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MANAGEMENT  
INFORMATION  
SYSTEMS

MANAGING THE DIGITAL FIRM

Kenneth C. Laudon | Jane P. Laudon



# MANAGEMENT INFORMATION SYSTEMS

MANAGING THE DIGITAL FIRM

SIXTEENTH EDITION

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**Library of Congress Cataloging-in-Publication Data**

Names: Laudon, Kenneth C., author. | Laudon, Jane P. (Jane Price), author.

Title: Management information systems: managing the digital firm / Kenneth C. Laudon, New York University, Jane P. Laudon, Azimuth Information Systems.

Description: Sixteenth edition. | New York, NY: Pearson, [2020] | Includes bibliographical references and index.

Identifiers: LCCN 2018053013 | ISBN 9780135191798 | ISBN 0135191793

Subjects: LCSH: Management information systems.

Classification: LCC T58.6 .L376 2020 | DDC 658.4/038011--dc23

LC record available at <https://lccn.loc.gov/2018053013>



ISBN 10: 0-13-519179-3

ISBN 13: 978-0-13-519179-8

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# BRIEF CONTENTS

## **PART ONE** Organizations, Management, and the Networked Enterprise 1

Chapter 1	Information Systems in Global Business Today	2
Chapter 2	Global E-business and Collaboration	40
Chapter 3	Information Systems, Organizations, and Strategy	78
Chapter 4	Ethical and Social Issues in Information Systems	120

## **PART TWO** Information Technology Infrastructure 161

Chapter 5	IT Infrastructure and Emerging Technologies	162
Chapter 6	Foundations of Business Intelligence: Databases and Information Management	210
Chapter 7	Telecommunications, the Internet, and Wireless Technology	250
Chapter 8	Securing Information Systems	294

## **PART THREE** Key System Applications for the Digital Age 337

Chapter 9	Achieving Operational Excellence and Customer Intimacy: Enterprise Applications	338
Chapter 10	E-commerce: Digital Markets, Digital Goods	372
Chapter 11	Managing Knowledge and Artificial Intelligence	418
Chapter 12	Enhancing Decision Making	458

## **PART FOUR** Building and Managing Systems 491

Chapter 13	Building Information Systems	492
Chapter 14	Managing Projects	532
Chapter 15	Managing Global Systems	564

Glossary G-1

Indexes I-1

**PART ONE** Organizations, Management, and the Networked Enterprise 1

**Chapter 1** Information Systems in Global Business Today 2

**Opening Case:** PCL Construction: The New Digital Firm 3

**1-1** How are information systems transforming business, and why are they so essential for running and managing a business today? 5

How Information Systems Are Transforming Business 6 • What's New in Management Information Systems? 7

**Interactive Session | Management** Can You Run the Company with Your iPhone? 9

Globalization Challenges and Opportunities: A Flattened World 11 • The Emerging Digital Firm 12 • Strategic Business Objectives of Information Systems 13

**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? 16

What Is an Information System? 16 • Dimensions of Information Systems 18

**Interactive Session | Technology** UPS Competes Globally with Information Technology 23

It Isn't Just Technology: A Business Perspective on Information Systems 24 • Complementary Assets: Organizational Capital and the Right Business Model 26

**1-3** What academic disciplines are used to study information systems, and how does each contribute to an understanding of information systems? 28

Technical Approach 28 • Behavioral Approach 29 • Approach of This Text: Sociotechnical Systems 29

**1-4** How will MIS help my career? 30

The Company 30 • Position Description 31 • Job Requirements 31 • Interview Questions 31 • Author Tips 31

Review Summary 32 • Key Terms 33 • Review Questions 33 • Discussion Questions 34

Hands-On MIS Projects 34

Collaboration and Teamwork Project 35

**Case Study:** Did Information Systems Cause Deutsche Bank to Stumble? 36

**References:** 39

## Chapter 2

### Global E-business and Collaboration 40

**Opening Case:** Enterprise Social Networking Helps Sanofi Pasteur Innovate and Improve Quality 41

**2-1** What are business processes? How are they related to information systems? 43

Business Processes 43 • How Information Technology Improves Business Processes 45

**2-2** How do systems serve the different management groups in a business, and how do systems that link the enterprise improve organizational performance? 45

Systems for Different Management Groups 46 • Systems for Linking the Enterprise 51

**Interactive Session | Organizations** Data Changes How NFL Teams Play the Game and How Fans See It 52

• E-business, E-commerce, and E-government 55

**2-3** Why are systems for collaboration and social business so important, and what technologies do they use? 56

What Is Collaboration? 56 • What Is Social Business? 57 • Business Benefits of Collaboration and Social Business 58 • Building a Collaborative Culture and Business Processes 60 • Tools and Technologies for Collaboration and Social Business 60

**Interactive Session | Technology** Videoconferencing: Something for Everyone 62

**2-4** What is the role of the information systems function in a business? 66

The Information Systems Department 66 • Organizing the Information Systems Function 68

**2-5** How will MIS help my career? 68

The Company 68 • Position Description 68 • Job Requirements 69 • Interview Questions 69 • Author Tips 69

Review Summary 70 • Key Terms 71 • Review Questions 71 • Discussion Questions 72

Hands-On MIS Projects 72

Collaboration and Teamwork Project 73

**Case Study:** Should Companies Embrace Social Business? 74

**References:** 77

## Chapter 3

### Information Systems, Organizations, and Strategy 78

**Opening Case:** Technology Helps Starbucks Find Better Ways to Compete 79

**3-1** Which features of organizations do managers need to know about to build and use information systems successfully? 81

What Is an Organization? 81 • Features of Organizations 84

**3-2** What is the impact of information systems on organizations? 89

Economic Impacts 89 • Organizational and Behavioral Impacts 90 • The Internet and Organizations 93 • Implications for the Design and Understanding of Information Systems 93

- 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? 94

Porter's Competitive Forces Model 94 • Information System Strategies for Dealing with Competitive Forces 96

- Interactive Session | Organizations** Digital Technology Helps Crayola Brighten Its Brand 98

The Internet's Impact on Competitive Advantage 100 • The Business Value Chain Model 101

- Interactive Session | Technology** Smart Products—Coming Your Way 102

Synergies, Core Competencies, and Network-Based Strategies 105

- 3-4** What are the challenges posed by strategic information systems, and how should they be addressed? 109

Sustaining Competitive Advantage 109 • Aligning IT with Business Objectives 109 • Managing Strategic Transitions 110

- 3-5** How will MIS help my career? 111

The Company 111 • Position Description 111 • Job Requirements 111 • Interview Questions 112 • Author Tips 112

- Review Summary 112 • Key Terms 113 • Review Questions 113 • Discussion Questions 114

Hands-On MIS Projects 114

Collaboration and Teamwork Project 115

**Case Study:** Grocery Wars 116

**References:** 118

## Chapter 4

## Ethical and Social Issues in Information Systems 120

**Opening Case:** Are Cars Becoming Big Brother on Wheels? 121

- 4-1** What ethical, social, and political issues are raised by information systems? 123

A Model for Thinking about Ethical, Social, and Political Issues 124 • Five Moral Dimensions of the Information Age 126 • Key Technology Trends that Raise Ethical Issues 126

- 4-2** What specific principles for conduct can be used to guide ethical decisions? 129

Basic Concepts: Responsibility, Accountability, and Liability 129 • Ethical Analysis 129 • Candidate Ethical Principles 130 • Professional Codes of Conduct 131 • Some Real-World Ethical Dilemmas 131

- 4-3** Why do contemporary information systems technology and the Internet pose challenges to the protection of individual privacy and intellectual property? 131

Information Rights: Privacy and Freedom in the Internet Age 132 • Property Rights: Intellectual Property 138

- 4-4** How have information systems affected laws for establishing accountability and liability and the quality of everyday life? 142

Computer-Related Liability Problems 142 • System Quality: Data Quality and System Errors 143 • Quality of Life: Equity, Access, and Boundaries 144



- Interactive Session | Organizations** Will Automation Kill Jobs? 148
  - Health Risks: RSI, CVS, and Cognitive Decline 149
- Interactive Session | Technology** How Harmful Are Smartphones? 151
- 4-5** How will MIS help my career? 152
  - The Company 152 • Position Description 152 • Job Requirements 152 • Interview Questions 153 • Author Tips 153
- Review Summary 153 • Key Terms 154 • Review Questions 154 • Discussion Questions 155
- Hands-On MIS Projects 155
- Collaboration and Teamwork Project 156
- Case Study:** Facebook Privacy: Your Life for Sale 157
- References:** 160

## PART TWO Information Technology Infrastructure 161

---

### Chapter 5 IT Infrastructure and Emerging Technologies 162

- Opening Case:** PeroxyChem's Cloud Computing Formula for Success 163
- 5-1** What is IT infrastructure, and what are the stages and drivers of IT infrastructure evolution? 165
  - Defining IT Infrastructure 165 • Evolution of IT Infrastructure 167 • Technology Drivers of Infrastructure Evolution 171
- 5-2** What are the components of IT infrastructure? 175
  - Computer Hardware Platforms 176 • Operating System Platforms 178 • Enterprise Software Applications 178 • Data Management and Storage 179 • Networking/Telecommunications Platforms 179 • Internet Platforms 179 • Consulting and System Integration Services 180
- 5-3** What are the current trends in computer hardware platforms? 180
  - The Mobile Digital Platform 180 • Consumerization of IT and BYOD 180
- Interactive Session | Technology** Is Business Ready for Wearable Computers? 181
  - Quantum Computing 183 • Virtualization 183 • Cloud Computing 183
- Interactive Session | Organizations** Look to the Cloud 186
  - Edge Computing 188 • Green Computing 189 • High-Performance and Power-Saving Processors 190
- 5-4** What are the current computer software platforms and trends? 190
  - Linux and Open Source Software 190 • Software for the Web: Java, HTML, and HTML5 191 • Web Services and Service-Oriented Architecture 192 • Software Outsourcing and Cloud Services 193
- 5-5** What are the challenges of managing IT infrastructure and management solutions? 196
  - Dealing with Platform and Infrastructure Change 196 • Management and Governance 197 • Making Wise Infrastructure Investments 197

<b>5-6</b>	How will MIS help my career?	200
	The Company	200 • Position Description 200 • Job Requirements 200 • Interview Questions 201 • Author Tips 201
	Review Summary	201 • Key Terms 202 • Review Questions 203 • Discussion Questions 204
	Hands-On MIS Projects	204
	Collaboration and Teamwork Project	205
	<b>Case Study:</b> Is BYOD Good for Business?	206
	<b>References:</b>	209

## Chapter 6

### Foundations of Business Intelligence: Databases and Information Management 210

**Opening Case:** Data Management Helps the Charlotte Hornets Learn More About Their Fans 211

<b>6-1</b>	What are the problems of managing data resources in a traditional file environment?	213
	File Organization Terms and Concepts	213 • Problems with the Traditional File Environment 214
<b>6-2</b>	What are the major capabilities of database management systems (DBMS), and why is a relational DBMS so powerful?	216
	Database Management Systems	217 • Capabilities of Database Management Systems 219 • Designing Databases 222 • Non-relational Databases, Cloud Databases, and Blockchain 224
<b>6-3</b>	What are the principal tools and technologies for accessing information from databases to improve business performance and decision making?	227
	The Challenge of Big Data	227 • Business Intelligence Infrastructure 228
	<b>Interactive Session   Technology</b> Kraft Heinz Finds a New Recipe for Analyzing Its Data	230
	Analytical Tools: Relationships, Patterns, Trends	231 • Databases and the Web 235
<b>6-4</b>	Why are information policy, data administration, and data quality assurance essential for managing the firm's data resources?	236
	Establishing an Information Policy	236 • Ensuring Data Quality 237
	<b>Interactive Session   Organizations</b> Databases Where the Data Aren't There	239
<b>6-5</b>	How will MIS help my career?	240
	The Company	240 • Position Description 240 • Job Requirements 241 • Interview Questions 241 • Author Tips 241
	Review Summary	241 • Key Terms 242 • Review Questions 243 • Discussion Questions 244
	Hands-On MIS Projects	244
	Collaboration and Teamwork Project	245
	<b>Case Study:</b> How Reliable Is Big Data?	246
	<b>References:</b>	248

## Chapter 7

## Telecommunications, the Internet, and Wireless Technology 250

**Opening Case:** Tour de France Wins with Wireless Technology 251

**7-1** What are the principal components of telecommunications networks and key networking technologies? 253

Networking and Communication Trends 253 • What Is a Computer Network? 254 • Key Digital Networking Technologies 256

**7-2** What are the different types of networks? 259

Signals: Digital Versus Analog 259 • Types of Networks 259 • Transmission Media and Transmission Speed 261

**7-3** How do the Internet and Internet technology work, and how do they support communication and e-business? 261

What Is the Internet? 261 • Internet Addressing and Architecture 262

**Interactive Session | Organizations** Net Neutrality: The Battle Rages On 265

Internet Services and Communication Tools 267

**Interactive Session | Management** Monitoring Employees on Networks: Unethical or Good Business? 270

The Web 271

**7-4** What are the principal technologies and standards for wireless networking, communication, and Internet access? 279

Cellular Systems 279 • Wireless Computer Networks and Internet Access 280 • RFID and Wireless Sensor Networks 282

**7-5** How will MIS help my career? 285

The Company 285 • Position Description 285 • Job Requirements 285 • Interview Questions 286 • Author Tips 286

Review Summary 286 • Key Terms 287 • Review Questions 288 • Discussion Questions 288

Hands-On MIS Projects 288

Collaboration and Teamwork Project 289

**Case Study:** Google, Apple, and Facebook Battle for Your Internet Experience 290

**References:** 293

## Chapter 8

## Securing Information Systems 294

**Opening Case:** Hackers Target the U.S. Presidential Election: What Happened? 295

**8-1** Why are information systems vulnerable to destruction, error, and abuse? 297

Why Systems are Vulnerable 298 • Malicious Software: Viruses, Worms, Trojan Horses, and Spyware 299 • Hackers and Computer Crime 302 • Internal Threats: Employees 306 • Software Vulnerability 307

**8-2** What is the business value of security and control? 308

Legal and Regulatory Requirements for Electronic Records Management 308

**Interactive Session | Technology** Meltdown and Spectre Haunt the World's Computers 309

Electronic Evidence and Computer Forensics 311

- 8-3** What are the components of an organizational framework for security and control? 312  
 Information Systems Controls 312 • Risk Assessment 313 • Security Policy 314 • Disaster Recovery Planning and Business Continuity Planning 315 • The Role of Auditing 315
- 8-4** What are the most important tools and technologies for safeguarding information resources? 316  
 Identity Management and Authentication 316 • Firewalls, Intrusion Detection Systems, and Anti-malware Software 318 • Securing Wireless Networks 320 • Encryption and Public Key Infrastructure 320 • Securing Transactions with Blockchain 322 • Ensuring System Availability 323 • Security Issues for Cloud Computing and the Mobile Digital Platform 323
- Interactive Session | Management** How Secure Is the Cloud? 324  
 Ensuring Software Quality 326
- 8-5** How will MIS help my career? 327  
 The Company 327 • Position Description 327 • Job Requirements 327 • Interview Questions 327 • Author Tips 328
- Review Summary 328 • Key Terms 329 • Review Questions 330 • Discussion Questions 330
- Hands-On MIS Projects 330
- Collaboration and Teamwork Project 332
- Case Study:** Is the Equifax Hack the Worst Ever—and Why? 333
- References:** 336

## PART THREE Key System Applications for the Digital Age 337

---

### Chapter 9 Achieving Operational Excellence and Customer Intimacy: Enterprise Applications 338

- Opening Case:** Avon Beautifies Its Supply Chain 339
- 9-1** How do enterprise systems help businesses achieve operational excellence? 341  
 What are Enterprise Systems? 341 • Enterprise Software 342 • Business Value of Enterprise Systems 343
- 9-2** How do supply chain management systems coordinate planning, production, and logistics with suppliers? 344
- Interactive Session | Management** Soma Bay Prospers with ERP in the Cloud 345  
 The Supply Chain 346 • Information Systems and Supply Chain Management 348 • Supply Chain Management Software 349 • Global Supply Chains and the Internet 350 • Business Value of Supply Chain Management Systems 352
- 9-3** How do customer relationship management systems help firms achieve customer intimacy? 352  
 What Is Customer Relationship Management? 353 • Customer Relationship Management Software 353 • Operational and Analytical CRM 357 • Business Value of Customer Relationship Management Systems 357

- 9-4** What are the challenges that enterprise applications pose, and how are enterprise applications taking advantage of new technologies? 358
  - Enterprise Application Challenges 358
- Interactive Session | Organizations** Kenya Airways Flies High with Customer Relationship Management 359
  - Next-Generation Enterprise Applications 361
- 9-5** How will MIS help my career? 363
  - The Company 363 • Position Description 363 • Job Requirements 363 • Interview Questions 363 • Author Tips 364
- Review Summary 364 • Key Terms 365 • Review Questions 365 • Discussion Questions 366
- Hands-On MIS Projects 366
- Collaboration and Teamwork Project 367
- Case Study:** Clemens Food Group Delivers with New Enterprise Applications 368
- References:** 370

## Chapter 10

### E-commerce: Digital Markets, Digital Goods 372

- Opening Case:** Youtube Transforms the Media Landscape 373
- 10-1** What are the unique features of e-commerce, digital markets, and digital goods? 375
  - E-commerce Today 376 • The New E-commerce: Social, Mobile, Local 377 • Why E-commerce Is Different 379 • Key Concepts in E-commerce: Digital Markets and Digital Goods in a Global Marketplace 382
- 10-2** What are the principal e-commerce business and revenue models? 385
  - Types of E-commerce 385 • E-commerce Business Models 386
- Interactive Session | Organizations** Uber: Digital Disruptor 389
  - E-commerce Revenue Models 390
- 10-3** How has e-commerce transformed marketing? 392
  - Behavioral Targeting 393 • Social E-commerce and Social Network Marketing 396
- Interactive Session | Management** “Socializing” with Customers 399
- 10-4** How has e-commerce affected business-to-business transactions? 400
  - Electronic Data Interchange (EDI) 401 • New Ways of B2B Buying and Selling 402
- 10-5** What is the role of m-commerce in business, and what are the most important m-commerce applications? 404
  - Location-Based Services and Applications 405 • Other Mobile Commerce Services 406
- 10-6** What issues must be addressed when building an e-commerce presence? 406
  - Develop an E-commerce Presence Map 406 • Develop a Timeline: Milestones 407

- 10-7** How will MIS help my career? 408  
 The Company 408 • Job Description 408 • Job Requirements 409 •  
 Interview Questions 409 • Author Tips 409
- Review Summary 410 • Key Terms 410 • Review Questions 411 •  
 Discussion Questions 412
- Hands-On MIS Projects 412
- Collaboration and Teamwork Project 413
- Case Study:** A Nasty Ending for Nasty Gal 414
- References:** 416

## Chapter 11

## Managing Knowledge and Artificial Intelligence 418

**Opening Case:** Machine Learning Helps Akershus University Hospital Make  
 Better Treatment Decisions 419

- 11-1** What is the role of knowledge management systems in  
 business? 421  
 Important Dimensions of Knowledge 422 • The Knowledge  
 Management Value Chain 423 • Types of Knowledge Management  
 Systems 426
- 11-2** What are artificial intelligence (AI) and machine learning? How do  
 businesses use AI? 427  
 Evolution of AI 427 • Major Types of AI 428 • Expert Systems 428 •  
 Machine Learning 430 • Neural Networks 432 • Genetic Algorithms 435 •  
 Natural Language Processing, Computer Vision Systems, and  
 Robotics 436 • Intelligent Agents 437
- 11-3** What types of systems are used for enterprise-wide knowledge  
 management, and how do they provide value for businesses? 438  
 Enterprise Content Management Systems 439 • Locating and Sharing  
 Expertise 440 • Learning Management Systems 441
- 11-4** What are the major types of knowledge work systems, and how  
 do they provide value for firms? 441  
 Knowledge Workers and Knowledge Work 441
- Interactive Session | Management** Sargent & Lundy Learns to Manage  
 Employee Knowledge 442  
 Requirements of Knowledge Work Systems 443 • Examples of Knowledge  
 Work Systems 444
- Interactive Session | Technology** The Reality of Virtual Reality 446
- 11-5** How will MIS help my career? 447  
 The Company 447 • Position Description 448 • Job Requirements 448 •  
 Interview Questions 448 • Author Tips 448
- Review Summary 449 • Key Terms 450 • Review Questions 450 •  
 Discussion Questions 451
- Hands-On MIS Projects 451
- Collaboration and Teamwork Project 452
- Case Study:** Can Cars Drive Themselves—And Should They? 453
- References:** 456

## Chapter 12 Enhancing Decision Making 458

**Opening Case:** Big Data and the Internet of Things Drive Precision Agriculture 459

**12-1** What are the different types of decisions, and how does the decision-making process work? 461

Business Value of Improved Decision Making 461 • Types of Decisions 462 • The Decision-Making Process 463

**12-2** How do information systems support the activities of managers and management decision making? 464

Managerial Roles 464 • Real-World Decision Making 466 • High-Velocity Automated Decision Making 467

**12-3** How do business intelligence and business analytics support decision making? 468

What Is Business Intelligence? 468 • The Business Intelligence Environment 468 • Business Intelligence and Analytics Capabilities 470

**Interactive Session | Technology** Siemens Makes Business Processes More Visible 471

**12-4** How do different decision-making constituencies in an organization use business intelligence, and what is the role of information systems in helping people working in a group make decisions more efficiently? 475

Decision Support for Operational and Middle Management 475 • Decision Support for Senior Management: Balanced Scorecard and Enterprise Performance Management Methods 478

**Interactive Session | Management** Anthem Benefits from More Business Intelligence 480

Group Decision-Support Systems (GDSS) 481

**12-5** How will MIS help my career? 482

The Company 482 • Position Description 482 • Job Requirements 482 • Interview Questions 483 • Author Tips 483

Review Summary 483 • Key Terms 484 • Review Questions 485 • Discussion Questions 485

Hands-On MIS Projects 485

Collaboration and Teamwork Project 486

**Case Study:** Is Predix GE's Future? 487

**References:** 489

## PART FOUR Building and Managing Systems 491

### Chapter 13 Building Information Systems 492

**Opening Case:** Cameron International Builds a New System for Financial Reporting 493

**13-1** How does building new systems produce organizational change? 495

Systems Development and Organizational Change 495

**Interactive Session | Organizations** Carter's Redesigns Its Business Processes 497

Business Process Redesign 498

- 13-2** What are the core activities in the systems development process? 502  
Systems Analysis 502 • Systems Design 503 • Completing the Systems Development Process 504
- 13-3** What are the principal methodologies for modeling and designing systems? 507  
Structured Methodologies 507 • Object-Oriented Development 509 • Computer-Aided Software Engineering 511
- 13-4** What are alternative methods for building information systems? 511  
Traditional Systems Life Cycle 511 • Prototyping 512 • End-User Development 514 • Application Software Packages, Software Services, and Outsourcing 514
- 13-5** What are new approaches for system building in the digital firm era? 517  
Rapid Application Development (RAD), Agile Development, and DevOps 517 • Component-Based Development and Web Services 518 • Mobile Application Development: Designing for a Multiscreen World 519
- 13-6** How will MIS help my career? 520  
The Company 520 • Position Description 520
- Interactive Session | Technology** Systems Development Is Different for Mobile Apps 521  
Job Requirements 522 • Interview Questions 522 • Author Tips 523
- Review Summary 523 • Key Terms 524 • Review Questions 525 • Discussion Questions 525
- Hands-On MIS Projects 526  
Collaboration and Teamwork Project 527
- Case Study:** Hitachi Consulting Moves Human Resources to the Cloud 528
- References:** 530

## Chapter 14

### Managing Projects 532

- Opening Case:** Sound Project Management Helps Stepan Company Improve Financial Planning and Reporting 533
- 14-1** What are the objectives of project management, and why is it so essential in developing information systems? 535  
Runaway Projects and System Failure 535 • Project Management Objectives 536
- 14-2** What methods can be used for selecting and evaluating information systems projects and aligning them with the firm's business goals? 537  
Management Structure for Information Systems Projects 537 • Linking Systems Projects to the Business Plan 538 • Portfolio Analysis 540 • Scoring Models 541
- 14-3** How can firms assess the business value of information systems? 542  
Information System Costs and Benefits 542 • Capital Budgeting for Information Systems 542 • Limitations of Financial Models 543



- 14-4** What are the principal risk factors in information systems projects, and how can they be managed? 544  
 Dimensions of Project Risk 544 • Change Management and the Concept of Implementation 545 • Controlling Risk Factors 547 • Designing for the Organization 550 • Project Management Software Tools 551
- Interactive Session | Management** ConocoPhillips Implements a New System for Access Control 552
- 14-5** How will MIS help my career? 553  
 The Company 553
- Interactive Session | Technology** Arup Moves Project Management to the Cloud 554  
 Position Description 555 • Job Requirements 555 • Interview Questions 556 • Author Tips 556
- Review Summary 556 • Key Terms 557 • Review Questions 557 • Discussion Questions 558
- Hands-On MIS Projects 558
- Collaboration and Teamwork Project 559
- Case Study:** Pennsylvania's Unemployment Compensation Modernization System: Unfinished Business 560
- References:** 562

## Chapter 15

### Managing Global Systems 564

- Opening Case:** New Systems Help Eli Lilly Standardize as a Global Company 565
- 15-1** What major factors are driving the internationalization of business? 567  
 Developing an International Information Systems Architecture 567 • The Global Environment: Business Drivers and Challenges 569 • State of the Art 572
- 15-2** What are the alternative strategies for developing global businesses? 572  
 Global Strategies and Business Organization 573 • Global Systems to Fit the Strategy 574 • Reorganizing the Business 575
- 15-3** What are the challenges posed by global information systems and management solutions for these challenges? 575  
 A Typical Scenario: Disorganization on a Global Scale 576 • Global Systems Strategy 576 • The Management Solution: Implementation 579
- 15-4** What are the issues and technical alternatives to be considered when developing international information systems? 580  
 Computing Platforms and Systems Integration 581 • Connectivity 581 • Software Localization 582
- 15-5** How will MIS help my career? 583  
 The Company 583
- Interactive Session | Technology** The Global Internet Goes Multimedia 584  
 Position Description 585 • Job Requirements 585 • Interview Questions 585

**Interactive Session | Management** AbbVie Builds a Global Systems  
 Infrastructure 586  
 Author Tips 587  
 Review Summary 588 • Key Terms 588 • Review Questions 589 •  
 Discussion Questions 589  
 Hands-On MIS Projects 589  
 Collaboration and Teamwork Project 590  
**Case Study:** E-Commerce in China: Opportunities and Obstacles 591  
**References:** 593

Glossary G-1

Indexes I-1

# 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

PCL Construction: The New Digital Firm  
Can You Run the Company with Your iPhone?  
UPS Competes Globally with Information Technology  
Did Information Systems Cause Deutsche Bank to Stumble?

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## Chapter 2: Global E-business and Collaboration

Enterprise Social Networking Helps Sanofi Pasteur Innovate and Improve Quality  
Data Changes How NFL Teams Play the Game and How Fans See It  
Videoconferencing: Something for Everyone  
Should Companies Embrace Social Business?

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## Chapter 3: Information Systems, Organizations, and Strategy

Technology Helps Starbucks Find Better Ways to Compete  
Digital Technology Helps Crayola Brighten Its Brand  
Smart Products—Coming Your Way  
Grocery Wars

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## Chapter 4: Ethical and Social Issues in Information Systems

Are Cars Becoming Big Brother on Wheels?  
Will Automation Kill Jobs?  
How Harmful Are Smartphones?  
Facebook Privacy: Your Life for Sale

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## Chapter 5: IT Infrastructure and Emerging Technologies

PeroxyChem's Cloud Computing Formula for Success  
Is Business Ready for Wearable Computers?  
Look to the Cloud  
Is BYOD Good for Business?

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

Data Management Helps the Charlotte Hornets Learn More About Their Fans  
Kraft Heinz Finds a New Recipe for Analyzing Its Data  
Databases Where the Data Aren't There  
How Reliable Is Big Data?

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## Chapter 7: Telecommunications, the Internet, and Wireless Technology

Tour de France Wins with Wireless Technology  
Net Neutrality: The Battle Rages On  
Monitoring Employees on Networks: Unethical or Good Business?  
Google, Apple, and Facebook Battle for Your Internet Experience

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## **Chapter 8: Securing Information Systems**

Hackers Target the U.S. Presidential Election: What Happened?  
Meltdown and Spectre Haunt the World's Computers  
How Secure Is the Cloud?  
Is the Equifax Hack the Worst Ever—and Why?

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## **Chapter 9: Achieving Operational Excellence and Customer Intimacy: Enterprise Applications**

Avon Beautifies Its Supply Chain  
Soma Bay Prospers with ERP in the Cloud  
Kenya Airways Flies High with Customer Relationship Management  
Clemens Food Group Delivers with New Enterprise Applications

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## **Chapter 10: E-commerce: Digital Markets, Digital Goods**

Youtube Transforms the Media Landscape  
Uber: Digital Disruptor  
“Socializing” with Customers  
A Nasty Ending for Nasty Gal

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## **Chapter 11: Managing Knowledge and Artificial Intelligence**

Machine Learning Helps Akershus University Hospital Make Better Treatment Decisions  
Sargent & Lundy Learns to Manage Employee Knowledge  
The Reality of Virtual Reality  
Can Cars Drive Themselves—And Should They?

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## **Chapter 12: Enhancing Decision Making**

Big Data and the Internet of Things Drive Precision Agriculture  
Siemens Makes Business Processes More Visible  
Anthem Benefits from More Business Intelligence  
Is Predix GE's Future?

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## **Chapter 13: Building Information Systems**

Cameron International Builds a New System for Financial Reporting  
Carter's Redesigns Its Business Processes  
Systems Development Is Different for Mobile Apps  
Hitachi Consulting Moves Human Resources to the Cloud

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## **Chapter 14: Managing Projects**

Sound Project Management Helps Stepan Company Improve Financial Planning and Reporting  
ConocoPhillips Implements a New System for Access Control  
Arup Moves Project Management to the Cloud  
Pennsylvania's Unemployment Compensation Modernization System: Unfinished Business

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## **Chapter 15: Managing Global Systems**


New Systems Help Eli Lilly Standardize as a Global Company  
The Global Internet Goes Multimedia  
AbbVie Builds a Global Systems Infrastructure  
E-Commerce in China: Opportunities and Obstacles

## New To This Edition

*Management Information Systems*, 16th edition has new features and content to make your MIS course more exciting, current, and relevant.



## New Features

- **New Career Opportunities** section in each chapter, identified by , shows students specifically how this book can help them find a job and build their careers. The last major section of each chapter presents a description of an entry-level job for a recent college graduate based on a real-world job description. The job requirements are related to the topics covered in that chapter. The job description shows the required educational background and skills, lists business-related questions that might arise during the job interview, and provides author tips for answering the questions and preparing for the interview.
- **New Conceptual Videos** collection includes 45 conceptual videos of 3 to 5 minutes in length. Ken Laudon walks students through three of the most important concepts in each chapter using a contemporary animation platform. Available only in the MyLab MIS digital edition.
- **New Video Cases** collection: 36 video cases (two or more per chapter) and 10 additional instructional videos covering key concepts and experiences in the MIS world. The video cases illustrate how real-world corporations and managers are using information technology and systems. Video Cases are listed at the beginning of each chapter.
- **Learning Tracks:** 49 Learning Tracks in MyLab MIS for additional coverage of selected topics. This edition includes new Learning Tracks for case-based reasoning and fuzzy logic.

## New Topics

The 16th edition features all new opening, closing, and Interactive Session cases. The text, figures, tables, and cases have been updated through September 2018 with the latest sources from industry and MIS research. New topics and coverage include:

- **Updated coverage of artificial intelligence (AI):** Chapter 11 has been rewritten to include new 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.
- **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 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).
- **Social, Mobile, Local:** New e-commerce content in Chapter 10 describing how social tools, mobile technology, and location-based services are transforming marketing and advertising.
- **Social Business:** Expanded coverage of social business, introduced in Chapter 2 and discussed throughout the text. Detailed discussions of enterprise (internal corporate) social networking as well as social networking in e-commerce.
  - Machine learning
  - Natural language processing
  - Computer vision systems
  - Robotics
  - “Deep learning”
  - Supervised learning
  - Unsupervised learning
  - Edge computing
  - 5G networks
  - General Data Protection Regulation (GDPR)
  - Mobile device management (MDM)
  - Office 365
  - Blockchain
  - Data lake
  - Distributed database
  - FinTech

The CORE Laudon text and MyLab MIS 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.

The MyLab MIS platform provides an interactive digital environment that supports the unique strengths of our work. Our goal with *Management Information Systems: Managing the Digital Firm* is to provide students with an introduction to the MIS field that is authoritative, up-to-date, interactive, and engaging for students and professors. The MyLab MIS edition extends these

features to a digital platform that emphasizes videos, animations, interactive quizzes, and 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.

## Reach Every Student with MyLab MIS

MyLab 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 auto-graded Excel and Access Projects, students understand how MIS concepts will help them succeed in their future careers.

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## Solving Teaching and Learning Challenges

The Laudon learning package is more current, real-world, and authoritative than competitors. Laudon MIS16 and MyLab MIS help students understand MIS concepts and issues through extensive use of examples of real-world companies, a wide variety of short and long 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.

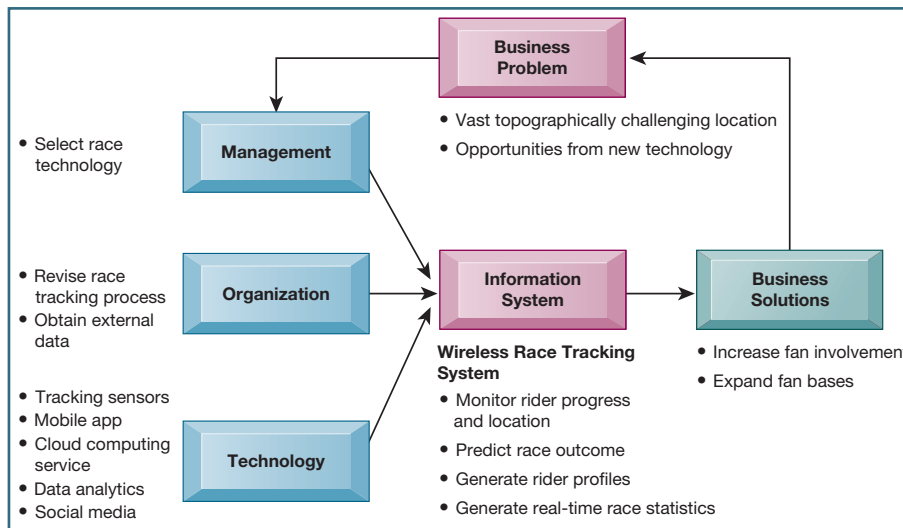
The Laudon text and learning package now has a very strong career focus, which incentivizes students to learn by showing exactly how each chapter will help them prepare for future jobs. In addition to Career Opportunities, MyLab MIS features Career Resources, including how to incorporate MIS knowledge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

The MyLab MIS edition offers unique digital interactive features that hold student attention spans longer and make learning more effective, including 45 animated conceptual learning modules that walk students through key concepts in each chapter; 36 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 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: 36 video case studies (two to three per chapter) plus 10 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
- Two assisted-graded writing questions with prebuilt grading rubrics
- 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 (2018) examples from business and public organizations throughout the text to illustrate the important concepts in each chapter. All the case studies describe companies or organizations that are familiar to students, such as Uber, the NFL, Facebook, Crayola, Walmart, Amazon, Google, Starbucks, and GE.

## Interactivity

There's no better way to learn about MIS than by doing MIS! We provide different kinds of hands-on projects where students can work with real-world business scenarios and data and learn firsthand what MIS is all about. These projects heighten student involvement in this exciting subject.

- **MyLab MIS Online Video Case Package.** Students can watch short videos online, either in-class or at home, and then apply the concepts of the book to the analysis of the video. Every chapter contains at least two business video cases that explain how business firms and managers are using information systems and explore concepts discussed in the chapter. Each video case consists of one or more videos about a real-world company, a background text case, and case study questions. These video cases enhance students' understanding of MIS topics and the relevance of MIS to the business world. In addition, there are 10 Instructional Videos that describe developments and concepts in MIS keyed to respective chapters.
- **MyLab MIS Online Conceptual Videos.** Forty-five video animations where the authors walk students through three concepts from each chapter.
- **Interactive Sessions.** Two short cases in each chapter have been redesigned as Interactive Sessions to be used in the classroom (or on Internet discussion boards) to stimulate student interest and active learning. Each case concludes with case study questions. The case study questions provide topics for class discussion, Internet discussion, or written assignments.

## INTERACTIVE SESSION ORGANIZATIONS

### Digital Technology Helps Crayola Brighten Its Brand

Crayola is one of the world's most beloved brands for children and their parents. The Easton, Pennsylvania-based company has been noted for high-quality, non-toxic crayons, markers, pencils, modeling clay, creative toys, and innovative art tools that have inspired artistic creativity in children for more than one hundred years. You can find Crayola products nearly everywhere, including schools, offices, supermarkets, drug stores, hospitals, theme parks, airports, gas stations, and restaurants.

The Crayola crayon box became part of the collective history and experiences of generations of Americans, and a symbol of the color and fun of childhood. But today, that Crayola crayon box is not as iconic as in the past. The popularity of Crayola crayons is under assault—not by Crayola's traditional competitors (Faber-Castelli, DixonTiconderoga, and MEGA Brands), but by changing times.

There has been a profound technological and cultural shift in how children play. Children and their families are being bombarded with increasingly sophisticated forms of entertainment, many of them digitally based. Digital products are starting to supplant physical ones in the world of children's play as well as in other areas of work and everyday life. With the advent of computers and web-based learning, children are leaving behind hand-held art supplies at an increasingly younger age. The phenomenon is called KGOY, standing for "Kids Growing Older Younger." As children reach the age of 4 or 5, when they become old enough to play with a computer, they become less interested in toys and crayons and prefer electronics

help children learn and play in colorful ways. The question they asked was not, how can we sell more crayons? Instead they asked, what kinds of experiences and technologies should Crayola embrace? Crayola has reframed its business model, introduced a new innovation process for product development, and created new products and revenue streams. The company has been transformed from a manufacturer of crayons and art tools into a trusted source of tools and experiences for creative play.

Crayola is using digital technology, but not to replace its core crayon business. Instead, it's integrating the old and the new. The company now offers a new range of products like the iMarker, an all-in-one digital pen, crayon, and pencil, designed for use with the Color Studio HD iPad app. It's like a traditional coloring book, but includes new interactive sounds and motion. Lights, Camera, Color! is another digital application that allows kids to turn their favorite photos into digital coloring book pages. Tech toys such as the Digital Light Designer, a 360-degree domed drawing surface, encourage imaginations to run wild with colored LED lights. Children can play updated versions of their favorite games or animate and save up to 50 pieces of their own artwork. Crayola found that parents are looking for toys that are less messy than traditional markers or fingerpaints. These digital toys are "100 percent mess-proof," and technology has helped Crayola make its other products less messy as well.

In designing new digital products and experiences, Crayola has drawn on its extensive knowledge of child development. It understands how digital tech-

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

## CASE STUDY QUESTIONS

1. Analyze Crayola's problem. What management, organization, and technology factors contributed to the problem?
2. What competitive strategies is Crayola pursuing? How does digital technology support those strategies?
3. What people issues did Crayola have to address in designing its new technology-based products?
4. How has digital technology changed Crayola's business model and the way it runs its business?

◀ 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. A 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.

Item #	Store #	Sales Region	Item #	Item Description	Unit Price	Units Sold	Week Ending
1	1	South	2005	17" Monitor	\$229.00	28	10/27/2018
2	1	South	2005	17" Monitor	\$229.00	30	11/24/2018
3	1	South	2005	17" Monitor	\$229.00	9	12/29/2018
4	1	South	3006	101 Keyboard	\$19.95	30	10/27/2018
5	1	South	3006	101 Keyboard	\$19.95	35	11/24/2018
6	1	South	3006	101 Keyboard	\$19.95	39	12/29/2018
7	1	South	6050	PC Mouse	\$8.95	28	10/27/2018
8	1	South	6050	PC Mouse	\$8.95	3	11/24/2018
9	1	South	6050	PC Mouse	\$8.95	38	12/29/2018
10	1	South	8500	Desktop CPU	\$849.95	25	10/27/2018
11	1	South	8500	Desktop CPU	\$849.95	27	11/24/2018
12	1	South	8500	Desktop CPU	\$849.95	33	12/29/2018
13	2	South	2005	17" Monitor	\$229.00	8	10/27/2018
14	2	South	2005	17" Monitor	\$229.00	8	11/24/2018
15	2	South	2005	17" Monitor	\$229.00	10	12/29/2018
16	2	South	3006	101 Keyboard	\$19.95	8	10/27/2018
17	2	South	3006	101 Keyboard	\$19.95	8	11/24/2018
18	2	South	3006	101 Keyboard	\$19.95	8	12/29/2018
19	2	South	6050	PC Mouse	\$8.95	9	10/27/2018
20	2	South	6050	PC Mouse	\$8.95	9	11/24/2018
21	2	South	6050	PC Mouse	\$8.95	8	12/29/2018
22	2	South	8500	Desktop CPU	\$849.95	18	10/27/2018

► 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.

You are interested in purchasing a new Ford Escape (or some other car of your choice). Go to the website of CarsDirect ([www.carsdirect.com](http://www.carsdirect.com)) and begin your investigation. Locate the Ford Escape. Research the various Escape models, and choose one you prefer in terms of price, features, and safety ratings. Locate and read at least two reviews. Surf the website of the manufacturer, in this case Ford ([www.ford.com](http://www.ford.com)). Compare the information available on Ford's website with that of CarsDirect for the Ford Escape. Try to locate the lowest price for the car you want in a local dealer's inventory. Suggest improvements for CarsDirect.com and Ford.com.

## Customization and Flexibility

Our Learning Tracks and Video Cases in MyLab MIS give instructors the flexibility to provide in-depth coverage of the topics and additional cases they choose. Video Cases and Instructional Videos are listed at the beginning of each chapter as well as in the Preface.

## Learning Tracks

There are 49 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, telecommunications, 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 Occupational and Career Outlook for Information Systems Majors 2014–2020
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 Works How Computer Software Works Service Level Agreements The Open Source Software Initiative Comparing Stages in IT Infrastructure Evolution Cloud Computing

Chapter	Learning Tracks
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	Broadband Network Services and Technologies Cellular System Generations Wireless Applications for Customer Relationship Management, Supply Chain Management, and Healthcare Introduction to Web 2.0 LAN Topologies
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	SAP Business Process Map Business Processes in Supply Chain Management and Supply Chain Metrics 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 Building an E-commerce Website
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 Fourth-Generation Languages
Chapter 14: 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	Walmart's Retail Link Supply Chain CEMEX: Becoming a Social Business Instructional Video: US Foodservice Grows Market with Oracle CRM on Demand
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? The 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

## Video Cases and Instructional Videos (Continued)


Chapter	Video
Chapter 6: Foundations of Business Intelligence: Databases and Information Management	Dubuque Uses Cloud Computing and Sensors to Build a Smarter City 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	Life Time Fitness Gets in Shape with Salesforce CRM Instructional Video: GSMS Protects Products and Patients by Serializing Every Bottle of Drugs
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 Instructional Video: Walmart's eCommerce Fulfillment Center Network Instructional Video: Behind the Scenes of an Amazon Warehouse
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: Workflow Management Visualized Instructional Video: BPM: Business Process Management Customer Story
Chapter 14: Managing Projects	Blue Cross Blue Shield Smarter Computing Project NASA Project Management Challenges
Chapter 15: Managing Global Systems	Daum Runs Oracle Apps on Linux Lean Manufacturing and Global ERP: Humanetics and Global Shop

## 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: Managing the Digital Firm, we focus on developing 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? Our new Career Opportunities feature shows how to use this text and MyLab MIS 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, multi-task, 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. Business Information Systems in Your Career	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. Improving Decision Making	Entry Level Data Analyst
13. Building Information Systems	Entry Level Junior Business Systems Analyst
14. 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.

## Table of Contents Overview

Chapter	Title
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
Chapter 5	IT Infrastructure and Emerging Technologies
Chapter 6	Foundations of Business Intelligence: Databases and Information Management
Chapter 7	Telecommunications, the Internet, and Wireless Technology
Chapter 8	Securing Information Systems
Chapter 9	Achieving Operational Excellence and Customer Intimacy: Enterprise Applications
Chapter 10	E-Commerce: Digital Markets, Digital Goods
Chapter 11	Managing Knowledge and Artificial Intelligence
Chapter 12	Enhancing Decision Making
Chapter 13	Building Systems
Chapter 14	Managing Projects
Chapter 15	Managing Global Systems

## Instructor Teaching Resources

Supplements available to instructors at <a href="http://www.pearsonhighered.com/laudon">www.pearsonhighered.com/laudon</a>	Features of the Supplement
<b>Instructor's Manual</b>	<ul style="list-style-type: none"> <li>• Chapter-by-chapter summaries</li> <li>• Examples and activities not in the main book</li> <li>• Teaching outlines</li> <li>• Teaching tips</li> <li>• Solutions to all questions and problems in the book</li> </ul>
<b>Test Bank</b> authored by Professor Kenneth Laudon, New York University	<p>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.</p> <p><b>AACSB Assessment Guidelines</b></p> <p>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.</p> <p>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 e-mail the authors or contact your local Pearson representative for contact information.</p>
<b>Computerized TestGen</b>	<p>TestGen allows instructors to:</p> <ul style="list-style-type: none"> <li>• Customize, save, and generate classroom tests</li> <li>• Edit, add, or delete questions from the Test Item Files</li> <li>• Analyze test results</li> <li>• Organize a database of tests and student results</li> </ul>

### Supplements available to instructors at [www.pearsonhighered.com/laudon](http://www.pearsonhighered.com/laudon)

### Features of the Supplement

#### 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

## Acknowledgments

The production of any book involves valued contributions from a number of persons. We would like to thank all of our editors for encouragement, insight, and strong support for many years. We thank our editor, Samantha McAfee Lewis and Content Producer, Faraz Sharique Ali for their role in managing the project.

Our special thanks go to our supplement authors for their work, including the following MyLab MIS content contributors: Roberta M. Roth, University of Northern Iowa; Gipsi Sera, Indiana University; Robert J. Mills, Utah State University; and John Hupp, Columbus State University. We are indebted to Erica Laudon for her contributions to Career Opportunities and to Megan Miller for her help during production.

Special thanks to colleagues at the Stern School of Business at New York University; to Professor Werner Schenk, Simon School of Business, University of Rochester; to Professor Mark Gillenson, Fogelman College of Business and Economics, University of Memphis; to Robert Kostrubanic, Indiana-Purdue University Fort Wayne; to Professor Ethné Swartz, Department of Information Management and Business Analytics, Feliciano School of Business; to Professor Detlef Schoder of the University of Cologne; to Professor Walter Brenner of the University of St. Gallen; to Professor Lutz Kolbe of the University of Gottingen; and to Professor Donald Marchand of the International Institute for Management Development who provided additional suggestions for improvement. Thank you to Professor Ken Kraemer, University of California at Irvine, and Professor John King, University of Michigan, for more than a decade-long discussion of information systems and organizations. And a special remembrance and dedication to Professor Rob Kling, University of Indiana, for being our friend and colleague over so many years.

We also want to especially thank all our reviewers whose suggestions helped improve our texts. Reviewers for recent editions include:

Brad Allen, Plymouth State University  
Wanda Curtsinger, Texas A&M University  
Dawit Demissie, University of Albany  
Anne Formalarie, Plymouth State University  
Bin Gu, University of Texas–Austin



Essia Hamouda, University of California–Riverside  
Linda Lau, Longwood University  
Kimberly L. Merritt, Oklahoma Christian University  
James W. Miller, Dominican University  
Fiona Nah, University of Nebraska–Lincoln  
M. K. Raja, University of Texas Arlington  
Thomas Schambach, Illinois State University  
Shawn Weisfeld, Florida Institute of Technology

## 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?

## 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

PCL Construction: The New Digital Firm  
Can You Run the Company with Your iPhone?  
UPS Competes Globally with Information Technology  
Did Information Systems Cause Deutsche Bank to Stumble?

## 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;  
Writing Assignments: 1-16, 1-17; eText with Conceptual Animations

## PCL Construction: The New Digital Firm

Many people think the most widely used tool in a construction project is a hammer, but it is more likely a filing cabinet or fax machine. The construction industry has traditionally been very paper-intensive and manual. A complex project such as a large building requires hundreds of architectural drawings and design documents, which can change daily. Costly delays because of difficulty locating and accessing the documents and other project information could make or break a project. Now that's changing, and PCL Construction is at the forefront. Information technology has transformed the way this business works, and it is a prime example of the new digital firm.

PCL is a group of independent general contracting construction companies, with over 4,400 employees in the United States, Canada, and Australia. The organization is active in the commercial, institutional, multifamily residential, renewable energy, heavy industrial, historical restoration, and civil construction sectors. PCL has corporate headquarters in Edmonton, Alberta, Canada and a United States head office in Denver, Colorado.

At a PCL job site, you'll now see employees using mobile devices, including smartphones, tablets, and laptops, to access important information from PCL systems or input data. Electronic touch-screen kiosks throughout the job site and electronic plan rooms provide access to digitized, updated blueprints so team members don't have to waste time tracking down paper versions.

In the past, on-site trailers used to house large paper blueprints for a project. Each time a project team member wanted to view plans, that person had to visit a trailer. With up to 800 active construction projects running simultaneously, PCL had trouble keeping project documentation up to date. Information on paper forms to track small changes to project specifications or work requirements might not reach project decision makers until 30–40 days from the time it was recorded. By then, it was too late—decisions were made “from the gut” rather than based on facts.

PCL Construction plans are now in digital form, or the paper versions are scanned for digital storage. Digitized plans can be revised much more rapidly. By performing much of the design and planning work on the computer, PCL is able to identify and resolve conflicts and constructability issues early in the construction process to help keep projects ahead of schedule and within budget.



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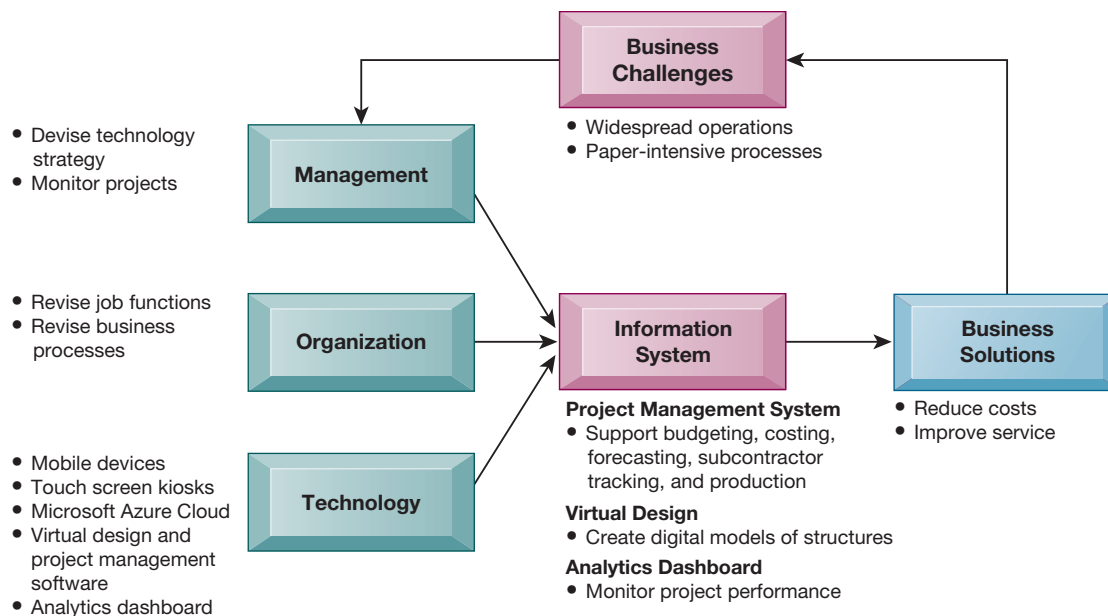
PCL implemented Project Document Controls (PDC) to facilitate collaboration among project team members. A secure project-based website provides real-time storage and management of information in a single shared accessible location. Construction contractors, subcontractors, consultants, suppliers, and clients can work from the same documents wherever they are. PCL uses its own proprietary project management system for budgeting, costing, forecasting, subcontractor tracking, production, and reporting. The project management system is linked to other PCL systems, including the People and Projects database, client management and accounting systems, and the BEST Estimating system. BEST Estimating is PCL's in-house estimating program for creating lump sum and unit price estimates and providing accurate resource and cost information.

PCL started moving its computing work to Microsoft Azure Cloud, which hosts the hardware and software for running some of PCL's applications in remote computing centers managed by Microsoft. Staff working on PCL projects can access information from cloud-based systems at any time and location using mobile devices as well as conventional desktop machines and an Internet connection. PCL saves 80 percent of the cost of backing up its corporate data by using the Azure platform. Azure Cloud also hosts a real-time analytics dashboard to monitor project performance in terms of quality, safety, schedule, and cost. The data are displayed visually as bar graphs or pie charts to construction field staff, project managers, and executives, and colors ranging from red to orange to green display performance ratings.

**Sources:** "Technology and Innovation," [pcl.com](http://pcl.com), accessed February 9, 2018; "PCL: Capitalizing on the Cloud," [itworldcanada.com](http://itworldcanada.com), accessed February 9, 2018; Brian Jackson, "PCL Constructors Reach New Heights with Real-time Analytics Solution in the Cloud," *IT World Canada*, November 9, 2017.

PCL Construction's experience shows how essential information systems are today. PCL operates construction projects in numerous distributed locations in an industry that has been traditionally very paper-intensive. Processing and accessing the large number of documents and other information required by construction projects was excessively costly and time-consuming, driving up costs. PCL used leading-edge information technology to digitize documents and streamline business processes for documenting, tracking, and analyzing projects. The information flows that drive PCL's business have become largely digital, making use of mobile tools and a cloud computing infrastructure. PCL Construction has become a leading example of a digital firm.

The chapter-opening diagram calls attention to important points raised by this case and this chapter. To reduce time and costs and improve customer service in a heavily paper-based industry, PCL management chose to use information technology to increase the precision and efficiency of key business activities for designing, costing, budgeting, and monitoring a construction project. These technologies include mobile devices (phones, tablets, laptops), touch screen kiosks, cloud computing services, the Internet, and software for creating models, managing documents, monitoring project progress, budgeting, estimating costs, and



displaying key project performance indicators on a digital dashboard. 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 PCL Construction runs its business. To effectively use all of its new digital tools, PCL had to redesign jobs and procedures for gathering, inputting, and accessing information, for designing, budgeting, and calculating costs, and for monitoring project progress. These changes had to be carefully planned to make sure they enhanced efficiency, service, and profitability.

Here are some questions to think about: How did information technology change operations at PCL construction? What was the role of mobile technology and cloud computing?

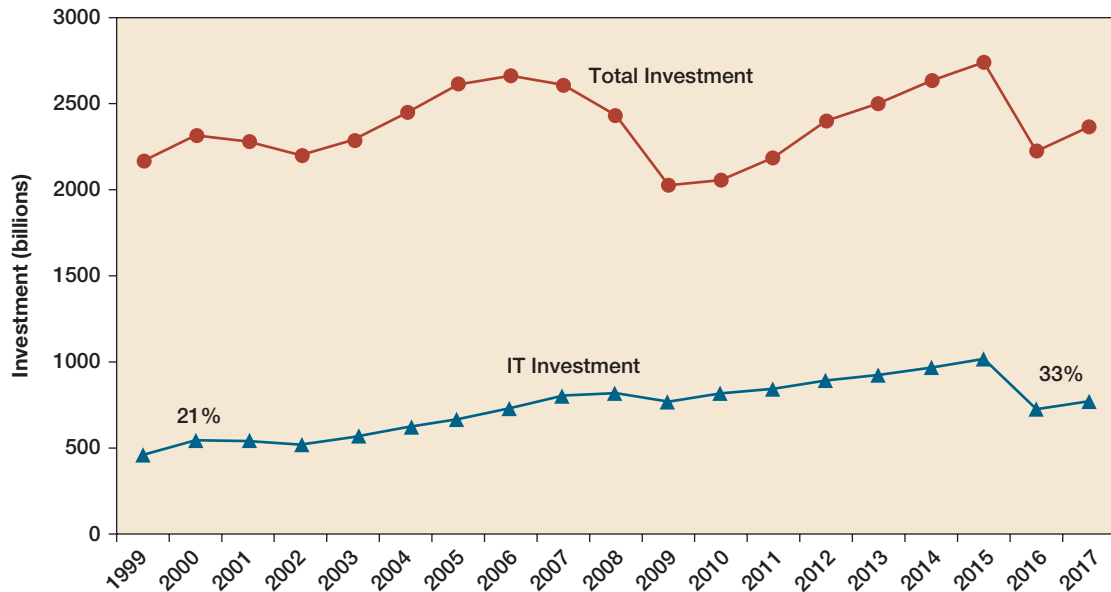
## 1-1 How are information systems transforming business, and why are they so essential for running and managing a business today?

It's not business as usual in the United States or the rest of the global economy anymore. In 2017, American businesses spent nearly \$1 trillion on information systems hardware, software, and telecommunications equipment. In addition, they spent another \$143 billion on business and management consulting and services—much of which involves redesigning firms' business operations to take advantage of these new technologies. 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 2017, private business investment in information technology consisting of hardware, software, and communications equipment grew from 21 to 33 percent of all invested capital.

**FIGURE 1.1 INFORMATION TECHNOLOGY CAPITAL INVESTMENT**

Information technology capital investment, defined as hardware, software, and communications equipment, grew from 21 to 33 percent of all invested capital between 1999 and 2017.

Source: Based on data in U.S. Department of Commerce, Bureau of Economic Analysis, *National Income and Product Accounts*, Table 5.3.6. Real Private Fixed Investment by Type, Chained Dollars (2018).



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.

## How Information Systems Are Transforming Business

You can see the results of this large-scale spending around you every day by observing how people conduct business. Changes in technology and new innovative business models have transformed social life and business practices. More than 269 million Americans have mobile phones (81 percent of the population), and 230 million of these people access the Internet using smartphones and tablets. Fifty-five percent of the entire population now uses tablet computers, whose sales have soared. Two hundred million Americans use online social networks; 175 million use Facebook, while 54 million use Twitter. Smartphones, social networking, texting, e-mailing, and webinars have all become essential tools of business because that's where your customers, suppliers, and colleagues can be found (eMarketer, 2018).

By June 2017, more than 140 million businesses worldwide had dot-com Internet sites registered. Today, 220 million Americans shop online, and 190 million will purchase online. In 2017, FedEx moved about 16 million packages daily in 220 countries and territories around the world, mostly overnight, and the United Parcel Service (UPS) moved more than 28 million packages daily. Businesses are using information technology to sense and respond to rapidly changing customer demand, reduce inventories to the lowest possible levels, and achieve higher

levels of operational efficiency. Supply chains have become more fast-paced, with companies of all sizes depending on just-in-time inventory to reduce their overhead costs and get to market faster.

As newspaper print readership continues to decline, in 2017 more than 180 million people read a newspaper online, and millions more read other news sites. Online digital newspaper readership is growing at 10 percent annually, about twice as fast as the Internet itself. About 128 million people watch a video online every day, 85 million read a blog, and 30 million post to blogs, creating an explosion of new writers and new forms of customer feedback that did not exist five years ago (eMarketer, 2018). Social networking site Facebook attracted 214 million monthly visitors in 2018 in the United States and more than 2 billion worldwide. Businesses are using social networking tools to connect their employees, customers, and managers worldwide. Most *Fortune* 500 companies now have Facebook pages, Twitter accounts, and Tumblr sites.

E-commerce and Internet advertising continue to expand. Google's U.S. online ad revenues surpassed \$32 billion in 2017, and Internet advertising continues to grow at more than 20 percent a year in the United States, reaching more than \$107 billion in revenues in 2018 (eMarketer, 2018).

New federal security and accounting laws requiring many businesses to keep e-mail messages for five years, coupled with existing occupational and health laws requiring firms to store employee chemical exposure data for up to 60 years, are spurring the annual growth of digital information at the estimated rate of 5 exabytes annually, equivalent to 37,000 new Libraries of Congress.

## 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.

**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 iTunes, and Amazon, has forever changed how premium video is distributed and even created. Netflix in 2018 attracted more than 125 million subscribers worldwide to what it calls the "Internet TV revolution." Netflix has moved into premium TV show production with nearly 1,000 original shows such as *American Vandal*, *Suburra*, *The Crown*, *Friends From College*, *No Country For Old Men*, *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's iTunes now accounts for 67 percent of movie and TV show downloads and 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 generated about \$700 billion in revenues in 2017 and is estimated to grow to nearly \$950 billion by 2020. 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 in the United States, 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: 85 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 e-commerce hit \$229 billion in 2017 and is growing at 30 percent a year.

**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 Management. Millions of managers rely heavily on the mobile digital platform to coordinate suppliers and shipments, satisfy customers, and manage their employees. A business day without these mobile devices or Internet access would be unthinkable.

## INTERACTIVE SESSION MANAGEMENT

### Can You Run the Company with Your iPhone?

Can you run the company just by using your iPhone? Perhaps not entirely, but there are many business functions today that can be performed using an iPhone, iPad, or Android mobile device. Smartphones and tablets have become all-in-one tools that help managers and employees work more efficiently, packing a powerful, networked computer into a pocket-size device. With a tap or flick of a finger, these mobile devices can access the Internet or serve as a telephone, camera, music or video player, an e-mail and messaging machine, and, increasingly, a gateway into corporate systems. New software applications for document sharing, collaboration, sales, order processing, inventory management, scheduling, and production monitoring make these devices even more versatile business tools.

Network Rail runs, maintains, and develops the rail tracks, signaling, bridges, tunnels, level crossings, and many key stations for most of the rail network in England, Scotland, and Wales. Keeping trains running on time is one of its top priorities. To maintain 20,000 miles of track safely and efficiently, skilled workers must be equipped with appropriate tools and work across thousands of sites throughout the rail network, 24 hours a day. Network Rail uses a group of custom apps for its 22,000 iPhone and iPad devices to streamline maintenance operations, quickly capture incident data, and immediately share critical information.

Several apps help Network Rail improve railway performance and safety. The Close Call app helps employees report hazards as they are found so problems can be addressed quickly. The MyWork app gives maintenance teams all the information they need to start and complete repair tasks. The Sentinel app allows field managers to electronically scan ID cards to verify that workers are qualified to perform specific tasks.

The iPhone and iPad apps provide maintenance technicians with current technical data, GPS locations, and streamlined reports, replacing cumbersome reference books and rain-soaked paperwork that slowed the repair process. Many service calls start with hazardous conditions reported by Network Rail employees themselves. Rather than waiting hours to fill out a report at the depot, workers can take pictures of dangerous situations right away,

using the Close Call app to describe situations and upload photos to the call center. Once provided with the hazard's GPS coordinates, the call center will usually schedule repairs within 24 hours.

MyWork gives maintenance workers a simple overview of all of the jobs each team needs to complete during a specific shift. This mobile app clusters jobs by location, skills required, and opening and closing times. Using precise map coordinates, workers can find sites easily and finish jobs more quickly. By electronically delivering daily job schedules to over 14,000 maintenance staff members, MyWork has enabled them to complete over a half a million work orders to date while minimizing interruptions.

British Airways is the largest airline in the United Kingdom, with operations in more than 200 airports worldwide. The airline has found many ways to use the iPad to improve customer service and operational efficiency. The airline has created more than 40 custom apps for over 17,000 iPads for its workforce that have transformed the way it does business.

Unforeseen disruptions can create long lines of passengers seeking flight information and rebooking. The FlightReact app used by British Airways mobilizes agents to scan a boarding pass, review the customer's booking, look up alternate flight options, and rebook and reticket passengers—all within four minutes. iBanner allows agents to identify passengers transferring onto a specific flight, while iTranslate enables staff to communicate easily with travelers speaking any language.

Inside the airport, iPads and iPhones communicate with low-energy wireless Bluetooth signals from iBeacon, notifying customers of Wi-Fi access, gate locations, and flight updates. Beyond the terminal, mobile apps are helping British Airways to improve the aircraft turnaround process. British Airways has more than 70 planes at London Heathrow Terminal, five turning around at once, and each requiring a team of around 30 people. To shorten and streamline this process can generate huge business benefits.

Loading luggage and cargo onto an aircraft is one of the most complex parts of the turnaround process, requiring detailed communications between the turnaround manager (TRM), who coordinates and manages the services around the aircraft during