

EIGHTH EDITION  
GLOBAL EDITION

# **INFORMATION SYSTEMS TODAY**

---

## **MANAGING IN THE DIGITAL WORLD**

**Joseph Valacich**

University of Arizona

**Christoph Schneider**

City University of Hong Kong



---

Harlow, England • London • New York • Boston • San Francisco • Toronto • Sydney • Dubai • Singapore • Hong Kong  
Tokyo • Seoul • Taipei • New Delhi • Cape Town • Sao Paulo • Mexico City • Madrid • Amsterdam • Munich • Paris • Milan

*Preface* 19

- Chapter 1** Managing in the Digital World 30
- Chapter 2** Gaining Competitive Advantage Through Information Systems 76
- Chapter 3** Managing the Information Systems Infrastructure and Services 118
- Chapter 4** Enabling Business-to-Consumer Electronic Commerce 166
- Chapter 5** Enhancing Organizational Communication and Collaboration Using Social Media 210
- Chapter 6** Enhancing Business Intelligence Using Big Data and Analytics 252
- Chapter 7** Enhancing Business Processes Using Enterprise Information Systems 298
- Chapter 8** Strengthening Business-to-Business Relationships via Supply Chain and Customer Relationship Management 334
- Chapter 9** Developing and Acquiring Information Systems 372
- Chapter 10** Securing Information Systems 418
- Technology Briefing** Foundations of Information Systems Infrastructure 470

*Acronyms* 519

*Glossary* 521

*Name Index* 541

*Organization Index* 542

*Subject Index* 545

Preface 19

---

<b>Chapter 1</b>	<b>Managing in the Digital World</b>	<b>30</b>
	<b>MANAGING IN THE DIGITAL WORLD: Open Innovation</b>	30
	<b>Information Systems Today</b>	<b>32</b>
	The Emergence of the Digital World	32
	Globalization and Societal Issues in the Digital World	35
	■ <b>COMING ATTRACTIONS: Memory Crystals</b>	35
	Five IT Megatrends That Shape the Digital Future	38
	■ <b>WHO'S GOING MOBILE: Wearable Technologies</b>	38
	■ <b>GREEN IT: The Green Internet of Things</b>	44
	<b>Information Systems Defined</b>	<b>44</b>
	Data: The Root and Purpose of Information Systems	46
	Hardware, Software, and Telecommunications Networks: The Components of Information Systems	46
	People: The Builders, Managers, and Users of Information Systems	47
	■ <b>SECURITY MATTERS: Ransomware</b>	52
	Organizations: The Context of Information Systems	53
	■ <b>WHEN THINGS GO WRONG: Technology Addiction</b>	56
	<b>The Dual Nature of Information Systems</b>	<b>57</b>
	Case in Point: An Information System Gone Awry: Outages Outrage Gamers	57
	Case in Point: An Information System That Works: FedEx	57
	Information Systems for Competitive Advantage	58
	■ <b>ETHICAL DILEMMA: The Social and Environmental Costs of the Newest Gadgets</b>	59
	<b>IS Ethics</b>	<b>60</b>
	Information Privacy	60
	Intellectual Property	64
	The Need for a Code of Ethical Conduct	65
	■ <b>INDUSTRY ANALYSIS: Business Career Outlook</b>	66
	Key Points Review	67
	• Key Terms	67
	• Review Questions	68
	• Self-Study Questions	68
	• Problems and Exercises	69
	• Application Exercises	70
	• Team Work Exercise	70
	• Answers to the Self-Study Questions	71
	■ <b>APPLE</b>	72
	■ <b>HEALTHCARE IS</b>	73
<b>Chapter 2</b>	<b>Gaining Competitive Advantage Through Information Systems</b>	<b>76</b>
	<b>MANAGING IN THE DIGITAL WORLD: Startups and New Business Models</b>	76
	<b>Enabling Organizational Strategy through Information Systems</b>	<b>78</b>
	Organizational Decision-Making Levels	78
	Organizational Functional Areas	80

---

Information Systems for Automating: Doing Things Faster	81
Information Systems for Organizational Learning: Doing Things Better	83
Information Systems for Supporting Strategy: Doing Things Smarter	84
Identifying Where to Compete: Analyzing Competitive Forces	84
Identifying How to Compete: Choosing a Generic Strategy	85
Identifying How to Compete: Resources and Capabilities	86
■ <b>GREEN IT: The Electric Navy</b>	87
Identifying How to Compete: Analyzing the Value Chain	88
The Role of Information Systems in Value Chain Analysis	88
The Technology/Strategy Fit	89
<b>Business Models in the Digital World</b>	89
■ <b>WHO'S GOING MOBILE: Digital Nomads</b>	90
Revenue Models in the Digital World	90
■ <b>WHEN THINGS GO WRONG: The Pains of Uber in China</b>	93
Platform-Based Business Models and the Sharing Economy	93
Service-Based Business Models	95
■ <b>ETHICAL DILEMMA: The Ethics of the Sharing Economy</b>	96
<b>Valuing Innovations</b>	97
The Need for Constant IS Innovation	99
Successful Innovation Is Difficult	100
Open Innovation	101
Organizational Requirements for Innovation	102
■ <b>COMING ATTRACTIONS: The CITE Project</b>	103
The Innovation Process	103
■ <b>SECURITY MATTERS: The Bangladesh SWIFT Theft</b>	106
Startups and Crowdfunding	106
■ <b>INDUSTRY ANALYSIS: Education</b>	108
Key Points Review	109
• Key Terms	109
• Review Questions	110
• Self-Study Questions	110
• Problems and Exercises	111
• Application Exercises	112
• Team Work Exercise	112
• Answers to the Self-Study Questions	112
■ <b>LINKEDIN</b>	113
■ <b>STREAMING VIDEO</b>	114

---

## Chapter 3 Managing the Information Systems Infrastructure and Services 118

■ <b>MANAGING IN THE DIGITAL WORLD: From Google to Alphabet</b>	118
<b>The IS Infrastructure</b>	120
■ <b>WHO'S GOING MOBILE: Mobile Payments Are Transforming Developing Countries</b>	122
Applications and Databases Supporting Business Processes	124
■ <b>ETHICAL DILEMMA: Putting People's Lives Online</b>	125
<b>IS Infrastructure Components</b>	126
Hardware	126
System Software	128
Storage	130
■ <b>COMING ATTRACTIONS: Making Death Optional?</b>	130
Networking	131
■ <b>GREEN IT: Alphabet Renewables</b>	137
Data Centers	139

<b>Issues Associated with Managing the IS Infrastructure</b>	<b>140</b>
Rapid Obsolescence and Shorter IT Cycles	140
Big Data and Rapidly Increasing Storage Needs	143
Demand Fluctuations	143
Increasing Energy Needs	144
<b>Cloud Computing</b>	<b>144</b>
■ <b>WHEN THINGS GO WRONG: Old and Dirty Energy Drives Global Internet Growth</b>	<b>145</b>
What Is Cloud Computing?	145
Managing the Cloud	149
Advanced Cloud Applications	152
■ <b>SECURITY MATTERS: Car Hacking</b>	<b>154</b>
Green Computing	157
■ <b>INDUSTRY ANALYSIS: Movie Industry</b>	<b>158</b>
Key Points Review	159
• Key Terms	159
• Review Questions	160
• Self-Study Questions	160
• Problems and Exercises	161
• Application Exercises	162
• Team Work Exercise	162
• Answers to the Self-Study Questions	163
■ <b>DBS SINGAPORE MOVES TO THE CLOUD</b>	<b>163</b>
■ <b>THE DARK WEB</b>	<b>164</b>

<b>Chapter 4</b>	<b>Enabling Business-to-Consumer Electronic Commerce</b>	<b>166</b>
	■ <b>MANAGING IN THE DIGITAL WORLD: Taobao and the World of E-commerce</b>	<b>166</b>
	<b>E-Commerce and E-Government</b>	<b>168</b>
	Types of Electronic Commerce	168
	E-government	169
	E-finance	170
	<b>Business-To-Consumer E-Commerce</b>	<b>171</b>
	■ <b>COMING ATTRACTIONS: The AI Hedge Fund</b>	<b>172</b>
	E-tailing: Capabilities and Opportunities	174
	Benefits of E-tailing	177
	■ <b>ETHICAL DILEMMA: The Ethics of Reputation Management</b>	<b>178</b>
	Drawbacks of E-tailing	179
	<b>Electronic Commerce Websites and Internet Marketing</b>	<b>179</b>
	Designing Websites to Meet Online Consumers' Needs	180
	■ <b>SECURITY MATTERS: Too Small to Be Hacked?</b>	<b>180</b>
	Internet Marketing	182
	■ <b>WHEN THINGS GO WRONG: Buying Likes</b>	<b>186</b>
	<b>Mobile Commerce, Consumer-To-Consumer EC, and Consumer-To-Business EC</b>	<b>187</b>
	C2C EC	189
	C2B EC	190
	<b>Securing Payments and Navigating Legal Issues in EC</b>	<b>191</b>
	Securing Payments in the Digital World	191
	■ <b>GREEN IT: Green Online Shopping</b>	<b>192</b>
	■ <b>WHO'S GOING MOBILE: Mobile Payments</b>	<b>193</b>
	Legal Issues in EC	196
	■ <b>INDUSTRY ANALYSIS: Retailing</b>	<b>199</b>

Key Points Review 200 • Key Terms 200 • Review Questions 201 • Self-Study Questions 201 • Problems and Exercises 202 • Application Exercises 203 • Team Work Exercise 203 • Answers to the Self-Study Questions 204

■ **WEB ANALYTICS** 205

■ **ROCKET INTERNET—CLONING BUSINESS MODELS** 206

## Chapter 5 Enhancing Organizational Communication and Collaboration Using Social Media 210

**MANAGING IN THE DIGITAL WORLD: Facebook** 210

**The Need for Communication and Collaboration** 212

Virtual Teams 212

Groupware 213

Videoconferencing 214

■ **GREEN IT: Green IT Fueling Renewable Energy** 216

Intranets and Employee Portals 216

**The Evolving Web** 218

■ **COMING ATTRACTIONS: Dissolvable Electronics** 219

Evolving Web Capabilities 219

Evolving Social Interaction 220

The Evolving Workspace 221

Future Web Capabilities 221

**Social Media and the Enterprise** 222

Enhancing Communication Using Social Media 222

Enhancing Cooperation with Social Media 225

■ **SECURITY MATTERS: Terrorism Is Winning the Social Media Battle** 228

Enhancing Collaboration with Social Media 229

■ **WHO'S GOING MOBILE: Going SoLoMo: Yelp** 231

Enhancing Connection with Social Media 233

■ **ETHICAL DILEMMA: Anonymity, Trolling, and Cyberharassment** 235

**Managing Social Media Applications in the Enterprise** 236

Organizational Issues 236

■ **WHEN THINGS GO WRONG: Crowdfunding Failures** 238

Downsides and Dangers of using Social Media Applications 239

■ **INDUSTRY ANALYSIS: Online Travel** 241

Key Points Review 242 • Key Terms 242 • Review Questions 243 • Self-Study Questions 243 • Problems and Exercises 244 • Application Exercises 244 • Team Work Exercise 245 • Answers to the Self-Study Questions 246

■ **LIVING IN A BUBBLE: FACEBOOK, NEWSFEEDS, AND JOURNALISM** 246

■ **LIKE FARMING AND CLICKBAIT** 247

## Chapter 6 Enhancing Business Intelligence Using Big Data and Analytics 252

**MANAGING IN THE DIGITAL WORLD: Intelligence Through Drones** 252

**Enhancing Organizational Decision Making** 254

Why Organizations Need Business Intelligence and Advanced Analytics 254

■ **GREEN IT: Big Data, Internet of Things, and Analytics Fuel Greener Facilities** 257

Databases: Providing Inputs into Business Intelligence and Advanced Analytics 257

- **WHEN THINGS GO WRONG:** Twitter Fever—Look Before You Tweet 261
- **COMING ATTRACTIONS:** Emotion Aware Gaming 267
- Business Intelligence and Advanced Analytics 267**
  - Business Intelligence 268
  - **WHO'S GOING MOBILE:** Identifying Malaria Hotspots 273
  - Advanced Analytics 273
  - **ETHICAL DILEMMA:** Orwellian Internet of Things 275
  - **SECURITY MATTERS:** Hacktivists Versus Fembots: The Ashley Madison Case 281
- Knowledge Management and Geographic Information Systems 282**
  - Knowledge Management Systems 282
  - Geographic Information Systems 285
  - **INDUSTRY ANALYSIS:** Healthcare 288
- Key Points Review 289 • Key Terms 289 • Review Questions 290 • Self-Study Questions 290 • Problems and Exercises 291 • Application Exercises 292 • Team Work Exercise 293 • Answers to the Self-Study Questions 293
- **DATA ANALYTICS IN HEALTHCARE 293**
- **GATHERING SOCIAL INTELLIGENCE 294**

## Chapter 7 Enhancing Business Processes Using Enterprise Information Systems 298

- **MANAGING IN THE DIGITAL WORLD:** Amazon.com 298
- Core Business Processes and Organizational Value Chains 300**
  - Core Business Processes 300
  - Organizational Activities Along the Value Chain 302
  - **GREEN IT:** Why Your Enterprise Systems Should Be in the Cloud 305
  - Value Systems: Connecting Multiple Organizational Value Chains 307
- Enterprise Systems 307**
  - The Rise of Enterprise Systems 308
  - Supporting Business Processes 309
  - **ETHICAL DILEMMA:** Too Much Intelligence? RFID and Privacy 310
  - **COMING ATTRACTIONS:** The Internet of Things Will Transform ERP and Organizations 313
- Enterprise Resource Planning 316**
  - Responding to Compliance and Regulatory Demands 317
  - Choosing an ERP System 317
  - **SECURITY MATTERS:** To Update or Not to Update, *That Shouldn't Be the Question* 318
  - Enabling Business Processes Using ERP Core Components 319
  - ERP Installation 322
  - ERP Limitations 322
- Achieving Enterprise System Success 322**
  - **WHO'S GOING MOBILE:** Big ERP Systems Embracing Small Mobile Devices 323
  - Secure Executive Sponsorship 323
  - Get Help from Outside Experts 324
  - Thoroughly Train Users 324
  - Take a Multidisciplinary Approach to Implementations 324
  - Evolve the Implementation 324
  - **WHEN THINGS GO WRONG:** Software Error Frees Prisoners Early and Is Linked to Killings 325

■ **INDUSTRY ANALYSIS: The Automobile Industry** 326

Key Points Review 327 • Key Terms 327 • Review Questions 328 • Self-Study Questions 328 • Problems and Exercises 329 • Application Exercises 330 • Team Work Exercise 330 • Answers to the Self-Study Questions 330

■ **SOFTWARE AS A SERVICE: ERP BY THE HOUR** 331

■ **TH MILK VIETNAM ADOPTS CLOUD ERP** 332

## Chapter 8 Strengthening Business-to-Business Relationships via Supply Chain and Customer Relationship Management 334

**MANAGING IN THE DIGITAL WORLD: Walmart** 334

### Supply Chain Management 336

What Is a Supply Chain? 336

Business-to-Business Electronic Commerce: Exchanging Data in Supply Networks 336

Managing Complex Supply Networks 339

Benefits of Effectively Managing Supply Chains 340

Optimizing the Supply Chain Through Supply Chain Management 342

■ **WHEN THINGS GO WRONG: SpaceX Rocket Failure due to Supply Chain Failure** 343

Developing an SCM Strategy 344

■ **GREEN IT: Nike's Green Supply Chain** 345

Supply Chain Planning 345

Supply Chain Execution 346

Supply Chain Visibility and Analytics 349

### Customer Relationship Management 349

■ **COMING ATTRACTIONS: Augmenting Supply Chain Success** 350

■ **SECURITY MATTERS: Disclosing the Customer Data of the Most Vulnerable** 353

Developing a CRM Strategy 353

Architecture of a CRM System 354

■ **WHO'S GOING MOBILE: Developing a Mobile CRM App for Customers** 358

■ **ETHICAL DILEMMA: When Algorithms Discriminate** 362

Ethical Concerns with CRM 363

■ **INDUSTRY ANALYSIS: Manufacturing** 363

Key Points Review 364 • Key Terms 364 • Review Questions 365 • Self-Study Questions 365 • Problems and Exercises 366 • Application Exercises 367 • Team Work Exercise 367 • Answers to the Self-Study Questions 367

■ **SUPPLY CHAIN HAVOC** 368

■ **EFFICIENTLY DELIVERING PRODUCTS OVER THE "LAST MILE"** 369

## Chapter 9 Developing and Acquiring Information Systems 372

**MANAGING IN THE DIGITAL WORLD: The Maker Movement** 372

### Making the Business Case 374

Business Case Objectives 374

The Productivity Paradox 374

Making a Successful Business Case 376

■ **GREEN IT: Project Natick—Microsoft's Underwater Data Centers** 378



- **COMING ATTRACTIONS: Harvesting Human Energy** 380
  - Presenting the Business Case 382
- **ETHICAL DILEMMA: Ethical App Development** 384
- The Systems Development Process** 385
  - Custom Versus Off-the-Shelf Software 385
  - Open Source Software 386
  - Systems Integration: Combining Custom, Open Source, and Off-the-Shelf Systems 387
  - IS Development in Action 387
  - The Role of Users in the Systems Development Process 389
  - Systems Development Controls 389
  - Steps in the Systems Development Process 389
  - **WHO'S GOING MOBILE: Creating Mobile Apps** 390
    - Phase 1: Systems Planning and Selection 390
    - Phase 2: Systems Analysis 391
    - Phase 3: Systems Design 394
    - Phase 4: Systems Implementation and Operation 395
    - Repeating the SDLC: Systems Maintenance 397
  - **SECURITY MATTERS: Mobile Cybercrime** 399
    - Other Approaches to Designing and Building Systems 399
- Acquiring Information Systems** 401
  - External Acquisition 401
  - **WHEN THINGS GO WRONG: Top Security Threats** 402
    - Outsourcing Systems Development 406
  - **INDUSTRY ANALYSIS: Broadcasting** 408
    - Key Points Review 409 • Key Terms 409 • Review Questions 410 • Self-Study Questions 410 • Problems and Exercises 411 • Application Exercises 412 • Team Work Exercise 412 • Answers to the Self-Study Questions 413
  - **NEXT GENERATION IDENTIFICATION: FBI, ICE DATABASES EXPAND AND JOIN FORCES** 414
  - **BIG DATA, HADOOP, MAP REDUCE** 415

## Chapter 10 Securing Information Systems 418

- **MANAGING IN THE DIGITAL WORLD: Not So "Anonymous"—Activists, Hacktivists, or Just Plain Criminals?** 418
- Computer Crime** 420
  - Hacking and Cracking 420
  - Types of Computer Criminals and Crimes 420
  - **GREEN IT: Anonymous Protests the Killing of Dolphins and Whales in Japan** 424
    - Computer Viruses and Other Destructive Code 425
  - **WHEN THINGS GO WRONG: The Bug That Almost Killed the Internet** 430
    - Cyberharassment, Cyberstalking, and Cyberbullying 432
    - Software Piracy 432
    - Cybersquatting 434
    - Laws Against Computer Crime 434
- Cyberwar and Cyberterrorism** 435
  - **WHO'S GOING MOBILE: Backdoors in Every Mobile Phone?** 436
    - Cyberwar 436
    - Cyberterrorism 437

- **ETHICAL DILEMMA: Ethics and Cyberwar: Just Because We Can, Should We?** 440

### Managing Information Systems Security 440

Assessing Risks 442

Developing a Security Strategy 444

Implementing Controls and Training 446

- **SECURITY MATTERS: Back to the Future: Analog May Be the Future of Securing Critical Infrastructure** 447

- **COMING ATTRACTIONS: Can You Become Your Password?** 453

Monitoring Security 456

- **INDUSTRY ANALYSIS: Cybercops Track Cybercriminals** 459

Key Points Review 460 • Key Terms 460 • Review Questions 461 • Self-Study Questions 461 • Problems and Exercises 462 • Application Exercises 464 • Team Work Exercise 464 • Answers to the Self-Study Questions 465

- **SINGPASS E-GOVERNMENT SECURITY** 466

- **CHINA'S GREAT (FIRE) WALL** 467

## TECHNOLOGY BRIEFING

### Foundations of Information Systems Infrastructure 470

#### Foundational Topics in IS Hardware 471

Input Technologies 471

Processing: Transforming Inputs into Outputs 473

Output Technologies 477

#### Foundational Topics in IS Software 478

System Software 479

Programming Languages and Development Environments 479

#### Foundational Topics in Networking 485

Evolution of Computer Networking 485

Types of Networks 487

Packet Switching 490

Network Standards and Protocols 490

Network Technologies 494

The Internet 500

#### Foundational Topics in Database Management 506

Relational Database Design 506

Advanced Database Models 511

Key Points Review 511 • Key Terms 512 • Review Questions 513 • Self-Study Questions 514 • Problems and Exercises 515 • Answers to the Foundational Hardware Self-Study Questions 517 • Answers to the Foundational Software Self-Study Questions 517 • Answers to the Foundational Networking Self-Study Questions 517 • Answers to the Foundational Database Self-Study Questions 517

*Acronyms* 519

*Glossary* 521

*Name Index* 541

*Organization Index* 542

*Subject Index* 545