

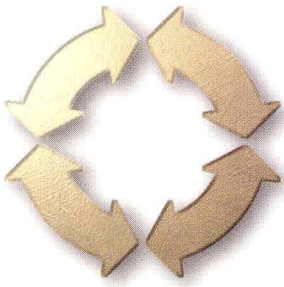
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Turban • McLean • Wetherbe



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**INFORMATION
TECHNOLOGY
for MANAGEMENT**
**Making Connections for
Strategic Advantage**

SECOND EDITION

INFORMATION TECHNOLOGY FOR MANAGEMENT



Making Connections for Strategic Advantage

Second Edition

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INFORMATION TECHNOLOGY FOR MANAGEMENT



PREFACE

As we approach the end of the century and the millennium, we witness the growing importance of computerized information systems. The number of computers is growing rapidly, as are their applications in business, education, government, the military, medicine, and at home. Computerized systems can be found today in even the smallest businesses. In most cases it is impossible to run a competitive business without a computerized information system.

Global competitive pressures and continuous innovations are forcing many organizations to *rethink* the manner in which they do business and to *reengineer* themselves. Such reengineering requires, in almost all cases, the support of some information technologies. As organizations increasingly depend on computerized information systems, the construction, use, management, and maintenance of these systems becomes essential to the welfare or even survival of many organizations. Therefore, many organizations are creating a new position, chief technology officer (CTO) to manage the technology assets.

▶ MAKING CONNECTIONS FOR STRATEGIC ADVANTAGE

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, 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 companies, and will be essential to the survival of businesses as we reach the year 2000.

Many introductory texts on information systems are geared toward yesterday's environment, where the important issues were the technology, the con-

struction 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 where 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 Enterprise Resource Planning (ERP) concept and the integrated information systems (such as those provided by SAP AG) that support it.

▶ FEATURES OF THIS TEXT

In developing the second 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 as we move into the twenty-first century.

This book reflects our vision of where information systems are going and the direction of IS education in business programs. This vision is represented by the following features that we have integrated throughout the book.

- ▶ **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 the four technology guides at the end of the book*. 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, and business process reengineering 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 education. Furthermore, we show the relevance to public services and health care management, using additional icons. Finally, our examples cover small businesses as well.
- ▶ **Real-World Orientation.** Extensive, vivid examples from large corporations, small businesses, and 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.
- ▶ **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. 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 1997 and 1998 citations. Topics such as electronic commerce, extranets, chief knowledge officers and knowledge bases, Web-based supply chain systems, data warehousing, knowledge discovery, and information economics are presented both from the theoretical point of view and from the application side.
- ▶ **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 (6) dedicated to electronic commerce, but we demonstrate our belief in every chapter and major topic. The world of commerce is changing and it is important that students understand these changes and their implications. For example, world-class companies such as FedEx, Dell computers, and Wal-Mart are introducing extremely innovative logistics

systems supported by information technologies. This text tells you about all these innovations.

- ▶ **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 commerce.
- ▶ **Global Perspective.** The importance of global competition, partnerships, and trading is rapidly increasing. IT facilitates export and import, managing multinational companies, and trading electronically 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 the reader's interest at a very high level.

▶ ORGANIZATION OF THE BOOK

The book is divided into four major parts composed of 15 regular chapters with four technology guides supplementing them.

Part I introduces the drivers of the use of information technology in the new world of business. It also introduces the foundations of information systems and their strategic use. Special attention is given to the role information systems play in facilitating business process reengineering.

Part II introduces network computing, the various applications of telecommunication 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 an analysis of information technology impacts on individuals, groups, organizations, and society.

Part III 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 four 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 integrated systems, not only within organizations but also between and among business partners and customers. Also highlighted are the new approaches to marketing databases and knowledge management.

Part IV explores many topics, related to the planning, evaluation, construction, operation, security, and maintenance of information systems. We consider several issues ranging from the economics of information to outsourcing to the Year 2000 problem.

The four **technology guides** cover hardware, software, databases, and telecommunications, including 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.

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 (Connections).** 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.
- ▶ **“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 back to some major themes of the book. The icons alert students to the related functional areas, and to human resource management and health care applications.
- ▶ **Student Annotations.** To help business students understand the relevance of the topics in this book, we asked students who also hold jobs to add their comments about how the concepts are applied in the business world. Their remarks appear in the margins throughout the book.
- ▶ **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.** A list of all the important concepts covered, the chapter highlights are linked 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. The Group Assignments are class projects designed to foster teamwork.

- ▶ **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 group assignments are included.
- ▶ **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.
- ▶ **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** (0471-28333-9). Written by Tushar Hazra (University of Baltimore), 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** (0471-29933-2). Written by Lisa Friedrichsen (instructor at the Keller Graduate School of Management), the test bank contains approximately 1,000 questions and problems (about 50 per chapter) consisting of multiple-choice, short answer, fill-ins, and critical thinking/essay questions.
- ▶ **Computerized Test Bank** (0471-29927-8). This electronic version of the Test Bank allows instructors to customize tests and quizzes for their students.
- ▶ **PowerPoint Presentation** (0471-29928-6). A series of slides designed around the content of the text incorporates key points from the text and illustrations where appropriate. These were prepared by Wade Jackson of University of Memphis.
- ▶ **Video Series** (0471-29929-4). A collection of videos which provide 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 Website: 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* (0-471-25503-3) 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 Website* 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
- ▶ **The Turban Web Site** (www.wiley.com/college/turban2e). 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 student's experiences with using IT, links to many of the companies discussed in the text, and a link to a unique supplement called "The Virtual Company" described below.
- ▶ **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 the 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.

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Many other individuals provided assistance in the creation of the second edition. First, dozens of students participated in the class testing of the material and helped develop exercises and find illustrative applications, and contributed valuable suggestions and annotations for the text. It is not possible to name all of them, but they certainly deserve recognition and thanks.

Faculty feedback was essential to the development of the book. Many individuals participated in focus groups and/or acted as reviewers. Several others created portions of chapters or cases, especially international cases, some of which are in the text and others are on the Web site. We are grateful to the following faculty for their contributions to the second edition:

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Dr. Efraim Turban obtained his MBA and Ph.D 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. He also has extensive consulting experience to small and large corporations as well as to foreign governments.

In his thirty years of teaching, Professor Turban has served as Distinguished 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, 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*, *Expert Systems, Operations Research*, *Expert Systems With Applications*, *Journal of MIS*, *Communications of the ACM*, *Decision Support Systems*, *International Journal of Information Management*, *Heuristics*, *International Journal of Applied Expert Systems*, *The Journal of Investing*, *Accounting, Management and Information Systems*, *Computers and Operations Research*, *Computers and Industrial Engineering*, *IEEE Transactions on Engineering Management*, *Omega*, *Human Systems Management and Information Resources Management*. He has also published fifteen books, including bestsellers 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 Expert Systems* Prentice Hall, 5th edition, 1998; and *Expert Systems and Applied Artificial Intelligence* MacMillan Publishing Co., 1992. Books in progress include *Fundamentals of Electronic Commerce* (2000) and *Essentials of Managing Information Systems* (2000).

Professor Turban is currently on the faculty at California State University, Long Beach, Department of Information Systems, College of Business Administration. Professor Turban's current major interest is electronic commerce. He is the co-chair of the 1999 International Conference of Electronic Commerce.

DR. EPHRAIM MCCLEAN

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 the Fall of 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 new 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 WETHERBE

Dr. James Wetherbe is FedEx Professor of Excellence and the Executive Director of the FedEx Center for Cycle Time Research at the University of Memphis, as well as Professor of MIS and the Director of the MIS Research Center at the University of Minnesota. 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.

Quoted often in leading business and information system journals, Dr. Wetherbe writes regular columns and serves as a consulting editor for publishing companies. He is the author of 17 highly regarded books and over 200 articles in the field of management and information systems.



STUDENT PANEL

Written with students in mind, this book tries to present materials as they relate to today's world of commerce. To help business students understand the importance of these concepts and applications, we asked several students to provide annotations for *Information Technology for Management* to show how the information in the text can be applied directly to their careers, whatever function they may serve in their organization. We are grateful to the following students for their thoughtful annotations, which can be found in the margins throughout the text.

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BRIEF CONTENTS

PART I IT IN THE ORGANIZATION

- | | |
|--|-----|
| 1. Organizations, Environments, and Information Technology | 3 |
| 2. Information Technologies: Concepts and Management | 42 |
| 3. Strategic Information Systems | 74 |
| 4. Business Process Reengineering and Information Technology | 112 |

PART II NETWORKS AND IT

- | | |
|---|-----|
| 5. Network Computing: Discovery, Communication, and Collaboration | 167 |
| 6. Electronic Commerce | 209 |
| 7. Impacts of IT on Organizations, Individuals, and Society | 282 |

PART III USING IT

- | | |
|--|-----|
| 8. Transaction Processing, Innovative Functional Systems, Supply Chain Integration | 325 |
| 9. Supporting Management and Decision Making | 382 |
| 10. Data and Knowledge Management | 424 |
| 11. Intelligent Support Systems | 467 |

PART IV MANAGING IT

- | | |
|---|-----|
| 12. Planning for Information Technology and Systems | 517 |
| 13. Information Technology Economics | 557 |
| 14. Systems Development | 602 |
| 15. Managing Information Resources, Control, and Security | 645 |

TECHNOLOGY GUIDES

- | | |
|---|-----|
| T.1 Hardware | 696 |
| T.2 Software | 721 |
| T.3 Data and Databases | 744 |
| T.4 Telecommunications and the Internet | 762 |



CONTENTS

PART I IT IN THE ORGANIZATION 1

1. ORGANIZATIONS, ENVIRONMENTS, AND INFORMATION TECHNOLOGY 3

- 1.1 The New World of Business 4
 - Business Pressures* 7
 - Technological Pressures* 9
 - Organizational Responses* 10
 - Information Systems and Information Technology* 17
- 1.2 Examples of Information Systems at Work Worldwide 19
 - Managing Accounting Information Across Asia* 20
 - Russians Live in Moscow and Work in California* 20
 - Tracking UPS Packages with Pen Computers* 20
 - Mercy Hospital Provides Patient-Focused Care* 21
 - Boeing Trains Its Employees Electronically* 22
 - Integrating Finance, Manufacturing, and Sales Increases Customer Satisfaction and Productivity* 23
 - Crime Fighting Information Technology* 23
 - Maximizing the Value of John Deere's Pension Fund* 24
 - Web-based Information Systems at Oregon State* 24
 - Amazon.com Changes the Book Selling Industry* 25
- 1.3 Information Technology Developments and Trends 25
 - General Technological Trends* 26
 - Networked Computing* 28
- 1.4 Why Should You Learn About Information Technology? 31
 - Employment Opportunities in Information Technology* 32
- 1.5 Plan of the Book 33
- Technology Guides (at the End of the Book) 34
- Managerial Issues 35

2. INFORMATION TECHNOLOGIES: CONCEPTS AND MANAGEMENT 42

- 2.1 Information Systems: Concepts and Definitions 44
- 2.2 Classification of Information Systems 45
 - Classification by Organizational Structure* 46
 - Classification by Functional Area* 47
 - Classification by Support Provided* 47
 - The Evolution of the Support System* 48
 - Classification by System Architecture* 52
- 2.3 Transactional and Functional Processing 53
 - Transaction Processing* 53
 - Functional Management Information Systems* 54
- 2.4 Operational, Managerial, and Strategic Systems 55
 - Classification by the Activity Supported* 55
 - The Relationship Between People and Information Systems* 56
- 2.5 Information Infrastructure and Architecture 58
 - Infrastructure* 58
 - Architecture* 59
 - New Architecture: Client/Server, Enterprisewide Computing, Intranets, the Internet, and Extranets* 62
- 2.6 Managing Information Resources 65
 - Which Resources Are Managed by Whom?* 65
 - What Is the Role of the Information Systems Department?* 66
 - Managing Relationships with End Users* 67
- Managerial Issues 68

3. STRATEGIC INFORMATION SYSTEMS 74

- 3.1 Strategic Advantage and Information Technology 74
 - Strategic Information Systems* 76
 - Elements of Strategic Management* 77
- 3.2 Porter's Competitive Forces Model and Strategies 82

	<i>The Model</i>	82
	<i>Response Strategies</i>	83
	<i>How the Model Is Used</i>	85
3.3	Porter's Value Chain Analysis Model	88
	<i>How the Model Is Used</i>	90
3.4	Strategic Information Systems Frameworks	92
	<i>Porter and Millar's Framework</i>	92
	<i>Wiseman and MacMillan Framework</i>	94
	<i>Bakos and Treacy Framework</i>	94
	<i>Customer Resource Life Cycle Framework</i>	95
3.5	A Framework for Global Competition	96
	<i>The Global Business Drivers Framework</i>	96
3.6	Strategic Information Systems Applications	97
	<i>Sustaining a Strategic Advantage</i>	104
	Managerial Issues	106
4.	BUSINESS PROCESS REENGINEERING AND INFORMATION TECHNOLOGY	112
4.1	Basic Concepts and the Need for BPR	114
	<i>Definitions</i>	116
	<i>When Is Business Process Reengineering Needed?</i>	117
	<i>Problem of the Stovepipe</i>	119
	<i>Fragmented Piecemeal Systems</i>	120
	<i>Integration</i>	120
4.2	The Principles of BPR and the Role of IT	122
	<i>Characteristics of Business Process Reengineering</i>	122
	<i>Methodologies and Frameworks for BPR</i>	124
	<i>The Enabling Role of Information Technology</i>	124
4.3	BPR and Restructuring the Organization	127
	<i>From Mass Production to Mass Customization</i>	128
	<i>Cycle Time Reduction</i>	132
	<i>Restructuring Organizations</i>	132
4.4	The Networked Organization	136
	<i>The Structure of Networked Organizations</i>	136
	<i>Empowerment</i>	138
	<i>Teams</i>	140
4.5	Virtual Corporations	142
	<i>Definitions and Characteristics</i>	142
	<i>The Virtual Corporations and Interorganizational Information Systems</i>	143
	<i>How IT Supports Virtual Corporations</i>	143
	<i>Some Examples of IT-Supported Virtual Corporations</i>	144

4.6	Total Quality Management and Reengineering	145
	<i>Nothing Happens Until You Measure It</i>	146
	<i>Relevance of Information Systems TQM</i>	147
4.7	Implementing Reengineering	149
	<i>Redesign</i>	149
	<i>Retool</i>	151
	<i>Reorchestrate</i>	153
	<i>Some Implementation Issues</i>	155
	<i>When to Use BPR</i>	155
	Managerial Issues	156

PART II NETWORKS AND IT 165

5. NETWORK COMPUTING: DISCOVERY, COMMUNICATION, AND COLLABORATION 167

5.1	The Internet	169
	<i>Overview and Definitions</i>	169
	<i>The Information Superhighway</i>	170
	<i>Benefits of the Internet</i>	173
	<i>Supporting Discovery: Using the Web</i>	173
	<i>Supporting Communication</i>	174
	<i>Factors Determining the Uses of Information Technologies</i>	175
	<i>Supporting Collaboration</i>	178
5.2	Groupware Technology and Infrastructure	179
	<i>Workflow and Screen-sharing Systems</i>	180
	<i>Visual Communications</i>	181
	<i>Electronic Voice Communication</i>	184
	<i>Group Decision Support Systems (GDSS)</i>	186
	<i>Integrated Technologies and Lotus Notes/Domino</i>	189
	<i>The Intranet and the Extranet</i>	193
5.3	Some Internet Implementation Topics	196
	<i>Internet-Based Software Agents</i>	196
	<i>Ethics on the Net</i>	199
	Managerial Issues	201

6. ELECTRONIC COMMERCE 209

6.1	Foundations of Electronic Commerce	211
	<i>Definitions, History, and Scope</i>	211
	<i>Interorganizational Systems and Electronic Markets</i>	214
	<i>Benefits and Limitations of Electronic Commerce</i>	215
	<i>The Process and Future of Electronic Commerce</i>	219
6.2	Business-to-Consumer Applications	221

<i>Advertising, Online Publishing, Push Technology</i>	221
<i>Cyberbanking, Personal Finance, Stock Trading</i>	229
<i>The Job Market, Auctions, Bids, and Bartering</i>	232
<i>Travel and Real Estate</i>	235
<i>Electronic Retailing and Malls</i>	236
<i>A Non-Internet Application</i>	240
6.3 Business-to-Business Applications	241
<i>Electronic Data Interchange (EDI)</i>	241
<i>Intranet Commerce</i>	245
<i>The Extranet</i>	247
<i>Other Business-to-Business Activities</i>	249
6.4 Customers, Market Research, and Customer Support	252
<i>Customers and Their Behavior</i>	252
<i>Market Research</i>	253
<i>Customer Service</i>	254
<i>Electronic Commerce Agents</i>	255
6.5 Infrastructure, Payments, and Support	258
<i>Electronic Commerce Infrastructure</i>	258
<i>Electronic Payments</i>	259
<i>Support Services</i>	269
<i>Legal and Security Issues</i>	270
<i>Implementation Issues</i>	272
Managerial Issues	273
7. IMPACTS OF IT ON ORGANIZATIONS, INDIVIDUALS, AND SOCIETY	282
7.1 Does IT Have Only Positive Effects?	283
7.2 Ethical Issues	285
<i>A Framework</i>	285
<i>Protecting Privacy</i>	286
<i>Protecting Intellectual Property</i>	293
7.3 Impacts on Organizations	295
<i>Structure, Authority, Power, and Job Control</i>	295
<i>Personnel Issues</i>	296
<i>The Manager's Job</i>	297
7.4 Impacts on Individuals at Work	298
<i>Job Satisfaction</i>	298
<i>Dehumanization and Psychological Impacts</i>	298
<i>Impacts on Health and Safety</i>	299
7.5 Societal Impacts and the Internet	
Community	302
<i>Opportunities for People with Disabilities</i>	302
<i>Quality of Life Improvements</i>	303
<i>The Internet (Electronic) Community</i>	306
<i>Information Technology and Employment Level</i>	307

<i>Telecommuting</i>	310
<i>Other Impacts</i>	312
Managerial Issues	313

PART III USING IT 323

8. TRANSACTION PROCESSING, INNOVATIVE FUNCTIONAL SYSTEMS, SUPPLY CHAIN INTEGRATION 325

8.1 Functional Information Systems	326
<i>Crossing Functional Boundaries</i>	326
<i>Porter's Value Chain Model and the Supply Chain</i>	328
<i>Major Characteristics</i>	328
8.2 Transaction Processing Information Systems	330
<i>Computerization of Routine Transaction Processes</i>	330
<i>Activities and Methods of TPS</i>	330
<i>Client/Server and Internet-Based TPS</i>	332
<i>Typical Tasks in Transaction Processing</i>	333
8.3 Innovative IT Applications in the Functional Areas	337
<i>Managing Production/Operations and Logistics</i>	337
<i>Managing Marketing and Sales</i>	348
<i>Channel Systems</i>	348
<i>Distribution Channels</i>	352
<i>Managing the Accounting and Finance Systems</i>	356
<i>Managing Human Resources Systems</i>	365
8.4 ERP and Integrated Information Systems	371
Reasons for Integration	371
<i>Enterprise Resource Planning and SAP</i>	
Software	372
Managerial Issues	374

9. SUPPORTING MANAGEMENT AND DECISION MAKING 382

9.1 The Managers and Decision Making	384
<i>The Manager's Job</i>	384
<i>Managerial Decisions and Computerized Support</i>	385
<i>Modeling and Models</i>	386
<i>Computerized Decision Aids</i>	390
<i>A Framework for Computerized Decision Support</i>	393
9.2 Decision Support Systems	395
DSS Concepts	395