

THIRD EDITION

# Management Information Systems

Effy Oz



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**Third Edition**

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The Pennsylvania State University, Great Valley

**COURSE  
TECHNOLOGY**  
  
**THOMSON LEARNING**

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*To Narda, my best friend who  
also happens to be my wife,  
and to Sahar, Adi, Noam, and Ron,  
my younger friends and children,  
with endless love.*

# Preface

The goal of *Management Information Systems*, Third Edition, is simple: to provide a real-world understanding of information systems (ISs) for business and computer science students. Like its predecessor, this third edition provides students with a firm foundation in information systems on which they can build successful careers—no matter what type of business they enter. 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.

The fundamental principle guiding this book is that ISs are everywhere in business and that along with the Internet they have changed business forever. Information systems are pervasive because information is the single most powerful resource in every business function in every industry. Knowledge of information technology will not always be explicitly stated as a job requirement, but it is an essential element of success in virtually any position. Not everyone in business needs to be an IS professional with comprehensive and detailed technical know-how, but everyone needs a deep-enough understanding of the subject to know how to use IT in his or her profession.

*Management Information Systems* provides students with just the right 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 information technology (IT) to work productively with IS specialists, and they will know enough about business applications to get information systems to support their work in the best way possible.

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## EMERGING BUSINESS TRENDS

Just as business practices are ever changing, so is the IS discipline itself. To remain current, *Management Information Systems*, Third Edition, is committed to addressing each IS topic with a constant view toward emerging business trends, including:

- ◆ The transformation of business by the combination of online electronic commerce and increasingly powerful database and telecommunications technologies, especially the explosive growth of the Web as a major vehicle in business-to-business, business-to-consumer, and government services and procurement
- ◆ The empowerment of employees, who now have at their disposal many powerful applications



- ◆ The move from disparate systems to enterprise systems such as supply chain management systems
- ◆ The increasing use of ISs to create leading-edge strategic advantages in competitive global markets
- ◆ The increasing use of ISs to support decision making from the operational to the executive levels
- ◆ The growing realization that global business, especially through the Web, requires sensitivity to cultural and legal differences
- ◆ The increasing use of interorganizational and international alliances and the growing role of intranets and extranets in the drive to succeed in a global economy
- ◆ The increasing use of ISs to create new information products that become strong revenue sources in a variety of industries, sometimes forming the foundation of successful new companies
- ◆ The growing trend of acquiring ready-made software and using application service providers
- ◆ The increasing integration of state-of-the-art technologies, such as virtual reality and data mining, into business strategies and operations
- ◆ The increasing use of advanced information technology by industries that have traditionally “lagged behind,” such as manufacturing and health care

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## ORGANIZATION AND APPROACH

*Management Information Systems* is organized into five parts, followed by a reference table of measurement units, a glossary, and an index.

### Part I: The Information Age

Part I 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 ISs can be used to meet strategic goals. Chapter 3, “Information Systems in Business Functions,” provides a detailed discussion of how ISs are used in a variety of business functions and industries. Together, these three chapters address the essence of all overarching ideas that are discussed at greater depth in subsequent chapters.

### Part II: 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 II. Chapters 4, “Information Technology in Business: Hardware,” and 5, “Information Systems in Business: Software,” provide a concise treatment of state-of-the-art hardware and software technology in business. Chapter 6, “Information Technology in Business: Telecommunications and Networks,” discusses the most important infrastructure of modern ISs. It provides the technical foundation for Chapter 7, “E-Commerce: The Internet, Intranets, and

Extranets,” which is fully devoted to a thorough discussion of the Internet and its most popular segment, the World Wide Web, as well as intranets and extranets. Chapter 8, “Data and Knowledge Management,” covers database management systems, data warehousing, and knowledge management.

### **Part III: Information Technology in Management**

Part III is devoted to managerial issues as they relate to information systems. Chapter 9, “Managers and Their Information Needs,” is a review of the managerial pyramid and the information needs of managers at the different levels of responsibility. It covers topics such as online analytical processing and other applications that support daily and strategic managerial work. Chapter 10, “Organizing Information Technology Resources,” describes the organization of the information systems unit in corporations and the responsibilities of information systems professionals in organizations. It also reviews various architectures of information technology in organizations. And Chapter 11, “EDI, Supply Chain Management, and Global Information Systems,” discusses interorganizational and international information systems, which are the foundation of many successful alliances.

### **Part IV: Information Systems in Decision Making**

Part IV provides a view of state-of-the-art decision support and expert systems, including the use of artificial intelligence in business. Chapter 12, “Decision Support and Geographic Information Systems,” opens with a general discussion of decision making and moves on to discuss types of decision-support systems and the way they have blended over the years. Taking the approach that expert systems are an advanced version of decision aids, Chapter 13, “Artificial Intelligence and Expert Systems,” provides an extensive discussion of artificial intelligence in the context of decision making and expert systems.

### **Part V: Planning, Acquisition, and Controls**

Without careful planning and development, ISs may fail. Part V 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 14, “Planning Information Systems,” discusses how professionals plan information systems. Chapter 15, “Systems Development,” details the phases of systems analysis, design, and construction as an ideal and as it works in the real world. Chapter 16, “Alternative Avenues for Systems Acquisition,” presents alternative acquisition methods to development: outsourcing, purchased applications, end-user systems development, rented software, and application service providers. Controls and security measures, covered in Chapter 17, “Risks, Controls, and Security Measures,” must be incorporated into systems to ensure the integrity of business operations. In this chapter, we discuss the risks that information systems face and ways to minimize them. We put a special emphasis on risks to public networks and Web sites, such as computer viruses and distributed denial of service.

### **Emphasis on the Real World**

This is the only MIS book committed to portraying the world as it is, not as we wish it to be. *Management Information Systems* is not afraid to address the effect that interoffice politics might have on a particular type of project or to include, in the discussion of the great potential of ISs in business, warnings about their limitations. 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—grounding in the technology of information systems, because all managers in successful organizations are 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 stays close to the workplace in its presentation.

### **Thorough Presentation of Online Business Practices**

Perhaps the most fundamental new development in the way business is conducted today is the increasing use of telecommunications. Many important business phenomena—from electronic commerce to telecommuting to virtual organizations—are products of the enthusiastic adoption of this technology. How online commerce is changing business and how the impact will continue to grow are subjects addressed in the context of virtually every topic in this book. And, of course, *Management Information Systems* presents a sound technological foundation for understanding telecommunications, with separate chapters on both the technology (Chapter 6, “Information Technology in Business: Telecommunications and Networks”) and its business uses on the Internet, intranet, and extranets (Chapter 7, “E-Commerce: The Internet, Intranets, and Extranets”). While both chapters provide clear explanations of the technical infrastructure, the ultimate emphasis is on its contemporary business use, especially the use of the Web in global business and management.

### **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 data warehousing, data mining, online analytical processing, knowledge management, Web-based electronic data interchange, supply chain management systems, and applications software providers are explained in plain, easy-to-understand language. About 80 percent of the examples, case studies, statistics, and anecdotes are from the year 2000 and later.

### **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 so clearly that even the least technically oriented student can understand them. For

instance, databases, telecommunications techniques, and the Internet (Chapters 6 through 8), 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 and 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.

### **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 would you do? questions. The questions motivate students to evaluate many aspects of each situation and to repeatedly consider how quickly IT evolves.

## **ADDITIONAL EMPHASES IN THE THIRD EDITION**

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Building on the success of the second edition, *Management Information Systems*, Third Edition, again includes a uniquely effective combination of features. The cornerstone of the new edition is a series of part cases with accompanying videos that are carefully crafted to integrate all the IS principles that arise in business. These cases—a separate story for each part of the book—give students a rare opportunity to view IS issues in action and to solve business problems related to IT just as they might arise in the real world. Furthermore, *Management Information Systems*, Third Edition, uses a powerful combination of strong pedagogical writing, special focus features, illustrations and photographs for visual reinforcement, and plenty of new real-world cases and anecdotes to cover the full range of essential IS topics. The currency of the new text is reflected throughout the book and highlighted especially in the following ways:

### **Up-to-date Coverage of Electronic Commerce**

*Management Information Systems*, Third Edition, is the only text with the courage to present a realistic discussion of e-commerce (the Internet and the Web) that goes far beyond the hype. Reflecting the pervasiveness of e-commerce as a factor in many business functions and industries, the book integrates the topic seamlessly throughout the text, just as it has become integrated into business in general. But the text is willing to go 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.



The text:

- ◆ includes dozens of concrete e-commerce examples from a full range of business functions, industries, and business strategies.
- ◆ covers a full range of e-commerce business models.
- ◆ includes the most current applications of e-commerce, including the emergence of new businesses “reality check” by including coverage of real-world e-commerce failures as well as its successes.
- ◆ discusses the reasons for the collapse of many e-commerce enterprises and the ingredients for success of those that prosper.
- ◆ covers technical foundations for e-commerce and clear explanations of Web design languages and techniques.

### **Thorough Discussion of Global Information Systems and Challenges**

The Internet, and especially the Web, gave rise to businesses that are practically international as soon as they are online. We discuss the challenges in managing information systems that cross national borders, laws, and cultures. We bring to you the experts’ opinions on how these challenges can be addressed.

### **Underscoring Supply Chain Management Systems**

Supply chain management systems enable organizations to attain great degrees of efficiency by linking systems with suppliers and customers. In text and diagrams, we underscore the importance of these systems. Numerous examples of how these systems have been used successfully are given throughout the book.

### **Current Real-world Cases Reflecting a Wide Variety of Businesses**

The text 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. In addition, for strong pedagogical reinforcement, examples are embedded throughout the book.

### **Strong Foundation in Strategic ISs in Business Functions**

This edition continues to emphasize the harnessing of information technology for strategic business initiatives. We do so fully in Chapter 2, but also throughout the book. With an extensive update of this early chapter, Part I establishes a firm foundation: a general model of the systems approach to solving problems, a review of information systems, the strategic role of ISs, and the basics of business functions (with an operational focus) in a full range of industries.

### **Emphasis on the Increasing Importance of IS Technologies**

Because of their increasing importance in management decision making, **data warehousing, data mining, and supply chain management systems** are integrated into a number of different areas in the book, including concrete

real-world examples. The text also pays close attention to **enterprise software applications**, the most important of which are known as **ERP** (enterprise resource planning) software. These systems help organizations approach the implementation of the **holistic systems** approach to MIS, which is discussed in Chapter 1.

### **Continuing Coverage of Ethical and Societal Issues**

The coverage of ethical and societal concerns in *Management Information Systems* builds on the strong foundation started in the first two editions. Increased attention is paid to the evaluation of privacy issues as well as more recent concerns such as spam and monitoring of employee e-mail and Web browsing.

### **More Hands-on Reinforcement of Material**

This third edition provides even more end-of-chapter material: new review questions, new discussion questions, and more opportunities to apply what was learned in each chapter.

## **FEATURES UPDATED FROM THE SECOND EDITION**

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Maintaining the strength of the second edition was a major goal for the third edition. In addition to the new features just described, this new edition of *Management Information Systems* kept some of the unique powerful features developed for the first two editions—those designed to help the professor anchor concepts in real-world experience. Each chapter includes the following features:

### **Revolutionary Part Cases**

The third edition highlights again the well-received, powerful pedagogical tool: five part cases that clearly incorporate a wide array of real-world events and challenges that dramatize how information technology is integrated into everyday business. The cases are built around companies that range in size from the entrepreneurial start-up to the multimillion-dollar corporate giant, reflecting a wide variety of industries. These cases were created to show students how the full range of business functions operate within virtually every business setting. The instructor's package includes a five-minute video for each case: dramatic presentations that introduce the main business challenges and characters of the story. The Part Cases are integrated into the text in four ways:

- ◆ **The Case:** Each part of the text (made up of between two and five chapters) opens with the part case: the story of a business, including the business's IS challenges, the characters involved, and the issues. Everyone in business knows that almost every business problem has a human element; this aspect of managing IS business challenges is realistically represented in each case.
- ◆ **The Business Challenge:** The presentation of each case is immediately followed by a succinct statement of the business challenge of the case and the ways the information in each chapter in the case will help the reader meet that challenge.

- ◆ **Case Installments:** Each chapter opens with an installment of the part case that focuses and expands on an aspect of the original story that relates most closely to the chapter content.
- ◆ **Case Revisited Sections:** Each chapter ends with a Case Revisited section, which includes a **Summary**, a concise summary of the challenge in the Case Installment; a section called **What Would You Do?**, a series of questions that asks the reader to play a role in the case and decide how he or she would handle a variety of challenges inherent in the case; and **New Perspectives**, a series of questions that introduces a wide variety of “what ifs” reaching beyond the original scope of the case and again asking the student to play different roles to meet business challenges.

### Learning Objectives

Each chapter opens with a succinct statement of the thesis of the chapter, followed by a statement of the chapter’s learning objectives phrased as actions students will be capable of after reading the book. This helps students focus on the chapter’s overarching issues. The instructor can measure the extent to which the students have accomplished the objectives through the Review Questions and Discussion Questions provided at the end of the chapter.

### Why You Should . . .

This feature explains why students must understand and appreciate the concepts, terminology, and issues presented in the chapter in order to be successful in their careers. Why You Should . . . is unique to this book and was designed to help MIS professors create a compelling case that studying MIS is important to students’ careers.

### Ethical and Societal Issues

Each chapter includes an Ethical and Societal Issues box that provokes students to examine both sides of a particular issue, formulate their own opinions, and argue their views in class. (Review questions at the end of each chapter refer to the content of this feature.)

With information systems increasingly invading every aspect of our lives, ethical and societal concerns related to IT have become extremely important, often showing the price society pays for enjoying certain benefits of technology. The ease of violating privacy through the inappropriate distribution of personal data, the security risks created by the increasing use of electronic commerce (e-commerce) and the Internet in business, the disastrous loss of business due to computer viruses, the pervasive crime of software piracy, the challenges to free speech presented by certain laws, the financial losses due to the incompetence and unprofessional conduct of some IT specialists, the risks of overreliance on computers, and other similar topics must be addressed to ensure the well-being of businesses, individuals, and society as a whole.

### Points of Interest

The margins of each chapter are peppered with news items, statistics, and small anecdotes that punctuate the subject matter covered in the chapter. These information capsules may be used to illustrate a principle, give a unique

perspective on a particular managerial practice, or present a quantitative perspective through statistics on the subject of the chapter.

### From Ideas to Application: Real Cases

As in other fields of business, case studies are an effective way for students to integrate and internalize concepts. The cases in *Management Information Systems* were carefully chosen to reflect each chapter's discussion and to illustrate specific problems and solutions in the planning and use of information systems. Each case ends with questions that test the students' understanding of the material and challenges them to think in terms of real business situations.

### End-of-chapter Material

In addition to the "Case Revisited" section (described earlier), the end-of-chapter material is a powerful feature of this publication.

- ◆ **Summary** The purpose of the Summary is to help highlight the most important points of each chapter. It's an excellent tool to review what has already been studied.
- ◆ **Review Questions** The Review Questions test the student's knowledge of the material discussed in the chapter. While some simply enforce the understanding of the concepts and issues, others require that the student apply this understanding to situations somewhat different from those mentioned in the chapter.
- ◆ **Discussion Questions** The Discussion Questions help students determine whether they have absorbed the material in the chapter; these questions can be used by professors to lead discussion in the classroom. Most of these questions are not addressed directly in the concepts and terminology detailed in the chapter but require that the student use the knowledge gained when reading the material and then apply his or her own judgment on technical, business, and ethical issues.
- ◆ **Applying Concepts** These assignments require students to delve further into a concept presented in the chapter. Often, students are asked to approach executives with questions about methods of problem solving and decision making in their organizations. The purpose of the activity is to illustrate to students that what they have learned in the chapter reaches far beyond the classroom. The assignments encourage students to think, analyze, and propose solutions to practical problems.
- ◆ **Hands-on Activities** Learning by doing is an important element in the teaching of any subject. The Hands-on Activities at the end of each chapter require students to use software to learn or enhance a computer skill or to use a skill they have already mastered to prepare a paper, make a presentation, or analyze data. The activities involve the use of word processors, spreadsheets, and database applications.
- ◆ **Team Activities** The purpose of the Team Activities is twofold: to enrich students by both the content of the assignments and by the manner in which it is carried out. The team assignments teach students to carry out small-scale research projects, usually interacting with executives and IT professionals. Accomplishing the assignment with other students teaches the students to work as part of a team. This teamwork is an important aspect of

work in organizations in general and in the area of information systems in particular. Many MIS professors have emphasized the importance of team-work exercises, in which students break assignments into smaller, individual tasks; negotiate work load; integrate individual accomplishments into a coherent result; and present the result in writing, orally, or visually. The purpose of this feature is to respond to this pedagogical method.

The assignments at the end of each chapter include at least one task that the students must do on the Web or with the help of Web resources. This emphasizes the importance of the Web as a great resource.

### **Glossary**

Often, an instructor or a student may run into a term and not be sure of its meaning. The glossary at the end of the book is an alphabetical list of key terms and their meanings mentioned throughout the text.

### **Measurement Units**

Information technology has its own set of units to measure anything from the speed of a computer to the capacity of a communications line. Both professors and students can turn to this list at the end of the book for help with measurement conventions.

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## **INSTRUCTOR'S PACKAGE**

*Management Information Systems*, Third Edition, includes teaching tools to support instructors in the classroom. Six ancillaries accompany the textbook: an Instructor's Manual, a Test Bank, Case Videos, Distance Learning content, PowerPoint presentations, and a CNN Video. This textbook is one of the few accompanied by an Instructor's Manual that is written by the text author, ensuring compatibility with the textbook in content, pedagogy, and philosophy.

### **The Instructor's Manual**

The purpose of this manual is to provide materials to help instructors make their classes informative and interesting. The manual offers several approaches to teaching the material, with a sample syllabus and comments on different components. It also suggests alternative course outlines and ideas for term projects. For each chapter, the manual includes a chapter outline, learning objectives, lecture notes (including discussion topics) teaching tips, and solutions to Review Questions and Discussion Questions, and the questions following each case study.

### **The Test Bank**

Course Test Manager is a powerful testing and assessment package that enables instructors to create and print tests from test banks designed specifically for Course Technology titles. In addition, instructors with access to a networked computer lab (LAN) can administer, grade, and track tests online. Students can also take online practice tests, which generate customized study guides that indicate where in the text students can find more information on each question.



### **Case Videos**

Five five-minute case videos, one corresponding to each Part Case in the text, are available to instructors on VHS cassette. These videos give a “human” quality to the Part Cases, making the business challenges more lifelike and giving students a point of reference as they work through the “story” of each of the five Part Case businesses.

### **Distance Learning Content**

Course Technology is proud to present online courses in WebCT and Blackboard, as well as at MyCourse.com, Course Technology’s own course enhancement tool, to provide the most complete and dynamic online learning experience possible. When you add online content to one of your courses, you’re adding a lot: self-tests, links, glossaries, and, most of all, a gateway to the twenty-first century’s most important information resource. We hope you will make the most of your course, both online and offline. For more information on how to bring distance learning to your course, contact your local Course Technology representative.

### **PowerPoint Presentations**

These CD-ROM-based presentation tools developed in Microsoft PowerPoint offer a wealth of resources for use in the classroom. Instead of using traditional overhead transparencies, Course Presenter puts together impressive computer-generated screen shows including graphics from the book.

### **CNN for MIS**

This video, developed with CNN, includes 13 video clips on a range of MIS topics from all over the world. This video is free to instructors or may be bundled with the text for a small additional cost.

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## **ACKNOWLEDGMENTS**

This book is the fruit of a great concerted effort. 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 IS area whose ideas and opinions over all these years have helped me understand the real educational needs of our students. I also recognize the indirect contribution of the many students I have taught. Their comments helped me understand the points that need extra emphasis or a different presentation to make subjects that are potentially overwhelming more interesting.

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