

12TH EDITION

INTRODUCTION TO INFORMATION SYSTEMS

JAMES A. O'BRIEN

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Twelfth Edition

James A. O'Brien

*College of Business Administration
Northern Arizona University*



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About the Author



James A. O'Brien is an adjunct professor of Computer Information Systems in the College of Business Administration at Northern Arizona University. He completed his undergraduate studies at the University of Hawaii and Gonzaga University and earned an M.S. and Ph.D. in Business Administration from the University of Oregon. He has been professor and coordinator of the CIS area at Northern Arizona University, professor of Finance and Management Information Systems and chairman of the Department of Management at Eastern Washington University, and a visiting professor at the University of Alberta, the University of Hawaii, and Central Washington University.

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 Chinese, Dutch, French, Japanese, or Spanish 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

A Business
and
Managerial
Perspective

Strategic,
International,
and Ethical
Coverage
Realistic
Coverage of
e-Business
and
e-Commerce

This new Twelfth Edition is an introduction to information systems and information technology for business students who are or who will soon become business professionals in the fast changing business world of today. The goal of this text is to help business students learn how to use and manage information technologies to revitalize business processes, improve business decision making, and gain competitive advantage. Thus it places a major emphasis on up-to-date coverage of the essential role of Internet technologies in providing a platform for business, commerce, and collaboration processes among all business stakeholders in today's networked enterprises and global markets.

This is the business and managerial perspective that this text brings to the study of information systems. Of course, as in all my texts, this edition:

- Loads the text with real world cases, examples, and exercises about real people and companies in the business world.
- Organizes the text around a simple five-area framework that emphasizes the IS knowledge a business professional needs to know.
- Places a major emphasis on the strategic role of information technology in providing business professionals with tools and resources for managing business operations, supporting decision making, enabling enterprise collaboration, and gaining competitive advantage.

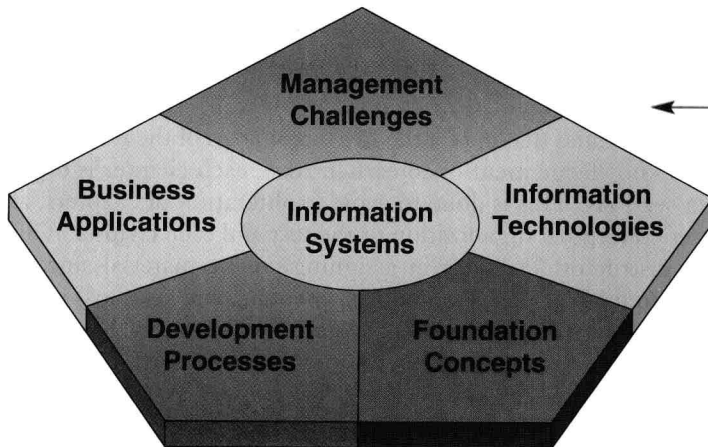
This edition also contains substantial text material and real world cases and examples reflecting strategic issues and uses of information technology for competitive advantage (Chapter 2), ethical and security issues and challenges (Chapter 11), and international and global business issues and practices (Chapter 12). These chapters demonstrate the strategic and ethical challenges of managing information technology for competitive advantage in today's dynamic global business markets.

Recently coined, yet already clichéd, the expression “e-business is business” speaks the truth . . .

Contrary to popular opinion, e-business is not synonymous with e-commerce. E-business is much broader in scope, going beyond transactions to signify use of the Net, in combination with other network technologies and forms of electronic communication, to enable any type of business activity [1].

Today, businesses of all sizes and types are using Internet technologies to enable all kinds of business activities. That's what e-business really is. The new Twelfth Edition recognizes that Internet-enabled business processes are becoming so fundamentally pervasive in business that the term “e-business” is becoming redundant in many instances. Therefore this edition has significantly reduced its use of that term, while concentrating the e-business coverage that today's business students need into one chapter on e-business applications and one chapter on e-commerce. The text material and real world cases and examples in these chapters provide students with a solid e-business foundation for their studies and work in business.

The O'Brien Method



An Information Systems Framework

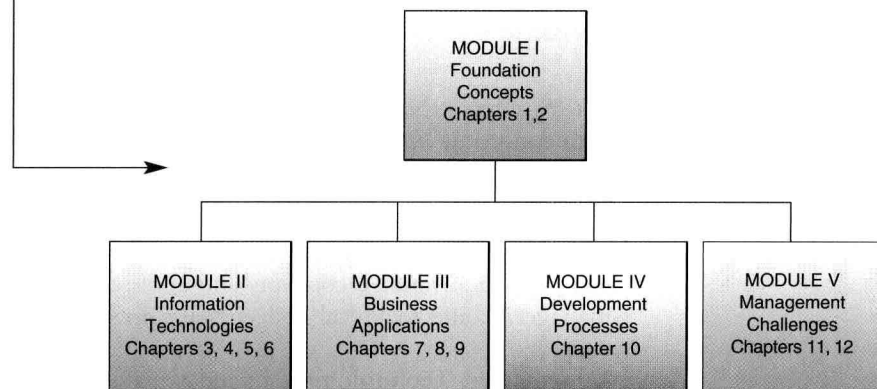
O'Brien uses a five-area IS framework to reduce the complexity of MIS. On each chapter opener the appropriate area is highlighted depending on what is being covered in that chapter.

This text reduces the complexity of a course in management information systems by using a conceptual framework that organizes the knowledge needed by business students into five major areas:

- **Foundation Concepts.** Fundamental business information systems concepts including trends, components, and roles of information systems (Chapter 1) and competitive advantage concepts and applications (Chapter 2). Other behavioral, managerial, and technical concepts are presented where appropriate in selected chapters.
- **Information Technologies.** Includes major concepts, developments, and managerial issues involved in computer hardware, software, telecommunications network and data resource management technologies (Chapters 3, 4, 5, and 6). Other technologies used in business information systems are discussed where appropriate in selected chapters.
- **Business Applications.** How businesses use Internet and other information technologies to support their business processes, e-business and e-commerce initiatives, and business decision making (Chapters 7, 8, and 9).
- **Development Processes.** Developing and implementing business/IT strategies and systems using several strategic planning and application development approaches (Chapters 10).
- **Management Challenges.** The challenges of business/IT technologies and strategies, including security and ethical challenges and global IT management (discussed in many chapters, but emphasized in Chapters 11 and 12).

Modular Structure of the Text

The text is organized into modules that reflect the five major areas of the framework for information systems knowledge mentioned earlier. 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.



Changes to this Edition

Besides providing all new real world cases, the Twelfth Edition includes significant changes to the Eleventh Edition's content which update and improve its coverage, many of them suggested by an extensive faculty review process. Highlights of the key changes in this edition include:

- Chapter 1 now starts with an introduction to the fundamental roles of information systems in business and an overview of the managerial challenges of IT in Section I. The more conceptual material on the components of information systems is then covered in Section II.
- Introductory coverage of competitive advantage issues in Chapter 2 has been further simplified at the urging of reviewers by removing several topics previously covered, including Internet value chains, e-business/e-commerce strategy development, and total quality management.
- Chapter 4 on Computer Software has been strengthened with new material on business application software, application service providers, XML and Java, and Web services.
- Chapter 5 on Data Resource Management has been restructured to improve its sequence of topics and improved with the addition of material on database software and traditional file processing, which has returned at the urging of reviewers to contrast it with the modern database management approach.
- Coverage of customer relationship management, enterprise resource planning, and supply chain management has been significantly expanded in Section I of Chapter 7 on Electronic Business Systems, emphasizing their role in essential business processes and the challenges they pose, as well as the benefits they can provide to a business. Coverage of functional business systems in Section II has been streamlined to emphasize a few key examples in each functional area of business.
- The content of Section I of Chapter 12 on Enterprise and Global Management of Information Technology has been revised to focus primarily on the management of information technology by expanding coverage of topics on the key management processes and challenges involved, and by moving some of the conceptual material on the impact of IT on managers and organizations to other chapters.
- All other chapters have been updated with new text material, and most in-text real world examples that illustrate topics throughout the text have been replaced with more current examples. In addition, most of the photos and software screen shots in the text have been replaced with updated content.

Solving Problems with Information Systems

O'Brien set the standard for bringing corporate reality into the information systems classroom.

Real World Cases

Each chapter includes four case studies of actual (and recent) situations faced by some of the most widely recognized organizations in the world.

Chapter 5 / Data Resource Management • 139

REAL WORLD CASE 1

Argosy Gaming Co.: Challenges in Building a Data Warehouse

When you've got half a dozen riverboat gambling operations, it's important that everyone plays by the same rules. Argosy Gaming Co., with headquarters in Alton, Illinois, and a fleet of six Mississippi riverboat casinos, had decided that bringing all customer data together would enhance management's view of operations and potentially help strengthen customer relationships. To accomplish those goals, though, the company needed to access a variety of databases and develop an extract, transform, and load (ETL) system to help construct and maintain a central data warehouse.

Jason Fortenberry, a data-warehousing analyst, came aboard at Argosy just as the company's data warehouse project started in 2001. His job was made easier, he says, by the adoption of Hummingbird Ltd.'s Genio ETL software tool, which helped bridge systems and automate processes. But like others going through such projects, he learned the hard way that preparing for the ETL process is just as important as having the right software.

The riverboats each had unique and incompatible ways of defining a host of operational activities and customer characteristics—in essence, the floating casinos were each playing the same game but with different rules. But those problems remained hidden until reports from the company's data warehouse began to turn up inconsistent or troubling data. That's when Fortenberry and his staff discovered conflicting definitions for a wide range of data types—problems he wishes he had identified much earlier. Fortenberry's troubles—and his successes—are typical of ETL, the complex and often expensive prelude to data warehouse success.

ETL is often problematic because of its inherent complexity and underlying business challenges, such as making sure you plan adequately and have quality data to process. Analysts, users, and even vendors say all bets are off if you don't have a clear understanding of your data resources and what you want to achieve with them. Then there are choices, like whether to go for a centralized architecture—the simplest and most common configuration—or a distributed system, with ETL processing spread across various software tools, system utilities, and target databases, which is sometimes a necessity in larger, more complicated data warehouses. Even if you navigate those waters successfully, you still need to ensure that the ETL foundation you build for your data warehouse can meet growing data streams and future information demands.

As the term implies, ETL involves extracting data from various sources, transforming it, (usually the trickiest part), and loading it into the data warehouse. A transformation could be as simple as reordering the fields of a record from a source system. But, as Philip Rossum, a Citicorp Information Group analyst explains, a data warehouse often contains data values and data structures that never existed in a source

system. Since many analytical questions a business user would ask of a data warehouse can be answered only with calculated values (like averages, rankings or metrics), the ETL tool must calculate these from various data sources and load them into the warehouse. Similarly, notes Rossum, a data warehouse typically contains "time-series" data. The average operational application keeps track of the current state of a value such as a bank account balance. It's the job of the ETL tool to regularly add new states of a value to the series.

For his yearlong ETL project, Argosy's Fortenberry says Hummingbird's Genio Suite, a data integration and ETL tool, quickly became the project's "central nervous system," coordinating the process for extracting source data and loading the warehouse.

But for Argosy, getting all that data into the warehouse didn't produce immediate usable and dependable results. "The lesson was that people thought that they were talking about the same thing, but they actually were not," says Fortenberry. For example, he explains, riverboats calculated visits differently. One riverboat casino would credit a customer with a visit only if he actually played at a slot machine or table. Another had an expanded definition and credited customers with visits when they redeemed coupons, even if they didn't play. So identical customer activity might have one riverboat reporting 4 player visits and another reporting 10. "This type of discovery was repeated for everything from defining what a 'player' is to calculating a player's profitability," says Fortenberry.

It played a lead role in identifying problems and helping to hammer out a consensus among the business units about how to define and use many categories of data, he says. Now, the data warehouse is running smoothly and producing dependable results for business analysis and management reporting, so the number of problem-resolution meetings has dropped dramatically. Still, Fortenberry reckons that three-quarters of the meetings he attends nowadays have a business focus. "For our part, we now know better what questions to ask business users as we continue with the data warehouse development process," he says.

Case Study Questions

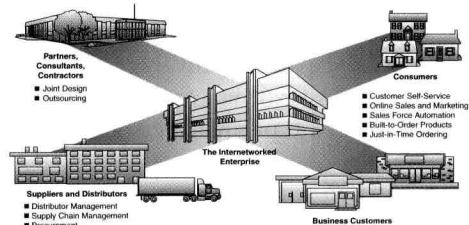
1. What is the business value of a data warehouse? Use Argosy Gaming as an example.
2. Why did Argosy use an ETL software tool? What benefits and problems arose? How were they solved?
3. What are some of the major responsibilities that business professionals and managers have in data warehouse development? Use Argosy Gaming as an example.

Source: Adapted from Alan Earls, "ETL: Preparation Is the Best Bet," *Computerworld*, August 25, 2003, pp. 27–28.

Chapter 6 / Telecommunications and Networks • 181

FIGURE 6.9

Extranets connect the internetworked enterprise to consumers, business customers, suppliers, and other business partners.



business can build and strengthen strategic relationships with its customers and suppliers. Also, extranets can enable and improve collaboration by a business with its customers and other business partners. Extranets facilitate an online, interactive product development, marketing, and customer-focused process that can bring better-designed products to market faster.

Countrywide and Snap-on: Extranet Examples

Countrywide Home Loans has created an extranet called Platinum Lender Access for its lending partners and brokers. About 500 banks and mortgage brokers can access Countrywide's intranet and selected financial databases. The extranet gives them access to their account and transaction information, status of loans, and company announcements. Each lender or broker is automatically identified by the extranet and provided with customized information on premium rates, discounts, and any special business arrangements they have negotiated with Countrywide [2].

Snap-on Incorporated spent \$100,000 to create an extranet link to their intranet called the Franchise Information Network. The extranet lets Snap-on's 4,000 independent franchisees for automotive tools access a secured intranet website for customized information and interactive communications with Snap-on employees and other franchisees. Franchisees can get information on sales plus marketing updates. Tips and training programs about managing a franchise operation and discussion forums for employees and franchisees to share ideas and best practices are also provided by the extranet. Finally, the Franchise Information Network provides interactive news and information on car racing and other special events sponsored by Snap-on, as well as corporate stock prices, business strategies, and other financial information [17].

Real Examples

The frequent use of real examples illustrates how companies apply the specific information systems concepts.

Analysis Exercises

1. Application Service Provider Marketplace

The traditional ASP definition includes web interface (or thin client) and external, Internet-based, server-side processing and data storage. However, the business world hasn't always felt constrained by these definitions. Microsoft, McAfee, QuickBooks, and others are providing Internet-based application services without meeting these exact criteria.

Microsoft provides automatic Internet-based application maintenance as part of its one-time licensing fee. Through "automatic updates," Microsoft provides updates, fixes, and security patches to its software without IT staff involvement and minimal end user inconvenience.

McAfee, on the other hand, charges an annual maintenance fee that includes daily application and virus-definition updates. McAfee provides it for one year as part of its license. After the first year, license holders may continue to use the software, but they must pay a subscription fee if they want updates. Customers tend to pay for this subscription service in order to protect themselves from new virus threats.

- Would you use or recommend any of Intuit's online application services (www.intuit.com) to a small business? Why or why not?
- America Online provides a free instant messaging service (AIM). This service enables instant messaging, file sharing, and voice- and video conferencing through a free application anyone can

download and install. Is AOL, operating as an ASP? How so?

- Visit AOL's "Enterprise AIM services" website (enterprise.aim.com). What additional features does AOL provide to enterprises? Why do you suppose AOL moved away from the ASP model for their enterprise solution?

2. eWork Exchange and eLance.com: Online Job Matching and Auctions

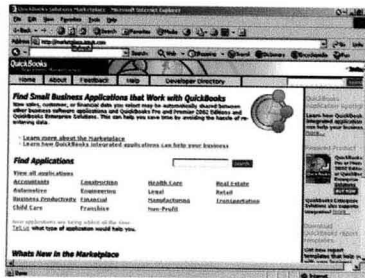
Many opportunities await those who troll the big job boards, the free-agent sites, the auction services where applicants bid for projects, and the niche sites for specialized jobs and skills. Examples of top job-matching and auction sites are eWorkExchange and eLance.com.

eWorkExchange (www.eworkexchange.com). No more sifting through irrelevant search results. Fill out a list of your skills and let eWork Exchange's proprietary technology find the most suitable projects for you—no bidding required.

eLance.com (www.elance.com). This global auction marketplace covers more than just IT jobs; it runs the gamut from astrology and medicine to corporate work and cooking projects. Register a description of your services or go straight to browsing the listings of open projects—and then start bidding. A feedback section lets both employers and freelancers rate one another.

FIGURE 7.29

The QuickBooks Solutions Marketplace provides online application software services from Intuit and their many business partners.



Source: Courtesy of Intuit

Analysis Exercises

Each chapter concludes with exercises that challenge students to analyze data from a variety of perspectives. Each innovative scenario inspires them to combine their newly acquired knowledge with analytical, Web-based, spreadsheet, and database skills to solve business problems.

- These systems can preserve and reproduce the knowledge of experts but have a limited application focus.

simulate an evolutionary process.

Discussion Questions

- Is the form and use of information and decision support in e-business changing and expanding? Why or why not?
- Has the growth of self-directed teams to manage work in organizations changed the need for strategic, tactical, and operational decision making in business?
- What is the difference between the ability of a manager to retrieve information instantly on demand using an MIS and the capabilities provided by a DSS?
- Refer to the Real World Case on Ben & Jerry's and GE Plastics in the chapter. How might a digital dashboard help you as a business professional or manager in your work activities? Give several examples to illustrate your answer.
- In what ways does using an electronic spreadsheet package provide you with the capabilities of a decision support system?
- Are enterprise information portals making executive information systems unnecessary? Explain your reasoning.
- Refer to the Real World Case on Wal-Mart, BankFinancial, and HP in the chapter. Why are neural network and expert system technologies used in many data-mining applications?
- Can computers think? Will they ever be able to? Explain why or why not.
- What are some of the most important applications of AI in business? Defend your choices.
- What are some of the limitations or dangers you see in the use of AI technologies such as expert systems, virtual reality, and intelligent agents? What could be done to minimize such effects?

Problem-solving, analysis, and critical thinking are important skills. Students hone these skills through a variety of thought-provoking questions and creative exercises.

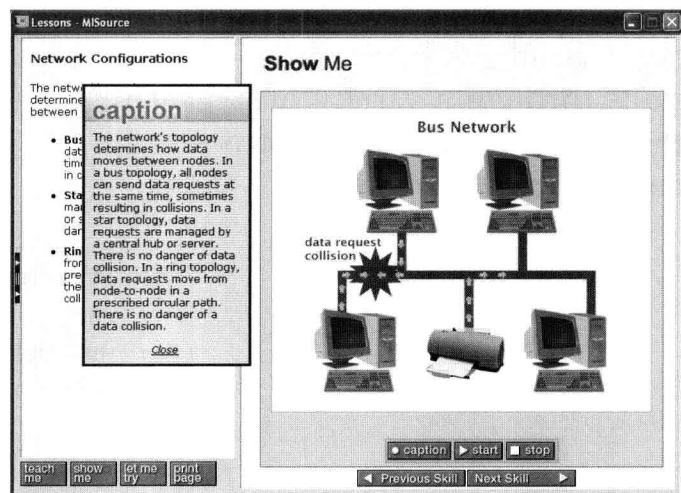
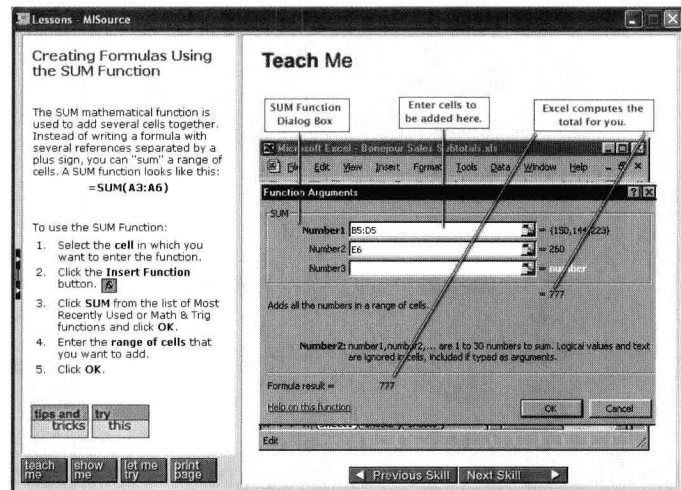
Discussion Questions

Whether assigned as homework or used for in-class discussion, these insightful questions develop critical thinking skills.

Software Skills & Computer Concepts

MISource provides animated tutorials and simulated practice of the core skills in Microsoft Excel, Access and PowerPoint. MISource also animates forty-seven important computer concepts.

Spend less time reviewing software skills and computer literacy. Each text includes a copy of MISource.



MIS Practice and Principles

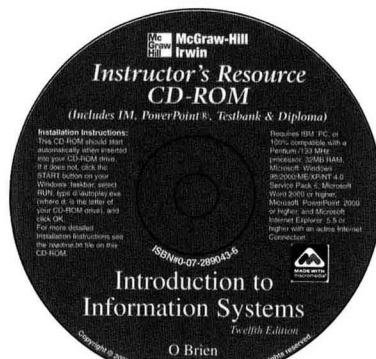
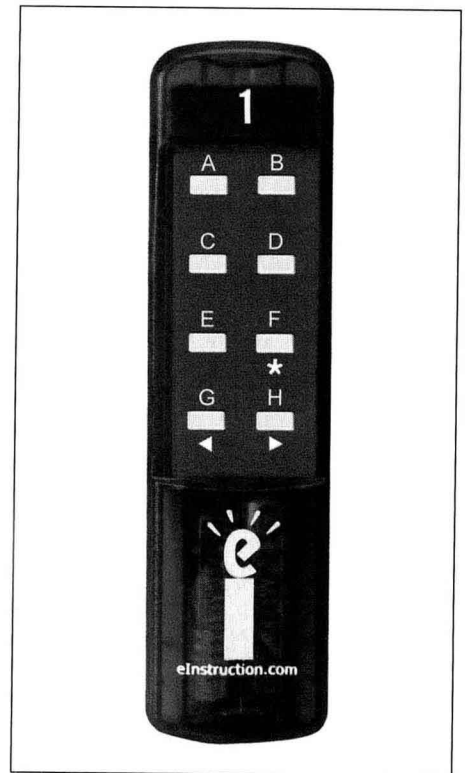
MISource includes three video vignettes about the problems and opportunities facing a growing beverage company. Use the questions that follow each vignette as homework assignments or for discussion. Animated presentations of data mining, online transaction processing, and the systems development life cycle give students more perspective.



Empowered Instruction

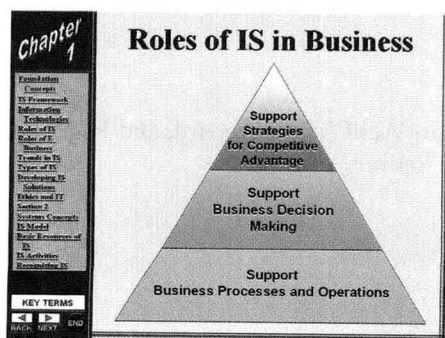
Classroom Performance System

Engage students and assess real-time lecture retention with this simple yet powerful wireless application. You can even deliver tests that instantly grade themselves.



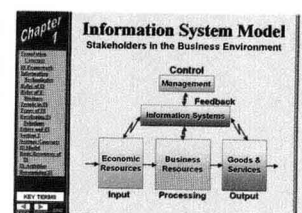
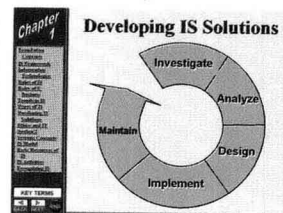
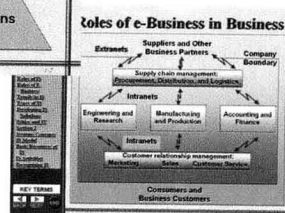
Instructor Resource CD

Everything you need on one CD: PowerPoint slides, Test Item File (in Word and Diploma format), Solutions to end-of-chapter exercises and real world case questions, and much more.



PowerPoint Presentation

Robust, detailed, and designed to keep students engaged.



Problem Solving Video Vignettes

Three separate segments show how a growing beverage company comes to terms with problems and opportunities that can be addressed with database systems, telecommunications technology, and system development. Use the questions that follow each segment to inspire discussion or test students' critical thinking skills.

PowerWeb

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Online Learning Center

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Content for the Twelfth Edition is available in WebCT, Blackboard, and PageOut formats to accommodate virtually any online delivery platform.

Acknowledgments

The new Twelfth Edition represents an ongoing effort to improve and adapt this text to meet the needs of students and instructors. For this revision, we received the guidance of sixty-nine reviewers. I thank every one of them for their insight and advice.

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Acknowledging the Real World of Business

The unique contribution of the hundreds of business firms and other computer-using organizations that are the subject of the real world cases, exercises, and examples in this text is 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 the Internet and other information technologies to enable electronic business and commerce, and enterprise communications and collaboration in support of the business processes, managerial decision making, and strategic advantage of the modern business enterprise.

James A. O'Brien

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