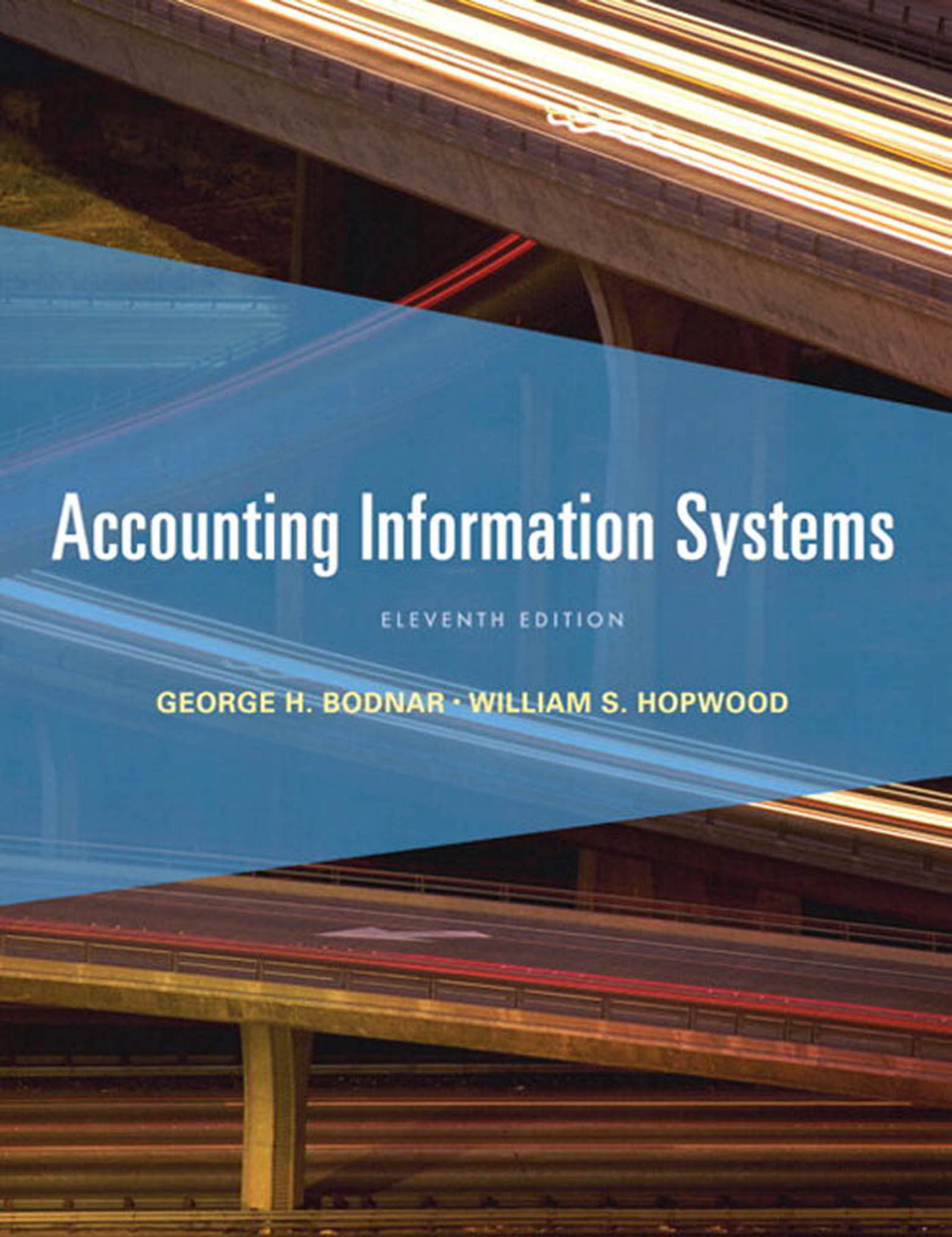

Accounting Information Systems

ELEVENTH EDITION

GEORGE H. BODNAR · WILLIAM S. HOPWOOD

Accounting Information Systems

Eleventh Edition

George H. Bodnar

William S. Hopwood

Florida Atlantic University

PEARSON

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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

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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G. H. B.
W. S. H.

Student Files

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

List of Acronyms

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

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

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CHAPTER 1

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.

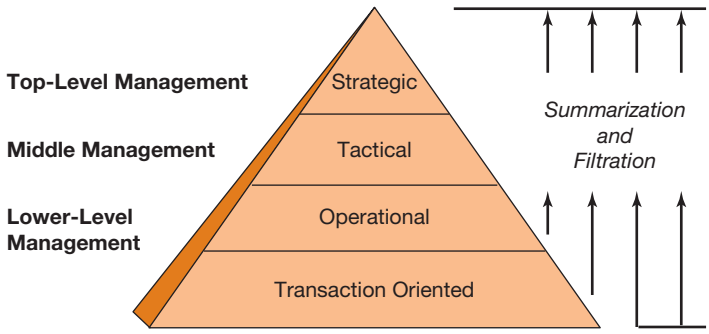
An **accounting information system (AIS)** is a collection of resources, such as people and equipment, designed to transform financial and other data into information. This information is communicated to a wide variety of decision makers. AISs perform this transformation whether they are essentially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

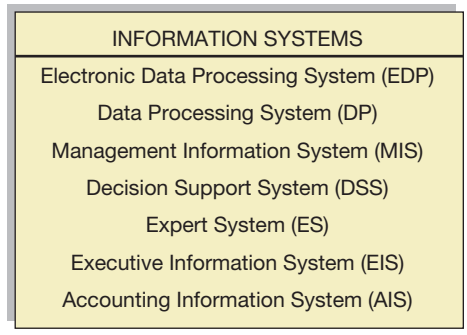


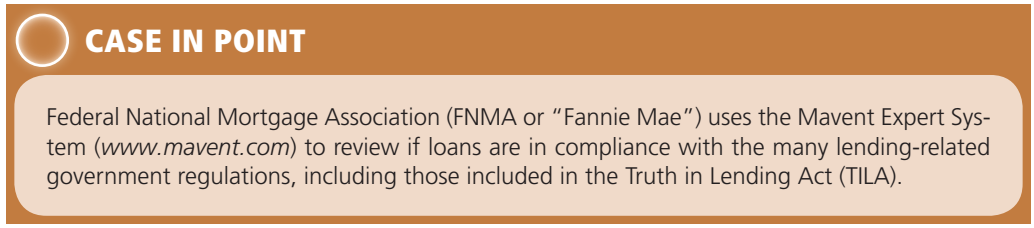
FIGURE 1.3
Types of Information Systems

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.



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

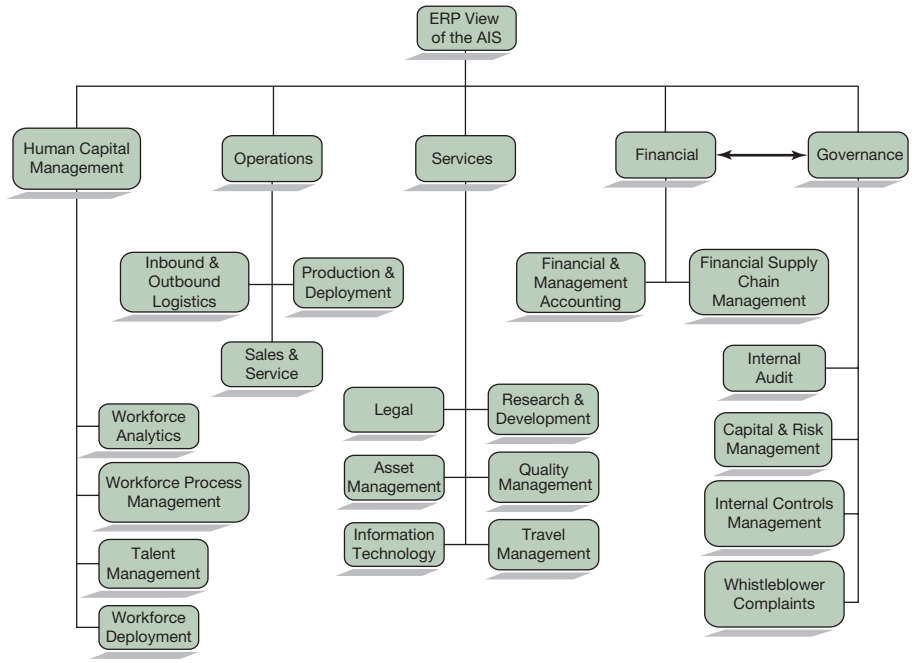


FIGURE 1.4
ERP Functional Systems View of a Typical Manufacturing Company

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.)

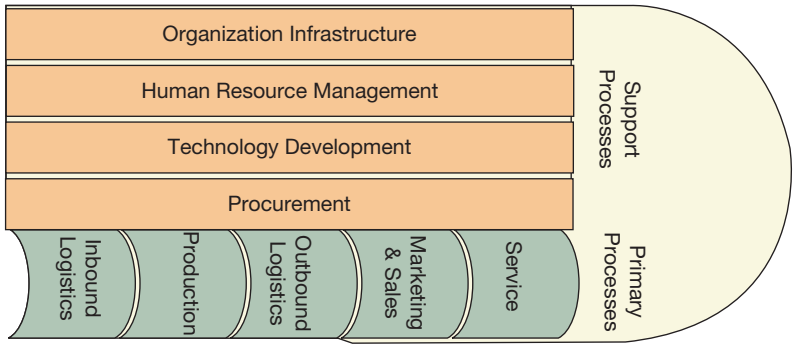


FIGURE 1.5
The Porter Value Chain Model

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).