GLOBAL EDITION

Management Information Systems

Managing the Digital Firm

SEVENTEENTH EDITION

Kenneth C. Laudon • Jane P. Laudon

MANAGEMENT INFORMATION SYSTEMS

MANAGING THE DIGITAL FIRM

SEVENTEENTH EDITION

GLOBAL EDITION

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BRIEF CONTENTS

PART **ONE** Organizations, Management, and the Networked Enterprise 33

Chapter 1 Information Systems in Global Business Today 34
Chapter 2 Global E-business and Collaboration 70
Chapter 3 Information Systems, Organizations, and Strategy 108
Chapter 4 Ethical and Social Issues in Information Systems 150

PART **TWO** Information Technology Infrastructure 193

Chapter 5 IT Infrastructure and Emerging Technologies 194
Chapter 6 Foundations of Business Intelligence: Databases and Information Management 242
Chapter 7 Telecommunications, the Internet, and Wireless Technology 280
Chapter 8 Securing Information Systems 324

PART **THREE** Key System Applications for the Digital Age 367

Chapter 9 Achieving Operational Excellence and Customer Intimacy: Enterprise Applications 368
Chapter 10 E-commerce: Digital Markets, Digital Goods 402
Chapter 11 Managing Knowledge and Artificial Intelligence 448
Chapter 12 Enhancing Decision Making 486

PART **FOUR** Building and Managing Systems 519

Chapter 13 Building Information Systems 520
Chapter 14 Making the Business Case for Information Systems and Managing Projects 558
Chapter 15 Managing Global Systems 590

Glossary 622

Indexes 634

PART **ONE** Organizations, Management, and the Networked Enterprise 33

Chapter 1 Information Systems in Global Business Today 34

Opening Case: Smart Stores Reinvent the Retail Space 35

1-1 How are information systems transforming business, and why are they so essential for running and managing a business today? 37

What's New in Management Information Systems? 37 • Globalization Challenges and Opportunities: A Flattened World 39

Interactive Session | Organizations Will the Coronavirus Pandemic Make Working from Home the New Normal? 40

The Emerging Digital Firm 42 • Strategic Business Objectives of Information Systems 43

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations? 46

What Is an Information System? 46 • Dimensions of Information Systems 48

Interactive Session | Technology Digital Transformation of Healthcare at Singapore's Jurong Health Services 53

It Isn't Just Technology: A Business Perspective on Information Systems 54 • Complementary Assets: Organizational Capital and the Right Business Model 55

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems? 58

Technical Approach 58 • Behavioral Approach 58 • Approach of This Text: Sociotechnical Systems 59

1-4 How will MIS help my career? 60

The Company 60 • Position Description 60 • Job Requirements 61 • Interview Questions 61 • Author Tips 61

Review Summary 62 • Key Terms 63 • Review Questions 63 • Discussion Questions 64

Hands-On MIS Projects 64

Collaboration and Teamwork Project 65

Case Study: Changes in the Financial Industry: Adyen and Fintech 66

References: 69

Chapter 2 Global E-business and Collaboration 70

Opening Case: Enterprise Social Networking Transforms Sharp Corporation into a More Innovative Connected Organization 71

2-1 What are business processes? How are they related to information systems? 73

Business Processes 73 • How Information Technology Improves Business Processes 75

2-2 How do systems serve the different management groups in a business, and how do systems that link the enterprise improve organizational performance? 76

Systems for Different Management Groups 76 • Systems for Linking the Enterprise 81 • E-business, E-commerce, and E-government 84

Interactive Session | Organizations The City of Mississauga Goes Digital 85

2-3 Why are systems for collaboration and social business so important, and what technologies do they use? 86

What Is Collaboration? 86 • What Is Social Business? 88 • Business Benefits of Collaboration and Social Business 89 • Building a Collaborative Culture and Business Processes 89 • Tools and Technologies for Collaboration and Social Business 90

Interactive Session | Technology Higher Education Redefined: Virtual Education at Ahlia University 92

2-4 What is the role of the information systems function in a business? 96

The Information Systems Department 96 • Organizing the Information Systems Function 97

2-5 How will MIS help my career? 98

The Company 98 • Position Description 98 • Job Requirements 99 • Interview Questions 99 • Author Tips 99

Review Summary 100 • Key Terms 101 • Review Questions 101 • Discussion Questions 102

Hands-On MIS Projects 102

Collaboration and Teamwork Project 103

Case Study: Is Social Business Good Business? 104

References: 106

Chapter 3 Information Systems, Organizations, and Strategy 108

Opening Case: N26: A Bank Without Branches 109

3-1 Which features of organizations do managers need to know about to build and use information systems successfully? 111

What Is an Organization? 111 • Features of Organizations 114

3-2 What is the impact of information systems on organizations? 118

Economic Impacts 118 • Organizational and Behavioral Impacts 120 • The Internet and Organizations 122 • Implications for the Design and Understanding of Information Systems 122

3-3 How do Porter's competitive forces model, the value chain model, synergies, core competencies, and network economics help companies develop competitive strategies using information systems? 123

Porter's Competitive Forces Model 123 • Information System Strategies for Dealing with Competitive Forces 125

Interactive Session | Organizations Shipping Wars 126

The Internet's Impact on Competitive Advantage 129 • The Business Value Chain Model 130

Interactive Session | Technology Singapore as a Smart Nation 131

Synergies, Core Competencies, and Network-Based Strategies 135

3-4 What are the challenges posed by strategic information systems, and how should they be addressed? 138

Sustaining Competitive Advantage 138 • Aligning IT with Business Objectives 138

3-5 How will MIS help my career? 139

The Company 139 • Position Description 140 • Job Requirements 140 • Interview Questions 140 • Author Tips 140

Review Summary 141 • Key Terms 142 • Review Questions 142 • Discussion Questions 143

Hands-On MIS Projects 143

Collaboration and Teamwork Project 144

Case Study: Offline, Online, and Back: The Evolution of the UK Grocery Market 145

References: 148

Chapter 4 Ethical and Social Issues in Information Systems 150

Opening Case: Your Smartphone: Big Brother's Best Friend 151

4-1 What ethical, social, and political issues are raised by information systems? 153

A Model for Thinking about Ethical, Social, and Political Issues 154 • Five Moral Dimensions of the Information Age 156 • Key Technology Trends that Raise Ethical Issues 156

4-2 What specific principles for conduct can be used to guide ethical decisions? 159

Basic Concepts: Responsibility, Accountability, and Liability 159 • Ethical Analysis 159 • Candidate Ethical Principles 160 • Professional Codes of Conduct 161 • Some Real-World Ethical Dilemmas 161

4-3 Why do contemporary information systems technology and the Internet pose challenges to the protection of individual privacy and intellectual property? 161

Information Rights: Privacy and Freedom in the Internet Age 162 • Property Rights: Intellectual Property 168

4-4 How have information systems affected laws for establishing accountability and liability and the quality of everyday life? 171

Computer-Related Liability Problems 172

Interactive Session | Management The Boeing 737 Max Crashes: What Happened and Why? 173

System Quality: Data Quality and System Errors 175 • Quality of Life: Equity, Access, and Boundaries 175 • Health Risks: RSI, CVS, and Cognitive Decline 180

Interactive Session | Technology Do Smartphones Harm Children? Maybe, Maybe Not 181

4-5 How will MIS help my career? 182

The Company 182 • Position Description 183 • Job Requirements 183 • Interview Questions 183 • Author Tips 183

Review Summary 184 • Key Terms 184 • Review Questions 185 • Discussion Questions 185

Hands-On MIS Projects 186

Collaboration and Teamwork Project 187

Case Study: Facebook Privacy: Your Life for Sale 188

References: 191

PART **TWO** Information Technology Infrastructure 193

Chapter 5 IT Infrastructure and Emerging Technologies 194

Opening Case: Southeast Asia's Grab Leverages Information Technology to Enhance Its Services 195

5-1 What is IT infrastructure, and what are the stages and drivers of IT infrastructure evolution? 197

Defining IT Infrastructure 197 • Evolution of IT Infrastructure 199

Technology Drivers of Infrastructure Evolution 203

5-2 What are the components of IT infrastructure? 207

Computer Hardware Platforms 208 • Operating System Platforms 210 • Enterprise Software Applications 210 • Data Management and Storage 211 • Networking/Telecommunications Platforms 211 • Internet Platforms 211 • Consulting and System Integration Services 212

5-3 What are the current trends in computer hardware platforms? 212

The Mobile Digital Platform 212 • Consumerization of IT and BYOD 212 • Quantum Computing 213 • Virtualization 213 • Cloud Computing 214

Interactive Session | Organizations Glory Finds Solutions in the Cloud 216

Edge Computing 219 • Green Computing 219 • High-Performance and Power-Saving Processors 220

5-4 What are the current computer software platforms and trends? 220

Linux and Open Source Software 220 • Software for the Web: Java, JavaScript, HTML, and HTML5 221

Interactive Session | Technology Open Source Innovation: The New Competitive Advantage 222

Web Services and Service-Oriented Architecture 224 • Software Outsourcing and Cloud Services 225

5-5 What are the challenges of managing IT infrastructure and management solutions? 228

Dealing with Platform and Infrastructure Change 228 • Management and Governance 229 • Making Wise Infrastructure Investments 229

5-6 How will MIS help my career? 232

The Company 232 • Position Description 232 • Job Requirements 232 • Interview Questions 233 • Author Tips 233

Review Summary 234 • Key Terms 235 • Review Questions 235 • Discussion Questions 236 • Hands-On MIS Projects 236

Collaboration and Teamwork Project 237

Case Study: Project JEDI: A Cloud of Controversy 238

References: 240

Chapter 6 Foundations of Business Intelligence: Databases and Information Management 242

Opening Case: Astro: Leveraging Data for Customer-Driven Service 243

6-1 What are the problems of managing data resources in a traditional file environment? 245

File Organization Terms and Concepts 245 • Problems With the Traditional File Environment 246

6-2 What are the major capabilities of database management systems (DBMS), and why is a relational DBMS so powerful? 248

Database Management Systems 249 • Capabilities of Database Management Systems 251 • Designing Databases 254 • Nonrelational Databases, Cloud Databases, and Blockchain 256

Interactive Session | Technology New Cloud Database Tools Help Vodafone Fiji Make Better Decisions 258

6-3 What are the principal tools and technologies for accessing information from databases to improve business performance and decision making? 260

The Challenge of Big Data 260

Interactive Session | Management Big Data Baseball 261

Business Intelligence Infrastructure 262 • Analytical Tools: Relationships, Patterns, Trends 265 • Databases and the Web 268

6-4 Why are data governance and data quality assurance essential for managing the firm's data resources? 269

Assuring Data Quality 270

6-5 How will MIS help my career? 271

The Company 271 • Position Description 271 • Job Requirements 271 • Interview Questions 272 • Author Tips 272

Review Summary 273 • Key Terms 274 • Review Questions 274 • Discussion Questions 275

Hands-On MIS Projects 275

Collaboration and Teamwork Project 276

Case Study: Big Data in the Asia-Pacific Takes On the COVID-19 Pandemic 277

References: 279

Chapter 7 Telecommunications, the Internet, and Wireless Technology 280

Opening Case: Alibaba: Redefining Traditional Retailing 281

7-1 What are the principal components of telecommunications networks and key networking technologies? 283

Networking and Communication Trends 283 • What Is a Computer Network? 284 • Key Digital Networking Technologies 286

7-2 What are the different types of networks? 288

Signals: Digital Versus Analog 288 • Types of Networks 289 • Transmission Media and Transmission Speed 290

7-3 How do the Internet and Internet technology work, and how do they support communication and e-business? 291

What Is the Internet? 291 • Internet Addressing and Architecture 292 • Internet Services and Communication Tools 295

Interactive Session | Management Monitoring Employees on Networks: Unethical or Good Business? 298

The Web 299

Interactive Session | Technology Talking Cars Make for Better Road Safety 307

7-4 What are the principal technologies and standards for wireless networking, communication, and Internet access? 308

Cellular Systems 308 • Wireless Computer Networks and Internet Access 309 • RFID and Wireless Sensor Networks 312

7-5 How will MIS help my career? 314

The Company 314 • Position Description 314 • Job Requirements 315 • Interview Questions 315 • Author Tips 315

Review Summary 316 • Key Terms 317 • Review Questions 317 • Discussion Questions 318

Hands-On MIS Projects 318

Collaboration and Teamwork Project 319

Case Study: Google, Apple, and Facebook Battle for Your Internet Experience 320

References: 323

Chapter 8 Securing Information Systems 324

Opening Case: Cyberattacks in the Asia-Pacific Target the Weakest Link: People 325

8-1 Why are information systems vulnerable to destruction, error, and abuse? 327

Why Systems are Vulnerable 327 • Malicious Software: Viruses, Worms, Trojan Horses, and Spyware 330 • Hackers and Computer Crime 332 • Internal Threats: Employees 336

Interactive Session | Technology Capital One: A Big Bank Heist from the Cloud 337

Software Vulnerability 338

8-2 What is the business value of security and control? 339

Legal and Regulatory Requirements for Electronic Records Management 340 • Electronic Evidence and Computer Forensics 341

8-3 What are the components of an organizational framework for security and control? 341

Information Systems Controls 342 • Risk Assessment 343 • Security Policy 343 • Disaster Recovery Planning and Business Continuity Planning 345 • The Role of Auditing 345

8-4 What are the most important tools and technologies for safeguarding information resources? 346

Identity Management and Authentication 346 • Firewalls, Intrusion Detection Systems, and Anti-malware Software 348 • Securing Wireless Networks 350 • Encryption and Public Key Infrastructure 350 • Securing Transactions with Blockchain 352 • Ensuring System Availability 352 • Achieving Digital Resiliency 353

Interactive Session | Management PayPal Ups Its Digital Resiliency 354

Security Issues for Cloud Computing and the Mobile Digital Platform 355 • Ensuring Software Quality 357

8-5 How will MIS help my career? 357

The Company 357 • Position Description 358 • Job Requirements 358 • Interview Questions 358 • Author Tips 358

Review Summary 359 • Key Terms 359 • Review Questions 360 • Discussion Questions 361

Hands-On MIS Projects 361

Collaboration and Teamwork Project 362

Case Study: Bulgaria: A Whole Nation Hacked 363

References: 365

PART **THREE** Key System Applications for the Digital Age 367

Chapter 9 Achieving Operational Excellence and Customer Intimacy: Enterprise Applications 368

Opening Case: Lenzing Sustainably Balances Supply and Demand 369

9-1 How do enterprise systems help businesses achieve operational excellence? 371

What Are Enterprise Systems? 371 • Enterprise Software 372 • Business Value of Enterprise Systems 373

9-2 How do supply chain management systems coordinate planning, production, and logistics with suppliers? 374

The Supply Chain 374 • Information Systems and Supply Chain Management 376 • Supply Chain Management Software 377 • Global Supply Chains and the Internet 378 • Business Value of Supply Chain Management Systems 380

9-3 How do customer relationship management systems help firms achieve customer intimacy? 381

What Is Customer Relationship Management? 381 • Customer Relationship Management Software 382 • Operational and Analytical CRM 385 • Business Value of Customer Relationship Management Systems 386

Interactive Session | Organizations CRM Helps Adidas Know Its Customers One Shoe Buyer at a Time 387

9-4 What are the challenges that enterprise applications pose, and how are enterprise applications taking advantage of new technologies? 388

Enterprise Application Challenges 388 • Next-Generation Enterprise Applications 389

Interactive Session | Technology Versum's ERP Transformation 391

9-5 How will MIS help my career? 392

The Company 392 • Position Description 393 • Job Requirements 393 • Interview Questions 393 • Author Tips 393

Review Summary 394 • Key Terms 395 • Review Questions 395 • Discussion Questions 395

Hands-On MIS Projects 396

Collaboration and Teamwork Project 397

Case Study: The Coronavirus Pandemic Disrupts Supply Chains Around the World 398

References: 400

Chapter 10 E-commerce: Digital Markets, Digital Goods 402

Opening Case: E-commerce Comes to the Dashboard: The Battle for the "Fourth Screen" 403

10-1 What are the unique features of e-commerce, digital markets, and digital goods? 405

E-commerce Today 405 • The New E-commerce: Social, Mobile, Local 406 • Why E-commerce is Different 409 • Key Concepts in E-commerce: Digital Markets and Digital Goods in a Global Marketplace 411

10-2 What are the principal e-commerce business and revenue models? 414

Types of E-commerce 415 • E-commerce Business Models 415 • E-commerce Revenue Models 418

Interactive Session | Technology Deliveroo: Global Food Delivery App 419

10-3 How has e-commerce transformed marketing? 422

Behavioral Targeting 422 • Social E-commerce and Social Network Marketing 426

Interactive Session | Management Engaging "Socially" with Customers 428

10-4 How has e-commerce affected business-to-business transactions? 429

Electronic Data Interchange (EDI) 430 • New Ways of B2B Buying and Selling 431

10-5 What is the role of m-commerce in business, and what are the most important m-commerce applications? 433

Location-Based Services and Applications 434 • Other Mobile Commerce Services 434 • Mobile App Payment Systems 435

10-6 What issues must be addressed when building an e-commerce presence? 436

Develop an E-commerce Presence Map 436 • Develop a Timeline: Milestones 437

10-7 How will MIS help my career? 438

The Company 438 • Job Description 438 • Job Requirements 438 • Interview Questions 438 • Author Tips 439

Review Summary 440 • Key Terms 441 • Review Questions 441 • Discussion Questions 442

Hands-On MIS Projects 442

Collaboration and Teamwork Project 443

Case Study: An iDEAL Solution to the Single Online EU Market 444

References: 447

Chapter 11 Managing Knowledge and Artificial Intelligence 448

Opening Case: Artificial Intelligence Beats Radiologists in Reading Mammograms 449

11-1 What is the role of knowledge management systems in business? 451

Important Dimensions of Knowledge 451 • The Knowledge Management Value Chain 453 • Types of Knowledge Management Systems 455

11-2 What are artificial intelligence (AI) and machine learning? How do businesses use AI? 456

Evolution of AI 457 • Major Types of AI 457 • Expert Systems 458 • Machine Learning 459 • Neural Networks 461

Interactive Session | Technology Do You Know Who Is Using Your Face? 463

Genetic Algorithms 466 • Natural Language Processing, Computer Vision Systems, and Robotics 467 • Intelligent Agents 468

Interactive Session | Organizations Will AI Kill Jobs? 469

11-3 What types of systems are used for enterprise-wide knowledge management, and how do they provide value for businesses? 471

Enterprise Content Management Systems 472 • Locating and Sharing Expertise 473 • Learning Management Systems 473

11-4 What are the major types of knowledge work systems, and how do they provide value for firms? 474

Knowledge Workers and Knowledge Work 474 • Requirements of Knowledge Work Systems 474 • Examples of Knowledge Work Systems 474

11-5 How will MIS help my career? 476

The Company 476 • Position Description 476 • Job Requirements 477 • Interview Questions 477 • Author Tips 477

Review Summary 478 • Key Terms 479 • Review Questions 479 • Discussion Questions 480

Hands-On MIS Projects 480

Collaboration and Teamwork Project 481

Case Study: Are Self-Driving Cars Ready for the Road? 482

References: 485

Chapter 12 Enhancing Decision Making 486

Opening Case: Eastspring: Targeted Enterprise System Building 487

12-1 What are the different types of decisions, and how does the decision-making process work? 489

Business Value of Improved Decision Making 489 • Types of Decisions 490 • The Decision-Making Process 491

12-2 How do information systems support the activities of managers and management decision making? 492

Managerial Roles 493 • Real-World Decision Making 494 • High-Velocity Automated Decision Making 495

12-3 How do business intelligence and business analytics support decision making? 496

What Is Business Intelligence? 496 • The Business Intelligence Environment 496 • Business Intelligence and Analytics Capabilities 498

Interactive Session | Organizations Predictive Maintenance in the Oil and Gas Industry 501

Interactive Session | Management GIS Help Land O'Lakes Manage Assets Strategically 504

12-4 How do different decision-making constituencies in an organization use business intelligence? 505

Decision Support for Operational and Middle Management 505 • Decision Support for Senior Management: Balanced Scorecard and Enterprise Performance Management Methods 508

12-5 How will MIS help my career? 510

The Company 510 • Position Description 510 • Job Requirements 510 • Interview Questions 510 • Author Tips 511

Review Summary 512 • Key Terms 512 • Review Questions 513 • Discussion Questions 513

Hands-On MIS Projects 513

Collaboration and Teamwork Project 514

Case Study: Should an Algorithm Make Our Decisions? 515

References: 517

PART **FOUR** Building and Managing Systems 519

Chapter 13 Building Information Systems 520

Opening Case: Vinci Energies Builds a New Mobile Employee Time Sheet App 521

13-1 How does building new systems produce organizational change? 523

Systems Development and Organizational Change 523

Interactive Session | Organizations Business Process Redesign at DP World 525

Business Process Redesign 526

13-2 What are the core activities in the systems development process? 529

Systems Analysis 530 • Systems Design 531 • Completing the Systems Development Process 532

13-3 What are the principal methodologies for modeling and designing systems? 535

Structured Methodologies 535 • Object-Oriented Development 537

13-4 What are alternative methods for building information systems? 538

Traditional Systems Life Cycle 539 • Prototyping 540 • Application Software Packages, Software Services, and Outsourcing 541

13-5 What are new approaches for system building in the digital firm era? 544

Rapid Application Development (RAD), Agile Development, Automated Software Testing, and DevOps 544

Interactive Session | Technology McAfee Turns to Automated Software Testing 546

Mobile Application Development: Designing for a Multiscreen World 547

13-6 How will MIS help my career? 548

The Company 548 • Position Description 548 • Job Requirements 549 • Interview Questions 549 • Author Tips 549

Review Summary 550 • Key Terms 551 • Review Questions 551 • Discussion Questions 552

Hands-On MIS Projects 552

Collaboration and Teamwork Project 554

Case Study: Pick n Pay's Cloud Migration to Enhance Business Intelligence 555

References: 557

Chapter 14 Making the Business Case for Information Systems and Managing Projects 558

Opening Case: Al-Asasyah Implements a Modern ERP Solution 559

14-1 How should managers build a business case for the acquisition and development of new information systems? 561

The Information Systems Plan 562 • Portfolio Analysis 564 • Scoring Models 565 • Determining Solution Costs and Benefits 566

14-2 What are the objectives of project management, and why is it so essential in developing information systems? 568

Runaway Projects and System Failure 568 • Project Management Objectives 569

14-3 What are the principal risk factors in information systems projects? 570

Dimensions of Project Risk 570 • Change Management and the Concept of Implementation 571

14-4 How can project risks be managed? 573

Managing Technical Complexity 574 • Formal Planning and Control Tools 574 • Increasing User Involvement and Overcoming User Resistance 576 • Designing for the Organization 577

Interactive Session | Management Sauder Woodworking Gets ERP Implementation Right 578

Project Management Software Tools 579

Interactive Session | Technology Arup Moves Project Management to the Cloud 580

14-5 How will MIS help my career? 581

The Company 581 • Position Description 581 • Job Requirements 582 • Interview Questions 582 • Author Tips 582

Review Summary 583 • Key Terms 583 • Review Questions 584 • Discussion Questions 584

Hands-On MIS Projects 584

Collaboration and Teamwork Project 585

Case Study: Pennsylvania's Unemployment Compensation Modernization System: Unfinished Business 586

References: 588

Chapter 15 Managing Global Systems 590

Opening Case: The Bel Group: Laughing All the Way to Success 591

15-1 What major factors are driving the internationalization of business? 593

Developing an International Information Systems Architecture 594 • The Global Environment: Business Drivers and Challenges 595

Interactive Session | Management Rethinking Global Supply Chains 597

State of the Art 599

15-2 What are the alternative strategies for developing global businesses? 600

Global Strategies and Business Organization 600 • Global Systems to Fit the Strategy 601 • Reorganizing the Business 602

15-3 What are the challenges posed by global information systems and management solutions for these challenges? 603

A Typical Scenario: Disorganization on a Global Scale 603 • Global Systems Strategy 604 • The Management Solution: Implementation 606

15-4 What are the issues and technical alternatives to be considered when developing international information systems? 607

Computing Platforms and Systems Integration 608 • Connectivity 608

Interactive Session | Organizations Digital Nationalism 610
Software Localization 611
15-5 How will MIS help my career? 612
The Company 612 • Position Description 612 • Job Requirements 612 • Interview Questions 613 • Author Tips 613
Review Summary 614 • Key Terms 614 • Review Questions 615 • Discussion Questions 615
Hands-On MIS Projects 615
Collaboration and Teamwork Project 616
Case Study: Souq.com: Amazon's Entry into the Middle East 617
References: 619

Glossary 622

Indexes 634

BUSINESS CASES AND INTERACTIVE SESSIONS

Here are some of the business firms you will find described in the cases and Interactive Sessions of this book:

Chapter 1: Information Systems in Global Business Today

Smart Stores Reinvent the Retail Space
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Chapter 8: Securing Information Systems

Cyberattacks in the Asia-Pacific Target the Weakest Link: People
Capital One: A Big Bank Heist from the Cloud
PayPal Ups Its Digital Resiliency
Bulgaria: A Whole Nation Hacked

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Engaging "Socially" with Customers
An iDEAL Solution to the Single Online EU Market

Chapter 11: Managing Knowledge and Artificial Intelligence

Artificial Intelligence Beats Radiologists in Reading Mammograms
Do You Know Who Is Using Your Face?
Will AI Kill Jobs?
Are Self-Driving Cars Ready for the Road?

Chapter 12: Enhancing Decision Making

Eastspring: Targeted Enterprise System Building
Predictive Maintenance in the Oil and Gas Industry
GIS Help Land O'Lakes Manage Assets Strategically
Should an Algorithm Make Our Decisions?

Chapter 13: Building Information Systems

Vinci Energies Builds a New Mobile Employee Time Sheet App
Business Process Redesign at DP World
McAfee Turns to Automated Software Testing
Pick n Pay's Cloud Migration to Enhance Business Intelligence

Chapter 14: Making the Business Case for Information Systems and Managing Projects

Al-Asasyah Implements a Modern ERP Solution
Sauder Woodworking Gets ERP Implementation Right
Arup Moves Project Management to the Cloud
Pennsylvania's Unemployment Compensation Modernization System: Unfinished Business

Chapter 15: Managing Global Systems

The Bel Group: Laughing All the Way to Success
Rethinking Global Supply Chains
Digital Nationalism
Souq.com: Amazon's Entry into the Middle East

New to This Edition

Management Information Systems, 17th Global Edition has been thoroughly updated to cover the latest industry and technology changes that impact the course.

MyLab MIS

The goal of *Management Information Systems* is to provide students and instructors with an authoritative,up-to-date, interactive, and engaging introduction to the MIS field. MyLab MIS for *Management Information Systems* is an extension of this goal in an interactive digital environment.

MyLab is the teaching and learning platform that empowers you to reach *every* student. By combining trusted author content with digital tools and a flexible platform, MyLab personalizes the learning experience and improves results for each student.

MyLab MIS features videos, animations, interactive quizzes to foster student comprehension of concepts, theories, and issues. The MyLab MIS environment reflects the new learning styles of students, which are more social, interactive, and usable on digital devices such as smartphones and tablets.

What's Included

- **Pearson eText** – Enhances learning both in and out of the classroom. Students can highlight, take notes, and review key vocabulary all in one place, even when offline. Seamlessly integrated interactivities and Conceptual Animations bring concepts to life via MyLab or the app.
- **New Conceptual Animations** – Have author Ken Laudon walk students through three of the most important concepts in each chapter (45 total) using a contemporary animation platform. Available not only in the Pearson eText that lives in MyLab MIS but can also be purchased as a standalone eText.
- **New Video Cases** – Collections of video cases (two or more per chapter) and 6 additional instructional videos cover key concepts and experiences in the MIS world. The video cases illustrate how real-world corporations and managers are using information technology and systems. Each case is paired with a brief quiz. Video cases are listed at the beginning of each chapter.
- **MIS Decision Simulations** – Foster critical decision making skills with these interactive exercises that allow students to play the role of a manager and make business decisions.
- **Chapter Warm Ups, Chapter Quizzes** – These objective-based quizzes evaluate comprehension.
- **Discussion Questions** – Threaded discussion topics taken from the end of chapter encourage critical thinking.
- **Excel & Access Grader Projects** – Live in the application auto-graded Grader projects provided inside MyLab MIS to support classes covering Office tools. In addition, Hands-On MIS Projects from the book are also available.

- **Running Case** on Dirt Bikes USA provides additional hands-on projects for each chapter.
- **Dynamic Study Modules** help students study chapter topics and the language of MIS on their own by continuously assessing their knowledge application and performance in real time. These are available as graded assignments prior to class, and are accessible on smartphones, tablets, and computers.
- **Learning Catalytics™** is a student response tool that helps you generate class discussion, customize your lecture, and promote peer-to-peer learning based on real-time analytics. Learning Catalytics uses students' devices to engage them in more interactive tasks.
- **Learning Tracks:** 38 Learning Tracks in MyLab MIS provide additional coverage of selected topics. (See pages 28 – 29 for list of Learning Tracks available.)

ENHANCED STAND-ALONE PEARSON ETEXT

Management Information Systems is also available as a stand-alone eText, which extends the learning experience, anytime and anywhere: The mobile app lets students use their eText whenever they have a moment in their day, on Android and iPhone mobile phones and tablets. Offline access ensures students never miss a chance to learn. The eText engages students with compelling media: Videos and animations written and produced by the authors bring key concepts to life, helping students place what they are reading into context. Other features include highlights that allow educators to share information directly with students within their eText, and analytics that let educators gain insight into how students use their eText, and plan more effective instruction.

Both the MyLab MIS and eText platforms provide an affordable, simple-to-use mobile-optimized reading experience that lets instructors and students extend learning beyond class time.

New and Updated Topics

The 17th Global Edition features all new or updated opening, closing, and Interactive Session cases. The text, figures, tables, and cases have been updated through July 2020 with the latest sources from industry and MIS research. New topics and coverage include:

- **Updated and expanded coverage of artificial intelligence (AI):** Chapter 11 has been rewritten to include new expanded coverage of machine learning, "deep learning," natural language systems, computer vision systems, and robotics, reflecting the surging interest in business uses of AI and "intelligent" techniques.
- **Making the business case for systems:** Chapter 14 has been rewritten to provide expanded coverage of techniques and decision-making criteria for developing a business case for the acquisition and deployment of information systems and related technologies. The chapter shows how to evaluate and select systems projects and technologies that will deliver the greatest value to the firm.
- **System impacts of the coronavirus pandemic:** Up-to-date coverage of the impact of the coronavirus pandemic on business uses of information systems. Three Interactive Sessions and two chapter-ending case studies cover topics such as working remotely, supply chain disruptions, and rethinking global supply chains.

- **Big Data and the Internet of Things:** In-depth coverage of big data, big data analytics, and the Internet of Things (IoT) in Chapters 1, 6, 7, and 12. Includes big data analytics, analyzing IoT data streams, Hadoop, in-memory computing, nonrelational databases, data lakes, and analytic platforms.
- **Cloud Computing:** Updated and expanded coverage of cloud computing in Chapter 5 (IT infrastructure) with more detail on types of cloud services, private and public clouds, hybrid clouds, managing cloud services, and a new Interactive Session on using cloud services. Cloud computing is also covered in Chapter 6 (databases in the cloud), Chapter 8 (cloud security), Chapter 9 (cloud-based CRM and ERP), Chapter 10 (e-commerce), and Chapter 13 (cloud-based systems development).
  - Digital resiliency
  - Expanded coverage on privacy and intellectual property laws and regulations in the EU and other countries
  - Low-code and no-code development and automated testing
  - Software for the web: Javascript, Java, HTML, and HTML5
  - Data governance
  - Dark web

The Laudon text, MyLab MIS, and eText provide the most up-to-date and comprehensive overview of information systems used by business firms today. After reading this book, we expect students will be able to participate in, and even lead, management discussions of information systems for their firms and understand how to use information technology in their jobs to achieve bottom-line business results.Regardless of whether students are accounting, finance, management, operations management, marketing, or information systems majors, the knowledge and information in this book will be valuable throughout their business careers.

Solving Teaching and Learning Challenges

MyLab MIS is the teaching and learning platform that empowers you to reach every student. By combining trusted authors' content with digital tools and a flexible platform, MyLab MIS personalizes the learning experience and improves results for each student. And with MIS Decision-Making Sims and autograded Excel and Access Projects, students understand how MIS concepts will help them succeed in their future careers.

MyLab MIS and Pearson eText offer unique digital interactive features that hold student attention spans longer and make learning more effective, including 45 conceptual animations that walk students through key concepts in each chapter, a collection of online video cases, and interactive quizzes. All of this is available anytime, anywhere, on any digital device. The result is a comprehensive learning environment that will heighten student engagement and learning in the MIS course.

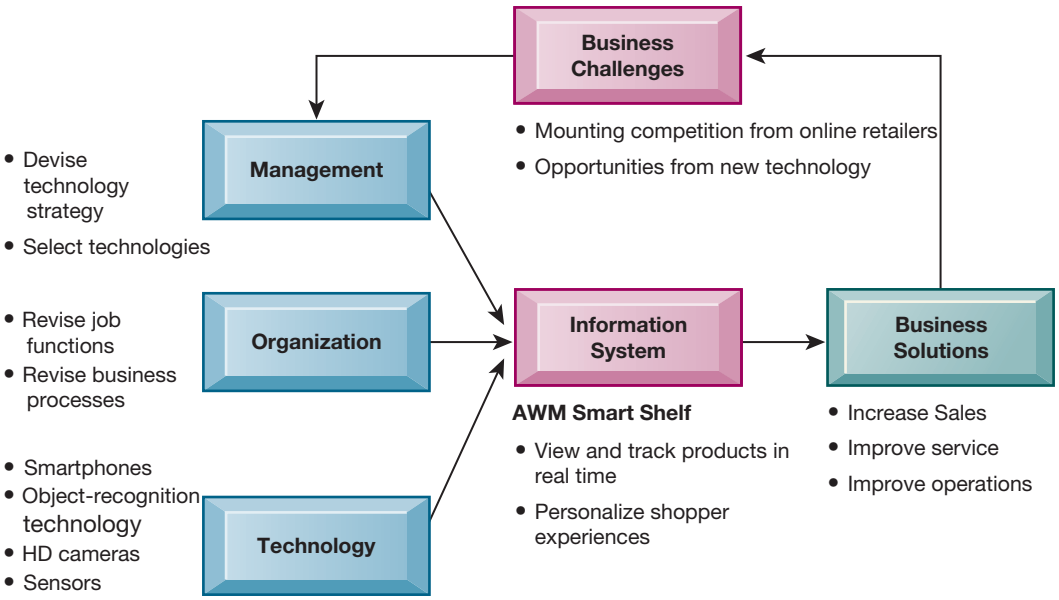
The Laudon learning package is more current, real-world, and authoritative than competitors. Laudon *Management Information Systems* 17th Global Edition, MyLab MIS, and Pearson eText help students understand MIS concepts and issues through extensive use of real-world company examples, a wide variety of text and video cases based on real-world organizations, and numerous line art illustrations, interactive animations, and hands-on software projects.

The Laudons are known for their outstanding real-world case studies, which describe how well-known business firms are using IT to solve problems and achieve objectives. Students are often asked to analyze the business problem and propose alternative solutions. The Laudons also provide hands-on MIS software and management decision-making problems in each chapter that are based on real-world companies and business scenarios.

The Laudon text and learning package now has a very strong career focus, which incentivizes students to learn by showing exactly how each chapter will help them prepare for future jobs. In addition to Career Opportunities, MyLab MIS features Career Resources, including how to incorporate MIS knowledge into resumes, cover letters, and job interviews.

The Core Text

The Core text provides an overview of fundamental MIS concepts using an integrated framework for describing and analyzing information systems. This framework shows information systems composed of management, organization, and technology elements and is reinforced in student projects and case studies. The Core text consists of 15 chapters with hands-on projects covering the most essential topics in MIS. An important part of the Core text is the Video Case Study and Instructional Video Package: video case studies (two to three per chapter) plus 6 instructional videos that illustrate business uses of information systems, explain new technologies, and explore concepts. Videos are keyed to the topics of each chapter.



◀ A diagram accompanying each chapter-opening case graphically illustrates how management, organization, and technology elements work together to create an information system solution to the business challenges discussed in the case.

Chapter Organization

Each chapter contains the following elements:

- A Chapter Outline based on Learning Objectives
- Lists of all the Case Studies and Video Cases for each chapter
- A chapter-opening case describing a real-world organization to establish the theme and importance of the chapter

- A diagram analyzing the opening case in terms of the management, organization, and technology model used throughout the text
- Two Interactive Sessions with Case Study Questions
- A Career Opportunities section showing students how to use the text for job hunting and career preparation
- A Review Summary keyed to the Student Learning Objectives
- A list of Key Terms that students can use to review concepts
- Review questions for students to test their comprehension of chapter material
- Discussion questions raised by the broader themes of the chapter
- A series of Hands-on MIS Projects consisting of two Management Decision Problems, a hands-on application software project, and a project to develop Internet skills
- A Collaboration and Teamwork Project to develop teamwork and presentation skills with options for using open source collaboration tools
- A chapter-ending case study for students to apply chapter concepts
- Chapter references

Student Learning-Focused

Student Learning Objectives are organized around a set of study questions to focus student attention. Each chapter concludes with a Review Summary and Review Questions organized around these study questions, and each major chapter section is based on a Learning Objective.

Key Features

We have enhanced the text to make it more interactive, leading edge, and appealing to both students and instructors. The features and learning tools are described in the following sections.

Business-Driven with Real-World Business Cases and Examples

The text helps students see the direct connection between information systems and business performance. It describes the main business objectives driving the use of information systems and technologies in corporations all over the world: operational excellence, new products and services, customer and supplier intimacy, improved decision making, competitive advantage, and survival. In-text examples and case studies show students how specific companies use information systems to achieve these objectives. We use current (2020) examples from business and public organizations throughout the text to illustrate the important concepts in each chapter. Most of the case studies describe companies or organizations that are familiar to students, such as Facebook, Google, Amazon, PayPal, the Bel Group, and Deliveroo.

Hands-On Text Activities

Real-world business scenarios and data to learn firsthand what MIS is all about. These projects heighten student involvement in this exciting subject.

- **Interactive Sessions.** Two short cases in each chapter have been redesigned as Interactive Sessions that can be used to stimulate student

interest and active learning. Each case concludes with case study questions. The case study questions provide topics for discussion or written assignments.

INTERACTIVE SESSION TECHNOLOGY

New Cloud Database Tools Help Vodafone Fiji Make Better Decisions

Vodafone Fiji Limited is a 100 percent locally owned wireless telecommunications services provider, with more than 760,000 subscribers on its network, 260 employees, and revenue of U.S. $185 million. Vodafone Fiji works closely with the Vodafone Group, a British multinational telecommunications conglomerate, which predominantly services Asia, Africa, Europe, and Oceania, and other operating companies to deliver cutting-edge technology to the people of Fiji. It has 85 percent of that country's market share in telecommunications services.

Prepaid customers account for 96 percent of Fiji's mobile communications market. (Less than 25 percent of U.S. mobile customers use prepaid services.) Prepaid customers are not bound by mobile service contracts, and thus are always looking for better ways to save. Consequently, Vodafone Fiji has to come up with better deals for its customers to persuade them to continue with its services. Unfortunately Vodafone Fiji's systems were not able to deliver the information for the task.

The company lacked the computing power, storage, and data management tools to analyze data quickly to make informed decisions about which deals to offer to which customers and the right times to do so. The data were stored on premises in multiple databases. Making matters worse, Amalgamated Telecom Holdings (Vodafone Fiji's major shareholder) had recently acquired several other telecommunications companies serving nearby markets in Samoa, American Samoa, Vanuatu, Cook Islands, and Kiribati. The data to be managed and mined for insights increased threefold. All those businesses had

Data Warehouse provides an easy-to-use, fully autonomous database that scales elastically as workloads increase, delivers fast query performance, and requires no database administration. Vodafone Fiji would be able to extract, move, and transform data from disparate sources in the cloud, where it could be analyzed much more rapidly.

By automating many of the routine tasks required to manage Oracle databases, Oracle Autonomous Database can free up database administrators (DBAs) to do higher-level and more strategic work. The warehouse system handles a great deal of tedious technical work on its own. Vodafone Fiji would not need to hire people with specialized database management skills, which would be challenging in a small job market such as Fiji's. An on-premises data warehouse would have taken the company two months to implement, whereas it set up Oracle Autonomous Data Warehouse Cloud within 30 minutes and reporting functionality within one week. Vodafone Fiji pays only for computing resources consumed.

Oracle Analytics Cloud is a cloud-based platform that can take data in almost any form or size from almost any source (desktop, enterprise, data center), with capabilities for collecting, consolidating, and transforming data, and creating transactional and analytical reports and dashboards. Oracle Analytics Cloud provides self-service capabilities for users to perform what-if modeling and analysis. Users are empowered to visualize and discover data, including working with Big Data.

Vodafone Fiji can now easily obtain insights from

◀ Each chapter contains two Interactive Sessions on Management, Organizations, or Technology using real-world companies to illustrate chapter concepts and issues.

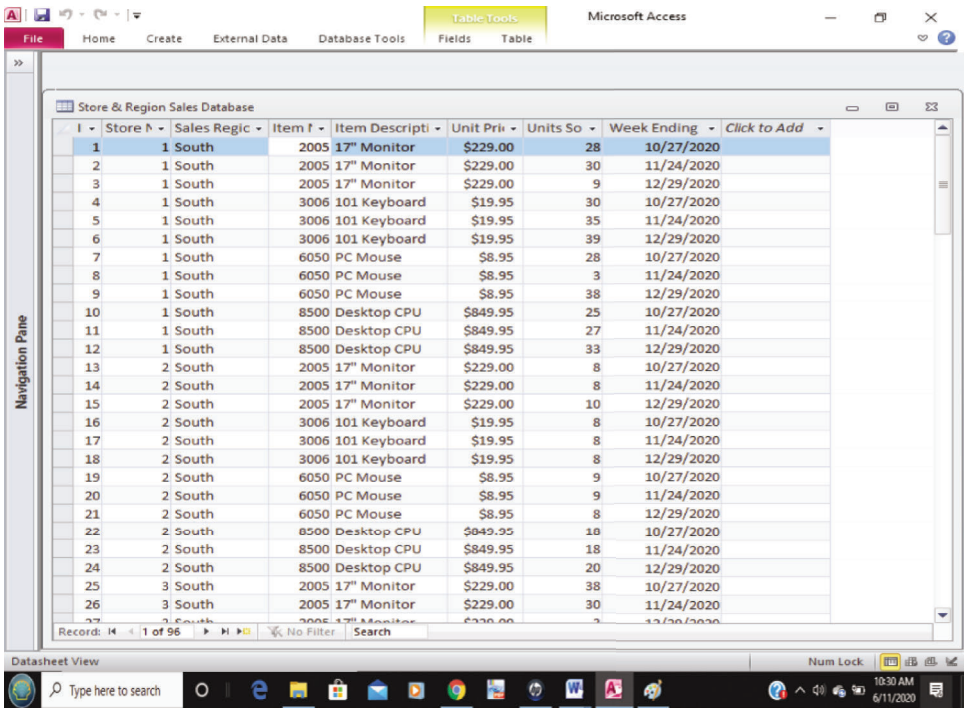
CASE STUDY QUESTIONS

1. Define the problem faced by Vodafone Fiji. What management, organization, and technology factors contributed to the problem?
2. Evaluate Oracle Autonomous Data Warehouse and Oracle Analytics Cloud as a solution for Vodafone Fiji.
3. How did the new Oracle tools change decision making at Vodafone Fiji?
4. Was using cloud services advantageous for Vodafone Fiji? Explain your answer.

◀ Case Study Questions encourage students to apply chapter concepts to real-world companies in class discussions, student presentations, or writing assignments.

- **Hands-On MIS Projects.** Every chapter concludes with a Hands-On MIS Projects section containing three types of projects: two Management Decision Problems; a hands-on application software exercise using Microsoft Excel, Access, or web page and blog creation tools; and a project that develops Internet business skills. Files for these projects are available in MyLab. As mentioned, the Dirt Bikes USA running case in MyLab MIS provides additional hands-on projects for each chapter.
- **Collaboration and Teamwork Projects.** Each chapter features a collaborative project that encourages students working in teams to use Google Drive, Google Docs, or other open source collaboration tools. The first team project in Chapter 1 asks students to build a collaborative Google site.

▶ Students practice using software in real-world settings for achieving operational excellence and enhancing decision making.



I	Store N	Sales Regic	Item I	Item Descripti	Unit Pri	Units So	Week Ending	Click to Add
1	1	South	2005	17" Monitor	$229.00	28	10/27/2020	
2	1	South	2005	17" Monitor	$229.00	30	11/24/2020	
3	1	South	2005	17" Monitor	$229.00	9	12/29/2020	
4	1	South	3006	101 Keyboard	$19.95	30	10/27/2020	
5	1	South	3006	101 Keyboard	$19.95	35	11/24/2020	
6	1	South	3006	101 Keyboard	$19.95	39	12/29/2020	
7	1	South	6050	PC Mouse	$8.95	28	10/27/2020	
8	1	South	6050	PC Mouse	$8.95	3	11/24/2020	
9	1	South	6050	PC Mouse	$8.95	38	12/29/2020	
10	1	South	8500	Desktop CPU	$849.95	25	10/27/2020	
11	1	South	8500	Desktop CPU	$849.95	27	11/24/2020	
12	1	South	8500	Desktop CPU	$849.95	33	12/29/2020	
13	2	South	2005	17" Monitor	$229.00	8	10/27/2020	
14	2	South	2005	17" Monitor	$229.00	8	11/24/2020	
15	2	South	2005	17" Monitor	$229.00	10	12/29/2020	
16	2	South	3006	101 Keyboard	$19.95	8	10/27/2020	
17	2	South	3006	101 Keyboard	$19.95	8	11/24/2020	
18	2	South	3006	101 Keyboard	$19.95	8	12/29/2020	
19	2	South	6050	PC Mouse	$8.95	9	10/27/2020	
20	2	South	6050	PC Mouse	$8.95	9	11/24/2020	
21	2	South	6050	PC Mouse	$8.95	8	12/29/2020	
22	2	South	8500	Desktop CPU	$849.95	18	10/27/2020	
23	2	South	8500	Desktop CPU	$849.95	18	11/24/2020	
24	2	South	8500	Desktop CPU	$849.95	20	12/29/2020	
25	3	South	2005	17" Monitor	$229.00	38	10/27/2020	
26	3	South	2005	17" Monitor	$229.00	30	11/24/2020	

▶ Each chapter features a project to develop Internet skills for accessing information, conducting research, and performing online calculations and analysis.

Improving Decision Making: Using Web Tools to Configure and Price an Automobile

Software skills: Internet-based software
Business skills: Researching product information and pricing

3-11 In this exercise, you will use software at car websites to find product information about a car of your choice and use that information to make an important purchase decision. You will also evaluate two of these sites as selling tools.

Developing Career Skills

For students to succeed in a rapidly changing job market, they should be aware of their career options and how to go about developing a variety of skills. With MyLab MIS and *Management Information Systems* 17th Global Edition, we focus on these skills in the following ways.

Career Opportunities and Resources

Every student who reads this text wants to know: How will this book help my career? The Career Opportunities feature shows how to use this text, MyLab MIS, and eText as tools for job-hunting and career-building. Job interviewers will typically ask about why you want the job, along with your ability to communicate, multitask, work in a team, show leadership, solve problems, and meet goals. These are general skills and behaviors you'll need to succeed in any job, and you should be prepared to provide examples from your course work and job experiences that demonstrate these skills. But there are also business knowledge and professional skills that employers will ask you about. Career Opportunities will show you how to use what you have learned in this text to demonstrate these skills.

The Career Opportunities section, identified by this icon is the last major section of each chapter under the heading "How will MIS help my career?". There you will find a description of an entry-level job for a recent college graduate based on a real-world job description from major online job sites related to the topics covered in that chapter. The name of the company offering the job and its location have been changed. Each chapter's job posting describes the

required educational background and specific job skills, and suggests some of the business-related questions that might arise during the job interview. The authors provide tips for answering the questions and preparing for the interview. Career Opportunities also show where students can find out more information about the technical and business knowledge required for the job in this text and on the web and social media.

Below are the job descriptions used in this edition based on postings from both large and small businesses. A few of these jobs call for an MIS major, others for MIS course work, but many postings are not that specific. Some require some previous internship or job experience, but many are entry-level positions suitable for new college graduates, and some of these positions provide on-the-job training. However, all require knowledge of business information systems and applications and the ability to work in a digital environment.

CHAPTER	CAREER OPPORTUNITY JOB DESCRIPTION
1. Information Systems in Global Business Today	Financial Client Support and Sales Assistant
2. Global E-business and Collaboration	Entry Level Sales Support Specialist
3. Information Systems, Organizations, and Strategy	Entry Level Business Development Representative
4. Ethical and Social Issues in Information Systems	Junior Privacy Analyst
5. IT Infrastructure and Emerging Technologies	Entry Level IT Consultant
6. Foundations of Business Intelligence: Databases and Information Management	Entry Level Data Analyst
7. Telecommunications, the Internet, and Wireless Technology	Automotive Digital Advisor
8. Securing Information Systems	Entry Level Identity Access and Management Support Specialist
9. Achieving Operational Excellence and Customer Intimacy: Enterprise Applications	Manufacturing Management Trainee
10. E-commerce: Digital Markets, Digital Goods	Junior E-Commerce Data Analyst
11. Managing Knowledge and Artificial Intelligence	AI Technology Sales Assistant
12. Enhancing Decision Making	Entry Level Data Analyst
13. Building Information Systems	Entry Level Junior Business Systems Analyst
14. Making the Business Case for Information Systems and Managing Projects	IT Project Management Assistant
15. Managing Global Systems	Global Data Services Sales and Marketing Trainee

Students can use Career Opportunities to shape their resumes and career plans as well as to prepare for interviews. For instructors, Career Opportunities are potential projects for student research and in-class discussion.

In MyLab MIS we have provided additional Career Resources, including job hunting guides and instructions on how to build a Digital Portfolio demonstrating the business knowledge, application software proficiency, and Internet skills acquired from using the text. The portfolio can be included in a resume or job application or used as a learning assessment tool for instructors.

Instructor Teaching Resources

SUPPLEMENTS AVAILABLE TO INSTRUCTORS AT WWW.PEARSONGLOBALEDITIONS.COM	FEATURES OF THE SUPPLEMENT
Instructor's Manual	• Chapter-by-chapter summaries • Examples and activities not in the main book • Teaching outlines • Teaching tips • Solutions to all questions and problems in the book
Test Bank authored by Professor Kenneth Laudon, New York University	The authors have worked closely with skilled test item writers to ensure that higher-level cognitive skills are tested. Test bank multiple-choice questions include questions on content but also include many questions that require analysis, synthesis, and evaluation skills. **AACSB Assessment Guidelines** As a part of its accreditation activities, the AACSB has developed an Assurance of Learning Program designed to ensure that schools do in fact teach students what they promise. Schools are required to state a clear mission, develop a coherent business program, identify student learning objectives, and then prove that students do in fact achieve the objectives. We have attempted in this book to support AACSB efforts to encourage assessment-based education. The end papers of this edition identify student learning objectives and anticipated outcomes for our Hands-On MIS projects. The authors will provide custom advice on how to use this text in colleges with different missions and assessment needs. Please email the authors or contact your local Pearson representative for contact information.
Computerized TestGen	TestGen allows instructors to: • Customize, save, and generate classroom tests • Edit, add, or delete questions from the Test Item Files • Analyze test results • Organize a database of tests and student results
PowerPoints authored by Professor Kenneth Laudon, New York University	The authors have prepared a comprehensive collection of 50 PowerPoint slides for each chapter to be used in your lectures. Many of these slides are the same as used by Ken Laudon in his MIS classes and executive education presentations. Each of the slides is annotated with teaching suggestions for asking students questions, developing in-class lists that illustrate key concepts, and recommending other firms as examples in addition to those provided in the text. The annotations are like an Instructor's Manual built into the slides and make it easier to teach the course effectively. PowerPoints meet accessibility standards for students with disabilities. Features include but are not limited to: • Keyboard and Screen Reader access • Alternative text for images • High color contrast between background and foreground colors

Learning Tracks

There are 38 Learning Tracks in MyLab MIS available to instructors and students. This supplementary content takes students deeper into MIS topics, concepts, and debates and reviews basic technology concepts in hardware, software, database design, and other areas.

CHAPTER	LEARNING TRACKS
Chapter 1: Information Systems in Global Business Today	How Much Does IT Matter? Information Systems and Your Career The Mobile Digital Platform
Chapter 2: Global E-business and Collaboration	Systems from a Functional Perspective IT Enables Collaboration and Teamwork Challenges of Using Business Information Systems Organizing the Information Systems Function
Chapter 3: Information Systems, Organizations, and Strategy	The Changing Business Environment for IT
Chapter 4: Ethical and Social Issues in Information Systems	Developing a Corporate Code of Ethics for IT
Chapter 5: IT Infrastructure and Emerging Technologies	How Computer Hardware and Software Work Service Level Agreements The Open Source Software Initiative Cloud Computing
Chapter 6: Foundations of Business Intelligence: Databases and Information Management	Database Design, Normalization, and Entity-Relationship Diagramming Introduction to SQL Hierarchical and Network Data Models
Chapter 7: Telecommunications, the Internet, and Wireless -Technology	Wireless Applications for Customer Relationship Management, Supply Chain Management, and Healthcare
Chapter 8: Securing Information Systems	The Booming Job Market in IT Security The Sarbanes-Oxley Act Computer Forensics General and Application Controls for Information Systems Management Challenges of Security and Control Software Vulnerability and Reliability
Chapter 9: Achieving Operational Excellence and Customer Intimacy: Enterprise Applications	Best-Practice Business Processes in CRM Software
Chapter 10: E-commerce: Digital Markets, Digital Goods	E-commerce Challenges: The Story of Online Groceries Build an E-commerce Business Plan Hot New Careers in E-Commerce E-commerce Payment Systems
Chapter 11: Managing -Knowledge and Artificial Intelligence	Challenges of Knowledge Management Systems Case-Based Reasoning Fuzzy Logic
Chapter 12: Enhancing Decision Making	Building and Using Pivot Tables
Chapter 13: Building Information Systems	Unified Modeling Language Primer on Business Process Design and Documentation Primer on Business Process Management
Chapter 14: Making the Business Case for Information Systems and Managing Projects	Capital Budgeting Methods for Information Systems Investments Enterprise Analysis (Business Systems Planning) and Critical Success Factors Information Technology Investments and Productivity

Video Cases and Instructional Videos

Instructors can download step-by-step instructions for accessing the video cases from the Instructor Resources Center.

CHAPTER	VIDEO
Chapter 1: Information Systems in Global Business Today	Business in the Cloud: Facebook, Google, and eBay Data Centers UPS Global Operations with the DIAD and Worldport Instructional Video: Tour IBM's Raleigh Data Center
Chapter 2: Global E-business and Collaboration	VisionX Grows with SAP Business One CEMEX: Becoming a Social Business
Chapter 3: Information Systems, Organizations, and Strategy	GE Becomes a Digital Firm: The Emerging Industrial Internet National Basketball Association: Competing on Global Delivery with Akamai OS Streaming
Chapter 4: Ethical and Social Issues in Information Systems	What Net Neutrality Means for You Facebook and Google Privacy: What Privacy? United States vs. Terrorism: Data Mining for Terrorists and Innocents Instructional Video: Viktor Mayer-Schönberger on the Right to Be Forgotten
Chapter 5: IT Infrastructure and Emerging Technologies	Rockwell Automation Fuels the Oil and Gas Industry with the Internet of Things (IoT) ESPN.com: The Future of Sports Coverage in the Cloud Netflix: Building a Business in the Cloud
Chapter 6: Foundations of Business Intelligence: Databases and Information Management	Brooks Brothers Closes In on Omnichannel Retail Maruti Suzuki Business Intelligence and Enterprise Databases
Chapter 7: Telecommunications, the Internet, and Wireless Technology	Telepresence Moves out of the Boardroom and into the Field Virtual Collaboration with IBM Sametime
Chapter 8: Securing Information Systems	Stuxnet and Cyberwarfare Cyberespionage: The Chinese Threat Instructional Video: Sony PlayStation Hacked; Data Stolen from 77 Million Users Instructional Video: Meet the Hackers: Anonymous Statement on Hacking Sony
Chapter 9: Achieving Operational Excellence and Customer Intimacy: Enterprise Applications	Maersk Develops a Global Shipping Management System
Chapter 10: E-commerce: Digital Markets, Digital Goods	Walmart Takes On Amazon: A Battle of IT and Management Systems Groupon: Deals Galore Etsy: A Marketplace and Community
Chapter 11: Managing Knowledge and Artificial Intelligence	How IBM's Watson Became a Jeopardy Champion Alfresco: Open Source Document Management and Collaboration
Chapter 12: Enhancing Decision Making	PSEG Leverages Big Data and Business Analytics Using GE's Predix Platform FreshDirect Uses Business Intelligence to Manage Its Online Grocery Business Intelligence Helps the Cincinnati Zoo Work Smarter
Chapter 13: Building Information Systems	IBM: Business Process Management in a SaaS Environment IBM Helps the City of Madrid with Real-Time BPM Software Instructional Video: BPM Business Process Management Customer Story Instructional Video: Workflow Management Visualized

CHAPTER	VIDEO
Chapter 14: Making the Business Case for Information Systems and Managing Projects	NASA Project Management Challenges
Chapter 15: Managing Global Systems	Daum Runs Oracle Apps on Linux Lean Manufacturing and Global ERP: Humanetics and Global Shop

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PART **ONE**

Organizations, Management, and the Networked Enterprise

CHAPTER 1
Information Systems in Global Business Today

CHAPTER 2
Global E-business and Collaboration

CHAPTER 3
Information Systems, Organizations, and Strategy

CHAPTER 4
Ethical and Social Issues in Information Systems

PART ONE introduces the major themes of this book, raising a series of important questions: What is an information system, and what are its management, organization, and technology dimensions? Why are information systems so essential in businesses today? Why are systems for collaboration and social business so important? How can information systems help businesses become more competitive? What broader ethical and social issues are raised by widespread use of information systems?

CHAPTER

1 Information Systems in Global Business Today

LEARNING OBJECTIVES

After reading this chapter, you will be able to answer the following questions:

1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

1-4 How will MIS help my career?

CHAPTER CASES

Smart Stores Reinvent the Retail Space

Will the Coronavirus Pandemic Make Working from Home the New Normal?

Digital Transformation of Healthcare at Singapore's Jurong Health Services

Changes in the Financial Industry: Adyen and Fintech

VIDEO CASES

Business in the Cloud: Facebook, Google, and eBay Data Centers

UPS Global Operations with the DIAD and Worldport

Instructional Video:
Tour IBM's Raleigh Data Center

MyLab MIS

Discussion Questions: 1-4, 1-5, 1-6; **Hands-On MIS Projects:** 1-7, 1-8, 1-9, 1-10;
eText with Conceptual Animations

Smart Stores Reinvent the Retail Space

Although there has been an upsurge in online shopping, retail stores are not going away. Some traditional retailers are fighting back by using information technology to provide new ways to bring people into physical stores or enhance their in-store experiences, even with new requirements for social distancing.

Acrelec, a French digital signage company, is piloting technology to help retailers manage store curbside pickups by customers placing orders online. Customers can use a retailer's smartphone app to indicate they are coming to pick up an order, and the Acrelec system will estimate when a customer will arrive at a particular store. Object-recognition cameras identify exactly when a customer's car arrives and where it is parked. Acrelec is especially useful for big-box retailers, grocery stores, and home-improvement stores.

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Shelves have become more than just a surface for storing and displaying objects. New systems for "smart" shelves use proximity sensors, 3D cameras, microphones, RFID readers, and weight sensors to enable interactions between shoppers in physical stores and the shelves they're standing in front of. These systems can create a highly personalized shopping experience that fundamentally improves the way shoppers move inside physical stores.

Brands and retailers such as Pepsi, Walmart, and Albertsons are starting to use Smart Shelf by AWM to replicate the benefits of the online experience in physical retail environments. Using super-wide-angle low-light HD cameras, retailers deploying Smart Shelf are able to view and track their products in real-time. The solution improves operational efficiencies by highlighting specific shelves that need product stocking and allows for real-time on-shelf marketing to consumers. When retailers connect Smart Shelf to their mobile apps, they can help shoppers locate products themselves through their smartphones and tablets.

AWM Frictionless is a walk-in, walk-out solution enabling customers to shop as normal and check out by simply exiting the store. The system uses digital shelving and object-recognition cameras to keep track of which customers leave with which items. When customers enter a store, they are required to have mobile device and facial recognition scans, which allow the system to charge their digital accounts when they leave with purchases and receive a receipt via email or text message.

In March 2020 AWM opened a low-contact cashierless micromarket called QuickEats at a luxury apartment community owned by Greenwood & McKenzie in Santa Ana California. QuickEats utilizes AWM Frictionless and features grab-and-go products such as sodas, water, juice drinks, sandwiches, cheese plates, fruit, and household cleaning items.

AWM Smart Shelf is able to personalize shoppers' experiences when they are in stores based on the items they pick up, even if they don't purchase them. For example, if a customer picks up a box of cookies and then puts it back, the retailer can use the system to offer a discount on the shelf beneath that item the next time the shopper encounters it in the store. Cofounder Kurtis Van Horn believes that Smart Shelf can provide the same level of customization and personalization as found in online shopping to brick-and-mortar stores.

AWM also offers an anonymous consumer behavior tracking application that can direct customers to other parts of a store using digital signage, enabling up-to-the-minute advertising and pricing. AWM solutions can be implemented in a wide range of store sizes and formats, from micromarkets, to convenience stores, to larger-format retailers. Technology is redefining the role of the shelf in retail marketing.

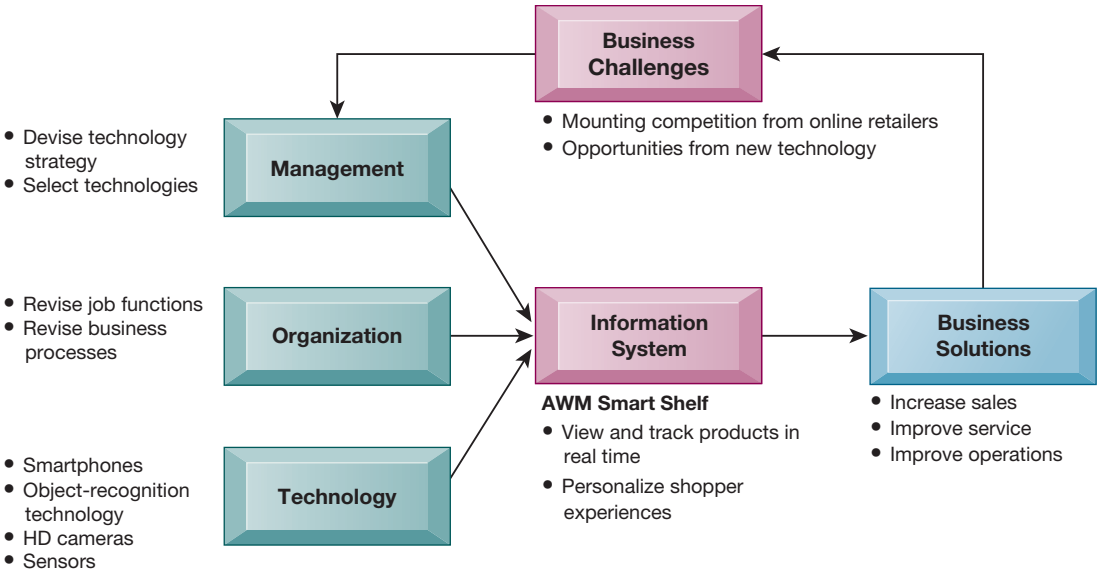
Sources: www.smartshelf.com, accessed April 29, 2020; AWM SmartShelf Launches Southern California's First Autonomous Micromarket in Santa Ana's Nineteen01 Community," Businesswire, March 24, 2020; Jared Council, "Retailers Hope In-Store Tech Will Keep Shoppers in Stores," *Wall Street Journal*, January 15, 2020.

The companies and technologies described here show how essential information systems are today. Today, retail stores are struggling to stay alive and relevant as more shoppers gravitate to online shopping and the Internet. One solution is to use leading-edge innovative information technology to provide new ways of drawing buyers into physical stores and making the in-store buying experience more efficient, safe, and pleasant. The information flows that drive these reimagined retail businesses have become much more digital, making use of mobile tools and object-recognition technology.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. To compete more effectively against online retailers and take advantage of new technology solutions, brick-and-mortar retail stores are using innovative systems based on object-recognition technology, sensors, and smartphones. The use of leading-edge digital technologies to drive business operations and management decisions is a key topic today in the MIS world and will be discussed throughout this text.

It is also important to note that deploying information technology has changed the way customers of Acrelec and AWM Smart Shelf run their businesses. To effectively use new digital tools, these companies had to redesign jobs and procedures for gathering, inputting, and accessing information. These changes had to be carefully planned to make sure they enhanced efficiency, service, and profitability.

Here are some questions to think about: How do Acrelec's and AWM's systems change retail operations? How do they improve the customer experience?



1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

It's not business as usual in the global economy anymore. Information systems and technologies are transforming the global business environment. In 2019, global spending on information technology (IT) and IT services was nearly $3.8 trillion (Gartner, 2019). In addition, firms spent another $160 billion on management consulting and services—much of which involves redesigning firms' business operations to take advantage of these new technologies (Statista, 2020). In fact, most of the business value of IT investment derives from these organizational, management, and cultural changes inside firms (Saunders and Brynjolfsson, 2016). Figure 1.1 shows that between 1999 and 2019, capital investment in information technology consisting of IT equipment, software, and research and development (R&D) accounted for over 40 percent of US total capital spending. A similar pattern has occurred globally.

As managers, most of you will work for firms that are intensively using information systems and making large investments in information technology. You will certainly want to know how to invest this money wisely. If you make wise choices, your firm can outperform competitors. If you make poor choices, you will be wasting valuable capital. This book is dedicated to helping you make wise decisions about information technology and information systems.

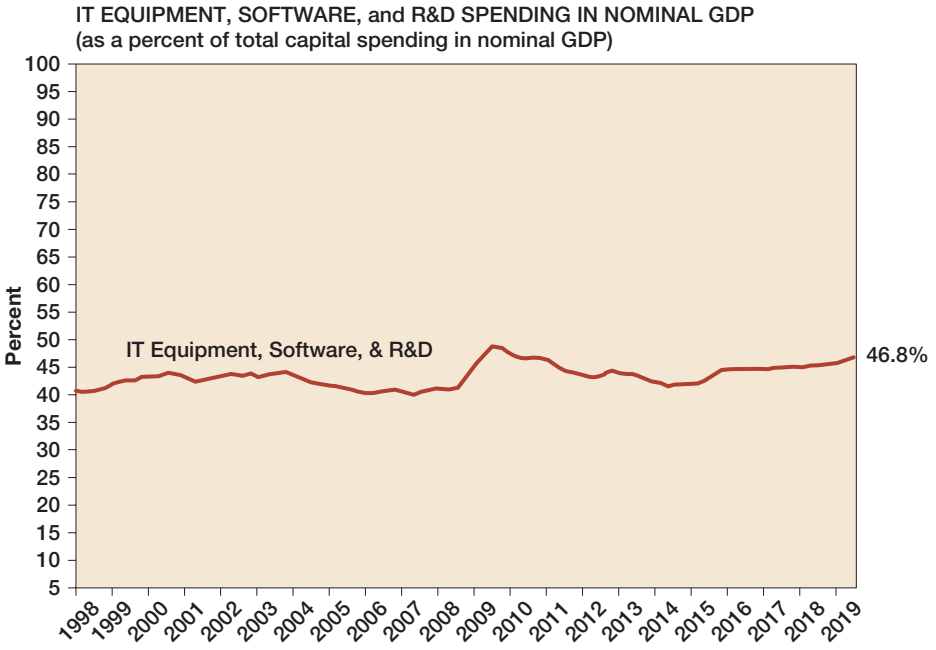
What's New in Management Information Systems?

Plenty. In fact, there's a whole new world of doing business using new technologies for managing and organizing. What makes the MIS field the most exciting area of study in schools of business is the continuous change in technology, management, and business processes. Five changes are of paramount importance.

FIGURE 1.1 INFORMATION TECHNOLOGY CAPITAL INVESTMENT

Information technology capital investment, defined as IT equipment, software and research and development (R&D) spending, amounted to over 40 percent of total US capital spending (in nominal GDP) between 1999 and 2019. A similar pattern has occurred globally.

Source: US Bureau of Economic Analysis.



IT Innovations A continuing stream of information technology innovations is transforming the traditional business world. Examples include the emergence of cloud computing, the growth of a mobile digital business platform based on smartphones and tablet computers, big data and the Internet of Things (IoT), business analytics, machine learning systems, and the use of social networks by managers to achieve business objectives. Most of these changes have occurred in the past few years. These innovations are enabling entrepreneurs and innovative traditional firms to create new products and services, develop new business models, and transform the day-to-day conduct of business. In the process, some old businesses, even industries, are being destroyed while new businesses are springing up.

New Business Models For instance, the emergence of online video services for streaming or downloading, such as Netflix, Apple TV Channels, and Amazon, has forever changed how premium video is distributed and even created. Netflix by early 2020 had attracted more than 167 million subscribers worldwide to what it calls the "Internet TV revolution." Netflix has moved into premium TV show production with nearly 1,200 original shows in 2019, such as *American Vandal, Suburra, The Crown, Friends From College, House of Cards*, and *Orange Is the New Black*, challenging cable and broadcast producers of TV shows, and potentially disrupting cable network dominance of TV show production. Apple has struck deals with major Hollywood studios for recent movies and TV shows. A growing trickle of viewers are unplugging from cable and using only the Internet for entertainment.

E-commerce Expansion E-commerce sales worldwide amounted to nearly $3.6 trillion in 2019 and are expected to approach $5 trillion by 2021 (Lipsman, 2019). E-commerce is changing how firms design, produce, and deliver their products and services. E-commerce has reinvented itself again, disrupting the traditional marketing and advertising industry and putting major media and content firms

in jeopardy. Facebook and other social networking sites such as YouTube, Twitter, and Tumblr, along with Netflix, Apple Music, and many other media firms, exemplify the new face of e-commerce in the twenty-first century. They sell services. When we think of e-commerce, we tend to think of selling physical products. While this iconic vision of e-commerce is still very powerful and the fastest-growing form of retail worldwide, growing up alongside is a whole new value stream based on selling services, not goods. It's a services model of e-commerce. Growth in social commerce is spurred by powerful growth of the mobile platform: 98 percent of Facebook's users access the service from mobile phones and tablets. Information systems and technologies are the foundation of this new services-based e-commerce. Mobile retail e-commerce worldwide approached $2.55 billion in 2020 (and is growing at almost 20 percent a year) (eMarketer, 2020).

Management Changes The management of business firms has changed: With new mobile smartphones, high-speed wireless Wi-Fi networks, and tablets, remote salespeople on the road are only seconds away from their managers' questions and oversight. Management is going mobile. Managers on the move are in direct, continuous contact with their employees. The growth of enterprise-wide information systems with extraordinarily rich data means that managers no longer operate in a fog of confusion but instead have online, nearly instant access to the really important information they need for accurate and timely decisions. In addition to their public uses on the web, social networking tools, wikis, and blogs are becoming important corporate tools for communication, collaboration, and information sharing.

Changes in Firms and Organizations Compared to industrial organizations of the previous century, new fast-growing twenty-first-century business firms put less emphasis on hierarchy and structure and more emphasis on employees taking on multiple roles and tasks and collaborating with others on a team. They put greater emphasis on competency and skills rather than position in the hierarchy. They emphasize higher-speed and more-accurate decision making based on data and analysis. They are more aware of changes in technology, consumer attitudes, and culture. They use social media to enter into conversations with consumers and demonstrate a greater willingness to listen to consumers, in part because they have no choice. They show better understanding of the importance of information technology in creating and managing business firms and other organizations. To the extent organizations and business firms demonstrate these characteristics, they are twenty-first-century digital firms.

You can see some of these trends at work in the Interactive Session on Organizations, which examines the impact on work and management as many companies had their employees work remotely during the coronavirus pandemic of 2020.

Globalization Challenges and Opportunities: A Flattened World

Prior to AD 1500, there was no truly global economic system of trade that connected all the continents on earth although there were active regional trade markets. After the sixteenth century, a global trading system began to emerge based on advances in navigation and ship technology. The world trade that ensued after these developments has brought the peoples and cultures of the world much closer together. The Industrial Revolution was really a worldwide phenomenon energized by expansion of trade among nations, making nations both competitors and collaborators in business. The Internet has greatly heightened the competitive tensions among nations as global trade expands

INTERACTIVE SESSION ORGANIZATIONS

Will the Coronavirus Pandemic Make Working from Home the New Normal?

As COVID-19 continued to spread around the globe, companies large and small started to make changes to the way they work, shuttering their offices and requiring most or all of their employees to work remotely from their homes.

- During the pandemic, ClearRisk, which offers integrated, cloud-based software solutions for claims, fleet, incident, and insurance certificate management had its entire staff working from home.
- Many large law firms, including Reed Smith, Baker McKenzie, and Nixon Peabody, closed offices and required work at home during the pandemic. The law firms emphasized that they could continue to serve clients despite office closings and remote work.
- OpenText Corp., a Canadian provider of enterprise information management products, plans to eliminate more than half of its 120 offices globally, with 2000 of its 15,000-person workforce working from home permanently.
- In mid-May 2020, Twitter Inc. notified employees that most of them could work from home indefinitely.

According to a recent MIT report, 34 percent of Americans who previously commuted to work stated that they were working from home by the first week of April 2020 due to the coronavirus outbreak. Prior to the pandemic, the number of people regularly working from home remained in the single digits, with only about 4 percent of the US workforce working from home at least half the time. However, the trend of working from home had been slowly gaining momentum thanks to advances in information technology for remote work and changes in corporate work culture. The coronavirus pandemic may mark a tipping point.

It's likely that many people who started working from home for the first time during the pandemic will continue to do so thereafter. New health guidelines about distancing will require some workplaces to expand to accommodate all their employees or to have a significant percentage of employees work permanently from home.

Information technologies driving these changes include broadband high-speed Internet connections, laptop computers, tablets, smartphones, email, messaging, and videoconferencing tools. As companies shift their work from face-to-face to remote, video conferencing is becoming the new normal for meetings. People are trying to have good conversations, share critical information, generate new ideas, reach consensus, and make decisions quickly on this platform.

Although less than ideal for face-to-face interactions, videoconferencing is becoming more powerful and affordable. There are many options, including Skype, Skype for Business, Zoom, Microsoft Teams, Amazon Chime, BlueJeans, Cisco's WebEx, GoToMeeting, and Google Meet. Some business people are using the same tools they do in their personal communications, such as FaceTime and Facebook Messenger. (FaceTime now supports group video chat with up to 32 people.)

Video conference software such as WebEx and BlueJeans appears designed for more corporate uses. Other software such as Microsoft's Skype and Zoom feels more consumer-friendly and easier to set up, with free or low-cost versions suitable for smaller businesses. Skype works for video chats, calls, and instant messaging and can handle up to 50 people in a single video call. Skype allows calls to be recorded in case someone misses a meeting. Skype also provides file-sharing capabilities, caller ID, voicemail, a split view mode to keep conversations separate, and screen share on mobile devices.

Up to 1,000 users can participate in a single Zoom video call, and 49 videos can appear on the screen at once. Zoom includes collaboration tools like simultaneous screen-sharing and co-annotation, and the ability to record meetings and generate transcripts. Users can adjust meeting times, select multiple hosts, and communicate via chat if microphones and cameras are turned off.

There are definite benefits to remote work: lower overhead, more flexible schedules, reductions in employee commuting time and attrition rates, and increases in productivity. (Many companies reported that productivity did not suffer when employees worked at home during the pandemic.) According to Global Workplace Analytics, a typical company saves about $11,000 per half-time telecommuter per year. Working remotely also poses challenges.

Not all employees have access to the Internet at home, and many work in industries that require on-site work. About 80 percent of American adults have high-speed broadband Internet service at home. However, according to a Pew Research Center study, racial minorities, older adults, rural residents, and people with lower levels of education and income are less likely to have in-home broadband service. In addition, one in five American adults access the Internet only through their smartphones. Employees with little children or small apartments find working at home more difficult.

Full-time employees are four times more likely to have remote work options than part-time employees. According to Global Workplace Analytics, a typical remote worker is college-educated, at least 45 years old, and earns an annual salary of $58,000 while working for a company with more than 100 employees.

Although email and text messaging are very useful, they are not effective tools for communication compared to the information exchange and personal connection of face-to-face conversations. Remote work also inhibits the creativity and innovative thinking that take place when people interact with each other face-to-face, and videoconferencing is only a partial solution. Studies have found that people working together in the same room tend to solve problems more quickly than remote collaborators, and that team cohesion suffers when members work remotely.

Sources: Dana Mattioli and Konrad Putzier, "The End of the Office," *Wall Street Journal*, May 16-17, 2020; Rani Molla, "This Is the End of the Office as We Know It," Vox, April 14, 2020; Josh Lowy, "Overcoming Remote Work Challenges," *MIT Sloan Management Review*, April 9, 2020; Cate Pye, "Coronavirus: What Does the 'New Normal' Mean for How We Work?" *Computer Weekly*, April 3, 2020; Lindsey Jacobson, "As Coronavirus Forces Millions to Work Remotely, the US Economy May Have Reached a 'Tipping Point' in Favor of Working from Home," CNBC, March 23, 2020; Derek Thompson, "The Coronavirus Is Creating a Huge, Stressful Experiment in Working from Home," *The Atlantic*, March 13, 2020; Kevin Roose, "Sorry, but Working from Home Is Overrated," *New York Times*, March 10, 2020.

CASE STUDY QUESTIONS

1. Define the problem described in this case. What are the management, organization, and technology issues raised by this problem?
2. Identify the information technologies used to provide a solution to this problem. Was this a successful solution? Why or why not?
3. Will working from home become the dominant way of working in the future? Why or why not?

and strengthened the benefits that flow from trade, and also created significant dislocations in labor markets.

In 2005, journalist Thomas Friedman wrote an influential book declaring the world was now flat, by which he meant that the Internet and global communications had greatly expanded the opportunities for people to communicate with one another and reduced the economic and cultural advantages of developed countries. The United States and European countries were in a fight for their economic lives, according to Friedman, competing for jobs, markets, resources, and even ideas with highly educated, motivated populations in low-wage areas in the less developed world (Friedman, 2007). This globalization presents you and your business with both challenges and opportunities.

A growing percentage of the economy of the United States and other advanced industrial countries in Europe and Asia depends on imports and exports. In 2019, an estimated 30 percent of the world economy resulted from foreign trade of goods and services, both imports and exports. Half of *Fortune* 500 US firms obtain nearly 50 percent of their revenue from foreign operations. For instance, more than 50 percent of Intel's revenues in 2019 came from overseas sales of its microprocessors.

It's not just goods that move across borders. So too do jobs, some of them high-level jobs that pay well and require a college degree. For instance, since 2000, the United States has lost an estimated 5 million manufacturing jobs to offshore, low-wage producers, so manufacturing is now a small part of US employment (less than 9 percent). In a normal year, about 300,000 service jobs move offshore to lower-wage countries, many of them in less-skilled information system occupations but also in tradable service jobs in architecture, financial services, customer call centers, consulting, engineering, and even radiology.

On the plus side, the US economy created 2.6 million new jobs in 2018. Employment in information systems and the other service occupations listed previously has rapidly expanded in sheer numbers, wages, productivity, and quality of work. Outsourcing has actually accelerated the development of new systems in the United States and worldwide by reducing the cost of building and maintaining them. In 2019 job openings in information systems and technologies far exceeded the supply of applicants.

The challenge for you as a business student is to develop high-level skills through education and on-the-job experience that cannot be outsourced. The challenge for your business is to avoid markets for goods and services that can be produced offshore much less expensively. The opportunities are equally immense. Throughout this book you will find examples of companies and individuals who either failed or succeeded in using information systems to adapt to this new global environment.

What does globalization have to do with management information systems? That's simple: everything. The emergence of the Internet into a full-blown international communications system has drastically reduced the costs of operating and transacting on a global scale. Communication between a factory floor in Shanghai and a distribution center in Rapid City, South Dakota, is now instant and virtually free. Customers can now shop in a worldwide marketplace, obtaining price and quality information reliably 24 hours a day. Firms producing goods and services on a global scale achieve extraordinary cost reductions by finding low-cost suppliers and managing production facilities in other countries. Internet service firms, such as Google and eBay, are able to replicate their business models and services in multiple countries without having to redesign their expensive fixed-cost information systems infrastructure. Briefly, information systems enable globalization.

The Emerging Digital Firm

All of the changes we have just described, coupled with equally significant organizational redesign, have created the conditions for a fully digital firm. A digital firm can be defined along several dimensions. A **digital firm** is one in which nearly all of the organization's *significant business relationships* with customers, suppliers, and employees are digitally enabled and mediated. *Core business processes* are accomplished through digital networks spanning the entire organization or linking multiple organizations.

Business processes refer to the set of logically related tasks and behaviors that organizations develop over time to produce specific business results and the unique manner in which these activities are organized and coordinated. Developing a new product, generating and fulfilling an order, creating a marketing plan, and hiring an employee are examples of business processes, and the ways organizations accomplish their business processes can be a source of competitive strength. (A detailed discussion of business processes can be found in Chapter 2.)

Key corporate assets—intellectual property, core competencies, and financial and human assets—are managed through digital means. In a digital firm, any piece of information required to support key business decisions is available at any time and anywhere in the firm.

Digital firms sense and respond to their environments far more rapidly than traditional firms, giving them more flexibility to survive in turbulent times. Digital firms offer extraordinary opportunities for more-flexible global organization and management. In digital firms, both time shifting and space shifting are the norm. *Time shifting* refers to business being conducted continuously, 24/7, rather than in narrow "work day" time bands of 9 a.m. to 5 p.m. *Space shifting* means that work takes place in a global workshop as well as within national boundaries. Work is accomplished physically wherever in the world it is best accomplished.

Many firms, such as Cisco Systems, 3M, and GE, are close to becoming digital firms, using the Internet to drive every aspect of their business. Most other companies are not fully digital, but they are moving toward close digital integration with suppliers, customers, and employees.

Strategic Business Objectives of Information Systems

What makes information systems so essential today? Why are businesses investing so much in information systems and technologies? In the United States, more than 25 million business and financial managers, and 36 million professional workers in the labor force rely on information systems to conduct business. Information systems are essential for conducting day-to-day business in most advanced countries as well as achieving strategic business objectives.

Entire sectors of the economy are nearly inconceivable without substantial investments in information systems. E-commerce firms such as Amazon, eBay, Google, and E*Trade simply would not exist. Today's service industries—finance, insurance, and real estate as well as personal services such as travel, medicine, and education—could not operate without information systems. Similarly, retail firms such as Walmart and Tesco and manufacturing firms such as General Motors and Siemens require information systems to survive and prosper. Just as offices, telephones, filing cabinets, and efficient tall buildings with elevators were once the foundations of business in the twentieth century, information technology is a foundation for business in the twenty-first century.

There is a growing interdependence between a firm's ability to use information technology and its ability to implement corporate strategies and achieve corporate goals (see Figure 1.2). What a business would like to do in five years often depends on what its systems will be able to do. Increasing market share, becoming the high-quality or low-cost producer, developing new products, and increasing employee productivity depend more and more on the kinds and quality of information systems in the organization. The more you understand about this relationship, the more valuable you will be as a manager.

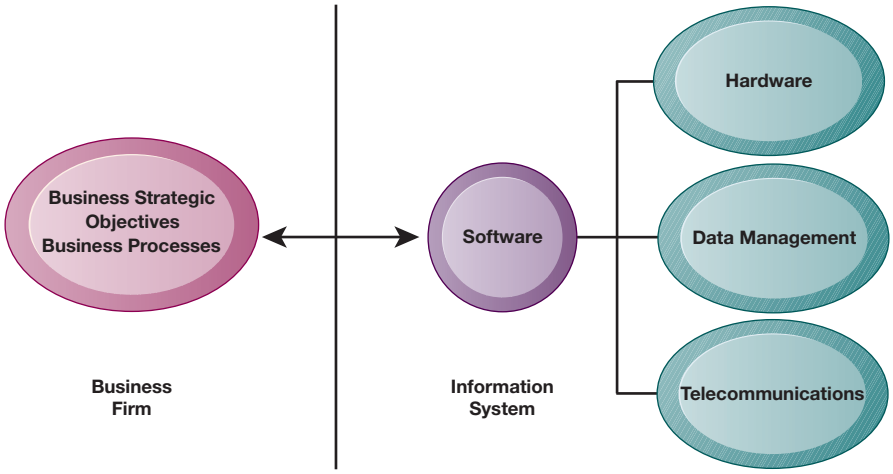
Specifically, business firms invest heavily in information systems to achieve six strategic business objectives: operational excellence; new products, services, and business models; customer and supplier intimacy; improved decision making; competitive advantage; and survival.

Operational Excellence

Businesses continuously seek to improve the efficiency of their operations in order to achieve higher profitability. Information systems and technologies are some of the most important tools available to managers for achieving higher

FIGURE 1.2 THE INTERDEPENDENCE BETWEEN ORGANIZATIONS AND INFORMATION SYSTEMS

In contemporary systems, there is a growing interdependence between a firm's information systems and its business capabilities. Changes in strategy, rules, and business processes increasingly require changes in hardware, software, databases, and telecommunications. Often, what the organization would like to do depends on what its systems will permit it to do.



levels of efficiency and productivity in business operations, especially when coupled with changes in business practices and management behavior.

Walmart, the largest retailer on earth, exemplifies the power of information systems coupled with state-of-the-art business practices and supportive management to achieve world-class operational efficiency. In fiscal year 2019, Walmart achieved $524 billion in sales—nearly one-tenth of retail sales in the United States—in large part because of its Retail Link system, which digitally links its suppliers to every one of Walmart's stores. As soon as a customer purchases an item, the supplier monitoring the item knows to ship a replacement to the shelf. Walmart is the most efficient retail store in the industry.

New Products, Services, and Business Models

Information systems and technologies are a major enabling tool for firms to create new products and services as well as entirely new business models. A **business model** describes how a company produces, delivers, and sells a product or service to create wealth.

Today's music industry is vastly different from the industry a decade ago. Apple Inc. transformed an old business model of music distribution based on vinyl records, tapes, and CDs into an online, legal distribution model based on its own technology platform. Apple has prospered from a continuing stream of innovations, including the iTunes music service, the iPad, and the iPhone.

Customer and Supplier Intimacy

When a business really knows its customers and serves them well, the customers generally respond by returning and purchasing more. This raises revenues and profits. Likewise with suppliers—the more a business engages its suppliers, the better the suppliers can provide vital inputs. This lowers costs. How to really know your customers or suppliers is a central problem for businesses with millions of offline and online customers.

High-end hotels, such as the Mandarin Oriental hotel group, which operates hotels in Asia, Europe, and the Americas, exemplify the use of information

systems and technologies to achieve customer intimacy. These hotels use computers to keep track of guests' preferences, such as their preferred room temperature, check-in time, frequently dialed telephone numbers, and television programs, and store these data in a large data repository. Individual rooms in the hotels are networked to a central network server computer so that they can be remotely monitored and controlled. When a customer arrives at one of these hotels, the system automatically changes the room conditions, such as dimming the lights, setting the room temperature, or selecting appropriate music, based on the customer's digital profile. The hotels also analyze their customer data to identify their best customers and to develop individualized marketing campaigns based on customers' preferences.

Charles Tyrwhitt, a UK retailer specializing in dress shirts, and JCPenney, a US department store chain, exemplify the use of information systems to enable supplier and customer intimacy. Every time a dress shirt is bought one of their stores, the record of the sale appears immediately on computers in Hong Kong at their supplier. TAL Apparel, a contract manufacturer that produces one in six dress shirts sold in the United States. TAL runs the numbers through a computer model it developed and then decides how many replacement shirts to make and in what styles, colors, and sizes. TAL then sends the shirts to each store, bypassing the retailer's warehouses. These systems reduce inventory costs and ensure that what customers want are actually on the shelves.

Improved Decision Making

Many business managers operate in an information fog bank, never really having the right information at the right time to make an informed decision. Instead, managers rely on forecasts, best guesses, and luck. The result is over- or underproduction of goods and services, misallocation of resources, and poor response times. These poor outcomes raise costs and lose customers. In the past decade, information systems and technologies have made it possible for managers to use real-time data from the marketplace when making decisions.

For instance, Privi Organics Ltd., a leading Indian company that manufactures, supplies, and exports aroma chemical products worldwide, uses the Oracle Human Capital Management system for real-time insight into individual employee information—including performance rating and compensation history. The system helps managers make faster human resource decisions, such as promotions or transfers, by integrating all employee records across the organization. Managers are able to quickly review employee performance ratings for the previous three years and drill down into more details. A digital dashboard helps management view and monitor hiring status in multiple locations, such as the number of open positions and the time taken to fill these positions.

Competitive Advantage

When firms achieve one or more of these business objectives—operational excellence; new products, services, and business models; customer/supplier intimacy; and improved decision making—chances are they have already achieved a competitive advantage. Doing things better than your competitors, charging less for superior products, and responding to customers and suppliers in real time all add up to higher sales and higher profits that your competitors cannot match. Apple Inc., Walmart, and UPS, described later in this chapter, are industry leaders because they know how to use information systems for this purpose.

Survival

Business firms also invest in information systems and technologies because they are necessities of doing business. Sometimes these "necessities" are driven by industry-level changes. For instance, after Barclays Bank introduced the first automated teller machines (ATMs) in London in 1967, its competitors rushed to provide ATMs to their customers to keep up. Today, virtually all large banks around the world have regional ATMs and link to national and international ATM networks, such as Cirrus. Providing ATM services to retail banking customers is simply required in the retail banking business.

Most nations have statutes and regulations that create a legal duty for companies and their employees to retain records, including digital records. For instance, the European Council's Regulation on Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) and the U.S. Toxic Substances Control Act (1976), which regulates the exposure of employees to toxic chemicals, require firms to retain records on employee exposure for a certain period of time. Many other pieces of national and regional legislation impose significant information retention and reporting requirements on US businesses. Firms turn to information systems to provide the capability to respond to these record management requirements.

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

So far we've used *information systems* and *technologies* informally without defining the terms. **Information technology (IT)** consists of all the hardware and software that a firm needs to use in order to achieve its business objectives. This includes not only computer machines, storage devices, and handheld mobile devices but also software, such as the Windows or Linux operating systems, the Microsoft Office desktop productivity suite, and the many thousands of computer programs that can be found in a typical large firm. "Information systems" are more complex and can be best understood by looking at them from both a technology and a business perspective.

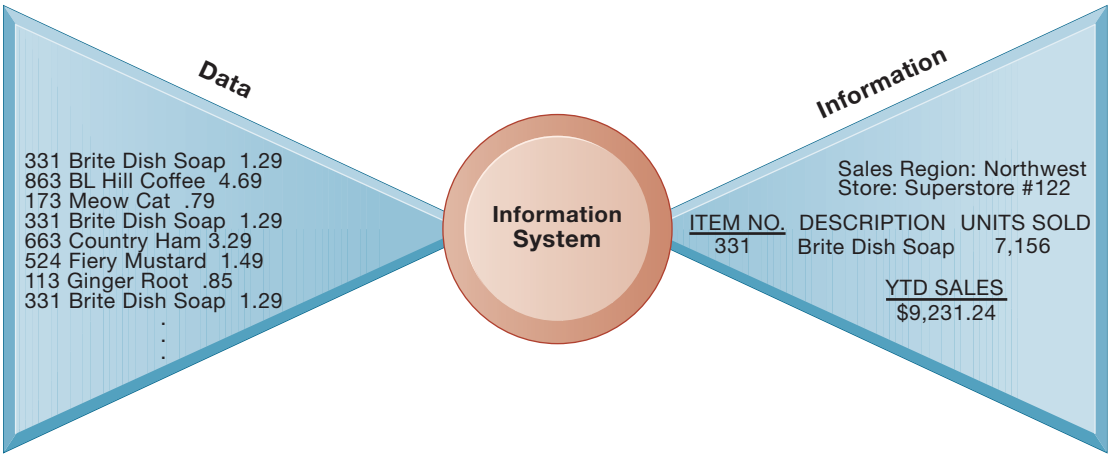
What Is an Information System?

An **information system** can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products.

Information systems contain information about significant people, places, and things within the organization or in the environment surrounding it. By **information** we mean data that have been shaped into a form that is meaningful and useful to human beings. **Data**, in contrast, are streams of raw facts representing events occurring in organizations or the physical environment before they have been organized and arranged into a form that people can understand and use.

FIGURE 1.3 DATA AND INFORMATION

Raw data from a supermarket checkout counter can be processed and organized to produce meaningful information, such as the total unit sales of dish detergent or the total sales revenue from dish detergent for a specific store or sales territory.



A brief example contrasting information and data may prove useful. Supermarket checkout counters scan millions of pieces of data from bar codes, which describe each product. Such pieces of data can be totaled and analyzed to provide meaningful information, such as the total number of bottles of dish detergent sold at a particular store, which brands of dish detergent were selling the most rapidly at that store or sales territory, or the total amount spent on that brand of dish detergent at that store or sales region (see Figure 1.3).

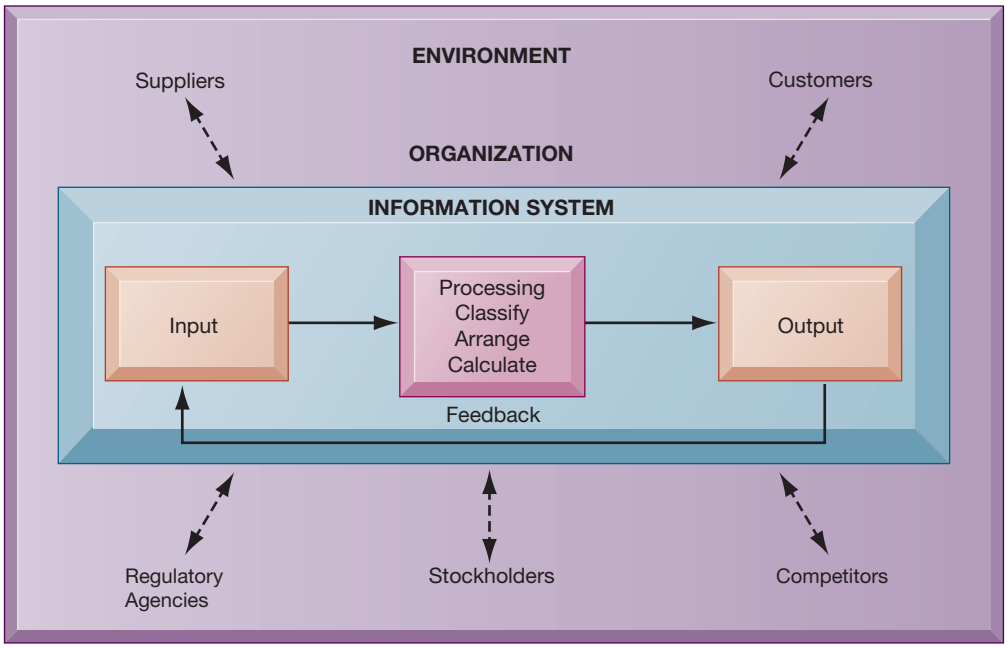
Three activities in an information system produce the information that organizations need to make decisions, control operations, analyze problems, and create new products or services. These activities are input, processing, and output (see Figure 1.4). **Input** captures or collects raw data from within the organization or from its external environment. **Processing** converts this raw input into a meaningful form. **Output** transfers the processed information to the people who will use it or to the activities for which it will be used. Information systems also require **feedback**, which is output that is returned to appropriate members of the organization to help them evaluate or correct the input stage.

In the AWM Smart Shelf system, input includes the digital results from scanning on-shelf products and store shelf identification codes, along with scanned images of items customers have selected for purchase. Computers store and process these data to keep track of the items on each shelf, the items each customer purchases or examines, and a history of the customer's purchases and items of interest. The system then determines what items on what shelves need restocking, and what items should be recommended to each customer. The system provides meaningful information such as all the items sold in a particular store or on a particular store shelf on a specific day, what items have been purchased by a specific customer, and which items need restocking.

Although computer-based information systems use computer technology to process raw data into meaningful information, there is a sharp distinction between a computer and a computer program on the one hand and an information system on the other. Computers and related software programs are the technical foundation, the tools and materials, of modern information systems. Computers provide the equipment for storing and processing information. Computer programs, or software, are sets of operating instructions that direct and control computer processing. Knowing how computers and computer

FIGURE 1.4 FUNCTIONS OF AN INFORMATION SYSTEM

An information system contains information about an organization and its surrounding environment. Three basic activities—input, processing, and output—produce the information organizations need. Feedback is output returned to appropriate people or activities in the organization to evaluate and refine the input. Environmental actors, such as customers, suppliers, competitors, stockholders, and regulatory agencies, interact with the organization and its information systems.



programs work is important in designing solutions to organizational problems, but computers are only part of an information system.

A house is an appropriate analogy. Houses are built with hammers, nails, and wood, but these do not make a house. The architecture, design, setting, landscaping, and all of the decisions that lead to the creation of these features are part of the house and are crucial for solving the problem of putting a roof over one's head. Computers and programs are the hammers, nails, and lumber of computer-based information systems, but alone they cannot produce the information a particular organization needs. To understand information systems, you must understand the problems they are designed to solve, their architectural and design elements, and the organizational processes that lead to the solutions.

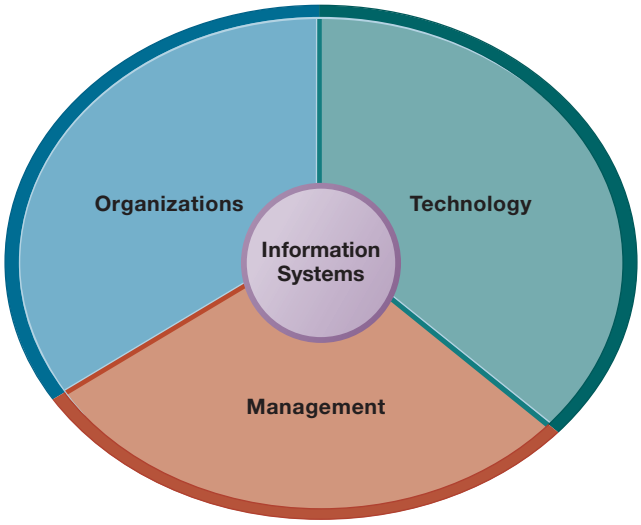
Dimensions of Information Systems

To fully understand information systems, you must understand the broader organization, management, and information technology dimensions of systems (see Figure 1.5) and their power to provide solutions to challenges and problems in the business environment. We refer to this broader understanding of information systems, which encompasses an understanding of the management and organizational dimensions of systems as well as the technical dimensions of systems, as **information systems literacy**. **Computer literacy**, in contrast, focuses primarily on knowledge of information technology.

The field of **management information systems (MIS)** tries to achieve this broader information systems literacy. MIS deals with behavioral issues as well as technical issues surrounding the development, use, and impact of information systems used by managers and employees in the firm.

FIGURE 1.5 INFORMATION SYSTEMS ARE MORE THAN COMPUTERS

Using information systems effectively requires an understanding of the organization, management, and information technology shaping the systems. An information system creates value for the firm as an organizational and management solution to challenges posed by the environment.



Let's examine each of the dimensions of information systems—organizations, management, and information technology.

Organizations

Information systems are an integral part of organizations. Indeed, for some companies, such as credit reporting firms, there would be no business without an information system. The key elements of an organization are its people, structure, business processes, politics, and culture. We introduce these components of organizations here and describe them in greater detail in Chapters 2 and 3.

Organizations have a structure that is composed of different levels and specialties. Their structures reveal a clear-cut division of labor. Authority and responsibility in a business firm are organized as a hierarchy, or a pyramid structure. The upper levels of the hierarchy consist of managerial, professional, and technical employees, whereas the lower levels consist of operational personnel.

Senior management makes long-range strategic decisions about products and services as well as ensures financial performance of the firm. **Middle management** carries out the programs and plans of senior management, and **operational management** is responsible for monitoring the daily activities of the business. **Knowledge workers**, such as engineers, scientists, or architects, design products or services and create new knowledge for the firm, whereas **data workers**, such as secretaries or clerks, assist with scheduling and communications at all levels of the firm. **Production or service workers** actually produce the product and deliver the service (see Figure 1.6).

Experts are employed and trained for different business functions. The major **business functions**, or specialized tasks performed by business organizations, consist of sales and marketing, manufacturing and production, finance and accounting, and human resources (see Table 1.1). Chapter 2 provides more detail on these business functions and the ways in which they are supported by information systems.

An organization coordinates work through its hierarchy and through its *business processes*. Most organizations' business processes include formal rules that

TABLE 1.1 MAJOR BUSINESS FUNCTIONS

FUNCTION	PURPOSE
Sales and marketing	Selling the organization's products and services
Manufacturing and production	Producing and delivering products and services
Finance and accounting	Managing the organization's financial assets and maintaining the organization's financial records
Human resources	Attracting, developing, and maintaining the organization's labor force; maintaining employee records

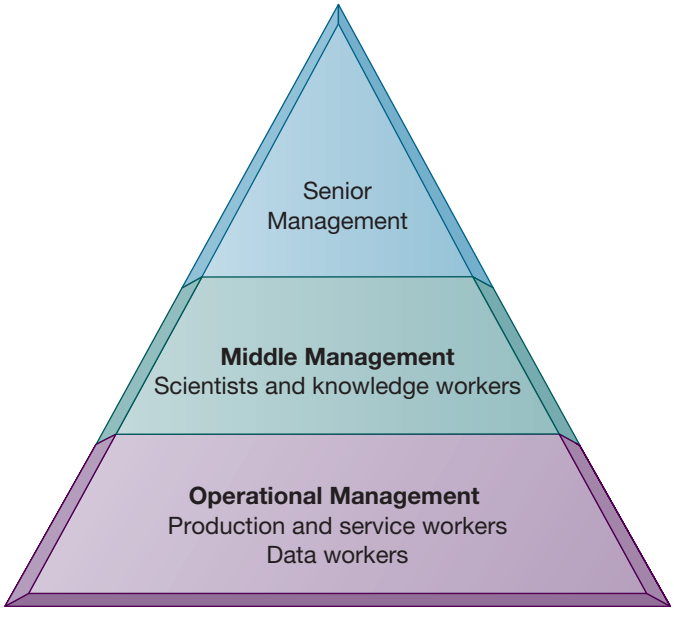
have been developed over a long time for accomplishing tasks. These rules guide employees in a variety of procedures, from writing an invoice to responding to customer complaints. Some of these business processes have been written down, but others are informal work practices, such as a requirement to return telephone calls from coworkers or customers, that are not formally documented. Information systems automate many business processes. For instance, how a customer receives credit or how a customer is billed is often determined by an information system that incorporates a set of formal business processes.

Each organization has a unique **culture**, or fundamental set of assumptions, values, and ways of doing things, that has been accepted by most of its members. You can see organizational culture at work by looking around your university or college. Some bedrock assumptions of university life are that professors know more than students, that the reason students attend college is to learn, and that classes follow a regular schedule.

Parts of an organization's culture can always be found embedded in its information systems. For instance, UPS's first priority is customer service, which is an aspect of its organizational culture that can be found in the company's package tracking systems, which we describe in this section.

FIGURE 1.6 LEVELS IN A FIRM

Business organizations are hierarchies consisting of three principal levels: senior management, middle management, and operational management. Information systems serve each of these levels. Scientists and knowledge workers often work with middle management.



Different levels and specialties in an organization create different interests and points of view. These views often conflict over how the company should be run and how resources and rewards should be distributed. Conflict is the basis for organizational politics. Information systems come out of this cauldron of differing perspectives, conflicts, compromises, and agreements that are a natural part of all organizations. In Chapter 3, we examine these features of organizations and their role in the development of information systems in greater detail.

Management

Management's job is to make sense out of the many situations faced by organizations, make decisions, and formulate action plans to solve organizational problems. Managers perceive business challenges in the environment, they set the organizational strategy for responding to those challenges, and they allocate the human and financial resources to coordinate the work and achieve success. Throughout, they must exercise responsible leadership. The business information systems described in this book reflect the hopes, dreams, and realities of real-world managers.

But managers must do more than manage what already exists. They must also create new products and services and even re-create the organization from time to time. A substantial part of management responsibility is creative work driven by new knowledge and information. Information technology can play a powerful role in helping managers design and deliver new products and services and redirecting and redesigning their organizations. Chapter 12 treats management decision making in detail.

Information Technology

Information technology is one of many tools managers use to cope with change. **Computer hardware** is the physical equipment used for input, processing, and output activities in an information system. It consists of the following: computers of various sizes and shapes (including mobile handheld devices); various input, output, and storage devices; and telecommunications devices that link computers together.

Computer software consists of the detailed, preprogrammed instructions that control and coordinate the computer hardware components in an information system. Chapter 5 describes the contemporary software and hardware platforms used by firms today in greater detail.

Data management technology consists of the software governing the organization of data on physical storage media. More detail on data organization and access methods can be found in Chapter 6.

Networking and telecommunications technology, consisting of both physical devices and software, links the various pieces of hardware and transfers data from one physical location to another. Computers and communications equipment can be connected in networks for sharing voice, data, images, sound, and video. A **network** links two or more computers to share data or resources, such as a printer.

The world's largest and most widely used network is the **Internet**. The Internet is a global "network of networks" that uses universal standards (described in Chapter 7) to connect millions of networks in more than 230 countries around the world.

The Internet has created a new "universal" technology platform on which to build new products, services, strategies, and business models. This same technology platform has internal uses, providing the connectivity to link different systems and networks within the firm. Internal corporate networks based on Internet

technology are called **intranets**. Private intranets extended to authorized users outside the organization are called **extranets**, and firms use such networks to coordinate their activities with other firms for making purchases, collaborating on design, and other interorganizational work. For most business firms today, using Internet technology is both a business necessity and a competitive advantage.

The **World Wide Web** is a service provided by the Internet that uses universally accepted standards for storing, retrieving, formatting, and displaying information in a page format on the Internet. Web pages contain text, graphics, animations, sound, and video and are linked to other web pages. By clicking on highlighted words or buttons on a web page, you can link to related pages to find additional information and links to other locations on the web. The web can serve as the foundation for new kinds of information systems such as UPS's web-based package tracking system described below.

All of these technologies, along with the people required to run and manage them, represent resources that can be shared throughout the organization and constitute the firm's **information technology (IT) infrastructure**. The IT infrastructure provides the foundation, or *platform*, on which the firm can build its specific information systems. Each organization must carefully design and manage its IT infrastructure so that it has the set of technology services it needs for the work it wants to accomplish with information systems. Chapters 5 through 8 of this book examine each major technology component of information technology infrastructure and show how they all work together to create the technology platform for the organization. The Interactive Session on Technology describes some examples of the technologies used in computer-based information systems today.

UPS's global delivery system provides another example. UPS invests heavily in information systems technology to make its business more efficient and customer oriented. It uses an array of information technologies, including bar code scanning systems, wireless networks, large mainframe computers, handheld computers, the Internet, and many different pieces of software for tracking packages, calculating fees, maintaining customer accounts, and managing logistics.

Let's identify the organization, management, and technology elements in the UPS package tracking system. The organization element anchors the package tracking system in UPS's sales and production functions (the main product of UPS is a service—package delivery). It specifies the required procedures for identifying packages with both sender and recipient information, taking inventory, tracking the packages en route, and providing package status reports for UPS customers and customer service representatives.

The system must also provide information to satisfy the needs of managers and workers. UPS drivers need to be trained in both package pickup and delivery procedures and in how to use the package tracking system so that they can work efficiently and effectively. UPS customers may need some training to use UPS in-house package tracking software or the UPS website.

UPS's management is responsible for monitoring service levels and costs and for promoting the company's strategy of combining low cost and superior service. Management decided to use computer systems to increase the ease of sending a package using UPS and of checking its delivery status, thereby reducing delivery costs and increasing sales revenues.

The technology supporting this system consists of handheld computers, bar code scanners, desktop computers, wired and wireless communications networks, UPS's data center, storage technology for the package delivery data, UPS in-house package tracking software, and software to access the web. The result is an information system solution to the business challenge of providing a high level of service with low prices in the face of mounting competition.

INTERACTIVE SESSION TECHNOLOGY

Digital Transformation of Healthcare at Singapore's Jurong Health Services

Jurong Health Services (JurongHealth) is one of Singapore's six public healthcare clusters. Healthcare clusters provide holistic and integrated care when patients move from one care setting, like a clinic, to another, like a hospital. JurongHealth primarily manages the 700-bed Ng Teng Fong General Hospital, the 400-bed Jurong Community Hospital, and the Jurong Medical Center, all of which are located in western Singapore.

JurongHealth's goal is to provide transformative medical care for its patients through the use of innovative information technologies. Underscoring this commitment, in 2016 JurongHealth's Ng Teng Fong General Hospital became the first hospital in Singapore and the ASEAN region, and fifth in Asia-Pacific, to receive the highest level of the Healthcare Information and Management Systems Society (HIMSS) Electronic Medical Record Adoption Model Award, which measures a hospital's implementation of IT systems.

JurongHealth has integrated more than 50 healthcare IT systems as part of the Project OneCare initiative. The systems' implementation and integration took four years and has enabled the hospital to become paperless, chartless, and filmless. For instance, self-service kiosks now enable patients to register themselves merely by scanning their national identification cards and obtaining a queue number generated by the Enterprise Queue Management System. This unique number is used throughout the patient's visit for all service itineraries in the hospital. Patients refer to live screens located in the waiting areas that display a real-time queue status showing their turn. This system has not only helped JurongHealth to cut down on expenses but also to improve efficiency, as patients do not need different numbers for different services. It reduces waiting time and increases patient satisfaction.

Similarly, the Visitor Management System self-service kiosks enable visitors to scan their identification cards and register themselves to gain access to hospital wards. Visitors can also register themselves and obtain an e-pass from the Visitor Registration counters. The identification card or e-pass is scanned at the gantry when entering and leaving the ward. The gantry not only logs visitor information but also tracks staff, who must also use the same gantries to enter the wards. The Visitor Management System enables the hospital to both control access to the wards and track or contact visitors and staff if necessary.

Another IT system implemented is the Warehouse Management System, which eliminates the tedious process of manually counting inventory. The system uses passive radio frequency identification (RFID) technology and a two-bin shelving system to automate inventory top-up requests and improve inventory management. Once the primary compartment of the storage bin is empty, the clinical staff transfers the relevant RFID tag into a drop-box, where the reader automatically sends a request for drug replenishment, thus avoiding stock-outs.

JurongHealth has also implemented a Real-Time Location Tracking System to automatically track patients and medical equipment using Wi-Fi triangulation, low frequency exciters, and about 6,000 active RFID tags attached to patients or medical equipment. These tags continuously communicate with the low frequency exciters to transmit data to the backend system for processing, allowing hospital staff to precisely locate patients and equipment, thus eliminating the need for tedious manual searching.

JurongHealth made a conscious effort to ensure that the different IT systems would not be standalone. The hospital thus implemented an integrated Electronic Medical Record (EMR) system that combines all the functional modules of the hospital in addition to being interfaced with 140 medical devices and equipment. Using the vendor-neutral Medical Devices Middleware Integration System, data from these medical devices is directly uploaded into the EMR system, so that the clinical staff no longer has to manually enter such readings, reducing the likelihood of charting errors. Being vendor-neutral also means the freedom to adopt best-of-breed individual modules as well as a lack of reliance on a single vendor.

Since the implementation of the EMR system, JurongHealth has continued to move forward, particularly in response to the COVID-19 pandemic. In September 2020, the hospital introduced a series of measures to make the facilities more secure and infection-free. For instance, they deployed a security robot to patrol the grounds and a second "Kenobi" (a security and concierge robot) to carry out thermal scanning of visitors. Drones have also been deployed

to carry out inspections and surveillance. In addition, as an immediate response to the pandemic, and as a longer-term solution to infection control, new touch-free technology has been introduced to operate patient and visitor lifts.

IT has played a key role in enabling JurongHealth to achieve its mission of providing world-class medical care at an affordable cost. As a result, JurongHealth has developed a reputation as a leading technology-driven healthcare provider as well as a role model not only in Singapore but also the entire region. This is also evident from its many accolades, which include awards for IT-driven transformation and for overall organizational transformation.

Sources: "Combating Covid-19: A Birth of Innovations," *The Straits Times*, September 29, 2020; Salma Khalik, "Singapore on Track to Have One of World's Most IT-enabled Healthcare Systems," *The Straits Times*, June 2, 2017; JurongHealth, "Awards & Accolades," www.juronghealth.com.sg, accessed January 5, 2017; P. Bhunia, "The JurongHealth IT Journey—Integrating IT from the Ground-Up into a New Digital Hospital," opengovasia.com, November 13, 2016; IHIS, "Ng Teng Fong General Hospital Becomes First in Singapore and ASEAN to Achieve HIMSS Analytics EMRAM Stage 7 Award," Press Release, www.ihis.com, October 7, 2016; "Our Milestones," www.juronghealth.com.sg, October 2016; Ai Lei Tao, "Singapore's Jurong Health Services: Transforming Healthcare Through Data Technologies," computerweekly.com, April 16, 2016; A. Shukla, "Singapore Hospitals Deliver Enhanced Care to Patients by Integrating Their IT Systems," www.cio-asia.com, March 17, 2016; IHIS, "Integrated Healthcare IT Systems at Ng Teng Fong General Hospital and Jurong Community Hospital Win the Project of the Year Award at the SPMI Symposium 2016," Press Release, www. ihis.com, March 14, 2016; J. Kelleher, "JurongHealth Services CIO Discusses the Fully Integrated EMR Suite, Hospital ICT Systems and Achieving HIMSS EMRAM Stage 6," opengovasia.com, February 18, 2016.

CASE STUDY QUESTIONS

1. What technologies are used by JurongHealth? What purpose do they serve?
2. Search the web for RFID. Suggest an example of how RFID can be used for locating and tracking people.
3. What information systems are implemented by JurongHealth? Describe the input, processing, and output of any one such system.
4. Why are information systems important for JurongHealth?

Case contributed by Neerja Sethi and Vijay Sethi, Nanyang Technological University

It Isn't Just Technology: A Business Perspective on Information Systems

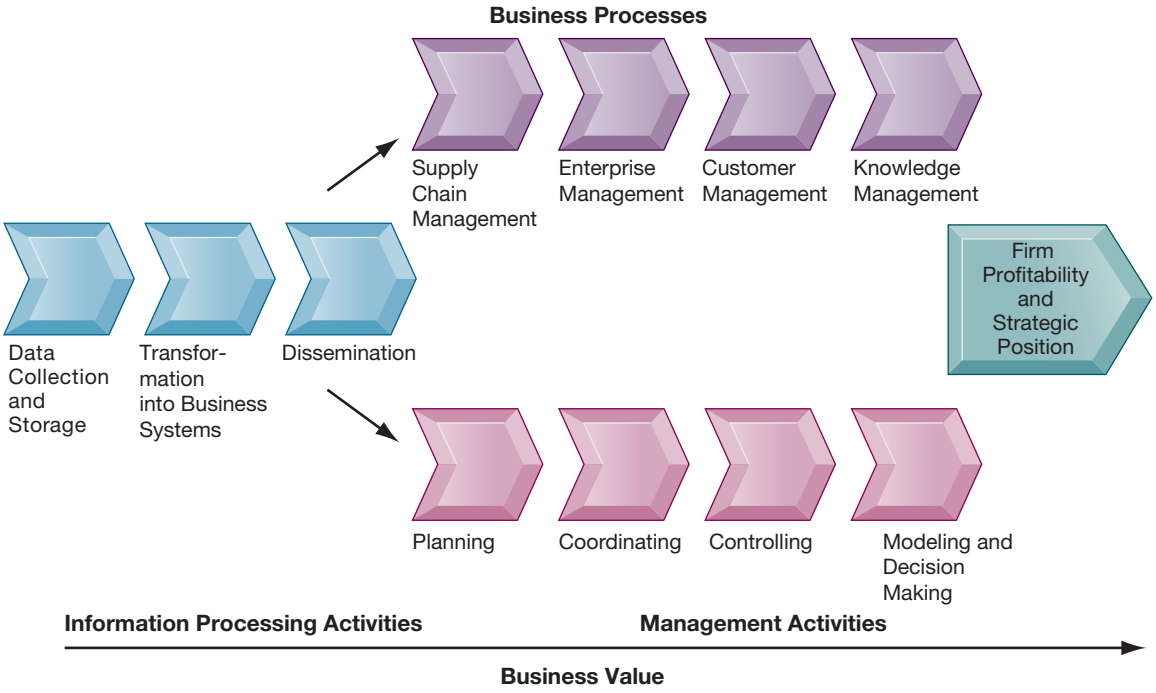
Managers and business firms invest in information technology and systems because they provide real economic value to the business. The decision to build or maintain an information system assumes that the returns on this investment will be superior to other investments in buildings, machines, or other assets. These superior returns will be expressed as increases in productivity, as increases in revenues (which will increase the firm's stock market value), or perhaps as superior long-term strategic positioning of the firm in certain markets (which will produce superior revenues in the future).

We can see that from a business perspective, an information system is an important instrument for creating value for the firm. Information systems enable the firm to increase its revenue or decrease its costs by providing information that helps managers make better decisions or that improves the execution of business processes. For example, the information system for analyzing supermarket checkout data illustrated in Figure 1.3 can increase firm profitability by helping managers make better decisions as to which products to stock and promote in retail supermarkets.

Every business has an information value chain, illustrated in Figure 1.7, in which raw information is systematically acquired and then transformed through various stages that add value to that information. The value of an information system to a business, as well as the decision to invest in any new information system, is, in large part, determined by the extent to which the system will lead to better management decisions, more efficient business processes, and higher

FIGURE 1.7 THE BUSINESS INFORMATION VALUE CHAIN

From a business perspective, information systems are part of a series of value-adding activities for acquiring, transforming, and distributing information that managers can use to improve decision making, enhance organizational performance, and, ultimately, increase firm profitability.



firm profitability. Although there are other reasons why systems are built, their primary purpose is to contribute to corporate value.

The business perspective calls attention to the organizational and managerial nature of information systems. An information system represents an organizational and management solution, based on information technology, to a challenge or problem posed by the environment. Every chapter in this book begins with a short case study that illustrates this concept. A diagram at the beginning of each chapter illustrates the relationship between a business challenge and resulting management and organizational decisions to use IT as a solution to challenges generated by the business environment. You can use this diagram as a starting point for analyzing any information system or information system problem you encounter.

Review the diagram at the beginning of this chapter. The diagram shows how the AWM Smart Shelf system helps solve the business problem of brick-and-mortar stores losing market share to online retailers. This system provides a solution that takes advantage of opportunities provided by new object-recognition and wireless digital technology.

AWM Smart Shelf digitally enables key business processes for inventory management, sales, and marketing, helping retailers improve their overall business performance. The diagram also illustrates how management, technology, and organizational elements work together to create the systems.

Complementary Assets: Organizational Capital and the Right Business Model

Awareness of the organizational and managerial dimensions of information systems can help us understand why some firms achieve better results from their information systems than others. Studies of returns from information

TABLE 1.2 COMPLEMENTARY SOCIAL, MANAGERIAL, AND ORGANIZATIONAL ASSETS REQUIRED TO OPTIMIZE RETURNS FROM INFORMATION TECHNOLOGY INVESTMENTS

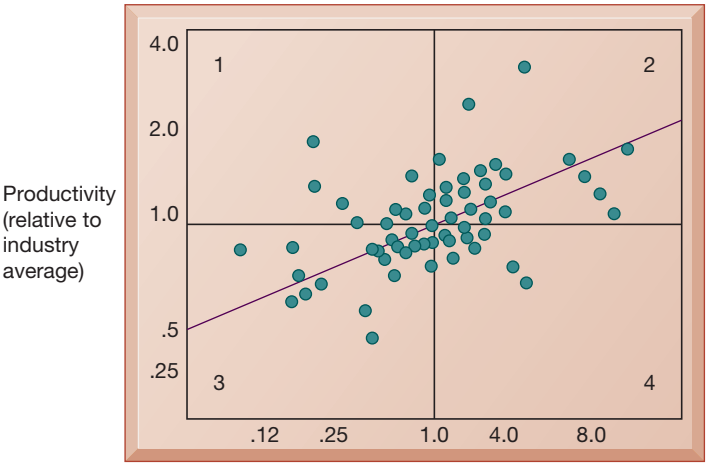
Organizational assets	Supportive organizational culture that values efficiency and effectiveness
	Appropriate business model
	Efficient business processes
	Decentralized authority
	Distributed decision-making rights
	Strong IS development team
Managerial assets	Strong senior management support for technology investment and change
	Incentives for management innovation
	Teamwork and collaborative work environments
	Training programs to enhance management decision skills
	Management culture that values flexibility and knowledge-based decision making
Social assets	The Internet and telecommunications infrastructure
	IT-enriched educational programs raising labor force computer literacy
	Standards (both government and private sector)
	Laws and regulations creating fair, stable market environments
	Technology and service firms in adjacent markets to assist implementation

technology investments show that there is considerable variation in the returns firms receive (see Figure 1.8). Some firms invest a great deal and receive a great deal (quadrant 2); others invest an equal amount and receive few returns (quadrant 4). Still other firms invest little and receive much (quadrant 1), whereas

FIGURE 1.8 VARIATION IN RETURNS ON INFORMATION TECHNOLOGY INVESTMENT

Although, on average, investments in information technology produce returns far above those returned by other investments, there is considerable variation across firms.

Source: Brynjolfsson, Erik, and Lorin M. Hitt. "Beyond Computation: Information Technology, Organizational Transformation, and Business Performance." Journal of Economic Perspectives 14, No. 4 (2000).



others invest little and receive little (quadrant 3). This suggests that investing in information technology does not by itself guarantee good returns. What accounts for this variation among firms?

The answer lies in the concept of complementary assets. Information technology investments alone cannot make organizations and managers more effective unless they are accompanied by supportive values, structures, and behavior patterns in the organization and other complementary assets. Business firms need to change how they do business before they can really reap the advantages of new information technologies.

Complementary assets are those assets required to derive value from a primary investment (Teece, 1998). For instance, to realize value from automobiles requires substantial complementary investments in highways, roads, gasoline stations, repair facilities, and a legal regulatory structure to set standards and control drivers.

Research indicates that firms that support their technology investments with investments in complementary assets, such as new business models, new business processes, management behavior, organizational culture, or training, receive superior returns, whereas those firms failing to make these complementary investments receive less or no returns on their information technology investments (Brynjolfsson, 2005; Brynjolfsson and Hitt, 2000; Laudon, 1974). These investments in organization and management are also known as **organizational and management capital**.

Table 1.2 lists the major complementary investments that firms need to make to realize value from their information technology investments. Some of this investment involves tangible assets, such as buildings, machinery, and tools. However, the value of investments in information technology depends to a large extent on complementary investments in management and organization.

Key organizational complementary investments are a supportive business culture that values efficiency and effectiveness, an appropriate business model, efficient business processes, decentralization of authority, highly distributed decision rights, and a strong information system (IS) development team.

Important managerial complementary assets are strong senior management support for change, incentive systems that monitor and reward individual innovation, an emphasis on teamwork and collaboration, training programs, and a management culture that values flexibility and knowledge.

Important social investments (not made by the firm but by the society at large, other firms, governments, and other key market actors) are the Internet and the supporting Internet culture, educational systems, network and computing standards, regulations and laws, and the presence of technology and service firms.

Throughout the book, we emphasize a framework of analysis that considers technology, management, and organizational assets and their interactions. Perhaps the single most important theme in the book, reflected in case studies and exercises, is that managers need to consider the broader organization and management dimensions of information systems to understand current problems as well as to derive substantial above-average returns from their information technology investments. As you will see throughout the text, firms that can address these related dimensions of the IT investment are, on average, richly rewarded.

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

The study of information systems is a multidisciplinary field. No single theory or perspective dominates. Figure 1.9 illustrates the major disciplines that contribute problems, issues, and solutions in the study of information systems. In general, the field can be divided into technical and behavioral approaches. Information systems are sociotechnical systems. Though they are composed of machines, devices, and "hard" physical technology, they require substantial social, organizational, and intellectual investments to make them work properly.

Technical Approach

The technical approach to information systems emphasizes mathematically based models to study information systems as well as the physical technology and formal capabilities of these systems. The disciplines that contribute to the technical approach are computer science, management science, and operations research.

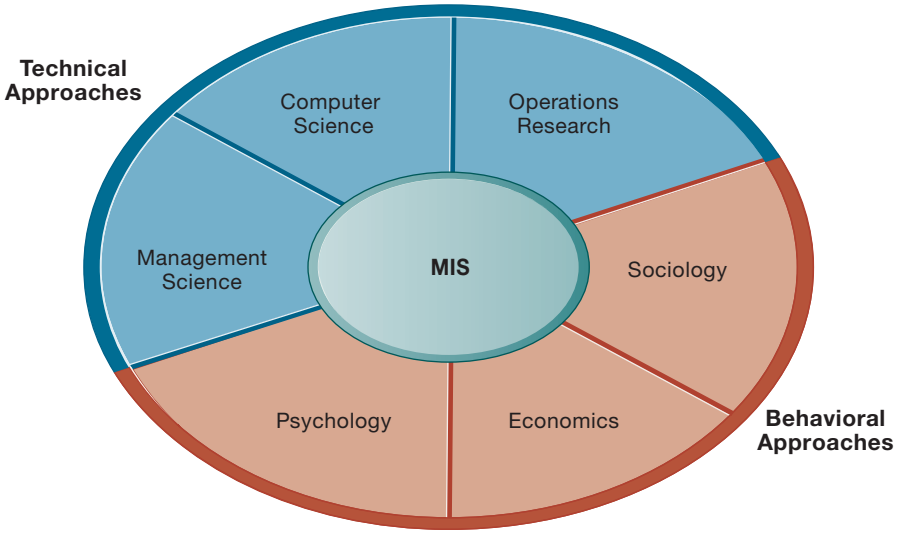
Computer science is concerned with establishing theories of computability, methods of computation, and methods of efficient data storage and access. Management science emphasizes the development of models for decision-making and management practices. Operations research focuses on mathematical techniques for optimizing selected parameters of organizations, such as transportation, inventory control, and transaction costs.

Behavioral Approach

An important part of the information systems field is concerned with behavioral issues that arise in the development and long-term maintenance of information systems. Issues such as strategic business integration, design, implementation,

FIGURE 1.9 CONTEMPORARY APPROACHES TO INFORMATION SYSTEMS

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines.



utilization, and management cannot be explored usefully with the models used in the technical approach. Other behavioral disciplines contribute important concepts and methods.

For instance, sociologists study information systems with an eye toward how groups and organizations shape the development of systems and also how systems affect individuals, groups, and organizations. Psychologists study information systems with an interest in how human decision makers perceive and use formal information. Economists study information systems with an interest in understanding the production of digital goods, the dynamics of digital markets, and how new information systems change the control and cost structures within the firm.

The behavioral approach does not ignore technology. Indeed, information systems technology is often the stimulus for a behavioral problem or issue. But the focus of this approach is generally not on technical solutions. Instead, it concentrates on changes in attitudes, management and organizational policy, and behavior.

Approach of This Text: Sociotechnical Systems

Throughout this book, you will find a rich story with four main actors: suppliers of hardware and software (the technologists); business firms making investments and seeking to obtain value from the technology; managers and employees seeking to achieve business value (and other goals); and the contemporary legal, social, and cultural context (the firm's environment). Together these actors produce what we call *management information systems*.

The study of management information systems (MIS) arose to focus on the use of computer-based information systems in business firms and government agencies. MIS combines the work of computer science, management science, and operations research with a practical orientation toward developing system solutions to real-world problems and managing information technology resources. It is also concerned with behavioral issues surrounding the development, use, and impact of information systems, which are typically discussed in the fields of sociology, economics, and psychology.

Our experience as academics and practitioners leads us to believe that no single approach effectively captures the reality of information systems. The successes and failures of information systems are rarely all technical or all behavioral. Our best advice to students is to understand the perspectives of many disciplines. Indeed, the challenge and excitement of the information systems field are that it requires an appreciation and tolerance of many different approaches.

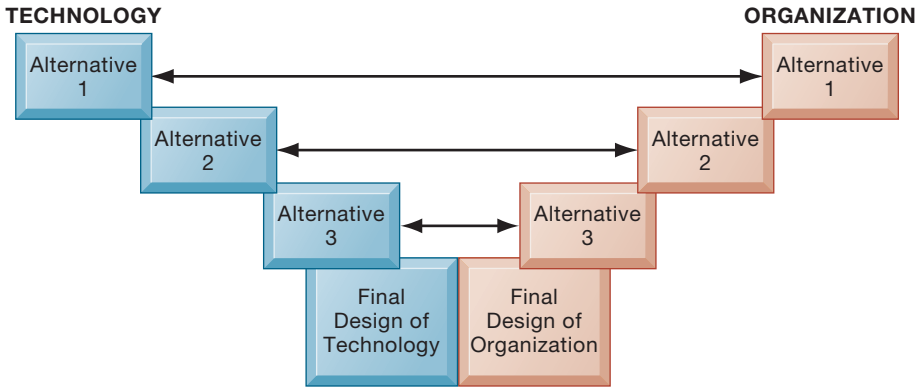
The view we adopt in this book is best characterized as the **sociotechnical view** of systems. In this view, optimal organizational performance is achieved by jointly optimizing both the social and technical systems used in production.

Adopting a sociotechnical systems perspective helps to avoid a purely technological approach to information systems. For instance, the fact that information technology is rapidly declining in cost and growing in power does not necessarily or easily translate into productivity enhancement or bottom-line profits. The fact that a firm has recently installed an enterprise-wide financial reporting system does not necessarily mean that it will be used, or used effectively. Likewise, the fact that a firm has recently introduced new business procedures and processes does not necessarily mean employees will be more productive in the absence of investments in new information systems to enable those processes.

In this book, we stress the need to optimize the firm's performance as a whole. Both the technical and behavioral components need attention. This means that technology must be changed and designed in such a way as to fit

FIGURE 1.10 A SOCIOTECHNICAL PERSPECTIVE ON INFORMATION SYSTEMS

In a sociotechnical perspective, the performance of a system is optimized when both the technology and the organization mutually adjust to one another until a satisfactory fit is obtained.



organizational and individual needs. Sometimes, the technology may have to be "de-optimized" to accomplish this fit. For instance, mobile phone users adapt this technology to their personal needs, and as a result manufacturers quickly seek to adjust the technology to conform to user expectations. Organizations and individuals must also be changed through training, learning, and planned organizational change to allow the technology to operate and prosper. Figure 1.10 illustrates this process of mutual adjustment in a sociotechnical system.

1-4 How will MIS help my career?

Here is how Chapter 1 and this text can help you find an entry-level job as a financial client support and sales assistant.

The Company

Power Financial Analytics Data Services, a data and software company serving the financial industry with offices in London, New York, Sydney, and Singapore, is looking to fill an entry-level position for a financial client support and sales assistant. The company has 1,600 employees, many of whom are consultants showing clients how to work with its powerful financial analytics software and data products.

Position Description

The financial client support and sales assistant will be part of a team in the company's consulting services. Consulting teams combine a thorough understanding of finance and technology with specific expertise in Power Financial Analytics Data Services software and assist clients in a variety of ways. The

company provides on-the-job training in its software and consulting methods. Job responsibilities include:

- Supporting Financial Analytics Data Services applications.
- Helping the team create custom models and screens.
- Training clients in their offices and at seminars.
- Providing expert consultation to clients by telephone and on-site.

Job Requirements

- Recent college graduate or investment professional with one to two years of experience. Applicants with backgrounds in finance, MIS, economics, accounting, business administration, and mathematics are preferred
- Knowledge of or interest in learning about financial markets
- Sound working knowledge of spreadsheets
- Very strong communication and interpersonal skills
- Strong desire to learn in rapidly changing environment

Interview Questions

1. What is your background in finance? What courses did you take? Have you ever worked in the financial industry? What did you do there?
2. What is your proficiency level with spreadsheet software? What work have you done with Excel spreadsheets? Can you show examples of your work?
3. Are you able to discuss current trends in the financial industry and how they impact Power Financial's business model and client base?
4. Did you ever work with clients? Can you give examples of how you provided client service or support?
5. Can you give us an example of a finance-related problem or other business problem that you helped solve? Did you do any writing and analysis? Can you provide examples?

Author Tips

1. Use the web to learn about financial markets and the financial industry.
2. Use the web to research the company, its financial products, and the tools and services it offers customers. Learn what you can about its consulting services. Additionally, examine the company's social medial channels, such as LinkedIn and Facebook, for trends and themes.
3. Inquire exactly how you would be using spreadsheets for this job. Provide examples of how you used spreadsheets to solve problems in the classroom or for a job assignment. Show the spreadsheet work you did in finance.
4. Bring examples of your writing (including some from your Digital Portfolio described in MyLab MIS) demonstrating your analytical skills and project experience. Be prepared to discuss how you helped customers solve a business problem or the business problem solving you did for your courses.

REVIEW **SUMMARY**

1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

Organizations are trying to become more competitive and efficient by digitally enabling their core business processes and evolving into digital firms. The Internet has stimulated globalization by dramatically reducing the costs of producing, buying, and selling goods on a global scale. New information system trends include the emerging mobile digital platform, big data (including IoT), more remote management, democratization of decision making, machine learning systems, and the growing use of social media in business.

Information systems are a foundation for conducting business today. In many industries, survival and the ability to achieve strategic business goals are difficult without extensive use of information technology. Businesses today use information systems to achieve six major objectives: operational excellence; new products, services, and business models; customer/supplier intimacy; improved decision making; competitive advantage; and day-to-day survival.

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

From a technical perspective, an information system collects, stores, and disseminates information from an organization's environment and internal operations to support organizational functions and decision making, communication, coordination, control, analysis, and visualization. Information systems transform raw data into useful information through three basic activities: input, processing, and output.

From a business perspective, an information system provides a solution to a problem or challenge facing a firm and represents a combination of management, organization, and technology elements. The management dimension of information systems involves issues such as leadership, strategy, and management behavior. The technology dimension consists of computer hardware, software, data management technology, and networking/telecommunications technology (including the Internet). The organization dimension of information systems involves issues such as the organization's hierarchy, functional specialties, business processes, culture, and political interest groups.

In order to obtain meaningful value from information systems, organizations must support their technology investments with appropriate complementary investments in organizations and management. These complementary assets include new business models and business processes, supportive organizational culture and management behavior, and appropriate technology standards, regulations, and laws. New information technology investments are unlikely to produce high returns unless businesses make the appropriate managerial and organizational changes to support the technology.

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines. The disciplines that contribute to the technical approach focusing on formal models and capabilities of systems are computer science, management science, and operations research. The disciplines contributing to the behavioral approach focusing on the design, implementation, management, and business impact of systems are psychology, sociology, and economics. A sociotechnical view of systems considers both technical and social features of systems and solutions that represent the best fit between them.

Key Terms

Business functions, 49
Business model, 44
Business processes, 42
Complementary assets, 57
Computer hardware, 51
Computer literacy, 48
Computer software, 51
Culture, 50
Data, 46
Data management technology, 51
Data workers, 49
Digital firm, 42
Extranets, 52
Feedback, 47
Information, 46
Information system, 46
Information systems literacy, 48
Information technology (IT), 46
Information technology (IT) infrastructure, 52
Input, 47
Internet, 51
Intranets, 52
Knowledge workers, 49
Management information systems (MIS), 48
Middle management, 49
Network, 51
Networking and telecommunications technology, 51
Operational management, 49
Organizational and management capital, 57
Output, 47
Processing, 47
Production or service workers, 49
Senior management, 49
Sociotechnical view, 59
World Wide Web, 52

MyLab MIS

To complete the problems with MyLab MIS, go to the EOC Discussion Questions in MyLab MIS.

Review Questions

1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

- Describe how information systems have changed the way businesses operate and their products and services.
- Identify three major new information system trends.
- Describe the characteristics of a digital firm.
- Describe the challenges and opportunities of globalization in a "flattened" world.
- List and describe six reasons why information systems are so important for business today.

1-2 What is an information system? How does it work? What are its management, organization, and technology components? Why are complementary assets essential for ensuring that information systems provide genuine value for organizations?

- Explain the differences between information and data. Why is the former essential to the latter?
- Describe the three activities in an information system that produce the information that organizations need.
- Explain why organizations have a structure composed of different levels and specialties.
- Describe how the parts of an organization's culture can be found embedded in its information systems.
- Describe the features of an organization's information value chain.
- Based on what you have read, identify the key elements of organizational and management capital.

1-3 What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems?

- List and describe each discipline that contributes to a technical approach to information systems.
- List and describe each discipline that contributes to a behavioral approach to information systems.
- Describe the sociotechnical perspective on information systems.

Discussion Questions

1-4 MyLab MIS Information systems are too important to be left to computer specialists. Do you agree? Why or why not?

1-5 MyLab MIS If you were setting up the website for a professional football team, what management, organization, and technology issues might you encounter?

1-6 MyLab MIS What are some of the organizational, managerial, and social complementary assets that help make UPS's information systems so successful?

Hands-On MIS Projects

The projects in this section give you hands-on experience in analyzing financial reporting and inventory management problems, using data management software to improve management decision making about increasing sales, and using Internet software for researching job requirements. Visit MyLab MIS to access this chapter's Hands-On MIS Projects.

Management Decision Problems

1-7 Magical Toys is a South African toy store chain. The toys are sold in their five stores and from their own web shop. Each Tuesday, management needs sales reports from last week's activities. Work at the stores is hectic, so usually at least one store fails to deliver the report, making it impossible to sum up the previous week's sales. The reports, sent by email as spreadsheets, sometimes have inconclusive or erroneous data, and following up means that employees are unable to give their full focus to the customers. Some errors in the spreadsheets may also cause the purchasing manager to place unnecessary purchase orders. What are the main issues that Magical Toys faces in the absence of an information system? How could an information system be of help, and what issues can an information system not solve?

1-8 Diskonto operates deep-discount stores in Estonia offering housewares, cleaning supplies, clothing, health and beauty aids, and packaged food, with most items selling for a very low price. Its business model calls for keeping costs as low as possible. The company has no automated method for keeping track of inventory at each store. Managers know approximately how many cases of a particular product the store is supposed to receive when a delivery truck arrives, but the stores lack technology for scanning the cases or verifying the item count inside the cases. Merchandise losses from theft or other mishaps have been rising and now represent more than 3 percent of total sales. What decisions have to be made before investing in an information system solution?

Improving Decision Making: Using Databases to Analyze Sales Trends

Software skills: Database querying and reporting
Business skills: Sales trend analysis

1-9 In this project, you will start out with raw transactional sales data and use Microsoft Access database software to develop queries and reports that help managers make better decisions about product pricing, sales promotions, and inventory replenishment. In MyLab MIS, you can find a Store and Regional Sales Database developed in Microsoft Access. The database contains raw data on weekly store sales of computer equipment in various sales regions. The database includes fields for store identification number, sales region, item number, item description, unit price, units sold, and the weekly sales period when the sales were made. Use Access to develop some reports and queries to make this information more useful for running the business. Sales and production managers want answers to the following questions:

- Which products should be restocked?
- Which stores and sales regions would benefit from a promotional campaign and additional marketing?
- When (what time of year) should products be offered at full price, and when should discounts be used?

You can easily modify the database table to find and report your answers. Print your reports and results of queries.