

CONTENTS

	Preface	xvii
PART 1	Overview	1
Chapter 1	An Introduction to Information Systems	2
	Braskem S.A., Brazil	3
	Information Concepts	5
	Data, Information, and Knowledge	5
	The Characteristics of Valuable Information	7
	The Value of Information	8
	System Concepts	8
	System Performance and Standards	9
	What Is an Information System?	10
	Input, Processing, Output, Feedback	11
	Manual and Computerized Information Systems	12
	Computer-Based Information Systems	12
	Business Information Systems	18
	Information Systems @ Work: Hilton Hospitality in the Palm of Your Hand	19
	Electronic and Mobile Commerce	20
	Enterprise Systems: Transaction Processing Systems and Enterprise Resource Planning	21
	Information and Decision Support Systems	22
	Specialized Business Information Systems: Knowledge Management, Artificial Intelligence, Expert Systems, and Virtual Reality	25
	Systems Development	28
	Systems Investigation and Analysis	29
	Systems Design, Implementation, and Maintenance and Review	30
	Information Systems in Society, Business, and Industry	30
	Security, Privacy, and Ethical Issues in Information Systems and the Internet	30
	Ethical and Societal Issues: Who Is Interested in Your Social Network Updates?	31
	Computer and Information Systems Literacy	32
	Information Systems in the Functional Areas of Business	33
	Information Systems in Industry	34
	Global Challenges in Information Systems	34
Chapter 2	Information Systems in Organizations	40
	Marriott International, Inc., United States	41
	Organizations and Information Systems	43
	Information Systems @ Work: Aldra Manages Workflow to Support Customization	47
	Organizational Structures	48
	Organizational Culture and Change	51

Reengineering and Continuous Improvement 53
User Satisfaction and Technology Acceptance 55
Quality 56
Outsourcing, On-Demand Computing, and Downsizing 56

Competitive Advantage 58

Factors that Lead Firms to Seek Competitive Advantage 58

**Ethical and Societal Issues: The New Corporate Mantra: Social and Environmental
Responsibility 59**

Strategic Planning for Competitive Advantage 60

Performance-based Information Systems 63

Productivity 63

Return on Investment and the Value of Information Systems 64

Risk 65

Careers in Information Systems 66

Roles, Functions, and Careers in IS 67

Typical IS Titles and Functions 70

Other IS Careers 71

Working in Teams 72

Finding a Job in IS 72

Part 1: Activities, Exercises, and Cases 77

PART 2 Information Technology Concepts 83

Chapter 3 Hardware: Input, Processing, and Output Devices 84
Turboinstitut d.d., Slovenia 85

Computer Systems: Integrating the Power of Technology 87

Hardware Components 88

Hardware Components in Action 89

Processing and Memory Devices: Power, Speed, and Capacity 90

Processing Characteristics and Functions 90

Memory Characteristics and Functions 92

Multiprocessing 94

Parallel Computing 95

Secondary Storage 96

Access Methods 96

Secondary Storage Devices 97

Enterprise Storage Options 99

Input and Output Devices: The Gateway to Computer Systems 101

Characteristics and Functionality 102

Input Devices 102

Output Devices 108

**Information Systems @ Work: Handheld Computers Streamline National
Inventory 109**

Computer System Types 115

Portable Computers 116

Nonportable Single-User Computers 117

Multiple-User Computer Systems 119

	Ethical and Societal Issues: Electronics Manufacturers Face the Global E-Waste Problem	123
	Green Computing	124
Chapter 4	Software: Systems and Application Software	130
	Rheinmetall AG	131
	An Overview of Software	133
	Systems Software	133
	Application Software	133
	Supporting Individual, Group, and Organizational Goals	133
	Systems Software	135
	Operating Systems	135
	Current Operating Systems	139
	Information Systems @ Work: Blended Platforms at LinkedIn	142
	Workgroup Operating Systems	144
	Enterprise Operating Systems	145
	Operating Systems for Small Computers, Embedded Computers, and Special-Purpose Devices	146
	Utility Programs	147
	Middleware	150
	Application Software	150
	Overview of Application Software	151
	Personal Application Software	153
	Mobile Application Software	159
	Workgroup Application Software	159
	Enterprise Application Software	161
	Application Software for Information, Decision Support, and Specialized Purposes	162
	Programming Languages	162
	The Evolution of Programming Languages	162
	Visual, Object-Oriented, and Artificial Intelligence Languages	163
	Software Issues and Trends	165
	Software Bugs	165
	Ethical and Societal Issues: Software-Driven Cars	166
	Copyrights and Licenses	167
	Freeware and Open-Source Software	167
	Software Upgrades	169
	Global Software Support	169
Chapter 5	Database Systems, Data Centers, and Business Intelligence	176
	Aquent, United States	177
	Data Management	179
	The Hierarchy of Data	179
	Data Entities, Attributes, and Keys	180
	Data Modeling and Database Characteristics	183
	Data Center	184
	Data Modeling	185

Ethical and Societal Issues: Mega Data Centers and Their Environmental Impact 186

The Relational Database Model 187

Database Management Systems 191

Overview of Database Types 192

Providing a User View 193

Creating and Modifying the Database 193

Storing and Retrieving Data 195

Manipulating Data and Generating Reports 196

Database Administration 198

Popular Database Management Systems 199

Special-Purpose Database Systems 200

Selecting a Database Management System 200

Using Databases with Other Software 201

Database Applications 201

Linking the Company Database to the Internet 202

Data Warehouses, Data Marts, and Data Mining 202

Business Intelligence 206

Information Systems @ Work: The Database that Drives the Austrian Turnpike 207

Distributed Databases 208

Online Analytical Processing (OLAP) 209

Object-Relational Database Management Systems 210

Visual, Audio, and Other Database Systems 211

Chapter 6 Telecommunications and Networks 216

Procter & Gamble, United States 217

An Overview of Telecommunications 219

Basic Telecommunications Channel Characteristics 220

Short-Range Wireless Options 224

Medium-Range Wireless Options 225

Wide Area Wireless Network Types 226

Ethical and Societal Issues: Building Out the Broadband Infrastructure in the United States 228

Networks and Distributed Processing 232

Network Types 232

Basic Processing Alternatives 234

Client/Server Systems 235

Telecommunications Hardware 236

Telecommunications Software 240

Securing Data Transmission 240

Virtual Private Network (VPN) 242

Telecommunications Services and Network Applications 242

Cellular Phone Services 242

Linking Personal Computers to Mainframes and Networks 244

Voice Mail 244

	Home and Small Business Networks	244
	Electronic Document Distribution	245
	Call Centers	245
	Telecommuting and Virtual Workers and Workgroups	246
	Electronic Meetings	246
	Electronic Data Interchange	247
	Unified Communications	248
	Global Positioning System Applications	248
	Information Systems @ Work: Henny Penny Moves to Unified Communications	249
Chapter 7	The Internet, Web, Intranets, and Extranets	254
	Avon, USA	255
	Use and Functioning of the Internet	257
	How the Internet Works	259
	Accessing the Internet	261
	Cloud Computing	263
	Ethical and Societal Issues: Danger in the Cloud	265
	The World Wide Web	266
	How the Web Works	266
	Web Programming Languages	270
	Web Services	271
	Developing Web Content and Applications	271
	Internet and Web Applications	273
	Online Information Sources	273
	Search Engines and Web Research	278
	Web Portals	282
	Communication and Collaboration	282
	Web 2.0	286
	Blogging and Podcasting	288
	Online Media and Entertainment	289
	Shopping Online	294
	Travel, Geolocation, and Navigation	296
	Information Systems @ Work: Selling Real Estate with Google Maps	298
	Internet Utilities	299
	Intranets and Extranets	299
	Part 2: Activities, Exercises, and Cases	306
PART 3	Business Information Systems	321
Chapter 8	Electronic and Mobile Commerce	322
	Tommy Hilfiger, United States	323
	An Introduction to Electronic Commerce	324
	Business-to-Business (B2B) E-Commerce	325
	Business-to-Consumer (B2C) E-Commerce	325
	Consumer-to-Consumer (C2C) E-Commerce	327
	e-Government	327

- Multistage Model for E-Commerce 328
- E-Commerce Challenges 330
- Defining an Effective E-Commerce Model and Strategy 331
- Dealing with Consumer Privacy Concerns 331
- Overcoming Consumers' Lack of Trust 332
- Overcoming Global Issues 333

An Introduction to Mobile Commerce 333

- Mobile Commerce in Perspective 334
- M-Commerce Web Sites 334
- Advantages of Electronic and Mobile Commerce 335

Electronic and Mobile Commerce Applications 335

- Retail and Wholesale 335
- Manufacturing 336
- Marketing 337
- Advertising 338
- Investment and Finance 340
- Banking 340
- E-Boutiques 341

Threats to Electronic and Mobile Commerce 342

- Security 342

Information Systems @ Work: Virtual Models Sell Clothes at Sears.com 343

- Theft of Intellectual Property 344
- Fraud 344
- Invasion of Consumer Privacy 345
- Lack of Internet Access 345
- Legal Jurisdiction 346
- Taxation 346

Strategies for Successful E-Commerce and M-Commerce 346

- Defining the Web Site Functions 346
- Establishing a Web Site 347
- Building Traffic to Your Web Site 347
- Maintaining and Improving Your Web Site 348

Ethical and Societal Issues: North Face Web Site Mixes Business, Philanthropy, and Humanity 349

Technology Infrastructure Required to Support E-Commerce and M-Commerce 350

- Hardware 350
- Web Server Software 351
- E-Commerce Software 351
- Mobile Commerce Hardware and Software 352
- Electronic Payment Systems 352

Chapter 9

Enterprise Systems 360

FedEx, United States 361

An Overview of Transaction Processing Systems 362

- Traditional Transaction Processing Methods and Objectives 363

	Transaction Processing Systems for Small and Medium-Size Enterprises (SMEs)	367
	Transaction Processing Activities	368
	Data Collection	368
	Data Editing	369
	Data Correction	369
	Data Manipulation	370
	Data Storage	370
	Document Production and Reports	370
	Enterprise Resource Planning and Customer Relationship Management	370
	An Overview of Enterprise Resource Planning	371
	Advantages of ERP	371
	Information Systems @ Work: Kabbani Integrates and Secures	
	Information with ERP	372
	Disadvantages of ERP Systems	374
	Leading ERP Systems	376
	ERP for Small and Medium-Size Enterprises (SMEs)	376
	Supply Chain Management (SCM)	377
	Financial and Managerial Accounting and ERP	380
	Business Intelligence and ERP	380
	Customer Relationship Management	381
	Hosted Software Model for Enterprise Software	384
	International Issues Associated with Enterprise Systems	385
	Different Languages and Cultures	385
	Disparities in Information System Infrastructure	385
	Varying Laws and Customs Rules	386
	Multiple Currencies	386
	Ethical and Societal Issues: Google Pulls Out of China	387
Chapter 10	Information and Decision Support Systems	392
	Tru-Test, New Zealand	393
	Decision Making and Problem Solving	394
	Decision Making as a Component of Problem Solving	395
	Programmed versus Nonprogrammed Decisions	396
	Optimization, Satisficing, and Heuristic Approaches	397
	The Benefits of Information and Decision Support Systems	398
	An Overview of Management Information Systems	399
	Management Information Systems in Perspective	399
	Ethical and Societal Issues: Southwest Airlines Applies MIS to Customer Service	401
	Inputs to a Management Information System	402
	Outputs of a Management Information System	402
	Characteristics of a Management Information System	404
	Functional Aspects of the MIS	404
	Financial Management Information Systems	405
	Manufacturing Management Information Systems	408

	Marketing Management Information Systems	411
	Human Resource Management Information Systems	414
	Other Management Information Systems	417
	An Overview of Decision Support Systems	418
	Characteristics of a Decision Support System	418
	Capabilities of a Decision Support System	420
	Information Systems @ Work: Amenities Inc. Gets a Grip on Pachinko	
	Information	421
	A Comparison of DSS and MIS	422
	Components of a Decision Support System	422
	The Database	422
	The Model Base	423
	The User Interface or Dialogue Manager	424
	Group Support Systems	425
	Characteristics of a GSS that Enhance Decision Making	426
	GSS Software	428
	GSS Alternatives	429
	Executive Support Systems	430
	Executive Support Systems in Perspective	430
	Capabilities of Executive Support Systems	431
Chapter 11	Knowledge Management and Specialized Information Systems	438
	Capgemini, France	439
	Knowledge Management Systems	440
	Overview of Knowledge Management Systems	441
	Data and Knowledge Management Workers and Communities of Practice	442
	Obtaining, Storing, Sharing, and Using Knowledge	442
	Technology to Support Knowledge Management	443
	An Overview of Artificial Intelligence	445
	Artificial Intelligence in Perspective	445
	The Nature of Intelligence	445
	The Brain Computer Interface	447
	The Major Branches of Artificial Intelligence	447
	Expert Systems	448
	Robotics	448
	Information Systems @ Work: WebEx Uses AI-Powered Analytics to Focus	
	Salesforce	449
	Vision Systems	451
	Natural Language Processing and Voice Recognition	451
	Learning Systems	452
	Neural Networks	452
	Other Artificial Intelligence Applications	453
	An Overview of Expert Systems	454
	When to Use Expert Systems	454

	Components of Expert Systems	455
	The Inference Engine	457
	The Explanation Facility	457
	The Knowledge Acquisition Facility	457
	The User Interface	458
	Participants in Developing and Using Expert Systems	458
	Ethical and Societal Issues: Austin Energy First to Implement a Smart Grid	460
	Expert Systems Development Tools and Techniques	461
	Multimedia and Virtual Reality	462
	Overview of Multimedia	462
	Overview of Virtual Reality	465
	Interface Devices	466
	Forms of Virtual Reality	466
	Virtual Reality Applications	467
	Specialized Systems	470
	Part 3: Activities, Exercises, and Cases	478
PART 4	Systems Development	489
Chapter 12	Systems Development: Investigation and Analysis	490
	LEGO, Denmark	491
	An Overview of Systems Development	492
	Participants in Systems Development	493
	Individual Systems Developers and Users	495
	Initiating Systems Development	496
	Ethical and Societal Issues: U.S. Federal Government IS Project to Save Billions	498
	Information Systems Planning and Aligning Corporate and IS Goals	499
	Information Systems @ Work: Hess Information Systems Take the Long View	501
	Establishing Objectives for Systems Development	502
	Systems Development Life Cycles	505
	The Traditional Systems Development Life Cycle	506
	Prototyping	507
	Rapid Application Development, Agile Development, and Other Systems Development Approaches	509
	Outsourcing and On-Demand Computing	510
	Factors Affecting Systems Development Success	512
	Degree of Change	512
	The Importance of Planning	513
	Use of Project Management Tools	514
	Use of Computer-Aided Software Engineering (CASE) Tools	515
	Object-Oriented Systems Development	516
	Systems Investigation	517
	Initiating Systems Investigation	517
	Participants in Systems Investigation	517
	Feasibility Analysis	518
	Object-Oriented Systems Investigation	519

	The Systems Investigation Report	519
	Systems Analysis	520
	General Considerations	520
	Participants in Systems Analysis	520
	Data Collection	520
	Data Analysis	522
	Requirements Analysis	526
	Object-Oriented Systems Analysis	528
	The Systems Analysis Report	528
Chapter 13	Systems Development: Design, Implementation, Maintenance, and Review	536
	Ryder, United States	537
	Systems Design	539
	Logical and Physical Design	539
	Object-Oriented Design	540
	Interface Design and Controls	541
	Design of System Security and Controls	541
	Environmental Design Considerations	545
	Generating Systems Design Alternatives	546
	Evaluation Techniques	548
	Freezing Design Specifications	550
	The Contract	551
	The Design Report	551
	Systems Implementation	552
	Acquiring Hardware from an IS Vendor	553
	Acquiring Software: Make or Buy?	554
	Ethical and Societal Issues: Medical Center Moves Patient Records to Cloud	555
	Acquiring Database and Telecommunications Systems	557
	User Preparation	558
	IS Personnel: Hiring and Training	558
	Site Preparation	558
	Data Preparation	559
	Installation	559
	Testing	559
	Start-Up	560
	User Acceptance	561
	Systems Operation and Maintenance	562
	Information Systems @ Work: Tasty Baking Moves Data Center	563
	Reasons for Maintenance	564
	Types of Maintenance	564
	The Request for Maintenance Form	564
	Performing Maintenance	564
	The Relationship Between Maintenance and Design	565
	Systems Review	566
	Types of Review Procedures	566

System Performance Measurement 567

Part 4: Activities, Exercises, and Cases 573

PART 5 Information Systems in Business and Society 579

Chapter 14 The Personal and Social Impact of Computers 580

Facebook, United States 581

Computer Waste and Mistakes 583

Computer Waste 583

Computer-Related Mistakes 584

Preventing Computer-Related Waste and Mistakes 584

Establishing Policies and Procedures 584

Implementing Policies and Procedures 585

Monitoring Policies and Procedures 586

Reviewing Policies and Procedures 586

Computer Crime 587

The Computer as a Tool to Commit Crime 588

Cyberterrorism 588

Identity Theft 589

Internet Gambling 589

The Computer as a Tool to Fight Crime 589

Recovery of Stolen Property 589

Monitoring Sex Offenders 590

Use of Geographic Information Systems 590

The Computer as the Object of Crime 591

Illegal Access and Use 591

Spyware 593

Information and Equipment Theft 593

Information Systems @ Work: Data Theft: An Ongoing Concern for Businesses 594

Safe Disposal of Personal Computers 595

Patent and Copyright Violations 595

Computer-Related Scams 596

International Computer Crime 597

Preventing Computer-Related Crime 597

Crime Prevention by State and Federal Agencies 597

Crime Prevention by Corporations 597

Crime Prevention for Individuals and Employees 600

Privacy Issues 602

Privacy and the Federal Government 602

Privacy at Work 603

E-Mail Privacy 603

Instant Messaging Privacy 604

Privacy and Personal Sensing Devices 604

Privacy and the Internet 604

Internet Libel Concerns 605

Filtering and Classifying Internet Content 606

Fairness in Information Use 606

Electronic Communications Privacy Act 608

Individual Efforts to Protect Privacy 610

The Work Environment 610

Health Concerns 611

Ethical and Societal Issues: Is the Internet Eating Our Brains? 612

Avoiding Health and Environmental Problems 613

Ethical Issues in Information Systems 614

Part 5: Activities, Exercises, and Cases 619

Notes 623

Glossary 639

Index 653