

Seventh Edition

Managing Information Technology

Carol V. Brown

*Howe School of Technology Management,
Stevens Institute of Technology*

Daniel W. DeHayes

*Kelley School of Business,
Indiana University*

Jeffrey A. Hoffer

*School of Business Administration,
The University of Dayton*

E. Wainright Martin

*Kelley School of Business,
Indiana University*

William C. Perkins

*Kelley School of Business,
Indiana University*

Prentice Hall

Boston Columbus Indianapolis New York San Francisco Upper Saddle River
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montreal Toronto
Delhi Mexico City Sao Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

BRIEF CONTENTS

Chapter 1 Managing IT in a Digital World 1

PART I Information Technology 17

Chapter 2 Computer Systems 19

Chapter 3 Telecommunications and Networking 60

Chapter 4 The Data Resource 95

PART II Applying Information Technology 187

Chapter 5 Enterprise Systems 189

Chapter 6 Managerial Support Systems 223

Chapter 7 E-Business Systems 253

PART III Acquiring Information Systems 327

Chapter 8 Basic Systems Concepts and Tools 329

Chapter 9 Methodologies for Custom Software Development 361

Chapter 10 Methodologies for Purchased Software Packages 390

Chapter 11 IT Project Management 410

PART IV The Information Management System 517

Chapter 12 Planning Information Systems Resources 519

Chapter 13 Leading the Information Systems Function 536

Chapter 14 Information Security 561

Chapter 15 Social, Ethical, and Legal Issues 575

Glossary 668

Index 691

CONTENTS

Preface xvii

Chapter 1 Managing IT in a Digital World 1

- Recent Information Technology Trends 2
 - Computer Hardware: Faster, Cheaper, Mobile 2
 - Computer Software: Integrated, Downloadable, Social 2
 - Computer Networks: High Bandwidth, Wireless, Cloudy 4
- New Ways to Compete 4
- New Ways to Work 5
- Managing IT in Organizations 5
 - Managing IT Resources 5
 - IT Leadership Roles 7
- The Topics and Organization of This Textbook 8
 - Review Questions 9 • Discussion Questions 9 • Bibliography 9
- **CASE STUDY 1** **Midsouth Chamber of Commerce (A): The Role of the Operating Manager in Information Systems 10**

PART I Information Technology 17

Chapter 2 Computer Systems 19

- Basic Components of Computer Systems 20
 - Underlying Structure 20
 - Input/Output 20
 - Computer Memory 21
 - Arithmetic/Logical Unit 23
 - Computer Files 23
 - Control Unit 25
- The Stored-Program Concept 25
- Types of Computer Systems 28
 - Microcomputers 29
 - Midrange Systems 30
 - Mainframe Computers 33
 - Supercomputers 34
- Key Types of Software 34
- Applications Software 36
 - An Example of an Application Product 37
 - Personal Productivity Software 38
- Support Software 41
 - The Operating System 41
 - Language Translators 43

Third Generation Languages	43	
Fourth Generation Languages	46	
Markup Languages	48	
Object-Oriented Programming	49	
Languages for Developing Web Applications	51	
Database Management Systems	52	
CASE Tools	54	
Communications Interface Software	54	
Utility Programs	54	
The Changing Nature of Software	55	
The Information Technology Industry	55	
<i>Review Questions</i>	56 • <i>Discussion Questions</i>	57 •
<i>Bibliography</i>	58	

Chapter 3 Telecommunications and Networking 60

The Need for Networking	61	
Sharing of Technology Resources	61	
Sharing of Data	61	
Distributed Data Processing and Client/Server Systems	62	
Enhanced Communications	62	
Marketing Outreach	62	
An Overview of Telecommunications and Networking	62	
Key Elements of Telecommunications and Networking	63	
Analog and Digital Signals	63	
Speed of Transmission	64	
Types of Transmission Lines	65	
Transmission Media	65	
Topology of Networks	70	
Types of Networks	72	
Network Protocols	86	
The Exploding Role of Telecommunications and Networking	88	
Online Operations	88	
Connectivity	89	
Electronic Data Interchange and Electronic Commerce	89	
Marketing	89	
The Telecommunications Industry	90	
<i>Review Questions</i>	92 • <i>Discussion Questions</i>	92 •
<i>Bibliography</i>	93	

Chapter 4 The Data Resource 95

Why Manage Data?	96
Technical Aspects of Managing the Data Resource	97
The Data Model and Metadata	97
Data Modeling	98
Database Programming	100

Managerial Issues in Managing Data	101
Principles in Managing Data	101
The Data Management Process	106
Data Management Policies	110
<i>Review Questions</i>	114
<i>Discussion Questions</i>	114
<i>Bibliography</i>	114
▶ CASE STUDY I-1 IMT Custom Machine Company, Inc.: Selection of an Information Technology Platform	116
▶ CASE STUDY I-2 VolP2.biz, Inc.: Deciding on the Next Steps for a VoIP Supplier	128
▶ CASE STUDY I-3 The VoIP Adoption at Butler University	144
▶ CASE STUDY I-4 Supporting Mobile Health Clinics: The Children's Health Fund of New York City	157
▶ CASE STUDY I-5 Data Governance at InsuraCorp	166
▶ CASE STUDY I-6 HH Gregg: Deciding on a New Information Technology Platform	170
▶ CASE STUDY I-7 Midsouth Chamber of Commerce (B): Cleaning up an Information Systems Debacle	177

PART II Applying Information Technology 187

Chapter 5 Enterprise Systems 189

Application Areas	189
Critical Concepts	191
Batch Processing versus Online Processing	191
Functional Information Systems	192
Vertical Integration of Systems	192
Distributed Systems	192
Client/Server Systems	193
Virtualization	194
Service-Oriented Architecture and Web Services	194
Transaction Processing Systems	196
Payroll System	196
Order Entry System	196
Enterprise Resource Planning Systems	198
An Example ERP System: SAP ERP	199
Data Warehousing	201
Customer Relationship Management Systems	204
Office Automation	206
Videoconferencing	207
Electronic Mail	208
Groupware and Collaboration	209
An Example Groupware System: Lotus Notes	210

Intranets and Portals	213
Factory Automation	215
Engineering Systems	216
Manufacturing Administration	216
Factory Operations	217
Robotics	217
Supply Chain Management Systems	217
<i>Review Questions</i>	219 • <i>Discussion Questions</i> 220 •
<i>Bibliography</i>	220

Chapter 6 Managerial Support Systems 223

Decision Support Systems	223
Data Mining	224
Group Support Systems	228
Geographic Information Systems	229
Business Adopts Geographic Technologies	230
What's Behind Geographic Technologies	231
Issues for Information Systems Organizations	232
Executive Information Systems/Business Intelligence Systems	234
Knowledge Management Systems	237
Two Recent KMS Initiatives within a Pharmaceutical Firm	239
KMS Success	240
Artificial Intelligence	241
Expert Systems	241
Obtaining an Expert System	242
Examples of Expert Systems	242
Neural Networks	244
Virtual Reality	245
<i>Review Questions</i>	250 • <i>Discussion Questions</i> 250 •
<i>Bibliography</i>	251

Chapter 7 E-Business Systems 253

Brief History of the Internet	254
E-Business Technologies	254
Legal and Regulatory Environment	257
Strategic E-Business Opportunities (and Threats)	259
B2B Applications	260
B2C Applications	263
Two Dot-Com Retailers	264
Two Traditional Catalog Retailers	266
Two Traditional Store Retailers	267
Summary: B2C Retailing	268

Dot-Com Intermediaries	269
Summary: Successful Online Intermediary Models	273
Special Issue: What Makes a Good Web Site for Consumers	273
Special Issue: What Makes a Good B2C Social Media Platform	275
<i>Review Questions</i>	276 •
<i>Discussion Questions</i>	276 •
<i>Bibliography</i>	277
▶ CASE STUDY II-1 Vendor-Managed Inventory at NIBCO	279
▶ CASE STUDY II-2 Real-Time Business Intelligence at Continental Airlines	284
▶ CASE STUDY II-3 Norfolk Southern Railway: The Business Intelligence Journey	294
▶ CASE STUDY II-4 Mining Data To Increase State Tax Revenues in California	300
▶ CASE STUDY II-5 The Cliptomania™ Web Store	308
▶ CASE STUDY II-6 Rock Island Chocolate Company, Inc.: Building a Social Networking Strategy	321

PART III Acquiring Information Systems 327

Chapter 8 Basic Systems Concepts and Tools 329

The Systems View	329
What Is a System?	330
Seven Key System Elements	330
Organizations as Systems	334
Systems Analysis and Design	335
Business Processes	336
Identifying Business Processes	336
Business Process Redesign	336
Processes and Techniques to Develop Information Systems	339
The Information Systems Development Life Cycle	339
Structured Techniques for Life-Cycle Development	340
Procedural-Oriented Techniques	341
Techniques for the As-Is Model	343
Techniques for the Logical To-Be Model	344
Techniques for Documenting the Physical To-Be System	348
Object-Oriented Techniques	351
Core Object-Oriented Concepts	351
Summary of Processes and Techniques to Develop Information Systems	353

Information Systems Controls to Minimize Business Risks	354
Types of Control Mechanisms	355
Controls in the Definition and Construction Phases	355
Controls in the Implementation Phase	357
<i>Review Questions</i>	358 • <i>Discussion Questions</i> 359 •
<i>Bibliography</i>	359

Chapter 9 Methodologies for Custom Software Development 361

Systems Development Life Cycle Methodology	361
The SDLC Steps	362
Initiating New Systems Projects	363
Definition Phase	363
Construction Phase	365
Implementation Phase	366
The SDLC Project Team	370
Managing an SDLC Project	371
SDLC Advantages and Disadvantages	371
Prototyping Methodology	373
The Prototyping Steps	373
The Prototyping Project Team	375
Managing a Prototyping Project	375
Prototyping Advantages and Disadvantages	375
Prototyping Within an SDLC Process	376
Newer Approaches	377
Rapid Application Development (RAD)	377
Agile Methodologies	378
Managing Software Projects Using Outsourced Staff	381
Supporting User Application Development (UAD)	382
Advantages and Disadvantages of User-Developed Applications	382
Assessing the Risks from UAD	384
Guidelines for User Developers	385
<i>Review Questions</i>	387 • <i>Discussion Questions</i> 387 •
<i>Bibliography</i>	388

Chapter 10 Methodologies for Purchased Software Packages 390

The Make-or-Buy Decision	391
Purchasing Methodology	391
The Purchasing Steps	392
Project Team for Purchasing Packages	400
Managing a Purchased System Project	401
Purchasing Advantages and Disadvantages	402
Special Case: Enterprise System Packages	403
Open Source Software	405

New Purchasing Option: Application Service Providers (ASPs) 406

Review Questions 408 • *Discussion Questions* 408 •

Bibliography 409

Chapter 11 IT Project Management 410

IT Portfolio Management 411

Project Management Roles 412

Project Manager 412

Project Sponsor and Champion Roles 413

Project Initiation 415

Project Planning 416

Scheduling 416

Budgeting 417

Staffing 418

Planning Documents 420

Project Execution and Control 420

Managing Project Risks 423

Managing Business Change 424

Project Closing 426

Special Issue: Managing Complex IT Projects 427

Special Issue: Managing Virtual Teams 427

Review Questions 430 • *Discussion Questions* 430 •

Bibliography 431

▶ **CASE STUDY III-1** **Managing a Systems Development Project at Consumer and Industrial Products, Inc.** 432

▶ **CASE STUDY III-2** **A Make-or-Buy Decision at Baxter Manufacturing Company** 442

▶ **CASE STUDY III-3** **ERP Purchase Decision at Benton Manufacturing Company, Inc.** 449

▶ **CASE STUDY III-4** **The Kualu Financial System: An Open-Source Project** 455

▶ **CASE STUDY III-5** **NIBCO's "Big Bang": An SAP Implementation** 468

▶ **CASE STUDY III-6** **BAT Taiwan: Implementing SAP for a Strategic Transition** 484

▶ **CASE STUDY III-7** **A Troubled Project at Modern Materials, Inc.** 498

▶ **CASE STUDY III-8** **Purchasing and Implementing a Student Management System at Jefferson County School System** 506

PART IV The Information Management System 517

Chapter 12 Planning Information Systems Resources 519

Benefits of Information Resources Planning 519

Creating a Context for IS Resource Decisions 520

Aligning IS and Business Goals 520

- Balancing the Trade-offs Between Standardization and Agility 520
- Obtaining IT Capital Investment Approvals 520
- The Information Resources Planning Process 520
- Assessing The Current Information Resources 521
 - Measuring IS Use and Attitudes 521
 - Reviewing the IS Organizational Mission 522
 - Assessing Performance versus Goals 523
- Creating an Information Vision 524
- Designing the IT Architecture 524
- Formulating the Strategic IS Plan 526
 - The Strategic IS Planning Process 526
 - Tools for Identifying IT Strategic Opportunities 527
- Formulating Operational IS Plans 532
- Guidelines for Effective IS Planning 532
 - Review Questions 534 • Discussion Questions 534 • Bibliography 534*

Chapter 13 Leading the Information Systems Function 536

- IS Organization Responsibilities and Governance 537
- Managing IT Service Delivery 539
 - Chargeback Systems 539
 - Service Level Agreements (SLAs) 541
 - IT Service Management with ITIL 542
 - Supporting Computer Users 543
 - Strategies for User Computing 543
 - Support Services 544
 - Control Policies and Procedures 546
 - Supporting Telecommuters 546
- Managing IT Applications 548
 - An Applications Portfolio Approach 548
 - Metrics for IT Applications Management 549
- Managing IT Human Resources 549
- Managing the Business/IT Relationship 553
- Measuring Overall IS Performance 554
- Special Issue: IS Management in Global Organizations 554
- Special Issue: Managing IT Outsourcing 556
 - Review Questions 558 • Discussion Questions 559 • Bibliography 559*

Chapter 14 Information Security 561

- Computer Crime 561
- The Chief Security Officer Role 565

Risk Management for Information Security	565
Compliance with Laws and Regulations	567
Sarbanes-Oxley (SOX)	567
Gramm-Leach-Bliley Act of 1999 (GLBA)	569
Health Insurance Portability and Accountability Act (HIPAA)	569
The PATRIOT Act	569
Organizational Policies for Information Security	569
Planning for Business Continuity	571
Electronic Records Management (ERM)	571
<i>Review Questions</i>	573 •
<i>Discussion Questions</i>	574 •
<i>Bibliography</i>	574

Chapter 15 Social, Ethical, and Legal Issues 575

The Legal Environment	575
Ethics Frameworks	576
Identifying Ethical Problems	576
Analyzing Ethical Problems	577
Social Issues	578
Privacy	579
Privacy Problems	579
E-Commerce Privacy Concerns	580
Workplace Privacy	581
Ethics of Invasion of Privacy	582
Laws on Privacy	582
Identity Theft	583
Impact of Identity Theft	584
Laws on Identity Theft	585
Intellectual Property Rights	585
Software Piracy	586
Copyright Protection	586
Patent Protection	586
Digital Entertainment Piracy	587
Internet File Sharing	587
Ethical Questions	589
Other Social Issues	589
Access to the Technology	589
Freedom of Speech	590
Hazards of Inaccuracy	590
Impact on Workers	590
The Future	591
<i>Review Questions</i>	591 •
<i>Discussion Questions</i>	592 •
<i>Bibliography</i>	592

- ▶ CASE STUDY IV-1 **The Clarion School for Boys, Inc.—Milwaukee Division: Making Information Systems Investments** 594
- ▶ CASE STUDY IV-2 **FastTrack IT Integration for the Sallie Mae Merger** 611
- ▶ CASE STUDY IV-3 **IT Infrastructure Outsourcing at Schaeffer (A): The Outsourcing Decision** 628
- ▶ CASE STUDY IV-4 **IT Infrastructure Outsourcing at Schaeffer (B): Managing the Contract** 634
- ▶ CASE STUDY IV-5 **Systems Support for a New Baxter Manufacturing Company Plant in Mexico** 642
- ▶ CASE STUDY IV-6 **The Challenges of Local System Design for Multinationals: The Maxfli Sales Force Automation System at BAT** 647
- ▶ CASE STUDY IV-7 **Meridian Hospital Systems, Inc.: Deciding Which IT Company to Join** 660
- ▶ CASE STUDY IV-8 **Mary Morrison’s Ethical Issue** 666

Glossary 668

Index 691