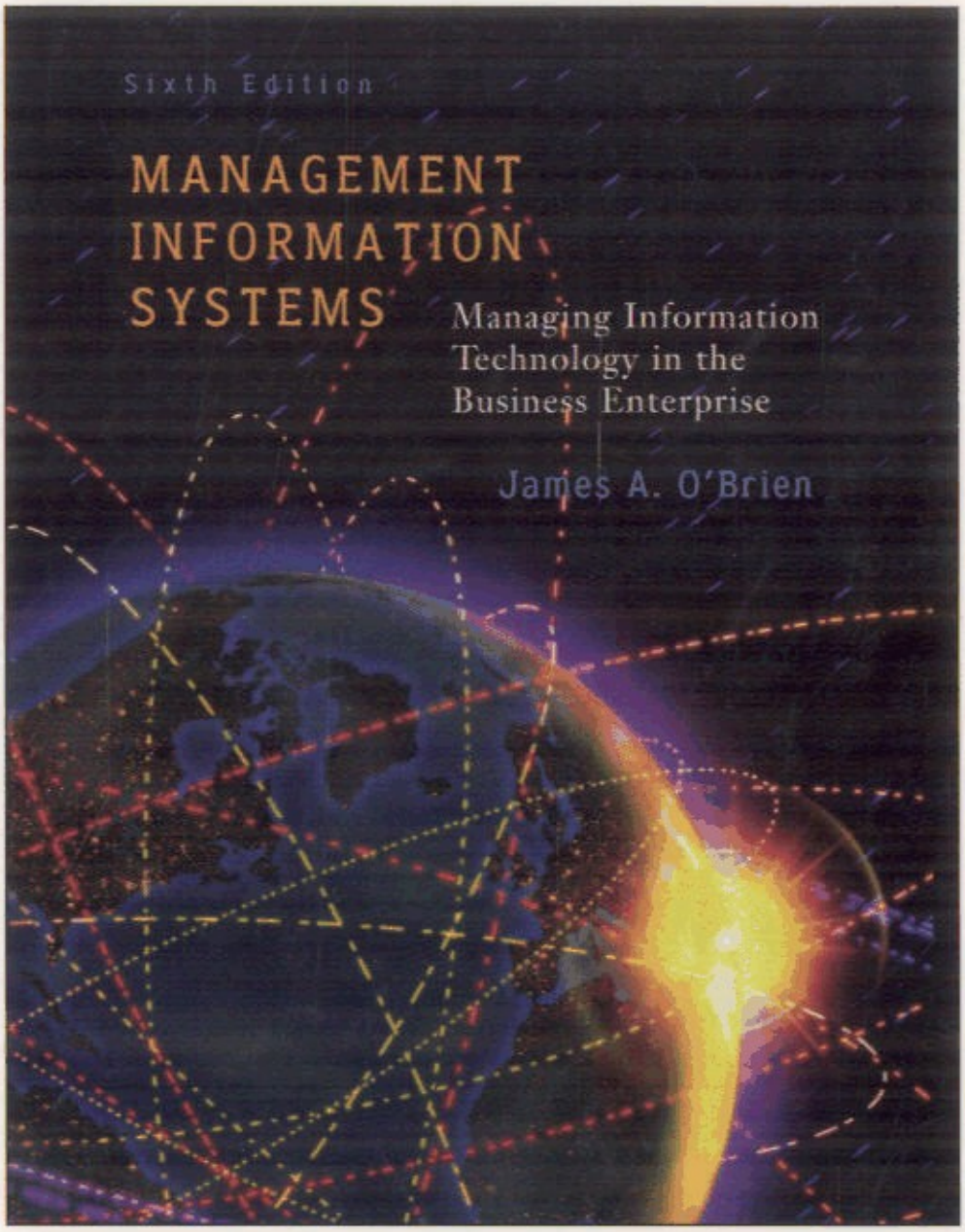
INTERNATIONAL EDITION



McGRAW-HILL

CONTENTS

MODULE 1 Foundation Concepts

CHAPTER 1

Foundations of Information Systems in Business 3

Section I: Foundation Concepts: Information Systems and Technologies 4

Why Information Systems Are Important 4

The Real World of Information Systems 4

Analyzing BellSouth Corporation 4

Real World Case: BellSouth Corporation: The Business Payback of Information Technology 5

What You Need to Know 6

An IS Framework for Business Professionals 6
What Is an Information System? 7
Information Technologies 7

System Concepts: A Foundation 8

What Is a System? 8
Feedback and Control 9
Other System Characteristics 9

Components of an Information System 10

Information System Resources 10

People Resources 11
Hardware Resources 11
Software Resources 12
Data Resources 13
Network Resources 13

Information System Activities 14

Input of Data Resources 14
Processing of Data into Information 14
Output of Information Products 15
Storage of Data Resources 15
Control of System Performance 15

Recognizing Information Systems 15

Analyzing BellSouth Corporation 15

Section II: Foundation Concepts: Business Applications, Development, and Management 17

The Fundamental Roles of IS Applications in Business 17

Analyzing Royal Caribbean International 17

Real World Case: Royal Caribbean International: Renewing and Realigning IT with Business 18

The Major Roles of IS: Examples 19

e-Business in Business 19

Trends in Information Systems 21

Types of Information Systems 22

Operations Support Systems 22
Management Support Systems 24
Other Classifications of Information Systems 25

Managerial Challenges of Information Technology 26

Success and Failure with IT 26
Developing IS Solutions 27
Challenges of Ethics and IT 28
Challenges of IT Careers 29
The IS Function 30

Real World Case: Clariant International: Developing e-Business Systems That Pay Off 36

Real World Case: Hershey Foods Corp.: Failure and Success with Information Technology 37

Real World Case: WH Smith PLC: Supporting Retail Management with Information Technology 38

CHAPTER 2

Competing with Information Technology 39

Section I: Fundamentals of Strategic Advantage 40

Strategic IT 40

Analyzing WESCO International 40

Real World Case: WESCO International, Inc.: Strategic Links in the Supply Chain 41

Competitive Strategy Concepts 42

Strategic Uses of Information Technology 43

Other Competitive Strategies 44

The Value Chain and Strategic IS 46

Value Chain Examples 46

Section II: Using Information Technology for Strategic Advantage 48

Strategic Uses of IT 48

Analyzing Staples Inc. 48

Real World Case: Staples Inc.: Innovations in Business and Consumer e-Commerce 49

Building a Customer-Focused e-Business 50

Reengineering Business Processes 52

The Role of Information Technology 53

Improving Business Quality 54

Total Quality Management 54

Becoming an Agile Company 55

Creating a Virtual Company 57

Virtual Company Strategies 57

Building a Knowledge-Creating Company 58

Knowledge Management Systems 59

Real World Case: Enron Corp. and Others: Lessons in the Strategic Business Use of IT 64

Real World Case: Delta Technology and First Health Group: Evaluating the ROI of Strategic IT 65

Real World Case: Ford, Dow Chemical, IBM, and Others: Success and Failure with Six Sigma 66

MODULE II Information Technologies

CHAPTER 3

Data Resource Management 69

Section I: Managing Data Resources 70

Data Resource Management 70

Analyzing IBM versus Oracle 70

Real World Case: IBM versus Oracle: Playing Catch-Up in Database Management 71

Foundation Data Concepts 72

Character 72
Field 72
Record 73
File 73
Database 73

Types of Databases 73

Operational Databases 73
Distributed Databases 74
External Databases 75
Hypermedia Databases 75

Data Warehouses and Data Mining 75

Data Mining 77

The Database Management Approach 78

Database Management Software 79
Database Interrogation 79
Database Maintenance 80
Application Development 81

Implementing Data Resource Management 81

Challenges of Data Resource Management 82

Section II: Technical Foundations of Database Management 84

Database Management 84

Analyzing Experian Automotive 84

Database Structures 84

Real World Case: Experian Automotive: The Business Value of Data Resource Management 85

Hierarchical Structure 86
Network Structure 87
Relational Structure 87
Multidimensional Structure 87
Object-Oriented Structure 87
Object Technology and the Web 88
Evaluation of Database Structures 88

Accessing Databases 90

Key Fields 90
Sequential Access 90
Direct Access 91

Database Development 91

Data Planning and Database Design 92

Real World Case: Shell Exploration and Others: Using Data Warehouses for Data Resource Management 98

Real World Case: BlueCross BlueShield and Warner Bros.: The ROI of Storage Area Networks 99

Real World Case: Sherwin-Williams and Krispy Kreme: Managing External Data Sources 100

CHAPTER 4

Telecommunications and Networks 101

Section I: The Networked Enterprise 102

Networking the Enterprise 102

Analyzing FedEx versus UPS 102

Real World Case: FedEx versus UPS: Playing Catch-Up in Telecommunications Innovation 103

Trends in Telecommunications 104

Industry Trends 104
Technology Trends 104
Business Application Trends 106

The Business Value of Telecommunications Networks 106
The Internet Revolution 107
Internet Applications 107
Business Use of the Internet 108
The Business Value of the Internet 109
The Role of Intranets 110
The Business Value of Intranets 110
The Role of Extranets 112
Business Value of Extranets 113

Section II: Telecommunications Network Alternatives 114

Telecommunications Alternatives 114
Analyzing Nielsen Media and Others 114
Real World Case: Nielsen Media Research and Others: Network Bandwith Management Challenges 115
A Telecommunications Network Model 116
Types of Telecommunications Networks 117
Wide Area Networks 117
Local Area Networks 117
Virtual Private Networks 118
Client/Server Networks 119
Network Computing 120
Peer-to-Peer Networks 120
Telecommunications Media 122
Twisted-Pair Wire 122
Coaxial Cable 122
Fiber Optics 122
Wireless Technologies 123
Terrestrial Microware 123
Communications Satellites 123
Cellular and PCS Systems 125
Wireless LANs 125
The Wireless Web 125
Telecommunications Processors 127
Modems 127
Multiplexers 128
Internetwork Processors 128
Telecommunications Software 128
Network Management 129
Network Topologies 130
Network Architectures and Protocols 131
The OSI Model 131
The Internet's TCP/IP 131
Bandwidth Alternatives 131
Switching Alternatives 132
Real World Case: Link Staffing, FMC, AutoWeb, and APL Logistics: Evaluating Virtual Private Network Services 139
Real World Case: Dow Chemical: The Business Case for Internet Telephony 140
Real World Case: General Motors Corporation: The Business Value of Wireless LANs 141

MODULE III Business Applications

CHAPTER 5

Introduction to e-Business Systems 143

Section I: Functional Business Systems 144

Introduction 144
Analyzing Cypress Semiconductor and FleetBoston 144
Real World Case: Cypress Semiconductor and FleetBoston: Benefits and Challenges of Targeted Marketing 145
IT in Business 146
Marketing Systems 146
Interactive Marketing 147
Targeted Marketing 148
Sales Force Automation 148
Manufacturing Systems 150
Computer-Integrated Manufacturing 151
Process Control 152
Machine Control 152
Human Resource Systems 153
HRM and the Internet 154
HRM and Corporate Intranets 154
Staffing the Organization 155
Training and Development 155
Accounting Systems 156
Online Accounting Systems 156
Order Processing 158
Inventory Control 158
Accounts Receivable 158
Accounts Payable 158
Payroll 159
General Ledger 159
Financial Management Systems 159
Cash Management 159
Online Investment Management 160
Capital Budgeting 160
Financial Forecasting and Planning 160

Section II: Cross-Functional Enterprise Systems 161

Introduction 161
Analyzing Johnson Controls 161
Real World Case: Johnson Controls: Enterprise Collaboration Systems in Manufacturing 162
Cross-Functional Enterprise Applications 163
Enterprise Application Architecture 163
Enterprise Application Integration 165
Transaction Processing Systems 167
The Transaction Processing Cycle 167
Enterprise Collaboration Systems 169
Tools for Enterprise Collaboration 170
Real World Case: Union Pacific, Corporate Express, and Best Buy: Enterprise Application Integration Challenges 178
Real World Case: Baxter International: Web-Enabled Human Resource Management 179
Real World Case: IBM Corporation: The Business Value of Instant Messaging Collaboration 180

CHAPTER 6

Enterprise e-Business Systems 181

Section I: Customer Relationship Management: The Business Focus 182

Introduction 182
Analyzing Mitsubishi Motor Sales 182
Real World Case: Mitsubishi Motor Sales: Implementing Customer Relationship Management Systems 183
What Is CRM? 184
Contact and Account Management 184
Sales 185
Marketing and Fulfillment 185
Customer Service and Support 185
Retention and Loyalty Programs 185
The Three Phases of CRM 187
Benefits and Challenges of CRM 188
CRM Failures 188
Trends in CRM 189

Section II: Enterprise Resource Planning: The Business Backbone 192

Introduction 192
Analyzing Agilent Technologies and Russ Berrie 192
Real World Case: Agilent Technologies and Russ Berrie: Challenges of Implementing ERP Systems 193
What Is ERP? 194
Benefits and Challenges of ERP 196
The Costs of ERP 196
Causes of ERP Failures 198
Trends in ERP 199

Section III: Supply Chain Management: The Business Network 201

Introduction 201
Analyzing TaylorMade Golf and HON Industries 201
Real World Case: TaylorMade Golf and HON Industries: The Business Value of Supply Chain Management 202
What Is SCM? 203
Electronic Data Interchange 204
The Role of SCM 206
Benefits and Challenges of SCM 208
Trends in SCM 209
Real World Case: H-P, Eastman Chemical, and Others: The Benefits and Challenges of SCM Systems 215
Real World Case: Wal-Mart and Mattel: Supply Chain Management Best Practices 216

CHAPTER 7

Electronic Commerce Systems 217

Section I: Electronic Commerce Fundamentals 218

Introduction to e-Commerce 218
Analyzing Yahoo! Inc. 218
The Scope of e-Commerce 218
Real World Case: Yahoo! Inc.: Striving for Success in e-Commerce 219
Electronic Commerce Technologies 221
Essential e-Commerce Processes 223
Access Control and Security 223
Profiling and Personalizing 224
Search Management 225
Content and Catalog Management 225
Workflow Management 226
Event Notification 227
Collaboration and Trading 228
Electronic Payment Processes 228
Web Payment Processes 228
Electronic Funds Transfer 228
Secure Electronic Payments 229

Section II: e-Commerce Applications and Issues 231

e-Commerce Application Trends 231
Analyzing ChemConnect and Heritage Services 231
Real World Case: ChemConnect and Heritage Services: Public versus Private B2B Exchanges 232
e-Commerce Trends 233
e-Commerce Sectors 233
Business-to-Consumer e-Commerce 234
e-Commerce Success Factors 235

Web Store Requirements 238
Developing a Web Store 238
Serving Your Customers 239
Managing a Web Store 240
Business-to-Business e-Commerce 241
e-Commerce Marketplaces 241
Clicks and Bricks in e-Commerce 244
e-Commerce Integration 245
Other Clicks and Bricks Strategies 246
e-Commerce Channel Choices 246
Real World Case: Staples, Steelcase, Countrywide, and HSN: Evaluating e-Commerce Website ROI 254
Real World Case: eBags, Economy.com, and Classmates Online: Evaluating e-Commerce Business Models 255
Real World Case: Office Depot, Lands' End, and Others: Trends in e-Commerce Website Capabilities 256

CHAPTER 8
Decision Support Systems 257

Section I: Decision Support in Business 258
Business and Decision Support 258
Analyzing AmeriKing and Others 258
Real World Case: AmeriKing and Others: The Business Value of Enterprise Portals 259
Information, Decisions, and Management 260
Information Quality 261
Decision Structure 261
Decision Support Trends 262
Management Information Systems 264
Management Reporting Alternatives 264
Online Analytical Processing 265
Decision Support Systems 267
DSS Components 268
Geographic Information and Data Visualization Systems 269
Using Decision Support Systems 270
What-If Analysis 271
Sensitivity Analysis 271
Goal-Seeking Analysis 271
Optimization Analysis 272
Data Mining for Decision Support 273
Executive Information Systems 274
Features of an EIS 274
Enterprise Portals and Decision Support 276
Enterprise Information Portals 276
Knowledge Management Systems 278

Section II: Artificial Intelligence Technologies in Business 281
Business and AI 281
Analyzing BAE Systems 281
Real World Case: BAE Systems: The Benefits of AI in Knowledge Management Systems 282
An Overview of Artificial Intelligence 283
The Domains of Artificial Intelligence 283
Neural Networks 285
Fuzzy Logic Systems 287
Fuzzy Logic in Business 287
Genetic Algorithms 287
Virtual Reality 288
VR Applications 289
Intelligent Agents 290
Expert Systems 292
Components of an Expert System 292
Expert System Applications 294
Developing Expert Systems 296
Knowledge Engineering 297
The Value of Expert Systems 297
Benefits of Expert Systems 298
Limitations of Expert Systems 298
Real World Case: Cisco Systems, NetFlix, and Office Depot: The Business Value of Real-Time Web Decision Support 304
Real World Case: Producers Assistance, Kinko's, and Champion Printing: Using Spatial Information Systems 305
Real World Case: Schneider National: The Business Value of Business Intelligence 306

MODULE IV **Development Processes**

CHAPTER 9
Developing Business/IT Strategies 309

Section I: Planning Fundamentals 310
Introduction 310
Analyzing The Rowe Cos. and Merrill Lynch 310
Real World Case: The Rowe Cos. and Merrill Lynch: The ROI Process in Business/IT Planning 311
Organizational Planning 312
The Scenario Approach 312
Planning for Competitive Advantage 314

SWOT Analysis 315
Business Models and Planning 315
Business/IT Planning 318
Information Technology Architecture 319
Identifying Business/IT Strategies 319
Business Application Planning 319
Business/IT Architecture Planning 322
Section II: Implementation Challenges 324
Implementation 324
Analyzing Verizon, F.X. Coughlin, and A-dec 324
Real World Case: Verizon, F.X. Coughlin, and A-dec: Implementation Challenges of Application Integration 325
Implementing Information Technology 326
End User Resistance and Involvement 326
Change Management 329
A Change Management Process 331
Real World Case: PeopleFirst, Cessna, Allstate and Sprint: Challenges of Implementing CRM Systems 338
Real World Case: Corning Inc: Business/IT Planning Strategies in Challenging Times 339
Real World Case: Cincinnati Bell: Change Management Challenges of Business Convergence 340

CHAPTER 10
Developing Business/IT Solutions 341

Section I: Developing Business Systems 342
IS Development 342
Analyzing Fidelity Investments and Others 342
Real World Case: Fidelity Investments and Others: Evaluating Usability in Website Design 343
The Systems Approach 344
Systems Thinking 344
The Systems Development Cycle 345
Prototyping 345
The Prototyping Process 346
Starting the Systems Development Process 348
Feasibility Studies 348
Systems Analysis 349
Organizational Analysis 350
Analysis of the Present System 350
Functional Requirements Analysis 352
Systems Design 352
User Interface Design 353
System Specifications 354
End User Development 354
Focus on IS Activities 355
Doing End User Development 356
Section II: Implementing Business Systems 358
Implementation 358
Analyzing PacifiCorp, Reynolds, and Zurich NA 358
Implementing New Systems 358
Real World Case: PacifiCorp, Reynolds, and Zurich NA: IT Project Management Requirements 359
Evaluating Hardware, Software, and Services 360
Hardware Evaluation Factors 361
Software Evaluation Factors 362
Evaluating IS Services 362
Other Implementation Activities 364
Testing 364
Documentation 365
Training 365
Conversion Methods 365
IS Maintenance 367
Real World Case: IMG Worldwide and Others: IT Resource Acquisition Strategies 374
Real World Case: Macy's and Lands' End: Systems Design Criteria for Website Shopability 375
Real World Case: GM Locomotive Group: Failure in ERP System Implementation 376

MODULE V **Management Challenges**

CHAPTER 11
Security and Ethical Challenges 379

Section I: Security, Ethical, and Societal Challenges of IT 380
Introduction 380
Analyzing MTV Networks and First Citizens Bank 380
Business/IT Security, Ethics, and Society 380
Real World Case: MTV Networks and First Citizens Bank: Defending against Hacker and Virus Attacks 381
Ethical Responsibility of Business Professionals 382
Business Ethics 382
Technology Ethics 383
Ethical Guidelines 384
Computer Crime 385

Hacking 386
Cyber Theft 387
Unauthorized Use at Work 388
Software Piracy 390
Piracy of Intellectual Property 390
Computer Viruses and Worms 391

Privacy Issues 393

Privacy on the Internet 393
Computer Matching 394
Privacy Laws 394
Computer Libel and Censorship 394

Other Challenges 395

Employment Challenges 395
Computer Monitoring 395
Challenges in Working Conditions 396
Challenges to Individuality 397

Health Issues 397

Ergonomics 398

Societal Solutions 398

Section II: Security Management of Information Technology 400

Introduction 400

Analyzing Oppenheimer Funds, Cardinal Health, and Exodus 400

Real World Case: Oppenheimer Funds, Cardinal Health, and Exodus: IT Security Management Qualifications 401

Tools of Security Management 402

Internetworked Security Defenses 403

Encryption 403
Firewalls 403
Denial of Service Defenses 405
e-Mail Monitoring 406
Virus Defenses 407

Other Security Measures 408

Security Codes 408
Backup Files 408
Security Monitors 408
Biometric Security 409
Computer Failure Controls 410
Fault Tolerant Systems 410
Disaster Recovery 411

System Controls and Audits 411

Information System Controls 411
Auditing Business Systems 412

Real World Case: Brandon Internet Services and PayPal: The Business Value of Cyberforensics 418

Real World Case: Providence Health Systems and Others: Challenges of IT Security Management 419

Real World Case: The Doctor's Co. and Rockland Trust: Outsourcing IT Security Management 420

CHAPTER 12

Enterprise and Global Management of Information Technology 421

Section I: Managing Information Technology 422

Business and IT 422

Analyzing USG Corp. and Others 422

Real World Case: USG Corp. and Others: Evaluating the ROI of IT Investments 423

The Impact of IT on Managers 424

The Impact of IT on Organizations 425

Managing Information Technology 428

Managing the IS Function 428

Organizing IT 428
Managing Application Development 430
Managing IS Operations 431
Human Resource Management of IT 432
The CIO and Other IT Executives 432
Technology Management 433
Managing User Services 433

Failures in IT Management 433

Management Involvement and Governance 434

Section II: Managing Global IT 436

The International Dimension 436

Analyzing Agilent Technologies and Citibank 436

Real World Case: Agilent Technologies and Citibank: The Challenges of Consolidating Global IT 437

Global IT Management 438

Cultural, Political, and Geoeconomic Challenges 438

Global Business/IT Strategies 440

Global Business/IT Applications 440

Global IT Platforms 443

The Internet as a Global IT Platform 444

Global Data Access Issues 445

Internet Access Issues 446

Global Systems Development 447

Systems Development Strategies 448

Real World Case: Cisco Systems: Failure in Supply Chain Management 454

Real World Case: Merrill Lynch & Co.: The Business Case for Global IT Consolidation 455

Real World Case: Fireman's Fund, Allmerica Financial, and FMC: The Business Case for IT Outsourcing 456

MODULE VI Review of Hardware and Software Technologies

CHAPTER 13

Computer Hardware 459

Section I: Computer Systems: End User and Enterprise Computing 460

Analyzing City of Richmond and Tim Beaty Builders 460

Real World Case: City of Richmond and Tim Beaty Builders: The Business Value of PDAs 461

Types of Computer Systems 462

Microcomputer Systems 462

Network Computers 465
Information Appliances 465
Computer Terminals 465

Midrange Computer Systems 466

Mainframe Computer Systems 468

Supercomputer Systems 468

Technical Note: The Computer System Concept 470

Computer Processing Speeds 471

Section II: Computer Peripherals: Input, Output, and Storage Technologies 472

Analyzing United Technologies and Eastman Kodak 472

Real World Case: United Technologies and Eastman Kodak: The Business Case for Consolidating Computer Operations and Systems 473

Peripherals 474

Input Technologies 474

Pointing Devices 474

Pen-Based Computing 476

Speech Recognition Systems 476

Optical Scanning 478

Other Input Technologies 479

Output Technologies 480

Video Output 480

Printed Output 481

Storage Trade-Offs 481

Computer Storage Fundamentals 482
Direct and Sequential Access 483

Semiconductor Memory 483

Magnetic Disk Storage 484

Types of Magnetic Disks 485
RAID Storage 485

Magnetic Tape Storage 486

Optical Disk Storage 486

Business Applications 487

Real World Case: Boscov's, Winnebago, and WPS Health: Moving to Linux on the Mainframe 491

Real World Case: La-Z-Boy and Corporate Express: The Business Benefits of Server Consolidation 492

Real World Case: Los Alamos National Laboratory and Others: The ROI of Blade Servers 493

CHAPTER 14

Computer Software 495

Section I: Application Software: End User Applications 496

Introduction to Software 496

Analyzing Intuit Inc. 496
Types of Software 496

Real World Case: Intuit Inc.: Driving for Success in Small Business Software 497

Application Software for End Users 498

Software Suites and Integrated Packages 498

Web Browsers and More 499

Electronic Mail and Instant Messaging 500

Word Processing and Desktop Publishing 501

Electronic Spreadsheets 502

Database Management 503

Presentation Graphics 504

Personal Information Managers 505

Groupware 506

Other Business Software 507

Section II: System Software: Computer System Management 508

System Software Overview 508

Analyzing Amazon, Orbitz, and Others 508
Overview 508

Operating Systems 508

Real World Case: Amazon, Orbitz, and Others: The Business Case for Linux 509

Operating System Functions 510
Popular Operating Systems 513

Network Management Programs 513

Database Management Systems 514

Other System Management Programs 514

Programming Languages 516

Machine Languages 516
Assembler Languages 516
High-Level Languages 517
Fourth-Generation Languages 517
Object-Oriented Languages 518
HTML, XML, and Java 519

Programming Software 521

Language Translator Programs 521
Programming Tools 522

Real World Case: Burlington Coat Factory and Others: Evaluating Software Suite Alternatives 527

Real World Case: Clark Retail and Others: Evaluating Operating System Upgrades 528

Real World Case: Dollar Rent A Car and Imperial Sugar: Pioneering Web Services 529

Appendix: Real World Case Studies A-1
Review Quiz Answers RQ-1
Selected References R-1
Glossary for Business Professionals G-1
Name Index I-3
Company Index I-7
Subject Index I-11