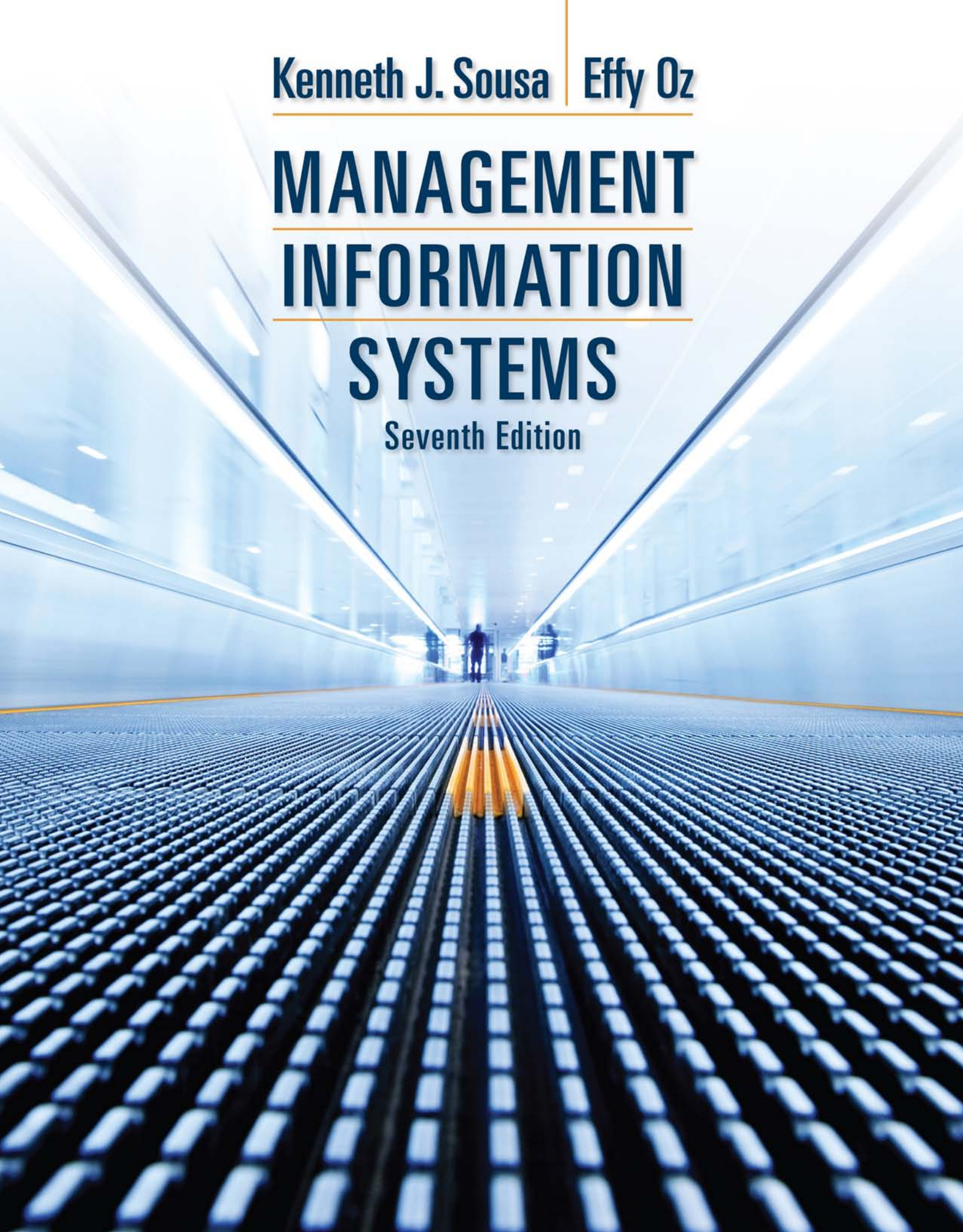
Kenneth J. Sousa | Effy Oz

MANAGEMENT INFORMATION SYSTEMS

Seventh Edition



edition seventh

MANAGEMENT INFORMATION SYSTEMS

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Management Information Systems, Seventh Edition

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To my father, Henry, and in memory of my mother, Virginia, and my sister, Karen.

—Kenneth J. Sousa

In Memoriam: Dr. Effy Oz

Dr. Oz was a passionate and beloved teacher at The Pennsylvania State University, Great Valley. He wrote several books, including six previous editions of this popular textbook on management information systems. He touched the lives of many students at Boston University, Boston College, Wayne State University, and Penn State. With this revision, we honor his legacy and careful thought about MIS education.

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preface

The goal of *Management Information Systems, Seventh Edition* is to provide a real-world understanding of information systems (ISs) for business and computer science students. Like its predecessor, this Seventh Edition provides students with a firm foundation in business-related information technology (IT) on which they can build successful careers regardless of the particular fields they choose. They may find themselves formulating strategic plans in executive suites, optimizing operations in businesses or on factory floors, fine-tuning plans for their own entrepreneurial ventures, designing ISs to optimize their organization's operations, working as consultants, augmenting business activities on the web, or creating valuable new information products in any number of industries. Ultimately, the integration of technology into the strategy and operations of a business is an important factor in its success.

This Seventh Edition is organized in 14 chapters that contain the most important topics for business students. The fundamental principle guiding this book is that ISs are everywhere in business. Information systems are pervasive because information is the single most powerful resource in every business function in every industry. Knowledge of IT is not always explicitly stated as a job requirement. However, a solid understanding has become an essential element of success in virtually any position. Not everyone in business needs to have all the technical skills of an IT professional, but everyone needs a working knowledge and exposure of the subject to know how to use IT in his or her profession. These skills are imperative in the increasingly digital and networked business world.

Management Information Systems provides students with the proper balance of technical information and real-world applications. No matter what field they undertake, students will enter the business world knowing how to get information to work for them. They will know enough about IT to work productively with IT specialists, and they will know enough about business applications to get information systems to support their work in the best way possible.

Approach

Ongoing Business Case Shows IS Principles in Action

In this edition, one business example is used as the foundation to integrate business case material for each Part and each Chapter. Part One introduces the textbook case, Kimball's Restaurant. The restaurant case provides a practical, "real world" example of a business scenario. In the succeeding chapters, material is added to the case to communicate a scenario tailored to each chapter's content. Each chapter case provides a narrative similar to the challenges and opportunities a business professional or entrepreneur would encounter in a company. Ultimately, the case scenario gives students the opportunity to integrate business IT principles, view IS issues in action, and to solve business problems related to IT just as they arise in the real world. The running case approach shows students how the full range of business functions operate while gaining an in-depth knowledge of a specific business. The textbook case is integrated into the text in several ways:

- **The Case:** Each chapter begins with a case based on the textbook running case, Kimball's Restaurant. The case is structured to be sequential in nature, beginning as a small restaurant then expanding to a new location at the Lakeside. In each chapter, a new "episode" of the restaurant's expansion is framed with new strategic and operational issues. Students are

encouraged to "embed" themselves as a consultant to the business by (1) identifying the problems and opportunities, (2) applying general business and information technology concepts, (3) analyzing the alternatives to resolve the issues, and (4) recommending a suitable solution to focus on the success of the business.

- **The Business Challenge:** At the beginning of each Part in the textbook, a series of statements introduces the restaurant's challenges, which are outlined in more detail in each chapter case.
- **Kimball's Revisited:** At the end of each chapter, the textbook revisits issues framed in the chapter opening case and sets the environment for students to analyze the specific challenges facing Kimball's in two sections. Students can assume the role of consultants, providing advice to the restaurant's owners.
- **What Is Your Advice?:** This section communicates the various strategic and operational problems and issues confronting the restaurant. Students should carefully read the discussion points, analyze the issues, and integrate the technology concepts to provide specific advice.
- **New Perspectives:** In this section, students have an opportunity to answer questions that introduce a wide variety of "what ifs," reaching beyond the original scope of the case and asking students to think creatively and assume various different roles to meet business challenges.

Emphasis on the Real World

Management Information Systems is not afraid to warn about the limitations and challenges of ISs. The text also explains the great potential of many information technologies, which many organizations have not yet unleashed. Of course, this book includes chapters and features that provide a thorough, concise—and refreshingly clear—focusing on the technology of information systems, because all professionals in successful organizations are actively involved in making decisions about hardware, software, and telecommunications. But, through current, detail-rich, real-world case studies throughout the book, and a dedication to qualifying each presentation with the real-world factors that may affect business, this book provides issues and topics that are directly related to the business workplace in its presentation. It is important to understand the basic issues and concepts associated with information systems. However, business organizations continue to require its professionals to reinvent, integrate, and create a competitive advantage using information systems.

Attention to New Business Practices and Trends

Large parts of the text are devoted to discussing innovative uses of information technology and its benefits and risks. Contemporary concepts such as supply chain management systems, Big Data and data warehousing, business intelligence systems, knowledge management, social media, web-based electronic data interchange, and software as a service are explained in plain, easy-to-understand language.

Illustration of the Importance of Each Subject to One's Career

Business students often do not understand why they have to learn about information technology. The reason many students are frustrated with introductory MIS courses is that they do not fully understand how information technology works or why it is important for them to understand it. One of the primary goals of this book is for its entire presentation to make the answers to these questions apparent. First, all subjects are explained clearly that even the least technically oriented student can understand them. Technology is never explained for technology's sake, but to immediately demonstrate how it supports successful business strategies and operations. For instance, networking, database management, and web technologies (Chapters 6 through 8), which are often confusing topics, are presented with clear, concise, and vivid descriptions to paint a picture of technology at work. In addition, each chapter includes a feature titled **Why You Should**, which explains to students how being well-versed in that chapter's aspect of IT is important to their careers.

Emphasis on Ethical Thinking

The book puts a great emphasis on some of the questionable and controversial uses of information technology, with special treatment provided in the **Ethical & Societal Issues** boxes. The students are required to weigh the positive and negative impacts of technology and to convincingly argue their own positions on important issues such as privacy, free speech, and professional conduct. Successful businesses focus not only on profit and revenue, but also on ethical and transparent interaction with their stakeholders.

Emphasis on Critical Thinking

Critical thinking is used throughout the text as well as in the book's many features. For instance, the students are put in the midst of a business dilemma relating to the running case of each chapter and required to answer **What Is Your Advice?** questions. The questions motivate students to evaluate many aspects of each situation and to repeatedly consider how quickly IT evolves. Similarly, many of the **Discussion Questions** at the end of chapters call for their evaluation and judgment.

Additional Emphases in the Seventh Edition

Building on the success of the Sixth Edition, *Management Information Systems, Seventh Edition* includes a uniquely effective combination of features.

Updated Textbook Running Case Study

This Seventh Edition introduces a modified and dynamic pedagogical tool: one running case focusing on a business entity that incorporates a wide array of real-world events and challenges that dramatize how information technology is integrated into everyday business. The integration of one business example, rather than several different cases across chapters, focuses the attention of students on gaining an intimate and up-close perspective on one business. As students progress through the textbook, their analysis and insights will expand as they leverage the previous knowledge and information on Kimball's Restaurant. Additionally, the one case example helps students develop a distinct perspective on the maturation and development of one business as it wades through a variety of obstacles and challenges.

Strong Foundation in Strategic ISs in Business Functions

In addition to a complete chapter on strategic uses of ISs (Chapter 2), strategic thinking is an underlying theme throughout the book. Current examples are used to illustrate how information systems can help give businesses build and sustain a strategic competitive advantage.

Up-to-date Coverage of Web-Enabled and Mobile Commerce

Reflecting the use of web technologies in so many business activities, the book integrates the topic seamlessly throughout the text, just as it has become integrated into business in general. But the text goes beyond the well-worn discussions of the topic (and the handful of sites everyone knows about) to tell the students what works about e-commerce and what doesn't work. In addition, the rapid adoption of mobile technology through the use of tablets and smartphone technology is integrated throughout the textbook.

Current Real-world Examples Reflect a Wide Variety of Businesses

The textbook incorporates more applications, cases, and projects in the full range of business functions and industries throughout the book. The cases at the end of the chapter, in the **From Ideas to Application: Real Cases** sections, have been carefully selected to include critical thinking questions to guide students to apply what they have learned. Most of these cases are new to this edition and others have been updated and reflect current technology and trends. In addition, for strong pedagogical reinforcement, examples are embedded throughout the book.

Coverage of Global Issues

Globalization has become an important issue both economically and technologically. An entire chapter, Chapter 9, is devoted to discussing challenges to global information systems, from legal discrepancies through cultural issues to time zone issues. The chapter also discusses how the challenges can be met successfully. This topic receives little coverage in similar textbooks. The breadth and depth of coverage of challenges to global uses of IT in this book has been enthusiastically received by adopters.

New Aspects of Ethical and Societal Issues

The coverage of **Ethical & Societal Issues** in *Management Information Systems* builds on the strong foundation started in the first six editions. However, new issues have emerged, such as data security, Big Data and privacy, and offshoring, which are discussed in this edition.

New Student Assignments for Reinforcement of Material

This Seventh Edition continues to provide an updated selection of assignments at the ends of chapters, mainly assignments that require the use of relevant software and the web. Many of these assignments, including **Applying Concepts**, **Hands-On Activities**, and **Team Activities**, have been updated for this Edition. Responding to instructors' recommendations, more assignments require research involving the web. In addition to the hands-on exercises in each chapter, students and instructors will find a host of additional new hands-on work available at the student companion website, which is discussed later in this Preface.

More Points of Interest

Responding to instructors' enthusiastic reception of **Points of Interest**, a wealth of updated sidebar statistics, anecdotes, and short stories were added to this edition which add an interesting and entertaining aspect to the main chapter text. Except for a few entries believed to have remained accurate, all points of interest are updated in this edition.

Instructor's Package

Management Information Systems, Seventh Edition, includes teaching tools to support instructors in the classroom. The ancillaries that accompany the textbook include an Instructor's Manual, Solutions, Test Banks and Test Engine, PowerPoint presentations, and Figure Files. This textbook is one of the few accompanied by an Instructor's Manual written by the text author, ensuring compatibility with the textbook in content, pedagogy, and philosophy. All teaching tools available with this book are available on Cengage.com.

The Instructor's Manual

The text author has created this manual to provide materials to help instructors make their classes informative and interesting. The manual offers several approaches to teaching the material, with sample syllabi and comments on different components. It also suggests alternative course outlines and ideas for term projects. For each chapter, the manual includes teaching tips, useful websites, and answers to the Review Questions, Discussion Questions, and Thinking about the Case questions. Having an Instructor's Manual created by the text author is particularly valuable, as the author is most familiar with the topical and pedagogical approach of the text.

Solutions

We provide instructors with solutions to Review Questions and Discussion Questions as well as for quantitative hands-on work in each chapter. If appropriate, we will also provide solution files for various activities.

Cengage Learning Testing Powered by Cognero

A flexible, online system that allows you to:

- author, edit, and manage test bank content from multiple Cengage Learning solutions
- create multiple test versions in an instant
- deliver tests from your LMS, your classroom, or wherever you want

PowerPoint Presentations

Microsoft PowerPoint slides are included for each chapter. Instructors might use the slides in a variety of ways, including as teaching aids during classroom presentations or as printed handouts for classroom distribution. Instructors can add their own slides for additional topics introduced to the class.

Figure Files

Figure files allow instructors to create their own presentations using figures taken directly from the text.

Organization

Management Information Systems, Seventh Edition is organized into five parts, followed by a glossary and an index. It includes the following major elements.

Part One: The Information Age

Part One of the book includes three chapters. Chapter 1, "Business Information Systems: An Overview," provides an overview of information technology (IT) and information systems (ISs) and a framework for discussions in subsequent chapters. Chapter 2, "Strategic Uses of Information Systems," discusses organizational strategy and ways in which ISs can be used to meet strategic goals. Chapter 3, "Business Functions and Supply Chains," provides a detailed discussion of business functions, supply chains, and the systems that support management of supply chains in various industries. Together, these three chapters address the essence of all overarching ideas that are discussed at greater depth in subsequent chapters.

Part Two: Information Technology

To understand how ISs enhance managerial practices, one must be well versed in the technical principles of information technology, which are covered in Part Two. Chapters 4, "Business Hardware," 5, "Business Software," and 6, "Business Networks and Telecommunications," provide a concise treatment of state-of-the-art hardware, software, and networking technologies in business. Chapter 7, "Databases and Data Warehouses," covers database management systems and data warehousing, which provide the technical foundation leading to an expanded discussion of business intelligence and knowledge management in Chapter 11.

Part Three: Web-Enabled Commerce

Part Three is devoted to networked businesses and their use of the Internet. Chapter 8, "The Web-enabled Enterprise," is fully devoted to a thorough discussion of relevant web technologies for business operations. All chapters were updated to include mobile computing, tablets, and social media. Chapter 9, "Challenges of Global Information Systems," highlights cultural and other challenges organizations face in planning and using the web and international information systems.

Part Four: Decision Support and Business Intelligence

Part Four provides a view of state-of-the-art decision support and expert systems in Chapter 10 and business intelligence in Chapter 11. Electronic decision aids have been integrated into other systems in recent years, but understanding of their fundamentals is important. Business intelligence applications, such as data mining, Big Data, and online analytical processing, are essential tools in a growing number of businesses. Ample examples have been provided to demonstrate their power and benefits for businesses.

Part Five: Planning, Acquisition, and Controls

Part Five is devoted to planning, acquisition, and controls of information systems to ensure their successful and timely development and implementation, as well as their security. Chapter 12, "Systems Planning and Development," discusses how professionals plan information systems. It details traditional and agile methods of software development. Chapter 13, "Choices in Systems Acquisition," presents alternative acquisition methods to in-house development: outsourcing, purchased applications, end-user systems development, and software as a service. Additional material and recent trends in outsourcing and offshoring have been integrated as alternatives in systems acquisition. Chapter 14, "Risks, Security, and Disaster Recovery," discusses the risks that information systems face and ways to minimize them, as well as approaches to recovering from disasters.

New Features of this Edition

We listened carefully to our adopters, potential adopters, and reviewers in planning and writing this Seventh Edition of *Management Information Systems*. We kept the number and organization of chapters the same as in the previous edition to suit optimal coverage, pedagogy, and allow for flexibile term management. The major changes and improvements in this edition are:

- Complete update to integrate a running case into all 14 chapters
- Updated and extended coverage of the latest technologies and trends in MIS, including information security, mobile computing, social media, cloud computing, and Software as a Service
- New Point of Interest boxes throughout each chapter
- All end-of-chapter case studies were updated with recent examples
- New or revised end-of-chapter exercises

Some instructors would like students to consider careers in IT. Therefore, the discussion of IT careers was moved to Chapter 1, "Business Information Systems: An Overview." This allows the students to learn what IT professionals do early on.

Supply chain management (SCM) systems and customer relationship management (CRM) systems have become important staples in businesses. Therefore, they are now introduced early in Chapter 1, thoroughly explained in Chapter 3, "Business Functions and Supply Chains," and discussed widely throughout the text in various contexts. While we still discuss information systems by business function in Chapter 3, a large part of the chapter is devoted to enterprise applications such as SCM, CRM, and ERP systems.

Chapter 4, "Business Hardware," now includes shorter discussions of the innards of computers and extensive discussions on external memory devices and networked storage technologies such as SAN, NAS, and cloud storage.

In Chapter 5, "Business Software," the discussion of programming language generations was significantly cut to make room for more important discussions of software that all students will encounter in most organizations. The growing trend of using open source software is extensively discussed and students are exposed to a plethora of open source applications.

Chapter 6, "Business Networks and Telecommunications," focuses on the use of various networking technologies in business. A new section covers the latest wireless technologies, as this is the future of networking in communities, businesses, and homes. A detailed discussion of RFID technologies is included to provide the technical foundation for further discussion of current and future application of this technology in business.

The major web technologies are discussed and demonstrated in Chapter 8, "The Web-Enabled Enterprise." The chapter reflects the latest technologies. The section on alternatives in establishing commercial websites reflects the latest array of hosting options. Chapter 9, "Challenges of Global Information Systems," is devoted to illuminating the challenges and efficiencies of managing business information systems on a global scale.

Many current examples of decision support systems and artificial intelligence are provided in Chapter 10, "Decision Support and Expert Systems." Chapter 11, "Business Intelligence and Knowledge Management," combines discussions that were included in different chapters in earlier editions. The concept of employee knowledge networks is explained and demonstrated in examples.

Chapter 12, "Systems Planning and Development," discusses the traditional "waterfall" approaches such as the systems development life cycle, but also devotes a thorough discussion to agile methods, which have become so popular among software developers.

Chapter 13, "Choices in Systems Acquisition," discusses alternatives to in-house software development, such as Software as a Service.

Security and disaster recovery are discussed in Chapter 14, "Risks, Security, and Disaster Recovery," with more attention to increasingly severe risks, such as phishing. The discussion of threats to privacy were updated to address new technologies such as RFID tags and location-based services.

Except for very few entries, all the *Point of Interest* box features are new. All *Ethical & Societal Issues* discussions have been updated.

Nearly all of the end-of-chapter Real Cases are new. As in previous editions, all are real-world examples reported in a wide range of major business and technology journals.

Acknowledgments

I am honored to have been selected to revise the successful textbook that Effy Oz created. Dr. Oz was an exceptional educator and author, and my first and primary acknowledgment is to him. It is my hope that my efforts will continue his legacy and his great work.

Revising a textbook is a challenging process that requires commitment and unwavering discipline. However, as in any long, challenging initiative, a project such as this could not be successful without the contribution of many people. I would first like to thank my colleagues in the business, consulting, IT, and academic organizations whose ideas, efforts, and opinions over all these years have helped me understand the educational needs of our students and the marketplace. Without them, it would be impossible to have attained the experience and knowledge required to compile this textbook. I also must recognize the indirect but important contribution of the many students I have taught. Their comments (and criticism) helped me refine and sharpen my teaching. Over 20 years of teaching, they have helped me to comprehend the points that needed extra emphasis, a different presentation, or an experiential assignment to make topics that may be overwhelming clearer and more interesting. I have learned that teaching only prepares students for today, but educating builds skilled and mature professionals for life.

Many thanks go to Kate Mason for being so enthusiastic about this project. She was always there for me with advice, encouragement, and patience as a new author. Kate demonstrated and exerted unbounded energy while leading this project. Her active guidance and constant involvement made an immense contribution to this edition. Kate also handled the smooth coordination of the instructor's package, web materials, and more. Arul Joseph Raj, the Content Product Manager, guided the textbook through its production while managing the process in a very orderly and timely manner. The design and art managers at PreMediaGlobal ensured the textbook and photos were visually appealing, and the team of artists skillfully rendered our ideas. I extend both my personal and professional gratitude to these talented professionals.

Deb Kaufmann, the developmental editor, has demonstrated again her excellent skills and high integrity. I was very fortunate to have Deb on the team because of her involvement with Dr. Oz for the sixth edition. It was wonderful to work with an editor who excels not only in improving style and organization but who is also so knowledgeable in the subject matter. She is a consummate professional who helped me tremendously through her broad perspective while always attending to the details that were essential ingredients supporting my work.

Reviewers are the most important aides to any writer, especially when preparing a college textbook. I would like to thank the reviewers who carefully reviewed each chapter for this edition:

Merlin Amirtharaj, *Stanley Community College*
Don Danner, *San Francisco State University*
John Delalla, *University of Arizona South*
Lewis Todd, *Belhaven University*
Patricia Wallace, *The College of New Jersey*

A special thanks goes to Charles McCormick, who retired from Cengage in 2012, for supporting me to author this textbook.

This textbook would not be possible without the contribution of my research assistant. Jerry Theiler, a senior accounting student, assisted with the research and compilation of updates for this edition. Jerry is a diligent, intelligent, and mature young man who provided me with quality work throughout this revision.

Lastly, I would like to thank my mother Virginia, who recently passed away, and my father Henry. They have provided me with the work ethic, integrity, and loyalty that that has been the bedrock of my achievements. This textbook and other accomplishments in my life could not have been gained without their exceptional influence and support. Additionally, I would like to acknowledge my many friends and former students as well as my colleagues at Bryant University for their constant encouragement and support. As Kingman Brewster said, "*There is no greater challenge than to have someone relying upon you, no greater satisfaction than to vindicate their expectations*." It is my hope that I have fulfilled your expectations.

I welcome suggestions and comments from our adopters and their students to continue developing a quality textbook as well as to continue Dr. Oz's legacy and contributing to the education of students that this textbook will provide.

Kenneth J. Sousa
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PART one

THE INFORMATION AGE

Textbook Case: KIMBALL'S RESTAURANT

Liz and Michael Kimball dreamed about opening their own restaurant. They believed that they could use their talents and experience to operate a successful restaurant. Liz was a great cook and had accumulated many family recipes for appetizers, entrees, and bakery desserts. Michael had a degree in business and several years of experience in business management. They believed that it was the right time to think about new careers and realize their dream.

Michael began his career in the human resources department of a local manufacturing business. Over the course of his 20 years in human resources, he was responsible for recruiting, compensation evaluation, and employee orientation. He also managed employees' performance evaluations for the production departments. While he has some accounting and budgeting experience, it was specific only to human resources, not for an entire business organization.

Liz started work as a customer service rep for a financial services company right after high school. Her 15 years of customer service experience has given her some ability to manage people. She does not have a formal culinary education, but she has an excellent sense of food preparation, ingredient selection, and meal planning. These skills should provide a foundation for the menu development and food preparation that a restaurant will require. However, her lack of a formal culinary education and experience in commercial kitchen operations might require some additional training.

The Kimballs live in Lakeside Heights, a suburb of a metropolitan city. Their community and the adjacent towns consist of primarily middle-income households. Many of the adults in the community are college-educated and have professional jobs in business and manufacturing. The population of the town and surrounding communities is approximately 40,000 people. The city, about 12 miles from Lakeside Heights, has a population of 110,000.

Michael and Liz believe that a restaurant serving Liz's specialties of "home style" American, Italian, and seafood dishes would be a good choice for their location. They are excited about the possibility of providing quality food at a reasonable cost. The same family and friends that enjoy Liz's cooking would match their expected customers. They want to offer a quiet, relaxed dining environment offering mid-priced meals.

Researching the Business

As they talked about the details, their dream gathered momentum. However, they both knew that they couldn't build their business on dreams alone. They would need additional business advice and perspective to ensure that their business concept was realistic. First, they checked out the numbers.

Liz and Michael, along with their advisors and friends, assessed the capital required for starting a restaurant. They agreed that Liz and Michael had sufficient funds to use as start-up capital for the new venture.

Tom, a family friend employed as a marketing consultant, felt that their business model would be well suited for their location. They had their eye on a strip mall location that was vacant and could be suitable for a small family restaurant. They contacted the local real estate agent, Anne Marie Simmons, to ask about its rental cost, availability, and size. Liz and Michael visited the location with Anne Marie. The agent said that the store housed a diner for three years before it closed. She speculated that the diner might not have been able to compete against the fast-food franchises in the area. The agent also believed that the owners did not have the proper financial and marketing plan to be successful.

Liz studied the store's floor plan and dimensions. The store had floor space to accommodate about 50 diners as well as a full kitchen operation and storage areas. The strip mall location had plenty of parking as well as access on a major road. The gas, plumbing, and electrical infrastructure were in good working order. The décor and kitchen appliances need to be purchased as well as all restaurant fixtures (pans, dishes, flatware, etc.) if they signed a lease to occupy the restaurant.

In order to be efficient and leverage their individual skills, Liz and Michael segregated the various research tasks necessary to compile business projections and forecasts. Michael focused his attention on the front-house operations, sales, and marketing plan while Liz analyzed the kitchen operations, inventory, and menu planning. Each of them compiled forecasts for the startup and operational costs in their areas of specialty. These costs included the labor, materials, food, utilities, rent, and other necessary costs. These forecasts would be the foundation of their business, financial, and operations plan.

Creating the Business Plan

Michael continued to work with Tom on the marketing and promotion of the restaurant. Their first thought was to gather sales, customer, and meal data from the previous owner. To protect the anonymity of the new owners, Michael asked Anne Marie to contact the previous owner. She provided three years of weekly data on the number of meals and tables served. Unfortunately, the previous owner could not or did not want to provide any sales data. Michael entered 164 weeks of data into a simple Excel spreadsheet to review. The spreadsheet contained three data points: week ending date (Sunday), total checks, and total meals served. Michael and Tom reviewed the spreadsheet to attempt to find some relevant information for their marketing and forecasting projections.

The diner had been open seven days a week. However, the data Michael received was not broken down by the day of the week. Therefore, the data could not be used to analyze daily traffic and sales, but only to analyze weekly trends without information on daily traffic and sales.

Tom coached Michael on how to analyze the data through a "rough" first glance. He separated the data into three spreadsheet tabs by year, where the first row of weekly data was the first week in the calendar year. He added a column that calculated the average meals per check. Then, to gain an understanding of the restaurant's customer load, he ranked both the number of meals and checks within the year. These values provided a basic sense of the high and low weeks for the previous restaurant. He then sorted each of the three calendar years by the meal count (descending with the highest ranking first).

The lack of daily data limited the depth of analysis that could be completed. Tom looked at the hard-copy of three years of data side by side. After reviewing the three years of data, Tom pointed out that their weekly data showed only one clear trend: Some weeks showed lower sales than the other periods. Upon further analysis, it appeared that they were holiday periods (Thanksgiving and Christmas weeks) as well as some summer weeks. Without the daily data, it was impossible to determine the distribution or trending of customer sales.

Liz completed another tour of the restaurant location. The kitchen was equipped with an operational walk-in refrigerator, exhaust fan, several tables, and shelving units. She assembled a tentative new floor plan for the kitchen and food preparation area. From the floor plan, she compiled a cost estimate listing the appliances and fixtures still needed for the kitchen.

In addition to seating about 50 people comfortably with 15 tables, Michael believes that a bar can be built to seat an additional 10 patrons. He created estimates for dining room and bar equipment, furniture and fixtures, including all labor installation costs.

Tom helped them create a spreadsheet using various factors to estimate the weekly sales. They used some of the previous owner's data to calculate the seasonal and weekly trends. With the menu that

Liz compiled, they estimated the weekly sales for the restaurant for the first year. The entire spreadsheet calculated the variable costs (labor, food) based on the number of meals served. The list of fixed overhead costs (like utilities, taxes, and rent) then helped to generate the monthly cash flow and profit estimates. The spreadsheet calculated three scenarios: aggressive, reasonable, and conservative. The most conservative estimate resulted in a small loss for most months. They felt comfortable with the range of projections they had compiled. Tom believed that Liz and Michael could present these forecasts and a business plan to a bank for a loan for the startup costs.

Launching the Dream

Kimball's Restaurant opened in the strip mall location. As with any new business, the restaurant started out slowly with sales closer to the conservative estimates. However, as their reputation for quality, reasonably priced meals developed, Liz and Michael knew their dream had become a reality.

Three years later, Kimball's was operating successfully and profitably. Their dining room was often at capacity with both new and returning customers. They often had a small waiting line on weekend nights. Liz and Michael were very satisfied with their dream. What would be next?

BUSINESS CHALLENGES

In the next three chapters, you will learn what Michael and Liz need to get started in harnessing the power of information systems to help build and grow their restaurant. They will need to understand how information systems can help with a restaurant's short-term (operational) needs as well as plan for long-term initiatives (strategic) to expand the business.

- In Chapter 1, "Business Information Systems: An Overview," you learn the various types of information systems businesses use and why familiarity with information technology is important for your career. You also are introduced to some of the major ethical and societal concerns about acquiring, storing, and reporting potentially sensitive information.
- In Chapter 2, "Strategic Uses of Information Systems," you learn how to use information strategically, and how to harness information technology for competitive advantage.
- In Chapter 3, "Business Functions and Supply Chains," you learn how you might best use information technology to help manage a business, whether you need to order inventory and track sales, generate financial statements, or automate payroll systems. You also learn how supply chain management systems serve whole enterprises.

CHAPTER one

BUSINESS INFORMATION SYSTEMS
An Overview

Learning Objectives

It is likely that you are carrying or using an information system. This is so if you have a smartphone, a tablet, or a laptop computer. Information systems pervade almost every aspect of our lives. Whether you are withdrawing money from a bank's automatic teller machine, surfing the web, or making a hotel reservation on your cell phone, hardly a day goes by without our feeding data into, or using information generated by, an information system. In business especially, digital information systems generate most of the information we use. Information systems receive and process data from various sources. These systems have become essential to successful business operations.

When you finish this chapter, you will be able to:

- Explain why information technology matters.
- Define digital information and explain why digital systems are so powerful and useful.
- Explain why information systems are essential to business.
- Describe how computers process data into useful information for problem solving and decision making.
- Identify the functions of different types of information systems in business.
- Describe careers in information technology.
- Identify major ethical and societal concerns created by widespread use of information technology.

KIMBALL'S RESTAURANT: Business Systems and Information

The restaurant has been operating successfully for three years. Although they experienced challenges, Liz and Michael believe that they developed a great dining establishment. Sales forecasts have steadily increased over the last three years. Thankfully, the growth was not so fast as to cause any "growing pains" or problems with their business. Michael found that during most weeks, they had reservations for 50 to 100 percent of their dining capacity.

Processing Orders and Payments

Michael believed his analysis was fairly accurate, but it took a lot of effort to compile his information. The servers wrote the customer orders on multipart paper checks. One copy of these checks went to the kitchen for preparation. The server tabulated totals on the original copy and gave it to the customer when the meal was complete. At that point, the customer paid the cashier directly with cash or a credit card and the hardcopy of the check was saved. Several times a week, Michael used the paper checks to enter the sales and table information in an Excel spreadsheet for analysis. Because he was so busy with other operational priorities, the spreadsheet data entry and subsequent analysis was often delayed.

The restaurant processed its payroll through a local service. Employees maintained their timecards manually. Each week, the timecard data was validated by Michael and sent to the payroll service for processing and check printing. Michael was not comfortable with the manual entry of employee time punches, but he did not have a simple, cost effective alternative.

Michael used a small business accounting package to track the restaurant's expenses, process payable checks to suppliers, and record deposits. The software was easy to use and provided the balance sheet and income statement needed for the business. It also generated the required tax information for his accountant to file the appropriate tax forms. However, it did not track a level of information needed for analyzing the business operations and forecasting sales. From his experience in human resources, Michael understood the need for quality data and business information. At his former employer, the information technology department provided that expertise and assistance. Unfortunately, those skills were not available at the restaurant.

Michael knew that his time was limited and that he needed to focus more on the operations rather than data entry, but he also wanted to collect and analyze data about his business to manage it and plan effectively.

Their son, Tyler, finished his education to complete a business degree, specializing in marketing and management. He had worked in the restaurant during the summers and semester breaks as a busboy and server so he had some familiarity with the business. He was also anxious to gain more experience to try out some of the skills he had learned in business school. Liz and Michael decided it was a good time for Tyler to join the business.

Defining the Problems

Michael told Tyler that he would like to streamline the front- and back-house operations and gather more information for analysis without relying on manual data entry. Tyler understood the challenges because some of the problems in these areas were directly related to issues that Tyler encountered while he was a server at the restaurant. The issues could be categorized into two areas: completeness and accuracy of guest check information, and check payment.

Because the guests' orders were handwritten, sometimes parts of the orders were not legible. In addition, especially with new servers, some of the information needed to complete a meal was either inaccurate or incomplete for that meal choice (cooking preferences, toppings, special preparation). This issue added time for the server and cooking staff as well as reduced customer satisfaction. Check payment was another problem. Often, it was not clear to the customers whether they should pay the server or the cashier. Michael wanted to control the cash and credit-card processing at a central location, but was willing to review this policy.

Tyler talked to the servers and kitchen personnel to gain perspective on the guest check and payment problems. The staff was pleased to be asked for input. They confirmed that guest check accuracy and payment were issues, but additional issues were uncovered. As in many restaurants, at Kimball's the servers were responsible for any checks not paid by the customer. However, it was impossible for the server to know if the customer paid the cashier or left without paying. The servers would prefer that customers settle their payment directly with the server so that they could know if a customer has paid. Servers also conveyed that even when they wrote out the order legibly and completely, meals sometimes were not prepared properly. The kitchen staff said that changes to guest orders are often "rushed" and disrupted the completion of other meals in progress. On many occasions, servers submitted changes after the order was ready to deliver to the table. Kitchen staff said a new process was needed to communicate order changes before the table's meals were cooked. Unfortunately, it was impossible to tell

from the current checks which orders required changes. Therefore, no data was available to objectively assess the magnitude of the problem.

Collecting Data to Address Problems and Make Decisions

Tyler then focused his attention on the data analysis. He asked his parents to define two lists of questions: (1) What do you know from the information you currently maintain? and (2) What answers would you like to know that would help you operate the business more efficiently and profitably? They responded that they knew how many tables were seated by day as well as the total check amounts. The checks separated the liquor and food totals for tax purposes, but the daily totals for these categories did not provide any details about the individual customers' orders. Michael would also like to know more details, such as ... What meals did they order? Did they order appetizers? How many patrons were at the table (adults and children)? Did the customer take advantage of any of the specials? Liz wanted to know, how much food do I need to order based on past sales?

Tyler said that these questions were a great start. He categorized their questions into two areas: marketing/promotion and operational. He knew that additional marketing information was needed to determine menu planning, promotions, and customer satisfaction. He wondered how many people were returning or new customers. How did they learn about the restaurant? For operational issues, was there any monitoring of the operations as issues occurred?

Does Information Technology Matter?

The Denver-based hamburger chain Smashburger developed more than a secret recipe for its hamburgers. It used social media giants, Facebook and Twitter, by inviting bloggers to promote the opening of new locations in their area. Instead of relying solely on paid media promotion, Smashburger engaged their consumers directly through the use of social media.

A survey compiled by Boston-based Aite Group of 1,000 consumers demonstrated their adoption of mobile devices to complete banking transactions. Approximately one-third of the consumers conveyed that they have increased their use of mobile banking applications to check their account balances; an increase of 10 times within one year (Cerny, 2011).

These examples, as well as many other observations, show that IT can no longer be the sole domain of IT professionals. Business professionals can no longer count solely on IT specialists to make decisions on development, purchasing, and deployment of information systems. Social media and mobile computing clearly rely on a well-developed strategy across all functions of business organizations. Today's business professionals are expected to know how to develop and use IT significantly more than just a few years ago. Regardless of their major field of expertise, those who have the proper IT knowledge and skills stand a better chance of receiving more lucrative job offers and faster promotions.

The Power of Digital Systems

We are accustomed to using 10 digits to represent quantities. We call it the decimal counting system. However, we could also use a system consisting of only two digits, zero and one, to represent quantities. This is the binary counting system. Because computers and related devices use the binary system—a system that uses two *digits*—they are referred to as **digital systems**. However, digital systems are not used only to represent information that contains numbers, or quantities. They can also represent any information as combinations of zeroes and ones, or, more accurately, the two states that represent zeroes and ones.

Digital information consists of zeroes and ones representing two states. When you have a mechanism that can represent two states, such as electrically charged and uncharged elements, magnetized and non-magnetized areas, light and no light, you have a way to represent the zeroes and ones. Based on such signals, information can be represented, stored, communicated, and processed *digitally*.

Unlike analog systems (systems based on a continuous signal that varies in strength or quantity), digital systems are capable of delivering data and information—quantities, text, sound, pictures, video, and any other type of information—so that the original information can be re-created with complete accuracy. That is, a digital copy is an exact copy of the original. For example, an analog copy machine reproduces images by reflection or a similar technique. The copy may be good, but it is never as good as the original. And as you make a copy from the copy, the quality deteriorates. When you make a copy of a digital file, such as an image file or a musical file, the system you use first captures the combinations of signals (the digits, zeroes and ones) that make up the file. When processed by the proper hardware and software, the digits are transformed back into the image, or music, or whatever other information you copied. As long as your computer or other digital device can capture all the digits that make up the information, the original information can be re-created fully.

Digital information is stored and communicated by way of electromagnetic signals—electricity, magnetism, and light. These processes involve few or no moving parts. Therefore, storage, retrieval, processing, and communication of digital information are extremely fast. These capabilities—accuracy and speed—make digital systems powerful and therefore useful and important in so many fields: business, education, entertainment, and many others.

POINT OF INTEREST

Tornadoes in Oklahoma City, Is Mom OK?

Social media technology can provide genuine benefits to its users. In 2012, The Weather Channel developed a Facebook app that alerts users when severe weather is approaching their friends. Users can track severe weather in relation to their friends' locations and post an alert on their friend's Facebook timeline. The idea is that people may pay more attention to a personalized alert from a friend or family member than a generalized, local weather warning.

Source: Honker, D. (2012). "Weather Channel Launches 'My Friends' Weather' to Integrate Alerts with Social Media." www.awareforum.org/2012/07/weather-channel-launches-my-friends-weather-to-integrate-alerts-with-social-media/

The Purpose of Information Systems

People require information for many reasons and in varied ways. For instance, you probably seek information for entertainment and enlightenment by viewing television, watching movies, browsing the Internet, listening to the radio, and reading newspapers, magazines, and books. In business, however, people and organizations seek and use information mainly to make sound decisions and to solve problems—two closely related practices that form the foundation of every successful company.

What is a problem? A *problem* is the root cause of an undesirable situation. When you are stuck in the middle of nowhere with a flat tire, you have a problem. If you know that some customers do not pay their debts on time, but you don't know who or how much they owe, you have a problem. You can solve both problems with the aid of information. In the first case, you can call a towing company, which might use a computerized tracking system to send the tow truck closest to your location; in the second case, simple accounting software can help.

An organization or individual that identifies more than one way to solve a problem or a dilemma must make a *decision*. The problem "2+2=?" does not require decision making because it has only one solution. However, as a manager, you might face a dilemma such as "Which is the best way to promote the company's new car?" There are many potential ways to promote the new car—television advertising, radio advertising, newspaper advertising, web advertising, auto shows, direct mail, social media, or any combination of these methods. This dilemma calls for decision making.

Both problem solving and decision making require information. Gathering the right information efficiently, storing it so that it can be used and manipulated as necessary, and using it to help an

organization achieve its business goals—all topics covered in this book—are the keys to success in business today. The purpose of information systems is to support these activities. In addition to solving problems and making decisions, businesses use information systems to support daily operations, such as electronic commerce, making airline reservations, and many other activities. As a professional, you need to understand and apply information fundamentals to succeed.

WHY YOU SHOULD Be Well-Versed in Information Systems

You might be surprised at how much information technology (IT) knowledge your prospective employer will expect of you when you interview for your next job, even if the position you seek is not in the IT area. Today's corporations look for IT-savvy professionals, and with good reason. Information is the lifeblood of any organization, commercial or nonprofit; it is essential to sound problem solving and decision making, upon which business success is built. In fact, the main factor limiting the services and information that computers can provide within an organization is the budget.

Because of rapid changes in technology, information systems, unlike many other business components, are quickly changing in form and content. A computer considered fast and powerful today will be an outdated machine in 18–24 months. In 12–24 months, a better application or technology model will surpass one that is considered innovative right now. The dynamic nature of information technology is like a moving target. Your new idea or product concept using information technology will be replaced by someone else's new idea or product concept.

A professional who does not stay informed is of diminishing value to an organization. All knowledge workers—professionals, scientists, managers, and others who create new information and knowledge in their work—must be familiar with IT. Moreover, they must know which IT is relevant for their work and what information they can obtain with a certain technology or networked resource.

Professionals must at all times maintain a clear picture of their organizations and the outside business environment. They must know what resources are available to them and to their competitors. Information technology provides excellent tools for collecting, storing, and presenting facts. But to be truly effective, those facts must be manipulated into useful information that indicates the best allocation of various resources, including personnel, time, money, equipment, and other assets. Regardless of the operations being managed, information systems (ISs) are important tools. Successful professionals must know which ISs are available to their organizations and what systems might be developed in the future.

Data, Information, and Information Systems

We use the words "data," "information," and "system" almost daily. Understanding what these terms mean, both generally and in the business context, is necessary if you are to use information effectively in your career.

Data vs. Information

The terms "data" and "information" do not mean the same thing. The word **data** is derived from the Latin *datum*, literally a given or fact, which might take the form of a number, a statement, or a picture. Data is the raw material in the production of information. **Information**, on the other hand, is facts or conclusions that have meaning within a context. Raw data is rarely meaningful or useful as information. To become information, data is manipulated through tabulation, statistical analysis, or any other operation that leads to greater understanding of a situation.

Data Manipulation

Here's a simple example that demonstrates the difference between data and information. Assume that you work for a car manufacturer. Last year, the company introduced a new vehicle to the market. Because management realizes that keeping a loyal customer base requires continuously improving products and services, it periodically surveys large samples of buyers. It sends out questionnaires that include 30 questions in several categories, including demographic data (such

as gender, age, and annual income); complaints about different performance areas (such as ease of handling, braking, and the quality of the sound system); features that satisfy buyers most; and courtesy of the dealer's personnel.

Reading through all this data would be extremely time consuming and not very helpful. However, if the data is manipulated, it might provide highly useful information. For example, by categorizing complaints by topic and totaling the number of complaints for each type of dissatisfaction and each car model, the company might be able to pinpoint a car's weaknesses. The marketing analysts then can pass the resulting information along to the appropriate engineering or manufacturing unit.

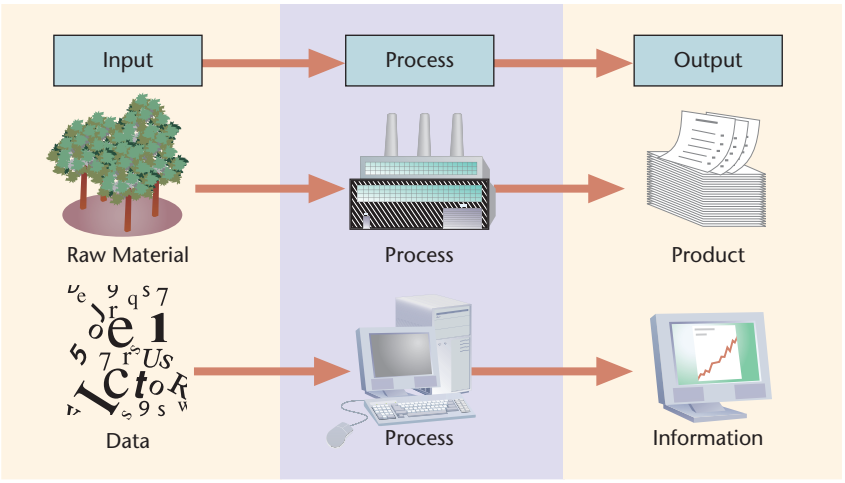
Also, the company might already have sufficient data on dealers who sold cars to the customers surveyed, the car models they sold, and the financing method for each purchase. But with the survey results, the company can generate new information to improve its marketing. For instance, by calculating the average age and income of current buyers and categorizing them by the car they purchased, marketing executives can better target advertising to groups most likely to purchase each car. If the majority of buyers of a particular type of car do not ask for financing, the company might wish to drop this service option for that car and divert more loan money to finance purchases of other cars. In this way, the company generates useful information from data.

Generating Information

In the examples just cited, calculating totals and averages of different complaints or purchasers' ages may reveal trends in buying habits. These calculations are processes. A **process** is any manipulation of data, usually with the goal of producing information. Hence, while data is essentially raw materials, information is output. Just as raw materials are processed in manufacturing to create useful end products, so raw data is processed in information systems to create useful information (see Figure 1.1). Some processes, however, produce yet another set of data.

FIGURE 1.1

Input-process-output



Sometimes, data in one context is considered information in another context. For example, if an organization needs to know the age of every person attending a basketball game, then a list of that data is actually information. But if that same organization wants to know the average price of tickets each age group purchases, the list of ages is only data, which the organization must process to generate information.

Information in Context

Information is an extremely important resource for both individuals and organizations, but not all information is useful. Consider the following story. Two people touring in a hot-air balloon