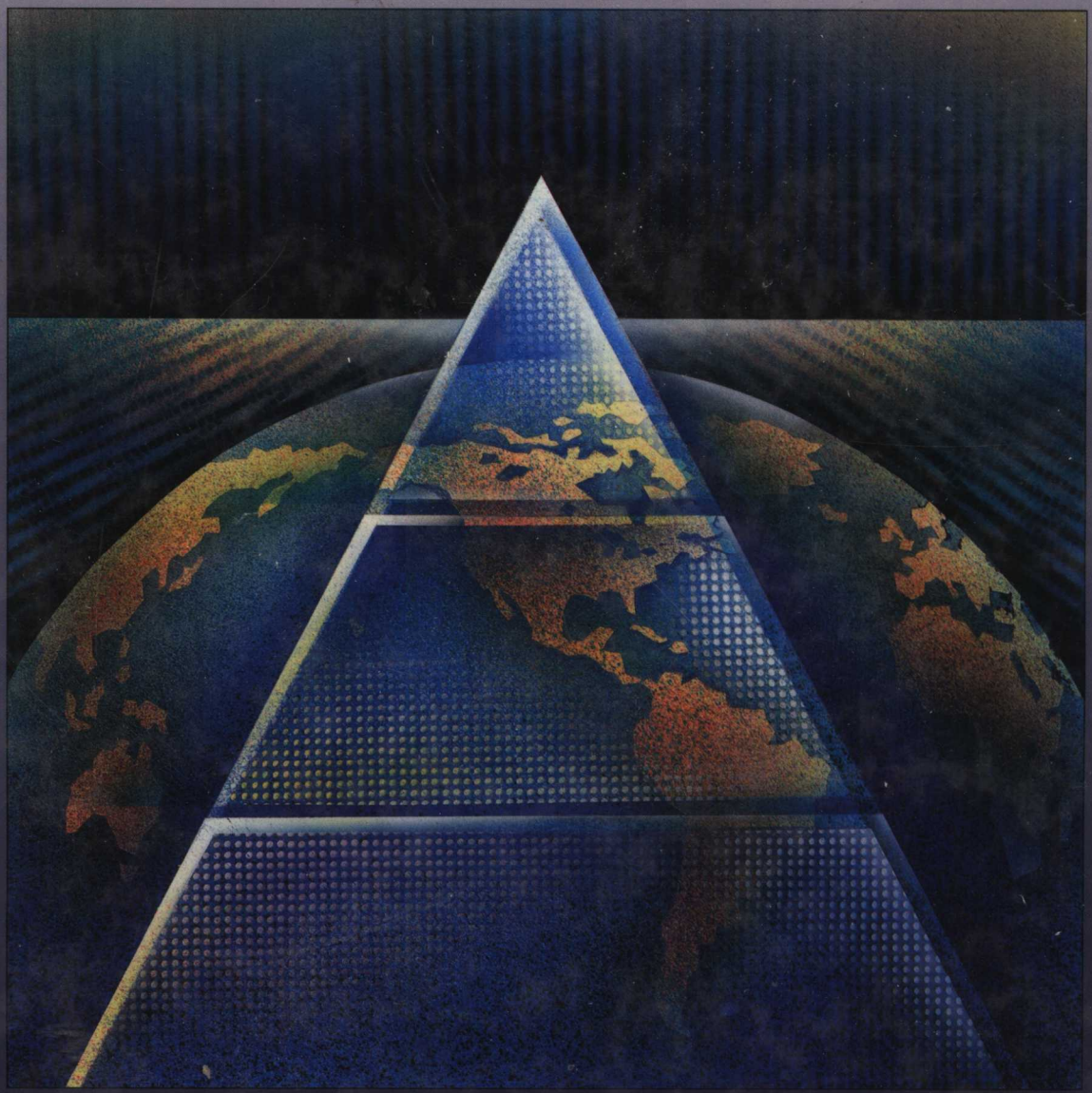

THIRD EDITION

Management Information Systems

Managing Information Technology in the Networked Enterprise

James A. O'Brien

T H I R D E D I T I O N

Management Information Systems

Managing Information Technology in the Networked Enterprise

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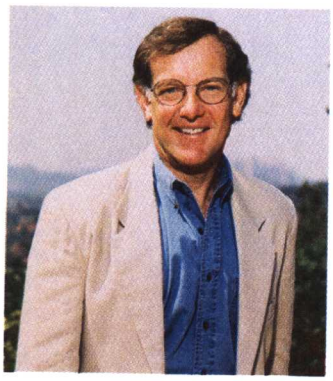
About the Author



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Dr. O'Brien's business experience includes working in the Marketing Management Program of the IBM Corporation, as well as serving as a financial analyst for the General Electric Company. He is a graduate of General Electric's Financial Management Program. He has also served as an information systems consultant to several banks and computer services firms.

Jim's research interests lie in developing and testing basic conceptual frameworks used in information systems development and management. He has written eight books, including several that have been published in multiple editions, as well as in Dutch, French, or Japanese translations. He has also contributed to the field of information systems through the publication of many articles in business and academic journals, as well as through his participation in academic and industry associations in the field of information systems.

Preface

Managers and Information Technology

> What are the new skills demanded of effective managers in the 1990s? Competence and comfort in handling information technology (IT) will be high on the list. . . .
>
> Business managers are moving from a tradition where they could avoid, delegate, or ignore decisions about IT to one where they cannot create a marketing, product, international, organizational, or financial plan that does not involve such decisions.[1]

As tomorrow's managers, entrepreneurs, or business specialists, business students need to know how to use and manage information technology in today's networked enterprises and global markets. In this new environment, they will rely on global networks of information systems to share ideas and information and work together over wide geographical and cultural distances. Fast communications across the enterprise and easy collaboration among work groups become vital keys to business success. And of course, information technology makes it all happen.

This text is written as an introduction to information systems for the business students of today who will work in this dynamic environment. As tomorrow's business professionals, they will rely on interconnected networks of information systems for:

- End user collaboration, including communications and computing among end user work groups and teams.
- Enterprisewide computing, including communications and information processing for business operations, managerial decision making, and strategic advantage.

About the Text

This is the managerial and networked enterprise perspective that the third edition brings to the study of information systems. Of course, as in the second edition, this edition:

- Loads the text with real world cases and problems about real people and companies in the business world.
- Organizes the text around a simple five-level framework that emphasizes the IS knowledge a managerial end user needs to know.
- Distributes and integrates information systems foundation theory throughout the text instead of concentrating it in several early chapters.
- Places a major emphasis on the strategic role of information systems in providing competitive advantage, as well as on the operational and decision support roles of information technology.

[1]Peter Keen, *Shaping the Future: Business Design Through Information Technologies* (Cambridge: Harvard Business School Press, 1991), pp. 1, 236.

- Emphasizes how a systems approach to the problem-solving process can provide information system solutions to business problems.

This new third edition is a major revision that retains these important features, while significantly updating coverage of IS technology and its business and managerial applications. In addition, this edition includes a new chapter on the strategic use of IT for competitive advantage. Major revisions have been made to the organization of topics in many chapters, and new pedagogical components have been added to end-of-chapter materials. Finally, the third edition provides all new Real World Cases and Problems in every chapter.

This text is designed for use in undergraduate or introductory MBA courses in management information systems, which are required in many business administration or management programs as part of the *common body of knowledge* required of all business majors. Thus, this text treats the subject area known as information systems (IS), management information systems (MIS), or computer information systems (CIS) as a major functional area of business that is as important to management education as are the areas of accounting, finance, operations management, marketing, and human resource management.

This text is designed to support the attainment of **information system literacy** by students. That is, its objective is to build a basic understanding of the value and uses of information technology in information systems for business operations, managerial decision making, and strategic advantage. Although this text is not designed for courses in *computer literacy,* it does include a module entitled "Information Technology: A Managerial Overview." The four chapters of this module emphasize managerial implications of information technology. However, they do contain overviews of computer hardware, software, telecommunications, and database management that can be used as a refresher on such topics or to help remedy deficiencies in student computer literacy.

An Information Systems Framework

This text provides a teaching-learning resource that reduces the complexity of an introductory course in information systems by using a conceptual framework that organizes the knowledge needed by business students into five major areas:

- **Foundation concepts.** Basic information systems concepts and the operations, decision-making, and strategic roles of information systems (Chapters 1 and 2). Other behavioral, managerial, and technical concepts are presented where appropriate in other chapters.
- **Technology.** Major concepts, developments, and managerial implications involved in computer hardware, software, telecommunications technologies, and database management (Chapters 4, 5, 6, and 7). Other technologies used in computer-based information systems are discussed where appropriate in selected chapters.
- **Applications.** How information technology is used in modern information systems to support end user collaboration, enterprise operations, managerial decision making, strategic advantage, and artificial intelligence and expert systems (discussed in Chapters 8, 9, 10, 11, and 12).
- **Development.** Developing information system solutions to business problems using a systems approach to problem solving and application develop-

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ment (presented in Chapter 3 and Appendix B and in other chapters when discussing development issues for major types of information systems).

- **Management.** The challenges and methods of managing information systems technologies, activities, and resources, including information resource management, global IT management, issues in planning and implementing change with IT, and security and ethical challenges (emphasized in each chapter, but discussed specifically in Chapters 13, 14, and 15).

Real World Cases, Problems, and Exercises

This text makes extensive use of up-to-date "real world" case studies and problems. These are not fictional stories, but actual situations faced by business firms and other organizations as reported in current business and IS periodicals. This includes three real world case studies in each chapter that apply specifically to that chapter's contents, six real world problems provided at the end of every chapter, and seven major case studies found in Appendix A. In addition, each chapter contains several Application Exercises, including at least two hands-on spreadsheet or database software assignments in Chapters 2 through 14. The purpose of this variety of assignment options is to give instructors and students many opportunities to apply each chapter's material to real world situations, using managerial problem solving or end user development approaches.

Developing Information System Solutions to Business Problems

This text introduces students early on to (1) basic information system concepts, (2) a systems approach to problem solving, and (3) information systems development. This approach emphasizes that information system concepts, the systems approach, and the systems development process are fundamental interrelated concepts used by both end users and IS specialists to solve business problems.

Many students are better motiviated if they can be shown how to apply such concepts to business problem solving early in the course. Then they can learn how to identify, analyze, and propose possible information system solutions to a variety of simple business problems early in the course. So this text introduces students to a systems approach to problem solving (demonstrated with a business case study) in the first section of Chapter 3, while the second section introduces the systems development process as a way for end users to develop IS solutions to business problems. At the option of the instructor, the Application Exercises in Chapter 8 can be assigned to present end user development approaches to the use of spreadsheet and database software, while Appendix B can be assigned to provide coverage of systems development tools. This helps students to begin analyzing chapter cases and problems and completing hands-on exercises early in the course. Students will also be ready to analyze the case studies in Appendix A and any actual business situations that instructors may assign as class projects.

Distributing and Integrating IS Theory

MIS texts have traditionally lumped coverage of systems theory, information theory, decision theory, management theory, and organization theory into their first three or four chapters. Although this placement is conceptually natural and defensible, it devastates many students and frustrates their instructors. It's just too much theory, too early, for most students. Much of it is forgotten by the time they finally get to chapters that apply such theories to various information system applications.

That's why this text distributes and integrates theory throughout the text, especially in chapters covering major information system applications. For example, important concepts from management and decision theory are discussed in the first section of Chapter 10, followed by coverage of management reporting, decision support, and executive information systems in the second section of that chapter. This method of organizing the text ties theoretical concepts more directly and naturally to their application to major types of information systems. It thus makes it easier for students to understand and remember such concepts, while providing a rationale for the importance of specific information systems applications and issues.

Strategic, International, and Ethical Dimensions

This text contains substantial text material and cases reflecting the strategic, international, and ethical dimensions of information systems. This can be found not only in Chapter 11, *Information Systems for Strategic Advantage*, in Chapter 13, *Managing IT: Enterprise and Global Management*, and in Chapter 15, *Managing IT: Security and Ethical Challenges*, but in all other chapters of the text. This is especially evident in many Real World Cases and Problems, such as GE Plastics, Abaco Grupo Financiero, Scotiabank, West American T-Shirt Company, Wal-Mart Stores, R. J. Reynolds, Tropicana Products, DHL Worldwide Express, PC Gifts and Flowers, Opticon Holding A/S, Capital One Financial, Nissan Motor Corp., Canada Trust, Levi Strauss & Co., Barclays Bank, Nestle, and Elf Atochem, ABB Asea Brown Boveri, the World Bank, Kevin Mitnick and Tsutomu Shimomura, David LaMacchia of MIT, Canter and Siegel, Johnson Controls, Credit Agricole-Lazard, and many, many others. These examples repeatedly demonstrate the strategic and ethical challenges of managing information technology for competitive advantage in global business markets and in the global information society in which we all live and work.

Modular Structure of the Text

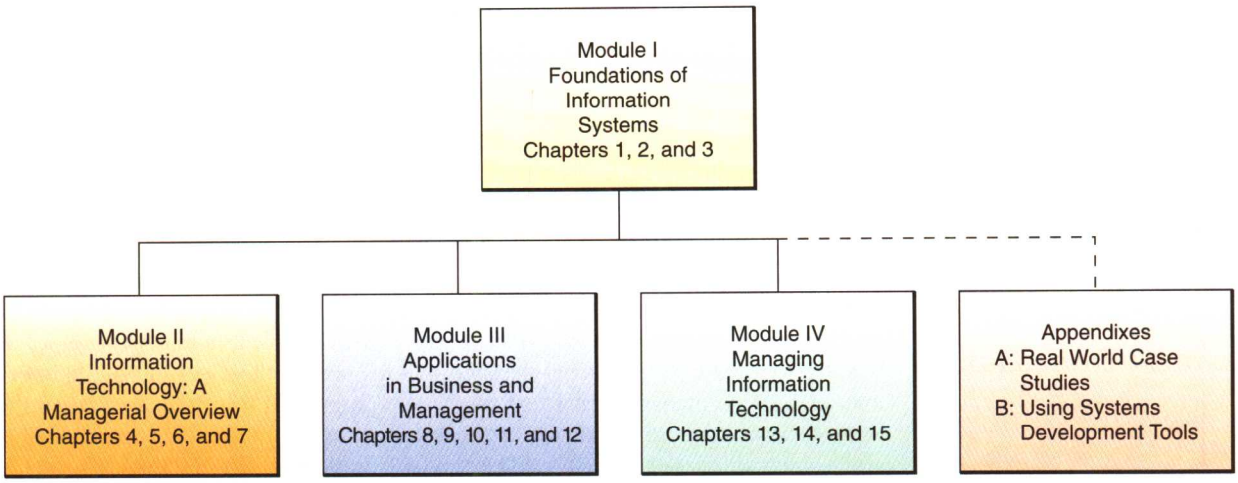
The text is organized according to the five major areas of the framework for information systems knowledge mentioned earlier. Figure 1 illustrates how the text is organized into four modules and two appendices. Also, each chapter is organized into two distinct sections. This is done to avoid proliferation of chapters, as well as to provide better conceptual organization of the text and each chapter. This organization increases instructor flexibility in assigning course material since it structures the text into modular levels (i.e., modules, chapters, and sections) while reducing the number of chapters that need to be covered.

Each chapter starts with a Chapter Outline and Learning Objectives and ends with a Summary, Key Terms and Concepts, a Review Quiz tied directly to the Key Terms and Concepts, Discussion Questions, Real World Problems, Application Exercises, Review Quiz Answers, and Selected References. Real World Cases are also provided at the end of each section and chapter.

Module I: Foundations of Information Systems

The first module of this text is designed as a **core module** of foundation concepts. Once instructors have covered this module, they can assign any other module, depending on their pedagogical preferences. Chapter 1 stresses the importance of information systems and information technology in business, and introduces a framework of information systems knowledge needed by managerial end users. Chapter 2 introduces the generic components and properties of information systems, and how the major types of information systems support business operations, managerial decision making, and strategic advantage. Chapter 3 introduces a sys-

FIGURE 1
The modular organization of the text.



tems approach to business problem solving and then applies these concepts to the information systems development process from the viewpoint of a managerial end user.

Module II: Information Technology: A Managerial Overview

Module II contains chapters on computer hardware (Chapter 4), software (Chapter 5), telecommunications (Chapter 6), and database management (Chapter 7). Its purpose is to give students an overview of the technology used in modern computer-based information systems and its implications for end user management. This material is consolidated in an independent module since students may have already covered some of these topics in an earlier course. Thus, instructors can selectively use the chapters and sections of this module, depending on the preparation of their students. This is especially useful in the case of the important topics of telecommunications and database management, in which many students, typically, have had only a brief exposure. Students need an adequate background in such topics in order to propose realistic information system solutions to business problems.

Module III: Applications in Business and Management

Module III contains five chapters that discuss the basic concepts and major applications of computer-based information systems. It emphasizes how information systems support end user productivity and the operations, managerial decision making, and competitive advantage of business firms and other organizations. Thus, it includes coverage of concepts and applications in end user computing and collaboration and office automation (Chapter 8), business information systems and transaction processing (Chapter 9), managerial reporting, decision support, and executive information systems (Chapter 10), information systems for strategic advantage (Chapter 11), and artificial intelligence, human information processing, and expert systems (Chapter 12).

Module IV: Managing Information Technology

It is important that prospective managerial end users learn that although information technology can help them solve business problems, it also poses major managerial challenges. That is the focus of the three chapters of Module IV. The impact of information technology, the importance of information resource management, and the managerial implications of the global use of information technology are covered in Chapter 13. Chapter 14 discusses management issues in the planning and implementation of organizational change caused or enabled by IT. Chapter 15 explores the controls and safeguards needed to improve information system performance and security, as well as the ethical challenges posed by computer crime and other societal impacts of information technology.

Appendixes

Appendix A is a 41-page appendix containing seven major case studies which can be used at the option of the instructor. They describe problems and opportunities in business operations, managerial decision making, competitive advantage, or information systems management faced by actual computer-using firms and organizations. These cases can thus be used to integrate many of the concepts and applications discussed in the text. They are an additional method of giving students an opportunity to apply knowledge gained throughout the course to the development of information system solutions to business problems. Thus, these longer case studies can be used as the basis for class discussion or for term project assignments.

Appendix B offers optional coverage of systems development tools. This includes simple introductions to systems flowcharts, data flow diagrams, and entity relationship diagrams.

Summary of Changes

Besides providing all new Real World Cases and Problems, the third edition represents a major revision of chapter contents. Highlights of the changes made in the second-edition material are found in the following third-edition chapters:

Chapter 1: *Introduction to Information Systems in Business.*
Section II of this chapter is a new section that emphasizes the importance of IT in business with an overview of the impact of IT on business developments such as globalization, reengineering, and competitive advantage.

Chapter 2: *Fundamentals of Information Systems.*
Coverage of information system concepts and components, formerly in Chapter 1, has been revised and moved to Section I of this chapter, with an overview of the types and roles of information systems moved to Section II.

Chapter 3: *Solving Business Problems with Information Systems.*
The coverage of the systems approach in business problem solving in Section I has been thoroughly revised and combined with an analysis of a business case study formerly in Appendix B.

Chapter 4, 5: *Managerial Overview: Computer Hardware* and *Managerial Overview: Computer Software.*
Updated and reorganized coverage of computer hardware and software.

Chapter 6: *Managerial Overview: Telecommunications.*
A major revision and new topics such as open systems, client/server, the information superhighway, and business use of the Internet.

Chapter 7: *Managerial Overview: Database Management.*
Updated and reorganized coverage of the role of database management in managing organizational and end user data resources in Section I, and technical topics in database management in Section II.

Chapter 8: *Information Systems for End User Computing and Collaboration.*
This revised chapter emphasizes the importance of end user computing and office automation applications, including new material on end user collaboration, work group computing, and hypertext and multimedia applications.

Chapter 9: *Information Systems for Business Operations.*
Section I is a revision and consolidation of material on IS support of the functional areas of business formerly in Chapter 12. Section II contains revised material on EDI, EFT, and transaction processing systems.

Chapter 10: *Information Systems for Managerial Decision Making and Support.*
Substantial new material has been added on online analytical processing (OLAP) and decision support and executive information systems. Also, coverage of information quality and management information systems (information reporting systems), formerly in Chapter 9, has been consolidated into this chapter.

Chapter 11: *Information Systems for Strategic Advantage.*
Section I of this new chapter contains new and revised coverage of competitive strategy concepts, formerly in Chapter 2. Section II contains much new material on the strategic use of IT for business process reengineering, total quality management, agile competition, virtual corporations, and strategic use of the Internet.

Chapter 12: *Information Systems and Artificial Intelligence Technologies.*
Revised coverage of artificial intelligence and expert systems, and new material on case-based reasoning, neural networks, fuzzy logic, virtual reality, intelligent agents, and hybrid AI systems in business.

Chapter 13: *Managing IT: Enterprise and Global Management.*
Section I is a revision of managerial issues in IT, including management involvement in IS governance, trends in IS organization, and the managerial and organizational impact of IT. Section II contains much new and revised material on global IT management, formerly in Chapter 15, including cultural challenges, global company requirements, and global business/IT strategies.

Chapter 14: *Managing IT: Planning and Implementing Change.*
The focus and content of this chapter has been revised to stress planning and implementing change with IT. This includes new IS planning materials on competitive advantage, reach and range analysis, and the scenario approach added to Section I (formerly in Chapter 13). Section II contains new material on managing change caused by implementing new information technologies in an organization.

Chapter 15: *Managing IT: Security and Ethical Challenges.*
Section I of this chapter contains new material on IS security and controls, and was formerly in Chapter 14. Section II contains new material on computer crime and ethical controversies on the Internet, as well as revised coverage of ethical and societal IT issues. Chapter 15 thus serves as a *capstone chapter* whose content provides an integrating and stimulating series of topics, Real World Cases and Problems, and Application Exercises for class discussion and assignments at the end of the course.

Appendix A: *Real World Case Studies.*
This optional appendix contains seven major case studies of computer-using firms. All of the case studies are new to this edition.

Appendix B: *Using Systems Development Tools.*
This optional appendix contains revised material on systems development tools, including new material on entity relationship diagrams.

Support Materials

The IRWIN Advantage Series is a collection of laboratory tutorials for the most popular microcomputer software packages available. There are over 30 lab manuals available, so you can choose any combination to accommodate your individual class needs.

A revised **software case book,** *Application Cases in MIS: Using Spreadsheet and Database Software,* second edition, by James N. Morgan, of Northern Arizona University, is available to supplement the hands-on exercises in this edition. This optional case book contains an extensive number of hands-on cases, many of which include a suggested approach for solving each case with a spreadsheet or database management software package to develop solutions for realistic business problems.

An **Instructor's Resource Manual,** revised by Margaret Edmunds, of Mount Allison University, is available to instructors upon adoption of the text. It contains instructional aids and suggestions, detailed annotated chapter outlines with instructional suggestions for use in lectures, answers to chapter questions, and problems and case study questions. A data/solutions disk is included for use with the spreadsheet and database exercises in the text. There are also several additional case studies and their solutions that do not appear in the text.

A set of 40 color **overhead transparencies** of line art from the book is available to adopters.

A **Transparency Masters** manual of line art from the book is available to adopters. In addition, there is a **presentation graphics disk** in PowerPoint that supplies a color slide show of line art from the text to support classroom discussion, as well as additional teaching tips and lecture script.

A **Test Bank,** which contains over 3,000 true-false, multiple choice, and fill-in-the-blank questions, has been revised by Margaret Edmunds, of Mount Allison University. It is available as a separate test manual and in computerized form on floppy disk for use with the Irwin Test Generator Program.

Acknowledgments

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Much credit should go to several individuals who played significant roles in this project. Thus, my thanks go to the editorial and production team at Irwin, especially Rick Williamson, senior sponsoring editor, Christine Wright, developmental editor, Jean Lou Hess, project editor, and Matthew Baldwin, designer. Their ideas and hard work were invaluable contributions to the successful completion of the project. Thanks also to Michele Allen whose word processing skills helped me meet many manuscript deadlines. The contributions of many authors, periodicals, and firms in the computer industry who contributed case material, ideas, illlustrations, and photographs used in this text are also thankfully acknowledged.

Acknowledging the Real World of Business

The unique contribution of over 200 business firms and other computer-using organizations that are the subject of the real world cases, problems, exercises, and case studies in each chapter is also gratefully acknowledged. The real-life situations faced by these firms and organizations provide the readers of this text with a valuable demonstration of the benefits and limitations of using information technology to support business operations, managerial decision making, and strategic advantage.

James A. O'Brien

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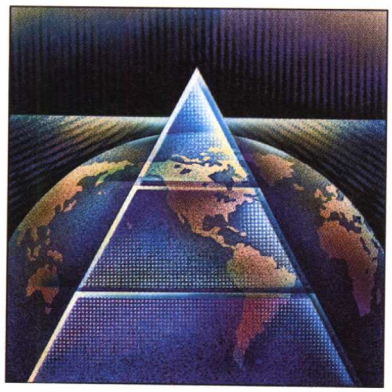

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