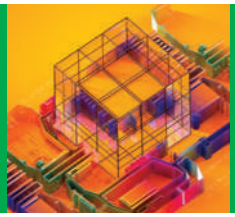
Chapter 12 Systems Design and Implementation

This chapter looks at how the analysis discussed in Chapter 11 can be used to design and build IT solutions. The chapter mainly looks at developing a new system but also examines solving a problem by buying an existing IS that has already been developed.

Chapter 13 Security, Privacy and Ethical Issues in Information Systems

This last chapter looks at security, privacy and ethical issues, something that is in the background throughout the text. A wide range of non-technical issues associated with the use of IS provide both opportunities and threats to modern organizations. The issues span the full spectrum – from preventing computer waste and mistakes, to avoiding violations of privacy, to complying with laws on collecting data about customers, to monitoring employees.

About the Authors



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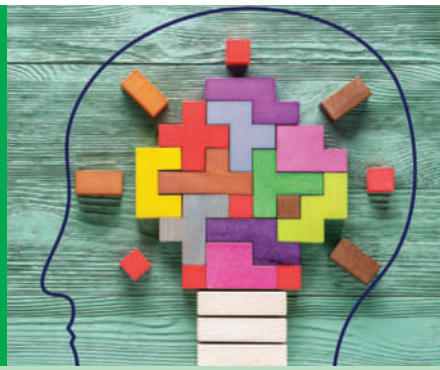
PART 1

Overview

1 An Introduction to Information Systems
2 Information Systems in Organizations

01

An Introduction to Information Systems



Principles	Learning Objectives
The value of information is directly linked to how it helps decision makers achieve organizational goals.	■ Discuss why it is important to study and understand information systems. ■ Describe the characteristics used to evaluate the quality of data.
Computers and information systems are constantly making it possible for organizations to improve the way they conduct business.	■ Name the components of an information system and describe several system characteristics.
Knowing the potential impact of information systems and having the ability to put this knowledge to work can result in a successful personal career, organizations that reach their goals and a society with a higher quality of life.	■ Identify the basic types of business information systems and discuss who uses them, how they are used and what kinds of benefits they deliver.
System users, business managers and information systems professionals must work together to build a successful information system.	■ Identify the major steps of the systems development process and state the goal of each.
Information systems must be applied thoughtfully and carefully so that society, business and industry can reap their enormous benefits.	■ Describe some of the threats to security and privacy that information systems and the Internet can pose. ■ Discuss the expanding role and benefits of information systems in business and industry.

Why Learn About Information Systems?

Information systems are used in almost every imaginable profession. Sales representatives use information systems to advertise products, communicate with customers and analyze sales trends. Managers use them to make major decisions, such as whether to build a manufacturing plant or research a cancer drug. From a small music store to huge multinational companies, businesses of all sizes could not survive without information systems to perform accounting and finance operations. Regardless of your chosen career, you will use information systems to help you achieve goals.

This chapter presents an overview of information systems. The sections on hardware, software, databases, telecommunications, e-commerce and m-commerce, transaction processing and enterprise resource planning, information and decision support, special purpose systems, systems development, and ethical and societal issues are expanded to full chapters in the rest of the book. We will start by exploring the basics of information systems.

1.1 What is an Information System?

People and organizations use information every day. Many retail chains, for example, collect data from their shops to help them stock what customers want and to reduce costs. Businesses use information systems to increase revenues and reduce costs. We use automated teller machines outside banks and access information over the Internet. Information systems usually involve computers, and together they are constantly changing the way organizations conduct business. Today we live in an information economy. Information itself has value, and commerce often involves the exchange of information rather than tangible goods. Systems based on computers are increasingly being used to create, store and transfer information. Using information systems, investors make multimillion-euro decisions, financial institutions transfer billions of euros around the world electronically, and manufacturers order supplies and distribute goods faster than ever before. Computers and information systems will continue to change businesses and the way we live. To define an information system, we will start by examining what a system is.

What is a System?

system A set of elements or components that interact to accomplish goals.

A central concept of this book is that of a **system**. A system is a set of elements or components that interact to accomplish goals. The elements themselves and the relationships between them determine how the system works. Systems have inputs, processing mechanisms, outputs and feedback (see Figure 1.1). A system processes the input to create the output. For example, consider an automatic car wash. Tangible inputs for the process are a dirty car, water and various cleaning ingredients. Time, energy, skill and knowledge also serve as inputs to the system because they are needed to operate it.

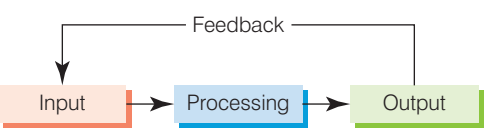


Figure 1.1 Components of a System *A system's four components consist of input, processing, output and feedback.*

The processing mechanisms consist of first selecting which cleaning option you want (wash only, wash with wax, wash with wax and hand dry, etc.) and communicating that to the operator of the car wash. Liquid sprayers shoot clean water, liquid soap or car wax depending on where your car is in the process and which options you selected. The output is a clean car. As in all systems,

independent elements or components (the liquid sprayer, foaming brush and air dryer) interact to create a clean car. A feedback mechanism is your assessment of how clean the car is.

System performance can be measured in various ways. **Efficiency** is a measure of what is produced divided by what is consumed. For example, the efficiency of a motor is the energy produced (in terms of work done) divided by the energy consumed (in terms of electricity or fuel). Some motors have an efficiency of 50 per cent or less because of the energy lost to friction and heat generation.

efficiency A measure of what is produced divided by what is consumed.

Effectiveness is a measure of the extent to which a system achieves its goals. It can be computed by dividing the goals actually achieved by the total of the stated goals. For example, a company might want to achieve a net profit of €100 million for the year with a new information system. Actual profits, however, might only be €85 million for the year. In this case, the effectiveness is 85 per cent (85/100 = 85 per cent).

effectiveness A measure of the extent to which a system achieves its goals; it can be computed by dividing the goals actually achieved by the total of the stated goals.

Evaluating system performance also calls for using performance standards. A **system performance standard** is a specific objective of the system. For example, a system performance standard for a marketing campaign might be to have each sales representative sell €100,000 of a certain type of product each year (see Figure 1.2a). A system performance standard for a manufacturing process might be to produce no more than 1 per cent defective parts (see Figure 1.2b). After standards are established, system performance is measured and compared with the standard. Variances from the standard are determinants of system performance.

system performance standard A specific objective of the system.

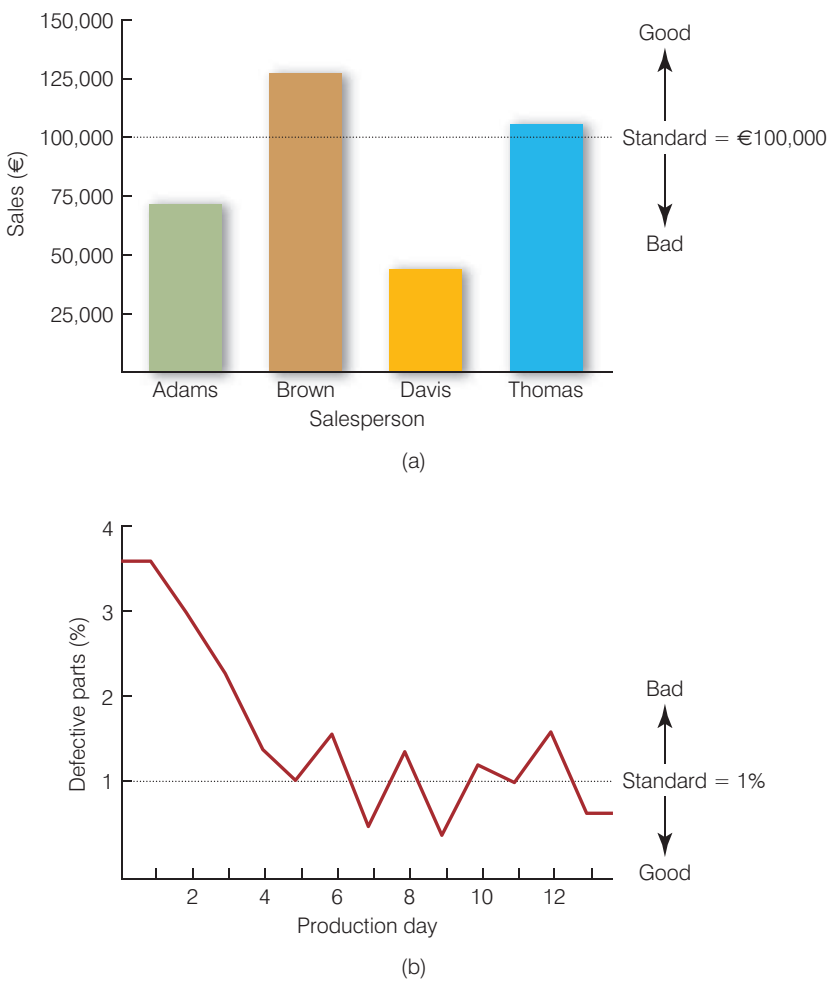


Figure 1.2 System Performance Standards
(a) Sales broken down by salesperson.
(b) Percentage of defective parts.

What is Information?

Information is one of those concepts that we all seem intuitively able to grasp but find tricky to define. In the 1940s, mathematician Claude Shannon defined it as: information is that which reduces uncertainty. Shannon was working on the technical problems involved in sending messages over communication networks, and his concept of information is actually quite different from what we in business information systems mean by 'information'. Nevertheless, we can use his definition as a starting point. Imagine you are unsure of what today's weather will be like. Getting out of bed you open the curtains to see that the sun is shining. You now know a bit more about what it's going to be like: your uncertainty about the weather has been reduced. Therefore looking out of the window gave you information. When you turn on your radio and hear a detailed weather report, your uncertainty has been reduced further. When you look at the temperature gauge in your car, again your uncertainty has gone down. According to Shannon's definition, each of these events has therefore given you information.

However, his definition does not really capture what we would think of when we consider the information in, say, a management report. Therefore we simply define information as a collection of facts. These facts can take many forms. The temperature gauge in the car gives information in the form of a number. The radio gives audio information. Looking out of the window gives visual information. Other forms of information include text, images and video clips.

Another term that is closely related to information is 'data'. It's not intuitive but a philosopher might define data as 'variation'. To explain this: a blank page contains no data, but as soon as there is a mark on the page, that is, as soon as there is variation in the blankness, then data exist. Again this doesn't really capture what we mean by data in the context of business information systems. The traditional information systems view is that the input to an information system is data, and the output from the system is information. This means therefore that the difference between them is to do with how much processing has been done: unprocessed facts are data; processed facts are information. Unfortunately, however, this distinction is of little practical use. Therefore we will simply use the terms 'information' and 'data' interchangeably and define them as a collection of facts which can come in a variety of formats. (Incidentally, strictly speaking, the term data is plural, so we would say 'data are used' rather than 'data is used'. However, this is often not adhered to and we won't worry too much about it here.)

What is an Information System?

information system (IS) A set of interrelated components that collect, manipulate, store and disseminate information and provide a feedback mechanism to meet an objective.

input The activity of gathering and capturing data.

processing Converting or transforming input into useful outputs.

Now that we have defined the terms 'system' and 'information', we can define an information system: an **information system (IS)** is a set of interrelated components that collect, manipulate, store and disseminate information and provide a feedback mechanism to meet an objective. It is the feedback mechanism that helps organizations achieve their goals, such as increasing profits or improving customer service.

In information systems, **input** is the activity of gathering and capturing data. In producing employment payment, for example, the number of hours every employee works must be collected before the cheques can be calculated or printed. In a university grading system, instructors must submit student grades before a summary of grades for the semester can be compiled and sent to the students.

Processing means converting or transforming this input into useful outputs. Processing can involve making calculations, comparing data and taking alternative actions, and storing data for future use. In a payroll application, the number of hours each employee worked must be converted into net, or take-home, pay. Other inputs often include employee ID number and department. The required processing can first involve multiplying the number of hours

worked by the employee's hourly pay rate to get gross pay. If weekly hours worked exceed basic hours, overtime pay might also be included. Then tax must be deducted along with contributions to health and life insurance or savings plans to get net pay.

After these calculations and comparisons are performed, the results are typically stored. Storage involves keeping data and information available for future use, including output.

Output involves producing useful information, usually in the form of documents and reports. Outputs can include paycheques for employees, reports for managers, and information supplied to stockholders, banks, government agencies and other groups. In addition, output from one system can become input for another. For example, output from a system that processes sales orders can be used as input to a customer billing system. Computers typically produce output on printers and display screens. Output can also be handwritten or manually produced reports, although this is not common.

output Production of useful information, often in the form of documents and reports.

Lastly, **feedback** is information from the system that is used to make changes to input or processing activities. For example, errors or problems might make it necessary to correct input data or change a process. Consider a payroll example. Perhaps the number of hours an employee worked was entered as 400 instead of 40 hours. Fortunately, most information systems check to make sure that data falls within certain ranges. For number of hours worked, the range might be from 0 to 100 hours because it is unlikely that an employee would work more than 100 hours in a week. The information system would determine that 400 hours is out of range and provide feedback. The feedback is used to check and correct the input on the number of hours worked to 40.

feedback Output that is used to make changes to input or processing activities.

Feedback is also important for managers and decision makers. For example, a furniture maker could use a computerized feedback system to link its suppliers and manufacturing plants. The output from an information system might indicate that inventory levels for mahogany and oak are getting low – a potential problem. A manager could use this feedback to decide to order more wood from a supplier. These new inventory orders then become input to the system. In addition to this reactive approach, a computer system can also be proactive – predicting future events to avoid problems. This concept, often called **forecasting**, can be used to estimate future sales and order more inventory before a shortage occurs. Forecasting is also used to predict the strength of hurricanes and where they will reach land, future stock-market values and who will win a political election.

forecasting Predicting future events.

The Characteristics of Valuable Information

To be valuable to managers and decision makers, information should have some and possibly all of the characteristics described in Table 1.1. Many shipping companies, for example, can determine the exact location of inventory items and packages in their systems, and this information makes them responsive to their customers. In contrast, if an organization's information is not accurate or complete, people can make poor decisions costing thousands, or even millions, of euros. Many claim, for example, that the collapse and bankruptcy of some companies, such as drug companies and energy-trading firms, was a result of inaccurate accounting and reporting information, which led investors and employees alike to misjudge the actual state of these companies' finances and suffer huge personal losses. As another example, if an inaccurate forecast of future demand indicates that sales will be very high when the opposite is true, an organization can invest millions of euros in a new plant that is not needed. Furthermore, if information is not relevant, not delivered to decision makers in a timely fashion, or too complex to understand, it can be of little value to the organization.

The value of information is directly linked to how it helps decision makers achieve their organization's goals. For example, the value of information might be measured in the time required to make a decision or in increased profits to the company. Consider a market forecast

that predicts a high demand for a new product. If you use this information to develop the new product and your company makes an additional profit of €10,000, the value of this information to the company is €10,000 minus the cost of the information.

Table 1.1 Characteristics of Valuable Information

Characteristics	Definitions
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
Complete	Complete information contains all the important facts, but not more facts than are necessary (see the Simple characteristic below)
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 total value the company has invested in inventory
Relevant	Relevant information is important to the decision maker
Reliable	Reliable information can be depended on. 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 rumour from an unknown source that oil prices might go up soon may not be reliable (even though it might be useful)
Secure	Information should be secure from access by unauthorized users
Simple	Information should be simple, not overly complex. Sophisticated and detailed information might not be needed. In fact, too much information can cause information overload, whereby a decision maker 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

Manual and Computerized Information Systems

An information system can be manual or computerized. For example, some investment analysts manually draw charts and trend lines to assist them in making investment decisions. Tracking data on stock prices (input) over the last few months or years, these analysts develop patterns in graphical form (processing) that help them determine what stock prices are likely to do in the next few days or weeks (output). Some investors have made millions of euros using manual stock analysis information systems. Of course, today, many excellent computerized information systems

follow stock indexes and markets and suggest when large blocks of stocks should be purchased or sold to take advantage of market discrepancies.

The components of a **computer-based information system (CBIS)** are illustrated in Figure 1.3. Information technology (IT) refers to hardware, software, databases and telecommunications. A business's **technology infrastructure** includes all the hardware, software, databases, telecommunications, people and procedures that are configured to collect, manipulate, 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.

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

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

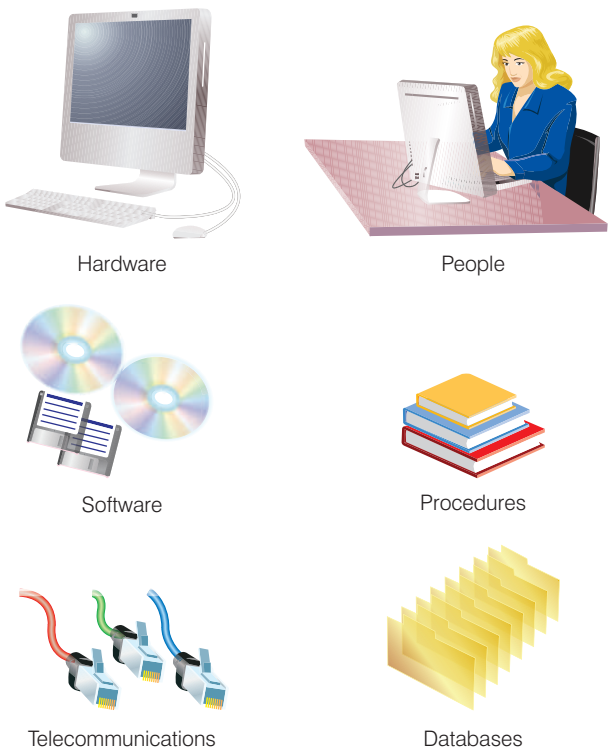


Figure 1.3 The Components of a Computer-Based Information System

Hardware

Hardware consists of computer equipment used to perform input, processing and output activities. Input devices include keyboards, mice and other pointing devices, automatic scanning devices and equipment that can read magnetic ink characters. Investment firms often use voice-response technology to allow customers to access their balances and other information with spoken commands. Processing devices include computer chips that contain the central processing unit and main memory. One processor chip, called the 'Bunny Chip' by some, mimics living organisms and can be used by the drug industry to test drugs instead of using animals, such as rats or bunnies.[1] The experimental chip could save millions of euros and months of time in drug research costs, as well as having a positive impact by reducing animal testing. Speed is an important part of assessing hardware. The TOP500 project (www.top500.org) has collected statistics on the world's fastest computers since 1993. Currently the fastest is the Summit computer at the Oak Ridge National Laboratory in Tennessee, USA. Summit is providing

hardware Any machinery (most of which uses digital circuits) that assists in the input, processing, storage and output activities of an information system.