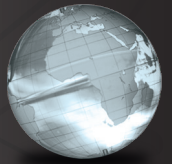


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# Accounting Information Systems


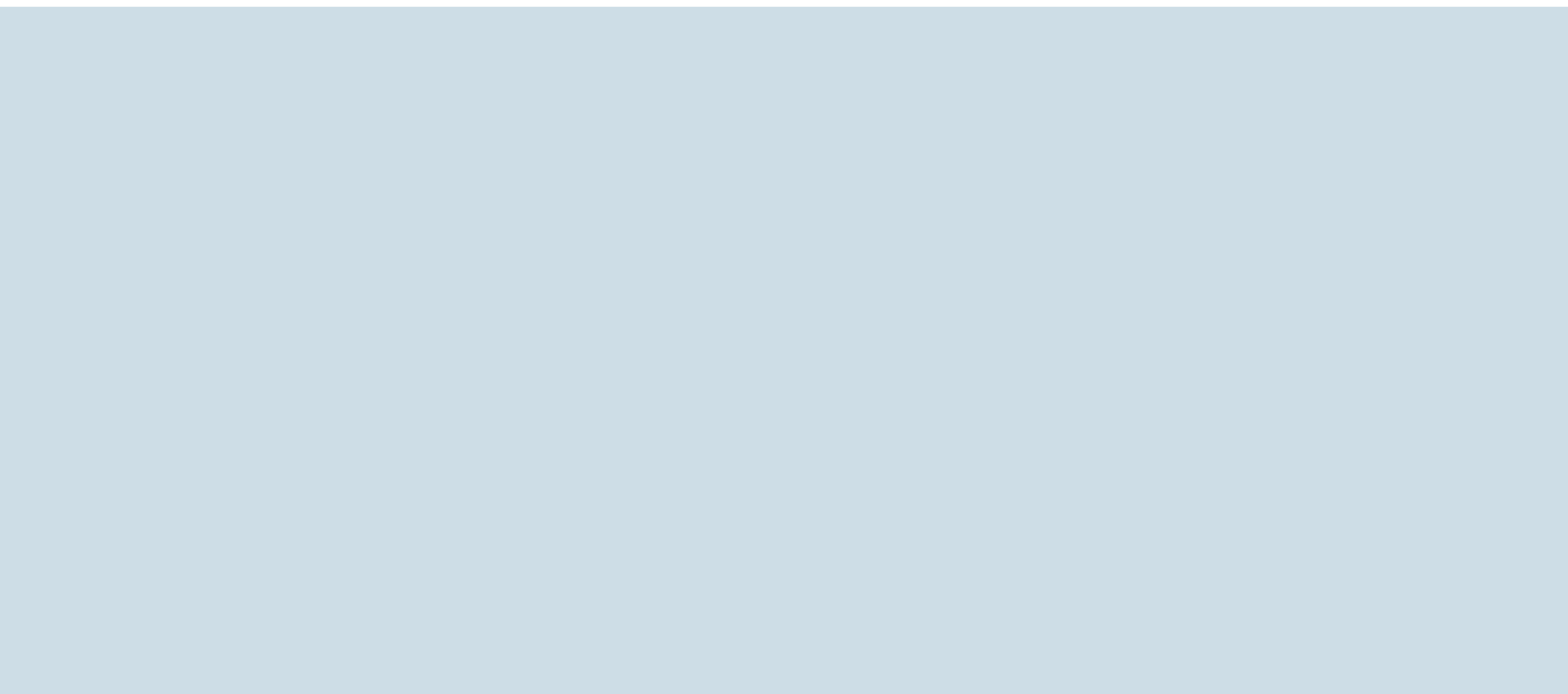

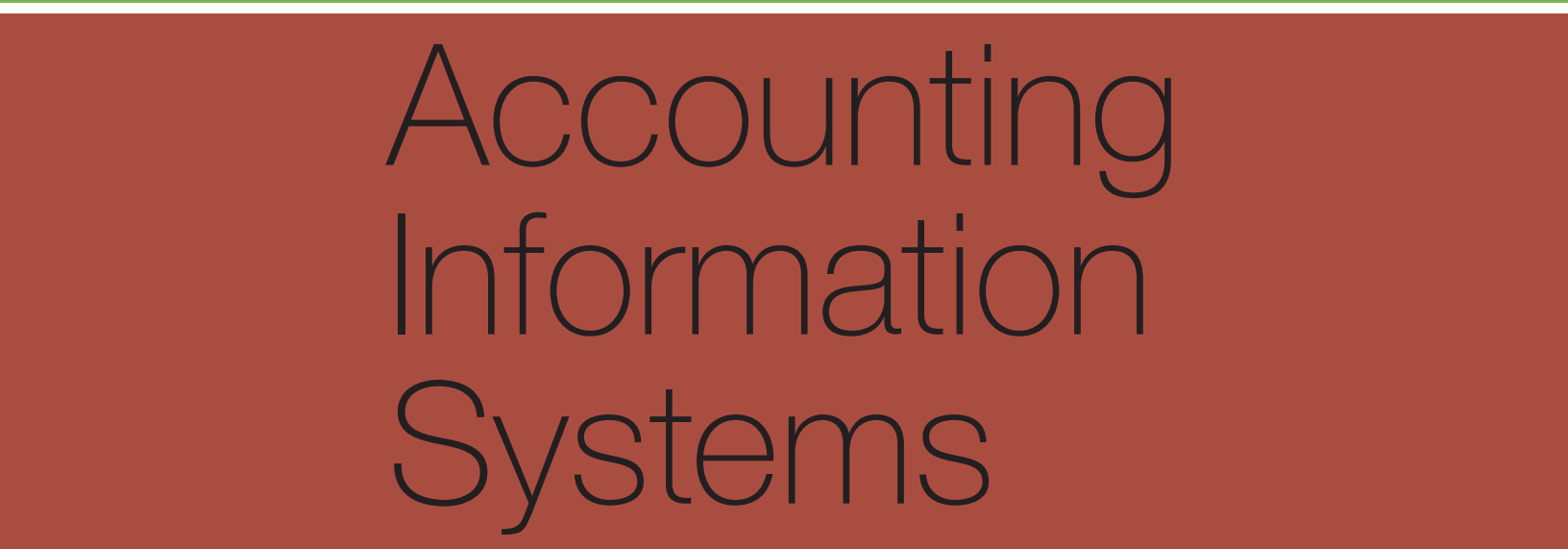
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# Accounting Information Systems



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# Accounting Information Systems

**FOURTEENTH EDITION**  
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**Marshall B. Romney**  
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# Brief Contents

Preface 19

## **PART I** Conceptual Foundations of Accounting Information Systems 27

- CHAPTER 1** Accounting Information Systems: An Overview 28
- CHAPTER 2** Overview of Transaction Processing and Enterprise Resource Planning Systems 50
- CHAPTER 3** Systems Documentation Techniques 76
- CHAPTER 4** Relational Databases 110

## **PART II** Control and Audit of Accounting Information Systems 151

- CHAPTER 5** Fraud 152
- CHAPTER 6** Computer Fraud and Abuse Techniques 182
- CHAPTER 7** Control and Accounting Information Systems 222
- CHAPTER 8** Controls for Information Security 262
- CHAPTER 9** Confidentiality and Privacy Controls 296
- CHAPTER 10** Processing Integrity and Availability Controls 322
- CHAPTER 11** Auditing Computer-Based Information Systems 348

## **PART III** Accounting Information Systems Applications 377

- CHAPTER 12** The Revenue Cycle: Sales to Cash Collections 378
- CHAPTER 13** The Expenditure Cycle: Purchasing to Cash Disbursements 420
- CHAPTER 14** The Production Cycle 458
- CHAPTER 15** The Human Resources Management and Payroll Cycle 488
- CHAPTER 16** General Ledger and Reporting System 518

**PART IV** The REA Data Model 551**CHAPTER 17** Database Design Using the REA Data Model 552**CHAPTER 18** Implementing an REA Model in a Relational Database 586**CHAPTER 19** Special Topics in REA Modeling 610**PART V** The Systems Development Process 643**CHAPTER 20** Introduction to Systems Development and  
Systems Analysis 644**CHAPTER 21** AIS Development Strategies 680**CHAPTER 22** Systems Design, Implementation, and Operation 708*Glossary* 734*Index* 755

# Contents

Preface 19

## **PART I** Conceptual Foundations of Accounting Information Systems 27

### **CHAPTER 1** Accounting Information Systems: An Overview 28

#### **Introduction 29**

#### **Information Needs and Business Processes 30**

Information Needs 31

Business Processes 32

#### **Accounting Information Systems 36**

How an AIS Can Add Value to an Organization 37

The AIS and Corporate Strategy 39

The Role of the AIS in the Value Chain 39

Summary and Case Conclusion 41 ■ Key Terms 42

**AIS IN ACTION:** Chapter Quiz 42 ■ Discussion Questions 43 ■ Problems 44

**CASE 1-1** Ackoff's Management Misinformation Systems 47

**AIS IN ACTION SOLUTIONS:** Quiz Key 48

### **CHAPTER 2** Overview of Transaction Processing and Enterprise Resource Planning Systems 50

#### **Introduction 51**

#### **Transaction Processing: The Data Processing Cycle 52**

Data Input 52

Data Storage 53

Data Processing 59

Information Output 59

#### **Enterprise Resource Planning (ERP) Systems 61**

Summary and Case Conclusion 64 ■ Key Terms 64

**AIS IN ACTION:** Chapter Quiz 64 ■ Discussion Questions 65 ■ Problems 66

**CASE 2-1** Bar Harbor Blueberry Farm 72

**AIS IN ACTION SOLUTIONS:** Quiz Key 73

### **CHAPTER 3** Systems Documentation Techniques 76

#### **Introduction 77**

#### **Data Flow Diagrams 78**

Subdividing the DFD 80



**Flowcharts 84**

Types of Flowcharts 84

Program Flowcharts 89

**Business Process Diagrams 89**

Summary and Case Conclusion 91 ■ Key Terms 92

 **AIS IN ACTION:** Chapter Quiz 92 ■ Comprehensive Problem 93 ■ Discussion Questions 93 ■ Problems 94 **CASE 3-1** Dub 5 101 **AIS IN ACTION SOLUTIONS:** Quiz Key 102 ■ Comprehensive Problem Solution 104**CHAPTER 4 Relational Databases 110****Introduction 110****Databases and Files 111**

Using Data Warehouses for Business Intelligence 112

The Advantages of Database Systems 113

The Importance of Good Data 113

**Database Systems 114**

Logical and Physical Views of Data 114

Schemas 114

The Data Dictionary 116

DBMS Languages 116

**Relational Databases 116**

Types of Attributes 116

Designing a Relational Database for S&amp;S, Inc. 118

Basic Requirements of a Relational Database 120

Two Approaches to Database Design 121

Creating Relational Database Queries 121

Query 1 123

Query 2 125

Query 3 126

Query 4 126

Query 5 128

Database Systems and the Future of Accounting 128

Summary and Case Conclusion 129 ■ Key Terms 130

 **AIS IN ACTION:** Chapter Quiz 130 ■ Comprehensive Problem 131 ■

Discussion Questions 132 ■ Problems 132

 **CASE 4-1** Research Project 139 **AIS IN ACTION SOLUTIONS:** Quiz Key 140 ■ Comprehensive Problem Solution 141 ■

Appendix: Data Normalization 144 ■ Summary 147 ■ Second Normalization Example 147

**PART II****Control and Audit of Accounting Information Systems 151****CHAPTER 5 Fraud 152****Introduction 153****AIS Threats 154****Introduction to Fraud 156**

Misappropriation of Assets 157

Fraudulent Financial Reporting 158

SAS No. 99 (AU-C Section 240): The Auditor's Responsibility to Detect Fraud 159

**Who Perpetrates Fraud and Why 159**

The Fraud Triangle 160

**Computer Fraud 164**

The Rise in Computer Fraud 164

Computer Fraud Classifications 166

**Preventing and Detecting Fraud and Abuse 168**

Summary and Case Conclusion 169 ■ Key Terms 170

 **AIS IN ACTION:** Chapter Quiz 170 ■ Discussion Questions 171 ■ Problems 172 **CASE 5-1** David L. Miller: Portrait of a White-Collar Criminal 176 **CASE 5-2** Heirloom Photo Plans 178 **AIS IN ACTION SOLUTIONS:** Quiz Key 179**CHAPTER 6 Computer Fraud and Abuse Techniques 182****Introduction 182****Computer Attacks and Abuse 183****Social Engineering 191****Malware 196**

Summary and Case Conclusion 205 ■ Key Terms 206

 **AIS IN ACTION:** Chapter Quiz 207 ■ Discussion Questions 208 ■ Problems 208 **CASE 6-1** Shadowcrew 218 **AIS IN ACTION SOLUTIONS:** Quiz Key 219**CHAPTER 7 Control and Accounting Information Systems 222****Introduction 223**

Why Threats to Accounting Information Systems are Increasing 223

**Overview of Control Concepts 224**

The Foreign Corrupt Practices and Sarbanes–Oxley Acts 225

**Control Frameworks 226**

COBIT Framework 226

COSO'S Internal Control Framework 228

COSO'S Enterprise Risk Management Framework 228

The Enterprise Risk Management Framework Versus the Internal Control Framework 230

**The Internal Environment 230**

Management's Philosophy, Operating Style, and Risk Appetite 231

Commitment to Integrity, Ethical Values, and Competence 231

Internal Control Oversight by the Board of Directors 232

Organizational Structure 232

Methods of Assigning Authority and Responsibility 232

Human Resources Standards that Attract, Develop, and Retain Competent Individuals 232

External Influences 234

**Objective Setting and Event Identification 234**

Objective Setting 234

Event Identification 235

**Risk Assessment and Risk Response 235**

Estimate Likelihood and Impact 236

Identify Controls 237

Estimate Costs and Benefits 237

Determine Cost/Benefit Effectiveness 237

Implement Control or Accept, Share, or Avoid the Risk 237

**Control Activities 238**

Proper Authorization of Transactions and Activities 238

Segregation of Duties 239

- Project Development and Acquisition Controls 241
- Change Management Controls 242
- Design and Use of Documents and Records 242
- Safeguard Assets, Records, and Data 242
- Independent Checks on Performance 243

### **Communicate Information and Monitor Control Processes 244**

- Information and Communication 244
- Monitoring 244

Summary and Case Conclusion 247 ■ Key Terms 248

**AIS IN ACTION:** Chapter Quiz 248 ■ Discussion Questions 250 ■ Problems 250

**CASE 7-1** The Greater Providence Deposit & Trust Embezzlement 258

**AIS IN ACTION SOLUTIONS:** Quiz Key 259

## **CHAPTER 8 Controls for Information Security 262**

### **Introduction 263**

### **Two Fundamental Information Security Concepts 264**

1. Security Is a Management Issue, Not Just a Technology Issue 264
2. The Time-Based Model of Information Security 265

### **Understanding Targeted Attacks 266**

### **Protecting Information Resources 267**

- People: Creation of a “Security-Conscious” Culture 268
- People: Training 268
- Process: User Access Controls 269
- Process: Penetration Testing 272
- Process: Change Controls and Change Management 273
- IT Solutions: Antimalware Controls 273
- IT Solutions: Network Access Controls 273
- IT Solutions: Device and Software Hardening Controls 277
- IT Solutions: Encryption 280
- Physical Security: Access Controls 280

### **Detecting Attacks 281**

- Log Analysis 281
- Intrusion Detection Systems 282
- Continuous Monitoring 282

### **Responding to Attacks 283**

- Computer Incident Response Team (CIRT) 283
- Chief Information Security Officer (CISO) 283

### **Security Implications of Virtualization, Cloud Computing, and the Internet of Things 284**

Summary and Case Conclusion 285 ■ Key Terms 286

**AIS IN ACTION:** Chapter Quiz 286 ■ Discussion Questions 287 ■ Problems 288

**CASE 8-1** Assessing Change Control and Change Management 292

**CASE 8-2** Research Project 293

**AIS IN ACTION SOLUTIONS:** Quiz Key 293

## **CHAPTER 9 Confidentiality and Privacy Controls 296**

### **Introduction 297**

### **Preserving Confidentiality 297**

- Identify and Classify Information to Be Protected 298
- Protecting Confidentiality with Encryption 298
- Controlling Access to Sensitive Information 298
- Training 300

**Privacy 300**

- Privacy Controls 300
- Privacy Concerns 301
- Privacy Regulations and Generally Accepted Privacy Principles 303

**Encryption 304**

- Factors That Influence Encryption Strength 305
- Types of Encryption Systems 306
- Hashing 308
- Digital Signatures 308
- Digital Certificates and Public Key Infrastructure 310
- Virtual Private Networks (VPNS) 311

Summary and Case Conclusion 311 ■ Key Terms 312

**AIS IN ACTION:** Chapter Quiz 312 ■ Discussion Questions 314 ■ Problems 314

**CASE 9-1** Protecting Privacy of Tax Returns 318

**CASE 9-2** Generally Accepted Privacy Principles 319

**AIS IN ACTION SOLUTIONS:** Quiz Key 319

**CHAPTER 10 Processing Integrity and Availability Controls 322****Introduction 322****Processing Integrity 323**

- Input Controls 323
- Processing Controls 325
- Output Controls 326
- Illustrative Example: Credit Sales Processing 327
- Processing Integrity Controls in Spreadsheets 328

**Availability 329**

- Minimizing Risk of System Downtime 329
- Recovery and Resumption of Normal Operations 330

Summary and Case Conclusion 334 ■ Key Terms 335

**AIS IN ACTION:** Chapter Quiz 335 ■ Discussion Questions 336 ■ Problems 337

**CASE 10-1** Ensuring Systems Availability 344

**CASE 10-2** Ensuring Process Integrity in Spreadsheets 345

**AIS IN ACTION SOLUTIONS:** Quiz Key 346

**CHAPTER 11 Auditing Computer-Based Information Systems 348****Introduction 349****The Nature of Auditing 350**

- Overview of the Audit Process 350
- The Risk-Based Audit Approach 352

**Information Systems Audits 353**

- Objective 1: Overall Security 353
- Objective 2: Program Development and Acquisition 355
- Objective 3: Program Modification 356
- Objective 4: Computer Processing 357
- Objective 5: Source Data 360
- Objective 6: Data Files 361

**Audit Software 362****Operational Audits of an AIS 364**

Summary and Case Conclusion 364 ■ Key Terms 365

**AIS IN ACTION:** Chapter Quiz 365 ■ Discussion Questions 366 ■ Problems 367

**CASE 11-1** Preston Manufacturing 374

**AIS IN ACTION SOLUTIONS:** Quiz Key 374

## **PART III Accounting Information Systems Applications 377**

### **CHAPTER 12 The Revenue Cycle: Sales to Cash Collections 378**

#### **Introduction 380**

#### **Revenue Cycle Information System 382**

Process 382

Threats and Controls 382

#### **Sales Order Entry 385**

Taking Customer Orders 385

Credit Approval 388

Checking Inventory Availability 390

Responding to Customer Inquiries 391

#### **Shipping 392**

Pick and Pack the Order 393

Ship the Order 394

#### **Billing 397**

Invoicing 397

Maintain Accounts Receivable 399

#### **Cash Collections 403**

Process 403

Threats and Controls 404

Summary and Case Conclusion 406 ■ Key Terms 407

**AIS IN ACTION:** Chapter Quiz 407 ■ Discussion Questions 408 ■

Problems 408

**CASE 12-1** Research Project: How CPA Firms Are Leveraging  
New Developments in IT 417

**AIS IN ACTION SOLUTIONS:** Quiz Key 417

### **CHAPTER 13 The Expenditure Cycle: Purchasing to Cash Disbursements 420**

#### **Introduction 421**

#### **Expenditure Cycle Information System 422**

Process 422

Threats and Controls 425

#### **Ordering Materials, Supplies, and Services 428**

Identifying What, When, and How Much to Purchase 428

Choosing Suppliers 431

#### **Receiving 435**

Process 435

Threats and Controls 436

#### **Approving Supplier Invoices 437**

Process 437

Threats and Controls 439

#### **Cash Disbursements 441**

Process 441

Threats and Controls 441

Summary and Case Conclusion 443 ■ Key Terms 444

**AIS IN ACTION:** Chapter Quiz 444 ■ Discussion Questions 445 ■

Problems 446

**CASE 13-1** Research Project: Impact of Information Technology on Expenditure Cycle Activities,  
Threats, and Controls 455

**AIS IN ACTION SOLUTIONS:** Quiz Key 455

**CHAPTER 14 The Production Cycle 458****Introduction 459****Production Cycle Information System 461**

Process 462

Threats and Controls 462

**Product Design 463**

Process 463

Threats and Controls 465

**Planning and Scheduling 465**

Production Planning Methods 465

Key Documents and Forms 465

Threats and Controls 469

**Production Operations 470**

Threats and Controls 470

**Cost Accounting 472**

Process 472

Threats and Controls 473

Summary and Case Conclusion 478 ■ Key Terms 479

 **AIS IN ACTION:** Chapter Quiz 479 ■ Discussion Questions 480 ■ Problems 481**CASE 14-1** The Accountant and CIM 485 **AIS IN ACTION SOLUTIONS:** Quiz Key 485**CHAPTER 15 The Human Resources Management and Payroll Cycle 488****Introduction 489****HRM/Payroll Cycle Information System 490**

Overview of HRM Process and Information Needs 490

Threats and Controls 492

**Payroll Cycle Activities 495**

Update Payroll Master Database 496

Validate Time and Attendance Data 497

Prepare Payroll 500

Disburse Payroll 503

Calculate and Disburse Employer-Paid Benefits, Taxes, and Voluntary Employee Deductions 505

**Outsourcing Options: Payroll Service Bureaus and Professional Employer Organizations 505**

Summary and Case Conclusion 506 ■ Key Terms 507

 **AIS IN ACTION:** Chapter Quiz 507 ■ Discussion Questions 508 ■ Problems 509**CASE 15-1** Research Report: HRM/Payroll Opportunities for CPAs 515 **AIS IN ACTION SOLUTIONS:** Quiz Key 515**CHAPTER 16 General Ledger and Reporting System 518****Introduction 519****General Ledger and Reporting System 520**

Process 521

Threats and Controls 521

**Update General Ledger 523**

Process 523

Threats and Controls 523

**Post Adjusting Entries 527**

Process 527

Threats and Controls 528

**Prepare Financial Statements 528**

Process 528

Threats and Controls 533

**Produce Managerial Reports 534**

Process 534

Threats and Controls 534

Summary and Case Conclusion 539 ■ Key Terms 540

**AIS IN ACTION:** Chapter Quiz 540 ■ Discussion Questions 541 ■ Problems 541**CASE 16-1** Exploring XBRL Tools 546**CASE 16-2** Evaluating a General Ledger Package 547**CASE 16-3** Visualization Tools for Big Data 547**AIS IN ACTION SOLUTIONS:** Quiz Key 547**PART IV The REA Data Model 551****CHAPTER 17 Database Design Using the REA Data Model 552****Introduction 552****Database Design Process 553****Entity-Relationship Diagrams 554****The REA Data Model 555**

Three Basic Types of Entities 556

Structuring Relationships: The Basic REA Template 556

**Developing an REA Diagram 559**

Step 1: Identify Relevant Events 559

Step 2: Identify Resources and Agents 561

Step 3: Determine Cardinalities of Relationships 562

**What an REA Diagram Reveals About an Organization 566**

Business Meaning of Cardinalities 566

Uniqueness of REA Diagrams 567

Summary and Case Conclusion 568 ■ Key Terms 569

**AIS IN ACTION:** Chapter Quiz 569 ■ Comprehensive Problem 572 ■

Discussion Questions 572 ■ Problems 573

**CASE 17-1** REA Data Modeling Extension 577**AIS IN ACTION SOLUTIONS:** Quiz Key 578 ■ Comprehensive Problem Solution 582**CHAPTER 18 Implementing an REA Model in a Relational Database 586****Introduction 587****Integrating REA Diagrams Across Cycles 587**

Merging Redundant Resource Entities 590

Merging Redundant Event Entities 591

Validating the Accuracy of Integrated REA Diagrams 592

**Implementing an REA Diagram in a Relational Database 592**

Step 1: Create Tables for Each Distinct Entity and M:N Relationship 592

Step 2: Assign Attributes to Each Table 594

Step 3: Use Foreign Keys to Implement 1:1 and 1:N Relationships 595

Completeness Check 596

**Using REA Diagrams to Retrieve Information from a Database 597**

Creating Journals and Ledgers 597

Generating Financial Statements 598

Creating Managerial Reports 599

Summary and Case Conclusion 599 ■ Key Term 600

**AI IN ACTION:** Chapter Quiz 600 ■ Comprehensive Problem 601 ■  
 Discussion Questions 601 ■ Problems 602  
**CASE 18-1** Practical Database Design 604  
**AI IN ACTION SOLUTIONS:** Quiz Key 605 ■ Comprehensive Problem Solution 607

## **CHAPTER 19 Special Topics in REA Modeling 610**

### **Introduction 611**

### **Additional Revenue and Expenditure Cycle Modeling Topics 611**

Additional Revenue Cycle Events and Attribute Placement 611  
 Additional Expenditure Cycle Events and Attribute Placement 613  
 Sale of Services 616  
 Acquisition of Intangible Services 616  
 Digital Assets 617  
 Rental Transactions 617

### **Additional REA Features 619**

Employee Roles 619  
 M:N Agent–Event Relationships 619  
 Locations 619  
 Relationships Between Resources and Agents 619

### **Production Cycle REA Model 620**

Additional Entities—Intellectual Property 620  
 Production Cycle Events 622  
 New REA Feature 622

### **Combined HR/Payroll Data Model 623**

HR Cycle Entities 623  
 Tracking Employees' Time 624

### **Financing Activities Data Model 625**

Summary and Case Conclusion 626

**AI IN ACTION:** Chapter Quiz 629 ■ Discussion Questions 630 ■ Problems 631

**CASE 19-1** Practical Database Assignment 636

**AI IN ACTION SOLUTIONS:** Quiz Key 636 ■ Appendix: Extending the REA Model to Include Information About Policies 640

## **PART V The Systems Development Process 643**

## **CHAPTER 20 Introduction to Systems Development and Systems Analysis 644**

### **Introduction 645**

### **Systems Development 647**

The Systems Development Life Cycle 647  
 The Players 648

### **Planning Systems Development 649**

Planning Techniques 649

### **Feasibility Analysis 651**

Capital Budgeting: Calculating Economic Feasibility 652

### **Behavioral Aspects of Change 654**

Why Behavioral Problems Occur 654  
 How People Resist Change 654  
 Preventing Behavioral Problems 655

### **Systems Analysis 656**

Initial Investigation 656  
 Systems Survey 657



Feasibility Study 659  
 Information Needs and Systems Requirements 659  
 Systems Analysis Report 661

Summary and Case Conclusion 662 ■ Key Terms 663

**AIS IN ACTION:** Chapter Quiz 664 ■ Comprehensive Problem 665 ■  
 Discussion Questions 665 ■ Problems 666

**CASE 20-1** Audio Visual Corporation 674

**AIS IN ACTION SOLUTIONS:** Quiz Key 675 ■ Comprehensive Problem Solution 678

## **CHAPTER 21 AIS Development Strategies 680**

**Introduction 681**

**Purchasing Software 681**

Selecting a Vendor 682  
 Acquiring Hardware and Software 682  
 Evaluating Proposals and Selecting a System 683

**Development by In-House Information Systems Departments 685**

End-User-Developed Software 685  
 Advantages and Disadvantages of End-User Computing 686  
 Managing and Controlling End-User Computing 687

**Outsourcing the System 688**

Advantages and Disadvantages of Outsourcing 688

**Methods for Improving Systems Development 689**

Business Process Management 690  
 Prototyping 691  
 Agile Methodologies 693  
 Computer-Aided Software Engineering 696

Summary and Case Conclusion 697 ■ Key Terms 697

**AIS IN ACTION:** Chapter Quiz 698 ■ Comprehensive Problem Freedom from  
 Telemarketers—the Do Not Call List 699 ■ Discussion Questions 699 ■  
 Problems 700

**CASE 21-1** Wong Engineering Corp. 704

**AIS IN ACTION SOLUTIONS:** Quiz Key 705 ■ Comprehensive  
 Problem Solution 707

## **CHAPTER 22 Systems Design, Implementation, and Operation 708**

**Introduction 709**

**Conceptual Systems Design 709**

Evaluate Design Alternatives 709  
 Prepare Design Specifications and Reports 711

**Physical Systems Design 711**

Output Design 712  
 File and Database Design 712  
 Input Design 713  
 Program Design 714  
 Procedures and Controls Design 715

**Systems Implementation 716**

Implementation Planning and Site Preparation 716  
 Selecting and Training Personnel 717  
 Complete Documentation 718  
 Testing the System 718

**Systems Conversion 719**

**Operation and Maintenance 720**

Summary and Case Conclusion 721 ■ Key Terms 722

**AIS IN ACTION:** Chapter Quiz 722 ■ Comprehensive Problem Hershey's Big Bang ERP 723 ■

Discussion Questions 724 ■ Problems 725

**CASE 22-1** Citizen's Gas Company 730

**AIS IN ACTION SOLUTIONS:** Quiz Key 731 ■ Comprehensive Problem Solution 733

*Glossary* 734

*Index* 755

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# Preface

## To the Instructor

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This book is intended for use in a one-semester course in accounting information systems at either the undergraduate or graduate level. Introductory financial and managerial accounting courses are suggested prerequisites, and an introductory information systems course that covers a computer language or software package is helpful, but not necessary.

The book can also be used as the main text in graduate or advanced undergraduate management information systems courses.

The topics covered in this text provide information systems students with a solid understanding of transaction processing systems that they can then build on as they pursue more in-depth study of specific topics such as databases, data warehouses and data mining, networks, systems analysis and design, cloud computing, virtualization, computer security, and information system controls.

### ENHANCEMENTS IN THE FOURTEENTH EDITION

We made extensive revisions to the content of the material to incorporate recent developments, while retaining the features that have made prior editions easy to use. Every chapter has been updated to include up-to-date examples of important concepts. Specific changes include:

1. We discuss the new revision to the COSO framework and have updated the discussion of IT controls to reflect the new distinction between governance and management that was introduced in COBIT 5.
2. Updated discussion of information security countermeasures, including the security and control implications associated with virtualization and cloud computing.
3. Updated end-of-chapter discussion questions and problems, including Excel exercises that are based on articles from the *Journal of Accountancy* so that students can develop the specific skills used by practitioners. Most chapters also include a problem that consists of multiple-choice questions that we have used in our exams to provide students with an additional chance to check how well they understand the chapter material.
4. Many new computer fraud and abuse techniques have been added to help students understand the way systems are attacked.
5. Chapter 21 includes a new section on agile development technologies that discusses scrum development, extreme programming, and unified process development.

## SUPPLEMENTAL RESOURCES

As with prior editions, our objective in preparing this fourteenth edition has been to simplify the teaching of AIS by enabling you to concentrate on classroom presentation and discussion, rather than on locating, assembling, and distributing teaching materials. To assist you in this process, the following supplementary materials are available to adopters of the text:

- *Solutions Manual* prepared by Marshall Romney at Brigham Young University and Paul John Steinbart at Arizona State University
- *Instructors Manual* prepared by Robyn Raschke at University of Nevada–Las Vegas
- *Test Item File* prepared by Lawrence Chui at University of St. Thomas
- *TestGen testing software*, a computerized test item file
- *PowerPoint Presentation* slides developed by Robyn Raschke at University of Nevada–Las Vegas

The fourteenth edition includes an entirely new set of PowerPoint slides that make extensive use of high-quality graphics to illustrate key concepts. The slides do not merely consist of bullet points taken verbatim from the text, but instead are designed to help students notice and understand important relationships among concepts. The large number of slides provides instructors a great deal of flexibility in choosing which topics they wish to emphasize in class.

In addition, you can access all these supplements from the protected instructor area accessible from [www.pearsonglobaleditions.com/Romney](http://www.pearsonglobaleditions.com/Romney).

## To the Student

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As did previous editions, the fourteenth edition of *Accounting Information Systems* is designed to prepare you for a successful accounting career whether you enter public practice, industry, or government. All of you will be users of accounting information systems. In addition to being users, some of you will become managers. Others will become internal and external auditors, and some of you will become consultants. Regardless of your role, you will need to understand how accounting information systems work in order to effectively measure how cost-effectively they perform, to assess their reliability and that of the information produced, or to lead the redesign and implementation of new and better systems. Mastering the material presented in this text will give you the foundational knowledge you need in order to excel at all those tasks.

This text discusses important new IT developments, such as virtualization and the move to cloud computing, because such developments affect business processes and often cause organizations to redesign their accounting systems to take advantage of new capabilities. The focus, however, is not on IT for the sake of IT, but on how IT affects business processes and controls. Indeed, new IT developments not only bring new capabilities, but also often create new threats and affect the overall level of risk. This text will help you understand these issues so that you can properly determine how to modify accounting systems controls to effectively address those new threats and accurately assess the adequacy of controls in those redesigned systems. We also discuss the effect of recent regulatory developments, such as the SEC mandate to use XBRL and the pending switch from GAAP to IFRS, on the design and operation of accounting systems.

In addition to technology- and regulatory-driven changes, companies are responding to the increasingly competitive business environment by reexamining every internal activity in an effort to reap the most value at the least cost. As a result, accountants are being asked to do more than simply report the results of past activities. They must take a more proactive role in both providing and interpreting financial and nonfinancial information about the organization's activities. Therefore, throughout this text we discuss how accountants can improve the design and functioning of the accounting information system (AIS) so that it truly adds value to the organization by providing management with the information needed to effectively run an organization.

## Key Learning Objectives

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When you finish reading this text, you should understand the following key concepts:

- The basic activities performed in the major business cycles
- What data needs to be collected to enable managers to plan, evaluate, and control the business activities in which an organization engages
- How IT developments can improve the efficiency and effectiveness of business processes
- How to design an AIS to provide the information needed to make key decisions in each business cycle
- The risk of fraud and the motives and techniques used to perpetrate fraud
- The COSO and COSO-ERM models for internal control and risk management, as well as the specific controls used to achieve those objectives
- The Control Objectives for Information and Related Technology (COBIT) Framework for the effective governance and control of information systems and how IT affects the implementation of internal controls
- The AICPA's Trust Services framework for ensuring systems reliability by developing procedures to protect the confidentiality of proprietary information, maintain the privacy of personally identifying information collected from customers, assure the availability of information resources, and provide for information processing integrity
- Fundamentals of information security
- Goals, objectives, and methods for auditing information systems
- Fundamental concepts of database technology and data modeling and their effect on an AIS
- The tools for documenting AIS work, such as REA diagrams, data flow diagrams, business processing diagrams, and flowcharts
- The basic steps in the system development process to design and improve an AIS

## Features to Facilitate Learning

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To help you understand these concepts the text includes the following features:

1. **Each chapter begins with an integrated case that introduces that chapter's key concepts and topics and identifies several key issues or problems that you should be able to solve after mastering the material presented in that chapter.** The case is referenced throughout the chapter and the chapter summary presents solutions to the problems and issues raised in the case.
2. **Focus Boxes and real-world examples** to help you understand how companies are using the latest IT developments to improve their AIS.
3. **Hands-on Excel exercises in many chapters** to help you hone your computer skills. Many of these exercises are based on "how-to" tutorials that appeared in recent issues of the *Journal of Accountancy*.
4. **Numerous problems in every chapter** provide additional opportunities for you to demonstrate your mastery of key concepts. Many problems were developed from reports in current periodicals. Other problems were selected from the various professional examinations, including the CPA, CMA, CIA, and SMAC exams. One problem consists of a set of multiple-choice questions in order to provide practice in answering exam-style questions. **Each chapter also has one or more cases** that require more extensive exploration of specific topics.
5. **Chapter quizzes** at the end of each chapter enable you to self-assess your understanding of the material. We also provide detailed explanations about the correct answer to each quiz question.
6. **Extensive use of Full-Color Graphics.** The text contains hundreds of figures, diagrams, flowcharts, and tables that illustrate the concepts taught in the chapters. Color is used to highlight key points.

7. Definitions of key terms are repeated in the **glossary margins** in each chapter. In addition, a **comprehensive glossary** located at the back of the book makes it easy to look up the definition of the various technical terms used in the text.
8. **Extensive on-line support** at Pearson’s content-rich, text-supported Companion Website accessible from [www.pearsonglobaleditions.com/Romney](http://www.pearsonglobaleditions.com/Romney).

## Excel Homework Problems

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Accountants need to become proficient with Excel because it is a useful tool for tasks related to every business process. That is why each of the chapters in the business process section contains several homework problems that are designed to teach you new Excel skills in a context related to one of the business processes discussed in the chapter.

As with any software, Microsoft regularly releases updates to Microsoft Office, but not everyone always immediately switches. Eventually, however, during your career you will periodically move to a newer version of Excel. When you do, you will find that sometimes you need make only minor changes to existing spreadsheets, but other times you may have to make more significant changes because the newer version of Excel now incorporates different features and functions.

So how do you keep abreast of changes? And how can you learn new Excel skills “on the job” to simplify tasks that you now find yourself doing repeatedly? You could pay to take a course, but that can be costly, time-consuming and may not always be timely. Alternatively, you can develop life-long learning skills to continuously update your knowledge. One important way to do this is to begin now to save copies of two types of articles that regularly appear in the *Journal of Accountancy*. The first is the monthly column titled “Technology Q&A,” which often contains answers to questions about how do you do something in a newer version of Excel that you know how to do in an older version. The second type of article is a complete tutorial about a powerful way to use one or more Excel functions to automate a recurring task. Often, this second type of article has an online spreadsheet file that you can download and use to follow along with the example and thereby teach yourself a new skill.

The *Journal of Accountancy* web site maintains an archive of these articles that you can search to see if there is one that addresses a task that is new for you. Even if the article explains how to do something (such as create a pivot table) in an older version of Excel, in most cases you will find that many of the steps have not changed. For those that have, if you read the old way to do it as described in the article, you can then use Excel’s built-in help feature to see how to do the same task in the newer version that you are now using.

The Excel homework problems in the five business process chapters in this textbook let you practice using *Journal of Accountancy* articles to help you develop new skills with Excel. Many of the problems reference a *Journal of Accountancy* tutorial article. Some are written for the version of Excel that you currently use, in which case it will be straightforward to follow the article to solve the problem. Others, however, were written for earlier versions of Excel, which gives you an opportunity to practice learning how to use Excel’s help functions to update the steps in the tutorial.

## Content and Organization

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This text is divided into five parts, each focused on a major theme.

### **PART I: CONCEPTUAL FOUNDATIONS OF ACCOUNTING INFORMATION SYSTEMS**

Part I consists of four chapters which present the underlying concepts fundamental to an understanding of AIS. Chapter 1 introduces basic terminology and provides an overview of AIS

topics. It discusses how an AIS can add value to an organization and how it can be used to help organizations implement corporate strategy. It also discusses the types of information companies need to successfully operate and introduces the basic business processes that produce that information. It concludes by describing the role of the AIS in an organization's value chain.

Chapter 2 introduces transaction processing in automated systems, presenting basic information input/output, processing, and data storage concepts. You will see the wide range of data that must be collected by the AIS. This information helps you to understand what an AIS does; as you read the remainder of the book, you will see how advances in IT affect the manner in which those functions are performed. Chapter 2 also introduces you to Enterprise Resource Planning (ERP) systems and discusses their importance and uses in modern business.

Chapter 3 covers three of the most important tools and techniques used to understand, evaluate, design, and document information systems: data flow diagrams, business process diagrams, and flowcharts. You will learn how to read, critique, and create systems documentation using these tools.

Chapter 4 introduces the topic of databases, with a particular emphasis on the relational data model and creating queries in Microsoft Access. The chapter also introduces the concept of business intelligence.

## **PART II: CONTROL AND AUDIT OF ACCOUNTING INFORMATION SYSTEMS**

The seven chapters in Part II focus on threats to the reliability of AIS and applicable controls for addressing and mitigating the risks associated with those threats. Chapter 5 introduces students to the different kinds of threats faced by information systems, primarily focusing on the threat of fraud. The chapter describes the different types of fraud and explains how fraud is perpetrated, who perpetrates it, and why it occurs.

Chapter 6 discusses computer fraud and abuse techniques. Three major types of computer fraud are discussed: computer attacks and abuse, social engineering, and malware. The chapter explains the dozens of ways computer fraud and abuse can be perpetrated.

Chapter 7 uses the COSO framework, including the expanded enterprise risk management (COSO-ERM) model, to discuss the basic concepts of internal control. It also introduces the COBIT framework which applies those concepts to IT, thereby providing a foundation for effective governance and control of information systems.

Chapter 8 focuses on information security. It introduces the fundamental concepts of defense-in-depth and the time-based approach to security. The chapter provides a broad survey of a variety of security topics including access controls, firewalls, encryption, and incident detection and response.

Chapter 9 discusses the many specific computer controls used in business organizations to achieve the objectives of ensuring privacy and confidentiality, and includes a detailed explanation of encryption.

Chapter 10 addresses the controls necessary to achieve the objectives of accurate processing of information and ensuring that information is available to managers whenever and wherever they need it.

Chapter 11 describes principles and techniques for the audit and evaluation of internal control in a computer-based AIS and introduces the topic of computer-assisted auditing.

## **PART III: ACCOUNTING INFORMATION SYSTEMS APPLICATIONS**

Part III focuses on how a company's AIS provides critical support for its fundamental business processes. Most large and many medium-sized organizations use enterprise resource planning (ERP) systems to collect, process, and store data about their business processes, as well as to provide information reports designed to enable managers and external parties to assess the organization's efficiency and effectiveness. To make it easier to understand how an ERP system functions, Part III consists of five chapters, each focusing on a particular business process.

Chapter 12 covers the revenue cycle, describing all the activities involved in taking customer orders, fulfilling those orders, and collecting cash.



Chapter 13 covers the expenditure cycle, describing all the activities involved in ordering, receiving, and paying for merchandise, supplies, and services.

Chapter 14 covers the production cycle, with a special focus on the implications of recent cost accounting developments, such as activity-based costing, for the design of the production cycle information system.

Chapter 15 covers the human resources management/payroll cycle, focusing primarily on the activities involved in processing payroll.

Chapter 16 covers the general ledger and reporting activities in an organization, discussing topics such as XBRL, the balanced scorecard, the switch from GAAP to IFRS, and the proper design of graphs to support managerial decision making.

Each of these five chapters explains the three basic functions performed by the AIS: efficient transaction processing, provision of adequate internal controls to safeguard assets (including data), and preparation of information useful for effective decision making.

## **PART IV: THE REA DATA MODEL**

Part IV consists of three chapters that focus on the REA data model, which provides a conceptual tool for designing and understanding the database underlying an AIS. Chapter 17 introduces the REA data model and how it can be used to design an AIS database. The chapter focuses on modeling the revenue and expenditure cycles. It also demonstrates how the REA model can be used to develop an AIS that can not only generate traditional financial statements and reports but can also more fully meet the information needs of management.

Chapter 18 explains how to implement an REA data model in a relational database system. It also shows how to query a relational database in order to produce various financial statements and management reports.

Chapter 19 explains how to develop REA data models of the production, HR/payroll, and financing cycles. It also discusses a number of advanced modeling issues, such as the acquisition and sale of intangible products and services and rental transactions.

## **PART V: THE SYSTEMS DEVELOPMENT PROCESS**

Part V consists of three chapters that cover various aspects of the systems development process. Chapter 20 introduces the systems development life cycle and discusses the introductory steps of this process (systems analysis, feasibility, and planning). Particular emphasis is placed on the behavioral ramifications of change.

Chapter 21 discusses an organization's many options for acquiring or developing an AIS (e.g., purchasing software, writing software, end-user-developed software, and outsourcing) and for speeding up or improving the development process (business process reengineering, prototyping, agile methodologies, and computer-assisted software engineering).

Chapter 22 covers the remaining stages of the systems development life cycle (conceptual design, physical design, implementation, and operation and maintenance) and emphasizes the interrelationships among the phases.

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Of course, any errors in this book remain our responsibility. We welcome your comments and suggestions for further improvement.

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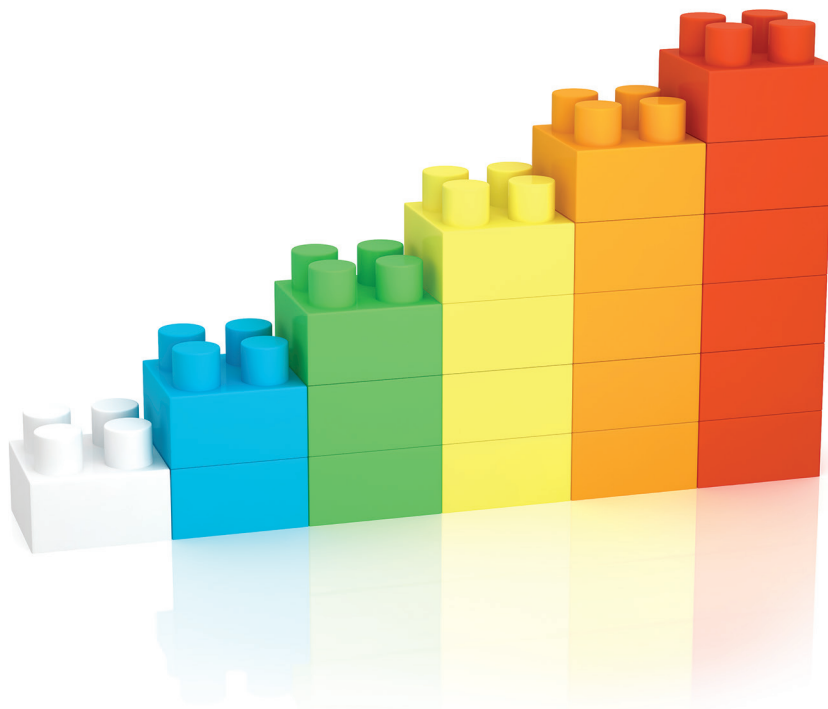
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# Conceptual Foundations of Accounting Information Systems

PART

I



## CHAPTER 1

Accounting Information  
Systems: An Overview

## CHAPTER 2

Overview of Transaction  
Processing and Enterprise  
Resource Planning (ERP)

## CHAPTER 3

Systems Documentation  
Techniques

## CHAPTER 4

Relational Databases

# Accounting Information Systems: An Overview

## LEARNING OBJECTIVES

After studying this chapter, you should be able to:

1. Distinguish data from information, discuss the characteristics of useful information, and explain how to determine the value of information.
2. Explain the decisions an organization makes, the information needed to make them, and the major business processes present in most companies.
3. Explain how an AIS adds value to an organization, how it affects and is affected by corporate strategy, and its role in a value chain.

## INTEGRATIVE CASE

### S&S

After working for years as a regional manager for a retail organization, Scott Parry opened his own business with Susan Gonzalez, one of his district managers, as his partner. They formed S&S to sell appliances and consumer electronics. Scott and Susan pursued a “clicks and bricks” strategy by renting a building in a busy part of town and adding an electronic storefront.

Scott and Susan invested enough money to see them through the first six months. They will hire 15 employees within the next two weeks—three to stock the shelves, four sales representatives, six checkout clerks, and two to develop and maintain the electronic storefront.

Scott and Susan will host S&S's grand opening in five weeks. To meet that deadline, they have to address the following important issues:

1. What decisions do they need to make to be successful and profitable? For example:
  - a. How should they price products to be competitive yet earn a profit?
  - b. Should they extend credit, and, if so, on what terms? How can they accurately track what customers owe and pay?
  - c. How should they hire, train, and supervise employees? What compensation and benefits package should they offer? How should they process payroll?
  - d. How can they track cash inflows and outflows to avoid a cash squeeze?
  - e. What is the appropriate product mix? What inventory quantities should they carry, given their limited showroom space?



2. What information do Scott and Susan need to make those decisions?
  - a. What information do the external entities they interact with need?
  - b. What information do management and other employees need?
  - c. How can they gather, store, and disseminate that information?
3. What business processes are needed, and how should they be carried out?
4. What functionality should be provided on the website?

Although Scott and Susan could use an educated guess or “gut feeling” to make these decisions, they know they can make better decisions if they obtain additional information. A well-designed AIS can solve these issues and provide the information they need to make any remaining decisions.

## Introduction

We begin this chapter by explaining important terms and discussing the kinds of information that organizations need and the business processes used to produce that information. We continue with an exploration of what an accounting information system (AIS) is, how an AIS adds value to an organization, how an AIS and corporate strategy affect each other, and the role of the AIS in the value chain.

A **system** is a set of two or more interrelated components that interact to achieve a goal. Most systems are composed of smaller subsystems that support the larger system. For example, a college of business is a system composed of various departments, each of which is a subsystem. Moreover, the college itself is a subsystem of the university.

Each subsystem is designed to achieve one or more organizational goals. Changes in subsystems cannot be made without considering the effect on other subsystems and on the system as a whole. **Goal conflict** occurs when a subsystem’s goals are inconsistent with the goals of another subsystem or with the system as a whole. **Goal congruence** occurs when a subsystem achieves its goals while contributing to the organization’s overall goal. The larger the organization and the more complicated the system, the more difficult it is to achieve goal congruence.

**Data** are facts that are collected, recorded, stored, and processed by an information system. Businesses need to collect several kinds of data, such as the activities that take place, the resources affected by the activities, and the people who participate in the activity. For example, the business needs to collect data about a sale (date, total amount), the resource sold (good or service, quantity sold, unit price), and the people who participated (customer, salesperson).

**Information** is data that have been organized and processed to provide meaning and improve the decision-making process. As a rule, users make better decisions as the quantity and quality of information increase.

**system** - Two or more interrelated components that interact to achieve a goal, often composed of subsystems that support the larger system.

**goal conflict** - When a subsystem’s goals are inconsistent with the goals of another subsystem or the system as a whole.

**goal congruence** - When a subsystem achieves its goals while contributing to the organization’s overall goal.

**data** - Facts that are collected, recorded, stored, and processed by an information system.

**information** - Data that have been organized and processed to provide meaning and improve decision making.

**TABLE 1-1** Characteristics of Useful Information

Relevant	Reduces uncertainty, improves decision making, or confirms or corrects prior expectations.
Reliable	Free from error or bias; accurately represents organization events or activities.
Complete	Does not omit important aspects of the events or activities it measures.
Timely	Provided in time for decision makers to make decisions.
Understandable	Presented in a useful and intelligible format.
Verifiable	Two independent, knowledgeable people produce the same information.
Accessible	Available to users when they need it and in a format they can use.

**information overload** - Exceeding the amount of information a human mind can absorb and process, resulting in a decline in decision-making quality and an increase in the cost of providing information.

**Information technology (IT)** - The computers and other electronic devices used to store, retrieve, transmit, and manipulate data.

**value of information** - The benefit provided by information less the cost of producing it.

However, there are limits to the amount of information the human mind can absorb and process. **Information overload** occurs when those limits are passed, resulting in a decline in decision-making quality and an increase in the cost of providing that information. Information system designers use **information technology (IT)** to help decision makers more effectively filter and condense information. For example, Walmart has over 500 terabytes (trillions of bytes) of data in its data warehouse. That is equivalent to 2,000 miles of bookshelves, or about 100 million digital photos. Walmart has invested heavily in IT so it can effectively collect, store, analyze, and manage data to provide useful information.

The **value of information** is the benefit produced by the information minus the cost of producing it. Benefits of information include reduced uncertainty, improved decisions, and improved ability to plan and schedule activities. The costs include the time and resources spent to produce and distribute the information. Information costs and benefits can be difficult to quantify, and it is difficult to determine the value of information before it has been produced and utilized. Nevertheless, the expected value of information should be calculated as effectively as possible so that the costs of producing the information do not exceed its benefits.

To illustrate the value of information, consider the case of 7-Eleven. When a Japanese company licensed the very successful 7-Eleven name from Southland Corporation, it invested heavily in IT. However, the U.S. stores did not. Each 7-Eleven store in Japan was given a computer that:

- Keeps track of the 3,000 items sold in each store and determines what products are moving, at what time of day, and under what weather conditions.
- Keeps track of what and when customers buy to make sure it has in stock the products most frequently purchased.
- Orders sandwiches and rice dishes from suppliers automatically. Orders are placed and filled three times a day so that stores always have fresh food. In addition, suppliers can access 7-Eleven sales data electronically so that they can forecast demand.
- Coordinates deliveries with suppliers. This reduces deliveries from 34 to 12 a day, resulting in less clerical receiving time.
- Prepares a color graphic display that indicates which store areas contribute the most to sales and profits.

Average daily sales of 7-Eleven Japan were 30% higher and its operating margins almost double those of its closest competitor. What happened to Southland and its 7-Eleven stores in the United States? Profits declined, and Southland eventually had to file for bankruptcy. 7-Eleven Japan came to the company's rescue and purchased 64% of Southland.

Table 1-1 presents seven characteristics that make information useful and meaningful.

## Information Needs and Business Processes

**business process** - A set of related, coordinated, and structured activities and tasks, performed by a person, a computer, or a machine, that help accomplish a specific organizational goal.

All organizations need information in order to make effective decisions. In addition, all organizations have certain business processes in which they are continuously engaged. A **business process** is a set of related, coordinated, and structured activities and tasks that are performed by a person, a computer, or a machine, and that help accomplish a specific organizational goal.