



Accounting Information Systems

ELEVENTH EDITION

GEORGE H. BODNAR • WILLIAM S. HOPWOOD

Accounting Information Systems

Eleventh Edition

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Florida Atlantic University

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Dedication

To my wife Donna

—George H. Bodnar

Dedicated to all the great people I work with in the Florida
Atlantic University School of Accounting

—William S. Hopwood

Contents

Preface xvii
List of Acronyms xx

PART I Introduction to Accounting Information Systems 1

Chapter 1 Accounting Information Systems: An Overview 1

Accounting Information Systems and Business Organizations 1

Information and Decisions 1
Users of Accounting Information 1
Characteristics of Information 2

Information Systems 3
Data Processing 3
Management Information Systems 4
Decision Support Systems 4
Expert Systems 4
Executive Information Systems 4
Accounting Information Systems 4

Accounting Information Systems and Application Architecture 5

Evolution of Applications Architecture 5
Enterprise Resource Planning (ERP) 6

Business Processes 8

Business Process Reference Models 8
The ERP Functional Model 9
The Value Chain Model 9
The Supply Chain Model 10
The Operations Process Model 10
The Transaction Cycle Model 10

Internal Control Process 12
Elements of Internal Control Process 12
Segregation of Accounting Functions 13
Internal Audit Function 14

Accounting and Information Technology 15

The Information System Function 15
Organizational Location 15
Functional Specializations 16
End-User Computing 17
Cloud Computing 17
Quick-Response Technology 19
Lean Manufacturing 20
Just-in-Time 20
Web Commerce 21
Electronic Data Interchange 21
Extensible Business Reporting Language 21
Electronic Payment Systems 22

The Accountant and Systems Development 23

The Nature of Systems Development 23
Business Process Blueprinting 24
Behavioral Considerations in Systems Development 25

Green IT: Designing for Sustainability 25

Energy Usage 25

E-Waste 26

Summary 26 • Glossary 26 • Webliography 28 • Chapter Quiz 28 • Review

Questions 29 • Discussion Questions and Problems 29 • Web Research

Assignments 33 • Answers to Chapter Quiz 34

Chapter 2 Systems Techniques and Documentation 35

Users of Systems Techniques 35

Use of Systems Techniques in Auditing 35

Internal Control Evaluation 35

Compliance Testing 36

Working Papers 36

Use of Systems Techniques in Systems

Development 36

Systems Analysis 36

Systems Design 36

Systems Implementation 37

Use of Systems Techniques by Sarbanes–Oxley Act

Compliance Participants 37

Systems Techniques 38

Flowcharting Symbols 38

Symbol Use in Flowcharting 41

IPO and HIPO Charts 42

Systems and Program Flowcharts 43

Logical Data Flow Diagrams 43

Logical Data Flow Diagrams and Structured

Analysis 44

Analytic, Document, and Forms Distribution Flowcharts 46

Analytic Flowcharting Illustration 48

Planning the Flowchart 48

Symbol Selection 48

System Analysis 48

Drawing the Flowchart 49

Sandwich Rule 50

Using the Connector Symbol 50

Entity-Column Relations 50

Unified Modeling Language™ (UML®) 52

Business Process Diagrams 54

Narrative Techniques 60

Resource Utilization Analysis 60

Work Measurement 61

Work Distribution Analysis 62

Decision Analysis Techniques 62

Branching and Decision Tables 62

Matrix Methods 64

Software for Systems Techniques 64

Microsoft Office® Applications 65

Computer-Aided Software Engineering 65

UML Modeling Tools 65

BPMN Modeling Tools 65

Summary 65 • Glossary 67 • Webliography 67 • Chapter Quiz 68 • Review

Problem 68 • Review Questions 69 • Discussion Questions and Problems 69 •

Web Research Assignments 79 • Answers to Chapter Quiz 79

Chapter 3	eBusiness and eCommerce	80
	Introduction: Electronic Business and Electronic Commerce	80
	The Internet	80
	Client and Servers	81
	Types of Servers	81
	eBusiness and Enterprise Architecture	83
	The Business Architecture	84
	The Data Architecture	85
	Databases	85
	The Corporate Information Factory	86
	The Applications Architecture	87
	ERP and EAS Architectures	88
	Service-Oriented Architecture	88
	Benefits of SOA	89
	Middleware	89
	The Technical Architecture	90
	Enterprise Architecture Frameworks	91
	Business Process Frameworks and Reference Models	91
	Value Chain Frameworks	91
	Supply Chain Frameworks	92
	eBusiness Architectures	92
	Electronic Commerce Technologies	93
	Electronic Payment Systems	93
	Digital Cash	93
	Virtual Cash	93
	Virtual Cash in Electronic Cards	93
	The Internet Store	94
	Trust in eCommerce: Privacy, Business Practices, and Transaction Integrity	95
	Summary	96 • Glossary 96 • Weblibliography 98 • Chapter Quiz 98 • Review Questions 99 • Discussion Questions and Problems 99 • Web Research Assignments 102 • Answers to Chapter Quiz 102
Chapter 4	Transaction Processing and the Internal Control Process	103
	The Necessity for Controls	103
	Enterprise Risk Management	103
	Controls and Exposures	104
	Common Exposures	104
	Excessive Costs	104
	Deficient Revenues	105
	Loss of Assets	105
	Inaccurate Accounting	105
	Business Interruption	105
	Statutory Sanctions	105
	Competitive Disadvantage	105
	Fraud and Embezzlement	105
	Fraud and White-Collar Crime	105
	Forensic Accounting	107
	Seriousness of Fraud	107
	Control Objectives and Transaction Cycles	107
	Components of the Internal Control Process	108
	External Influences Concerning an Entity and Internal Control	109
	The Sarbanes–Oxley Act	110
	Compliance with Sox Section 404	111

The Impact of the Business Environment on Internal Control	113
Control Environment	113
Integrity and Ethical Values	113
Commitment to Competence	115
Management Philosophy and Operating Style	115
Organizational Structure	116
Functions of the Board of Directors and Its Committees	116
Manner of Assigning Authority and Responsibility	117
Human Resource Policies and Practices	118
Risk Assessment	119
Control Activities	119
Segregation of Duties	119
Adequate Documents and Records	120
Restricted Access to Assets	120
Independent Accountability Checks and Reviews of Performance	121
Information Processing Controls	121
Information and Communication	122
Documentation of the Accounting System	122
Double-Entry System of Accounting	122
Communication	123
Monitoring	123
A Model for Monitoring	124
Transaction Processing Controls	124
General Controls	124
The Plan of Data Processing Organization and Operation	125
General Operating Procedures	125
Equipment Control Features	126
Equipment and Data-Access Controls	126
Application Controls	126
Input Controls	126
Processing Controls	128
Output Controls	129
Preventative, Detective, and Corrective Controls	130
Communicating the Objectives of Internal Control	130
Goals and Behavior Patterns	131
Analysis of Internal Control Processes	133
Analytic Techniques	133
Internal Control and Compliance in Small Business and Small Public Companies	135
Illustration of an Internal Control Analysis	137
Summary	138 • Glossary
Review Problem	141 • Solution to Review Problem
Questions	142 • Discussion Questions and Problems
Assignments	149 • Answers to Chapter Quiz
• Chapter Quiz	141
• Review	142
• Web Research	142
• Answers to Chapter Quiz	149
Chapter 5 Fraud Examination and Fraud Management	150
The Fraud Management Process	150
Fraud Prevention	151
Fraud Detection	151
Optimal Fraud Detection Systems	153
Fraud Investigation Process	153
The Fraud Engagement Process	154
The Evidence Collection Process	156
Physical, Document, and Observation Evidence	158

The Fraud Report 163
Loss Recovery and Litigation 163
Expert Testimony 164

Fraud Schemes 165

Financial Statement Fraud 165
Who Commits Financial Statement Fraud and Why 166
How to Prevent Financial Statement Fraud 167
Employee Fraud 167
Revenue Cycle Fraud 168
Expenditure Cycle Fraud 169
Production Cycle Fraud 171
Vendor Fraud 171

Computer Forensics 171

Evidence Gathering with Computers 172
Preliminary Steps 172
Collecting Computer-Related Evidence 172
Pull the Plug 173
Don't Pull the Plug 173
Device Processing 174
Content Investigation 174
Deleted or Corrupted Data Recovery 174

Location Analysis 174

Password Cracking 176

Surreptitious User Monitoring and Reporting 176

Summary 177 • Glossary 178 • Weblibliography 178 • Chapter Quiz 179 •
Review Problem 179 • Solution to Review Problem 179 • Review Questions 180 •
Discussion Questions and Problems 180 • Web Research Assignments 186 •
Answers to Chapter Quiz 186

Chapter 6 Information Security 187

An Overview of Information Security 187

The Information Security Management System Life Cycle 188
International Standards for Information Security 188
The Information Security System in the Organization 189
Analyzing Vulnerabilities and Threats 189

Vulnerabilities and Threats 190

The Seriousness of Information Systems Fraud 190
Individuals Posing a Threat to the Information System 191
Computer and Information Systems Personnel 191
Users 192
Intruders and Hackers 192
Methods of Attack by Information Systems Personnel and Users 198
Input Manipulation 198
Program Alteration 199
Direct File Alteration 199
Data Theft 199
Sabotage 200
Misappropriation or Theft of Information Resources 200

The Information Security Management System 201

The Control Environment 201
Management Philosophy and Operating Style 201
Organizational Structure 201

Board of Directors and Its Committees	201			
Methods of Assigning Authority and Responsibility	202			
Management Control Activities	202			
Internal Audit Function	202			
Personnel Policies and Practices	202			
External Influences	203			
Controls for Active Threats	203			
Site-Access Controls	203			
System-Access Controls	205			
File-Access Controls	206			
Controls for Passive Threats	207			
Fault-Tolerant Systems	207			
Correcting Faults: File Backups	207			
Internet Security—Special System and Configuration Considerations	208			
Operating System Vulnerabilities	208			
Web Server Vulnerabilities	209			
Private Network Vulnerabilities	209			
Vulnerabilities from Various Server and Communications Programs	209			
Cloud Computing	210			
Grid Computing	210			
General Security Procedures	211			
Disaster Risk Management	211			
Preventing Disasters	211			
Contingency Planning for Disasters	211			
Assess the Company's Critical Needs	212			
List Priorities for Recovery	212			
Recovery Strategies and Procedures	212			
Compliance Standards	213			
Information Security Standards	213			
Business Continuity Planning and Disaster Recovery Standards	214			
Summary	215 • Glossary	215 • Webliography	217 • Chapter Quiz	217 •
Review Problem	218 • Solution to Review Problem	218 • Review Questions	218 •	
Discussion Questions and Problems	219 • Web Research Assignments	226 •		
Answers to Chapter Quiz	226			

PART II Business Processes 227

Chapter 7 Electronic Data Processing Systems 227

The Input System 227

Manual Input Systems	227
Preparation and Completion of the Source Document	227
Transfer of Source Documents to Data Processing	227
Electronic Input Systems	232

The Processing System 233

Types of Files	233
Generic File Processing Operations	234
Batch-Processing Systems	234
Batch Processing with Sequential File Updating	235
Batch Processing with Random-Access File Updating	241
Illustration of Batch Processing with Random-Access File Updating	242
Real-Time Processing Systems	244

- Real-Time Sales Systems 245
 - Components of Extended Supply Chain Systems 246
 - Transaction Processing in EDI-Based Sales Systems 249
 - Special Internal Control Considerations 250

The Output System 251

- Summary 251 • Glossary 252 • Webliography 252 • Chapter Quiz 252 • Review Problem 253 • Solution to Review Problem 253 • Review Questions 254 • Discussion Questions and Problems 254 • Web Research Assignments 264 • Answers to Chapter Quiz 264

Chapter 8 Revenue Cycle Processes 265

Sales Business Process 265

- Overview 265
 - Inquiry 265
 - Contract Creation 266
 - Order Entry 266
 - Shipping 267
 - Billing 267
- SAP ERP Illustration 268
 - Customer Master Records 268
 - Data Fields 269
 - One-Time Customers 272
- Standard Order Processing in SAP ERP 272
 - Overview 272
 - Creating a Sales Order 272
 - Database Features 273

Transaction Cycle Controls in Order Processing 274

- Order Entry 274
- Credit 276
- Inventory 276
- Shipping 276
- Billing and Accounts Receivable 277
- General Ledger 277
- Sarbanes–Oxley Compliance: Sales Business Process 278

Customer Account Management Business Process 279

- Accounts Receivable 279

Transaction Controls in the Accounts Receivable Business Process 280

- Separation of Functions 280
 - Cash Receipts 280
 - Billing 280
 - Accounts Receivable 281
 - Credit 281
 - General Ledger 282
- Sales Returns and Allowances 282
- Write-Off of Accounts Receivable 282
- Sarbanes–Oxley Compliance: Accounts Receivable Business Process 283

Cash-Received-on-Account Business Process 284

- Overview 284
 - Mailroom 285
 - Cash Receipts 285
 - Accounts Receivable 286
 - General Ledger 286
 - Bank 287

Internal Audit 287
 Summary 287
 Lock-Box Collection Systems 288

Cash-Sales Business Process 289

Summary 290 • Glossary 290 • Webliography 290 • Chapter Quiz 291 •
 Review Problem 291 • Solution to Review Problem 292 • Review Questions 292 •
 Discussion Questions and Problems 293 • Web Research Assignments 304 •
 Answers to Chapter Quiz 304

Chapter 9 Procurement and Human Resource Business Processes 305

The Procurement Business Process 305

Overview 305
 Requirement Determination 306
 Selection of Source(s) 307
 Request for Quotation 307
 Selection of a Vendor 308
 Issuing of a Purchase Order 308
 Receipt of the Goods 309
 Invoice Verification 309
 Vendor Payment 310
 Master Records 310

Transaction Cycle Controls over Procurement 311

Requisitioning (Stores) 311
 Purchasing 313
 Receiving 314
 Stores 315
 Accounts Payable 315
 Additional Control Features 315
 Integrity of the Procurement Business Process 317
 The Attribute Rating Approach to Vendor Selection 317
 Sarbanes–Oxley Compliance: Procurement Business Process 317

Cash Disbursements Business Process 318

Accounts Payable 318
 Cash Disbursements 319
 General Ledger 319
 Internal Audit 319
 Voucher Systems 319
 Posting of Payables 320

Human Resource Management Business Process 321

HR Processing in SAP ERP 322
 HR Data Structure 323
 Master Data 323
 Data Organization 323
 HR Objects 324

Transaction Cycle Controls in Payroll Processing 324

Personnel 324
 Timekeeping 324
 Payroll 326
 Other Controls in Payroll 326
 Sarbanes–Oxley Compliance: Payroll Business Process 326
 Payroll Processing Requirements 326

Summary 328 • Glossary 328 • Webliography 329 • Chapter Quiz 329 •
Review Problem 330 • Solution to Review Problem 330 • Review Questions 332 •
Discussion Questions and Problems 332 • Web Research Assignments 348 •
Answers to Chapter Quiz 348

Chapter 10 The Production Business Process 349

The Production Business Process 349

Production Planning and Control 349

Cost Accounting Controls 351

Inventory Control 353

Lean Production 354

Property Accounting Applications 355

Fixed Assets 355

Investments 356

Internal Accounting Control Practices 356

Quick-Response Manufacturing Systems 357

Components of Quick-Response Manufacturing Systems 357

The Physical Manufacturing System 357

The Manufacturing Resource Planning (MRP II) System 359

Advanced Integration Technologies 360

Transaction Processing in Quick-Response Manufacturing Systems 361

Production Planning 361

Production Scheduling 363

Cost Accounting 364

Reporting 365

Activity-Based Costing 365

MRP II versus MRP 368

ERP, ERP II, and EAS 369

Implementing Lean Production in an MRP II/CIM Environment 369

Special Internal Control Considerations 370

Summary 371 • Glossary 371 • Webliography 372 • Chapter Quiz 372 •
Review Problem 373 • Solution to Review Problem 373 • Review Questions 373 •
Discussion Questions and Problems 374 • Web Research Assignments 380 •
Answers to Chapter Quiz 380

PART III Systems Development 381

Chapter 11 Systems Planning, Analysis, and Design 381

General Overview 381

Rigid Development 381

Flexible Development 382

Overview of Systems Planning and Analysis 383

Systems Planning and Feasibility Analysis 384

Systems Planning and Top Management 385

Steering Committee 385

Developing Objectives and System Constraints 385

Developing a Strategic Systems Plan 385

Identifying Individual Projects for Priority 386

Commissioning the Systems Project 386

The Steps in Systems Analysis 386

Phase 1: Survey Current System 386

Objectives of Surveying 386

- Behavioral Considerations 387
- Sources for Gathering Facts 387
- Analysis of Survey Findings 388
- Phase 2: Identify Information Needs 388
- Phase 3: Identify the Systems Requirements 389
- Phase 4: Develop a Systems Analysis Report 389

Fact-Gathering Techniques 390**Techniques for Organizing Facts 390****Structured Systems Analysis and Design 392**

- Logical Flow and Business Process Diagrams versus Flowcharts 392
- Systems Design versus Systems Analysis 392
- The Steps in Structured Systems Analysis 393
 - Develop Logical Data Flow Diagrams 393
 - Define Data Dictionaries 393
 - Define Access Methods 394
 - Define Process Logic 394

Iterative Systems Development 395

- Object-Oriented Design and Analysis 395
- Diagrams in Process Orientation versus Object Orientation 396

Overview of Systems Design 397**Steps in Systems Design 397**

- Evaluating Design Alternatives 398
 - Enumeration of Design Alternatives 398
 - Describing the Alternatives 400
 - Evaluating the Alternatives 400
- Preparing Design Specifications 400
- Preparing and Submitting the Systems Design Specifications 401
- Business Process Blueprinting 402
- Resources–Events–Agent (REA) Model 402

General Design Considerations 403

- Output Design 404
- Database Design 404
- Data Processing 404
- Data Input 404
- Controls and Security Measures 405

Design Techniques 405

- Forms Design 405
- Database Design 405
- Systems Design Packages 406
- Choosing Software and Hardware 406

Conventional Wisdom in Systems Development 408

- Summary 409 • Glossary 410 • Webliography 411 • Chapter Quiz 412 • Review Questions 413 • Discussion Questions and Problems 414 • Web Research Assignments 418 • Answers to Chapter Quiz 418

Chapter 12 Systems Project Management, Implementation, Operation, and Control 419**Overview 419****Systems Implementation 419**

- Establishing Plans and Controls for Implementation 419

- Executing Implementation Activities 422
 - Employee Training 422
 - Acquiring and Installing New Computer Equipment 423
 - Detailed Systems Design 423
 - Documenting the New System 424
 - File Conversion 424
 - Test Operations 424
- Evaluating the New System 425
- Planning and Organizing a Systems Project 425**
 - Project Selection 425
 - The Project Team 426
 - Project Leader Responsibilities 426
 - Project Uncertainty 427
 - Project Breakdown into Tasks and Phases 427
 - Time Estimates 428
 - Work Measurement Techniques 428
 - Accuracy of Estimates 430
 - Project Accounting 431
 - Operation of the System 431
 - Level of Detail 432
 - The Project Development Environment 432
 - The Project Collaboration Platform 432
 - The Software Application Framework 432
 - The Integrated Development Environment 434
 - The Software Versioning System 434
 - The Application Solution Stack 434
 - All-in-One and Integrated Platforms 435
- Control over Nonfinancial Information Systems Resources 435**
 - Auditing the Information System 436
 - Maintaining and Modifying the System 436
- Summary 437 • Glossary 437 • Webliography 437 • Chapter Quiz 438
- Review Questions 439 • Discussion Questions and Problems 439 • Web Research Assignments 440 • Answers to Chapter Quiz 440

PART IV Contemporary Information Systems Technology 441

Chapter 13 Data Management Concepts 441

- Introductory Terminology 441**
 - Databases 441
 - Basic Database Elements: Fields, Data Items, Attributes, and Elements 442
 - Data Occurrences 442
 - Fixed- and Variable-Length Records 442
 - Record Key and File Sequence 445
- Database Management Systems and Their Architecture 446**
 - Conceptual Architecture 446
 - Database Architecture at the Logical Level: Logical Data Structures 448
 - Tree or Hierarchical Structures 448
 - Network Structures 449
 - Relational Data Structures 450
 - Database Architecture: The Physical Level 454
 - Sequentially Accessed Files 454
 - Indexed Files 455

Directly Accessed Files	458
Economic Relations between File Organization Techniques	460
Physical Architecture, Hardware, and Response Time	461
Database Architecture and Database Development	462
Other Types of Logical Structures and Related Databases	463
OLAP	463
In-Memory Databases	463
Acid: Reliable Processing of Database Transactions	464
Database Management Systems and Databases in Practice	464
Data Description Language (DDL)	464
Data Manipulation Language	464
Data Query Language	465
SQL Data Manipulation Language	466
Select Queries	466
Update, Insert, and Delete Queries	468
High-Level Query Languages	468
Reporting Solutions	469
Why Database Management Systems Are Needed	469
Data Independence	470
Security	470
Database Documentation and Administration	471
Summary	472 •
Glossary	473 •
Webliography	475 •
Chapter Quiz	475 •
Review Problem	476 •
Solution to Review Problem	476 •
Review Questions	476 •
Discussion Questions and Problems	476 •
Web Research Assignments	481 •
Answers to Chapter Quiz	481

Chapter 14 Auditing Information Technology 482

Information Systems Auditing Concepts	482
Structure of a Financial Statement Audit	482
Auditing around the Computer	483
Auditing through the Computer	484
Auditing with the Computer	484
Risk-Based Auditing	485
Information Systems Auditing Technology	486
Test Data	486
Integrated-Test-Facility Approach	488
Parallel Simulation	489
Audit Software	490
Generalized Audit Software (GAS)	490
Embedded Audit Routines	490
Extended Records	491
Snapshot	491
Tracing	492
Review-of-Systems Documentation	492
Control Flowcharting	492
Mapping	493
Types of Information Systems Audits	493
General Approach to an Information Systems Audit	493
Information Systems Application Audits	494
Application Systems Development Audits	494
Computer Service Center Audits	495
Auditing Service-Oriented Architectures	495

IT Governance and COBIT 495

COBIT 496

Navigation Diagram 496

Maturity Models 498

Management Guidelines 500

Performance Measurement 500

COBIT and Sarbanes–Oxley Compliance 501

Professional Certifications Relating to IT Governance 501

Summary 502 • Glossary 502 • Webliography 503 • Chapter Quiz 503 •

Review Problem 504 • Solution to Review Problem 504 • Review Questions 505 •

Discussion Questions and Problems 505 • Web Research Assignments 512 •

Answers to Chapter Quiz 512

Index 513

Preface

The eleventh edition of *Accounting Information Systems* continues to stress electronic commerce, database management, and systems development, all applied within the context of business processes, transaction cycles, and internal control. Detailed presentation of business processes and internal control is central to the topical organization. The business process chapters are traditionally oriented in presentation but at times rely on SAP™ ERP to extend the presentation to contemporary information systems. However, these chapters do not require the instructor to possess technical expertise in SAP™ ERP. The detailed presentation of internal controls in these chapters is consistent with all technological incarnations of accounting information systems.

The text contains an extensive CPA examination problem collection pertaining to business processes and internal controls, with complete answers and explanations in The Instructor's Resource and Solutions Manual. Our extensive CPA problem collection is drawn from the same pool of CPA examination questions that continue to serve as the cornerstone of the coverage of internal control provided by professional CPA Examination Review courses. The text also contains an assortment of CMA exam and CIA exam questions.

The textbook's core coverage continues to include business processes, transaction cycles, and internal controls. These topics have been central to this textbook since its original publication in 1980. The passage of the Sarbanes–Oxley Act is a testament to the continuing importance of these topics. An understanding of business processes is fundamental to contemporary auditing, and professional and legal considerations relating to an organization's internal control processes. Every business process is subject to loss exposures. Management should develop detailed control objectives for each business process. Such control objectives provide a basis for analysis and the risk-based audit of an organization's internal control processes as well as a basis for managing the loss exposures that are associated with an organization's dependence on information systems.

The eleventh edition presents “successive refinement” of the topical additions that were new in the tenth edition. These included discussion of various information systems reference models, enterprise architecture, Business Process Modeling Notation (BPMN), international standards for information security, integration of BPMN into our business process chapters, and an in-depth discussion of COBIT. Chapter 3 “eBusiness and eCommerce” has been streamlined to eliminate unnecessary technical details. All chapters have been edited to improve clarity of presentation and readability.

The eleventh edition features an entirely new chapter titled “Fraud Examination and Fraud Management.” This chapter complements our presentation of internal controls and business processes by providing a vehicle to observe the effects of inadequate internal controls. The discussion of fraud investigations provides a step-by-step analysis of the processes required to prove that fraud has occurred. The objective is to teach students how to detect fraud, to conduct fraud investigations, and to appreciate that internal control, like the proverbial ounce of prevention, is worth a pound of cure. The chapter's discussion of the variety of methods used by employees to commit fraud reinforces the textbook's presentation of internal controls by providing scenarios in which the student can appreciate the value of specific controls in preventing specific types of fraud.

Learning Aids

Each chapter contains the following instructional aids:

- Learning Objectives
- Cases in Point in Text Boxes
- Glossary
- Annotated Webliography
- Chapter Quiz
- Review Problem

- Review Questions
- Discussion Questions and Problems
- Web Research Assignments

New to the eleventh edition is “List of Acronyms” that provides a quick reference to the many acronyms used in the text. The List is on pages xx to xxi of the Preface.

The Instructor’s Resource and Solutions Manual

The Instructor’s Resource and Solutions Manual is a comprehensive resource that includes teaching tips, chapter outlines that provide a base for planning lectures, as well as solutions/suggested solutions for review questions, discussion questions and problems, and Web research assignments. It also includes transparency masters derived from selected textbook figures.

The eleventh edition contains an extensive collection of multiple-choice questions from professional examinations. The majority of these questions are from CPA examinations. The Instructor’s Resource and Solutions Manual contains the Official Answer to these questions. However, the Official Answers were published without any explanation as to “why” the indicated answers are “correct.” Usually, the correctness of the answer will be evident. However, this may not be the case for at least a few of these questions.

The textbook’s collection of multiple-choice questions from professional examination is one of its strongest pedagogical features. These questions pertain to the most important control concepts in the textbook, and are an excellent vehicle for stimulating classroom discussion. Accordingly, the authors have prepared an Addendum, “Authors’ Discussion of Solutions to Multiple-Choice Professional Examination Questions,” which provides a detailed discussion/explanation of each stem for each question. This material was prepared to facilitate the instructor’s use of these questions in the classroom.

Test Item File

This Test Item File contains over 1,500 questions, including multiple-choice, true/false, and essay. Each question is followed by the correct answer, page reference, AACSB category, and difficulty rating. The Test Item File is available for download by visiting www.pearsonhighered.com/irc.

Testgen Test Management Software

Pearson Education’s test-generating software is available from www.pearsonhighered.com/irc. The software is PC/MAC compatible and preloaded with all of the Test Item File questions. You can manually or randomly view test questions, and drag and drop to create a test. You can add or modify test-bank questions as needed.

Learning Management Systems

Our TestGens are converted for use in BlackBoard and WebCT. These conversions can be found on the Instructor’s Resource Center. Conversions to Moodle, D2L, or Angel can be requested through your local Pearson sales representative.

PowerPoint Presentations

PowerPoint presentations are available for each chapter of the text. This resource allows instructors to offer a more interactive presentation using colorful graphics, outlines of chapter material, additional examples, and visual explanations of difficult topics. Instructors have the flexibility to add slides and/or modify the existing slides to meet the course needs.

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Student Files

To download files referenced in the text, please visit www.pearsonhighered.com/bodnar.

List of Acronyms

ABC	activity-based costing	EFT	electronic funds transfer
ACFE	Association of Certified Fraud Examiners	EIS	executive information system
ACID	atomicity, consistency, isolation, and durability	EOQ	economic order quantity
AICPA	American Institute of Certified Public Accountants	E-R	entity-relationship
AIS	accounting information system	ERM	enterprise risk management
ANSI	American National Standards Institute	ERP	enterprise resource planning
API	applications programming interface	ES	expert system
BPEL	Web Services Business Process Execution Languages	ESB	enterprise service bus
BPMN	Business Process Modeling Notation	EUC	end-user computing
CADD	computer-aided design and drafting	FCPA	Federal Foreign Corrupt Practices Act of 1977
CAM	computer-aided manufacturing	FMS	flexible manufacturing system
CASE	computer-aided software engineering	FTP	file transfer protocol
CEO	chief executive officer	GAAP	Generally Accepted Accounting Principles
CFE	certified fraud examiner	GAS	generalized audit software
CIA	certified internal auditor	HIPO	hierarchical plus input-process-output
CIA	confidentiality, integrity, and availability	HR	human resources
CIM	computer-integrated manufacturing	HTML	hypertext markup language
CIO	chief information officer	I/O	input/output
CMA	certified management accountant	IDE	integrated development environment
COBIT	Control Objectives for Information and related Technology	IP	Internet protocol
COSO	Committee of Sponsoring Organizations of the Treadway Commission	IPO	input process output
CPA	certified public accountant	ISACA	Information Systems Audit and Control Association
CPM	critical path method	ISAM	indexed-sequential access method
CRM	customer relation management	ISMS	information security management system
CSO	chief security officer	ISO	International Organization for Standardization
DASD	direct-access storage device	ISP	Internet service provider
DBA	database administrator	IT	information technology
DBMS	database management system	ITF	integrated test facility
DDL	data description language	JIT	just-in-time
DFD	data flow diagram	MDA	Model Driven Architecture
DML	data manipulation language	MIS	management information system
DNS	domain name server	MRP	materials requirements planning
DoS	denial-of-service	MRP II	materials requirements planning II
DP	data processing	OASIS	Organization for the Advancement of Structured Information Standards
DQL	data query language	OLAP	online analytical processing
DSS	decision support system	OLRS	online, real-time system
EA	enterprise architecture	OMG	Object Management Group
EAS	enterprise application suite	OMT	object-oriented modeling technique
ebXML	ebusiness XML	OO	object-oriented
EDI	electronic data interchange	ORM	Osterwalder Reference model
EDP	electronic data processing	PC	personal computer
		PCAOB	Public Company Accounting Oversight Board

PERT	program evaluation and review technique	SEC	Security and Exchanges Commission
PIN	personal identification number	SOA	service-oriented architecture
POS	point-of-sale	SOX	Sarbanes–Oxley Act
QBE	query by example	SPICE	Software Process Improvement and Capability DEtermination
RAD	rapid application development	SQL	Structured Query Language
REA	resources-events-agents	TQM	total quality management
RFID	radio frequency identification	TQP	total quality performance
RUP	rational unified process	UML	Unified Modeling Language
SaaP	software as a platform	UPC	universal product code
SaaS	software as a service	WS-BPEL	Web Services Business Process Execution Languages
SAP	SAP Aktiengesellschaft, Systems, Applications, and Products in Data Processing	WSDL	Web Services Description Language
SCM	supply chain management	XBRL	Extensible Business Reporting Language
		XML	Extensible Markup Language

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Accounting Information Systems: An Overview

Learning Objectives

Careful study of this chapter will enable you to:

- Understand the related concepts of business processes, transaction cycles, and internal control structure.
 - Describe the organizational structure of the information system function in organizations.
 - Understand the development of information system application architecture.
 - Discuss applications of information technology in organizations.
-

Accounting Information Systems and Business Organizations

Organizations depend on information systems to stay competitive. Information is just as much a resource as plant and equipment. Productivity, which is crucial to staying competitive, can be increased through better information systems. Accounting, as an information system, identifies, collects, processes, and communicates economic information about an entity to a wide variety of people. Information is useful data organized such that correct decisions can be based on it. A system is a collection of resources related such that certain objectives can be achieved.

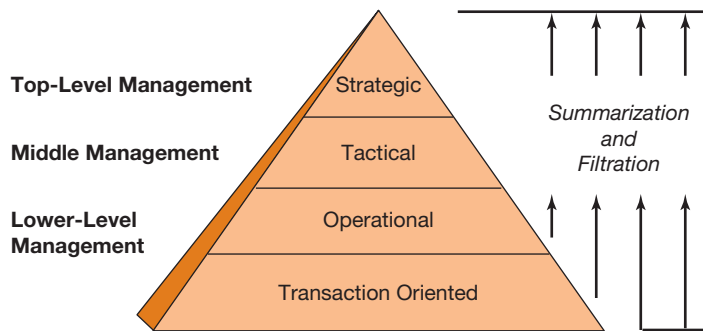
An **accounting information system (AIS)** is a collection of resources, such as people and equipment, designed to transform financial and other data into information. This information is communicated to a wide variety of decision makers. AISs perform this transformation whether they are essentially manual systems or thoroughly computerized.

Information and Decisions

An organization is a collection of decision-making units that exist to pursue objectives. As a system, every organization accepts inputs and transforms them into outputs that take the form of products and services. A manufacturing firm transforms raw material, labor, and other scarce resource inputs into tangible items, such as furniture, that are subsequently sold in pursuit of the goal of profit. A university accepts a variety of inputs, such as faculty labor and student time, and transforms these inputs into a variety of outputs in pursuit of the broad goals of education and the promotion of knowledge. Conceptually, all organizational systems seek objectives through a process of resource allocation, which is accomplished through the process of managerial decision making. Information has economic value to the extent that it facilitates resource allocation decisions, thus assisting a system in its pursuit of goals. Indeed, information may be the most important organizational resource.

USERS OF ACCOUNTING INFORMATION The users of accounting information fall into two broad groups: external and internal. External users include stockholders, investors, creditors,

FIGURE 1.1
Pyramid of Information Levels in an Organization



government agencies, customers and vendors, competitors, labor unions, and the public at large. External users receive and depend on a variety of outputs from an organization’s AIS. Many of these outputs are of a routine nature. Accounts payable transactions with suppliers, for example, require outputs such as purchase orders and checks from an organization’s AIS. Customers receive bills and make payments, which are processed by the AIS. Employees receive paychecks and other payroll-related data; stockholders receive dividend checks and routine information concerning stock transactions.

The information needs of external users are varied. The publication of general-purpose financial statements, such as balance sheets and income statements, assist in meeting these needs. Stockholders, investors at large, creditors, and other external users utilize a firm’s general-purpose financial statements to evaluate past performance, predict future performance, and gain other insights into an organization.

Internal users consist of managers, whose requirements depend on their level in an organization or on the particular function they perform. Figure 1.1 is a schematic of the different levels of managerial interest in information. The diagram emphasizes that there are different information needs and demands at different managerial levels in an organization. The AIS summarizes and filters the data available to decision makers. By processing the data, the AIS influences organizational decisions.

CHARACTERISTICS OF INFORMATION Figure 1.2 presents information characteristics relevant to lower-level, middle, and top-level managers in an organization. Top-level management generally is concerned with strategic planning and control. Accounting reports

FIGURE 1.2
Information Qualities

	Lower-Level Managers	Middle Managers	Top-Level Managers
Characteristics of Information	Operational Control	Management Control	Strategic Planning
Source	Largely Internal	<----->	External
Scope	Well-Defined, Narrow	<----->	Very Wide
Level of Aggregation	Detailed	<----->	Aggregate
Time Horizon	Historical	<----->	Future
Currency	Highly Current	<----->	Quite Old
Required Accuracy	High	<----->	Low
Frequency of Use	Very Frequent	<----->	Infrequent

to top-level management accordingly consist largely of aggregated and summarized items such as total quarterly sales by product line or division. Middle managers need more detail, such as daily or weekly sales by product line, because their scope of control is narrower. Lower-level managers typically receive information relevant only to their particular subunit, such as the total sales of Department A. Personnel in the lower levels of an organization, such as clerks processing payroll or sales transaction data, constantly interact with the detailed transaction data.

The production of useful information is constrained by the environment of an AIS and the cost–benefit structure inherent in users’ decisions. The uncertainty of the environment in which information is developed and presented means that estimates and judgments must be made. No information system can ignore the practicality of presenting information. If information costs more to provide than it is worth to the user, it is not practical to provide this information.

From an organization’s viewpoint, a distinction might be drawn between two broad classes of accounting information: mandatory and discretionary. Various government agencies, private agencies, and legislation set statutory requirements for record keeping and reports. Reports, for example, are required for federal and state income taxes, and Social Security taxes, and by the Securities and Exchange Commission (SEC), Federal Trade Commission, and the like. In addition, certain basic accounting functions are essential to normal business activity. Payroll and accounts receivable are prime examples. These functions must be performed in any organization if the organization is to survive. Budgetary systems, responsibility accounting systems, and specific reports for internal management are examples of discretionary information. Conceptually, information should satisfy a cost–benefit criterion. Although the criterion theoretically applies to all the outputs of an AIS, the typical organization does not have control over all its information requirements. In meeting mandatory information requirements, the primary consideration is minimizing costs while meeting minimum standards of reliability and usefulness. When the provision of information is discretionary, the primary consideration is that the benefits obtained exceed the costs of production.

Information Systems

The term *information system* suggests the use of information technology (IT) in an organization to provide information to users. A *computer-based* information system is a collection of computer hardware and software designed to transform data into useful information. As indicated in Figure 1.3, one might distinguish several types of computer-based information systems.

DATA PROCESSING **Electronic data processing (EDP)** is the use of IT to perform an organization’s transaction-oriented data processing. EDP is a fundamental AIS application in every organization. Data concerning sales transactions, purchase transactions, cash receipts and cash payments transactions, and all other financial transactions that an organization undertakes must be accurately recorded, processed, and stored if the organization is to be sustainable. As

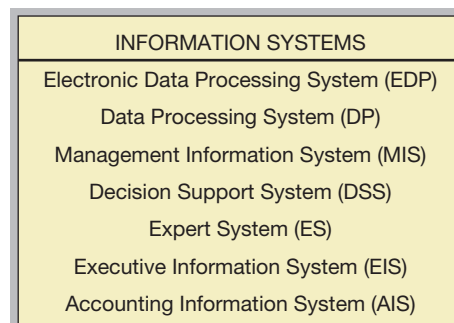


FIGURE 1.3
Types of Information Systems

computer technology has become commonplace, the term **data processing (DP)** has come to have the same meaning as EDP.

MANAGEMENT INFORMATION SYSTEMS **Management information systems (MIS)** describes the use of IT to provide decision-oriented information to managers. An MIS provides a wide variety of information beyond that which is associated with DP in organizations. An MIS recognizes that managers within an organization use and require information in decision making and that computer-based information systems can assist in providing information to managers.

DECISION SUPPORT SYSTEMS In a **decision support system (DSS)**, data are processed into a decision-making format for the end user. A DSS requires the use of decision models and specialized databases and differs significantly from a DP system. A DSS is directed at serving ad hoc, specific, non-routine information requests by management. DP systems serve routine, recurring, general information needs. A DSS is designed for specific types of decisions for specific users. A familiar example is the use of spreadsheet software to perform what-if analyses of operating or budget data, such as sales forecasting by marketing personnel.

EXPERT SYSTEMS An **expert system (ES)** is a knowledge-based information system that uses its knowledge about a specific application area to act as an expert consultant to end users. Like DSS, an ES requires the use of decision models and specialized databases. Unlike DSS, an ES also requires the development of a knowledge base—the special knowledge that an expert possesses in the decision area—and an inference engine—the process by which the expert makes a decision. An ES attempts to replicate the decisions that would be made by an expert human decision maker in the same decision situation. An ES differs from a DSS in that a DSS assists a user in making a decision, whereas an ES makes the decision.



CASE IN POINT

Federal National Mortgage Association (FNMA or “Fannie Mae”) uses the Mavent Expert System (www.mavent.com) to review if loans are in compliance with the many lending-related government regulations, including those included in the Truth in Lending Act (TILA).

EXECUTIVE INFORMATION SYSTEMS An **executive information system (EIS)** is tailored to the strategic information needs of top-level management. Much of the information used by top-level management comes from sources other than an organization’s information systems. Examples are meetings, memos, television, periodicals, and social activities. Some information must be processed by the organization’s information systems; however, an EIS provides top-level management with easy access to selective information that has been processed by the organization’s information systems. This selective information concerns the key factors that top-level management has identified as being critical to the organization’s success. Actual versus projected market share for product groups and budget versus actual profit and loss data for divisions might be key success factors for a top-level executive.

ACCOUNTING INFORMATION SYSTEMS Analogous to the preceding definitions, we might define an AIS as a computer-based system designed to transform accounting data into information. However, we use the term *accounting information system* more broadly to include the use of IT, transaction processing cycles, and the development of information systems.

Accounting Information Systems and Application Architecture

AISs and IT are strongly intertwined. The fundamental benefits of IT are automation, information organization, and communication.

- **Automation.** In the AIS, automation not only means replacing humans with machines, it means performing work that would otherwise be impossible with humans alone. For example, computers make it possible for very large companies to produce complicated accounting reports on demand, a feat that was once impossible due to the extensive human processing requirements. The result is a move away from periodic financial reporting to real-time financial reporting via the Web.
- **Information organization.** Automated recording of transactions plus direct-access storage devices (DASDs) and database technology make it possible to record, store, and organize larger amounts of data than would otherwise be possible manually. For example, Walmart's data warehouse stores nearly a billion new records each day. The company reportedly applies sophisticated data mining techniques for retrieving data from its massive database.
- **Communication.** Communication technologies are a key component in the development of AISs. For example, Covisint (www.covisint.com, a subsidiary of Compuware) used electronic data interchange (EDI) technologies to develop a common Internet-based collaborative platform that permits the U.S. automobile industry to electronically coordinate and conduct their procurement activities with over 30,000 parts suppliers. This has permitted automakers and suppliers to work together as extended enterprises.

The confluence of changes in automation, information organization, and communications has profoundly affected the development of the typical organization's application architecture. **Applications architecture** involves the process of ensuring the suite of organization's applications work together as a composite application according to the goals and objectives of the organization.

EVOLUTION OF APPLICATIONS ARCHITECTURE The earliest AIS application architecture focused on automating the traditional accounting cycle (i.e., the process that begins with recording transactions and ends with producing the financial statements). Eventually, software engineers shifted their attention to finding new ways to use computers to enhance functional planning and control within the organization. Several other types of functional information systems were developed.

A **customer relation management (CRM)** system manages all contacts with customers. Customers typically contact several different departments in the organization. Such departments may include, for example, sales, service, billing, support, and quality control. In a typical CRM system, all these departments record their contacts with customers in a common CRM database. IT technology allows this database to be very efficiently accessed and shared by all the involved departments.

A **supply chain management (SCM)** system encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management. It also includes collaboration with suppliers in the extended enterprise. An **extended enterprise** is a group of loosely connected companies that work together to maximize the value of their economic outputs. Expressed in more tangible terms, this means manufacturers and suppliers work together to meet market demand while minimizing inventories.

SCM systems received considerable attention by developers. The result was **Material Requirements Planning (MRP)** software that assisted management in managing inventories and scheduling production. It wasn't long before MRP evolved into **MRP II (Manufacturing Resource Planning II)**, which added new capabilities such as integration with the financial

accounting system, financial planning, and the ability to do extensive simulations of production-related activities.

MRP and MRP II paved the way for **computer-integrated manufacturing (CIM)** and **flexible manufacturing systems (FMSs)**. In CIM, computers take control of the entire manufacturing process, and in FMSs, computers not only control production processes but can also be reprogrammed so that the same processes can produce entirely different products.

CASE IN POINT

Chrysler's Sterling Heights Assembly Plant employs flexible manufacturing techniques that permit the production of several different models in the same plant at the same time. The plant's body shop uses over 750 different robots. Only the robots' "hands" need to be changed in switching the production from one model to another.

ENTERPRISE RESOURCE PLANNING (ERP) MRP, MRP II, CIM, and FMSs represented much more than innovation in the organization's application architecture. The new software capabilities plus the ability to rapidly process, organize, and communicate data helped to enable significant developments in related management science disciplines of logistics, process control, demand forecasting, queuing theory, and so on. Several process improvement methods emerged from these disciplines, such as just-in-time (JIT) manufacturing, lean manufacturing, and Six Sigma. These in turn were accompanied by various related international standards such as ISA-95, which includes various models for enterprise-control system integration. Today, a wide range of international standards apply not only to manufacturing companies but also to a variety of processes in many different types of organizations. ISO 9001 is a quality-management standard published by the International Standards Organization, www.iso.org. It is widely credited for promoting the process management approach. The process management approach involves the application of knowledge, skills, tools, techniques, and systems to manage and improve processes within the organization in a way that meets customers' needs and maximizes profitability.

However, these different systems tended to evolve as separate loosely coupled systems, with each system having its own database. In some cases, one functional system database would store the same data items that were stored in the databases of one or more other functional areas. This would result in unnecessary duplication. An equally important problem stemmed from different functional-area databases attempting to share information with each other. Differences in formats and standards made inter-database sharing a complicated and expensive data conversion process. To make things worse, simply updating the software for one functional database could necessitate the re-engineering of the conversion process before that database could again exchange data with other databases.

Enterprise resource planning (ERP) emerged as the solution to too-loosely connected functional information systems. ERP involves combining the various functional information systems under the umbrella of a single software package and a single database. Figure 1.4 shows a typical ERP view of a company, organized by various tightly integrated functional information systems: Human Resource Management, Operations, Services, Financial, and Governance. The Operations grouping includes the SCM system, and the Financial grouping includes financial and management accounting, as well as financial supply chain management (i.e., the flow of money and financial transactions).

Figure 1.4 is based on the organization within the SAP ERP™ system. It shows one way to view the organization's information systems. An alternate view, for example, might collapse

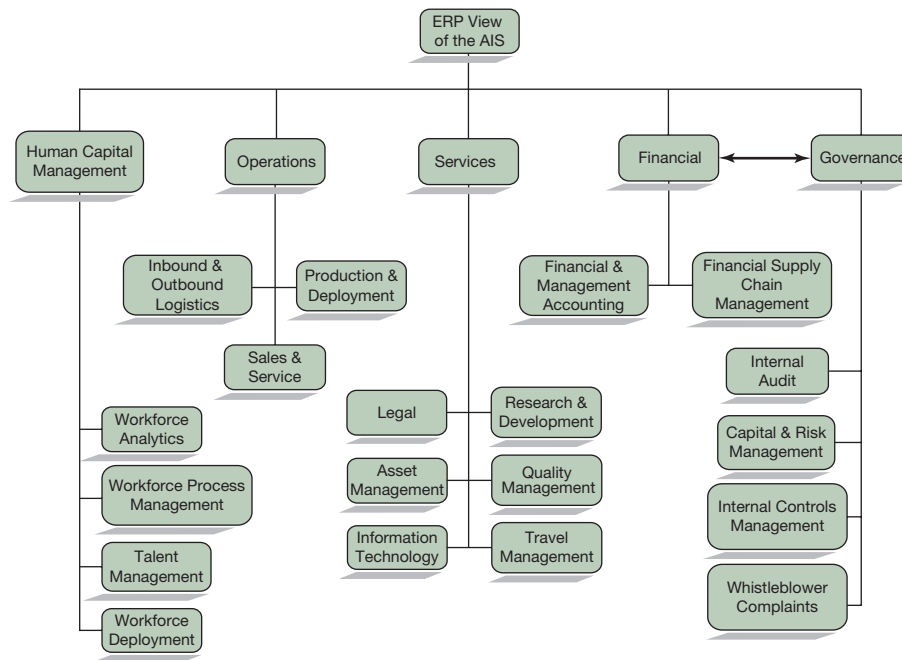


FIGURE 1.4
ERP Functional
Systems View
of a Typical
Manufacturing
Company

Services, Financial, and Governance into a single “Organization Infrastructure” process. This would leave three major groupings: Human Resources, Operations, and Infrastructure. Still another approach would be to view the organization in terms of primary versus secondary value chain activities, as discussed below.

ERP has evolved not just as a concept but as software. SAP (www.sap.com), for example, develops and markets comprehensive ERP solutions for small, medium-size, and large organizations. Such one-program-fits-all software is based on “best practices,” which imply that at least some companies can improve their processes by conforming them to the way the software works. There are also industry-specific versions of software.

ERP has been a blessing and a curse. In theory, companies can benefit from “throwing away” their various functional system software packages and replacing them all with a single software solution. But in practice, many companies find it extremely painful (and costly) to make the switch. In many cases, companies have spent many millions of dollars to implement ERP, only to end up with doubtful net improvements. Many famous cases abound. For example, when the Hershey Company implemented SAP, it ran into problems with its inventory system and was unable to ship chocolates as planned for the Halloween holiday. This resulted in a 19% drop in Hershey’s third quarter earnings, which Hershey blamed on “computer problems.” Many other well-know companies have suffered ERP implementation problems to varying degrees. Those with such problems include Apple Computer, Boeing, Dow Chemical, Dell Computer, Waste Management, and Whirlpool.

CASE IN POINT

FoxMeyer Drug, a pharmaceutical distributor in Texas, collapsed after a problematic SAP ERP implementation. The bankruptcy trustees then sued SAP and Andersen Consulting (the accounting firm that helped with the implementation) for \$500 million.

There have been so many ERP implementation problems and failures that some estimates place failures in the earlier years of ERP to be over 50%. The risk of an implementation failure is still substantial today. One reason for such failures is that most large-scale implementations of SAP require considerable customization of the SAP software in order to meet the needs of the deploying company. Hershey spent \$115 million on its implementation, with a significant portion of the costs going to customization. Despite the many companies having problems implementing ERP, many companies have also managed to successfully use ERP in ways that have produced strong competitive advantages.

ERP II represents the next step in the evolution of information systems applications architecture. ERP II adds collaborative commerce to ERP. **Collaborative commerce** involves groups of organizations working together toward common goals, such as new products, new process methods, and human capital intelligence. It expands the extended enterprise in ways that go beyond multi-company cooperation in supply chain management. It also forms a foundation for eBusiness, which is discussed in Chapter 3.

In recent years, the ERP system has given way to the **enterprise application suite (EAS)**. The EAS replaces one monolithic ERP software package with a group (i.e., a suite) of individual packages that work closely with each other and run in Web browsers. Most of the large providers of ERP software, including Oracle and SAP, market application suites. The linking together of various applications in suite is facilitated through a service-oriented architecture (SOA). SOA is discussed more thoroughly in Chapter 3.

Business Processes

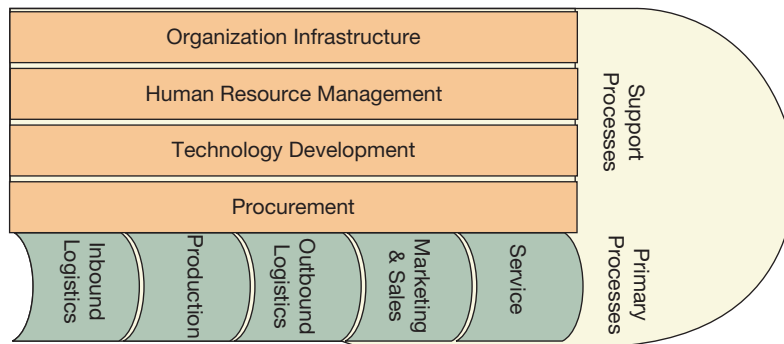
All financially related activities of the organization can be viewed as part of various business processes. A **business process** is an interrelated set of tasks that involve data, organizational units, and a logical time sequence. Business processes are always triggered by some economic event, and all have clearly defined starting and ending points. For example, the customer order management process might be triggered by the receipt of a customer purchase order; the process might begin with the creation of a sales order, and it might end with the collection of the customer's payment on accounts receivable.

A key characteristic of business processes is that they are not necessarily limited to a single functional area of the information system or the organization chart. For example, a sales process can span various departments in the organization chart, such as sales, inventory, shipping, and credit checking. Of course, how any given process is defined is simply a matter of convenience. One could just as easily define a sales process as only the act of entering the customer's order.

Business Process Reference Models

Since most organizations experience similar types of economic events and activities, it is possible to define general basic business processes. These include the following:

1. Procurement (purchasing, ordering, soliciting bids, etc.)
2. Inbound sales logistics (inventory, control, returns to supplier, etc.)
3. Manufacturing (production) operations (machining, assembly, packaging, etc.)
4. Outbound sales logistics (sales order processing, collection, shipping, delivery, etc.)
5. Sales/Service (sales, installation, repair, post-sales support, etc.)
6. Marketing (advertising, promotion, etc.)
7. Human Resources/Human Capital Management (hiring, training, etc.)
8. Accounting (financial accounting, management accounting, reporting, etc.)
9. Finance (collections, payments, financing, etc.)
10. Research and Technology Development
11. Governance (corporate governance, IT governance, strategic management, etc.)

**FIGURE 1.5****The Porter Value Chain Model**

The 11 basic business processes can be organized and grouped together according to various reference models, depending on the desired emphasis. Some key business process reference models include the ERP functional model, the value chain model, the supply chain model, the operational processes model, and the transaction cycle model. Each of these reference models is discussed.

THE ERP FUNCTIONAL MODEL The ERP functional model was presented in Figure 1.4. The focus in this model is on different ERP or EAS components. This model is of primary interest to ERP/EAS development.

THE VALUE CHAIN MODEL The **value chain** (Figure 1.5) is the chain of activities (i.e., processes) performed by the company that add value to the product. Defining business processes in terms of the value chain is popular because the value chain provides a simple and effective way of viewing the company's activities in a manner suited to analyzing its competitive advantages. The value chain breaks activities down into components that can be individually optimized in terms of the company's goals and strategies. This model is of primary interest to managers and process engineers in optimizing the value change as part of the organization's business strategies and goals.

Primary business processes involve activities that directly add value to the company's products, and **supporting business processes** involve activities that indirectly add value and support the primary processes. The primary processes include inbound logistics, production, outbound logistics, sales and marketing, and service. The supporting processes include firm infrastructure (accounting, finance, governance), technology development, human resource development, and procurement.

Collectively, the primary and supporting business processes comprise the entire value chain of activities. Both the primary and supporting business processes can be further subdivided into many subprocesses. For example, outbound sales logistics can be divided into order entry, credit checking, and so on. Subdividing processes is a helpful tool for the systems person and the accountant because it makes it possible to focus on clearly defined, specific areas of the enormous set of the company's activities.

CASE IN POINT

Many companies use VCML (Value Chain Markup Language), a type of XML (Extensible Markup Language) used to electronically collaborate in eBusiness transactions. VCML is promoted by Vitria® (www.vitria.com), a company that specializes in business process management. The VCML language facilitates business-to-business (B2B) commerce throughout the extended value chain, which includes both manufacturers and their suppliers. VCML complements standards for EDI, such as eBusiness XML (ebXML).