TURBAN • McLEAN • WETHERBE

INFORMATION TECHNOLOGY FOR MANAGEMENT

TRANSFORMING BUSINESS IN THE DIGITAL ECONOMY

3RD EDITION

3RD EDITION

Information Technology for Management

TRANSFORMING BUSINESS IN THE DIGITAL ECONOMY

EFRAIM TURBAN
City University of Hong Kong

EPHRAIM MCLEAN
Georgia State University

JAMES WETHERBE
Texas Tech University

JOHN WILEY & SONS, INC.

3_{RD} EDITION

3RD
EDITION

Information Technology for Management

TRANSFORMING BUSINESS
IN THE DIGITAL ECONOMY

Preface

THE DIGITAL AND WEB REVOLUTION. In the last few years we have been witnessing one of the most important events in human history thus far—the Web revolution. The Web is not only changing the way that we work, study, play, and conduct our lives, but it is doing so much more quickly than any other revolution (such as the Industrial Revolution), with impacts that are more far-reaching. Furthermore, all we have seen is the tip of the iceberg. It is difficult to predict all the implications. The Web revolution is facilitated by ever-changing information technologies.

Computerized systems in general and Web-based systems in particular can be found today in even the smallest businesses. It is almost impossible to run a competitive business without a computerized information system. Indeed, global competitive pressures and continuous innovations are forcing many organizations to *rethink* how they do business. To do so requires the ability to successfully incorporate *electronic commerce, knowledge management, customer relationship management, enterprise resource planning,* and *supply chain management* into an organization.

Information Technology for Management addresses the basic principles of MIS in light of these new developments. For example, one of the major changes occurring in IT is the ability to deliver systems over the Web, rather than to build them. This option, which is delivered by application server providers (ASPs), is a strategic option for the prudent managers of the digital economy. But does it fit all organizations? Such issues that resulted from the Web revolution are discussed in this text. Its major objective is to prepare managers and staff in the modern enterprise to understand the role of information technology in the digital economy.

TRANSFORMING ORGANIZATIONS TO THE DIGITAL ECONOMY

This book is based on the fundamental premise that the major role of information technology is to provide organizations with *strategic advantage by facilitating problem solving, increasing productivity and quality, improving customer service, enhancing communication and collaboration,* and *enabling business process reengineering.* By taking a practical, managerial-oriented approach, the book demonstrates that IT can be provided not only by information systems departments, but by end users and vendors as well. Managing information resources, new technologies, and communications networks is becoming a—or even *the*—critical success factor in the operations of many organizations, private and public, and will be essential to the survival of businesses in the digital economy.

Many introductory texts on information systems are geared toward yesterday's environment, where the important issues were the technology, the construction of information systems, and the support of traditional business functional applications. This book's approach is different. While recognizing the importance of the technology, system development, and functional transaction processing systems, we emphasize the *innovative* uses of information technology. The rapidly increased use of the Web, the Internet, intranets, extranets, and electronic commerce change the manner in which business is done in almost all organizations. This fact is reflected in our book: every chapter and major topic points to the role of the Web in facilitating competitiveness, effectiveness, and profitability. Of special importance is the emergence of the second-generation e-commerce applications such as m-commerce, c-commerce, and e-government. Also, the integration of ERP, CRM, and knowledge management with e-commerce is of a great importance.

FEATURES OF THIS TEXT

In developing the third edition of *Information Technology for Management*, we have tried to craft a book that will serve the needs of tomorrow's managers. During the process of revising and reorganizing this edition, we have been guided by certain recurring themes that are important to succeed in business in the digital economy.

This book reflects our vision of where information systems are going and the direction of IS education in business and e-business programs. This

vision is represented by the following features that we have integrated throughout the book.

- **Digital Economy Focus.** This book was written with the recognition that organizations desire to transform themselves successfully to the digital economy. To do so companies need not only to use Web-based systems, but also to have an appropriate e-strategy and ability to plan click-and-mortar systems as well as new business models. Furthermore, they need to plan the transformation process, which is dependent on information technology.

- **Managerial Orientation.** Most IS textbooks identify themselves as either technology or socio-behavioral oriented. While we recognize the importance of both, our emphasis is on managerial orientation. To do so *we assembled all the major technological topics in five technology guides at the end of the book and on the book's Web site.* Furthermore, we attempted not to duplicate detailed presentations of behavioral sciences topics, such as dealing with resistance to change, or motivating employees. Instead, we concentrate on managerial decision making, cost-benefit justification, supply chain management, organizational restructuring, and CRM as they relate to information technology.

- **Functional Relevance.** Frequently, non–IS major students wonder why they must learn technical details. In this text the relevance of information technology to the major functional areas is an important theme. Also, we show, through the use of icons, the relevance of topics to accounting, finance, marketing, production/operations management, and human resource management. Furthermore, we show the relevance to public services and health care management, using icons. Finally, our examples cover small businesses and the international setting as well.

- **Electronic Commerce and the Use of the Web.** We strongly believe that electronic commerce and the use of the Internet, intranets, and extranets are changing the world of business. Not only is an entire extended chapter (5) dedicated to electronic commerce, but we demonstrate the significance of e-commerce in every chapter and major topic. The world of business is changing, and it is important that students understand these changes and their implications. For example, world-class companies such as General Electric, IBM, FedEx, Dell Computer, and Wal-Mart are introducing extremely innovative logistics systems supported by information technologies. This text tells you about all these innovations.

- **Real-World Orientation.** Extensive, vivid examples from large corporations, small businesses, government, and not-for-profit agencies will make concepts come alive by showing students the capabilities of information technology, its cost and justification, and some of the innovative ways real corporations are using IT in their operations.

- **Failures and Lessons Learned.** While most IT and MIS books introduce only the success of information systems, we present to the students the fact that many systems do fail. Every chapter of this book includes a discussion or example of failures, and the lessons learned from them. The case of FoxMeyer (on the Web site) shows how a large company was bankrupted as a result of misuse of IT.

- **Solid Theoretical Backing.** Throughout the book we present the theoretical foundation necessary for understanding information technology, ranging from Moore's law to Porter's competitiveness models including his latest e-strategy adaptation. Furthermore, we provide extensive references and many exercises to supplement the theoretical presentations.

- **Most Current.** The book presents the most current topics of information technology as evidenced by the many 2000 and 2001 citations. Topics such as mobile and collaborative e-commerce, extranets, chief knowledge officers and knowledge bases, CRM, Web-based supply chain systems, data warehousing, knowledge discovery and management, and information economics are presented both from the theoretical point of view and from the application side.

- **Economic Justification.** Information technology is mature enough to stand the difficult test of economic justification, a topic which is ignored by most textbooks. It is our position that investment in information technology must be scrutinized like any other investment, despite the difficulties of measuring technology benefits. In addition to discussion throughout the text, we are unique in devoting a complete chapter (13, "Information Technology Economics") to this subject.

- **Integrated Systems.** In contrast with many books that highlight isolated functional information systems, we emphasize those systems that support enterprise resources planning (ERP) and supply

chain management. Interorganizational systems are particularly highlighted, including the latest innovations in global e-exchanges.

• *Global Perspective.* The importance of global competition, partnerships, and trading is rapidly increasing. IT facilitates export and import, managing multinational companies, and electronic trading around the globe. International examples are highlighted in a special Global Index in the back of the book, and the book's Web site includes several international cases.

• *Comprehensiveness and Ease of Reading.* All major topics of information technology are covered, many with more details than you will find elsewhere. Furthermore, the book is very user friendly, easy to understand and follow, and it is full of interesting real-world examples and "war stories" that keep readers' interest at a very high level.

• *Ethics.* The importance of ethics is growing rapidly in the digital economy. Therefore we introduce the essentials of ethics as an appendix to Chapter 1. Then ethics is introduced in every chapter highlighted by icons in the margin. Finally, a primer on ethics is provided on the Web site.

ORGANIZATION OF THE BOOK

The book is divided into five major parts composed of 16 regular chapters with five technology guides supplementing them.

Part I (IT in the Organization) introduces the drivers of the use of information technology in the digital economy. It also presents the foundations of information systems and their strategic use. Special attention is given to the role information systems play in facilitating Web-based business models and strategic information systems.

Part II (The Web Revolution) introduces the Web-based technologies and applications, starting with telecommunications networks and the role of the Internet, intranets, and extranets in contributing to communication, collaboration, and information discovery. Electronic commerce is presented in a most comprehensive way, followed by Web-based enterprise systems and supply chain management.

Part III (Organizational Applications) begins with the basics: IT applications in transaction processing and support of functional departments and operations. Planning for technology and the necessary organizational restructuring is discussed next, followed by a presentation of IT-supported knowledge management.

Part IV (Managerial and Decision Support Systems) discusses the many ways information systems can be used to support the day-to-day operations of a company, with a strong emphasis on the use of IT in managerial decision making. The three chapters in this part address some of the ways businesses are using information technology to solve specific problems and build strategic, innovative systems that enhance quality and productivity. Special attention is given to innovative applications of intelligent systems and to enterprise systems. The new approaches to data warehousing, analysis, and presentation are also highlighted.

Part V (Implementing and Managing IT) explores several topics related to the implementation, evaluation, construction, operation, security, and maintenance of information systems. We consider several issues ranging from the economics of information to outsourcing to the impacts of IT.

The five **Technology Guides** cover hardware, software, databases, telecommunications, and the essentials of the Internet. They contain condensed up-to-date presentations of all the material necessary for the understanding of these technologies. They can be used as a self-study refresher or as a basis for a class presentation. The technology guides are supplemented by a glossary, questions for review and discussion, and case studies, all of which are available on our Web site (*www.wiley.com/college/turban*).

PEDAGOGICAL STRUCTURE

We developed a number of pedagogical features to aid student learning and tie together the themes of the book.

• *Chapter Outline.* The outlines provide a quick indication of the major topics covered. Detailed outlines are provided at the beginning of the book.

• *Learning Objectives.* Learning objectives are provided at the beginning of each chapter to help students focus their efforts and alert them to the important concepts discussed.

• *Opening Cases.* Each chapter opens with a *real-world* example that illustrates the importance of information technology to modern corporations. These

cases were carefully chosen to demonstrate the relevance, for business students, of the topics introduced in the chapter. They are presented in a format (problem, IT solution, results) that helps model a way to think about business problems, and are followed by a brief section (called Lessons Learned from this Case) that ties the important points of the opening case to the topic of the chapter.

• *"A Closer Look" Boxes.* These contain detailed, in-depth discussions of specific concepts or procedures, often using real-world examples. Some boxes enhance the in-text discussion by offering an alternative approach to information technology.

• *"IT at Work" Boxes.* These spotlight some real-world innovations and new technologies that companies are relying on to solve organizational dilemmas or create new business opportunities. Each box concludes with "for further exploration" issues.

• *Highlighted Icons.* Icons appear throughout the text to relate the topics covered within each chapter to some major themes of the book. The icons alert students to the related functional areas, IT failures, and ethical issues. Icons also indicate where related enrichment resources can be found on the book's companion Web site.

• *Managerial Issues.* The final section of every chapter explores some of the special concerns managers face as they adapt to an increasingly technological environment. Thought-provoking questions can serve as a springboard for class discussion and challenge business students to consider some of the actions they might take if placed in similar circumstances.

• *Key Terms.* All boldfaced new terms introduced within the chapter appear in a list at the end of the chapter and are defined in the end-of-book glossary.

• *Chapter Highlights.* All the important concepts covered in the chapter are listed at the end and linked by number to the learning objectives introduced at the beginning of each chapter to reinforce the important ideas discussed.

• *End-of-Chapter Exercises.* Different types of questions measure student comprehension and their ability to apply knowledge. Questions for Review ask students to summarize the concepts introduced. Discussion Questions are intended to promote class discussion and develop critical thinking skills. Exercises are challenging assignments that require students to apply what they have learned.

• *Group and Role-Playing Activities.* Comprehensive group assignments, including Internet research, presentation to classes, and role playing are available in each chapter. Students are asked to make competitive presentations and conduct debates.

• *Internet Exercises.* Over 100 hands-on exercises send the students to the most interesting Web sites to conduct research, investigate an application, or learn about the state of the art of a topic.

• *Minicases.* Real-world cases highlight some of the problems encountered by corporations as they develop and implement information systems. Discussion questions and assignments are included. Two types of minicases are available in each chapter. The shorter one is suitable for a class discussion without the need of any reading or Internet search. The longer one requires work on the Internet to be done at home by an individual or a group.

• *Part Ending Cases.* Longer real-world cases were chosen specifically for their ability to bring together many of the overriding concepts from each part of the text. These can be found on our Web site (*www.wiley.com/college/turban*).

• *International Cases.* Several cases from countries around the globe (including multinational corporations) are available on our Web site.

SUPPLEMENTARY MATERIALS

An extensive package of instructional materials is available to support this edition:

• *Instructor's Manual.* This manual presents objectives from the text with additional information to make them more appropriate and useful for the instructor. Chapter overviews provide an explanation of how each chapter fits in with previous chapters and the entire course. The manual also includes practical applications of concepts, case study elaboration, answers to end-of-chapter questions, questions for review, questions for discussion, and Internet exercises.

• *Test Bank.* The test bank contains approximately 1000 questions and problems (about 50 per chapter) consisting of multiple-choice, short answer, fill-ins, and critical thinking/essay questions.

• *Computerized Test Bank.* This electronic version of the test bank allows instructors to customize tests and quizzes for their students.

• *PowerPoint Presentation.* A series of slides designed around the content of the text incorporates key points from the text and illustrations where ap-

propriate. These were prepared by Emily Moody, a specialist in educational technology.

• *Video Series.* A collection of videos provides the students and instructors with dynamic and interesting business examples directly related to the concepts introduced in the text. The video clips illustrate the ways in which computer information systems are utilized in various companies and industries.

• *Business Extra Web Site:* **Wall Street Journal Interactive and the On-Line Business Survival Guide.** Wiley has teamed up with the *Wall Street Journal* to bring you instant access to a wealth of current articles dealing with all aspects of today's volatile business world. Use this resource to get up-to-date articles dealing with issues in information systems. The *On-Line Business Survival Guide* covers everything your students need to know to become master sleuths at finding critical information on the Internet. Each copy of the Survival Guide includes a special password for Wiley's *Business Extra Web Site* that allows students access to a series of relevant clippings from news wires and Dow Jones publications. For more information, go to *www.wiley.com/college/businessextra*.

• *XanEdu.* In a new partnership with XanEdu.com, Wiley now offers students the opportunity to read hundreds of articles related to the information systems industry with just the click of a mouse. Through the Wiley Web site students can get access to hundreds of articles that have been preselected from millions of articles found in thousands of publications. And students always get the most recent articles, as they are updated every 24 hours.

• *The Turban Web Site.* (*www.wiley.com/college/turban*). The Web site extends the content and theme of the text to provide extensive support for instructors and students. Organized by chapter, it includes cases, questions, and exercises for the technology guides, and downloadable PowerPoint slides, self-testing material for students, working students' experiences with using IT, links to resources on the Web, links to many of the companies discussed in the text, and a link to a unique supplement called "The Virtual Company."

• *The Virtual Company.* A Web-based case, The Virtual Company, features Internet and intranet sites for a simulated company that produces snowboards. Students are "hired" by the company as consultants and given assignments which require the students to use the information in the Internet and intranet sites to develop solutions and produce deliverables to present to the company. These exercises get the student into active, hands-on learning to complement the conceptual coverage of the text.

ACKNOWLEDGMENTS

About the Authors

DR. EFRAIM TURBAN

Dr. Efraim Turban obtained his MBA and Ph.D. degrees from the University of California, Berkeley. His industry experience includes eight years as an industrial engineer, three of which were spent at General Electric Transformers Plant in Oakland, California. He also has extensive consulting experience to small and large corporations as well as to governments.

In his over thirty years of teaching, Professor Turban has served as Chaired Professor at Eastern Illinois University, and as Visiting Professor at Nanyang Technological University in Singapore. He has also taught at UCLA; USC; Simon Fraser University; Lehigh University; California State University, Long Beach; and Florida International University.

Dr. Turban was a Co-recipient of the 1984/85 National Management Science Award (Artificial Intelligence in Management). In 1997 he received the Distinguished Faculty Scholarly and Creative Achievement Award at California State University, Long Beach.

Dr. Turban has published articles in over 100 leading journals, including the following: *Management Science, MIS Quarterly, Operations Research, Journal of MIS, Communications of the ACM, Information Systems Frontiers, Decision Support Systems, International Journal of Information Management, Heuristics, Expert Systems with Applications, International Journal of Applied Expert Systems, Journal of Investing, Accounting, Management and Information Systems, Computers and Operations Research, Computers and Industrial Engineering, IEEE Transactions on Engineering Management, Omega, International Journal of Electronic Commerce, Organizational Computing and Electronic Commerce,* and *Electronic Markets.* He has also published 20 books, including best sellers such as *Neural Networks: Applications in Investment and Financial Services* (2nd edition) (co-editor with R. Trippi), Richard D. Irwin, 1996; *Decision Support Systems and Intelligent Systems,* (Prentice Hall, 6th edition, 2001); *Expert Systems and Applied Artificial Intelligence,* (MacMillan Publishing Co., 1992), *Electronic Commerce: A Managerial Approach,* (Prentice Hall, 2002) and *Introduction to Information Technology* (Wiley, 2001).

Professor Turban is currently on the faculty of City University of Hong Kong, Department of Information Systems, Faculty of Business Administration. Professor Turban's current major interest is electronic commerce, strategy, and implementation.

DR. EPHRAIM MCLEAN

Dr. Ephraim McLean obtained his Bachelor of Mechanical Engineering degree from Cornell University in 1958. After brief service in the U.S. Army Ordnance Corps, he worked for Procter & Gamble Co. for seven years, first in manufacturing management and later as a computer systems analyst. In 1965, he left P&G and entered the Sloan School of Management at the Massachusetts Institute of Technology, obtaining his master's degree in 1967 and his doctorate in 1970.

While at M.I.T., he began an interest in the application of computer technology to medicine, working on his dissertation at the Lahey Clinic in Boston. While there, he was instrumental in developing the Lahey Clinic Automated Medical History System. During the same period, he served as an instructor at M.I.T. and also assisted in the preparation of the books *The Impact of Computers on Management* (MIT Press, 1967); *The Impact of Computers on Collective Bargaining* (MIT Press, 1969); and *Computers in Knowledge-Based Fields* (MIT Press, 1970).

Dr. McLean left M.I.T. and joined the faculty of the Anderson Graduate School of Management at the University of California, Los Angeles (UCLA) in the winter of 1970. He was the founding Director of the Information Systems Research Program and the first Chairman of the Information Systems area, both within the Anderson Graduate School of Management. In fall 1987, he was named to the George E. Smith Eminent Scholar's Chair at the College of Business Administration at Georgia State University in Atlanta, Georgia.

Dr. McLean has published over 80 articles in such publications as the *Harvard Business Review; Sloan Management Review; California Management Review; Communications of the ACM; MIS Quarterly; Information Systems Research, Information & Management; Journal of MIS; Journal of Risk and Insurance; DATA BASE; InformationWEEK; Datamation; ComputerWorld;* and the *Journal of the American Hospital Association.* He is the co-author of *Strategic Planning for MIS* (Wiley Interscience, 1977) and co-editor of a book of programs entitled *APL Application in Management.* He was a founding Associate Editor for Research of the *MIS Quarterly* and is currently senior co-editor of the *DATA BASE for Advances in Information Systems.* He was twice on the national Executive Council of the Society for Information Management (SIM). In 1980, he helped organize the International Conference on Information Systems (ICIS) and was Conference Co-

chairman in 1981 in Cambridge, Massachusetts; Conference Chairman in 1986 in San Diego, California; and Conference Co-chairman in 1997 in Atlanta, Georgia. He is currently Vice President for Affiliated Organizations of the Association for Information Systems (AIS).

In addition to university work, he has served as a consultant to such firms as the IBM Corporation, General Electric Company, Atlantic Richfield Company, Digital Equipment Corporation, BellSouth Corporation, the National Science Foundation, American Hospital Supply Corporation, McCormick & Company, Security Pacific National Bank, Pennsylvania Financial Corporation (now Primerica), and Citibank, N.A. of New York. He has also made executive presentations and conducted management workshops in Asia, Australia, Europe, South Africa, and throughout North America.

DR. JAMES C. WETHERBE

Dr. James C. Wetherbe is Stevenson Chair of Information Technology at Texas Tech University as well as Professor of MIS at the University of Minnesota where he directed the MIS Research Center for 20 years. He is internationally known as a dynamic and entertaining speaker, author, and leading authority on the use of computers and information systems to improve organizational performance and competitiveness. He is particularly appreciated for his ability to explain complex technology in straightforward, practical terms that can be strategically applied by both executives and general management.

Dr. Wetherbe is the author of 18 highly regarded books and is quoted often in leading business and information systems journals. He has also authored over 200 articles, was ranked by *InformationWEEK* as one of the top dozen information technology consultants, and is the first recipient of the MIS Quarterly Distinguished Scholar Award. He has also served on the faculties of the University of Memphis, where he was Fed Ex Professor and Director of the Center for Cycle Time Research, and the University of Houston. Dr. Wetherbe received his Ph.D. from Texas Tech University.

Brief Contents

Contents