Accounting Information Systems

A Collection

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Chapter 1: Accounting Information System: An Overview

Introduction

Unlike many other accounting subjects, such as intermediate accounting, accounting information systems (AIS) lacks a well-defined body of knowledge. Much controversy exists among college faculty as to what should and should not be covered in the AIS course. To some extent, however, the controversy is being resolved through recent legislation. The Sarbanes-Oxley Act (SOX) of 2002 established new corporate governance regulations and standards for public companies registered with the Securities and Exchange Commission (SEC). This wide sweeping legislation impacts public companies, their management, and their auditors. Of particular importance to AIS students is the impact of SOX on internal control standards and related auditing procedures. Whereas SOX does not define the entire content of the AIS course, it does identify critical areas of study that need to be included for accountants.

The purpose of this chapter is to place the subject of AIS in perspective for accountants. Toward this end, the chapter is divided into four major sections, each dealing with a different aspect of information systems. The first section explores the information environment of the firm. It introduces basic systems concepts, identifies the types of information used in business, and describes the flows of information through an organization. This section also presents a framework for viewing AIS in relation to other information systems components. The second section of the chapter deals with the impact of organizational structure on AIS. Here we examine the business organization as a system of functional areas. The accounting function plays

an important role as the purveyor of financial information for the rest of the organization. The third section reviews the evolution of information systems. Over the years, AIS has been represented by a number of different approaches or models. Five AIS models are examined. The final section discusses the role of accountants as users, designers, and auditors of AIS.

The Information Environment

We begin the study of AIS with the recognition that information is a business resource. Like the other business resources of raw materials, capital, and labor, information is vital to the survival of the contemporary business organization. Every business day, vast quantities of information flow to decision makers and other users to meet a variety of internal needs. In addition, information flows out from the organization to external users, such as customers, suppliers, and stakeholders who have an interest in the firm. Figure 1-1 presents an overview of these internal and external information flows. The pyramid in Figure 1-1 shows the business organization divided horizontally into several levels of activity. Business operations form the base of the pyramid. These activities consist of the product-oriented work of the organization, such as manufacturing, sales, and distribution. Above the base level, the organization is divided into three management tiers: operations management, middle management, and top management. Operations management is directly responsible for controlling day-to-day operations. Middle management is accountable for the short-term planning and coordination of activities necessary to accomplish organizational objectives. Top management is responsible for longer-term planning and setting organizational objectives. Every individual in the organization, from business operations to top management, needs

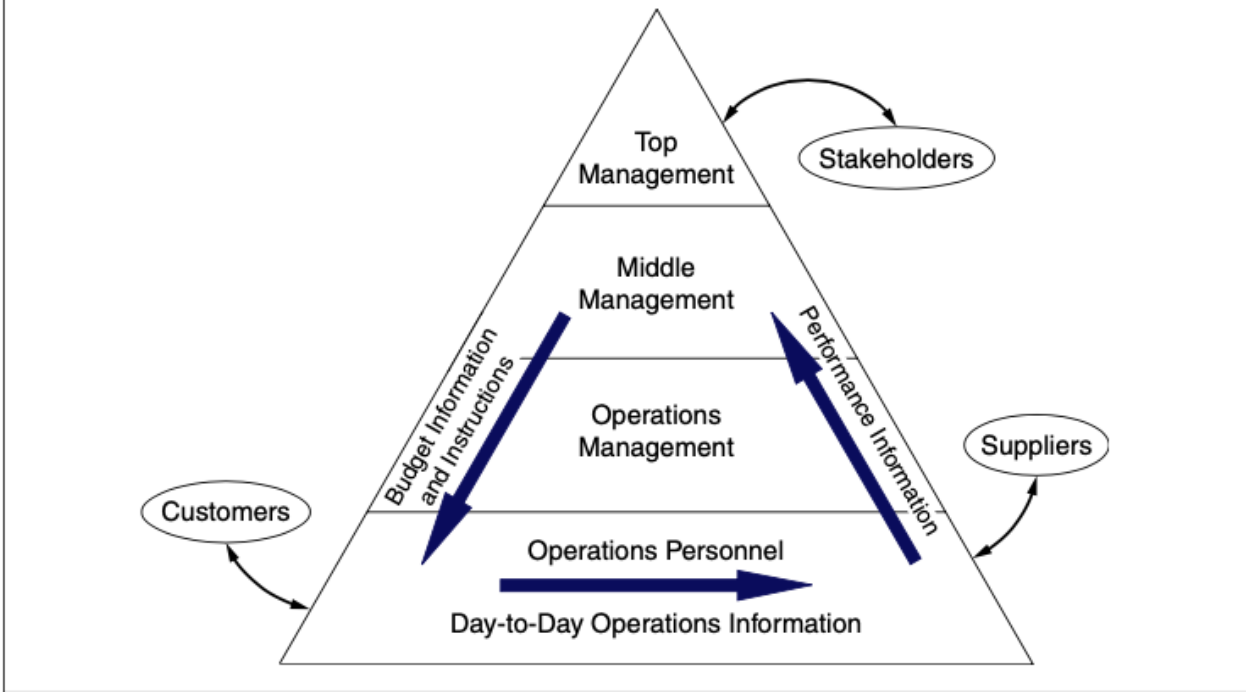
information to accomplish his or her tasks. Notice in Figure 1-1 how information flows in two directions within the organization: horizontally and vertically. The horizontal flow supports operations-level tasks with highly detailed information about the many business transactions affecting the firm. This includes information about events such as the sale and shipment of goods, the use of labor and materials in the production process, and internal transfers of resources from one department to another. The vertical flow distributes information downward from senior managers to junior managers and operations personnel in the form of instructions, quotas, and budgets. In addition, summarized information pertaining to operations and other activities flows upward to managers at all levels. Management uses this information to support its various planning and control functions.

A third flow of information depicted in Figure 1-1 represents exchanges between the organization and users in the external environment. External users fall into two groups: trading partners and stakeholders. Exchanges with trading partners include customer sales and billing information, purchase information for suppliers, and inventory receipts information. Stakeholders are entities outside (or inside) the organization with a direct or indirect interest in the firm. Stockholders, financial institutions, and government agencies are examples of external stakeholders. Information exchanges with these groups include financial statements, tax returns, and stock transaction information. Inside stakeholders include accountants and internal auditors.

All user groups have unique information requirements. The level of detail and the nature of the information these groups receive differ considerably. For example, managers cannot use the highly detailed information needed by operations personnel. Management information is thus more summarized and oriented toward reporting on overall performance

and problems rather than routine operations. The information must identify potential problems in time for management to take corrective action. External stakeholders, on the other hand, require information very different from that of management and operations users. Their financial statement information, based on generally accepted accounting principles (GAAP), is accrual based and far too aggregated for most internal uses.

FIGURE 1-1 INTERNAL AND EXTERNAL FLOWS OF INFORMATION



WHAT IS A SYSTEM?

For many, the term system generates mental images of computers and programming. In fact, the term has much broader applicability. Some systems are naturally occurring, whereas others are artificial. Natural systems range from the atom—a system of electrons, protons, and neutrons—to the universe—a system of galaxies, stars, and planets. All life

forms, plant and animal, are examples of natural systems. Artificial systems are man-made. These systems include everything from clocks to submarines and social systems to information systems.

Elements of a System

Regardless of their origin, all systems possess some common elements. To specify:

A system is a group of two or more interrelated components or subsystems that serve a common purpose.

Let's analyze the general definition to gain an understanding of how it applies to businesses and information systems.

MULTIPLE COMPONENTS. A system must contain more than one part. For example, a yo-yo carved from a single piece of wood and attached to a string is a system. Without the string, it is not a system.

RELATEDNESS. A common purpose relates the multiple parts of the system. Although each part functions independently of the others, all parts serve a common objective. If a particular component does not contribute to the common goal, then it is not part of the system. For instance, a pair of ice skates and a volleyball net are both components; however, they lack a common purpose, and thus do not form a system.

SYSTEM VERSUS SUBSYSTEM. The distinction between the terms system and subsystem is a matter of perspective. For our purposes, these terms are interchangeable. A system is called a subsystem when it is viewed in relation to the larger system of which it is a part. Likewise, a subsystem is called a

system when it is the focus of attention. Animals, plants, and other life forms are systems. They are also subsystems of the ecosystem in which they exist. From a different perspective, animals are systems composed of many smaller subsystems, such as the circulatory subsystem and the respiratory subsystem.

PURPOSE. A system must serve at least one purpose, but it may serve several. Whether a system provides a measure of time, electrical power, or information, serving a purpose is its fundamental justification. When a system ceases to serve a purpose, it should be replaced.

An Example of an Artificial System

An automobile is an example of an artificial system that is familiar to most of us and that satisfies the definition of a system provided previously. To simplify matters, let's assume that the automobile system serves only one purpose: providing conveyance. To do so requires the harmonious interaction of hundreds or even thousands of subsystems. For simplicity, Figure 1-2 depicts only a few of these.

In the figure, two points are illustrated of particular importance to the study of information systems: system decomposition and subsystem interdependency.

SYSTEM DECOMPOSITION. Decomposition is the process of dividing the system into smaller subsystem parts. This is a convenient way of representing, viewing, and understanding the relationships among subsystems. By decomposing a system, we can present the overall system as a hierarchy and view the relationships between subordinate and higher-

level subsystems. Each subordinate subsystem performs one or more specific functions to help achieve the overall objective of the higher-level system. Figure 1-2 shows an automobile decomposed into four primary subsystems: the fuel subsystem, the propulsion subsystem, the electrical subsystem, and the braking subsystem. Each contributes in a unique way to the system's objective, conveyance. These second-level subsystems are decomposed further into two or more subordinate subsystems at a third level. Each third-level subsystem performs a task in direct support of its second-level system.

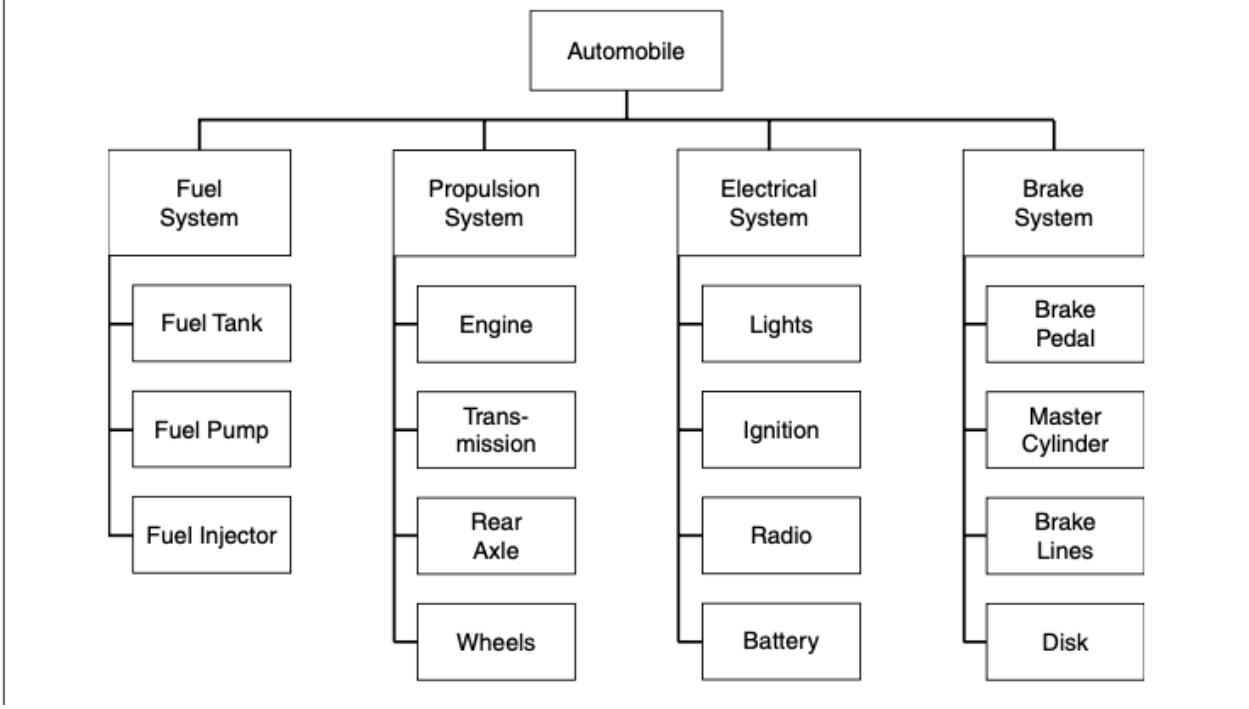
SUBSYSTEM INTERDEPENDENCY. A system's ability to achieve its goal depends on the effective functioning and harmonious interaction of its subsystems. If a vital subsystem fails or becomes defective and can no longer meet its specific objective, the overall system will fail to meet its objective. For example, if the fuel pump (a vital subsystem of the fuel system) fails, then the fuel system fails. With the failure of the fuel system (a vital subsystem of the automobile), the entire system fails. On the other hand, when a nonvital subsystem fails, the primary objective of the overall system can still be met. For instance, if the radio (a subsystem of the electrical system) fails, the automobile can still convey passengers.

Designers of all types of systems need to recognize the consequences of subsystem failure and provide the appropriate level of control. For example, a systems designer may provide control by designing a backup (redundant) subsystem that comes into play when the primary subsystem fails. Control should be provided on a cost-benefit basis. It is neither economical nor necessary to back up every subsystem. Backup is essential, however, when excessive negative consequences result from a subsystem

failure. Hence, virtually every modern automobile has a backup braking system, whereas very few have backup stereo systems.

Like automobile designers, information system designers need to identify critical subsystems, anticipate the risk of their failure, and design cost-effective control procedures to mitigate that risk. Of course, accountants feature prominently in this activity.

FIGURE 1-2 PRIMARY SUBSYSTEM OF AN AUTOMOBILE



AN INFORMATION SYSTEMS FRAMEWORK

The information system is the set of formal procedures by which data are collected, processed into information, and distributed to users.

Figure 1-3 shows the information system of a hypothetical manufacturing firm decomposed into its elemental subsystems. Notice that two broad classes of systems emerge from the decomposition: the

accounting information system (AIS) and the management information system (MIS). We will use this framework to identify the domain of AIS and distinguish it from MIS. Keep in mind that Figure 1-3 is a conceptual view; physical information systems are not typically organized into such discrete packages. More often, MIS and AIS functions are integrated to achieve operational efficiency.

The distinction between AIS and MIS centers on the concept of a transaction, as illustrated by Figure 1-4. The information system accepts input, called transactions, which are converted through various processes into output information that goes to users. Transactions fall into two classes: financial transactions and nonfinancial transactions. Before exploring this distinction, let's first broadly define:

A transaction as an event that affects or is of interest to the organization and is processed by its information system as a unit of work.

This definition encompasses both financial and nonfinancial events. Because financial transactions are of particular importance to the accountant's understanding of information systems, we need a precise definition for this class of transaction:

A financial transaction is an economic event that affects the assets and equities of the organization, is reflected in its accounts, and is measured in monetary terms.

Sales of products to customers, purchases of inventory from vendors, and cash disbursements and receipts are examples of financial transactions. Every business organization is legally bound to correctly process these types of transactions.

Nonfinancial transactions are events that do not meet the narrow definition of a financial transaction. For example, adding a new supplier of raw materials to the list of valid suppliers is an event that may be processed

by the enterprise's information system as a transaction. Important as this information obviously is, it is not a financial transaction, and the firm has no legal obligation to process it correctly—or at all.

Financial transactions and nonfinancial transactions are closely related and are often processed by the same physical system. For example, consider a financial portfolio management system that collects and tracks stock prices (nonfinancial transactions). When the stocks reach a threshold price, the system places an automatic buy or sell order (financial transaction). Buying high and selling low is not against the law, but it is bad for business. Nevertheless, no law requires company management to design optimal buy and- sell rules into their system. Once the buy-or-sell order is placed, however, the processing of this financial transaction must comply with legal and professional guidelines.

FIGURE 1-3 **A Framework for Information Systems**

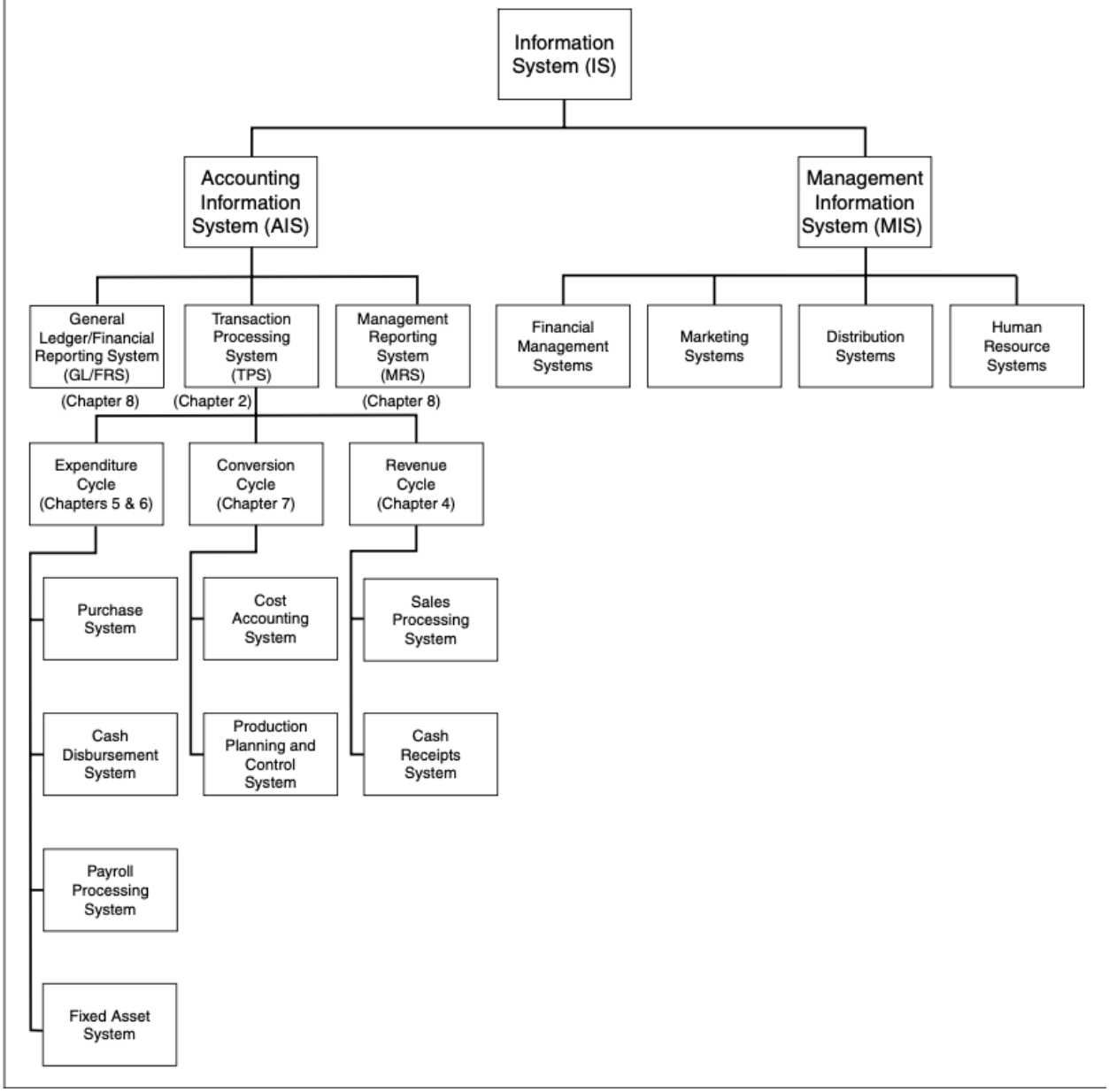
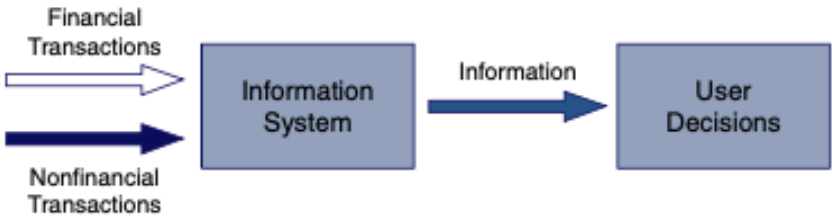


FIGURE 1-4 TRANSACTIONS PROCESSED BY THE INFORMATION SYSTEM



The Accounting Information System

AIS subsystems process financial transactions and nonfinancial transactions that directly affect the processing of financial transactions. For example, changes to customers' names and addresses are processed by the AIS to keep the customer file current. Although not technically financial transactions, these changes provide vital information for processing future sales to the customer.

The AIS is composed of three major subsystems: (1) the transaction processing system (TPS), which supports daily business operations with numerous reports, documents, and messages for users throughout the organization; (2) the general ledger/financial reporting system (GL/FRS), which produces the traditional financial statements, such as the income statement, balance sheet, statement of cash flows, tax returns, and other reports required by law; and (3) the management reporting system (MRS), which provides internal management with special-purpose financial reports and information needed for decision making such as budgets, variance reports, and responsibility reports. We examine each of these subsystems later in this chapter.

The Management Information System

Management often requires information that goes beyond the capability of AIS. As organizations grow in size and complexity, specialized functional areas emerge, requiring additional information for production planning and control, sales forecasting, inventory warehouse planning, market research, and so on. The management information system (MIS) processes nonfinancial transactions that are not normally processed by traditional AIS. Table 1-1 gives examples of typical MIS applications related to functional areas of a firm.

TABLE 1-1 EXAMPLES OF MIS APPLICATIONS IN FUNCTIONAL AREAS

Function	Examples of MIS Applications
Finance	Portfolio management systems Capital budgeting systems
Marketing	Market analysis New product development Product analysis
Distribution	Warehouse organization and scheduling Delivery scheduling Vehicle loading and allocation models
Personnel	Human resource management systems ■ Job skill tracking system ■ Employee benefits system

Why Is It Important to Distinguish between AIS and MIS?

SOX legislation requires that management design and implement internal controls over the entire financial reporting process. This includes the financial reporting system, the general ledger system, and the transaction

processing systems that supply the data for financial reporting. SOX further requires that management certify these controls and that the external auditors express an opinion on control effectiveness. Because of the highly integrative nature of modern information systems, management and auditors need a conceptual view of the information system that distinguishes key processes and areas of risk and legal responsibility from the other (nonlegally binding) aspects of the system. Without such a model, critical management and audit responsibilities under SOX may not be met.

AIS SUBSYSTEMS

At this point, we briefly outline the role of each subsystem depicted in Figure 1-3.

Transaction Processing System

The TPS is central to the overall function of the information system by converting economic events into financial transactions, recording financial transactions in the accounting records (journals and ledgers), and distributing essential financial information to operations personnel to support their daily operations.

The TPS deals with business events that occur frequently. In a given day, a firm may process thousands of transactions. To deal efficiently with such volume, similar types of transactions are grouped together into transaction cycles. The TPS consists of three transaction cycles: the revenue cycle, the expenditure cycle, and the conversion cycle. Each cycle captures and processes different types of financial transactions. Chapter 2 provides an overview of transaction processing. Chapters 3 and 4 examine in detail the revenue and expenditure cycles.

General Ledger/Financial Reporting Systems

The general ledger system (GLS) and the financial reporting system (FRS) are two closely related subsystems. However, because of their operational interdependency, they are generally viewed as a single integrated system—the GL/FRS. The bulk of the input to the GL portion of the system comes from the transaction cycles. Summaries of transaction cycle activity are processed by the GLS to update the general ledger control accounts. Other, less frequent, events such as stock transactions, mergers, and lawsuit settlements, for which there may be no formal processing cycle in place, also enter the GLS through alternate sources.

The FRS measures and reports the status of financial resources and the changes in those resources. The FRS communicates this information primarily to external users. This type of reporting is called nondiscretionary because the organization has few or no choices in the information it provides. Much of this information consists of traditional financial statements, tax returns, and other legal documents.

Management Reporting System

The MRS provides the internal financial information needed to manage a business. Managers must deal immediately with many day-to-day business problems, as well as plan and control their operations. Managers require different information for the various kinds of decisions they must make. Typical reports produced by the MRS include budgets, variance reports, cost-volume-profit analyses, and reports using current (rather than historical) cost data. This type of reporting is called discretionary reporting because the organization can choose what information to report and how to present it.

A GENERAL MODEL FOR AIS

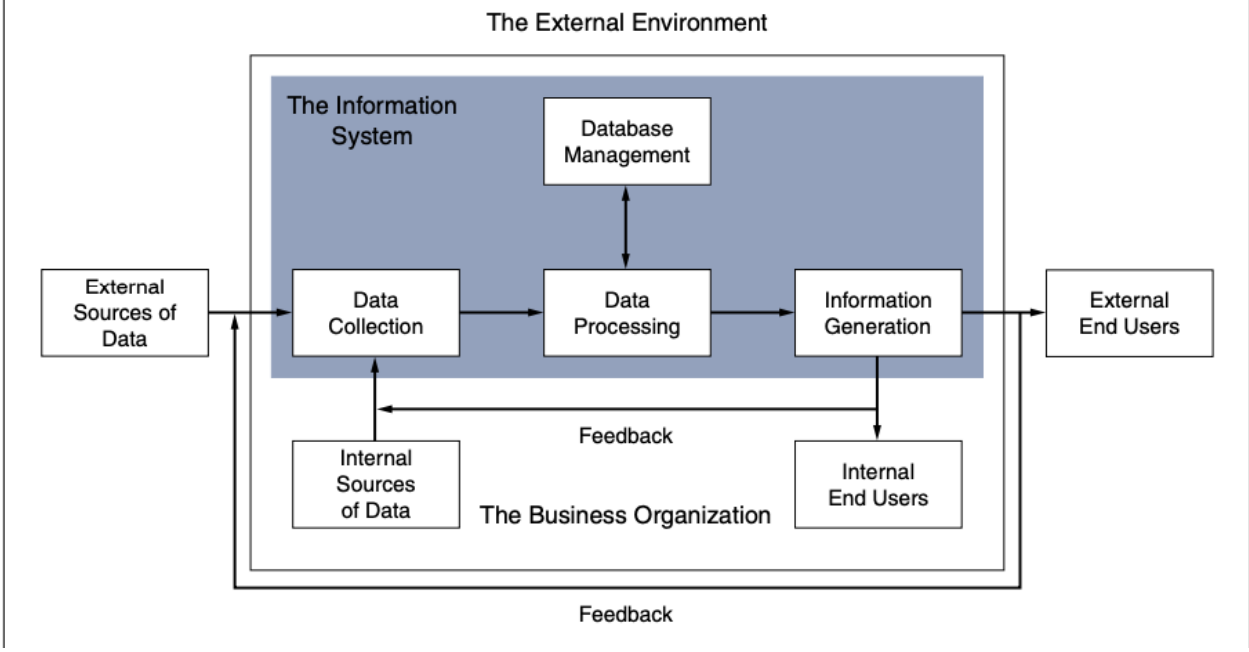
Figure 1-5 presents the general model for viewing AIS applications. This is a general model because it describes all information systems, regardless of their technological architecture. The elements of the general model are end users, data sources, data collection, data processing, database management, information generation, and feedback.

End Users

End users fall into two general groups: external and internal. External users include creditors, stockholders, potential investors, regulatory agencies, tax authorities, suppliers, and customers. Institutional users such as banks, the SEC, and the Internal Revenue Service (IRS) receive information in the form of financial statements, tax returns, and other reports that the firm has a legal obligation to produce. Trading partners (customers and suppliers) receive transaction-oriented information, including purchase orders, billing statements, and shipping documents.

Internal users include management at every level of the organization, as well as operations personnel. In contrast to external reporting, the organization has a great deal of latitude in the way it meets the needs of internal users. Although there are some well-accepted conventions and practices, internal reporting is governed primarily by what gets the job done. System designers, including accountants, must balance the desires of internal users against legal and economic concerns such as adequate control and security, proper accountability, and the cost of providing alternative forms of information. Thus, internal reporting poses a less structured and generally more difficult challenge than external reporting.

FIGURE 1-5 GENERAL MODEL FOR ACCOUNTING INFORMATION SYSTEM



DATA VERSUS INFORMATION. Before discussing the data sources portion of Figure 1-5, we must make an important distinction between the terms data and information. Data are facts, which may or may not be processed (edited, summarized, or refined) and have no direct effect on the user. By contrast, information causes the user to take an action that he or she otherwise could not, or would not, have taken. Information is often defined simply as processed data. This is an inadequate definition. Information is determined by the effect it has on the user, not by its physical form. For example, a purchasing agent receives a daily report listing raw material inventory items that are at low levels. This report causes the agent to place orders for more inventory. The facts in this report have information content for the purchasing agent. However, this same report in the hands of the personnel manager is a mere collection of facts, or data, causing no action and having no information content.

We can see from this example that one person's information is another person's data. Thus, information is not just a set of processed facts arranged in a formal report. Information allows users to take action to resolve conflicts, reduce uncertainty, and make decisions. We should note that action does not necessarily mean a physical act. For instance, a purchasing agent who receives a report showing that inventory levels are adequate will respond by ordering nothing. The agent's action to do nothing is a conscious decision, triggered by information and different from doing nothing because of being uninformed.

The distinction between data and information has pervasive implications for the study of information systems. If output from the information system fails to cause users to act, the system serves no purpose and has failed in its primary objective.

Data Sources

Data sources are financial transactions that enter the information system from both internal and external sources. External financial transactions are the most common source of data for most organizations. These are economic exchanges with other business entities and individuals outside the firm. Examples include the sale of goods and services, the purchase of inventory, the receipt of cash, and the disbursement of cash (including payroll). Internal financial transactions involve the exchange or movement of resources within the organization. Examples include the movement of raw materials into work-in-process (WIP), the application of labor and overhead to WIP, the transfer of WIP into finished goods inventory, and the depreciation of plant and equipment.

Data Collection

Data collection is the first operational stage in the information system. The objective is to ensure that event data entering the system are valid, complete, and free from material errors. In many respects, this is the most important stage in the system. Should transaction errors pass through data collection undetected, the system may process the errors and generate erroneous and unreliable output. This, in turn, could lead to incorrect actions and poor decisions by the users.

Two rules govern the design of data collection procedures: relevance and efficiency. The information system should capture only relevant data. A fundamental task of the system designer is to determine what is and what is not relevant. He or she does so by analyzing the user's needs. Only data that ultimately contribute to information (as defined previously) are relevant. The data collection stage should be designed to filter irrelevant facts from the system.

Efficient data collection procedures are designed to collect data only once. These data can then be made available to multiple users. Capturing the same data more than once leads to data redundancy and inconsistency. Information systems have limited collection, processing, and data storage capacity. Data redundancy overloads facilities and reduces the overall efficiency of the system. Inconsistency among redundant data elements can result in inappropriate actions and bad decisions.

Data Processing

Once collected, data usually require processing to produce information. Tasks in the data processing stage range from simple to complex. Examples include mathematical algorithms (such as linear

programming models) used for production scheduling applications, statistical techniques for sales forecasting, and posting and summarizing procedures used for accounting applications.

Database Management

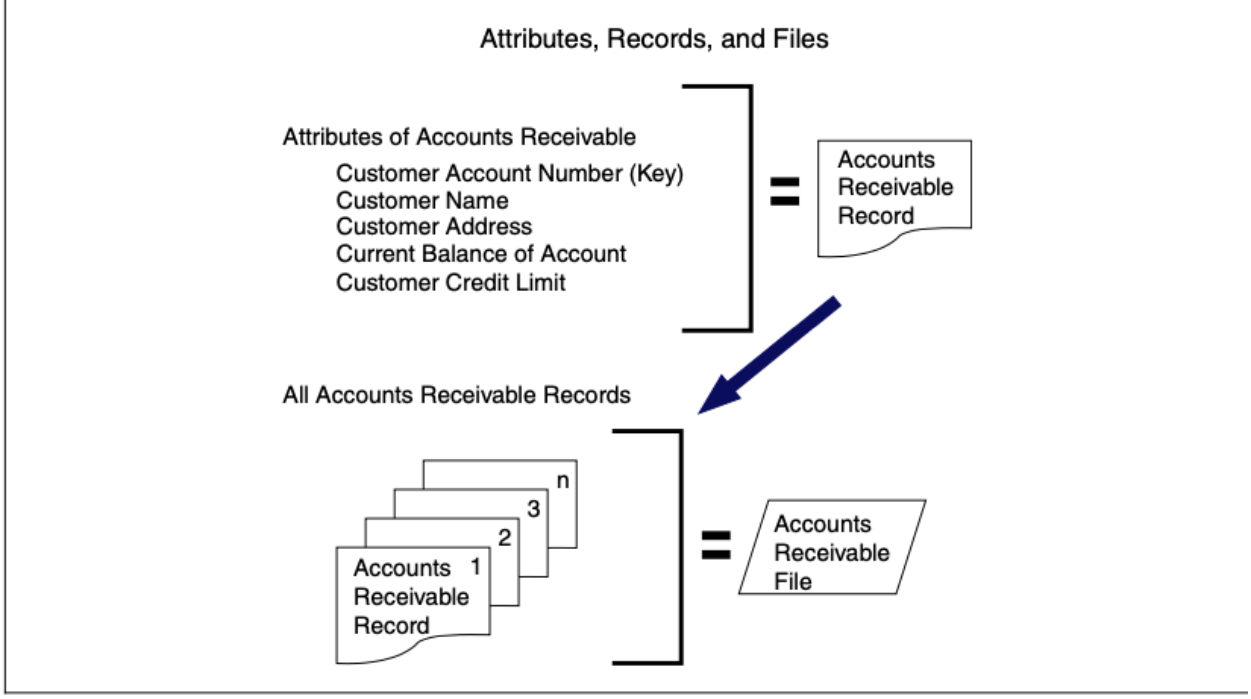
The organization's database is its physical repository for financial and nonfinancial data. We use the term database in the generic sense. It can be a filing cabinet or a computer disk. Regardless of the database's physical form, we can represent its contents in a logical hierarchy. The levels in the data hierarchy— attribute, record, and file—are illustrated in Figure 1-6.

DATA ATTRIBUTE. The data attribute is the most elemental piece of potentially useful data in the database. An attribute is a logical and relevant characteristic of an entity about which the firm captures data. The attributes shown in Figure 1-6 are logical because they all relate sensibly to a common entity— accounts receivable (AR). Each attribute is also relevant because it contributes to the information content of the entire set. As proof of this, the absence of any single relevant attribute diminishes or destroys the information content of the set. The addition of irrelevant or illogical data would not enhance the information content of the set.

RECORD. A record is a complete set of attributes for a single occurrence within an entity class. For example, a particular customer's name, address, and account balance is one occurrence (or record) within the AR class. To find a particular record within the database, we must be able to identify it uniquely. Therefore, every record in the database must be unique in at least one attribute.1 This unique identifier attribute is the primary key. Because no

natural attribute (such as customer name) can guarantee uniqueness, we typically assign artificial keys to records. The key for the AR records in Figure 1-6 is the customer account number. This is the only unique identifier in this record class. The other attributes possess values that may also exist in other records. For instance, multiple customers may have the same name, sales amounts, credit limits, and balances. Using any one of these as a key to find a record in a large database would be a difficult task. These nonunique attributes are, however, often used as secondary keys for categorizing data. For example, the account balance attribute can be used to prepare a list of customers with balances greater than $10,000.

FIGURE 1-6 THE DATA HIERARCHY



FILES. A file is a complete set of records of an identical class. For example, all the AR records of the organization constitute the AR file. Similarly, files

are constructed for other classes of records such as inventory, accounts payable, and payroll. The organization's database is the entire collection of such files.

DATABASE MANAGEMENT TASKS. Database management involves three fundamental tasks: storage, retrieval, and deletion. The storage task assigns keys to new records and stores them in their proper location in the database. Retrieval is the task of locating and extracting an existing record from the database for processing. After processing is complete, the storage task restores the updated record to its place in the database. Deletion is the task of permanently removing obsolete or redundant records from the database.

Information Generation

Information generation is the process of compiling, arranging, formatting, and presenting information to users. Information can be an operational document such as a sales order, a structured report, or a message on a computer screen. Regardless of physical form, useful information has the following characteristics: relevance, timeliness, accuracy, completeness, and summarization.

RELEVANCE. The contents of a report or document must serve a purpose. This could be to support a manager's decision or a clerk's task. We have established that only data relevant to a user's action have information content. Therefore, the information system should present only relevant data in its reports. Reports containing irrelevancies waste resources and may be counterproductive to the user. Irrelevancies detract attention from the true message of the report and may result in incorrect decisions or actions.

TIMELINESS. The age of information is a critical factor in determining its usefulness. Information must be no older than the time of the action it supports. For example, if a manager makes decisions daily to purchase inventory from a supplier based on an inventory status report, then the information in the report should be no more than a day old.

ACCURACY. Information must be free from material errors. However, materiality is a difficult concept to quantify. It has no absolute value; it is a problem-specific concept. This means that, in some cases, information must be perfectly accurate. In other instances, the level of accuracy may be lower. Material error exists when the amount of inaccuracy in information causes the user to make poor decisions or to fail to make necessary decisions. We sometimes must sacrifice absolute accuracy to obtain timely information. Often, perfect information is not available within the user's decision time frame. Therefore, in providing information, system designers seek a balance between information that is as accurate as possible, yet timely enough to be useful.

COMPLETENESS. No piece of information essential to a decision or task should be missing. For example, a report should provide all necessary calculations and present its message clearly and unambiguously.

SUMMARIZATION. Information should be aggregated in accordance with the user's needs. Lower level managers tend to need information that is highly detailed. As information flows upward through the organization to top management, it becomes more summarized. We shall look more closely at

the effects that organizational structure and managerial level have on information reporting later in this chapter.

Feedback

Feedback is a form of output that is sent back to the system as a source of data. Feedback may be internal or external and is used to initiate or alter a process. For example, an inventory status report signals the inventory control clerk that items of inventory have fallen to, or below, their minimum allowable levels. Internal feedback from this information will initiate the inventory ordering process to replenish the inventories. Similarly, external feedback about the level of uncollected customer accounts can be used to adjust the organization's credit-granting policies.

Information System Objectives

Each organization must tailor its information system to the needs of its users. Therefore, specific information system objectives may differ from firm to firm. Three fundamental objectives are, however, common to all systems:

1. To support the stewardship function of management. Stewardship refers to management's responsibility to properly manage the resources of the firm. The information system provides information about resource utilization to external users via traditional financial statements and other mandated reports. Internally, management receives stewardship information from various responsibility reports.

2. To support management decision making. The information system supplies managers with the information they need to carry out their decision-making responsibilities.

3. To support the firm's day-to-day operations. The information system provides information to operations personnel to assist them in the efficient and effective discharge of their daily tasks.

ACQUISITION OF INFORMATION SYSTEMS

We conclude this section with a brief discussion of how organizations obtain information systems. Usually, they do so in two ways: (1) they develop customized systems from scratch through in-house systems development activities, and (2) they purchase preprogrammed commercial systems from software vendors. Larger organizations with unique and frequently changing needs engage in in-house development. The formal process by which this is accomplished is called the system development life cycle. Smaller companies and larger firms that have standardized information needs are the primary market for commercial software. Three basic types of commercial software are turnkey systems, backbone systems, and vendor-supported systems.

Turnkey systems are completely finished and tested systems that are ready for implementation. Typically, they are general-purpose systems or systems customized to a specific industry. In either case, the end user must have standard business practices that permit the use of canned or off-the-shelf systems. The better turnkey systems have built-in software options that allow the user to customize input, output, and processing through menu choices. However, configuring the systems to meet user needs can be a formidable task.

Backbone systems consist of a basic system structure on which to build. The primary processing logic is preprogrammed, and the vendor then designs the user interfaces to suit the client's unique needs. A backbone system is a compromise between a custom system and a turnkey system. This approach can produce satisfactory results, but customizing the system is costly.

Vendor-supported systems are custom (or customized) systems that client organizations purchase commercially rather than develop in-house. Under this approach, the software vendor designs, implements, and maintains the system for its client. This is a popular option with health care and legal services organizations that have complex systems requirements but are not of sufficient magnitude to justify retaining an in-house systems development staff. Indeed, this has become a popular option for many organizations that traditionally have relied on in-house development but have chosen to outsource these activities. In recent years, public accounting firms have expanded their involvement in the vendor supported market.

The Evolution of Information System Models

Over the past 50 years, a number of different approaches or models have represented AIS. Each new model evolved because of the shortcomings and limitations of its predecessor. An interesting feature in this evolution is that the newest technique does not immediately replace older models. Thus, at any point in time, various generations of systems exist across different organizations and may even coexist within a single enterprise. The modern auditor needs to be familiar with the operational features of all AIS approaches that he or she is likely to encounter. This book deals extensively with five such models: manual processes, flat-file systems,

the database approach, the REA (resources, events, and agents) model, and ERP (enterprise resource planning) systems. Each of these is briefly outlined in the following section.

THE MANUAL PROCESS MODEL

The manual process model is the oldest and most traditional form of accounting systems. Manual systems constitute the physical events, resources, and personnel that characterize many business processes. This includes such tasks as order-taking, warehousing materials, manufacturing goods for sale, shipping goods to customers, and placing orders with vendors. Traditionally, this model also includes the physical task of record keeping. Often, manual record keeping is used to teach the principles of accounting to business students. However, this approach is simply a training aid. Manual records are never used in practice today.

Nevertheless, there is merit in studying the manual process model before mastering computer-based systems. First, learning manual systems helps establish an important link between the AIS course and other accounting courses. The AIS course is often the only accounting course in which students see where data originate, how they are collected, and how and where information is used to support day-to-day operations. By examining information flows, key tasks, and the use of traditional accounting records in transaction processing, the students' bookkeeping focus is transformed into a business processes perspective.

Second, the logic of a business process is more easily understood when it is not shrouded by technology. The information needed to trigger and support events such as selling, warehousing, and shipping is fundamental and independent of the technology that underlies the information system. For

example, a shipping notice informing the billing process that a product has been shipped serves this purpose whether it is produced and processed manually or digitally. Once students understand what tasks need to be performed, they are better equipped to explore different and better ways of performing these tasks through technology.

Finally, manual procedures facilitate understanding internal control activities, including segregation of functions, supervision, independent verification, audit trails, and access controls. Because human nature lies at the heart of many internal control issues, we should not overlook the importance of this aspect of the information system.

THE FLAT-FILE MODEL

The flat-file approach is most often associated with so-called legacy systems. These are large mainframe systems that were implemented in the late 1960s through the 1980s. Organizations today still use these systems extensively. Eventually, modern database management systems will replace them, but in the meantime, accountants must continue to deal with legacy system technologies.

The flat-file model describes an environment in which individual data files are not related to other files. End users in this environment own their data files rather than share them with other users. Thus, stand-alone applications rather than integrated systems perform data processing.

When multiple users need the same data for different purposes, they must obtain separate data sets structured to their specific needs. Figure 1-12 illustrates how customer sales data might be presented to three different users in a durable goods retailing organization. The accounting function needs customer sales data organized by account number and structured to

show outstanding balances. This is used for customer billing, AR maintenance, and financial statement preparation. Marketing needs customer sales history data organized by demographic keys. They use this for targeting new product promotions and for selling product upgrades. The product services group needs customer sales data organized by products and structured to show scheduled service dates. Such information is used for making after-sales contacts with customers to schedule preventive maintenance and to solicit sales of service agreements.

The data redundancy demonstrated in this example contributes to three significant problems in the flat-file environment: data storage, data updating, and currency of information. These and other problems associated with flat files are discussed in the following sections.

Data Storage

An efficient information system captures and stores data only once and makes this single source available to all users who need it. In the flat-file environment, this is not possible. To meet the private data needs of users, organizations must incur the costs of both multiple collection and multiple storage procedures. Some commonly used data may be duplicated dozens, hundreds, or even thousands of times.

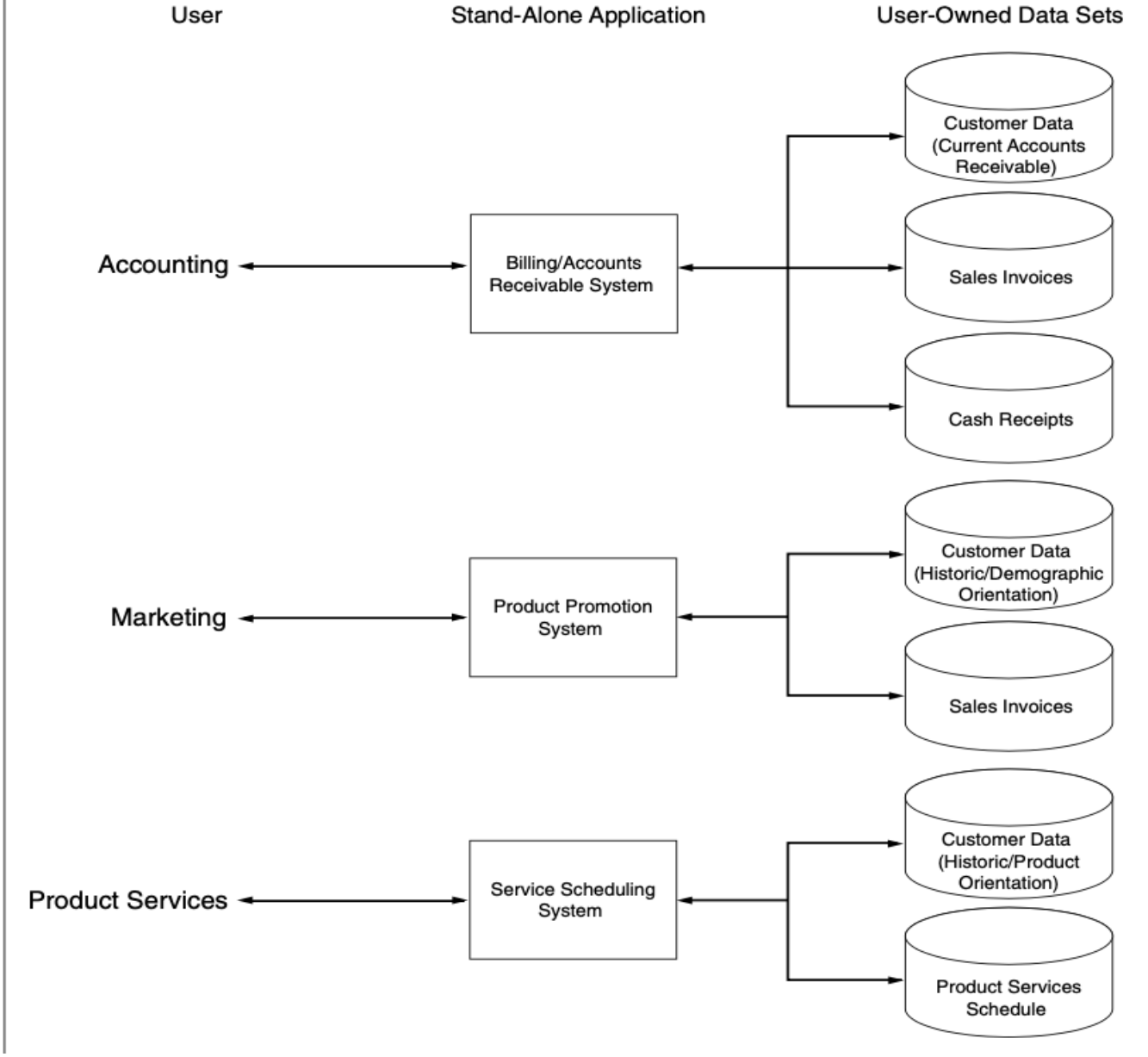
Data Updating

Organizations have a great deal of data stored in files that require periodic updating to reflect changes. For example, a change to a customer's name or address must be reflected in the appropriate master files. When users keep separate files, all changes must be made separately for each user. This adds significantly to the task and the cost of data management.

Currency of Information

In contrast to the problem of performing multiple updates is the problem of failing to update all the user files affected by a change in status. If update information is not properly disseminated, the change will not be reflected in some users' data, resulting in decisions based on outdated information.

FIGURE 1-12 FLAT-FILE MODEL



Task-Data Dependency

Another problem with the flat-file approach is the user's inability to obtain additional information as his or her needs change. This problem is called task-data dependency. The user's information set is constrained by the data that he or she possesses and controls. Users act independently rather than as members of a user community. In such an environment, it is very difficult to establish a mechanism for the formal sharing of data. Therefore, new information needs tend to be satisfied by procuring new data files. This takes time, inhibits performance, adds to data redundancy, and drives data management costs even higher.

Flat Files Limit Data Integration

The flat-file approach is a single-view model. Files are structured, formatted, and arranged to suit the specific needs of the owner or primary user of the data. Such structuring, however, may exclude data attributes that are useful to other users, thus preventing successful integration of data across the organization. For example, because the accounting function is the primary user of accounting data, these data are often captured, formatted, and stored to accommodate financial reporting and generally accepted accounting principles. This structure, however, may be useless to the organization's other (nonaccounting) users of accounting data (GAAP), such as the marketing, finance, production, and engineering functions. These users are presented with three options: (1) do not use accounting data to support decisions; (2) manipulate and massage the existing data structure to suit their unique needs; or (3) obtain additional private sets of the data and incur the costs and operational problems associated with data redundancy.

In spite of these inherent limitations, many large organizations still use flat files for their general ledger and other financial systems. Most members of the data processing community assumed that the end of the century would see the end of legacy systems. Instead, corporate America invested billions of dollars making these systems year-2000 (Y2K) compliant. Legacy systems continue to exist because they add value for their users, and they will not be replaced until they cease to add value. Students who may have to work with these systems in practice should be aware of their key features.

THE DATABASE MODEL

An organization can overcome the problems associated with flat files by implementing the database model to data management. Figure 1 13 illustrates how this approach centralizes the organization's data into a common database that is shared by other users. With the organization's data in a central location, all users have access to the data they need to achieve their respective objectives. Access to the data resource is controlled by a database management system (DBMS). The DBMS is a special software system that is programmed to know which data elements each user is authorized to access. The user's program sends requests for data to the DBMS, which validates and authorizes access to the database in accordance with the user's level of authority. If the user requests data that he or she is not authorized to access, the request is denied. Clearly, the organization's procedures for assigning user authority are an important control issue for auditors to consider.

The most striking difference between the database model and the flat-file model is the pooling of data into a common database that all organizational users share. With access to the full domain of entity data,

changes in user information needs can be satisfied without obtaining additional private data sets. Users are constrained only by the limitations of the data available to the entity and the legitimacy of their need to access it. Through data sharing, the following traditional problems associated with the flat-file approach may be overcome:

Elimination of data redundancy. Each data element is stored only once, thereby eliminating data redundancy and reducing data collection and storage costs. For example, customer data exist only once, but is shared by accounting, marketing, and product services users. To accomplish this, the data are stored in a generic format that supports multiple users.

Single update. Because each data element exists in only one place, it requires only a single update procedure. This reduces the time and cost of keeping the database current.

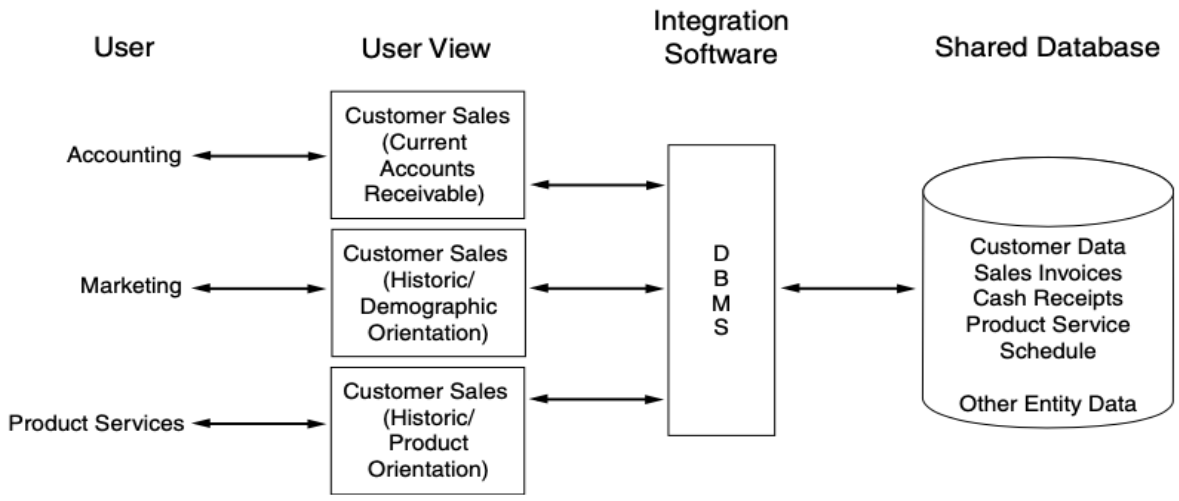
Current values. A single change to a database attribute is automatically made available to all users of the attribute. For example, a customer address change is immediately reflected in the marketing and product services views when the billing clerk enters it.

Flat-file and early database systems are called traditional systems. Within this context, the term traditional means that the organization's information systems applications (its programs) function independently of each other rather than as an integrated whole. Early database management systems were designed to interface directly with existing flat-file programs. Thus, when an organization replaced its flat files with a database, it did not have to spend millions of dollars rewriting its existing programs. Indeed, early database applications performed essentially the same independent functions as their flat-file counterparts.

Another factor that limited integration was the structured database models of the era. These models were inflexible and did not permit the degree of data sharing that is found in modern database systems. Whereas some degree of integration was achieved with this type of database, the primary and immediate advantage to the organization was the reduction in data redundancy.

True integration, however, would not be possible until the arrival of the relational database model. This flexible database approach permits the design of integrated systems applications capable of supporting the information needs of multiple users from a common set of integrated database tables. We should note, however, that the relational database model merely permits integration to occur; integration is not guaranteed. Poor systems design can occur under any model. In fact, most organizations today that employ a relational database run application that are traditional in design and do not make full use of relational technology. The two remaining models to be discussed (REA and ERP) employ relational database technology more effectively.

FIGURE 1-13 **DATABASE MODEL**



THE REA MODEL

REA is an accounting framework for modeling an organization's critical resources, events, and agents (REA) and the relationships between them. Once specified, both accounting and nonaccounting data about these phenomena can be identified, captured, and stored in a relational database. From this repository, user views can be constructed that meet the needs of all users in the organization. The availability of multiple views allows flexible use of transaction data and permits the development of AIS that promote, rather than inhibit, integration.

The REA model was proposed in 1982 as a theoretical model for accounting.3 Advances in database technology have focused renewed attention on REA as a practical alternative to the classic accounting framework. The following summarizes the key elements of the REA models.

Resources

Economic resources are the assets of the organization. They are defined as objects that are both scarce and under the control of the enterprise. This definition departs from the traditional model because it does not include AR. An account receivable is an artifact record used simply to store and transmit data. Because it is not an essential element of the system, it does not need to be included in the database. Instead, AR values are derived from the difference between sales to customers and the cash received in payment of sales.

Events

Economic events are phenomena that affect changes in resources. They can result from activities such as production, exchange, consumption,

and distribution. Economic events are the critical information elements of the accounting system and should be captured in a highly detailed form to provide a rich database.

Agents

Economic agents are individuals and departments that participate in an economic event. They are parties both inside and outside the organization with discretionary power to use or dispose of economic resources. Examples of agents include salesclerks, production workers, shipping clerks, customers, and vendors. The REA model requires that accounting phenomena be characterized in a manner consistent with the development of multiple user views. Business data must not be preformatted or artificially constrained and should reflect all relevant aspects of the underlying economic events. As such, REA procedures and databases are structured around events rather than accounting artifacts such as journals, ledgers, charts of accounts, and double-entry accounting. Under the REA model, business organizations prepare financial statements directly from the event database. The following sales and cash receipts events for a hypothetical retailer can be used to illustrate the inherent differences between classic and REA accounting:

Sept. 1: Sold 5 units of product X 21 @ $30 per unit and 10 units of product Y33 @ $20 per unit to customer Smith (Total sale ¼ $350). The unit cost of the inventory is $16 and $12, respectively (Total CGS ¼ $200).

Sept. 30: Received $200 cash from customer Smith on account, check number 451.

In flat-file or non-REA database systems, the two events would be recorded in a set of classic accounts like those shown in Figure 1-14. This involves summarizing the events to accommodate the account structure.

However, the details of the transactions are not captured under this approach.

An REA accounting system would capture these transactions in a series of relational database tables that emphasize events rather than accounts. This is illustrated in Figure 1-15. Each table deals with a separate aspect of the transaction. Data pertaining to the customer, the invoice, specific items sold, and so on can thus be captured for multiple uses and users. The tables of the database are linked via common attributes called primary keys (PK) and embedded foreign keys (FK) that permit integration. In contrast, the files in the traditional system are independent of each other and thus cannot accommodate such detailed data gathering. As a result, traditional systems must summarize event data at the loss of potentially important facts.

Traditional accounting records including journals, ledgers, and charts of accounts do not exist as physical files or tables under the REA model. For financial reporting purposes, views or images of traditional accounting records are constructed from the event tables. For example, the amount of Smith's account receivable balance is derived from [total sales (Quant sold * Sale price) less cash received (Amount) ¼ 350 _ 200 ¼ 150]. If necessary or desired, journal entries and general ledger amounts can also be derived from these event tables. For example, the Cost-of-Goods-Sold control account balance is (Quant sold * Unit cost) summed for all transactions for the period.

REA is a conceptual model, not a physical system. Many of its tenets, however, are found within advanced database systems. The most notable application of REA philosophy is seen in the proliferation of ERP systems, which are discussed in the following section.

FIGURE 1-14 CLASSIC ACCOUNTING RECORDS IN A NON-REA SYSTEM

Accounts Receivable File

Customer Number	Customer Name	Debit	Credit	Balance
23456	Smith	350	200	150

Cost of Goods Sold File

Acct Number	Debit	Credit
5734	270	

Sales File

Acct Number	Credit
4975	350

FIGURE 1-15 EVENT DATABASE IN AN REA SYSTEM

CUSTOMER Table

(PK)

Cust Num	Name	Address	Tel Num	Credit Limit	Billing Date	Anniver
23456	Smith	125 Elm St., City	610-555-1234	$5,000	12	12/9/89

INVOICE Table

(PK) (FK)

Invoice Num	Invoice Date	Ship Date	Terms	Carrier	Cust Num
98765	9/01/09	9/03/09	Net 30	UPS	23456

LINE ITEM Table

(PK) (FK)

Product Num	Invoice Num	**Quant Sold**
X21	98765	**5**
Y33	98765	**10**

PRODUCT Table

(PK)

Product Num	Description	**Sale Price**	**Unit Cost**	QOH	Reorder Point
X21	Something or other	**$30**	**$22**	200	50
Y33	Something else	**$20**	**$16**	159	60

CASH REC Table

(PK) (FK)

Trans Num	Cust Num	Check Num	**Amount**	Check Date	Date Posted
77654	23456	451	**$200**	9/28/09	9/30/09

ENTERPRISE RESOURCE PLANNING SYSTEMS

Enterprise resource planning (ERP) is an information system model that enables an organization to automate and integrate its key business processes. ERP breaks down traditional functional barriers by facilitating data sharing, information flows, and the introduction of common business practices among all organizational users. The implementation of an ERP system can be a massive undertaking that can span several years. Because of the complexity and size of ERPs, few organizations are willing or able to commit the necessary financial and physical resources and incur the risk of developing an ERP system inhouse. Hence, virtually all ERPs are commercial products. The recognized leaders in the market are SAP, Oracle, J.D. Edwards & Co., and PeopleSoft Inc.

ERP packages are sold to client organizations in modules that support standard processes. Some common ERP modules include:

- Asset Management
- Financial Accounting
- Human Resources
- Industry-Specific Solutions
- Plant Maintenance
- Production Planning
- Quality Management
- Sales and Distribution
- Inventory Management

One of the problems with standardized modules is that they may not always meet the organization’s exact needs. For example, a textile manufacturer in India implemented an ERP package only to discover that extensive,

unexpected, and expensive modifications had to be made to the system. The ERP would not allow the user to assign two different prices to the same bolt of cloth. The manufacturer charged one price for domestic consumption, but another (four times higher) for exported products. That particular ERP system, however, provided no way to assign two prices to the same item while maintaining an accurate inventory count.

Organizations that hope to successfully implement an ERP will need to modify their business processes to suit the ERP, modify the ERP to suit their business, or, more likely, modify both. Often, additional software applications need to be connected to the ERP to handle unique business functions, particularly industry-specific tasks. These applications, often called bolt-ons, are not always designed to communicate with ERP packages. The process of creating a harmonious whole can be quite complex and sometimes fails, resulting in significant losses to the organization. ERP packages are enormously expensive, but the savings in efficiencies should be significant. Organization management should exercise great care in deciding which, if any, ERP is best for them.

The Role of the Accountant

The final section of this chapter deals with the accountant's relationship to the information system. Accountants are primarily involved in three ways: as system users, designers, and auditors.

ACCOUNTANTS AS USERS

In most organizations, the accounting function is the single largest user of IT. All systems that process financial transactions impact the accounting function in some way. As end users, accountants must provide a clear picture

of their needs to the professionals who design their systems. For example, the accountant must specify accounting rules and techniques to be used, internal control requirements, and special algorithms such as depreciation models. The accountant's participation in systems development should be active rather than passive. The principal cause of design errors that result in system failure is the absence of user involvement.

ACCOUNTANTS AS SYSTEM DESIGNERS

An appreciation of the accountant's responsibility for system design requires a historic perspective that predates the computer as a business information tool. Traditionally, accountants have been responsible for key aspects of the information system, including assessing the information needs of users, defining the content and format of output reports, specifying sources of data, selecting the appropriate accounting rules, and determining the controls necessary to preserve the integrity and efficiency of the information system.

These traditional systems were physical, observable, and unambiguous. The procedures for processing information were manual, and the medium for transmitting and storing data was paper. With the arrival of the computer, computer programs replaced manual procedures, and paper records were stored digitally. The role accountants would play in this new era became the subject of much controversy. Lacking computer skills, accountants were generally uncertain about their status and unwilling to explore this emerging technology.

Many accountants relinquished their traditional responsibilities to the new generation of computer professionals who were emerging in their organizations. Computer programmers, often with no accounting or business

training, assumed full responsibility for the design of AIS. As a result, many systems violated accounting principles and lacked necessary controls. Large system failures and computer frauds marked this period in accounting history. By the mid-1970s, in response to these problems, the accounting profession began to reassess the accountant's professional and legal responsibilities for computer-based systems.

Today, we recognize that the responsibility for systems design is divided between accountants and IT professionals as follows: the accounting function is responsible for the conceptual system, and the IT function is responsible for the physical system. To illustrate the distinction between conceptual and physical systems, consider the following example:

The credit department of a retail business requires information about delinquent accounts from the AR department. This information supports decisions made by the credit manager regarding the creditworthiness of customers.

The design of the conceptual system involves specifying the criteria for identifying delinquent customers and the information that needs to be reported. The accountant determines the nature of the information required, its sources, its destination, and the accounting rules that need to be applied. The physical system is the medium and method for capturing and presenting the information. The computer professionals determine the most economical and effective technology for accomplishing the task. Hence, systems design should be a collaborative effort. Because of the uniqueness of each system and the susceptibility of systems to serious error and even fraud, the accountant's involvement in systems design should be pervasive. Later, we shall see that the active participation of accountants is critical to the system's success.

ACCOUNTANTS AS SYSTEM AUDITORS

Auditing is a form of independent attestation performed by an expert—the auditor—who expresses an opinion about the fairness of a company's financial statements. Public confidence in the reliability of internally produced financial statements rests directly on their being validated by an independent expert auditor. This service is often referred to as the attest function. Auditors form their opinions based on a systematic process.

Both internal and external auditors conduct audits. External auditing is often called independent auditing because certified public accounting (CPA) firms that are independent of the client organization's management perform them. External auditors represent the interests of third-party stakeholders in the organization, such as stockholders, creditors, and government agencies.

External Auditing

Historically, the external accountant's responsibility as a systems auditor was limited to the attest function described previously. In recent years this role has been expanded by the broader concept of assurance. The Big Four public accounting firms have now renamed their traditional audit functions assurance services.

ASSURANCE. Assurance services are professional services, including the attest function, that are designed to improve the quality of information, both financial and nonfinancial, used by decision makers. For example, a client may contract assurance services to obtain an opinion as to the quality or marketability of a product. Alternatively, a client may need information about the efficiency of a production process or the effectiveness of their network security system. A gray area of overlap exists between assurance and

consulting services, which auditors must avoid. They were once allowed to provide consulting services to audit clients. This is now prohibited under SOX legislation.

IT AUDITING. IT auditing is usually performed as part of a broader financial audit. The organizational unit responsible for conducting IT audits may fall under the assurance services group or be independent. Typically, they carry a name such as IT Risk Management, Information Systems Risk Management, or Global Risk Management. The IT auditor attests to the effectiveness of a client's IT controls to establish their degree of compliance with prescribed standards. Because many of the modern organization's internal controls are computerized, the IT audit may be a large portion of the overall audit.

Internal Auditing

Internal auditing is an appraisal function housed within the organization. Internal auditors perform a wide range of activities on behalf of the organization, including conducting financial statement audits, examining an operation's compliance with organizational policies, reviewing the organization's compliance with legal obligations, evaluating operational efficiency, detecting and pursuing fraud within the firm, and conducting IT audits. As you can see, the tasks that external and internal auditors perform are similar. The feature that most clearly distinguishes the two groups is their respective constituencies. External auditors represent third-party outsiders, whereas internal auditors represent the interests of management.

Summary

The first section of this chapter introduced basic systems concepts and presented a framework for distinguishing between accounting information systems and management information systems. This distinction is related to the types of transactions these systems process. AIS applications process financial transactions, and MIS applications process nonfinancial transactions. The section then presented a general model for accounting information systems. The model is composed of four major tasks that exist in all AIS applications: data collection, data processing, database management, and information generation.

The second section examined the relationship between organizational structure and the information system. It focused on functional segmentation as the predominant method of structuring a business and examined the functions of a typical manufacturing firm. The section presented two general methods of organizing the IT function: the centralized approach and the distributed approach.

The third section reviewed the evolution of AIS models. Each new model evolved because of the shortcomings and limitations of its predecessor. As new approaches evolved, however, the predecessor or legacy systems often remained in service. Thus, at any point in time, various generations of systems coexist across different organizations and even within a single enterprise. Five AIS models were examined.

The final section of this chapter examined three roles of accountants as (1) users of AIS, (2) designers of AIS, and (3) auditors of AIS. In most organizations, the accounting function is the single largest user of the AIS. The IT function is responsible for designing the physical system, and the accounting function is responsible for specifying the conceptual system.

Auditing is an independent attestation performed by the auditor, who expresses an opinion about the fairness of a company's financial statements. Both external and internal auditors conduct IT audits. The IT auditor attests to the effectiveness of a client's IT controls to establish their degree of compliance with prescribed standards.

Multiple-Choice Questions

1. Which of the following is NOT a financial transaction?

a. purchase of products

b. cash receipts

c. update valid vendor file

d. sale of inventory

2. The following are subsystems of the Accounting Information System, EXCEPT

a. Transaction Processing System.

b. Human Resources System.

c. General Ledger/Financial Reporting System.

d. Management Reporting System.

3. Which of the following is NOT a purpose of the Transaction Processing System?

a. managing and reporting on the status of financial investments

b. converting economic events into financial transactions

c. distributing essential information to operations personnel to support their daily operations

d. recording financial transactions in the accounting records

4. The objectives of the data collection activity of the general model for Accounting Information Systems are to collect data that are

a. relevant and redundant.

b. efficient and objective.

c. efficient and redundant.

d. efficient and relevant.

5. Which of the following is NOT a characteristic of effective information?

a. relevance

b. accuracy

c. summarization

d. precision

6. Which of the following is NOT a database management task?

a. retrieval

b. storage

c. summarization

d. deletion

7. When viewed from the highest to most elemental level, the data hierarchy is

a. attribute, record, file.

b. record, attribute, key.

c. file, record, attribute.

d. file, record, key.

e. key, record, file.

8. Which is NOT an accountant's primary role in information systems?

a. system user

b. system auditor

c. system designer

d. system programmer

9. Which of the following is NOT an objective of all information systems?

a. support for the stewardship function of management

b. support for management decision making

c. support for the day-to-day operations of the firm

d. all of the above are objectives

Problems

1. USERS OF INFORMATION

Classify the following users of information as either:

I—internal user

T—external user: trading partner

S—external user: stakeholder

a. Internal Revenue Service

b. Inventory control manager

c. Board of directors

d. Customers

e. Lending institutions

f. Securities and Exchange Commission

g. Stockholders

h. Chief executive officer

i. Suppliers

j. Bondholders

2. INFORMATION SYSTEM CATEGORIZATION

Classify the following items as either:

TPS—transaction processing system

FRS—financial reporting system

MRS—management reporting system

a. Variance reports

b. Sales order capture

c. Balance sheet

d. Budgets

e. Purchase order preparation

f. Tax returns

g. Sales summary by product line

h. Cash disbursements preparation

i. Annual report preparation

j. Invoice preparation

k. Cost-volume-profit analysis

Chapter 2: Introduction to Transaction Processing

Introduction

Chapter 1 introduced the transaction processing system (TPS) as an activity consisting of three major subsystems called cycles: the revenue cycle, the expenditure cycle, and the conversion cycle. Even though each cycle performs different specific tasks and supports different objectives, they share common characteristics. For example, all three TPS cycles capture financial transactions, record the effects of transactions in accounting records, and provide information about transactions to users in support of their day-to-day activities. In addition, transaction cycles produce much of the raw data from which management reports and financial statements are derived. Because of their financial impact on the firm, transaction cycles command much of the accountant's professional attention.

The purpose of this chapter is to present some preliminary topics that are common to all three transaction processing cycles. In subsequent chapters, we will draw heavily from this material as we examine the individual subsystems of each cycle in detail. This chapter is organized into five major sections. The first is an overview of transaction processing. This section defines the broad objective of the three transaction cycles and specifies the roles of their individual subsystems. The second section describes the relationship among accounting records in forming an audit trail in both manual and computer-based systems. The third section examines documentation techniques used to represent systems. This section presents several documentation techniques for manual and computer-based systems. The fourth section addresses computer-based systems. It reviews the

fundamental features of batch and real-time technologies and their implication for transaction processing. The final section examines data coding schemes and their role in transaction processing.

An Overview of Transaction Processing

TPS applications process financial transactions. A financial transaction was defined in Chapter 1 as

An economic event that affects the assets and equities of the firm, is reflected in its accounts, and is measured in monetary terms.

The most common financial transactions are economic exchanges with external parties. These include the sale of goods or services, the purchase of inventory, the discharge of financial obligations, and the receipt of cash on account from customers. Financial transactions also include certain internal events such as the depreciation of fixed assets; the application of labor, raw materials, and overhead to the production process; and the transfer of inventory from one department to another.

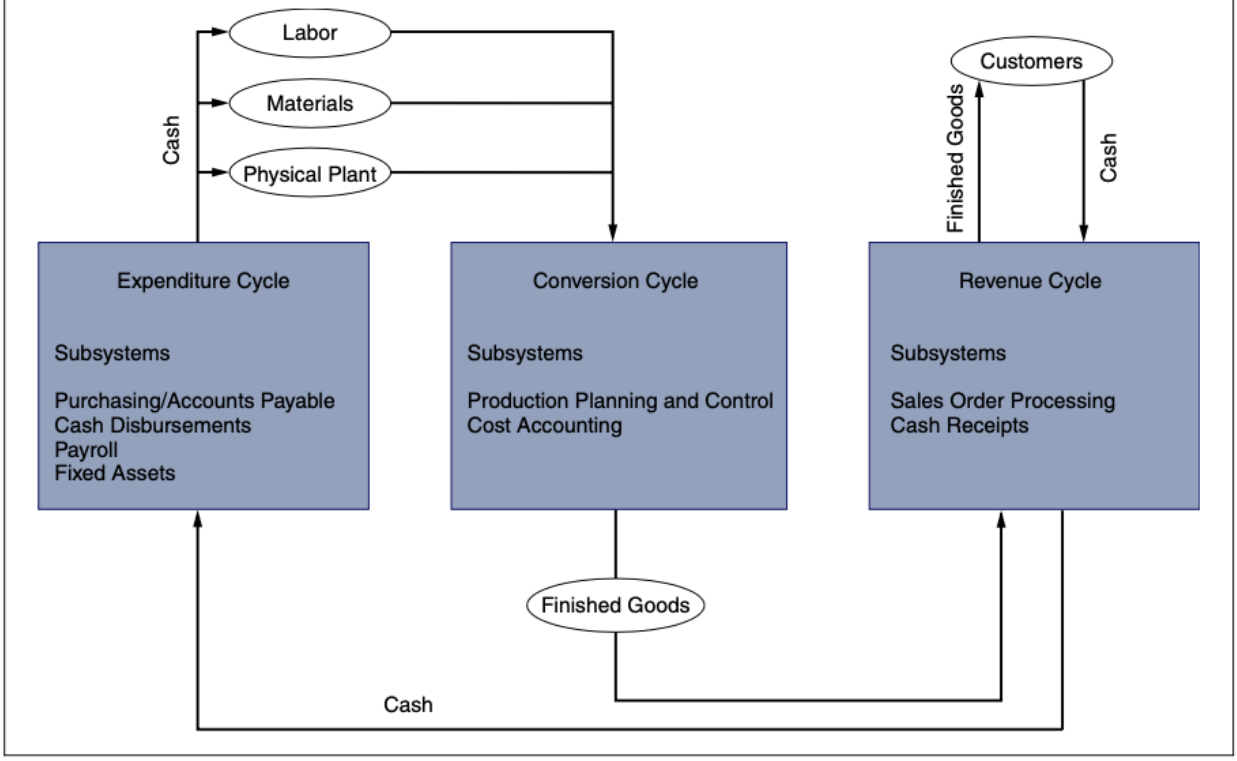
Financial transactions are common business events that occur regularly. For instance, thousands of transactions of a particular type (sales to customers) may occur daily. To deal efficiently with such volume, business firms group similar types of transactions into transaction cycles.

TRANSACTION CYCLES

Three transaction cycles process most of the firm's economic activity: the expenditure cycle, the conversion cycle, and the revenue cycle. These cycles exist in all types of businesses—both profit-seeking and not-for-profit types. For instance, every business (1) incurs expenditures in exchange for resources (expenditure cycle), (2) provides value added through its products

or services (conversion cycle), and (3) receives revenue from outside sources (revenue cycle). Figure 2-1 shows the relationship of these cycles and the resource flows between them.

FIGURE 2-1 RELATIONSHIP BETWEEN TRANSACTION CYCLES



The Expenditure Cycle

Business activities begin with the acquisition of materials, property, and labor in exchange for cash—the expenditure cycle. Figure 2-1 shows the flow of cash from the organization to the various providers of these resources. Most expenditure transactions are based on a credit relationship between the trading parties. The actual disbursement of cash takes place at some point after the receipt of the goods or services. Days or even weeks may pass between these two events. Thus, from a systems perspective, this

transaction has two parts: a physical component (the acquisition of the goods) and a financial component (the cash disbursement to the supplier). A separate subsystem of the cycle processes each component. The major subsystems of the expenditure cycle are outlined here.

Purchases/accounts payable system. This system recognizes the need to acquire physical inventory (such as raw materials) and places an order with the vendor. When the goods are received, the purchases system records the event by increasing inventory and establishing an account payable to be paid at a later date.

Cash disbursements system. When the obligation created in the purchases system is due, the cash disbursements system authorizes the payment, disburses the funds to the vendor, and records the transaction by reducing the cash and accounts payable accounts.

Payroll system. The payroll system collects labor usage data for each employee, computes the payroll, and disburses paychecks to the employees. Conceptually, payroll is a special-case purchases and cash disbursements system. Because of accounting complexities associated with payroll, most firms have a separate system for payroll processing.

Fixed asset system. A firm's fixed asset system processes transactions pertaining to the acquisition, maintenance, and disposal of its fixed assets. These are relatively permanent items that collectively often represent the organization's largest financial investment. Examples of fixed assets include land, buildings, furniture, machinery, and motor vehicles.

The Conversion Cycle

The conversion cycle is composed of two major subsystems: the production system and the cost accounting system. The production system

involves the planning, scheduling, and control of the physical product through the manufacturing process. This includes determining raw material requirements, authorizing the work to be performed and the release of raw materials into production, and directing the movement of the work-in-process through its various stages of manufacturing. The cost accounting system monitors the flow of cost information related to production. Information this system produces is used for inventory valuation, budgeting, cost control, performance reporting, and management decisions, such as make or- buy decisions.

Manufacturing firms convert raw materials into finished products through formal conversion cycle operations. The conversion cycle is not usually formal and observable in service and retailing establishments. Nevertheless, these firms still engage in conversion cycle activities that culminate in the development of a salable product or service. These activities include the readying of products and services for market and the allocation of resources such as depreciation, building amortization, and prepaid expenses to the proper accounting period. However, unlike manufacturing firms, merchandising companies do not process these activities through formal conversion cycle subsystems.

The Revenue Cycle

Firms sell their finished goods to customers through the revenue cycle, which involves processing cash sales, credit sales, and the receipt of cash following a credit sale. Revenue cycle transactions also have a physical and a financial component, which are processed separately. The primary subsystems of the revenue cycle are briefly outlined below.

Sales order processing. The majority of business sales are made on credit and involve tasks such as preparing sales orders, granting credit, shipping products (or rendering of a service) to the customer, billing customers, and recording the transaction in the accounts (accounts receivable, inventory, expenses, and sales).

Cash receipts. For credit sales, some period of time (days or weeks) passes between the point of sale and the receipt of cash. Cash receipts processing includes collecting cash, depositing cash in the bank, and recording these events in the accounts (accounts receivable and cash).

Accounting Records

MANUAL SYSTEMS

This section describes the purpose of each type of accounting record used in transaction cycles. We begin with traditional records used in manual systems (documents, journals, and ledgers) and then examine their magnetic counterparts in computer-based systems.

Documents

A document provides evidence of an economic event and may be used to initiate transaction processing. Some documents are a result of transaction processing. In this section, we discuss three types of documents: source documents, product documents, and turnaround documents.

SOURCE DOCUMENTS. Economic events result in some documents being created at the beginning (the source) of the transaction. These are called source documents. Source documents are used to capture and formalize

transaction data that the transaction cycle needs for processing. Figure 2-2 shows the creation of a source document.

The economic event (the sale) causes the salesclerk to prepare a multipart sales order, which is formal evidence that a sale occurred. Copies of this source document enter the sales system and are used to convey information to various functions, such as billing, shipping, and AR. The information in the sales order triggers specific activities in each of these departments.

FIGURE 2-2 CREATION OF A SOURCE DOCUMENT

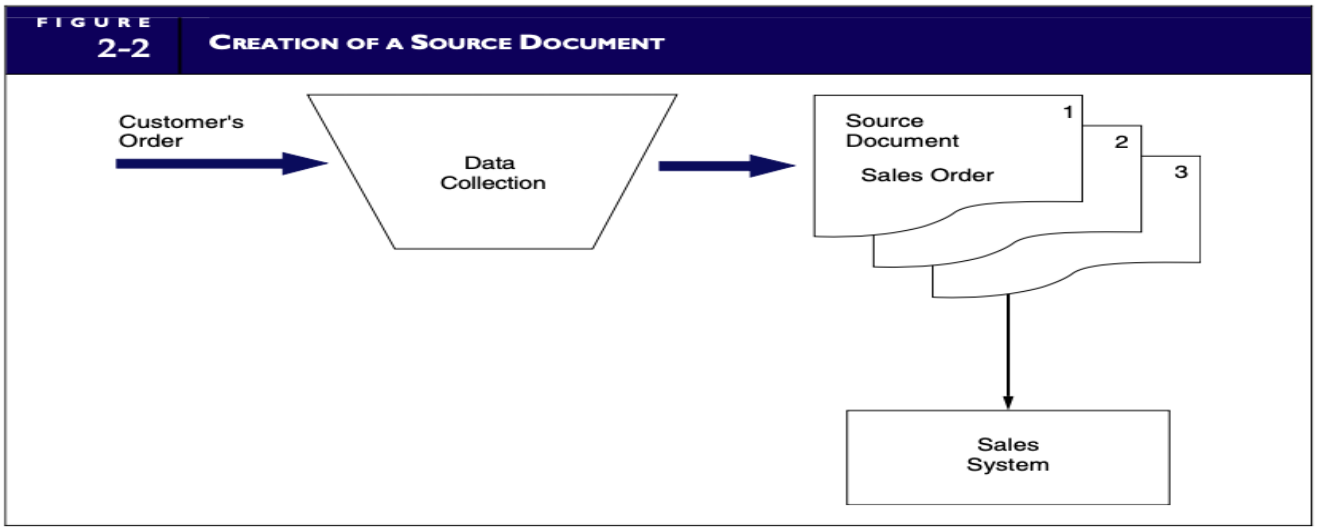
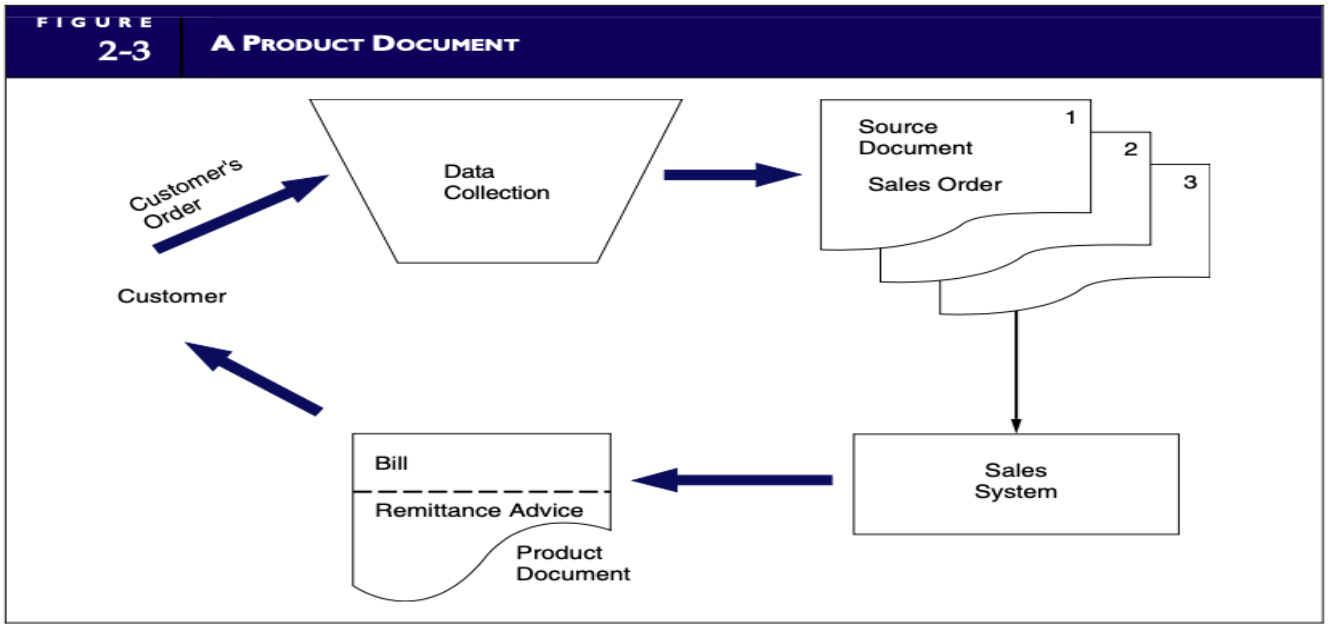


FIGURE 2-3 A PRODUCT DOCUMENT



PRODUCT DOCUMENTS. Product documents are the result of transaction processing rather than the triggering mechanism for the process. For example, a payroll check to an employee is a product document of the payroll system. Figure 2-3 extends the example in Figure 2-2 to illustrate that the customer's bill is a product document of the sales system.

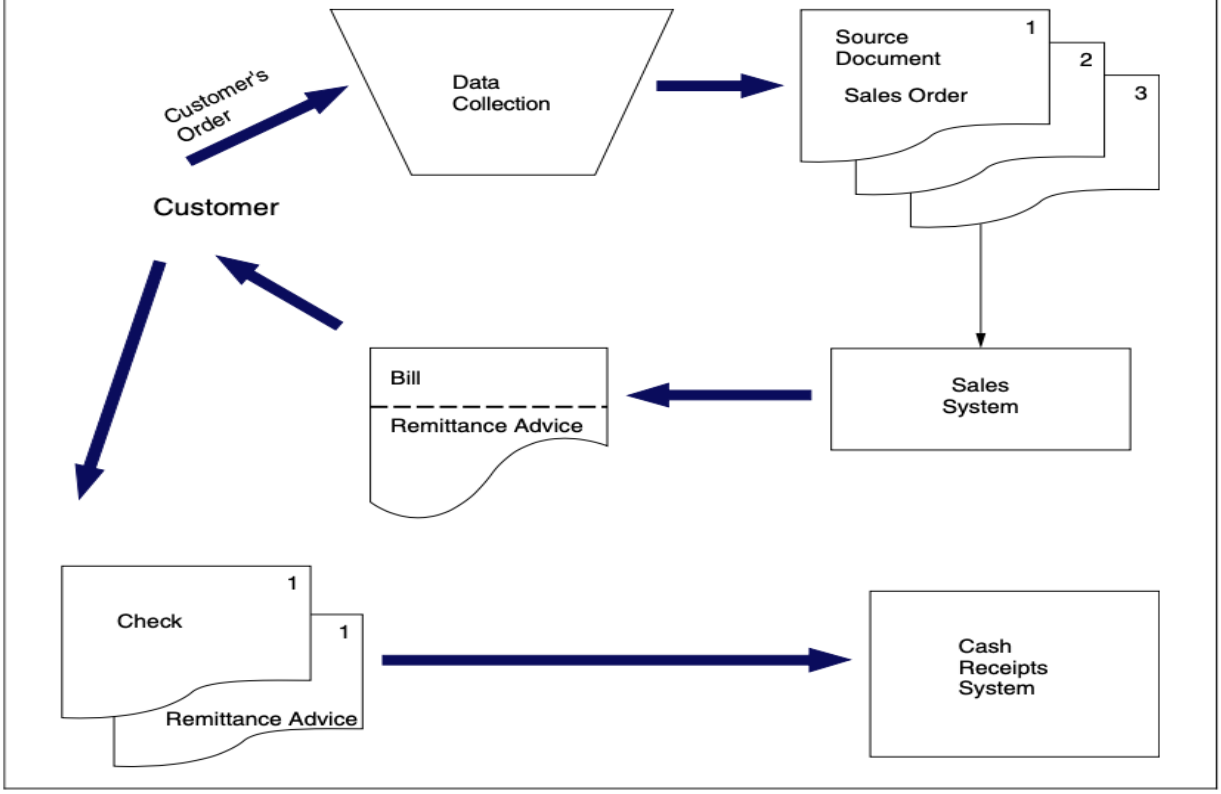
TURNAROUND DOCUMENTS. Turnaround documents are product documents of one system that become source documents for another system. This is illustrated in Figure 2-4. The customer receives a perforated two-part bill or statement. The top portion is the actual bill, and the bottom portion is the remittance advice. Customers remove the remittance advice and return it to the company along with their payment (typically a check). A turnaround document contains important information about a customer's account to help the cash receipts system process the payment. One of the problems designers of cash receipts systems face is matching customer payments to the correct customer accounts. Providing this needed information as a product of the sales system ensures accuracy when the cash receipts system processes it.

Journals

A journal is a record of a chronological entry. At some point in the transaction process, when all relevant facts about the transaction are known, the event is recorded in a journal in chronological order. Documents are the primary source of data for journals. Figure 2-5 shows a sales order being recorded in the sales journal (see the following discussion on special journals). Each transaction requires a separate journal entry, reflecting the accounts affected and the amounts to be debited and credited. There is often

a time lag between initiating a transaction and recording it in the accounts. The journal holds a complete record of transactions and thus provides a means for posting to accounts. There are two primary types of journals: special journals and general journals.

FIGURE 2-4 A TURNAROUND DOCUMENT



SPECIAL JOURNALS. Special journals are used to record specific classes of transactions that occur in high volume. Such transactions can be grouped together in a special journal and processed more efficiently than a general journal permits. Figure 2-6 shows a special journal for recording sales transactions.

As you can see, the sales journal provides a specialized format for recording only sales transactions. At the end of the processing period

(month, week, or day), a clerk posts the amounts in the columns to the ledger accounts indicated. For example, the total sales will be posted to account number 401. Most organizations use several other special journals, including the cash receipts journal, cash disbursements journal, purchases journal, and the payroll journal.

FIGURE 2-5 SALES ORDER RECORDED IN SALES JOURNAL

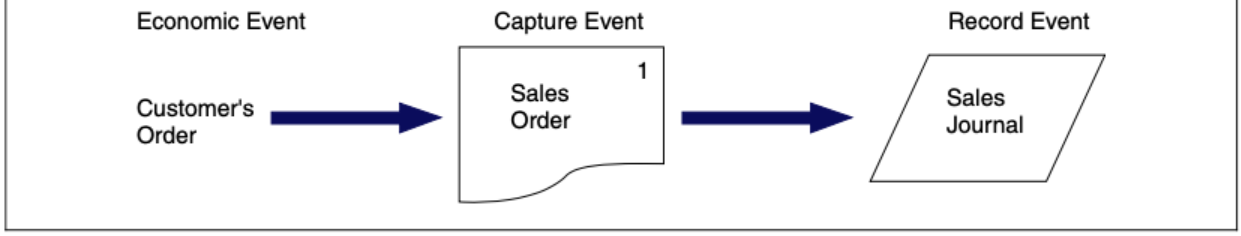


FIGURE 2-6 SALES JOURNAL

Date	Customer	Invoice Num.	Acct. Num.	Post	Debit Acct. Rec. #102	Credit Sales #401
Sept. 1	Hewitt Co.	4523	1120		3300	3300
15	Acme Drilling	8821	1298		6825	6825
Oct. 3	Buell Corp.	22987	1030		4000	4000
10	Check Ltd.	66734	1110		8500	8500

REGISTER. The term register is often used to denote certain types of special journals. For example, the payroll journal is often called the payroll register. We also use the term register, however, to denote a log. For example, a receiving register is a log of all receipts of raw materials or merchandise ordered from vendors. Similarly, a shipping register is a log that records all shipments to customers.

GENERAL JOURNALS. Firms use the general journal to record nonrecurring, infrequent, and dissimilar transactions. For example, we usually record periodic depreciation and closing entries in the general journal. Figure 2-7 shows one page from a general journal. Note that the columns are nonspecific, allowing any type of transaction to be recorded. The entries are recorded chronologically.

As a practical matter, most organizations have replaced their general journal with a journal voucher system. A journal voucher is actually a special source document that contains a single journal entry specifying the general ledger accounts that are affected. Journal vouchers are used to record summaries of routine transactions, nonroutine transactions, adjusting entries, and closing entries. The total of journal vouchers processed is equivalent to the general journal.

Ledgers

A ledger is a book of accounts that reflects the financial effects of the firm's transactions after they are posted from the various journals. Whereas journals show the chronological effect of business activity, ledgers show activity by account type. A ledger indicates the increases, decreases, and current balance of each account. Organizations use this information to

prepare financial statements, support daily operations, and prepare internal reports. Figure 2-8 shows the flow of financial information from the source documents to the journal and into the ledgers.

There are two basic types of ledgers: (1) general ledgers, which contain the firm's account information in the form of highly summarized control accounts, and (2) subsidiary ledgers, which contain the details of the individual accounts that constitute a particular control account.

FIGURE 2-7 GENERAL JOURNAL

GENERAL JOURNAL PAGE

	DATE	DESCRIPTION	POST. REF.	DEBIT	CREDIT	
1	Sept. 1, 2009	Depreciation Expense	520	500		1
2		Accumulated Depreciation	210		500	2
3						3
4	Sept. 2, 2009	Insurance Expense	525	1200		4
5		Prepaid Insurance	180		1200	5
6						6
7	Sept. 3, 2009	Cash	101	11000		7
8		Capital Stock	310		11000	8
9						9
10						10
11						11
12						12

GENERAL LEDGERS. The general ledger (GL) summarizes the activity for each of the organization's accounts. The general ledger department updates these records from journal vouchers prepared from special journals and other sources located throughout the organization. The general ledger presented in Figure 2-9 shows the beginning balances, the changes, and the ending balances as of a particular date for several different accounts.

The general ledger provides a single value for each control account, such as accounts payable, accounts receivable, and inventory. This highly summarized information is sufficient for financial reporting, but it is not useful for supporting daily business operations. For example, for financial reporting purposes, the firm's total accounts receivable value must be presented as a single figure in the balance sheet. This value is obtained from the accounts receivable control account in the general ledger. To actually collect the cash this asset represents, however, the firm must have certain detailed information about the customers that this summary figure does not provide. It must know which customers owe money, how much each customer owes, when the customer last made payment, when the next payment is due, and so on. The accounts receivable subsidiary ledger contains these essential details.

FIGURE 2-8 FLOW OF INFORMATION FROM THE ECONOMIC EVENT TO THE GENERAL LEDGER

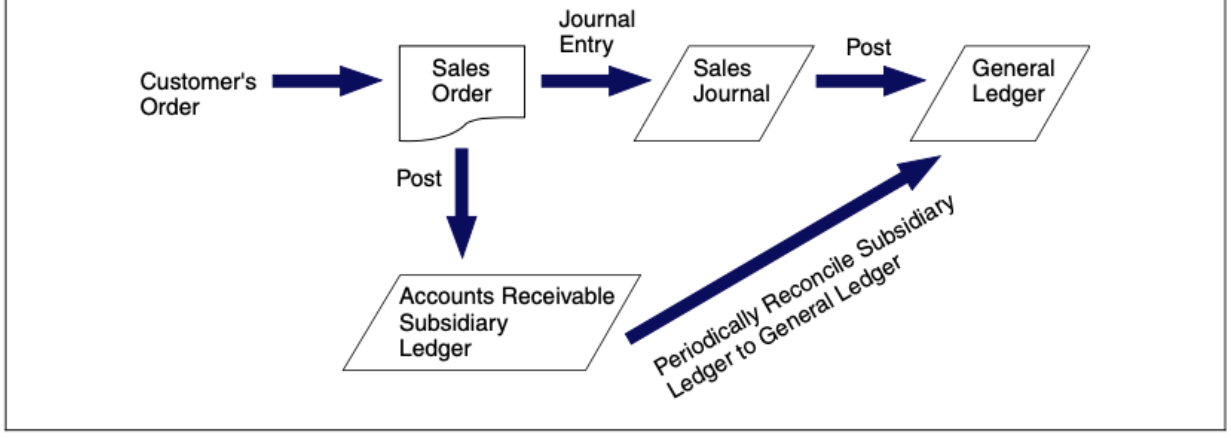


FIGURE 2-9 GENERAL LEDGER

Cash ACCOUNT NO. 101

DATE	ITEM	POST. REF.	DEBIT	CREDIT	BALANCE DEBIT	BALANCE CREDIT
Sept. 10		S1	3300		3300	
15		S1	6825		10125	
Oct. 3		S1	4000		14125	
10		CD1		2800	11325	

Accounts Receivable ACCOUNT NO. 102

DATE	ITEM	POST. REF.	DEBIT	CREDIT	BALANCE DEBIT	BALANCE CREDIT
Sept. 1		S1	1400		1400	
8		S1	2605		4005	
15		CR1		1650	2355	

Accounts Payable ACCOUNT NO. 201

DATE	ITEM	POST. REF.	DEBIT	CREDIT	BALANCE DEBIT	BALANCE CREDIT
Sept. 1		P1		20500		20500
10		CD1	2800			17700

SUBSIDIARY LEDGERS. Subsidiary ledgers are kept in various accounting departments of the firm, including inventory, accounts payable, payroll, and accounts receivable. This separation provides better control and support of operations. Figure 2-10 illustrates that the total of account balances in a

subsidiary ledger should equal the balance in the corresponding general ledger control account. Thus, in addition to providing financial statement information, the general ledger is a mechanism for verifying the overall accuracy of accounting data that separate accounting departments have processed. Any event incorrectly recorded in a journal or subsidiary ledger will cause an out-of-balance condition that should be detected during the general ledger update. By periodically reconciling summary balances from subsidiary accounts, journals, and control accounts, the completeness and accuracy of transaction processing can be formally assessed.

THE AUDIT TRAIL

The accounting records described previously provide an audit trail for tracing transactions from source documents to the financial statements. Of the many purposes of the audit trail, most important to accountants is the year-end audit. Although the study of financial auditing falls outside the scope of this text, the following thumbnail sketch of the audit process will demonstrate the importance of the audit trail.

The external auditor periodically evaluates the financial statements of publicly held business organizations on behalf of its stockholders and other interested parties. The auditor's responsibility involves, in part, the review of selected accounts and transactions to determine their validity, accuracy, and completeness. Let's assume an auditor wishes to verify the accuracy of a client's AR as published in its annual financial statements. The auditor can trace the AR figure on the balance sheet to the general ledger AR control account. This balance can then be reconciled with the total for the accounts receivable subsidiary ledger. Rather than examining every transaction that affected the AR account, the auditor will use a sampling technique to

examine a representative subset of transactions. Following this approach, the auditor can select a number of accounts from the AR subsidiary ledger and trace these back to the sales journal. From the sales journal, the auditor can identify the specific source documents that initiated the transactions and pull them from the files to verify their validity and accuracy.

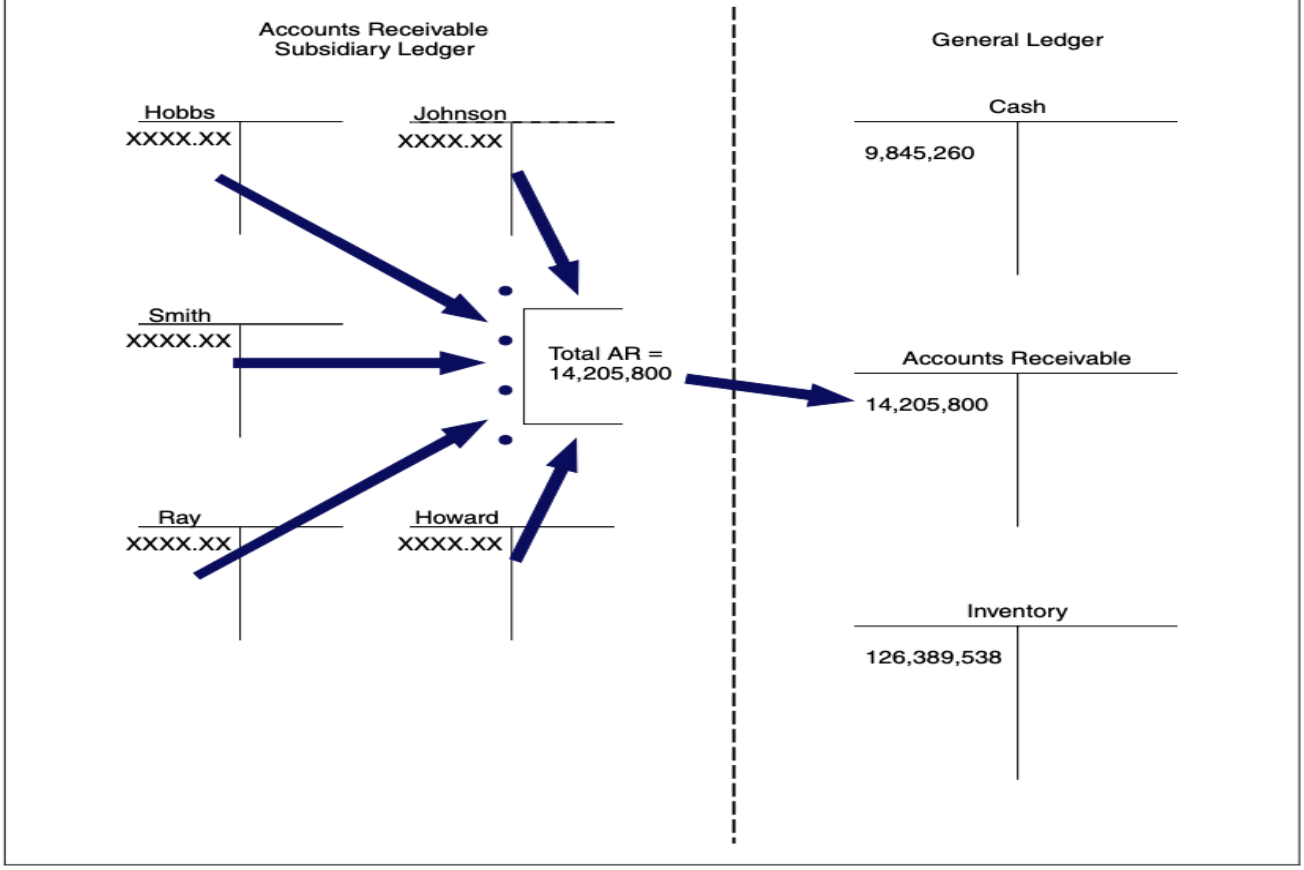
The audit of AR often includes a procedure called confirmation. This involves contacting selected customers to determine if the transactions recorded in the accounts actually took place and that customers agree with the recorded balance. Information contained in source documents and subsidiary accounts enables the auditor to identify and locate customers chosen for confirmation. The results from reconciling the AR subsidiary ledger with the control account and from confirming customers' accounts help the auditor form an opinion about the accuracy of accounts receivable as reported on the balance sheet. The auditor performs similar tests on all of the client firm's major accounts and transactions to arrive at an overall opinion about the fair presentation of the financial statement. The audit trail plays an important role in this process.

COMPUTER-BASED SYSTEMS

Types of Files

Audit trails in computer-based systems are less observable than in traditional manual systems, but they still exist. Accounting records in computer-based systems are represented by four different types of magnetic files: master files, transaction files, reference files, and archive files. Figure 2-11 illustrates the relationship of these files in forming an audit trail.

FIGURE 2-10 RELATIONSHIP BETWEEN THE SUBSIDIARY LEDGER AND THE GENERAL LEDGER



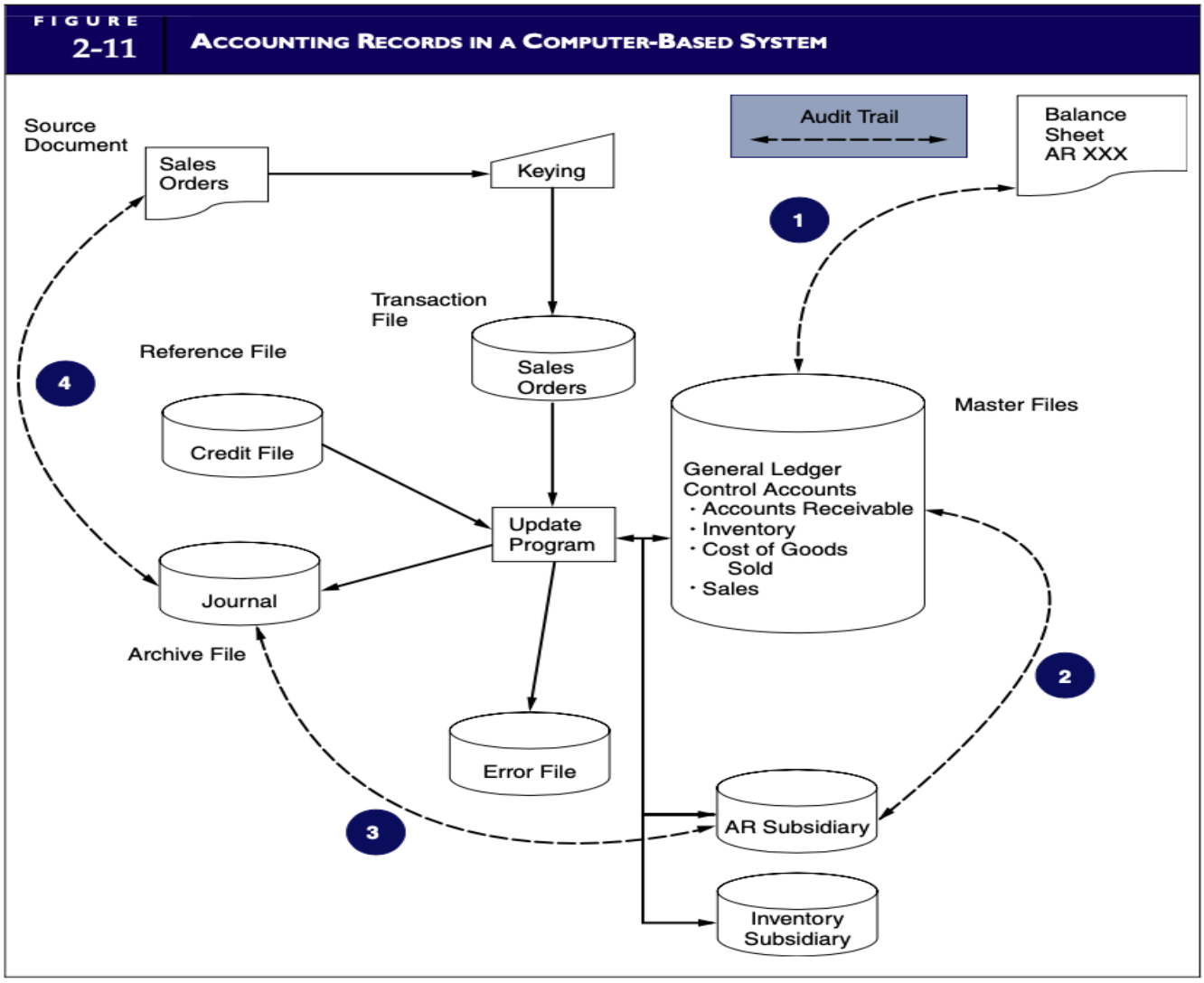
MASTER FILE. A master file generally contains account data. The general ledger and subsidiary ledgers are examples of master files. Data values in master files are updated from transactions.

TRANSACTION FILE. A transaction file is a temporary file of transaction records used to change or update data in a master file. Sales orders, inventory receipts, and cash receipts are examples of transaction files.

REFERENCE FILE. A reference file stores data that are used as standards for processing transactions. For example, the payroll program may refer to a tax table to calculate the proper amount of withholding taxes for payroll

transactions. Other reference files include price lists used for preparing customer invoices, lists of authorized suppliers, employee rosters, and customer credit files for approving credit sales. The reference file in Figure 2-11 is a credit file.

ARCHIVE FILE. An archive file contains records of past transactions that are retained for future reference. These transactions form an important part of the audit trail. Archive files include journals, prior period payroll information, lists of former employees, records of accounts written off, and prior-period ledgers.



The Digital Audit Trail

Let's walk through the system represented in Figure 2-11 to illustrate how computer files provide an audit trail. We begin with the capture of the economic event. In this example, sales are recorded manually on source documents, just as in the manual system. The next step in this process is to convert the source documents to digital form. This is done in the data-input stage, when the transactions are edited and a transaction file of sales orders is produced. Some computer systems do not use physical source documents. Instead, transactions are captured directly on digital media.

The next step is to update the various master file subsidiary and control accounts that the transaction affects. During the update procedure, additional editing of transactions takes place. Some transactions may prove to be in error or invalid for such reasons as incorrect account numbers, insufficient quantities on hand, or customer credit problems. In this example, the system determines the available credit for each customer from the credit file before processing the sale. Any records that are rejected for credit problems are transferred to the error file. The remaining good records are used to update the master files. Only these transactions are added to the archive file that serves as the sales journal. By copying the valid transactions to the journal, the original transaction file is not needed for audit trail purposes. This file can now be erased (scratched) in preparation for the next batch of sales orders.

Like the paper trail, this digital audit trail allows transaction tracing. Again, an auditor attempting to evaluate the accuracy of the AR figure published in the balance sheet could do so via the following steps, which are identified in Figure 2-11.

1. Compare the accounts receivable balance in the balance sheet with the master file AR control account balance.

2. Reconcile the AR control figure with the AR subsidiary account total.

3. Select a sample of update entries made to accounts in the AR subsidiary ledger and trace these to transactions in the sales journal (archive file).

4. From these journal entries, identify specific source documents that can be pulled from their files and verified. If necessary, the auditor can confirm the accuracy and propriety of these source documents by contacting the customers in question.

Documentation Techniques

The old saying that a picture is worth a thousand words is very applicable when it comes to documenting systems. A written description of a system can be wordy and difficult to follow. Experience has shown that a visual image can convey vital system information more effectively and efficiently than words. Accountants use system documentation routinely, as both systems designers and auditors, the ability to document systems in graphic form is thus an important skill for accountants to master. Five basic documentation techniques are introduced in this section: data flow diagrams, entity relationship diagrams, system flowcharts, program flowcharts, and record layout diagrams.

DATA FLOW DIAGRAMS AND ENTITY RELATIONSHIP DIAGRAMS

Two commonly used systems design and documentation techniques are the entity relationship diagram and the data flow diagram. This section

introduces the principal features of these techniques, illustrates their use, and shows how they are related.

Data Flow Diagrams

The data flow diagram (DFD) uses symbols to represent the entities, processes, data flows, and data stores that pertain to a system. Figure 2-12 presents the symbol set most commonly used. DFDs are used to represent systems at different levels of detail from very general to highly detailed. At this point, a single-level DFD is sufficient to demonstrate its use as a documentation tool. We see an example of this in Figure 2-13.

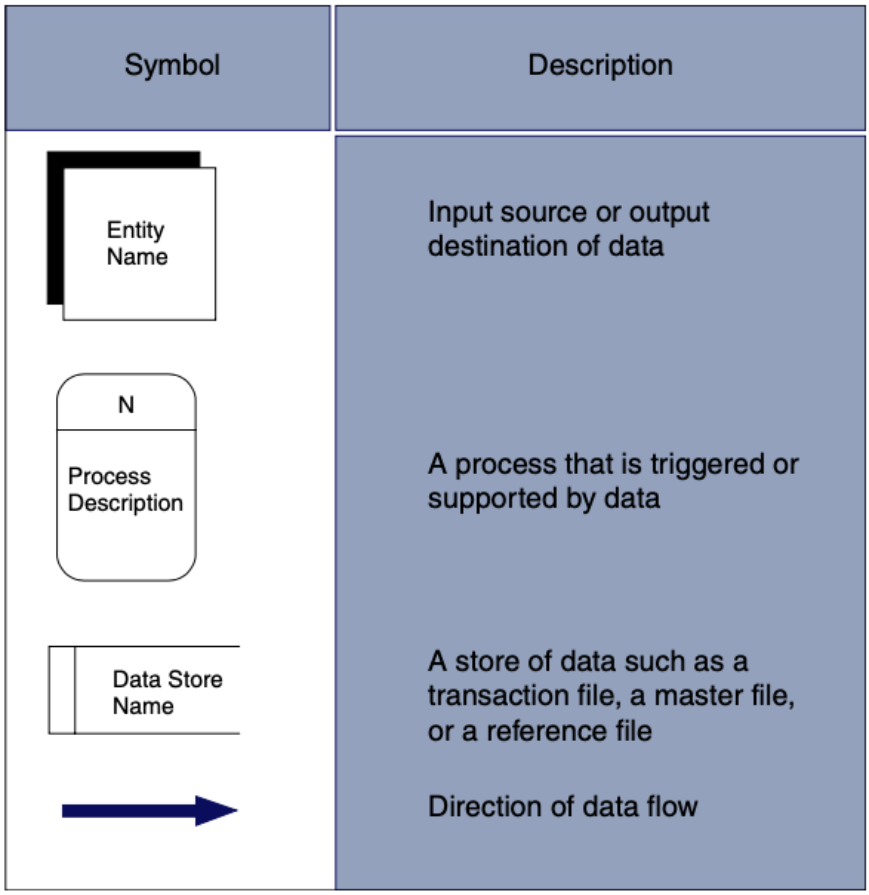
Entities in a DFD are external objects at the boundary of the system being modeled. They represent sources of and destinations for data. Entities may be other interacting systems or functions, or they may be external to the organization. Entities should always be labeled as nouns on a DFD, such as customer or supplier. Data stores represent the accounting records used in each process, and labeled arrows represent the data flows between processes, data stores, and entities.

Processes in the DFD should be labeled with a descriptive verb such as Ship Goods, Update Records, or Receive Customer Order. Process objects should not be represented as nouns like Warehouse, AR Dept., or Sales Dept. The labeled arrows connecting the process objects represent flows of data such as Sales Order, Invoice, or Shipping Notice. Each data flow label should be unique—the same label should not be attached to two different flow lines in the same DFD. When data flow into a process and out again (to another process), they have, in some way, been changed. This is true even if the data have not been physically altered. For example, consider the Approve Sales process in Figure 2-13, where Sales Order is examined

for completeness before being processed further. It flows into the process as Sales Order and out of it as Approved Sales Order.

Systems analysts use DFDs extensively to represent the logical elements of the system. This technique does not, however, depict the physical system. In other words, DFDs show what logical tasks are being done, but not how they are done or who (or what) is performing them. For example, the DFD does not show whether the sales approval process is separated physically from the billing process in compliance with internal control objectives.

FIGURE 2-12 DATA FLOW DIAGRAM SYMBOL SET



Entity Relationship Diagrams

An entity relationship (ER) diagram is a documentation technique used to represent the relationship between entities. Entities are physical resources (automobiles, cash, or inventory), events (ordering inventory, receiving cash, shipping goods), and agents (salesperson, customer, or vendor) about which the organization wishes to capture data. One common use for ER diagrams is to model an organization's database.

Figure 2-14 shows the symbol set used in an ER diagram. The square symbol represents entities in the system. The labeled connecting line represents the nature of the relationship between two entities. The degree of the relationship, called cardinality, is the numeric mapping between entity instances. A relationship can be one-to-one (1:1), one-to-many (1:M), or many-to-many (M:M).2 If we think of entities in the ER diagram as files of records, cardinality is the maximum number of records in one file that are related to a single record in the other file and vice versa.

Cardinality reflects normal business rules as well as organizational policy. For instance, the 1:1 cardinality in the first example in Figure 2-14 suggests that each salesperson in the organization is assigned one automobile. If instead the organization's policy were to assign a single automobile to one or more salespersons who share it, this policy would be reflected by a 1:M relationship. Similarly, the M:M relationship between vendor and inventory in Figure 2-14 implies that the organization buys the same type of products from one or more vendors. A company policy to buy particular items from a single vendor would be reflected by a 1:M cardinality.

System designers identify entities and prepare a model of them, similar to the one presented in Figure 2-15. This data model is the blueprint for what ultimately will become the physical database. The data model presented in

our example is not, however, sufficiently refined to be the plan for a workable database. Constructing a realistic data model is an advanced topic that involves understanding and applying techniques and rules that are beyond the scope of this chapter.

FIGURE 2-13 DATA FLOW DIAGRAM OF SALES ORDER PROCESSING SYSTEM

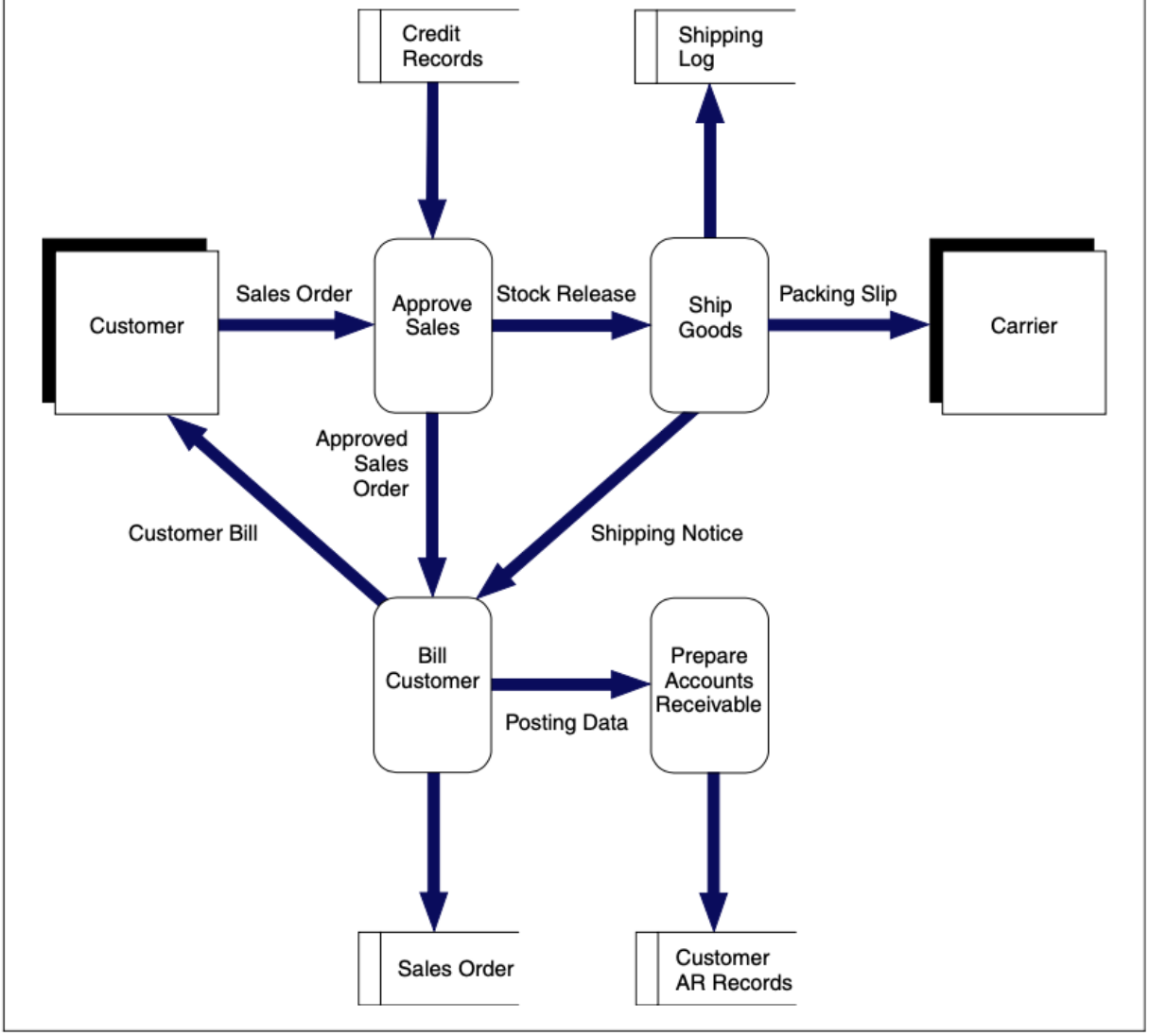


FIGURE 2-14 ENTITY RELATIONSHIP DIAGRAM SYMBOLS

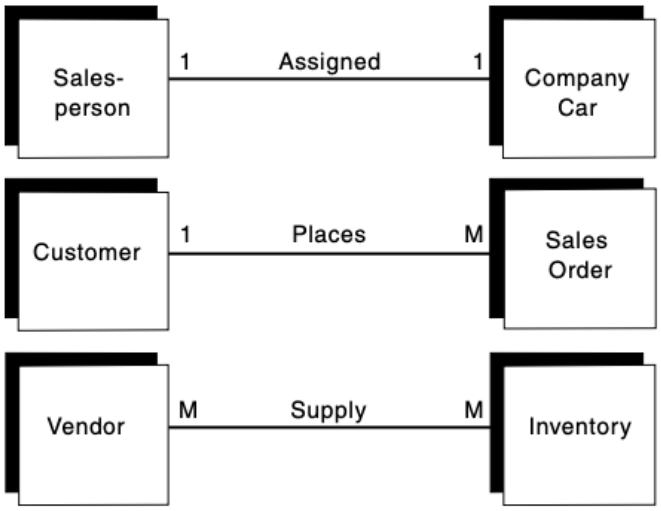
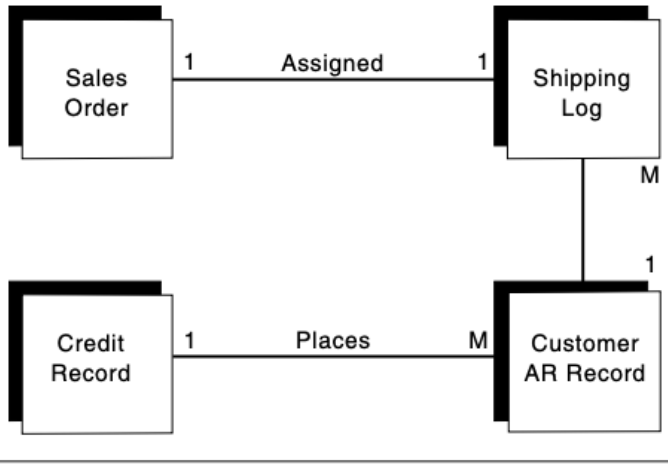


FIGURE 2-15 DATA MODEL



Relationship between ER Diagrams and Data Flow Diagrams

DFDs and ER diagrams depict different aspects of the same system, but they are related and can be reconciled. A DFD is a model of system processes, and the ER diagram models the data used in or affected by the system. The two diagrams are related through data; each data store in the

DFD represents a corresponding data entity in the ER diagram. Figure 2-15 presents the ER diagram for the DFD in Figure 2-13.

SYSTEM FLOWCHARTS

A system flowchart is the graphical representation of the physical relationships among key elements of a system. These elements may include organizational departments, manual activities, computer programs, hard-copy accounting records (documents, journals, ledgers, and files), and digital records (reference files, transaction files, archive files, and master files).3 System flowcharts also describe the type of computer media being employed in the system, such as magnetic tape, magnetic disks, and terminals.

The flowcharting examples in the following sections illustrate techniques for representing both manual and computer-based accounting processes. We begin by documenting manual procedures. We will add computer elements to the system later.

Flowcharting Manual Activities

To demonstrate the flowcharting of manual activities, let's assume that an auditor needs to flowchart a sales order system to evaluate its internal controls and procedures. The auditor will begin by interviewing individuals involved in the sales order process to determine what they do. This information will be captured in a set of written facts similar to those below. Keep in mind that the purpose here is to demonstrate flowcharting. Thus, for clarity, the system facts are intentionally simplistic.

1. A clerk in the sales department receives a hard-copy customer order by mail and manually prepares four hard copies of a sales order.

2. The clerk sends Copy 1 of the sales order to the credit department for approval. The other three copies and the original customer order are filed temporarily, pending credit approval.

3. The credit department clerk validates the customer's order against hard-copy credit records kept in the credit department. The clerk signs Copy 1 to signify approval and returns it to the sales clerk.

4. When the salesclerk receives credit approval, he or she files Copy 1 and the customer order in the department. The clerk sends Copy 2 to the warehouse and Copies 3 and 4 to the shipping department.

5. The warehouse clerk picks the products from the shelves, records the transfer in the hard-copy stock records, and sends the products and Copy 2 to the shipping department.

6. The shipping department receives Copy 2 and the goods from the warehouse, attaches Copy 2 as a packing slip, and ships the goods to the customer. Finally, the clerk files Copies 3 and 4 in the shipping department.

Based on these facts, the auditor can create a flowchart of this partial system. It is important to note that flowcharting is as much an art form as it is a technical skill, giving the flowchart author a great deal of license. Nevertheless, the primary objective should be to provide an unambiguous description of the system. With this in mind, certain rules and conventions need to be observed:

1. The flowchart should be labeled to clearly identify the system that it represents.

2. The correct symbols should be used to represent the various entities in the system.

3. All symbols on the flowchart should be labeled.

4. Lines should have arrowheads to clearly show the process flow and sequence of events.

5. If complex processes need additional explanation for clarity, a text description should be included on the flowchart or in an attached document referenced by the flowchart.

LAY OUT THE PHYSICAL AREAS OF ACTIVITY. Remember that a flowchart reflects the physical system, which is represented as vertical columns of events and actions separated by lines of demarcation. Generally, each of these areas of activity is a separate column with a heading. From the written system facts, we see that there are four distinct areas of activity: sales department, credit department, warehouse, and shipping department. The first step in preparing the flowchart is to lay out these areas of activity and label each of them. This step is illustrated in Figure 2-16.

TRANSCRIBE THE WRITTEN FACTS INTO VISUAL FORMAT. At this point we are ready to start visually representing the system facts. The symbols used for this purpose will be selected from the set presented in Figure 2-17. We begin with the first stated fact:

1. A clerk in the sales department receives a hard-copy customer order by mail and manually prepares four hard copies of a sales order.

Figure 2-18 illustrates how this fact could be represented. The customer is the source of the order but is not part of the system. The oval object is typically used to convey a data source or destination that is separate from the system being flowcharted. The document symbol entering the sales department signifies the hard-copy customer order and is labeled accordingly. The bucket-shaped symbol represents a manual process. In this

case, the clerk in the sales department prepares four copies of the sales order. Notice that the clerk's task, not the clerk, is depicted. The arrows between the objects show the direction of flow and
the sequence of events.

By transcribing each fact in this way, we systematically construct a flowchart. See how the second and third facts restated below add to the flowchart in Figure 2-19.

2. The clerk sends Copy 1 of the sales order to the credit department for approval. The other three copies and the original customer order are filed temporarily, pending credit approval.

3. The credit department clerk validates the customer's order against hard-copy credit records kept in the credit department. The clerk signs Copy 1 to signify approval and returns it to the salesclerk.

Two new symbols are introduced in this figure. First, the upside-down triangle symbol represents the temporary file mentioned in Fact 2. This is a physical file of paper documents such as a drawer in a filing cabinet or desk. Such files are typically arranged according to a specified order. To signify the filing system used, the file symbol will usually contain an ‘‘N’’ for numeric (invoice number), ‘‘C’’ for chronological (date), or ‘‘A’’ for alphabetic order (customer name). Secondly, the parallelogram shape represents the credit records mentioned in Fact 3. This symbol is used to depict many types of hard-copy accounting records, such as journals, subsidiary ledgers, general ledgers, and shipping logs.

FIGURE 2-16 **Flowchart Showing Areas of Activity**

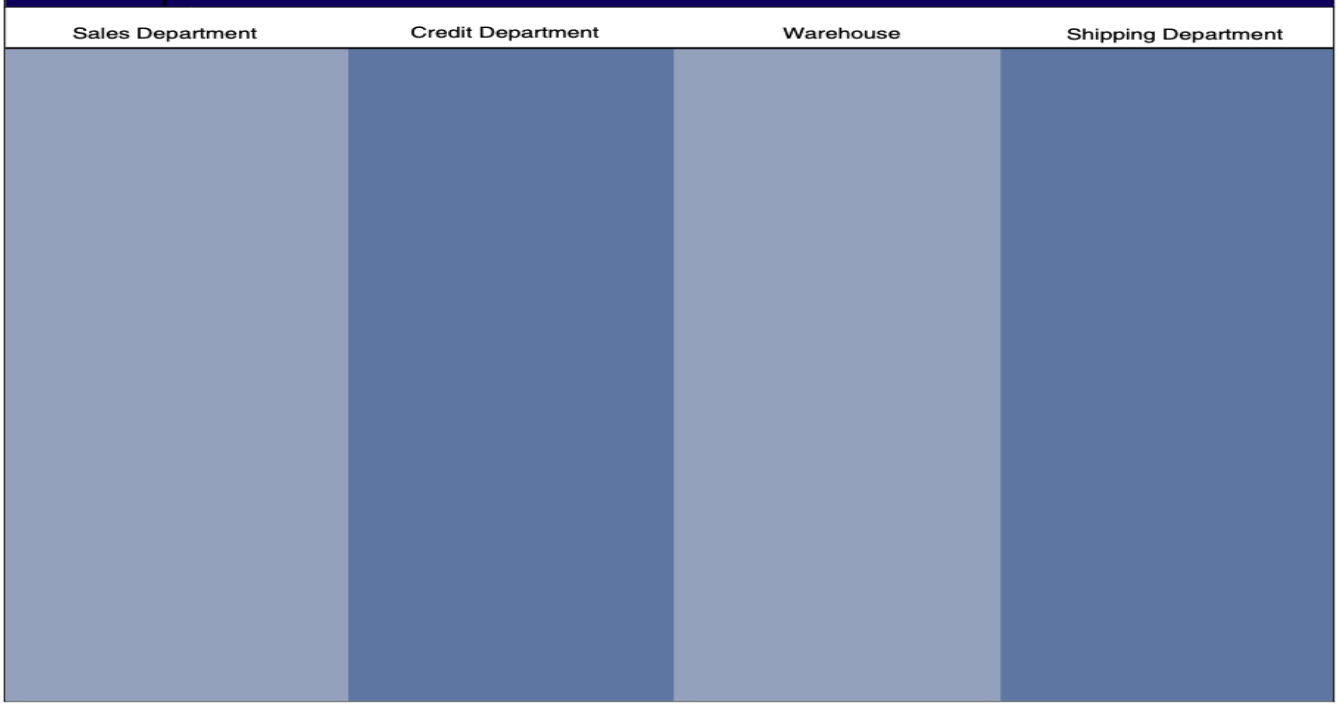


FIGURE 2-17 **Symbol Set for Representing Manual Procedures**

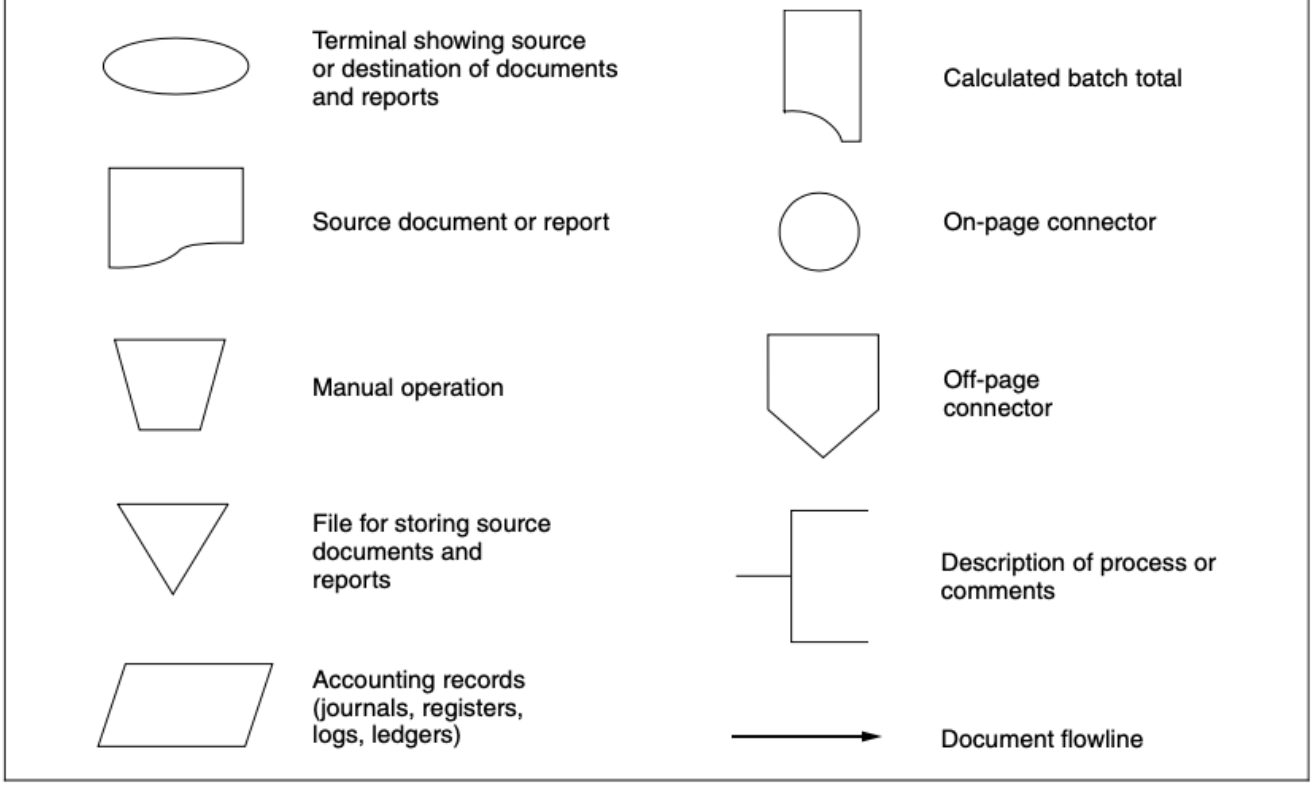


FIGURE 2-18 **FLOWCHART SHOWING STATED FACT I TRANSLATED INTO VISUAL SYMBOLS**

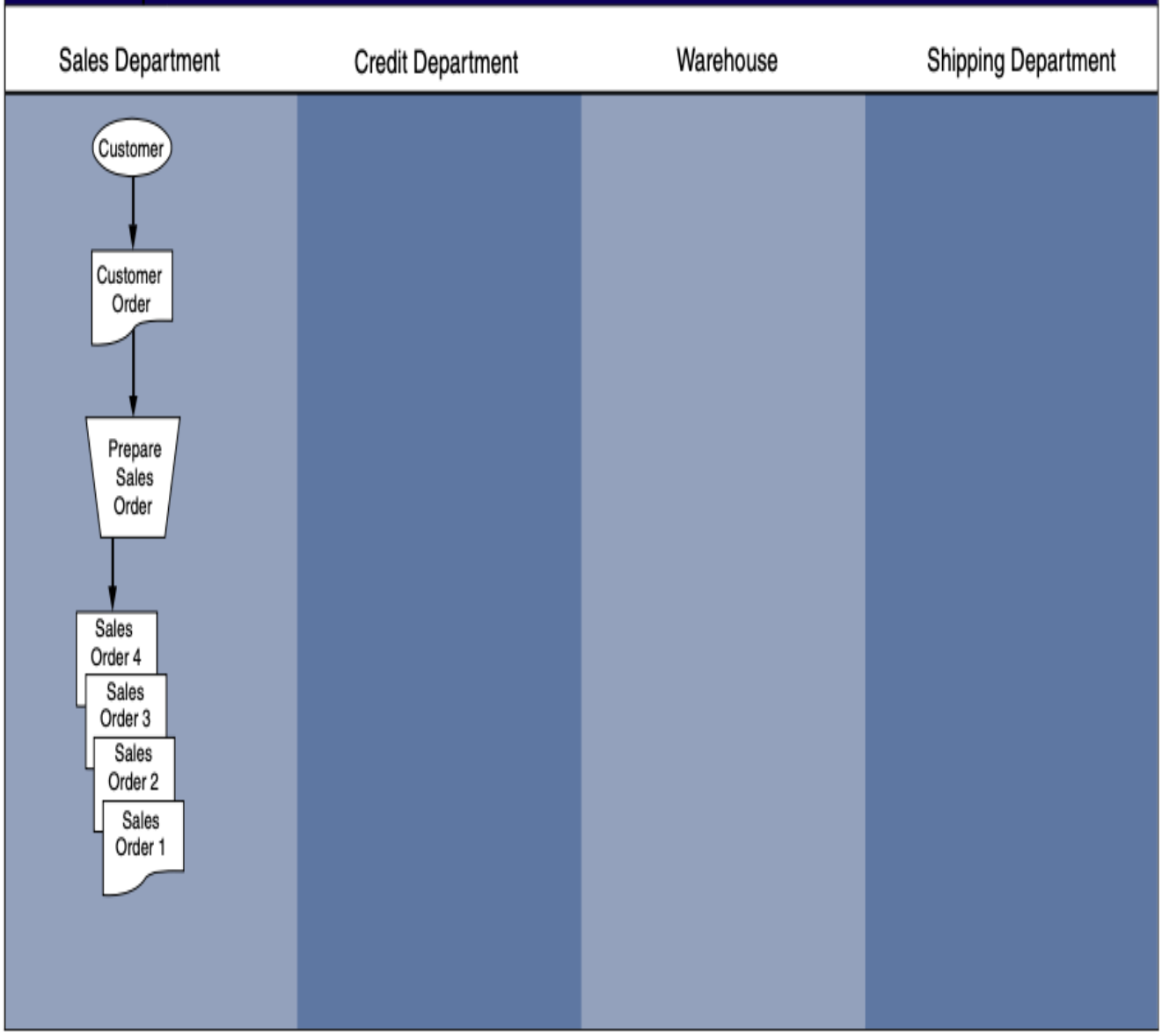
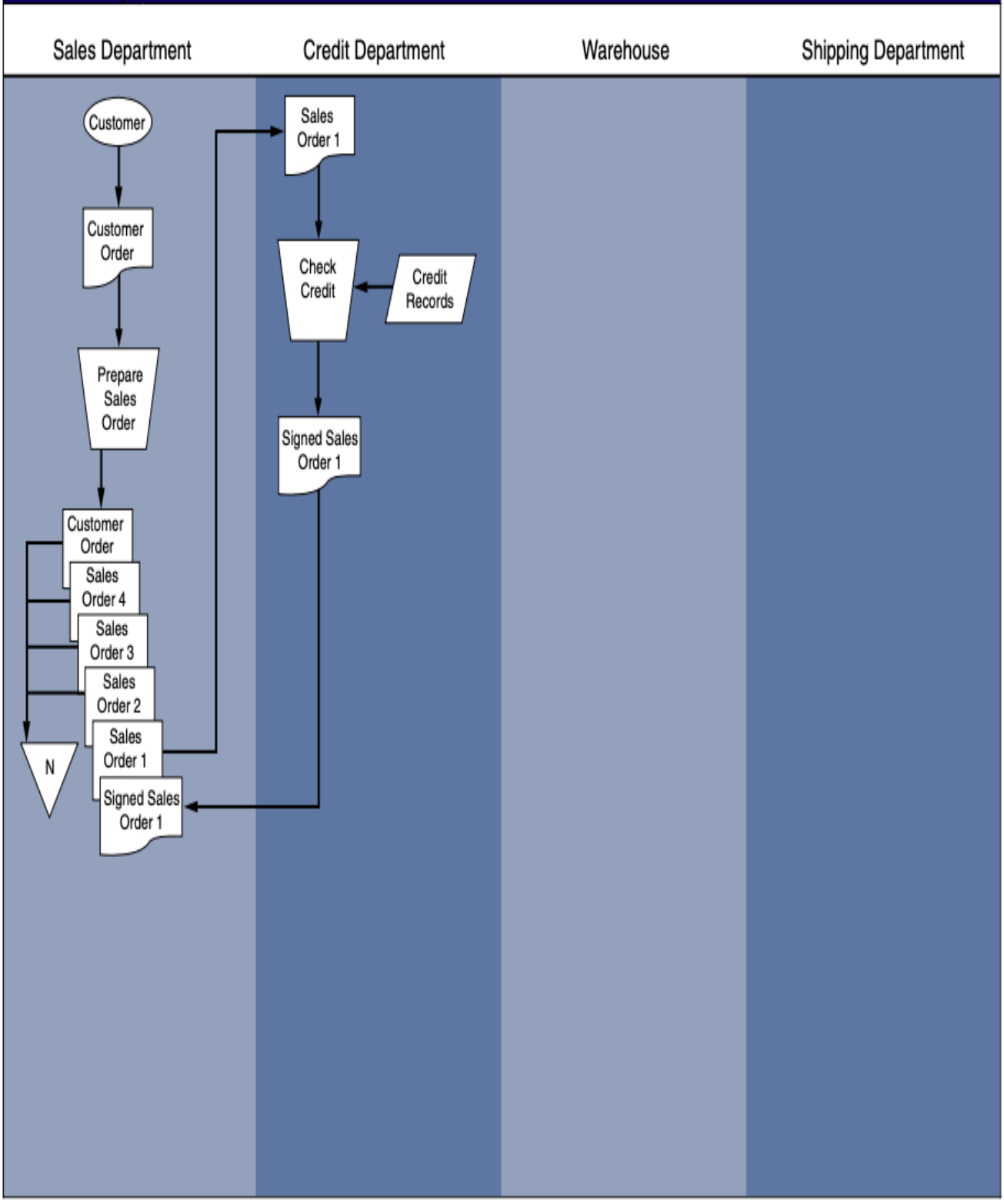


FIGURE 2-19 **FLOWCHART SHOWING STATED FACTS 1, 2, AND 3 TRANSLATED INTO VISUAL SYMBOLS**



Having laid these foundations, let's now complete the flowchart by depicting the remaining facts.

4. When the salesclerk receives credit approval, he or she files Copy 1 and the customer order in the department. The clerk sends Copy 2 to the warehouse and Copies 3 and 4 to the shipping department.

5. The warehouse clerk picks the products from the shelves, records the transfer in the hard-copy stock records, and sends the products and Copy 2 to the shipping department.

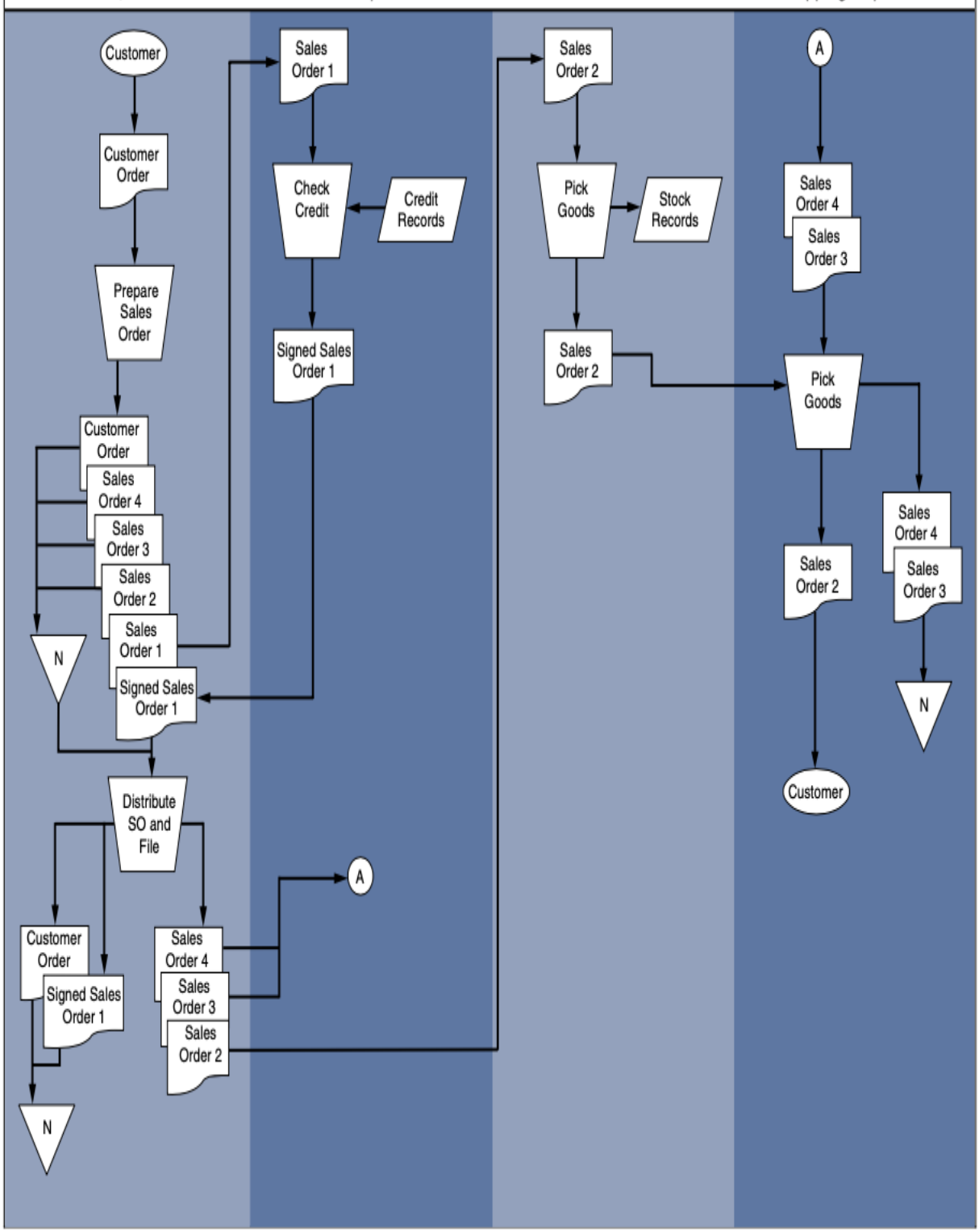
6. The shipping department receives Copy 2 and the goods from the warehouse, attaches Copy 2 as a packing slip, and ships the goods to the customer. Finally, the clerk files Copies 3 and 4 in the shipping department.

The completed flowchart is presented in Figure 2-20. Notice the circular symbol labeled ''A.'' This is an on-page connector used to replace flow lines that otherwise would cause excessive clutter on the page. In this instance, the connector replaces the lines that signify the movement of Copies 3 and 4 from the sales department to the shipping department. Lines should be used whenever possible to promote clarity. Restricted use of connectors, however, can improve the readability of the flowchart.

Notice also that the physical products or goods mentioned in Facts 4 and 5 are not shown on the flowchart. The document (Copy 2) that accompanies and controls the goods, however, is shown. Typically, a system flowchart shows only the flow of documents, not physical assets.

Finally, for visual clarity, system flowcharts show the processing of a single transaction only. You should keep in mind, however, that transactions usually pass through manual procedures in batches (groups). Before exploring documentation techniques further, we need to examine some important issues related to batch processing.

FIGURE 2-20 **FLOWCHART SHOWING ALL STATED FACTS TRANSLATED INTO VISUAL SYMBOLS**



Flowcharting Computer Processes

We now examine flowcharting techniques to represent a system that employs both manual and computer processes. The symbol set used to construct this system flowchart will come from both Figure 2-17 and Figure 2-21. Again, our example is based on a sales order system with the following facts:

1. A clerk in the sales department receives a customer order by mail and enters the information into a computer terminal that is networked to a centralized computer program in the computer operations department. The original customer order is filed in the sales department. Facts 2, 3, and 4 relate to activities that occur in the computer operations department.

2. A computer program edits the transactions, checks the customers' credit by referencing a credit history file, and produces a transaction file of sales orders.

3. The sales order transaction file is then processed by an update program that posts the transactions to corresponding records in AR and inventory files.

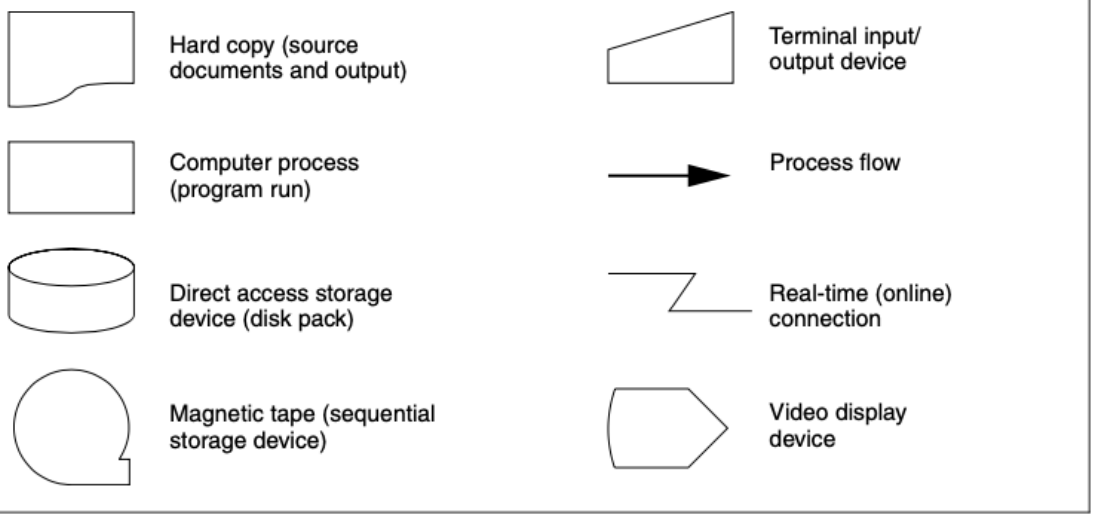
4. Finally, the update program produces three hard copies of the sales order. Copy 1 is sent to the warehouse, and Copies 2 and 3 are sent to the shipping department.

5. On receipt of Copy 1, the warehouse clerk picks the products from the shelves. Using Copy 1 and the warehouse personal computer (PC), the clerk records the inventory transfer in the digital stock records that are kept on the PC. Next, the clerk sends the physical inventory and Copy 1 to the shipping department.

6. The shipping department receives Copy 1 and the goods from the warehouse. The clerk reconciles the goods with Copies 1, 2, and 3 and

attaches Copy 1 as a packing slip. Next, the clerk ships the goods (with Copy 1 attached) to the customer. Finally, the clerk records the shipment in the hardcopy shipping log and files Copies 2 and 3 in the shipping department.

FIGURE 2-21 SYMBOL SET FOR REPRESENTING COMPUTER PROCESSES



LAY OUT THE PHYSICAL AREAS OF ACTIVITY. The flowcharting process begins by creating a template that depicts the areas of activity similar to the one shown in Figure 2-16. The only differences in this case are that this system has a computer operations department but does not have a credit department.

TRANSCRIBE THE WRITTEN FACTS INTO VISUAL FORMAT. As with the manual system example, the next step is to systematically transcribe the written facts into visual objects. Figure 2-22 illustrates how Facts 1, 2, and 3 translate visually.

The customer, customer order, and file symbols in this flowchart are the same as in the previous example. The salesclerk's activity, however, is

now automated, and the manual process symbol has been replaced with a computer terminal symbol. Also, because this is a data-input operation, the arrowhead on the flowchart line points in the direction of the edit and credit check program. If the terminal was also used to receive output (the facts do not specify such an operation), arrowheads would be on both ends of the line.

Recall that the emphasis in flowcharting is on the physical system. For example, the terminal used by the salesclerk to enter customer orders is physically located in the sales department, but the programs that process the transactions and the files that it uses and updates are stored in a separate computer operations department.

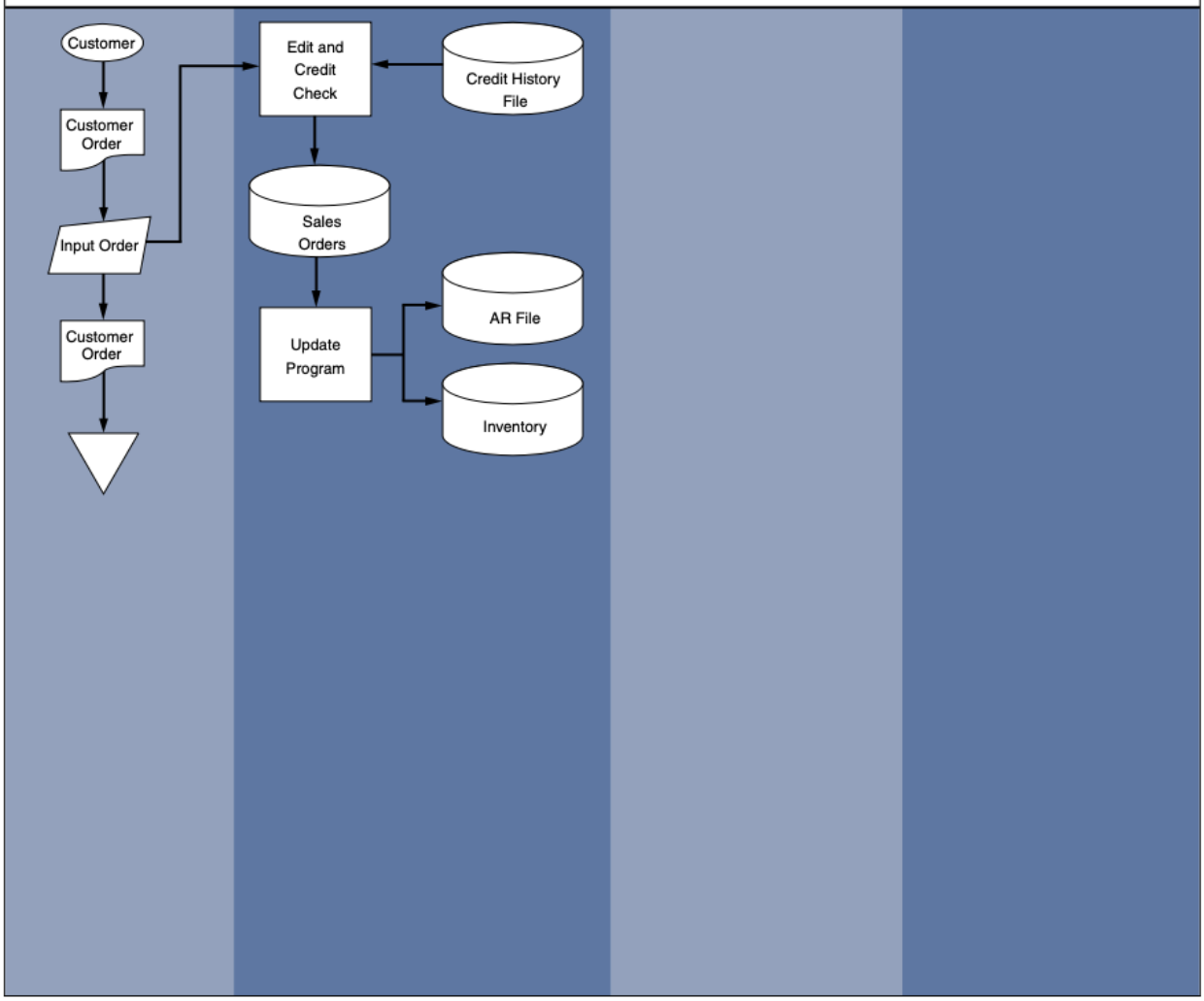
Notice how the flow line points from the credit history file to the edit program. This indicates that the file is read (referenced) but not changed (updated) by the program. In contrast, the interactions between the update program and the AR and inventory files are in the opposite direction. The relevant records in these files have been changed to reflect the transactions. The logic of a file update is explained later in the chapter.

Let’s now translate the remaining facts into visual symbols. Fact 4 states that the update program produces three hard-copy documents in the computer operations department, which are then distributed to the warehouse and shipping departments. The translation of this fact is illustrated in Figure 2-23.

Fact 5 states that the warehouse clerk updates the stock records on the department PC and then sends the physical inventory and Copy 1 to the shipping department. Notice on Figure 2-23 how this computer activity is represented. The warehouse PC is a stand-alone computer system that is not networked into the computer operations department like the terminal in

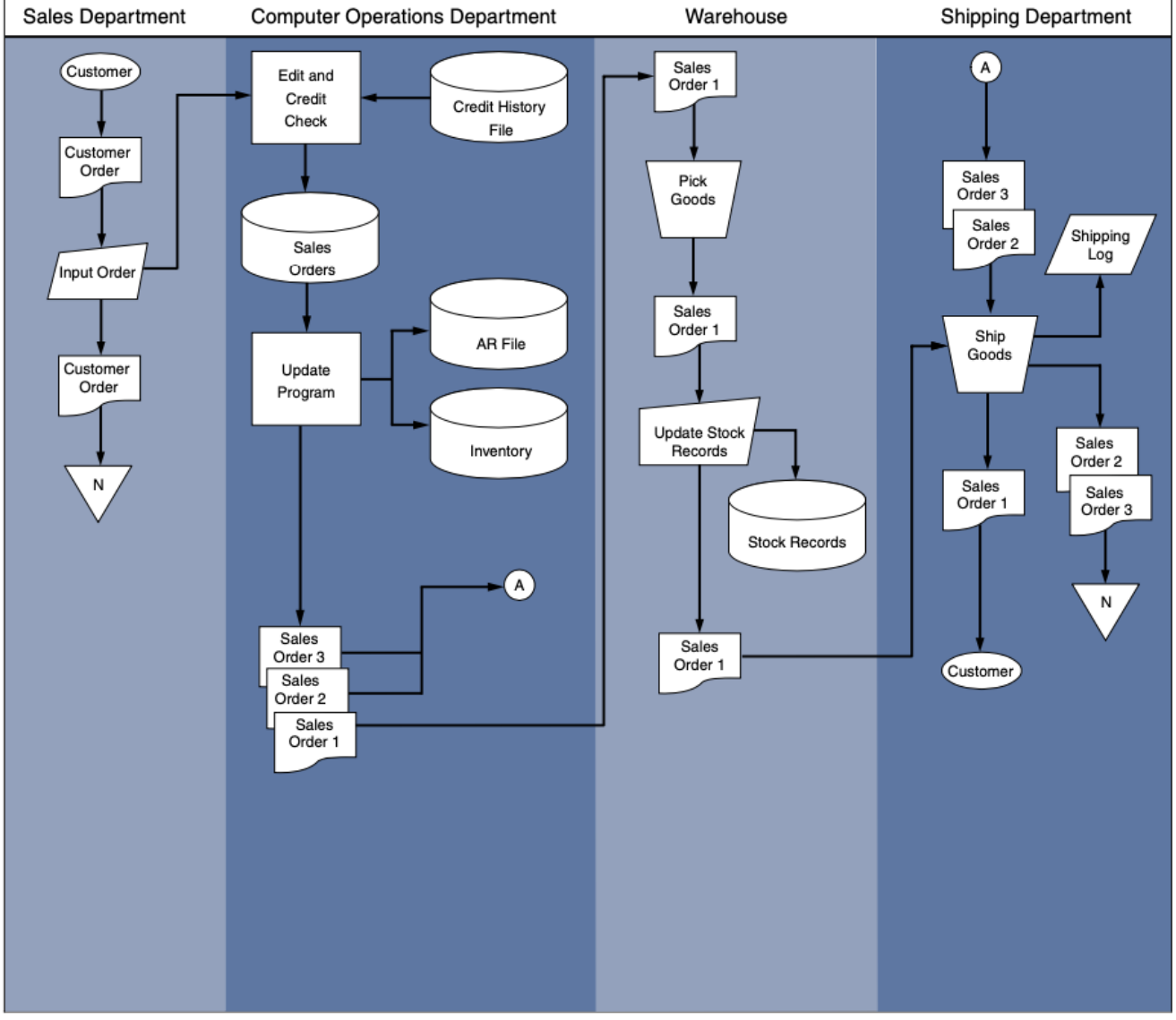
the sales department. The PC, the stock record update program, and the stock records themselves are all physically located in the warehouse. As with manual procedures, when documenting computer operations the flowchart author must accurately represent the physical arrangement of the system components. As we will see in later chapters, the physical arrangement of system components (both manual and computer) often plays an important role in the auditor's assessment of internal control.

FIGURE 2-22 FLOWCHART SHOWING THE TRANSLATION OF FACTS 1, 2, AND 3 INTO VISUAL SYMBOLS



Finally, Fact 6 describes how the shipping department clerk reconciles the goods with the supporting documents, sends the goods and the packing slip to the customer, updates the shipping log, and files two copies of the sales order. This is entirely a manual operation, as evidenced by the symbols in Figure 2-23. Note that the shipping log uses the same symbol that is used for representing journals and ledgers.

FIGURE 2-23 FLOWCHART SHOWING ALL FACTS TRANSLATED INTO VISUAL SYMBOLS



Summary

This chapter divided the treatment of transaction processing systems into five major sections. The first section provided an overview of transaction processing, showing its vital role as an information provider for financial reporting, internal management reporting, and the support of day-to-day operations. To deal efficiently with large volumes of financial transactions, business organizations group together transactions of similar types into transaction cycles. Three transaction cycles account for most of a firm's economic activity: the revenue cycle, the expenditure cycle, and the conversion cycle. The second section described the relationship among accounting records in both manual and computer-based systems. We saw how both hard-copy and digital documents form an audit trail. The third section of the chapter presented an overview of documentation techniques used to describe the key features of systems. Accountants must be proficient in using documentation tools to perform their professional duties. Five types of documentation are commonly used for this purpose: data flow diagrams, entity relationship diagrams, system flowcharts, program flowcharts, and record layout diagrams. The fourth section presented two computer-based transaction processing systems: (1) batch processing using real-time data collection and (2) realtime processing. The section also examined the operational efficiency issues associated with each configuration. Finally, we examined data coding schemes and their role in transaction processing and AIS as a means of coordinating and managing a firm's transactions. In examining the major types of numeric and alphabetic coding schemes, we saw how each has certain advantages and disadvantages.

Multiple-Choice Questions

1. Which statement is NOT true?

a. Business activities begin with the acquisition of materials, property, and labor in exchange for cash.

b. The conversion cycle includes the task of determining raw materials requirements.

c. Manufacturing firms have a conversion cycle but retail firms do not.

d. A payroll check is an example of a product document of the payroll system.

e. A journal voucher is actually a special source document.

2. A documentation tool that depicts the physical flow of information relating to a particular transaction through an organization is a

a. system flowchart.

b. program flowchart.

c. decision table.

d. work distribution analysis.

e. systems survey.

3. The production subsystem of the conversion cycle includes all of the following EXCEPT

a. determining raw materials requirements.

b. make or buy decisions on component parts.

c. release of raw materials into production.

d. scheduling the goods to be produced.

4. Which of the following files is a temporary file?

a. transaction file

b. master file

c. reference file

d. none of the above

5. A documentation tool used to represent the logical elements of a system is a(n)

a. programming flowchart.

b. entity relationship diagram.

c. system flowchart.

d. data flow diagram.

6. Which of the following is NOT true of a turnaround document?

a. They may reduce the number of errors made by external parties.

b. They are commonly used by utility companies (gas, power, water).

c. They are documents used by internal parties only.

d. They are both input and output documents.

7. Which of the following is NOT a true statement?

a. Transactions are recorded on source documents and are posted to journals.

b. Transactions are recorded in journals and are posted to ledgers.

c. Infrequent transactions are recorded in the general journal.

d. Frequent transactions are recorded in special journals.

8. Which of the following is true of the relationship between subsidiary ledgers and general ledger accounts?

a. The two contain different and unrelated data.

b. All general ledger accounts have subsidiaries.

c. The relationship between the two provides an audit trail from the financial statements to the source documents.

d. The total of subsidiary ledger accounts usually exceeds the total in the related general ledger account.

9. is the system flowchart symbol for:

a. on-page connector.

b. off-page connector.

c. home base.

d. manual operation.

e. document.

Problems

1. TRANSACTION CYCLE IDENTIFICATION

Categorize each of the following activities into the expenditure, conversion, or revenue cycles, and identify the applicable subsystem.

a. preparing the weekly payroll for manufacturing personnel

b. releasing raw materials for use in the manufacturing cycle

c. recording the receipt of payment for goods sold

d. recording the order placed by a customer

e. ordering raw materials

f. determining the amount of raw materials to order

2. TYPES OF FILES

For each of the following records, indicate the appropriate related file structure: master file, transaction file, reference file, or archive file.

a. customer ledgers

b. purchase orders

c. list of authorized vendors

d. records related to prior pay periods

e. vendor ledgers

f. hours each employee has worked during the current pay period

g. tax tables

h. sales orders that have been processed and recorded

Chapter 3: The Revenue Cycle

3/1 Introduction

This chapter is organized into two main sections. The first section presents the conceptual revenue cycle system. It provides an overview of key activities and the logical tasks, sources and uses of information, and movement of accounting information through the organization. The section concludes with a review of internal control issues. The second section presents the physical system. A manual system is first used to reinforce key concepts previously presented. Next, it explores large-scale computer-based systems. The focus is on alternative technologies used to achieve various levels of organizational change from simple automation to reengineering the workflow. The section concludes with a review of PC-based systems and control issues pertaining to end user computing.

3/2 The Conceptual System

❖ Overview of Revenue Cycle Activities

In this section we examine the revenue cycle conceptually. Using data flow diagrams (DFDs) as a guide, we will trace the sequence of activities through three processes that constitute the revenue cycle for most retail, wholesale, and manufacturing organizations. These are: sales order procedures, sales return procedures, and cash receipts procedures. Service companies such as hospitals, insurance companies, and banks would use different industry-specific methods.

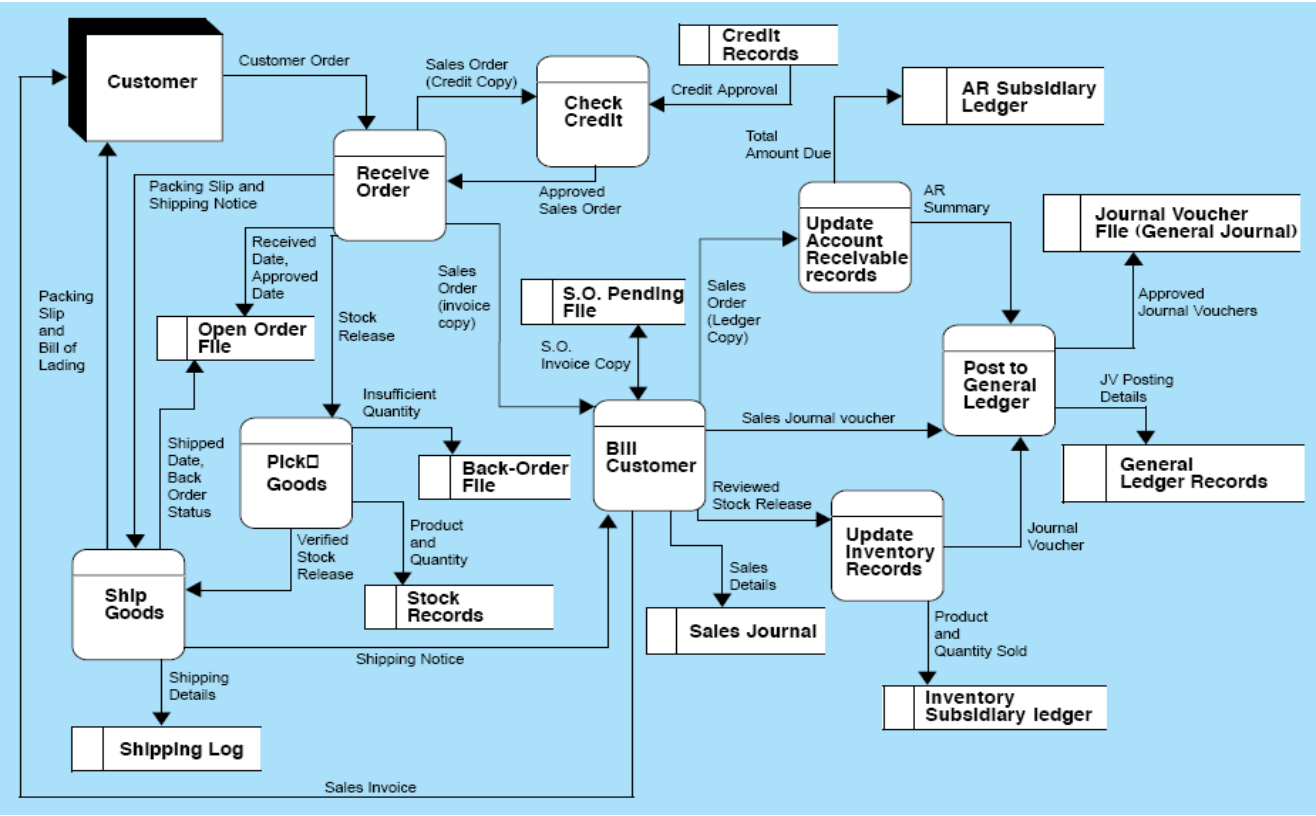
This discussion is intended to be technology neutral. In other words, the tasks described may be performed manually or by computer. At this point

our focus is on what (conceptually) needs to be done, not how (physically) it is accomplished. At various stages in the processes we will examine specific documents, journals, and ledgers as they are encountered. Again, this review is technology neutral. These documents and files may be physical (hard copy) or digital (computer generated). In the next section, we examine examples of physical systems.

3/3 Sales Order Procedures

Sales order procedures include the tasks involved in receiving and processing a customer order, filling the order and shipping products to the customer, billing the customer at the proper time, and correctly accounting for the transaction. The relationships between these tasks are presented with the DFD in Figure 1 and described in the following section.

Figure (1): DFD of Sales Order Processing System

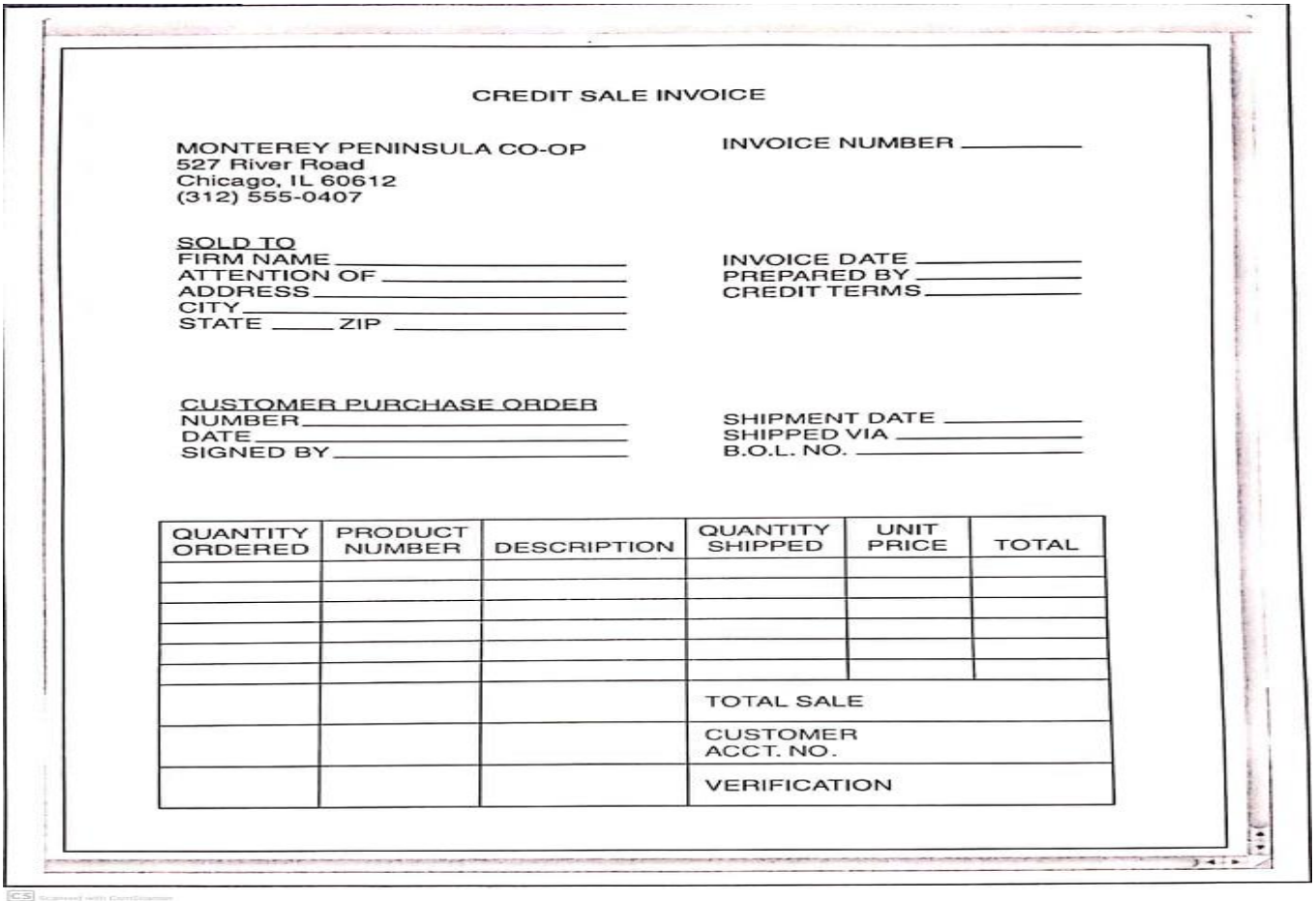


1) **Receive Order**. The sales process begins with the receipt of a customer order indicating the type and quantity of merchandise desired. At this point, the customer order is not in a standard format and may or may not be a physical document.

Orders may arrive by mail, by telephone, or from a field representative who visited the customer. When the customer is also a business entity, the order is often a copy of the customer's purchase order. A purchase order is an expenditure cycle document.

Because the customer order is not in the standard format that the seller's order processing system needs, the first task is to transcribe it into a formal sales order, an example of which is presented in Figure 2.

Figure (2): Sales Order



CREDIT SALE INVOICE

MONTEREY PENINSULA CO-OP
527 River Road
Chicago, IL 60612
(312) 555-0407

INVOICE NUMBER _____

SOLD TO
FIRM NAME _____
ATTENTION OF _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

INVOICE DATE _____
PREPARED BY _____
CREDIT TERMS _____

CUSTOMER PURCHASE ORDER
NUMBER _____
DATE _____
SIGNED BY _____

SHIPMENT DATE _____
SHIPPED VIA _____
B.O.L. NO. _____

QUANTITY ORDERED	PRODUCT NUMBER	DESCRIPTION	QUANTITY SHIPPED	UNIT PRICE	TOTAL
			TOTAL SALE		
			CUSTOMER ACCT. NO.		
			VERIFICATION		

The sales order captures vital information such as the customer's name, address, and account number; the name, number, and description of the items sold; and the quantities and unit prices of each item sold. At this point, financial information such as taxes, discounts, and freight charges may or may not be included. After creating the sales order, a copy of it is placed in the customer open order file for future reference.

The task of filling an order and getting the product to the customer may take days or even weeks. During this period, customers may contact their suppliers to check the status of their orders. The customer record in the open order file is updated each time the status of the order changes such as credit approval, on back-order, and shipment. The open order file thus enables customer service employees to respond promptly and accurately to customer questions.

2) **Check Credit.** Before processing the order further, the customer's creditworthiness needs to be established. The circumstances of the sale will determine the nature and degree of the credit check. For example, new customers may undergo a full financial investigation to establish a line of credit. Once a credit limit is set, however, credit checking on subsequent sales may be limited to ensuring that the customer has a history of paying his or her bills and that the current sale does not exceed the pre-established limit.

The credit approval process is an authorization control and should be performed as a function separate from the sales activity. In our conceptual system, the receive-order task **sends the sales order (credit copy)** to the check-credit task for approval. The returned **approved sales order** then triggers the continuation of the sales process by releasing sales order information simultaneously to various tasks. Several documents mentioned

in the following sections, such as the stock release, packing slip, shipping notice, and sales invoice, are simply special-purpose copies of the sales order and are not illustrated separately.

3) **Pick Goods.** The receive order activity forwards the stock release document (also called the picking ticket) to the pick goods function, in the warehouse. This document identifies the items of inventory that must be located and picked from the warehouse shelves. It also provides formal authorization for warehouse personnel to release the specified items.

After picking the stock, the order is verified for accuracy and the goods and verified stock release document are sent to the ship goods task. If inventory levels are insufficient to fill the order, a warehouse employee adjusts the verified stock release to reflect the amount actually going to the customer. The employee then prepares a back-order record, which stays on file until the inventories arrive from the supplier (not shown in this diagram). Back-ordered items are shipped before new sales are processed.

Finally, the warehouse employee adjusts the stock records to reflect the reduction in inventory. These stock records are not the formal accounting records for controlling inventory assets. They are used for warehouse management purposes only. Assigning asset custody and accounting record-keeping responsibility to the warehouse clerk would violate a key principle of internal control. The inventory control function, discussed later, maintains the formal accounting inventory records.

4) **Ship Goods**. Before the arrival of the goods and the verified stock release document, the shipping department receives the packing slip and shipping notice from the receive order function. The packing slip

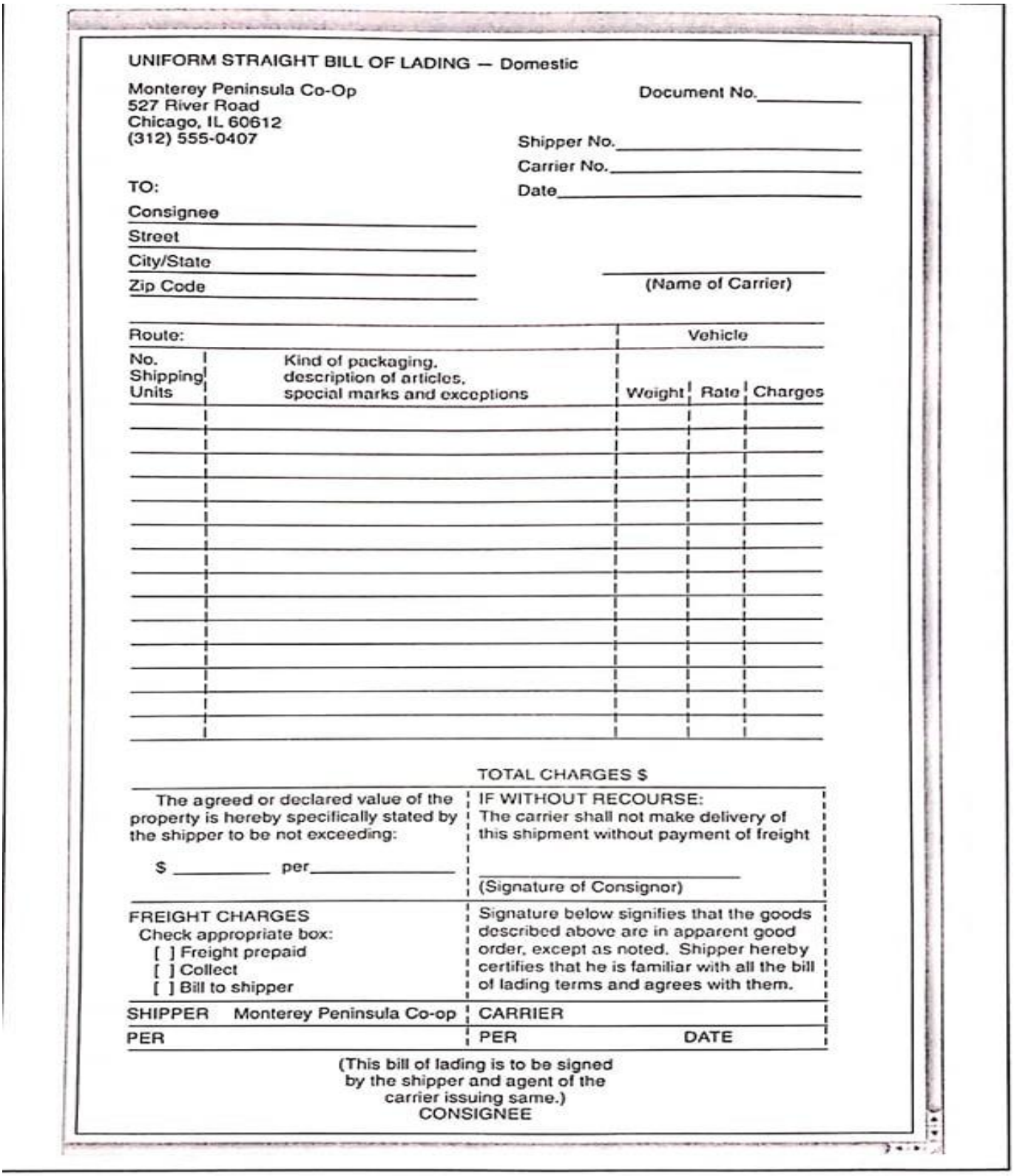
will ultimately travel with the goods to the customer to describe the contents of the order.

The shipping notice will later be forwarded to the billing function as evidence that the customer's order was filled and shipped. This document conveys pertinent new facts such as the date of shipment, the items and quantities actually shipped, the name of the carrier, and freight charges. In some systems, the shipping notice is a separate document prepared within the shipping function.

Upon receiving the goods from the warehouse, the shipping clerk reconciles the physical items with the stock release, the packing slip, and the shipping notice to verify that the order is correct. The ship goods function thus serves as an important independent verification control point and is the last opportunity to detect errors before shipment. The shipping clerk packages the goods, attaches the packing slip, completes the shipping notice, and prepares a bill of lading.

The bill of lading, as shown in Figure 3, is a formal contract between the seller and the shipping company (carrier) to transport the goods to the customer. This document establishes legal ownership and responsibility for assets in transit. Once the goods are transferred to the carrier, the shipping clerk records the shipment in the shipping log, forwards the shipping notice to the bill customer function as proof of shipment, and updates the customer's open order file.

Figure (3): Bill of Lading



UNIFORM STRAIGHT BILL OF LADING — Domestic

Monterey Peninsula Co-Op
527 River Road
Chicago, IL 60612
(312) 555-0407

Document No._____

Shipper No._____

Carrier No._____

Date_____

TO:

Consignee _____

Street _____

City/State _____

Zip Code _____

_____
(Name of Carrier)

Route: | Vehicle

No. Shipping Units	Kind of packaging, description of articles, special marks and exceptions	Weight	Rate	Charges

TOTAL CHARGES $

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding:

$ _____ per_____

IF WITHOUT RECOURSE:
The carrier shall not make delivery of this shipment without payment of freight

_____
(Signature of Consignor)

FREIGHT CHARGES
Check appropriate box:
[ ] Freight prepaid
[ ] Collect
[ ] Bill to shipper

Signature below signifies that the goods described above are in apparent good order, except as noted. Shipper hereby certifies that he is familiar with all the bill of lading terms and agrees with them.

SHIPPER Monterey Peninsula Co-op

PER

CARRIER

PER DATE

(This bill of lading is to be signed by the shipper and agent of the carrier issuing same.)
CONSIGNEE

5) **Bill Customer.** The shipment of goods marks the completion of the economic event and the point at which the customer should be billed. Billing before shipment encourages inaccurate record keeping and inefficient operations.

When the customer order is originally prepared, some details such as inventory availability, prices, and shipping charges may not be known with certainty. In the case of back-orders, for example, suppliers do not typically bill customers for out-of-stock items. Billing for goods not shipped causes confusion, damages relations with customers, and requires additional work to make adjustments to the accounting records.

To prevent such problems, the billing function awaits notification from shipping before it bills. Figure 1 shows that upon credit approval, the bill customer function receives **the sales order (invoice copy)** from the receive order task. This document is placed in an **S.O. pending file** until receipt of the shipping notice, which describes the products that were actually shipped to the customer. Upon arrival, the items shipped are reconciled with those ordered and unit prices, taxes, and freight charges are added to the invoice copy of the sales order. The completed **sales invoice** is the customer's bill, which formally depicts the charges to the customer. In addition, the billing function performs the following record keeping–related tasks:

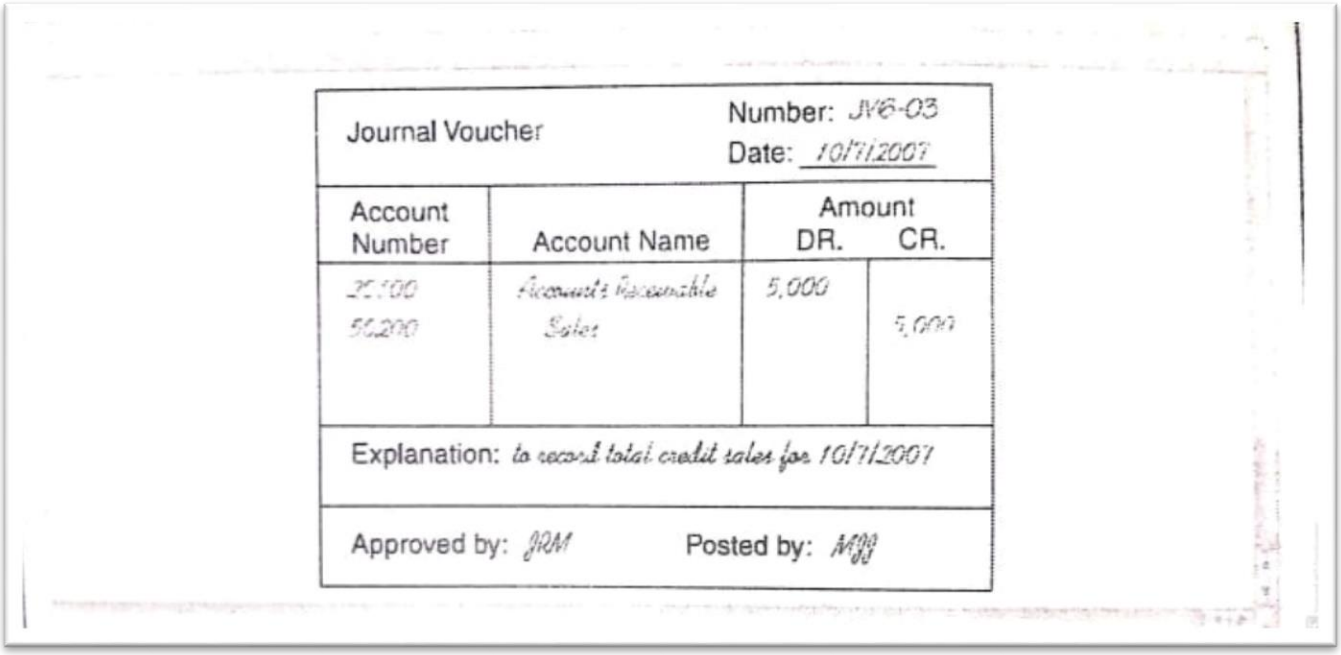
1. Records the sale in the sales journal.
2. Forwards the ledger copy of the sales order to the update accounts receivable task.
3. Sends the stock release document to the update inventory records task.

- **The sales journal** is a special journal used for recording completed sales transactions. The details of sales invoices are entered in the journal individually. At the end of the period, these entries are summarized into a sales journal voucher, which is sent to the general ledger task for posting to the following accounts:

Accounts Receivable	xxxx
Sales	xxxx

Figure 4 illustrates **a journal voucher**. Each journal voucher represents a general journal entry and indicates the general ledger accounts affected. Summaries of transactions, adjusting entries, and closing entries are all entered into the general ledger via this method. When properly approved, journal vouchers are an effective control against unauthorized entries to the general ledger. The journal voucher system eliminates the need for a formal general journal, which is replaced by **a journal voucher file.**

Figure (4): Journal Voucher



Journal Voucher — Number: JV6-03 — Date: 10/7/2007

Account Number	Account Name	Amount DR.	Amount CR.
20100	Accounts Receivable	5,000	
50200	Sales		5,000

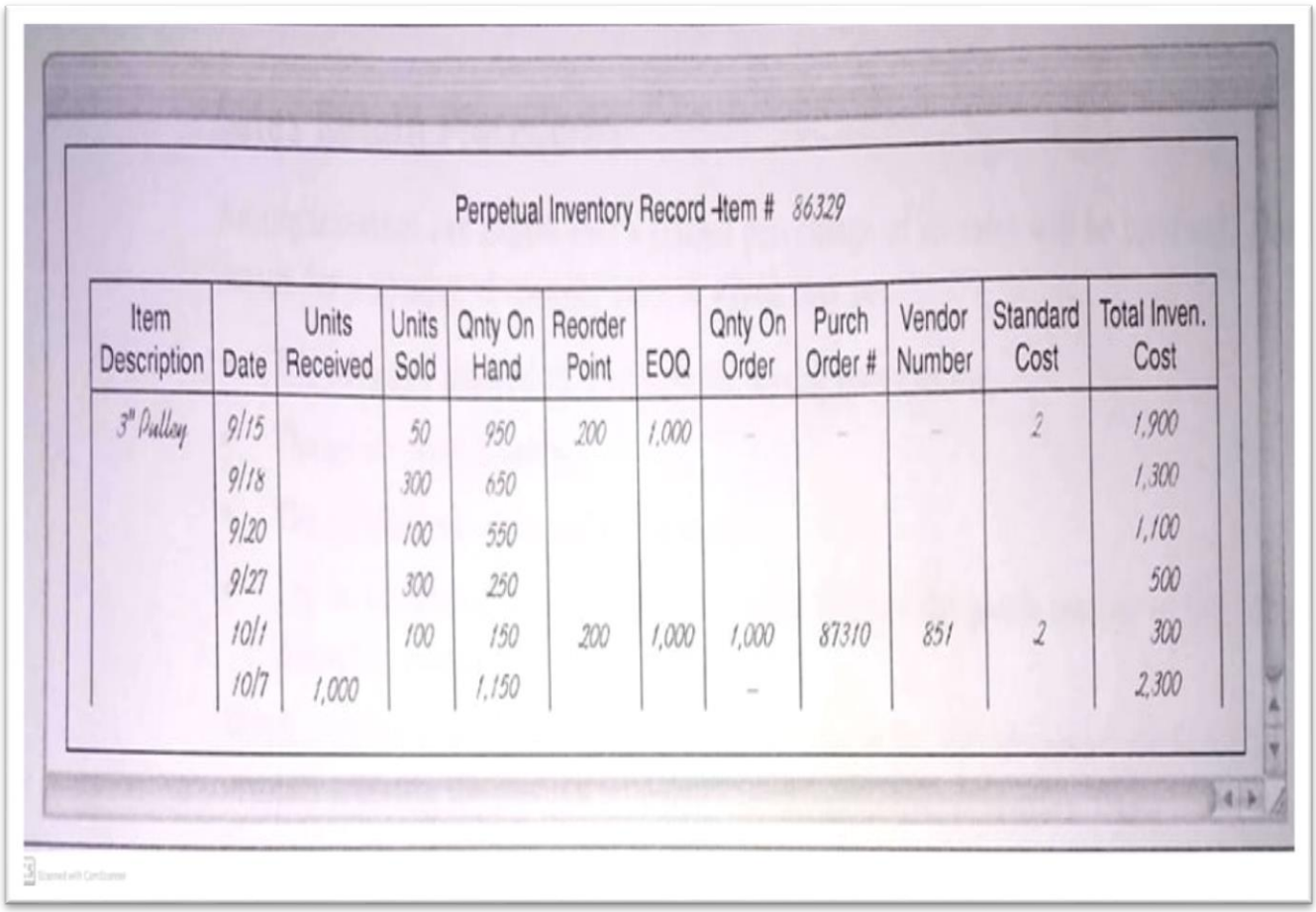
Explanation: to record total credit sales for 10/7/2007

Approved by: JRM Posted by: MBB

- ***Update Inventory Records.*** The inventory control function **updates inventory subsidiary ledger** accounts from information contained in the stock release document. In a perpetual inventory system, every inventory item has its own record in the ledger containing, at a minimum, the data depicted in Figure 5. Each stock release document reduces the quantity on hand of one or more inventory accounts. Periodically, the financial value of the total reduction in inventory is summarized in a journal voucher and sent to the general ledger function for posting to the following accounts:

Cost of Goods Sold	xxxx	
Inventory		xxxx

Figure (5): Inventory Subsidiary Ledger



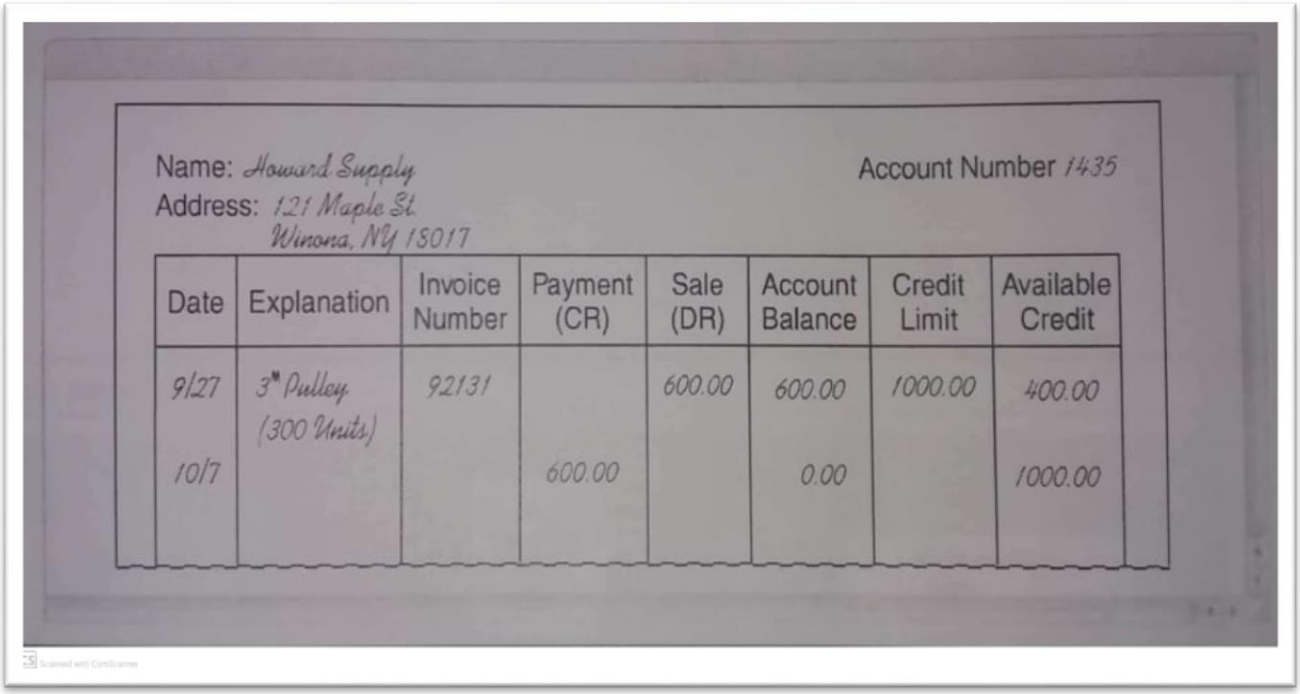
Perpetual Inventory Record -Item # 86329

Item Description	Date	Units Received	Units Sold	Qnty On Hand	Reorder Point	EOQ	Qnty On Order	Purch Order #	Vendor Number	Standard Cost	Total Inven. Cost
3" Pulley	9/15		50	950	200	1,000	–	–	–	2	1,900
	9/18		300	650							1,300
	9/20		100	550							1,100
	9/27		300	250							500
	10/1		100	150	200	1,000	1,000	87310	851	2	300
	10/7	1,000		1,150			–				2,300

- **Update Accounts Receivable**. Customer records in **the accounts receivable (AR) subsidiary ledger** are updated from information the sales order (ledger copy) provides. Every customer has an account record in the AR subsidiary ledger containing, at minimum, the following data: customer name; customer address; current balance; available credit; transaction dates; invoice numbers; and credits for payments, returns, and allowances.

  Figure 6 presents an example of an AR subsidiary ledger record. Periodically, the individual account balances are summarized in a report that is sent to the general ledger.

Figure (6) Accounts Receivable Subsidiary Ledger



Name: *Howard Supply* Account Number *1435*
Address: *121 Maple St.*
Winona, NY 15017

Date	Explanation	Invoice Number	Payment (CR)	Sale (DR)	Account Balance	Credit Limit	Available Credit
9/27	3" Pulley (300 Units)	92131		600.00	600.00	1000.00	400.00
10/7			600.00		0.00		1000.00

- **Post to General Ledger**. By the close of the transaction processing period, the general ledger function has received journal vouchers from the billing and inventory control tasks and an account summary from the AR function. This information set serves two purposes. First, the

general ledger uses the journal vouchers to post to the following control accounts:

	DR	CR
A/ R Control	xxx	
Cost of Goods Sold	xxx	
Inventory Control		xxx
Sales		xxx

Because general ledger accounts are used to prepare financial statements, they contain only summary figures (no supporting detail) and require only summary posting information. Second, this information supports an important independent verification control. The AR summary, which the AR function independently provides, is used to verify the accuracy of the journal vouchers from billing. The AR summary figures should equal the total debits to AR reflected in the journal vouchers for the transaction period. By reconciling these figures, the general ledger function can detect many types of errors.

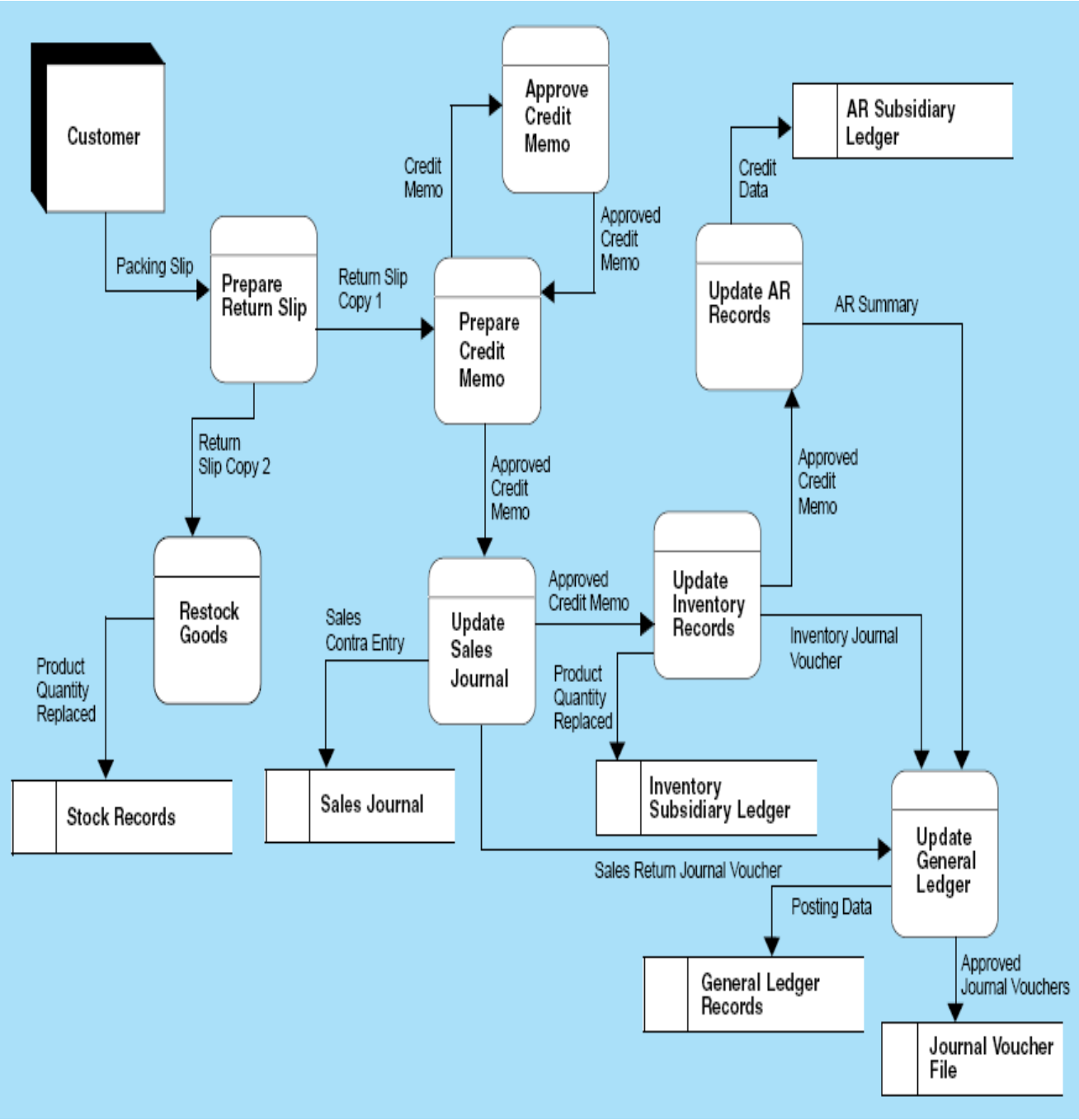
3/4 Sales Return Procedures

An organization can expect that a certain percentage of its sales will be returned. This occurs for a number of reasons, some of which may be:

1. The company shipped the customer the wrong merchandise.
2. The goods were defective.
3. The product was damaged in shipment.
4. The buyer refused delivery because the seller shipped the goods too late or they were delayed in transit.

When a return is necessary, the buyer requests credit for the unwanted products. This involves reversing the previous transaction in the sales order procedure. Using the DFD in Figure 7, let's now review the procedures for approving and processing returned items.

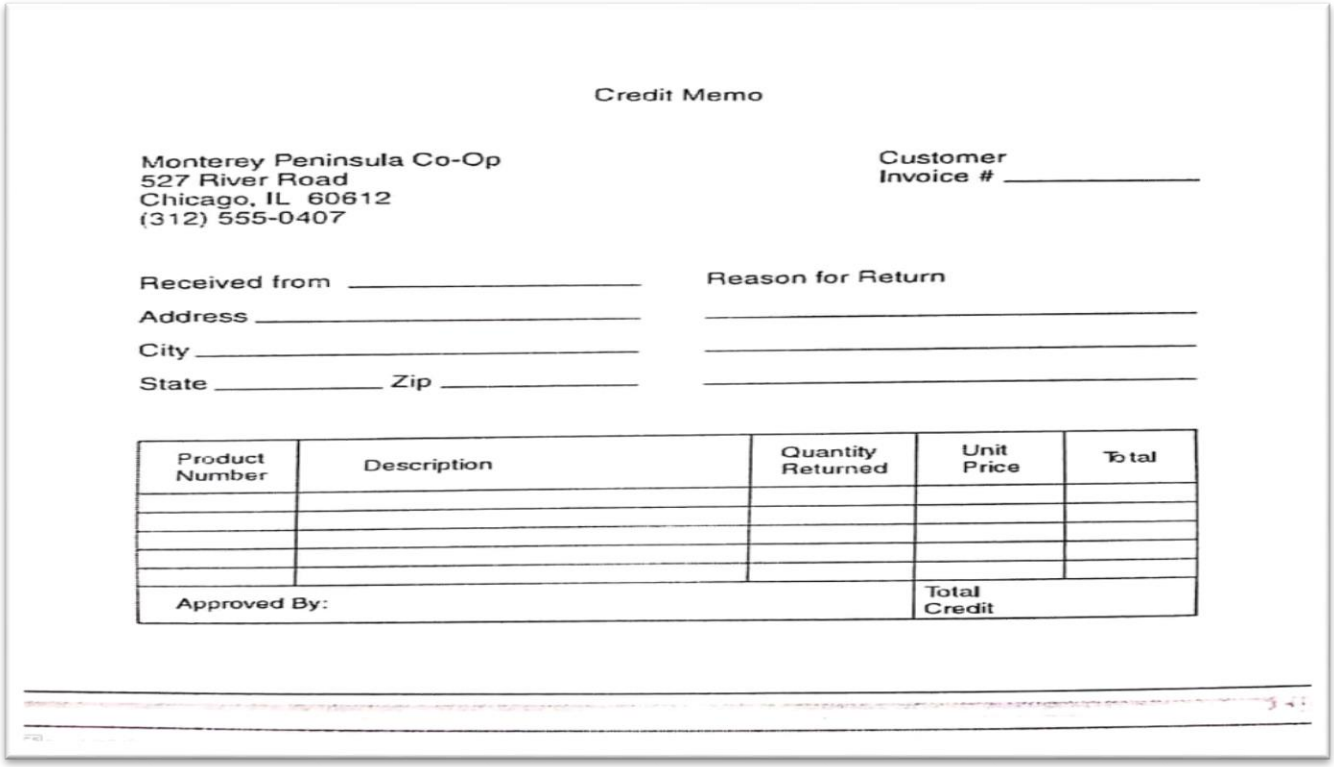
Figure (7) DFD of Sales Return Procedures



- **Prepare Return Slip**. When items are returned, the receiving department employee counts, inspects, and prepares a return slip describing the items. The goods, along with a copy of the return slip, go to the warehouse to be restocked. The employee then sends the second copy of the return slip to the sales function to prepare a credit memo.

- **Prepare Credit Memo.** Upon receipt of the return slip, the sales employee prepares a credit memo. This document is the authorization for the customer to receive credit for the merchandise returned. Note that the credit memo illustrated in Figure 8 is similar in appearance to a sales order. Some systems may actually use a copy of the sales order marked credit memo.

Figure (8): Credit Memo



Credit Memo

Monterey Peninsula Co-Op
527 River Road
Chicago, IL 60612
(312) 555-0407

Customer
Invoice # _____

Received from _____
Address _____
City _____
State _____ Zip _____

Reason for Return
_____
_____
_____

Product Number	Description	Quantity Returned	Unit Price	Total
Approved By:			Total Credit	

In cases where specific authorization is required (that is, the amount of the return or circumstances surrounding the return exceed the sales employee's general authority to approve), the credit memo goes to the credit manager for approval. However, if the clerk has sufficient general authority to approve the return, the credit memo is sent directly to the billing function, where the customer sales transaction is reversed.

- **Approve Credit Memo.** The credit manager evaluates the circumstances of the return and makes a judgment to grant (or disapprove) credit. The manager then returns the approved credit memo to the sales department.

- **Update Sales Journal**. Upon receipt of the approved credit memo, the transaction is recorded in the sales journal as a contra entry. The credit memo is then forwarded to the inventory control function for posting. At the end of the period, total sales returns are summarized in a journal voucher and sent to the general ledger department.

- **Update Inventory and AR Records**. The inventory control function adjusts the inventory records and forwards the credit memo to accounts receivable, where the customer's account is also adjusted. Periodically, inventory control sends a journal voucher summarizing the total value of inventory returns to the general ledger update task. Similarly, accounts receivable submits an AR account summary to the general ledger function.

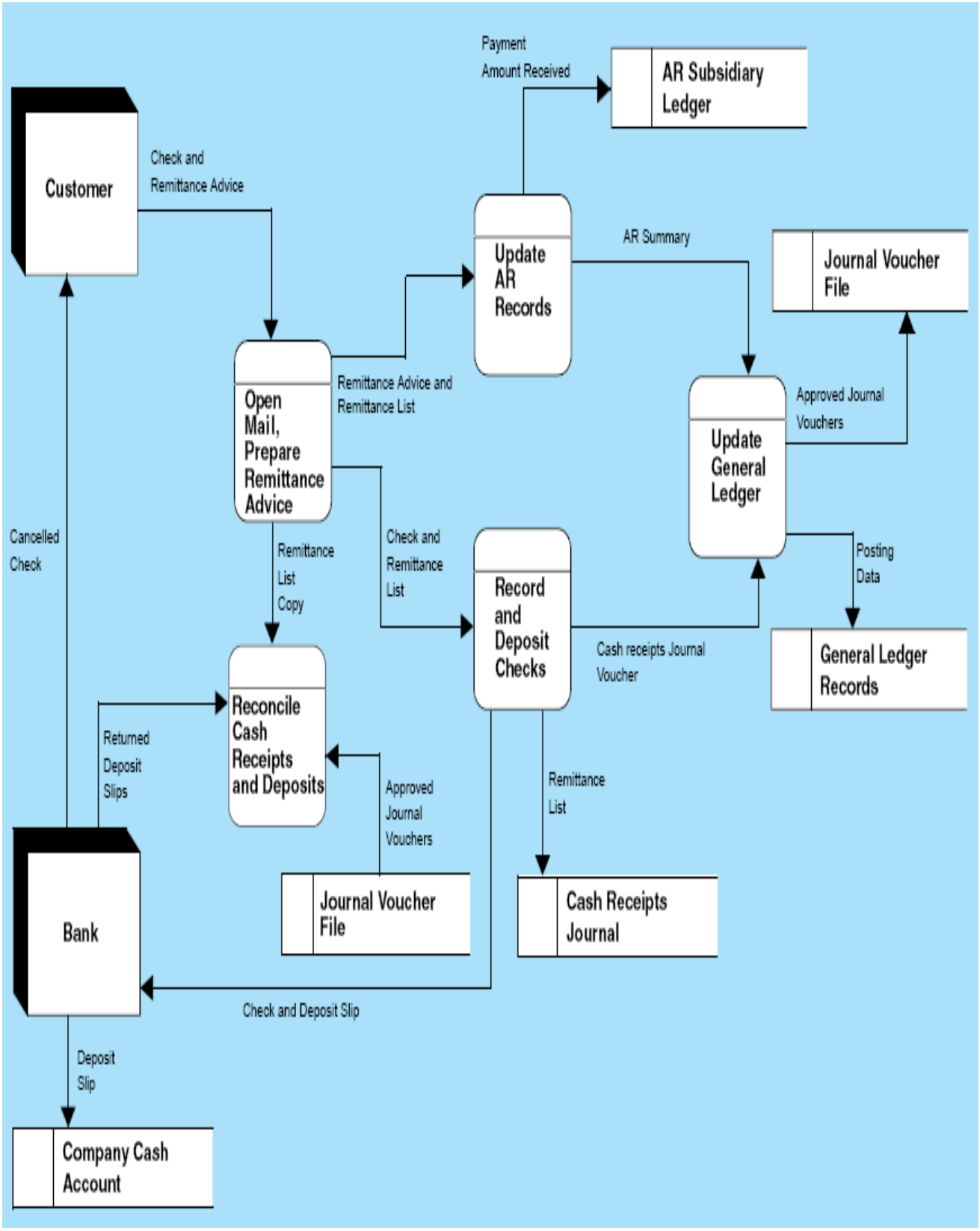
- **Update General Ledger.** Upon receipt of the journal voucher and account summary information, the general ledger function reconciles the figures and posts to the following control accounts:

	DR	CR
Inventory Control	xxx	
Sales Returns and Allowances	xxx	
Cost of Goods Sold		xxx
Accounts Receivable -Control		xxx

3/5 Cash Receipts Procedures

The sales order procedure described a credit transaction that resulted in the establishment of an account receivable. Payment on the account is due at some future date, which the terms of trade determine. Cash receipts procedures apply to this future event. They involve receiving and securing the cash; depositing the cash in the bank; matching the payment with the customer and adjusting the correct account; and properly accounting for and reconciling the financial details of the transaction. The data flow diagram in Figure 9 shows the relationship between these tasks. They are described in detail in the following section.

Figure (9) DFD of Sales Return Procedures



- **Open Mail and Prepare Remittance Advice**. A mail room employee opens envelopes containing customers' payments and remittance advices. Remittance advices contain information needed to service individual customers 'accounts. This includes payment date, account number, amount paid, and customer check number.

  Only the portion above the perforated line is the remittance advice, which the customer removes and returns with the payment. In some systems, the lower portion of the document is a customer statement that the billing department sends out periodically. In other cases, this could be the original customer invoice, which was described in the sales order procedures.

The remittance advice is a form of a turnaround document. Its importance is most apparent in firms that process large volumes of cash receipts daily. For example, processing a check from John Smith with no supporting details would require a time-consuming and costly search through perhaps thousands of records to find the correct John Smith. This task is greatly simplified when the customer provides necessary account number and posting information. Because of the possibility of transcription errors and omissions, however, sellers do not rely on their customers to provide this information directly on their checks. Errors are avoided and operational efficiency is greatly improved when using remittance advices.

Mail room personnel route the checks and remittance advices to an administrative clerk who endorses the checks "For Deposit Only" and reconciles the amount on each remittance advice with the corresponding check. The clerk then records each check on a form called a remittance list (or cash prelist), where all cash received is logged.

In this example, the clerk prepares three copies of the remittance list. The original copy is sent with the checks to the record and deposit checks function. The second copy goes with the remittance advices to the update AR function. The third goes to a reconciliation task.

- **Record and Deposit Checks.** A cash receipts employee verifies the accuracy and completeness of the checks against the prelist. Any checks possibly lost or misdirected between the mail room and this function are thus identified. After reconciling the prelist to the checks, the employee records the check in the cash receipts journal. All cash receipts transactions, including cash sales, miscellaneous cash receipts, and cash received on account, are recorded in the cash receipts journal. Figure 10 illustrates this with an example of each type of transaction. Notice that each check received from a customer is listed as a separate line item.

Figure (10): Cash Receipts Journal

Cash Receipts Journal

Date	Account	Post Ref	Check #	Cash Acct. # 101 (Debit)	Sales Discounts Acct. # 430 (Debit)	Accounts Receivable Acct. # 102	Sales Acct. # 401 Credit	Sundry Accounts Debit (Credit)
9/3	Capital Stock	301	2150	14,000				14,000
9/5	Ogment Supply	✓	6712	2,970	30	3,000		
9/9	Marvin Co.		3491	1,000			1,000	

Next, the clerk prepares a bank deposit slip showing the amount of the day's receipts and forwards this along with the checks to the bank. Upon deposit of the funds, the bank teller validates the deposit slip and returns it to the company for reconciliation. At the end of the day, the cash receipts employee summarizes the journal entries and sends the following journal voucher entry to the general ledger function.

	DR	CR
Cash	xxx	
Accounts Receivable Control		xxx

- **Update Accounts Receivable**. The remittance advices are used to post to the customers' accounts in the AR subsidiary ledger. Periodically, the changes in account balances are summarized and forwarded to the general ledger function.

- **Update General Ledger**. Upon receipt of the journal voucher and the account summary, the general ledger function reconciles the figures, posts to the cash and AR control accounts, and files the journal voucher.
- **Reconcile Cash Receipts and Deposits**. Periodically (weekly or monthly), a clerk from the controller's office (or an employee not involved with the cash receipts procedures) reconciles cash receipts by comparing the following documents: (1) a copy of the prelist, (2) deposit slips received from the bank, and (3) related journal vouchers.

3/6 Revenue Cycle Controls

The six classes of internal control activities that guide us in designing and evaluating transaction processing controls are transaction authorization, segregation of duties, supervision, accounting records, access control, and independent verification.

1. **Transaction Authorization**

The objective of transaction authorization is to ensure that only valid transactions are processed. In the following sections, we see how this objective applies in each of the three systems.

- **Credit Check.** Credit checking of prospective customers is a credit department function. This department ensures the proper application of the firm's credit policies. The principal concern is the creditworthiness of the customer. In making this judgment, the credit department may employ various techniques and tests.

  The complexity of credit procedures will vary depending on the organization, its relationship with the customer, and the materiality of the transaction. Credit approval for first-time customers may take time. Credit decisions that fall within a sales employee's general authority (such as verifying that the current transaction does not exceed the customer's credit limit) may be dealt with very quickly. Whatever level of test is deemed necessary by company policy, the transaction should not proceed further until credit is approved.

- **Return Policy**. Because credit approval is generally a credit department function, that department authorizes the processing of sales returns as well. An approval determination is based on the nature

of the sale and the circumstances of the return. The concepts of specific and general authority also influence this activity. Most organizations have specific rules for granting cash refunds and credits to customers based on the materiality of the transaction. As materiality increases, credit approval becomes more formal.

- **Remittance List (Cash Prelist).** The cash prelist provides a means for verifying that customer checks and remittance advices match in amount. The presence of an extra remittance advice in the AR department or the absence of a customer's check in the cash receipts department would be detected when the batch is reconciled with the prelist. Thus, the prelist authorizes the posting of a remittance advice to a customer's account.

2. Segregation of Duties

Segregating duties ensures that no single individual or department processes a transaction in its entirety. The number of employees and the volume of transactions being processed influence how to accomplish the segregation.

A. Transaction authorization should be separate from transaction processing.

Within the revenue cycle, the credit department is segregated from the rest of the process, so formal authorization of a transaction is an independent event. The importance of this separation is clear when one considers the potential conflict in objectives between the individual salesperson and the organization.

Often, compensation for sales staff is based on their individual sales performance. In such cases, sales staff have an incentive to maximize sales volume and thus may not adequately consider the creditworthiness of prospective customers. By acting in an independent capacity, the credit department may objectively detect risky customers and disallow poor and irresponsible sales decisions.

B. **Asset custody should be separate from the task of asset record keeping**.

The physical assets at risk in the revenue cycle are inventory and cash, hence the need to separate asset custody from record keeping. The inventory warehouse has physical custody of inventory assets, but inventory control (an accounting function) maintains records of inventory levels. To combine these tasks would open the door to fraud and material errors. A person with combined responsibility could steal or lose inventory and adjust the inventory records to conceal the event.

Similarly, the cash receipts department takes custody of the cash asset, while updating AR records is an accounts receivable (accounting function) responsibility. The cash receipts department typically reports to the treasurer, who has responsibility for financial assets. Accounting functions report to the controller. Normally these two general areas of responsibility are performed independently.

C. **The organization should be structured so that the perpetration of a fraud requires collusion between two or more individuals**.

The record-keeping tasks need to be carefully separated. Specifically, the subsidiary ledgers (AR and inventory), the journals (sales and cash

receipts), and the general ledger should be separately maintained. An individual with total record-keeping responsibility, in collusion with someone with asset custody, is in a position to perpetrate fraud. By separating these tasks, collusion must involve more people, which increases the risk of detection and therefore is less likely to occur.

3. Supervision

Some firms have too few employees to achieve an adequate separation of functions. These firms must rely on supervision as a form of compensating control. By closely supervising employees who perform potentially incompatible functions, a firm can compensate for this exposure.

Supervision can also provide control in systems that are properly segregated. For example, the mail room is a point of risk in most cash receipts systems. The individual who opens the mail has access both to cash (the asset) and to the remittance advice (the record of the transaction).

A dishonest employee may use this opportunity to steal the check, cash it, and destroy the remittance advice, thus leaving no evidence of the transaction. Ultimately, this sort of fraud will come to light when the customer complains after being billed again for the same item and produces the canceled check to prove that payment was made.

By the time the firm gets to the bottom of this problem, however, the perpetrator may have committed the crime many times and left the organization. Detecting crimes after the fact accomplishes little; prevention is the best solution. The deterrent effect of supervision can provide an effective preventive control.

4. Accounting Records

Chapter 2 described how a firm's source documents, journals, and ledgers form an audit trail that allows independent auditors to trace transactions through various stages of processing. This control is also an important operational feature of well-designed accounting systems. Sometimes transactions get lost in the system. By following the audit trail, management can discover where an error occurred. Several specific control techniques contribute to the audit trail.

- **Prenumbered Documents.**

  Prenumbered documents (sales orders, shipping notices, remittance advices, and so on) are sequentially numbered by the printer and allow every transaction to be identified uniquely. This permits the isolation and tracking of a single event (among many thousands) through the accounting system. Without a unique tag, one transaction looks very much like another. Verifying financial data and tracing transactions would be difficult or even impossible without prenumbered source documents.

- **Special Journals**.

  By grouping similar transactions together into special journals, the system provides a concise record of an entire class of events. For this purpose, revenue cycle systems use the sales journal and the cash receipts journal.

- **Subsidiary Ledgers.** Two subsidiary ledgers are used for capturing transaction event details in the revenue cycle: the inventory and AR subsidiary ledgers. The sale of products reduces quantities on hand in the inventory subsidiary records and increases the customers' balances in the AR subsidiary records. The receipt of cash reduces

customers' balances in the AR subsidiary records. These subsidiary records provide links back to journal entries and to the source documents that captured the events.

- **General Ledgers.** The general ledger control accounts are the basis for financial statement preparation. Revenue cycle transactions affect the following general ledger accounts: sales, inventory, cost of goods sold, AR, and cash. Journal vouchers that summarize activity captured in journals and subsidiary ledgers flow into the general ledger to update these accounts. Thus, we have a complete audit trail from the financial statements to the source documents via the general ledger, subsidiary ledgers, and special journals.
- **Files**. The revenue cycle employs several temporary and permanent files that contribute to the audit trail. The following are typical examples:
  i. Open sales order file shows the status of customer orders.
  ii. Shipping log specifies orders shipped during the period.
  iii. Credit records file provides customer credit data.
  iv. Sales order pending file contains open orders not yet shipped or billed.
  v. Back-order file contains customer orders for out-of-stock items.
  vi. Journal voucher file is a compilation of all journal vouchers posted to the general ledger.

5. Access Controls

Access controls prevent and detect unauthorized and illegal access to the firm's assets. The physical assets at risk in the revenue cycle are inventories and cash. Limiting access to these items includes:

- Warehouse security, such as fences, alarms, and guards.
- Depositing cash daily in the bank.
- Using a safe or night deposit box for cash.
- Locking cash drawers and safes in the cash receipts department.

Information is also an important asset at risk. Access control over information involves restricting access to documents that control physical assets including source documents, journals, and ledgers. An individual with unrestricted access to records can effectively manipulate the physical assets of the firm. The following are examples of access risks in the revenue cycle:

1. An individual with access to the AR subsidiary ledger could remove his or her account (or someone else's) from the books. With no record of the account, the firm would not send the customer monthly statements.
2. Access to sales order documents may permit an unauthorized individual to trigger the shipment of a product.
3. An individual with access to both cash and the general ledger cash account could remove cash from the firm and adjust the cash account to cover the act.

6. Independent Verification

The objective of independent verification is to verify the accuracy and completeness of tasks that other functions in the process perform. To be effective, independent verifications must occur at key points in the process where errors can be detected quickly and corrected. Independent verification controls in the revenue cycle exist at the following points:

1. The shipping function verifies that the goods sent from the warehouse are correct in type and quantity. Before the goods are sent to the

customer, the stock release document and the packing slip are reconciled.

2. The billing function reconciles the original sales order with the shipping notice to ensure that customers are billed for only the quantities shipped.

3. Prior to posting to control accounts, the general ledger function reconciles journal vouchers and summary reports prepared independently in different function areas. The billing function summarizes the sales journal, inventory control summarizes changes in the inventory subsidiary ledger, the cash receipts function summarizes the cash receipts journal, and accounts receivable summarizes the AR subsidiary ledger.

Discrepancies between the numbers supplied by these various sources will signal errors that need to be resolved before posting to the GL can take place. For example, the general ledger function would detect a sales transaction that had been entered in the sales journal but not posted to the customer's account in the AR subsidiary ledger.

The journal voucher from billing, summarizing total credit sales, would not equal the total increases posted to the AR subsidiary ledger. The specific customer account causing the out-of-balance condition would not be determinable at this point, but the error would be noted. Finding it may require examining all the transactions processed during the period. Depending on the technology in place, this could be a tedious task.

3/7 Physical Systems

In this section we examine the physical system. This begins with a review of manual procedures and then moves on to deal with several forms

of computer-based systems. The inclusion of manual systems in this age of computer technology is controversial. We do so for three reasons.

First, manual systems serve as a visual training aid to promote a better understanding of key concepts. Manual (document) flowcharts depict information as the flow of physical documents. Their source, routing, destination, and sequence of events are visually discernable from the flowchart. In computer-based systems, flows of digital documents are not easily represented on flowcharts and may be difficult for novice AIS students to follow.

Second, manual system flowcharts reinforce the importance of segregation of duties through clearly defined departmental boundaries. In computer-based systems, these segregations are often accomplished through computer programming techniques and password controls that cannot be represented visually on a flowchart. Indeed, a single box (program icon) on a system flowchart may consolidate tasks of many different organizational units.

Finally, manual systems are a fundamental component of the framework for viewing technology innovations. The shortcomings and failings of current generation technology become the design imperative for the next. The first generation of computer technology emerged out of the manual environment. An argument can be made that understanding what used to be state-of-the-art improves one's understanding of what led us to where we are now.

For these reasons, some instructors prefer to teach manual systems before moving on to computer applications. Others favor moving directly to computer-based systems. This section has been organized to accommodate both teaching styles. Following is a review of manual systems.

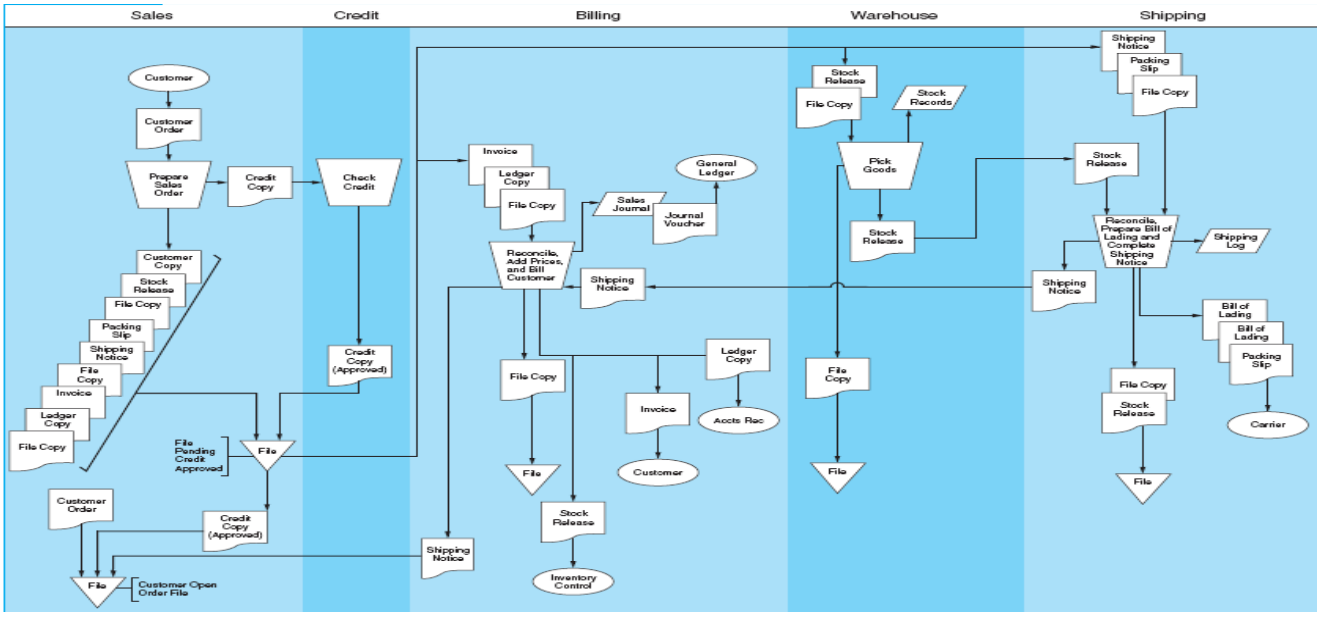
3/8 Manual Systems

The purpose of this section is to support the system concepts presented in the previous section with models depicting people, organizational units, and physical documents and files. This section should help you envision the segregation of duties and independent verifications, which are essential to effective internal control regardless of the technology in place. In addition, we highlight inefficiencies intrinsic to manual systems, which gave rise to modern systems using improved technologies.

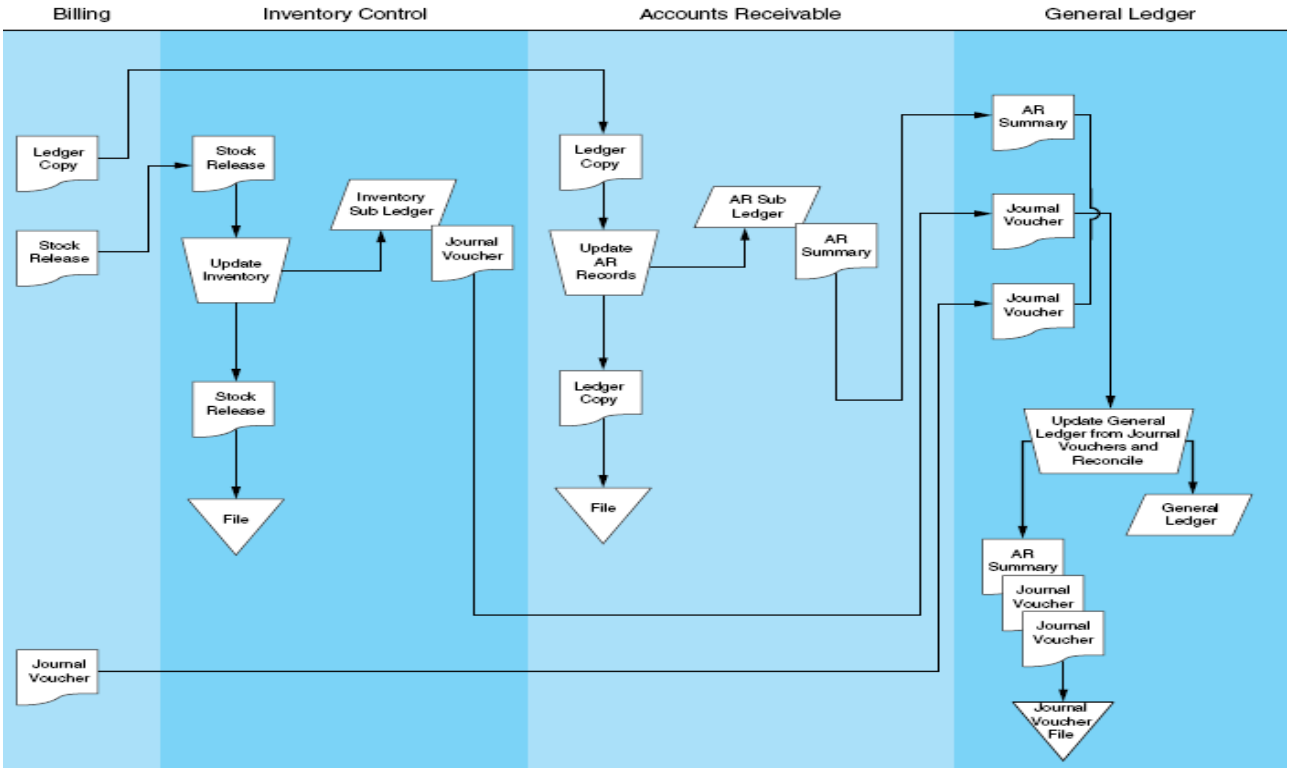
1. Sales Order Processing

The document flowchart in Figure 11 shows the procedures and the documents typical to a manual sales order system. In manual systems, maintaining physical files of source documents is critical to the audit trail. As we walk through the flowchart, notice that in each department, after completion of the assigned task, one or more documents are filed as evidence that the task was completed.

Figure (11): Manual Sales Order Processing Systems



Manual Sales Order Processing Systems (Continued)



1. Sales Department

The sales process begins with a customer contacting the sales department by telephone, mail, or in person. The sales department records the essential details on a sales order. This information will later trigger many tasks, but for the moment is filed pending credit approval.

2. Credit Department Approval

To provide independence to the credit authorization process, the credit department is organizationally and physically segregated from the sales department. When credit is approved, the sales department clerk pulls the various copies of the sales orders from the pending file and releases them to the billing, warehouse, and shipping departments. The customer order and credit approval are then placed in the open order file.

3. Warehouse Procedures

The next step is to ship the merchandise, which should be done as soon after credit approval as possible. The warehouse clerk receives the stock release copy of the sales order and uses this to locate the inventory. The inventory and stock release are then sent to the shipping department. Finally, the warehouse clerk records the inventory reduction in the stock records.

4. The Shipping Department

The shipping clerk reconciles the products received from the warehouse with the shipping notice copy of the sales order received earlier. As discussed previously, this reconciliation is an important control point, which ensures that the firm sends the correct products and quantities to the customer.

When the order is correct, a bill of lading is prepared, and the products are packaged and shipped via common carrier to the customer. The clerk then enters the transaction into the shipping log and sends the shipping notice to the billing department.

5. The Billing Department

The shipping notice is proof that the product has been shipped and is the trigger document that initiates the billing process. Upon receipt of the shipping notice, the billing clerk compiles the relevant facts about the transaction (product prices, handling charges, freight, taxes, and discount terms) and bills the customer. The billing clerk then enters the transaction into the sales journal and distributes documents to the AR and inventory control departments. Periodically, the clerk summarizes all transactions into a journal voucher and sends this to the general ledger department.

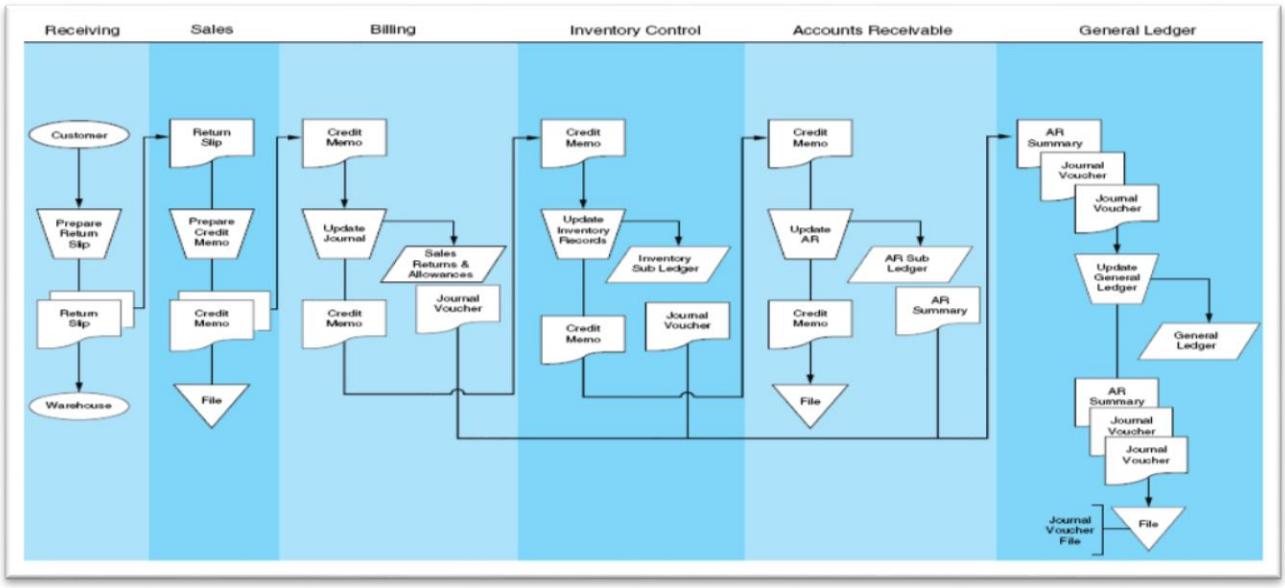
6. Accounts Receivable, Inventory Control, and General Ledger Departments

Upon receipt of sales order copies from the billing department, the AR and inventory control clerks update their respective subsidiary ledgers. Periodically they prepare journal vouchers and account summaries, which they send to the general ledger department for reconciliation and posting to the control accounts.

2. Sales Return Procedures

Figure 12 illustrates the procedures and documents used for processing sales returns.

Figure (12): Sales Return Procedures



1. Receiving Department

The sales return process begins in the receiving department, where personnel receive, count, inspect for damage, and send returned products to the warehouse. The receiving clerk prepares a return slip, which is forwarded to the sales department for processing.

2. Sales Department

Upon receipt of the return slip, the clerk prepares a credit memo. Depending on the materiality and circumstance of the return, company policy will dictate whether credit department approval (not shown) is required.

3. Processing the Credit Memo

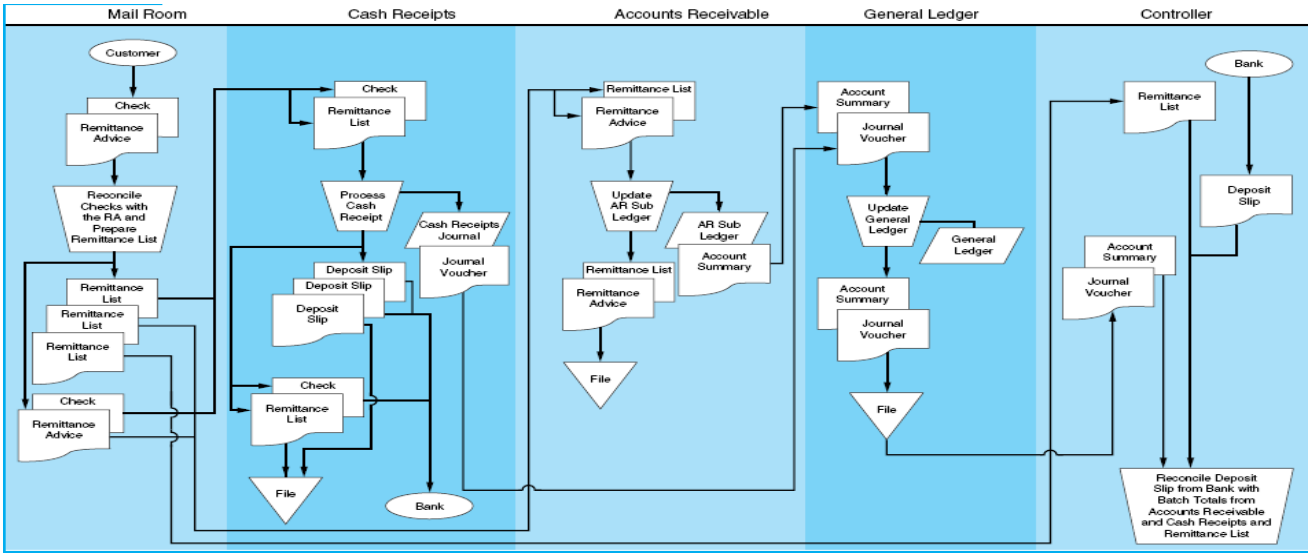
The objective of the sales return system is to reverse the effects of the original sales transaction. Billing records a contra entry into sales return, and allowance journal inventory control debits the inventory records to reflect the return of goods.

The AR clerk credits the customer account. All departments periodically prepare journal vouchers and account summaries, which are then sent to the general ledger for reconciliation and posting to the control accounts.

3. Cash Receipts Procedures

Figure 13 presents a document flowchart depicting the cash receipts procedures.

Figure (13): Flowchart of Cash Receipts System



1. **Mail Room**

Customer payments and remittance advices arrive at the mail room, where the envelopes are opened. The checks are sent to the cashier in the cash receipts department, and the remittance advices are sent to the AR department.

2. **Cash Receipts**

The cashier records the checks in the cash receipts journal and promptly sends them to the bank, accompanied by two copies of the deposit slip. Periodically, the employee prepares a journal voucher and sends it to the general ledger department.

3. **Accounts Receivable**

The AR department uses the remittance advices to reduce the customers' account balances consistent with the amount paid. The AR clerk prepares a summary of changes in account balances, which is sent to the general ledger department.

4. **General Ledger Department**

Upon receipt of the journal voucher and account summary from cash receipts and AR, respectively, the general ledger clerk reconciles the information and posts to the control accounts.

5. **Controller's Office**

Because cash is a liquid asset and subject to misappropriation, additional controls are necessary. In this case, someone from the controller's office periodically performs bank reconciliation by comparing deposit slips

returned from the bank, account summaries used to post to the accounts, and journal vouchers.

6. Concluding Remarks

We conclude our discussion of manual systems with two points of observation.

First, notice how manual systems generate a great deal of hard-copy (paper) documents. Physical documents need to be purchased, prepared, transported, and stored. Hence, these documents and their associated tasks add considerably to the cost of system operation. As we shall see in the next section, their elimination or reduction is a primary objective of computer-based systems design.

Second, for purposes of internal control, many functions such as the billing, accounts receivable, inventory control, cash receipts, and the general ledger are located in physically separate departments. These are labor-intensive and thus error-prone activities that add greatly to the cost of system operation.

When we examine computer-based systems, you should note that computer programs, which are much cheaper and far less prone to error, perform these clerical tasks. The various departments may still exist in computer-based systems, but their tasks are refocused on financial analysis and dealing with exception-based problems that emerge rather than routine transaction processing.

Multiple Choice Questions:

1. Which document is NOT prepared by the sales department?
    a. Packing slip
    b. Shipping notice
    c. Bill of lading
    d. Stock release

2. Which document triggers the update of the inventory subsidiary ledger?
    a. Bill of lading
    b. Stock release
    c. Sales order
    d. Shipping notice

3. Which function should the billing department NOT perform?
    a. Record the sales in the sales journal
    b. Send the ledger copy of the sales order to accounts receivable
    c. Send the stock release document and the shipping notice to the billing department as proof of shipment
    d. Send the stock release document to inventory control

4. When will a credit check approval most likely require specific authorization by the credit department?
    a. When verifying that the current transaction does not exceed the customer's credit limit
    b. When verifying that the current transaction is with a valid customer
    c. When a valid customer places a materially large order
    d. When a valid customer returns goods

5. Which type of control is considered a compensating control?

   a. Segregation of duties

   b. Access control

   c. Supervision

   d. Accounting records

6. Which of the following is NOT an independent verification control?

   a. The shipping department verifies that the goods sent from the warehouse are correct in type and quantity

   b. General ledger clerks reconcile journal vouchers that were independently prepared in various departments.

   c. The use of prenumbered sales orders.

   d. The billing department reconciles the shipping notice with the sales invoice to ensure that customers are billed for only the quantities shipped.

7. Which function or department below records the decrease in inventory due to a sale?

   a. Warehouse

   b. Sales department

   c. Billing department

   d. Inventory control

8. Which situation indicates a weak internal control structure?

   a. The AR clerk authorizes the write off of bad debts

   b. The record-keeping clerk maintains both AR and AP subsidiary ledgers

   c. The inventory control clerk authorizes inventory purchases

   d. The AR clerk prepares customer statements every month

9. The bill of lading is prepared by the

a. Sales clerk. b. Warehouse clerk. c. Shipping clerk. d. Billing clerk

Chapter 4: The Expenditure Cycle: Purchase and Cash Disbursements Procedures

4/1 Introduction

This chapter examines the principal features of the two major subsystems that constitute the expenditure cycle: (1) the purchases processing subsystem and (2) the cash disbursements subsystem. The chapter is organized into two main sections. The first section provides an overview of the conceptual system, including the logical tasks, the key entities, the sources and uses of information, and the flow of key documents through an organization. The second section deals with the physical system. We first use a manual system to reinforce the reader's understanding of key concepts. We then examine several computer-based systems, focusing on the operational and control implications of alternative data processing methods.

4/2 The Conceptual System

- **Overview of Purchases and Cash Disbursements Activities**

In this section we examine the expenditure cycle conceptually. Using data flow diagrams (DFDs) as a guide, we will trace the sequence of activities through two of the processes that constitute the expenditure cycle for most retail, wholesale, and manufacturing organizations. These are purchases processing and cash disbursements procedures.

As in the previous chapter, the conceptual system discussion is intended to be technology neutral. The tasks described in this section may be performed manually or by computer. At this point our focus is on what (conceptually) needs to be done, not how (physically) it is accomplished.

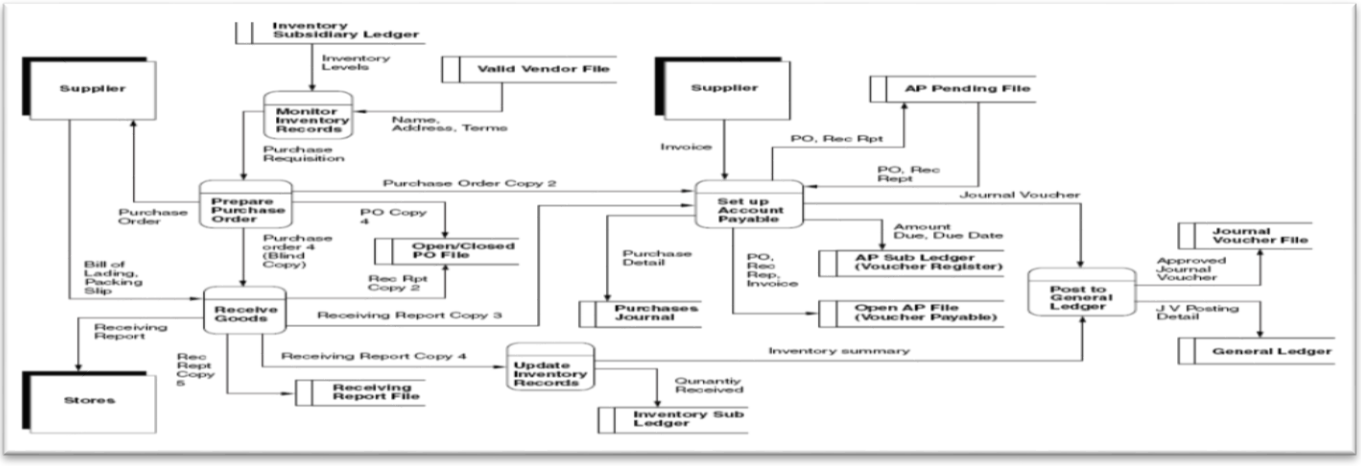
At various stages in the processes, we will examine specific documents, journals, and ledgers as they are encountered. Again, this review is technology neutral. These documents and files may be physical (hard copy) or digital (computer generated). Later in the chapter, we examine examples of physical systems.

4/3 Purchases Processing Procedures

Purchases procedures include the tasks involved in identifying inventory needs, placing the order, receiving the inventory, and recognizing the liability. The relationships between these tasks are presented with the DFD in Figure 1. In general, these procedures apply to both manufacturing and retailing firms.

A major difference between the two business types lies in the way purchases are authorized. Manufacturing firms purchase raw materials for production, and their purchasing decisions are authorized by the production planning and control function. Merchandising firms purchase finished goods for resale. The inventory control function provides the purchase authorization for this type of firm.

Figure (1): DFD of Purchases System



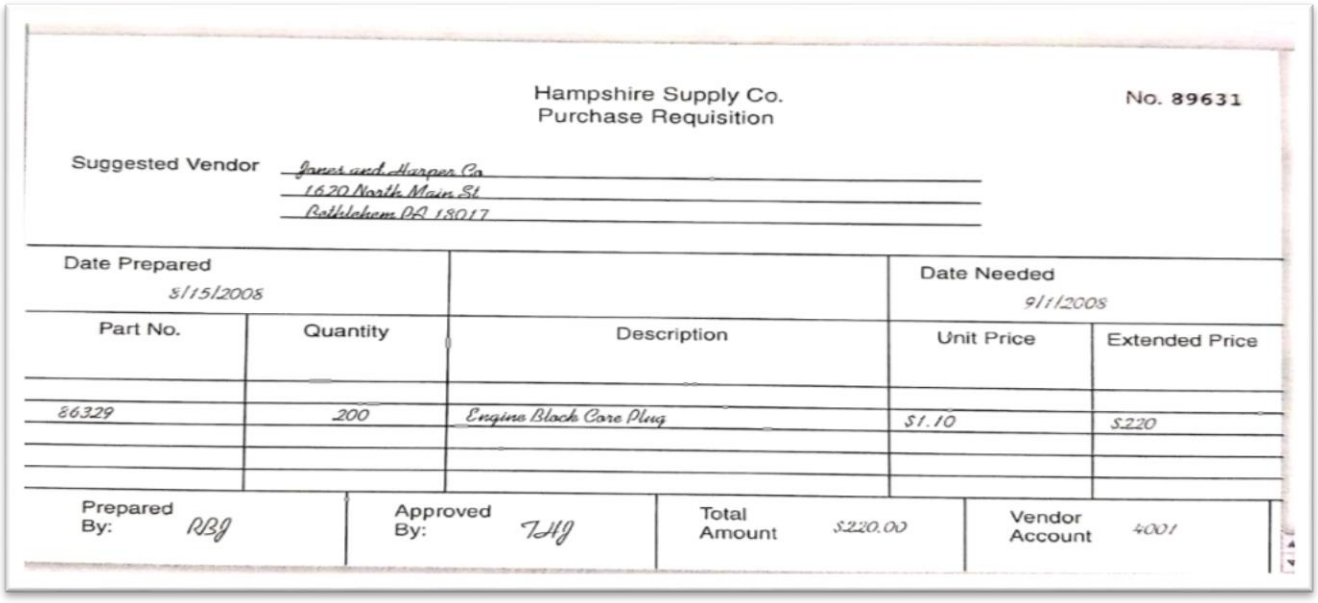
1. **Monitor Inventory Records**.

Firms deplete their inventories by transferring raw materials into the production process (the conversion cycle) and by selling finished goods to customers (revenue cycle). Our illustration assumes the latter case, in which inventory control monitors and records finished goods inventory levels.

When inventories drop to a predetermined reorder point, a purchase requisition is prepared and sent to the prepare purchase order function to initiate the purchase process. Figure 2 presents an example of a purchase requisition.

While procedures will vary from firm to firm, typically a separate purchase requisition will be prepared for each inventory item as the need is recognized. This can result in multiple purchase requisitions for a given vendor. These purchase requisitions need to be combined into a single purchase order (discussed next), which is then sent to the vendor. In this type of system, each purchase order will be associated with one or more purchase requisitions.

Figure (2): Purchase Requisition



Hampshire Supply Co.
Purchase Requisition

No. 89631

Suggested Vendor: Jones and Harper Co.
1620 North Main St
Bethlehem PA 18017

Date Prepared: 8/15/2008

Date Needed: 9/1/2008

Part No.	Quantity	Description	Unit Price	Extended Price
86329	200	Engine Block Core Plug	$1.10	$220

Prepared By: RBJ | Approved By: TJH | Total Amount: $220.00 | Vendor Account: 4001

2. Prepare Purchase Order.

The prepare purchase order function receives the purchase requisitions, which are sorted by vendor if necessary. Next, a purchase order (PO) is prepared for each vendor, as illustrated in Figure 3. A copy of the PO is sent to the vendor.

In addition, a copy is sent to the set-up accounts payable (AP) function for filing temporarily in the AP pending file, and a blind copy is sent to the receive goods function, where it is held until the inventories arrive. The last copy is filed in the **open/closed purchase order file**.

Figure (3): Purchase Order

Hampshire Supply Co.
Purchase Order

No. 23591

To : Jones and Harper Co.
1620 North Main St.
Bethlehem PA 18017

Please show the above number on all shipping documents and invoices.

Vendor Number	Date Ordered	Date Needed	Purchasing Agent	Terms
4001	8/15/08	9/1/08	J. Buell	2/10, n/30

Purchase Req. No.	Part No.	Quantity	Description	Unit Price	Extended Price
89631	86329	200	Engine Block Core Plug	$ 1.10	$220.00
89834	20671	100	Brake Shoes	9.50	950.00
89851	45218	10	Spring Compressors	33.00	330.00

Prepared By :	Approved By :	Total Amount
BKG	RMS	$1,500.00

To make the purchasing process efficient, the inventory control function will supply much of the routine ordering information that the purchasing department needs directly from the inventory and **valid vendor** files.

This information includes the name and address of the primary supplier, the economic order quantity (EOQ) of the item, and the standard or expected unit cost of the item. This allows the purchasing department to devote its efforts to meeting scarce, expensive, or unusual inventory needs.

To obtain the best prices and terms on special items, the purchasing department may need to prepare detailed product specifications and request bids from competing vendors. Dealing with routine purchases as efficiently as good control permits is desirable in all organizations. The valid vendor file contributes to both control and efficiency by listing only those vendors approved to do business with the organization.

3. Receive Goods.

Most firms encounter a time lag (sometimes a significant one) between placing the order and receiving the inventory. During this time, the copies of the PO reside in temporary files in various departments. Note that no economic event has yet occurred.

At this point, the firm has received no inventories and incurred no financial obligation. Hence, there is no basis for making a formal entry into any accounting record. However, firms often make memo entries of pending inventory receipts and associated obligations. The next event in the expenditure cycle is the receipt of the inventory. Goods arriving from the vendor are reconciled with the blind copy of the PO.

The blind copy, illustrated in Figure 4, contains no quantity or price information about the products being received. The purpose of the blind copy is to force the receiving clerk to count and inspect inventories prior to completing the receiving report.

At times, receiving docks are very busy and receiving staff are under pressure to unload the delivery trucks and sign the bills of lading so the truck drivers can go on their way. If receiving clerks are only provided quantity information, they may be tempted to accept deliveries on the basis of this information alone, rather than verify the quantity and condition of the goods. Shipments that are short or contain damaged or incorrect items must be detected before the firm accepts and places the goods in inventory. The blind copy is an important device in reducing this exposure.

Figure (4): Blind Copy Purchase Order

Hampshire Supply Co.
Purchase Order

No. 23591

To : Jones and Harper Co.
1620 North Main St.
Bethlehem PA 18017

Please show the above number on all shipping documents and invoices.

Vendor Number	Date Ordered	Date Needed	Purchasing Agent	Terms
4001	8/15/08	9/1/08	J. Buell	2/10, n/30

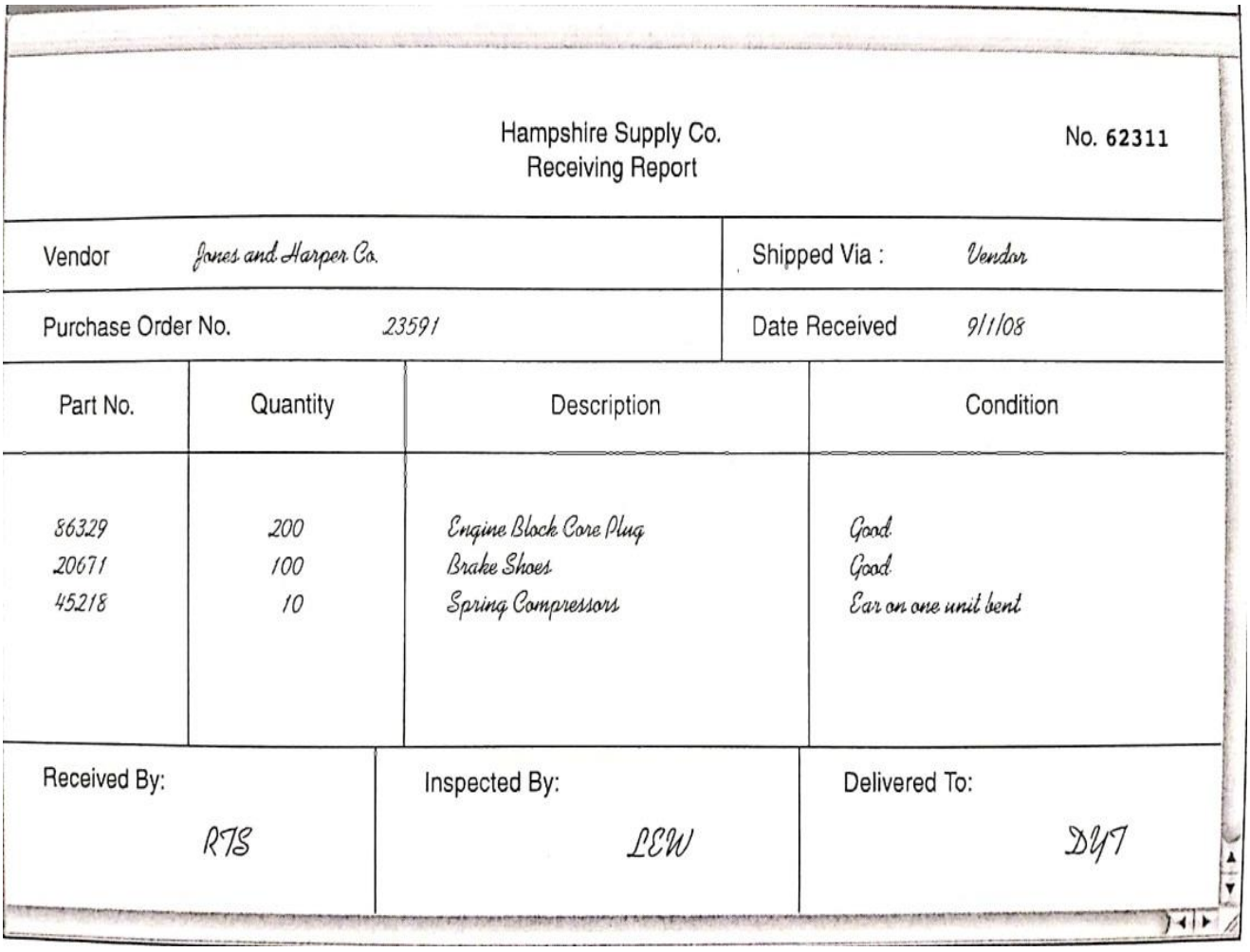
Purchase Req. No.	Part No.	Quantity	Description	Unit Price	Extended Price
89631 89834 89851	86329 20671 45218		Engine Block Core Plug Brake Shoes Spring Compressors		

Prepared By :	Approved By :	Total Amount
BKG	RMS	

Upon completion of the physical count and inspection, the receiving clerk prepares **a receiving report** stating the quantity and condition of the inventories. Figure 5 contains an example of a receiving report. One copy of the receiving report accompanies the physical inventories to either the raw materials storeroom or finished goods warehouse for safekeeping. Another copy is filed in the open/closed PO file to close out the purchase order.

A third copy of the **receiving report** is sent to the AP department, where it is filed in the **AP pending file**. A fourth copy of the receiving report is sent to inventory control for updating the inventory records. Finally, a copy of the receiving report is placed in the **receiving report file.**

Figure (5): Receiving Report



Hampshire Supply Co.
Receiving Report

No. 62311

Vendor: Jones and Harper Co.	Shipped Via: Vendor
Purchase Order No.: 23591	Date Received: 9/1/08

Part No.	Quantity	Description	Condition
86329	200	Engine Block Core Plug	Good
20671	100	Brake Shoes	Good
45218	10	Spring Compressors	Ear on one unit bent

Received By:	Inspected By:	Delivered To:
RTS	LEW	DYT

4. Update Inventory Records.

Depending on the inventory valuation method in place, the inventory control procedures may vary somewhat among firms. Organizations that use **a standard cost system** carry their inventories at a predetermined standard value regardless of the price actually paid to the vendor. Figure 6 presents a copy of a standard cost inventory ledger.

Figure (6): Inventory Subsidiary Ledger Using Standard Cost

HAMPSHIRE MACHINE CO.

Perpetual Inventory Record—Item #86329

Item Description	Units Received	Units Sold	Qnty on Hand	Reorder Point	Qnty on Order	EOC	Vendor Number	Standard Cost	Total Inven. Cost
Engine Block Core Plug	200		200	30		200	4001	1.10	220
		30	170						187
		20	150						165

Posting to a standard cost inventory ledger requires only information about the quantities received. Because the receiving report contains quantity information, it serves this purpose. Updating an actual cost inventory ledger requires additional financial information, such as a copy of the supplier's invoice when it arrives.

5. Set Up Accounts Payable.

During the course of this transaction, the set-up AP function has received and temporarily filed copies of the PO and receiving report. The organization has received inventories from the vendor and has incurred (realized) an obligation to pay for the goods.

At this point in the process, however, the firm has not received the **supplier's invoice.** containing the financial information needed to record the transaction. The firm will thus defer recording (recognizing) the liability until the invoice arrives.

This common situation creates a slight lag (a few days) in the recording process, during which time the firm's liabilities are technically understated. As a practical matter, this misstatement is a problem only at period-end when the firm prepares financial statements. To close the books, the accountant will need to estimate the value of the obligation until the invoice arrives.

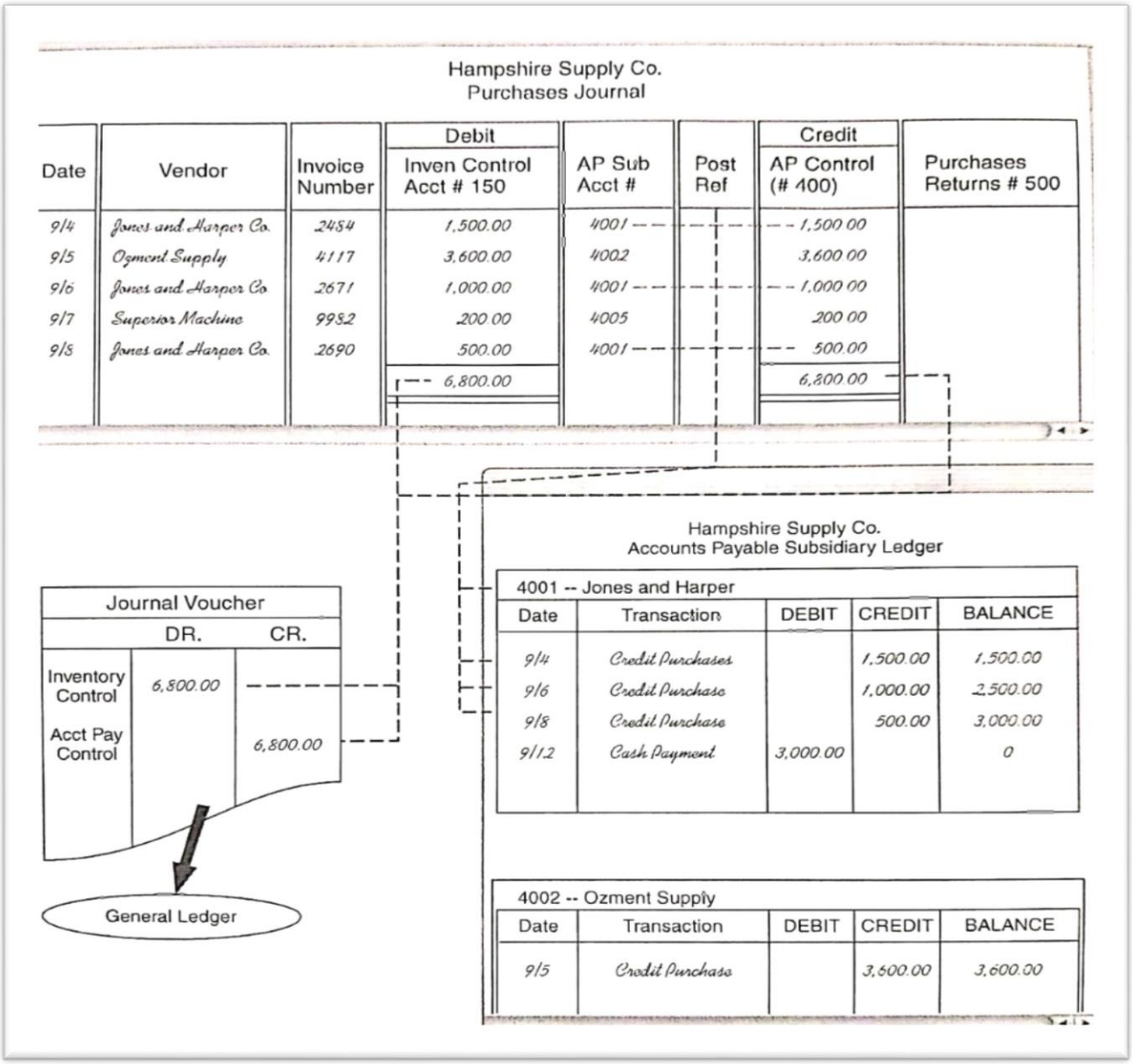
If the estimate is materially incorrect, an adjusting entry must be made to correct the error. Because the receipt of the invoice typically triggers AP procedures, accountants need to be aware that unrecorded liabilities may exist at period-end closing.

When the invoice arrives, the AP clerk reconciles the financial information with the receiving report and PO in the pending file. This is called

a three-way match, which verifies that what was ordered was received and is fairly priced.

Once the reconciliation is complete, the transaction is recorded in the purchases journal and posted to the supplier's account in the AP subsidiary ledger. Figure 7 shows the relationship between these accounting records.

Figure (7): Relationship between Purchase Journal, AP Subsidiary Ledger, and Journal Voucher



Recall that the inventory valuation method will determine how inventory control will have recorded the receipt of inventories. If the firm is using the actual cost method, the AP clerk would send a copy of the supplie's invoice to inventory control. If standard costing is used, this step is not necessary.

After recording the liability, the AP clerk transfers all source documents (PO, receiving report, and invoice) to the **open AP file**. Typically, this file is organized by payment due date and scanned daily to ensure that debts are paid on the last possible date without missing due dates and losing discounts. We examine cash disbursements procedures later in this section.

Finally, the AP clerk summarizes the entries in the purchases journal for the period (or batch) and prepares a journal voucher for the general ledger function (see Figure 7).

Assuming the organization uses the perpetual inventory method, the journal entry will be:

	DR	CR
Inventory—Control	6,800.00	
Accounts Payable—Control		6,800.00

If the periodic inventory method is used, the entry will be:

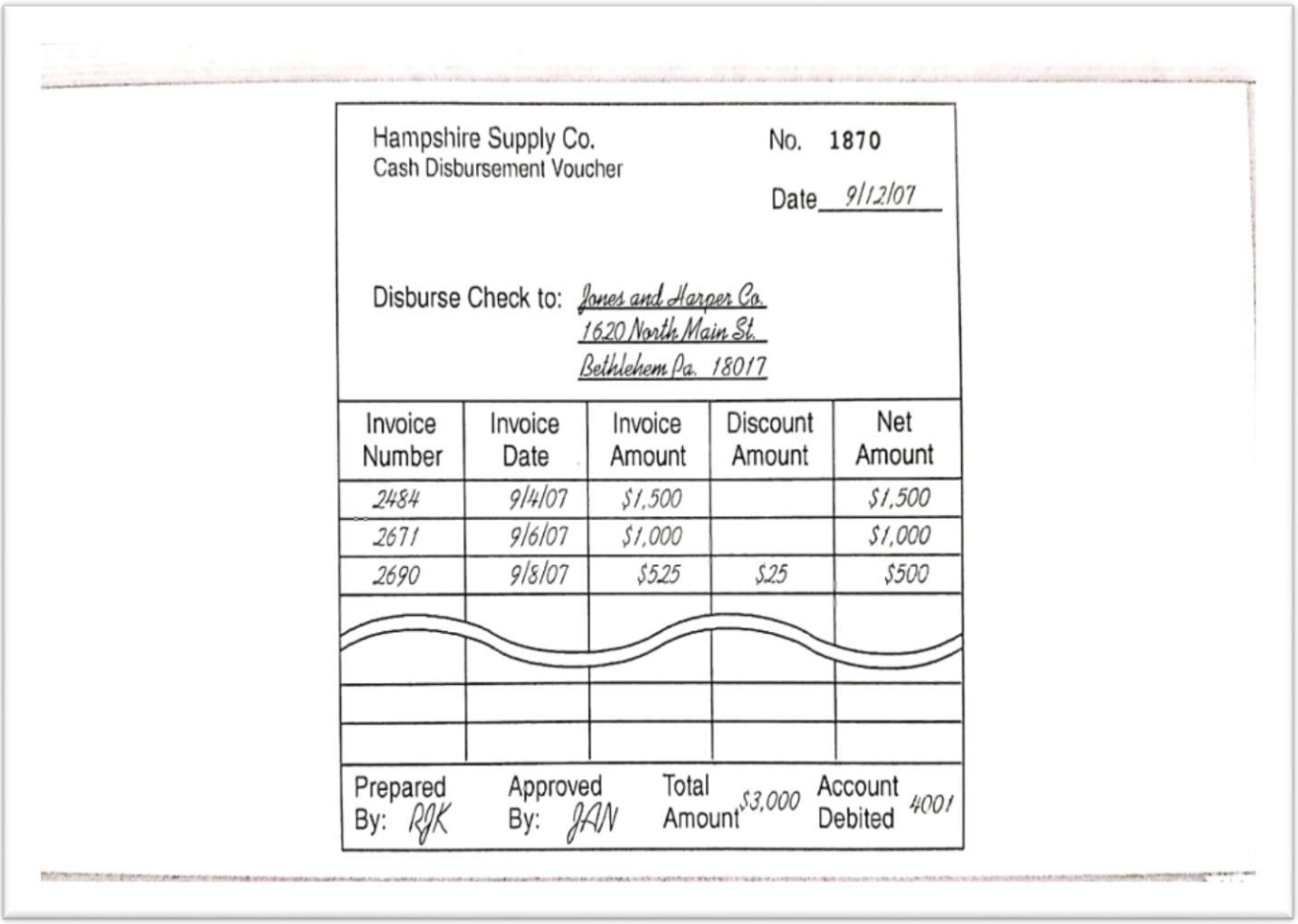
	DR	CR
Purchases	6,800.00	
Accounts Payable—Control		6,800.00

- **Vouchers Payable System**

Rather than using the AP procedures described in the previous section, many firms use **a vouchers payable system**. Under this system, the AP department uses **cash disbursement vouchers** and maintains a voucher register.

After the AP clerk performs the three-way match, he or she prepares a cash disbursement voucher to approve payment. Vouchers provide improved control over cash disbursements and allow firms to consolidate several payments to the same supplier on a single voucher, thus reducing the number of checks written. Figure 8 shows an example of a voucher.

Figure (8): Cash Disbursement Voucher



Hampshire Supply Co.
Cash Disbursement Voucher

No. 1870

Date 9/12/07

Disburse Check to: Jones and Harper Co.
1620 North Main St.
Bethlehem Pa. 18017

Invoice Number	Invoice Date	Invoice Amount	Discount Amount	Net Amount
2484	9/4/07	$1,500		$1,500
2671	9/6/07	$1,000		$1,000
2690	9/8/07	$525	$25	$500

Prepared By: RJK
Approved By: JAN
Total Amount $3,000
Account Debited 4001

Each voucher is recorded in the **voucher register**, as illustrated in Figure 9. The voucher register reflects the AP liability of the firm. The sum of the unpaid vouchers in the register (those with no check numbers and paid dates) is the firm's total AP balance.

The AP clerk files the cash disbursement voucher, along with supporting source documents, in the **vouchers payable file**. This file is equivalent to the open AP file discussed earlier and also is organized by due date. The DFD in Figure 1 illustrates both liability recognition methods.

Figure (9): Voucher Register

Hampshire Supply Co.
Voucher Register

Date	Voucher No.	Paid		Voucher Payable (Credit)	Merchandise Debit	Supplies Debit	Selling Expense Debit	Administrative Expense Debit	Fixed Assets Debit	Misc. Debits	
		Check No.	Date							Acct. No.	Amount
9/12/07	1870	104	9/14	3,000	3,000						
9/13/07	1871			3,600		3,600					
9/14/07	1872	105	9/15	500			500				

6. Post to General Ledger.

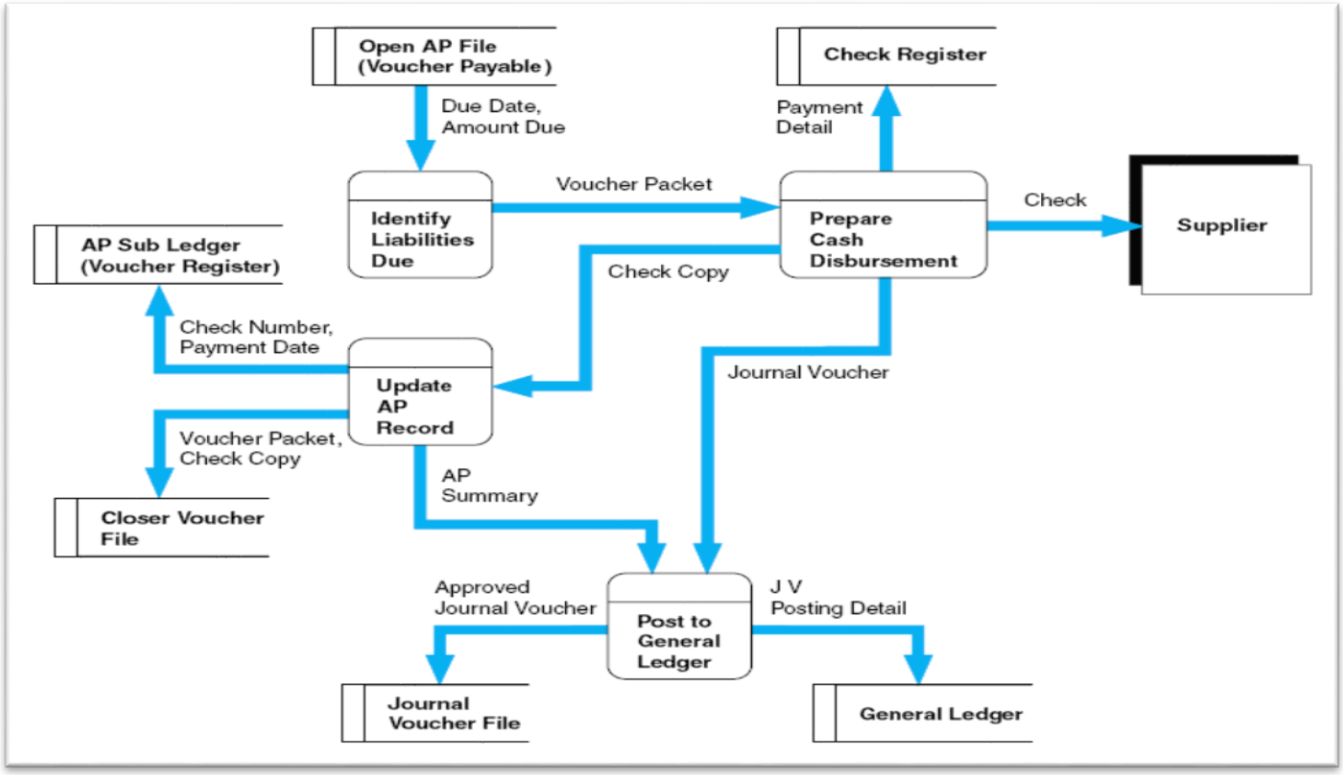
The general ledger function receives a journal voucher from the AP department and an account summary from inventory control. The general ledger function posts from the journal voucher to the inventory and AP control accounts and reconciles the inventory control account and the inventory subsidiary summary.

The approved journal vouchers are then posted to the journal voucher file. With this step, the purchases phase of the expenditure cycle is completed.

4/4 The Cash Disbursements Systems

The cash disbursements system processes the payment of obligations created in the purchases system. The principal objective of this system is to ensure that only valid creditors receive payment and that amounts paid are timely and correct. If the system makes payments early, the firm forgoes interest income that it could have earned on the funds. If obligations are paid late, however, the firm will lose purchase discounts or may damage its credit standing. Figure 10 presents a DFD conceptually depicting the information flows and key tasks of the cash disbursements system.

Figure (10): DFD for Cash Disbursements System



1. Identify Liabilities Due.

The cash disbursements process begins in the AP department by identifying items that have come due. Each day, the AP function reviews the open AP file (or vouchers payable file) for such items and sends payment approval in the form of a voucher packet (the voucher and/or supporting documents) to the cash disbursements department.

2. Prepare Cash Disbursement.

The cash disbursements clerk receives the voucher packet and reviews the documents for completeness and clerical accuracy. For each disbursement, the clerk prepares a check and records the check number, dollar amount, voucher number, and other pertinent data in the **check register**, which is also called the **cash disbursements journal**. Figure 11 shows an example of a check register.

Figure (11): Cash Disbursements Journal (Check Register)

Cash Disbursements Journal

Date	Check No.	Voucher No.	Description	Credit		GL / Subsidiary Account Debited	Posted	Vouch Pay 401	Freight-in 516	Op Expen 509	Other	Posted
				Cash	Purch. Disc.							
9/4/07	101	1867	Martin Motors	500		Auto					500	✓
9/4/07	102	1868	Pen Power	100		Utility	✓			100		
9/12/07	103	1869	Acme Auto	500		Purchases					500	✓
9/14/07	104	1870	Jones and Harper	3,000				3,000				

Depending on the organization's materiality threshold, the check may require additional approval by the cash disbursements department manager or treasurer (not shown in Figure 10).

The negotiable portion of the check is mailed to the supplier, and a copy of it is attached to the voucher packet as proof of payment. The clerk marks the documents in the voucher packets paid and returns them to the AP clerk.

Finally, the cash disbursements clerk summarizes the entries made to the check register and sends a journal voucher with the following journal entry to the general ledger department:

	DR	CR
Accounts Payable	XXX.	
Cash		XXX.

3. **Update AP Record.**

Upon receipt of the voucher packet, the AP clerk removes the liability by debiting the AP subsidiary account or by recording the check number and payment date in the voucher register. The voucher packet is filed in the **closed voucher file**, and an account summary is prepared and sent to the general ledger function.

4. **Post to General Ledger.**

The general ledger function receives the journal voucher from cash disbursements and the account summary from AP. The voucher shows the total reductions in the firm's obligations and cash account as a result of payments to suppliers. These numbers are reconciled with the AP summary, and the AP control and cash accounts in the general ledger are updated

accordingly. The approved journal voucher is then filed. This concludes the cash disbursements procedures.

4/5 Expenditure Cycle Controls

This section describes the primary internal controls in the expenditure cycle according to the control procedures specified in Statement on Auditing Standards No. 78. The main points are summarized in Table 1.

Table (1): Summary of Expenditure Cycle Controls

Control Activity	Purchases Processing System	Cash Disbursements System
Transactions authorization	Inventory control.	AP authorizes payment.
Segregation of duties	Inventory control separate from purchasing and inventory custody. AP subsidiary ledger separate from the general ledger.	Separate AP subsidiary ledger, cash disbursements, and general ledger functions.
Supervision	Receiving area.	
Accounting records	AP subsidiary ledger, general ledger, purchases requisition file, purchase order file, receiving report file.	Voucher payable file, AP subsidiary ledger, cash disbursements journal, general ledger cash accounts
Access	Security of physical assets. Limit access to the accounting records above.	Proper security over cash. Limit access to the accounting records above.

Independent verification	AP reconciles source documents before liability is recorded. General ledger reconciles overall accuracy of process.	Final review by cash disbursements. Overall reconciliation by general ledger. Periodic bank reconciliation by controller.

A. Transaction Authorization

A. Purchases Subsystem.

The inventory control function continually monitors inventory levels. As inventory levels drop to their predetermined reorder points, inventory control formally authorizes replenishment with a purchase requisition.

Formalizing the authorization process promotes efficient inventory management and ensures the legitimacy of purchases transactions. Without this step, purchasing agents could purchase inventories at their own discretion, being in a position both to authorize and to process the purchase transactions.

Unauthorized purchasing can result in excessive inventory levels for some items, while others go out of stock. Either situation is potentially damaging to the firm. Excessive inventories tie up the organization's cash reserves, and stock-outs cause lost sales and manufacturing delays.

B. Cash Disbursements Subsystem.

The AP function authorizes cash disbursements via the cash disbursement voucher. To provide effective control over the flow of cash from the firm, the cash disbursements function should not write checks without this explicit authorization. A cash disbursements journal (check register)

containing the voucher number authorizing each check (see Figure 11) provides an audit trail for verifying the authenticity of each check written.

B. Segregation of Duties

A. Segregation of Inventory Control from the Warehouse.

Within the purchases subsystem, the primary physical asset is inventory. Inventory control keeps the detailed records of the asset, while the warehouse has custody. At any point, an auditor should be able to reconcile inventory records to the physical inventory.

B. **Segregation of the General Ledger and Accounts Payable from Cash Disbursements**.

The asset subject to exposure in the cash disbursements subsystem is cash. The records controlling this asset are the AP subsidiary ledger and the cash account in the general ledger. An individual with the combined responsibilities of writing checks, posting to the cash account, and maintaining AP could perpetrate fraud against the firm.

For instance, an individual with such access could withdraw cash and then adjust the cash account accordingly to hide the transaction. Also, he or she could establish fraudulent AP (to an associate in a nonexistent vendor company) and then write checks to discharge the phony obligations. By segregating these functions, we greatly reduce this type of exposure.

C. Supervision

In the expenditure cycle, the area that most benefits from supervision is the receiving department. Large quantities of valuable assets flow through this area on their way to the warehouse. Close supervision here reduces the

chances of two types of exposure: (1) failure to properly inspect the assets and (2) the theft of assets.

A. Inspection of Assets.

When goods arrive from the supplier, receiving clerks must inspect items for proper quantities and condition (damage, spoilage, and so on). For this reason, the receiving clerk receives a blind copy of the original PO from purchasing.

A blind PO has all the relevant information about the goods being received except for the quantities and prices. To obtain quantities information, which is needed for the receiving report, the receiving personnel are forced to physically count and inspect the goods. If receiving clerks were provided with quantity information via an open PO, they may be tempted to transfer this information to the receiving report without performing a physical count.

Inspecting and counting the items received protects the firm from incomplete orders and damaged goods. Supervision is critical at this point to ensure that the clerks properly carry out these important duties. A packing slip containing quantity information that could be used to circumvent the inspection process often accompanies incoming goods.

A supervisor should take custody of the packing slip while receiving clerks count and inspect the goods.

B. Theft of Assets.

Receiving departments are sometimes hectic and cluttered during busy periods. In this environment, incoming inventories are exposed to theft until they are securely placed in the warehouse. Improper inspection

procedures coupled with inadequate supervision can create a situation that is conducive to the theft of inventories in transit.

D. Accounting Records

The control objective of accounting records is to maintain an audit trail adequate for tracing a transaction from its source document to the financial statements. The expenditure cycle employs the following accounting records: AP subsidiary ledger, voucher register, check register, and general ledger.

The auditor's concern in the expenditure cycle is that obligations may be materially understated on financial statements because of unrecorded transactions. This is a normal occurrence at year-end closing simply because some supplier invoices do not arrive in time to record the liabilities. This also happens, however, as an attempt to intentionally misstate financial information. Hence, in addition to the routine accounting records, expenditure cycle systems must be designed to provide supporting information, such as the purchase requisition file, the PO file, and the receiving report file. By reviewing these peripheral files, auditors may obtain evidence of inventory purchases that have not been recorded as liabilities.

5. Access Controls

A. Direct Access.

In the expenditure cycle, a firm must control access to physical assets such as cash and inventory. These control concerns are essentially the same as in the revenue cycle. Direct access controls include locks, alarms, and restricted access to areas that contain inventories and cash.

B. **Indirect Access**.

A firm must limit access to documents that control its physical assets. For example, an individual with access to purchase requisitions, purchase orders, and receiving reports has the ingredients to construct a fraudulent purchase transaction. With the proper supporting documents, a fraudulent transaction can be made to look legitimate to the system and could be paid.

6. Independent Verification

A. **Independent Verification by Accounts Payable**.

The AP function plays a vital role in the verification of the work others in this system have done. Copies of key source documents flow into this department for review and comparison. Each document contains unique facts about the purchase transaction, which the AP clerk must reconcile before the firm recognizes an obligation. These include:

1. The PO, which shows that the purchasing agent ordered only the needed inventories from a valid vendor. This document should reconcile with the purchase requisition.
2. The receiving report, which is evidence of the physical receipt of the goods, their condition, and the quantities received. The reconciliation of this document with the PO signifies that the organization has a legitimate obligation.
3. The supplier's invoice, which provides the financial information needed to record the obligation as an account payable. The AP clerk verifies that the prices on the invoice are reasonable compared with the expected prices on the PO.

B. Independent Verification by the General Ledger Department.

The general ledger function provides an important independent verification in the system. It receives journal vouchers and summary reports from inventory control, AP, and cash disbursements. From these sources, the general ledger function verifies that the total obligations recorded equal the total inventories received and that the total reductions in AP equal the total disbursements of cash.

4/6 Physical Systems

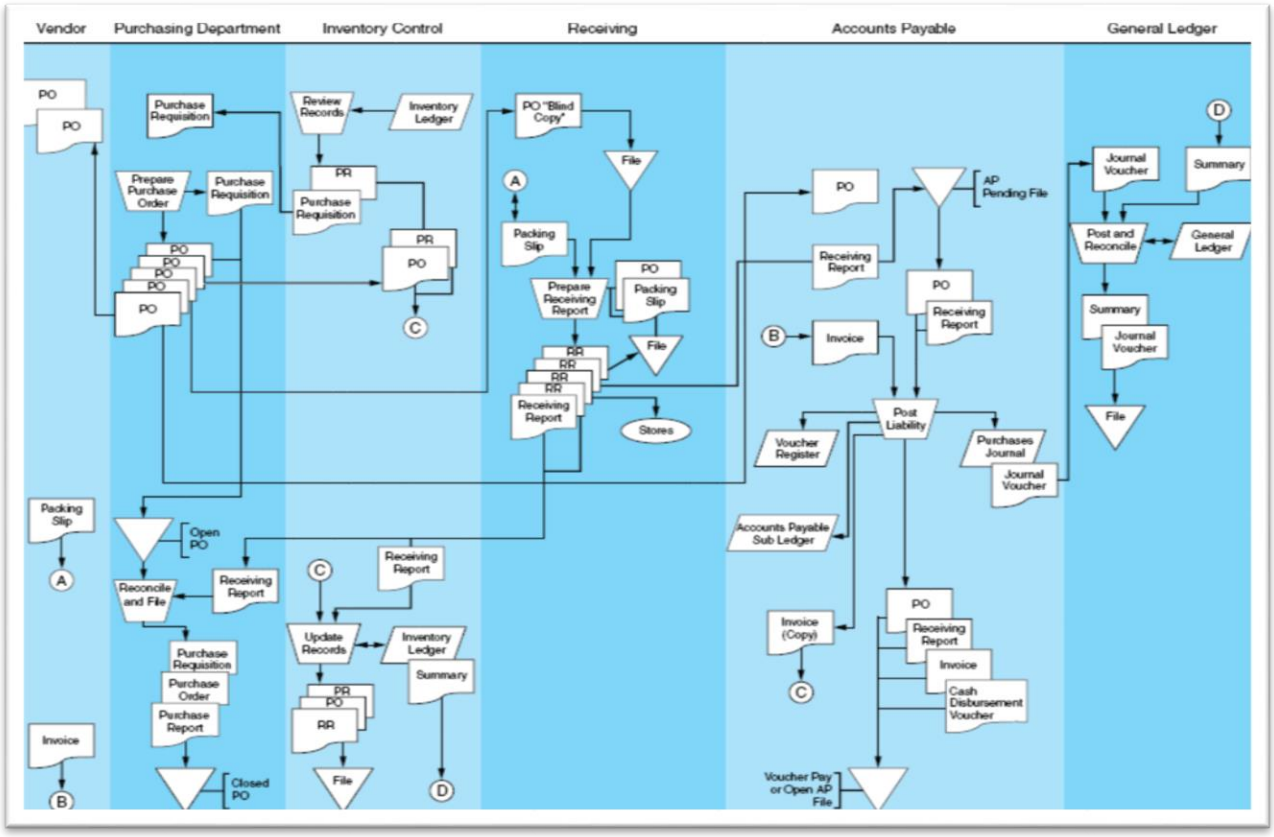
In this section we examine the physical system. This begins with a review of manual procedures and then moves on to deal with several forms of computer-based systems. As mentioned in the previous chapter, manual systems are covered here as a visual training aid to promote a better understanding of the concepts presented in the previous section.

- **A Manual System**

The purpose of this section is to support the conceptual treatment of systems presented in the previous section. This should help you envision the relationships between organizational units, the segregation of duties, and the information flows essential to operations and effective internal control.

In addition, we will highlight inefficiencies intrinsic to manual systems, which gave rise to improved technologies and techniques used by modern systems. The following discussion is based on Figure 12, which presents a flowchart of a manual purchases system.

Figure (12): Manual Purchase System



- **Inventory Control**

When inventories drop to a predetermined reorder point, the clerk prepares **a purchase requisition**. One copy of the requisition is sent to the purchasing department, and one copy is placed in the **open purchase requisition file**. Note that to provide proper authorization control, the inventory control department is segregated from the purchasing department, which executes the transaction.

- **Purchasing Department**

The purchasing department receives the purchase requisitions, sorts them by vendor, and prepares a multipart purchase order (PO) for each vendor. Two copies of the PO are sent to the vendor. One copy of the PO is

sent to inventory control, where the clerk files it with the open purchase requisition. One copy of the PO is sent to AP for filing in the AP pending file. One copy (the blind copy) is sent to the receiving department, where it is filed until the inventories arrive. The clerk files the last copy along with the purchase requisition in **the open PO file**.

- **Receiving**

Goods arriving from the vendor are reconciled with the blind copy of the PO. Upon completion of the physical count and inspection, the receiving clerk prepares a multipart receiving report stating the quantity and condition of the inventories. One copy of the receiving report accompanies the physical inventories to the storeroom. Another copy is sent to the purchasing department, where the purchasing clerk reconciles it with the open PO. The clerk closes the open PO by filing the purchase requisition, the PO, and the receiving report in the closed PO file.

A third copy of the receiving report is sent to inventory control where (assuming a standard cost system) the inventory subsidiary ledger is updated. A fourth copy of the receiving report is sent to the AP department, where it is filed in the AP pending file. The final copy of the receiving report is filed in the receiving department.

- **AP Department**

When the invoice arrives, the AP clerk reconciles the financial information with the documents in the pending file, records the transaction in the purchases journal, and posts it to the supplier's account in the AP subsidiary ledger (voucher register). After recording the liability, the AP clerk

transfers the source documents (PO, receiving report, and invoice) to the **open vouchers payable (AP) file.**

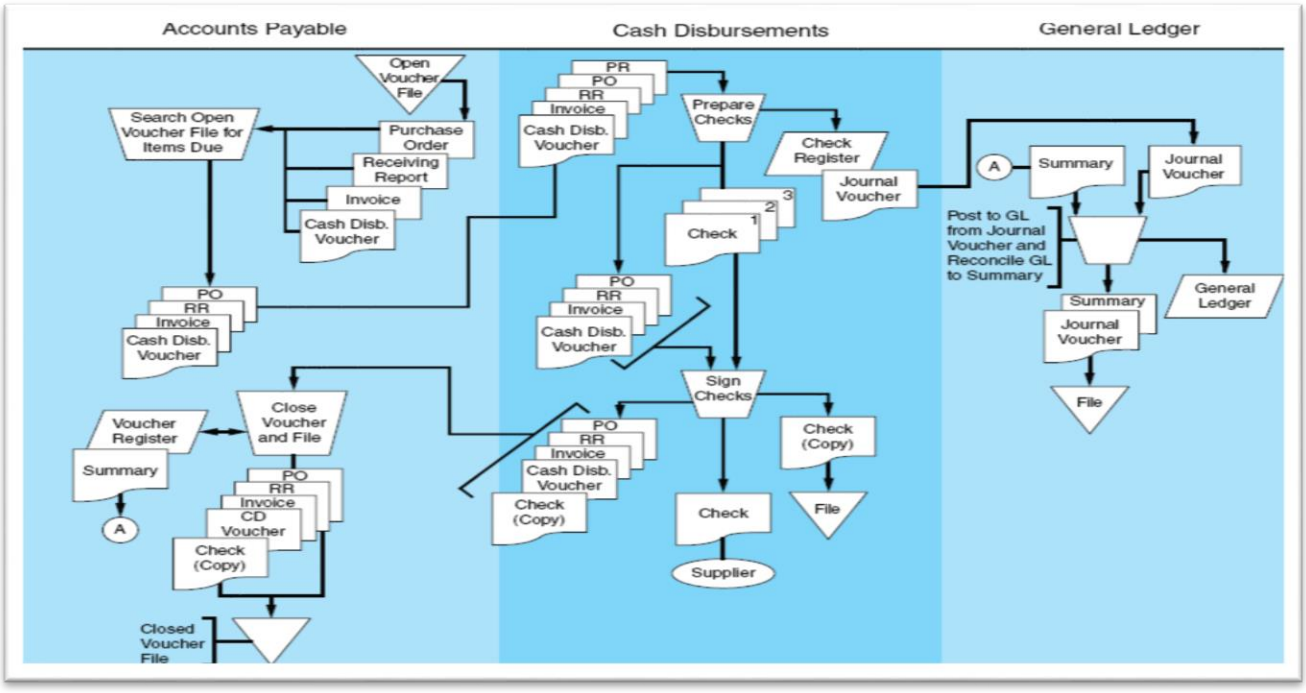
- **General Ledger Department**

The general ledger department receives a journal voucher from the AP department and an account summary from inventory control. The general ledger clerk reconciles these and posts to the inventory and AP control accounts. With this step, the purchases phase of the expenditure cycle is completed.

➢ **The Cash Disbursements Systems**

A detailed document flowchart of a manual cash disbursements system is presented in Figure 13. The tasks performed in each of the key processes are discussed in the following section.

Figure (13): Cash Disbursements System



- **AP Department**

Each day, the AP clerk reviews the open vouchers payable (AP) file for items due and sends the vouchers and supporting documents to the cash disbursements department.

✓ **Cash Disbursements Department**

The cash disbursements clerk receives the voucher packets and reviews the documents for completeness and clerical accuracy. For each disbursement, the clerk prepares a three part check and records the check number, dollar amount, voucher number, and other pertinent data in the check register.

The check, along with the supporting documents, goes to the cash disbursements department manager, or treasurer, for his or her signature. The negotiable portion of the check is mailed to the supplier. The clerk returns the voucher packet and check copy to the AP department and files one copy of the check. Finally, the clerk summarizes the entries made to the check register and sends a journal voucher to the general ledger department.

- **AP Department**

Upon receipt of the voucher packet, the AP clerk removes the liability by recording the check number in the voucher register and filing the voucher packet in the closed voucher file. Finally, the clerk sends an AP summary to the general ledger department.

- **General Ledger Department**

Based on the journal voucher from cash disbursements and the account summary from AP, the general ledger clerk posts to the general ledger control accounts and files the documents. This concludes the cash disbursements procedures.

- **Concluding Remarks**

We conclude our discussion of manual systems with two points of observation.

First, notice how manual expenditure cycle systems generate a great deal of paper documentation. Buying, preparing, transporting, and filing physical documents add considerably to the cost of system operation. As we shall see in the next section, their elimination or reduction is a primary objective of computer-based systems design.

Second, for purposes of internal control, many functions such as the inventory control, purchasing, AP, cash disbursements, and the general ledger are located in physically separate departments. These labor-intensive activities also add greatly to the cost of system operation.

In computer-based systems, computer programs perform these clerical tasks, which is much cheaper and far less prone to error. Although the classic department structure may still exist in computer-based environments, personnel responsibilities are refocused. Rather than being involved in day-to-day transaction processing, these departments are now involved with financial analysis and exception-based problem solving. As a result, these departments are smaller and more efficient than their manual system counterpart.

Multiple Choice Questions:

1. Which document helps to ensure that the receiving clerks actually count the number of goods received?
    a. Packing list
    b. Blind copy of purchase order
    c. Shipping notice
    d. Invoice

2. When the goods are received and the receiving report has been prepared, which ledger may be updated?
    a. Standard cost inventory ledger
    b. Inventory subsidiary ledger
    c. General ledger
    d. AP subsidiary ledger

3. Which statement is NOT correct for an expenditure system with proper internal controls?
    a. Cash disbursements maintain the check register.
    b. AP maintains the AP subsidiary ledger.
    c. AP is responsible for paying invoices.
    d. AP is responsible for authorizing invoices.

4. Which duties should be segregated?
    a. Matching purchase requisitions, receiving reports, and invoices and authorizing payment
    b. Authorizing payment and maintaining the check register
    c. Writing checks and maintaining the check register
    d. Authorizing payment and maintaining the AP subsidiary ledger

5. Which documents would an auditor most likely choose to examine closely to ascertain that all expenditures incurred during the accounting period have been recorded as a liability?
    a. Invoices
    b. Purchase orders
    c. Purchase requisitions
    d. Receiving reports

6. Which task must still require human intervention in an automated purchases/cash disbursements system?
    a. Determination of inventory requirements
    b. Preparation of a purchase order
    c. Preparation of a receiving report
    d. Preparation of a check register

7. Which one of the following departments does not have a copy of the purchase order?
    a. The purchasing department
    b. The receiving department
    c. Accounts payable
    d. General ledger

8. Which document typically triggers the process of recording a liability?
    a. Purchase requisition
    b. Purchase order
    c. Receiving report
    d. Supplier's invoice

9. Which of the following tasks should the cash disbursement clerk NOT perform?
    a. Review the supporting documents for completeness and accuracy
    b. Prepare checks

c. Approve the liability

d. Mark the supporting documents paid

10. Which of the following is true?

a. The cash disbursement function is part of accounts payable.

b. Cash disbursements is an independent accounting function.

c. Cash disbursements is a treasury function.

d. The cash disbursement function is part of the general ledger department.

CHAPTER 5: E-Commerce and E-Business

INTRODUCTION TO E-COMMERCE AND E-BUSINESS

Organizations use information technology to improve efficiency and effectiveness of their operations. Walmart transitioned to Internet EDI to save costs and to take advantage of the new EDI technology. In many cases this IT enablement causes major changes for not only that organization, but also for its trading partners, the entire business world, and other aspects of the economy. The Walmart decision caused 10,000 Walmart suppliers to invest in new IT systems and resulted in major changes in the demand for EDIINT.

The Walmart transition is an example of e-business. **E-business** is the use of electronic means to enhance business processes. E-business encompasses all forms of on-line electronic trading, consumer-based e-commerce, and business-to-business electronic trading and process integration, as well as the internal use of IT and related technologies for process integration inside organizations.

“E-business” is a term used widely in business and in the mass media. However, there are sometimes misunderstandings about e-business and e-commerce, and any differences between the two. In addition, the sheer number of acronyms in use in e-business and the technological nature of some of the acronyms can make it difficult to understand e-business. The first purpose of this chapter is to define and clarify many of the terms and concepts related to e-business and ecommerce. In addition, this chapter describes the advantages, disadvantages, security issues, and controls related to e-business.

There is some overlap between e-commerce and e-business, and this leads some to confuse the two concepts. **E-commerce** is electronically enabled transactions between a business and its customers. E-business is a broader concept that includes not only electronic trade with customers, but also servicing customers and vendors, trading information with customers and vendors, and electronic recording and control of internal processes. These internal processes include electronic internal employee services such as access to personnel records, access to fringe benefit information, travel and expense reporting, and purchase of items such as office supplies. Figure 5-1 shows the differences and the overlap between the two concepts.

E-commerce is the sale of goods or services from a business to an end-user consumer. Since E-commerce involves selling to consumers, the usual sale will be a relatively small dollar amount when only a few items are sold. The company making the sale will strive for high-volume sales to many consumers to generate a profit. Its customers will use a user-friendly interface, such as a Web browser, to place the order and pay with a credit card. Amazon.com, Inc., is a well-known example of an e-commerce enterprise. The sales between Amazon.com and its customers are sales between a company and end-user customers.

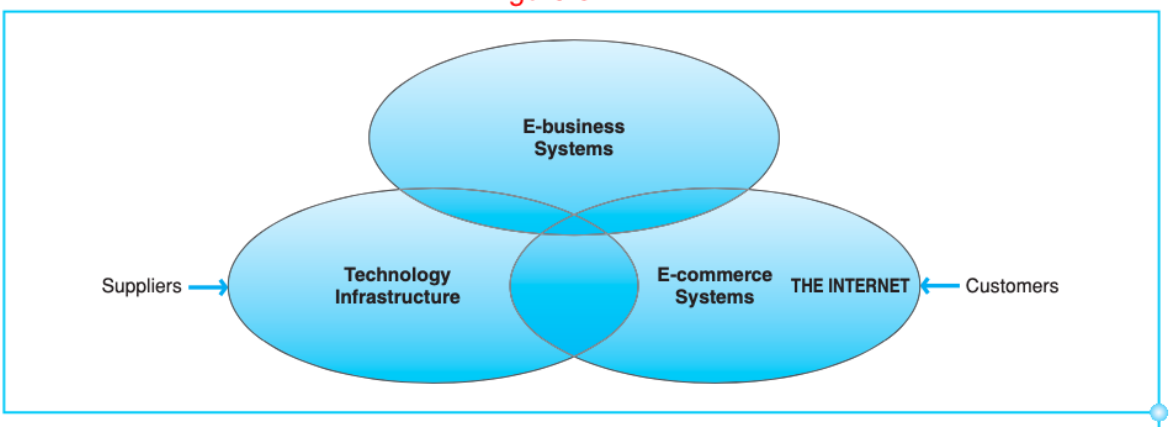
On the other hand, e-business is a broader concept that encompasses many business processes, using IT systems to enhance or streamline these processes. A part of e-business includes company-to-company sales. E-business includes the sale of goods, services, or raw materials between companies in a supply chain, as well as internal processes like product design and production. An example of a supply chain sale is a manufacturer that buys raw materials from a vendor, using

the Internet as the electronic network. These e-business sales tend to be much larger in dollar value, and there are likely to be many items on each order. The buyer and seller will use common business documents such as purchase orders and invoices, but in electronic form. The software interface between buyer and seller will usually involve more than just a Web browser. The vendor's and buyer's computer systems may be linked, and the vendor may actually be able to access and monitor the buyer's inventory systems.

For a large majority of e-business–enabled companies, the infrastructure that supports e-business and e-commerce includes software systems such as ERP, CRM, and SCM.

The most common method of conducting e-commerce and e-business is to use the Internet to electronically exchange data. The next section presents the historical development of the Internet, which provides insight into its current widespread application in the business world.

Figure 5-1



THE PHYSICAL STRUCTURE AND STANDARDS OF THE INTERNET

THE NETWORK

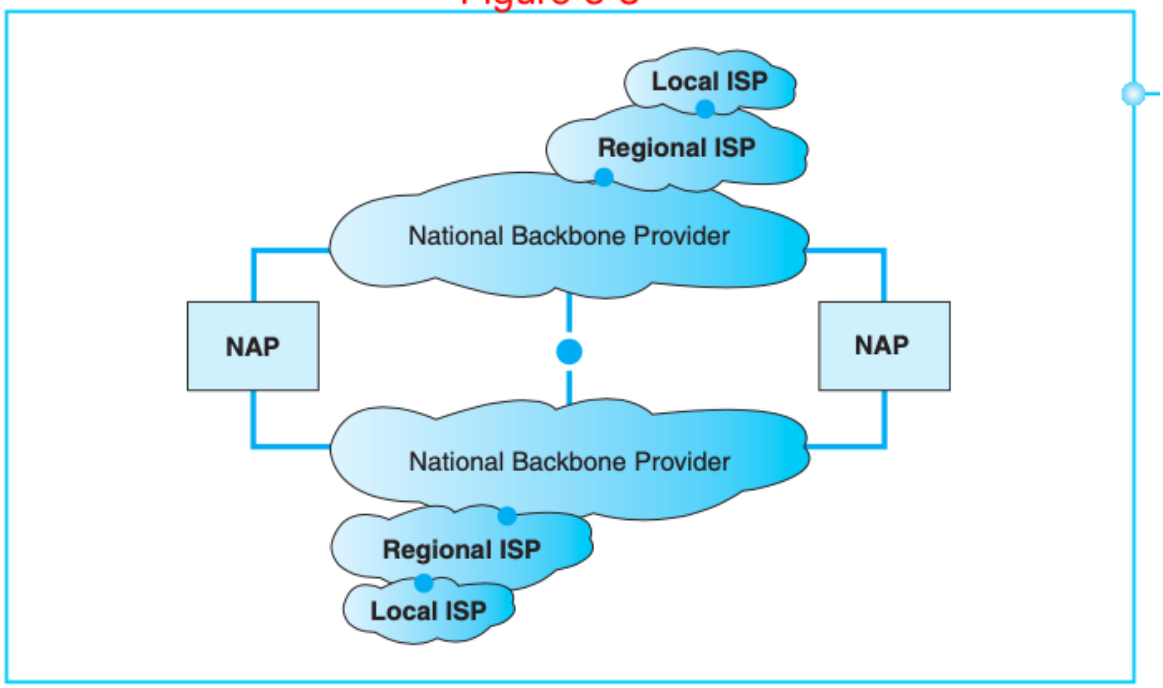
Figure 5-3 shows the types of organizations that make up the interconnected networks of the Internet. The Internet includes backbone providers, network access points, regional Internet service providers (ISPs), local ISPs, and Internet subscribers. The Internet is a hierarchical arrangement: There are a few large backbone providers, many more regional and local ISPs, and millions of Internet subscribers. Internet subscribers are the individual users of the Internet.

A **backbone provider** is an organization which supplies access to high-speed transmission lines that make up the main network lines of the Internet. Much like the way that your spinal bones, or backbone, support all the skeletal systems of your body, the Internet **backbone** is the main trunk line of the Internet. The backbone has extremely high capacity and high-speed network lines. The actual speed and capacity of the backbone lines continually increase as the technology is upgraded, and the speed of the U.S. backbone is 1 trillion bytes per second. This means that one trillion bits of data could be transmitted over the network lines in one second. The backbone providers connect to each other either directly through private lines or through network access points (NAPs). Major backbone providers in the United States are companies such as Sprint,AT&T, and UUNET.

Regional ISPs connect to the backbone through lines that have less speed and capacity than the backbone. The network lines used to connect regional ISPs to the backbone are usually T3 lines. A T3 line carries data at 44.476 megabits per second (44 million bits per second). Local ISPs connect to regional ISPs by either T3 or T1 lines. A T1 line carries data at a speed of 1.544 megabits per second (Mbps). Regional and local ISPs usually use

several T3 or T1 lines simultaneously. You might envision how this works by thinking about water hoses. If you squirt one water hose at a house fire, only a small volume of water reaches the fire.The use of four water hoses, all aimed at the same fire, will send four times the volume of water. Examples of local ISPs are local telephone companies and local cable companies.

Figure 5-3



Local ISPs connect individual users to the Internet. These Internet subscribers are connected to local ISPs using either dial-up modems, digital subscriber lines (DSL), or cable TV lines. Dial-up modem speeds are typically 56 kilobytes per second, while DSL speed is usually approximately 5 mbps and cable broadband speeds are approximately 5 to 10 mbps.

At each of these organizations and gateways, there are computers that function as Web servers. A **Web server** is a computer and hard drive space that stores Web pages and data. These Web servers respond to requests

for Web pages or data and transmit the Web pages or data over the network. Through these interconnected networks and Web servers, any computer connected to the Internet can communicate with any other computer on the Internet. This system enables e-business, e-commerce, and e-mail to function as we know it today.

THE COMMON STANDARDS OF THE INTERNET

Since any computer can theoretically link to any other computer on the Internet, there must be common and standard methods to display and communicate the data transmitted via the Internet. Each computer on the Internet uses the TCP/IP protocol to communicate with the network. While every computer connected to the Internet could possibly be part of the World Wide Web, every such computer is not necessarily part of the Web. The World Wide Web is an information-sharing network that uses the Internet as the network to share data.

Web pages that are part of the World Wide Web are available to anyone using a Web browser. However, a common way to present and read the data on a Web page is also necessary. The language invented to present data on websites is **HTML,** a hypertext markup language. Nearly all websites use HTML to format the words, data, and pictures that you see on a Web page. Figure 5-4 shows a very simple Web page and the HTML source code that formats and presents the words and the arrow symbol on this Web page. There are many users of the Internet throughout the world, using different types of computers with different operating systems. The common formatting language HTML for Web pages allows any computer to display the Web page the way it was intended to be displayed. HTML has evolved over the years to increase functionality and security. The current standard, HTML 5, allows much richer use of video and audio, as well as better security than

the previous versions. These enhancements make the Internet user-friendly for browsing, and also increase its usefulness for e-commerce or e-business.

In addition to a standard communication protocol and a standard formatting language for Web pages, there must also be a common addressing method to store and locate Web pages. The addresses of websites and Web pages use a uniform resource locater (URL) address. A **URL** is the address you type in to reach a website. For example, the URL address of the Google search engine is http://www.google.com. The “http” in a URL address stands for “hypertext transmission protocol.” When you type in a URL, your Web browser actually sends an http command to a Web server, directing the server to find and transmit the Web page you requested.

In a URL address such as http://www.google.com, the google.com part is called the **domain name**—the unique name that identifies the Internet site. Organizations must register a domain name to own its exclusive use. For example, The Coca-Cola Company has registered, and pays a monthly fee to own and use, the domain name coke.com. Domains have a suffix that indicates the type of organization owning the rights to that domain name. In the United States, some of the common suffix portions of domain names are as follows:

Suffix	**Organization Type**
.com	commercial business
.edu	educational institution
.org	nonprofit organization
.gov	governmental organization or unit
.mil	military organization
.net	network or commercial business

For domains outside the United States, the suffix indicates the country. For example, .ca is Canada and .au is Australia.

The URL addressing system actually uses IP addresses rather than domain names that are spelled out. An IP address is an Internet protocol address. A given domain name is associated with a single IP address. In the same way that your postal address allows your mail carrier to locate your exact home, an IP address is the unique information that allows a specific website or server to be located.

There are specialized servers on the Internet called domain name servers (DNS), which function to store, index, and provide the IP address for each domain name. When a domain name such as coke.com is typed into a Web browser, a request is sent to a DNS to find the IP address of the domain, and the website is located on the basis of the IP address.

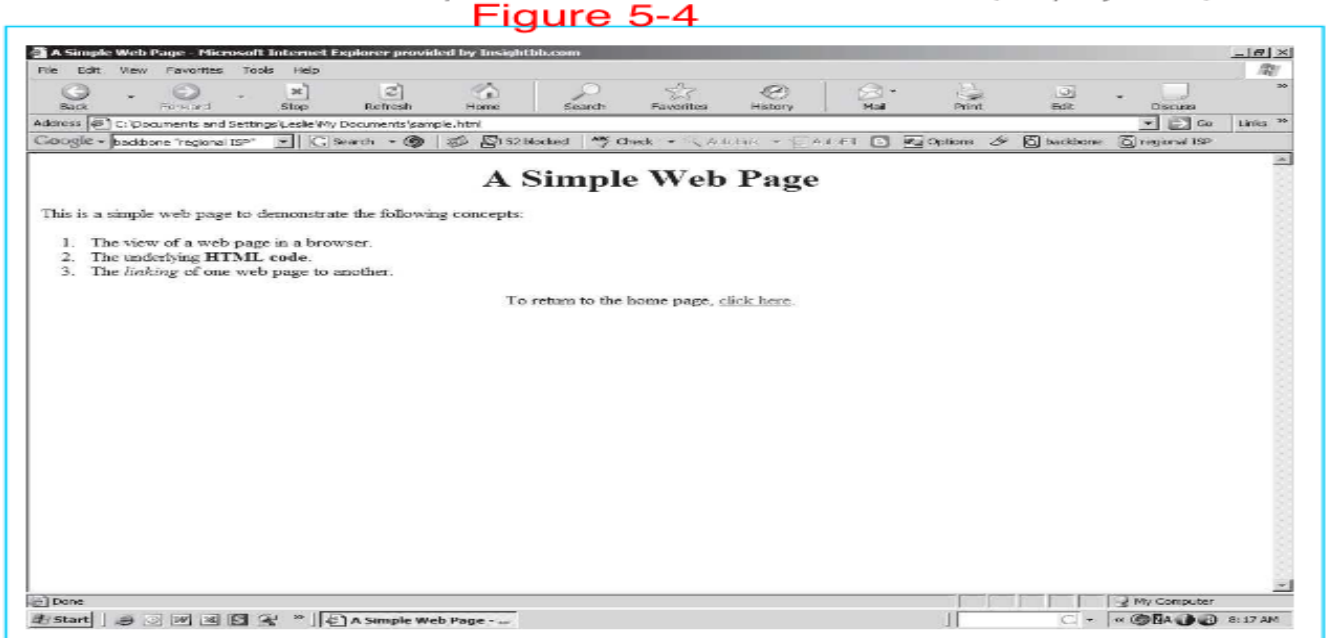
Since the Internet is an open network system that anyone can access, there are those who misuse the Internet for illegal and fraudulent activity. Examples of such risks are hackers, identity thieves, password sniffers, and denial of service attacks. Without an extra layer of protection, any data exchange between a user and a Web server is open for anyone to read. This means if you enter your credit card number on an e-commerce website, your credit card number and other data can possibly be intercepted. Therefore, the majority of e-commerce sites use common forms of encryption and data protection.

The standard form of encryption embedded in e-commerce sites and in Web browser software is **secure sockets layering** (**SSL**), an encryption system in which the Web server and the user's browser exchange data in encrypted form. The Web server uses a public encryption key, and only the browser interacting with that Web server can decode the data. Web browsers

in use today use 128-bit encryption. Persons using a Web browser will know they are connected to a secure encrypted site that uses SSL by seeing two things in their Web browser. First, a website using SSL will have a URL address that begins with https://. The extra “s” at the end of the http denotes a secure site. Also, most browsers show a picture of a locked padlock in the lower bar of the Web browser. SSL and encryption allow the general public to conduct e-commerce over websites with less fear of exposure regarding credit card or other private information.

The Internet network, the World Wide Web, and the common standards used allow the general public to browse the Web, share data, send e-mail, and conduct e-commerce. The next section describes e-commerce.

Figure 5-4




```
<html>
<head>
<title>A Simple Web Page</title>
</head>
<body>
<h1><center>A Simple Web Page</center></h1>
This is a simple Web page to demonstrate the following concepts:
        <ol>
        <li>The view of a Web page in a browser.</li>
        <li>The underlying <b>HTML code</b>.</li>
        <li>The <i>linking</i> of one Web page to another.</li>
        </ol>
<center>To return to the home page, <a href="www.simplesite.com/index.htm">click
here</a>.</center>
</body>
</html>
```

E-COMMERCE AND ITS BENEFITS

There has never been complete agreement on an exact definition of e-commerce. However, most would agree that e-commerce is a transaction between a business and customer, in which the transaction information is exchanged electronically. Under such a broad definition, there are many forms of exchange that could be called e-commerce. The use of a credit card at a department store, ATM transactions with a bank, EDI transactions between vendor and buyer, and Web-based transactions all fit into this definition of e-commerce. With the explosive growth of "Web-based" commerce in the last decade, ecommerce has widely come to be thought of as Web-based. That is, the average person thinks that e-commerce is Web-based commerce. Since Web-based commerce is the most common form of e-commerce, this section will focus on the Web-based form of e-commerce.

Hereafter, the references to e-commerce will be to Web-based e-commerce. Also, e-commerce will refer to business-to-consumer sales. The common term for business-to-consumer e-commerce is **B2C**. Conversely, the term e-business will include business-to-business electronic transactions. The common term for business-to-business electronic sales is **B2B**.

B2C sales are transactions between a business and a consumer, which usually involve a retail or service company whose customers are end-user consumers. While there are literally thousands of different types of B2C transactions, some examples are as follows:

1. Buying a book on Amazon.com

2. Downloading a song purchased from Apple's iStore

3. Buying an airline ticket on Expedia.com

4. Buying a computer at Dell.com

The common aspect in these transactions in that the consumer interacts with the business via the business's website.

There are many advantages of B2C sales to the business and to the customer. Both parties benefit from the increased access to the market, the speed and convenience of e-commerce, and the ability to share information.

BENEFITS AND DISADVANTAGES OF E-COMMERCE FOR THE CUSTOMER

The major benefits to the customer of buying products or services relate to the increased access, speed, convenience, and information sharing mentioned previously. More specifically, the benefits to the customer are the following:

1. E-commerce provides access to a much broader market for goods and services. By using e-commerce, the customer is not constrained by geography or geographic boundaries. If a customer wishes to buy a shirt, he can access any number of websites selling shirts, some of which may be in other states or countries. The customer need not physically visit a store to buy.

2. E-commerce also provides more convenient times for shopping. Orders can be placed 24 hours a day, 7 days a week. As mentioned in item 1, the customer does not need to go to a store to buy the product or service and is not limited by location or hours of operation of the website, as he would be when shopping at a store.

3. The wider access to the marketplace also provides more choices to the customer. This may enable the customer to more easily find the same product at a less expensive price. In addition, the wider market access may allow the customer to find a product with better features at a more competitive price.

4. E-commerce is likely to provide lower prices, for many reasons. Businesses that sell via e-commerce can reduce many costs, and these cost savings can be passed on to the customer. The details of the cost savings will be discussed later in the section on the benefits to businesses of e-commerce. In addition, the customer may not be required to pay sales taxes for e-commerce purchases. However, in many cases, the tax savings may be offset by shipping or delivery costs.

5. The information-sharing aspect of the Internet and World Wide Web allows the customer to exchange information with businesses before, during, and after the purchase. Some e-commerce websites have live chat sessions with product or service specialists to answer questions.

6. E-commerce can allow quicker delivery of the product, enabled by the faster processing time of e-commerce. To fill an order, the business does not have to undertake steps such as entering order information into the computer system. As soon as the customer enters the order via the website, order processing can begin.

7. Customers can receive targeted marketing from businesses that they frequently purchase from. For example, Amazon.com analyzes customer buying patterns and can recommend specific books that may be of interest to the customer.

While there are significant advantages to e-commerce to the customer, there are also disadvantages. The free and open nature the World Wide Web allows the opportunity for fraud, theft of assets, or theft of data. Customers have concerns about the privacy and security of personal information shared with businesses during e-commerce transactions. Hackers and identity thefts can potentially steal credit card information, banking information, and private data. Because such concerns may prevent some customers from purchasing

via e-commerce, businesses must respond by trying to ensure the security and privacy of customer data. The details of privacy principles are covered later in this chapter.

The other disadvantage for the customer is the inability to handle or try out the product. Compared with a store shopping experience, the customer does not have the same ability to see and handle the product.

BENEFITS AND DISADVANTAGES OF E-COMMERCE FOR THE BUSINESS

Advantages to the business are as follows:

1. E-commerce provides access to a much broader market, including the potential of a global market for even small businesses. Traditional geographic boundaries are no longer a constraint if the business uses e-commerce.

2. Dramatically reduced marketing costs are a typical result of the expanded market. While a business may still spend for advertising, such as for Web based ads, the cost per customer reached is usually substantially less than that for traditional forms of marketing. For example, suppose that an electronics store can place a local television advertisement at a cost $10,000 to reach 10,000 customers. That same amount spent on a Web-based ad has the potential to reach millions of potential customers.

3. E-commerce provides the potential for much richer marketing concepts that include video, audio, product comparisons, and product testimonials or product tests. On its website, the business can provide links to these marketing tools.

4. The company can quickly react to changes in market conditions. For example, if market changes require price drops, the business can quickly change prices on the website, and all customers will see the new price

immediately. If a company uses mail-order catalogs instead of e-commerce, price changes can occur only when a new catalog is printed. If a chain store such as Walmart wished to change prices in all of its stores in a specific region or state, it would be somewhat time-consuming to update the signs and systems in order to institute the price changes.

5. The business using e-commerce is likely to experience reduced order processing and distribution costs. Order-processing costs are reduced because e-commerce automates all or most of the order processing. Rather than business employees taking sales orders by phone or mail and keying them into the IT system, the customer enters all order information. Distribution costs are reduced simply because e-commerce uses a much different model than traditional retail businesses. Many e-commerce businesses do not maintain stocks of inventory in stores or warehouses. The business may instead order only when the customer orders and have the product drop-shipped directly from the supplier to the customer.

6. The customer convenience aspect of e-commerce means that the business is likely to experience higher sales.

7. Higher sales coupled with reduced marketing, order processing, and distribution costs can lead to much higher profits.

There are also some disadvantages to e-commerce, for businesses. The IT systems necessary to conduct e-commerce are usually much more complex and costly. The e-commerce software and systems must also be implemented in a way that integrates the existing general ledger, inventory, and payment IT systems. In addition, the free and open nature of the World Wide Web opens a business to greater chances for fraud, hackers, and compromised customer privacy.

THE COMBINATION OF E-COMMERCE AND TRADITIONAL COMMERCE

Much of the preceding discussion focused on the comparison of e-commerce with traditional forms of commerce, namely, catalog and store commerce. However, in the retail environment of today, most retailers or service businesses use a combination of traditional commerce and e-commerce. For example, Walmart, Target, and Kmart are traditional store-based retailers that now also offer to customers Web-based shopping. Local, regional, and national banks all used to depend on customers' walking, riding, or driving to a bank branch office. Today, banks also offer Web-based banking. So, traditional forms of commerce have changed to incorporate e-commerce. However, the converse is true also. Many e-commerce retailers that began purely as e-commerce forms of business
have found that they must add the traditional customer interaction in the form of stores or offices. For example, E*TRADE Financial Corp., a Web-based brokerage firm, found that to better service customers, it needed some physical office locations. E*TRADE opened offices around the country and placed a link on its website, called "Physical Locations." The Web page that customers access by clicking on that link presents the addresses of regional offices of E*TRADE in large cities.

This merging and melding of forms of commerce has led to new terminology in the world of commerce. Companies that work from purely traditional stores, are called **bricks and mortar** retailers in e-commerce. At one point in the evolution of e-commerce, businesses that were purely Web-based were called **e-tailers**. As businesses merged the two, the resulting combined forms are referred to as **clicks and mortar** businesses. Alternatively, some call this form of business **bricks and clicks**.

PRIVACY EXPECTATIONS IN E-COMMERCE

The fourth risk area of IT systems described in the AICPA Trust Services Principles is “online privacy.” Regarding this risk area, the Trust Services Principles states that the “online privacy principle focuses on protecting the personal information an organization may collect from its customers, employees, and other individuals” through its e-commerce systems. This personal information consists of many different kinds of data. The Trust Services Principles provide the following partial list of personal information to be protected:

- Name, address, Social Security number, or other government ID numbers
- Employment history
- Personal or family health conditions
- Personal or family financial information
- History of purchases or other transactions
- Credit records

In the course of conducting business with customers, an organization may have legitimate reasons to collect and keep these customer data. However, to conduct e-commerce, the organization must provide to customers a level of confidence in the privacy and security of this kind of personal information shared. To engender such confidence, the organization must demonstrate to customers that it has taken appropriate steps to ensure privacy. The Trust Services Principles explain ten privacy practices that an organization should follow to ensure adequate customer confidence regarding privacy of information, as follows:

1. Management. The organization should assign a specific person or persons, the responsibility of privacy practices for the organization. That responsible person should insure that the organization has defined and documented its privacy practices. That person should also insure that privacy practices have been communicated to both employees and customers. Management would also include the responsibility to insure that privacy practices are followed by employees.

2. Notice. The organization should have policies and practices to maintain privacy of customer data. Notice implies that the company provides the privacy practices to customers in some form. At the time that data is to be collected, a notice should be available to the customer that describes the privacy policies and practices. Many e-commerce organizations accomplish this by providing a link on their website to privacy policies. Notice should include information regarding the purpose of collecting the information, and how that information will be used.

3. Choice and consent. The organization should provide choice to its customers regarding the collection of data, and also should ask for consent to collect, retain, and use the data. The customer should be informed of any choices that the customer may have to opt out of providing information. The customer should have access to descriptions about the choices available. The customer should also be able to read policies about how the data will be used. As in “notice” above, these descriptions usually are in the form of a link to privacy policies.

4. Collection. The organization should collect only the data that is necessary for the purpose of conducting the transaction. In addition, the customer should have provided implicit or explicit consent before data is collected. Explicit consent might be in the form of placing a check mark by a

box indicating consent. Implicit consent occurs when the customer provides data that is clearly marked as voluntary, or when the customer has provided data and has not clearly stated that it cannot be used.

5. Use and retention. The organization uses customers' personal data only in the manner described in "notice" from part a. on page 590. The use of this data occurs only after the customer has given implicit or explicit consent to use the data. Such personal data is retained only as long as necessary.

6. Access. Every customer should have access to the data provided so that the customer can view, change, delete, or block further use of the data provided.

7. Disclosure to third parties. In some cases, e-commerce organizations forward customer information to third parties. Before this forwarding of data occurs, the organization should receive explicit or implicit consent of the customer. Personal data should only be forwarded to third parties that have equivalent privacy protections.

8. Security for privacy. The organization has necessary protections to try to insure that customer data is not lost, destroyed, altered, or subject to unauthorized access. The organization should put internal controls in place that prevent hackers and unauthorized employees from accessing customer data.

9. Quality. The organization should institute procedures to insure that all customer data collected retains quality. Data quality means that the data remains "accurate, complete, current, relevant, and reliable."

10. Monitoring and enforcement. The organization should continually monitor to insure that its privacy practices are followed. The

organization should have procedures to address privacy related inquiries or disputes.

In summary, these practices require that a company establish, enforce, monitor, and update policies and practices that protect the privacy and security of customer information. The company should consider not only its own privacy practices and policies, but also the practices and policies of any third parties who will share information. Companies that fail to establish good policies or that fail to enforce policies have violated the ethical standards that customers expect when conducting e-commerce. The ethics-related aspects of privacy are addressed at the end of this chapter.

E-BUSINESS AND IT ENABLEMENT

As discussed previously, e-business is a very broad, encompassing term for the electronic enabling of business processes. The business processes enabled by IT systems can be internal and external. Examples of internal processes are the movement of raw materials within a company, the timekeeping and labor management of workers, the dissemination of employee information such as health and retirement benefits, and the sharing of data files among workers. These types of internal processes can be streamlined and enhanced by incorporating electronic forms of these processes through the use of IT systems. Likewise, there are many external business processes that can be streamlined and enhanced through the use of IT systems. For example, the processes that involve suppliers and distributors can be streamlined, enhanced, and improved by the use of IT systems.

The **supply chain** is the set of linked processes that take place from the acquisition and delivery of raw materials, through the manufacturing, distribution, wholesale, and delivery of the product to the customer. The

supply chain includes vendors; manufacturing facilities; logistics providers; internal distribution centers such as warehouses, distributors, and wholesalers; and any other entities that are involved, up to the final customer. In some cases, the supply is larger at both ends because it can include secondary suppliers to the company's suppliers and the customers of the company's immediate customers. Figure 5-5 illustrates the entities in a sample supply chain for a manufacturer and the relationships between those entities. Service firms have a less complex supply chain.

To gain an understanding of the supply chain, it may be helpful to begin in the middle of the exhibit. A manufacturer makes products. Upon completion of the manufacturing, the finished products are sent to and stored in warehouses. As those products are needed, they are shipped to distributors or wholesalers. The distributors or wholesalers eventually ship the products to retail companies, and the retail companies sell the products to end-user consumers.

However, before a manufacturing company can produce products, it must buy the raw materials that are the ingredients of the products. For example, a wine maker must buy grapes. In some instances, a manufacturing company's supply chain may include secondary suppliers. For example, a company that manufactures personal computers (PCs) may buy components such as graphics cards from a supplier. The supplier, however, makes the graphics cards after buying chips and circuit boards from secondary suppliers. While there may not be direct exchanges between the manufacturer (maker of the PC) and the secondary supplier's (the chip maker), the secondary supplier's performance and product quality have a dramatic effect on the manufacturer. For example, if the chip maker runs out of chips, the graphics card maker is prevented from making graphics cards

on time, which thereby makes the PC maker unable to make and ship PCs. Similarly, poor quality chip production by the chip maker affects the quality of the graphics board, and therefore the quality of the PC.

This interdependency of entities in the supply chain means that companies should be interested in enhancing and streamlining the processes and exchanges that occur throughout the supply chain. Poor quality, slow performance, or a process bottleneck anywhere in the supply chain affects other parts of the supply chain. There is an old saying that a chain is only as strong as the weakest link. Similarly, a supply chain is only as efficient as its weakest, or most inefficient, link.

Many interactions between entities and many business processes must occur to complete the steps that result in raw materials being converted into products and eventually sold to the customer. Any of these processes or linkages between entities can be enabled or enhanced by the use of IT systems. Any that are enabled by IT become a part of e-business. This view of the supply chain shows how broad the scope of e-business is in comparison with e-commerce. E-commerce, or B2C sales, includes only the extreme right-hand part of the diagram in figure 5-5, when the sale is between a company and the end-user customer. E-business includes the entire supply chain, and there is overlap between e-business and e-commerce. E-commerce is a subset of e-business.

Some companies may choose to be involved in many parts of their supply chain. For example, a vertically integrated company may have its own related subsidiaries so that each of the interactions within the supply chain is owned or controlled by the larger corporate entity. Vertical integration occurs when a single company owns all of the entities that make up the

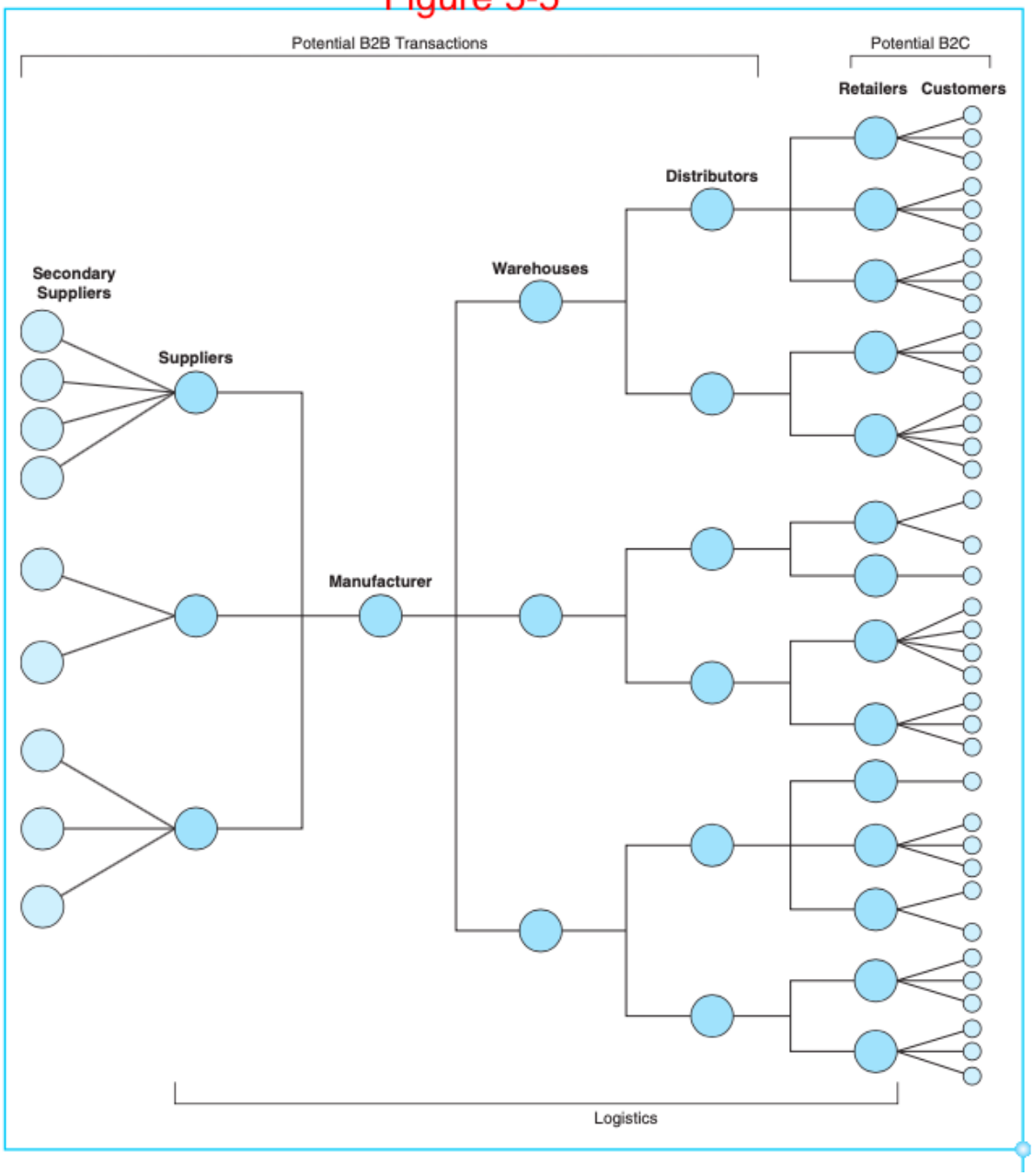
supply chain, from the movement of raw materials to the delivery of the finished product to the customer.

Other companies may choose to focus on only a small part of the supply chain. For example, a company could choose to do only the manufacturing portion of the supply chain; all other entities within the supply chain, such as suppliers, distributors, wholesalers, and retailers, are separate companies. These differing levels of integration within the supply chain mean that the processes which occur within a supply chain may be internal to a company or may involve exchanges with external companies. In either case, internal or external, those processes and exchanges can be streamlined or enhanced through e-business.

The “Logistics” label in figure 5-5 illustrates that there are entities within the supply chain whose function is to provide the physical support that moves materials and goods between parts of the supply chain. For example, a manufacturer must have a means of moving raw materials from the supplier to the plant and of moving finished goods from the plant to the warehouse and distributor. Logistics are the types of services provided by entities such as trucking companies, air and rail freight companies, and freight expediting companies.

Any of the interactions between the entities within the supply chain can be a point at which e-business can be applied to streamline or reduce costs. The next section describes a smaller subset of e-business interactions within the supply chain: B2B, or business-to-business electronic transactions.

Figure 5-5



B2B: A PART OF E-BUSINESS

B2B is the sale of products or services between a business buyer and a business seller that is electronically enabled by the Internet. In B2B sales, neither buyer nor seller is an end-user consumer. Although there are many ways to conduct business electronically between businesses, this chapter

focuses on Internet based e-business. As in the case of e-commerce, both parties benefit from the increased access to the market, the speed and convenience of e-business, and ability to share information. There are also many differences between B2C and B2B transactions, as illustrated in figure 5-6. When comparing B2B with B2C, B2B has the following differing characteristics:

- The transaction or exchange is between businesses.
- The order would have many line items, and the dollar amount of each sale is usually large.
- While a B2C sale might be a single book purchased from Amazon, a B2B sale might be tons of raw materials, as in the case of grapes to make wine.
- The B2B sale will have specific shipping details such as type of carrier used, delivery dates, and locations of delivery to different plants within the company.
- The B2B transaction can involve electronic forms of standard business documents such as purchase order and invoice.
- The B2C transaction is between the company and any potential customer on the Internet. There need not be any preexisting relationship. The B2B transaction is between buyer and supplier, and the parties usually have a preexisting relationship. The buyer knows which suppliers it will use, and the supplier knows that the buyer will be buying raw materials or services. The buyer and supplier would have already negotiated many of the details of the transaction, such as prices, discounts, payment terms, credit limits, delivery dates, and locations of delivery.

Figure 5-6

Differences between E-Commerce and E-Business

E-COMMERCE, or B2C	E-BUSINESS, or B2B
• Business-to-consumer	• Business-to-business
• Few line items per order	• Many line items per order
• Large order volume	• Very specific shipping data
• Geared to consumer's ease of use	• User-selected information content and interaction tools, deeper functionality
• Use of credit card purchasing	• Use of purchase orders • Sophisticated transaction protocols
• No necessity of a preexisting relationship between buyer and seller	• Buyer and seller usually have a pre-existing relationship and negotiated prices and delivery details

When conducted via the Internet, B2B transactions between supplier and buyer offer many advantages to both parties. Many of the advantages are similar to those described in the e-commerce section of this chapter. Internet-based transactions offer a wider potential market, reduced transaction cost, and higher profits. B2B will also result in faster cycle times for the purchases from suppliers. The cycle time is the time from the placement of an order for goods to the receipt of, and payment for, the goods. The faster cycle time results from the increased efficiency

of processing transactions via the Internet. In B2B transactions between suppliers and buyers, the two IT systems exchange data through the Internet network. The Internet allows companies to reduce or eliminate manually keying the order into the computer system, mailing documents to initiate the order, entering receipt of goods, and keying in documents to initiate payment. The fact that the two IT systems communicate eliminates data errors, since data may no longer be manually keyed into the system.

E-BUSINESS ENABLEMENT EXAMPLES

There is much more to e-business than just B2B transactions. The Internet can be used in many different ways to streamline business processes, reduce operational costs, and enhance efficiency that it is difficult to describe the entire range of e-business possibilities. The summaries that follow are real business examples of the ways in which businesses adopt e-business strategies.

These examples illustrate the broad nature of e-business, even though they do not encompass all the ways that e-business is used to streamline processes, reduce costs, and improve relationships with suppliers, distributors, wholesalers, retailers, and customers. To gain the advantages available in e-business, organizations must utilize various levels of networks within and attached to the Internet. Companies must use the Internet network to interact electronically with the entities in the supply chain. The levels of the Internet network structure that enable e-business are the Internet, extranets, and intranets. These levels of the network serve as the platform to connect parties throughout the supply chain.

INTRANETS AND EXTRANETS TO ENABLE E-BUSINESS

In many cases, interaction between entities within the supply chain occurs between entities that are part of the same company. As an example, in the eGM vignette, GM was using e-business to enhance the engineering and manufacturing of vehicles. Therefore, engineers and plant personnel have interaction electronically. This interaction within the same company would use an intranet. Figure 5-7 depicts the three levels of network platforms—intranets, extranets, and the Internet—that are used in e-business.

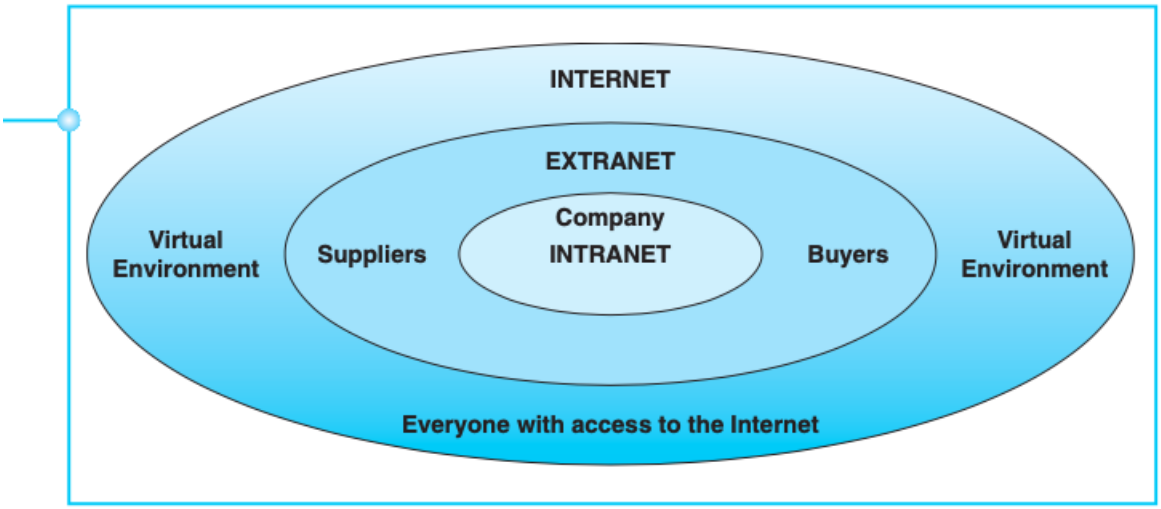
An **intranet** is a private network accessible only to the employees of a company. The intranet uses the same common standards and protocols of the Internet. An intranet uses TCP/IP protocol and the same type of HTML Web pages as the Internet. However, the computer servers of the intranet are accessible only from internal computers within the company. The purposes of an intranet are to distribute data or information to employees, to make shared data or files available, and to manage projects within the company. For example, GM engineers located in several different offices across the United States may collaborate on the design of a new car. Those engineers can share project files and information by the use of the internal network, the intranet.

To engage in B2C e-commerce, a company must access the Internet, since it is the network platform that gives a wide range of customers access to B2C sales. For example, Amazon.com could not exist as it currently does if it were not able to reach customers anywhere and anytime over the Internet. However, when an organization engages in B2B e-business and e-business throughout the supply chain, it is not interested in reaching the general public. Instead, e-business activities require network access to entities such as suppliers, distributors, logistics providers, and wholesalers. When communicating with these entities, the company in fact needs to exclude access by the general public. For example, if Dell, Inc., is buying computer hard drives from a supplier, Western Digital Corporation, it would be more appropriate for these two businesses to use a network that does not allow the general public to have access. Rather than using the Internet, this type of exchange may use an extranet.

An **extranet** is similar to an intranet except that it offers access to selected outsiders—buyers, suppliers, distributors, or wholesalers in the

supply chain. Extranets are the networks that allow business partners to exchange information through limited access to company servers and data. The external parties have access only to the data necessary to conduct supply chain exchanges with the company. For example, suppliers would need access to raw material inventory levels of the company they sell to, but they would not need access to finished product inventory levels. Conversely, a wholesaler within the value chain may need access to the manufacturer's finished product inventory, but would not need access to raw material inventory levels.

Figure 5-7



INTERNAL CONTROLS FOR THE INTERNET, INTRANETS, AND EXTRANETS

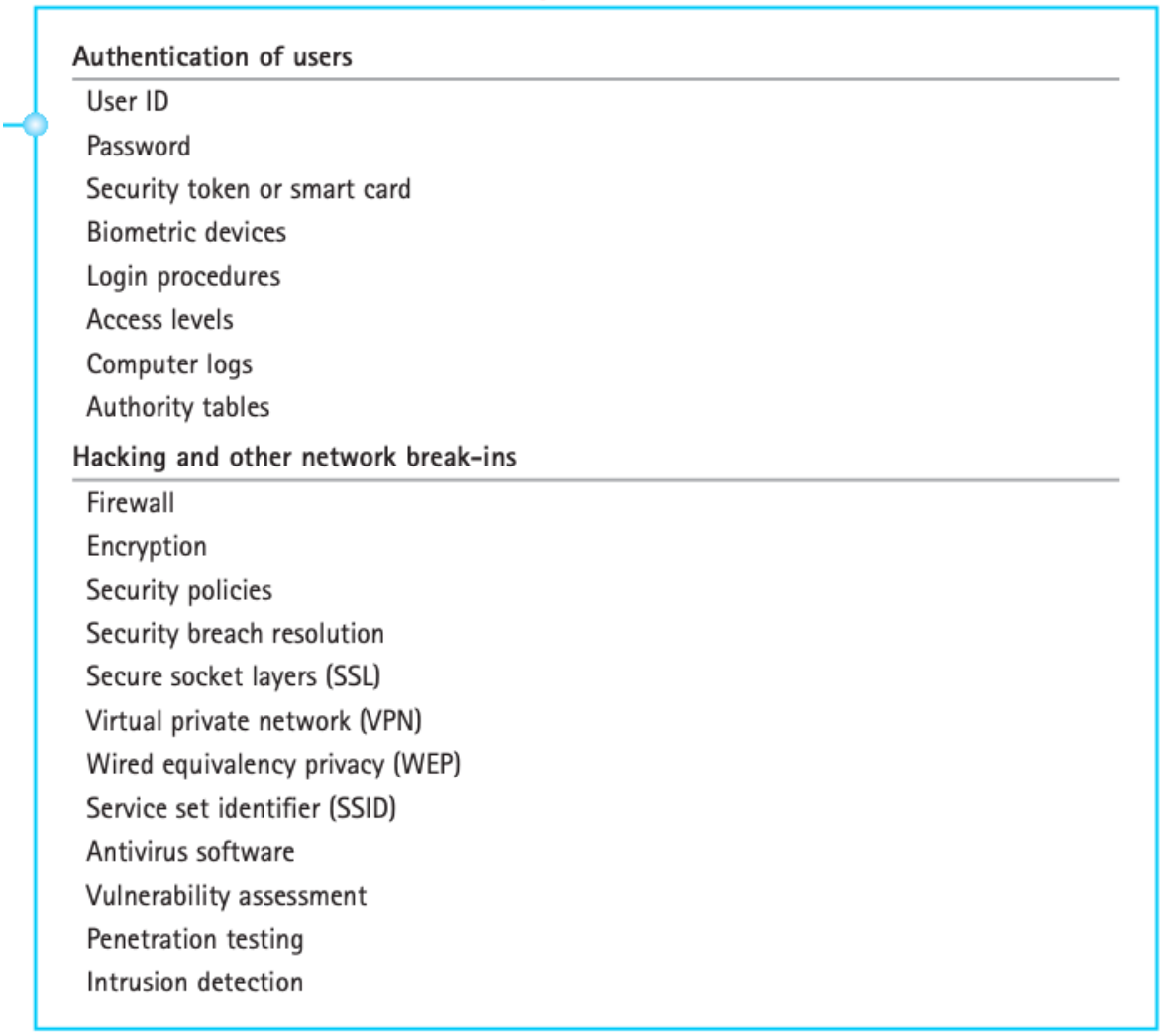
The Internet, intranets, and extranets are all networks that are intended for the sharing of information and the conducting of transactions. In all three networks, controls must be in place to limit access and prevent hackers and other network break-ins. As illustrated in figure 5-7, extranets must have more limited access than the Internet, and intranets must limit access to

those inside the company. For all three network levels, a company must establish the correct level of controlled access. In the case of intranets, only internal employees are given access to the network and information. Extranet access should be limited to those parties in the supply chain who will be sharing information or engaging in exchanges with the company. The general public must be prevented from gaining access to these intranet and extranet networks. The Internet connections of a company must also be controlled. When a company uses the Internet for exchanges such as B2C transactions, it must by default give access to all potential customers. However, controls must still exist to limit those customers' access. For example, a potential customer of Amazon.com would need to know whether a particular book was in stock and available for immediate shipment but would not need to know the number of units in stock of that book. On the other hand, a supplier in the supply chain of Amazon.com would probably need access to inventory levels by virtue of being a part of the extranet of Amazon.com. The point of this illustration is that a company must establish and maintain controls that limit access to the appropriate level for related parties. Customers, suppliers, and employees need different levels of access, as well as access to different types of data. Therefore, a company must carefully implement and maintain proper controls over Internet, extranet, and intranet network connections.

Access is limited by establishing appropriate internal controls such as firewalls and user authentication. The establishment and use of user authentication is intended to prevent log-in to the intranet or extranet by unauthorized users. Firewalls prevent external users from accessing the network and data on the extranet or intranet. Two of the categories of risks

and controls that can limit access to intranets and extranets are reproduced in figure 5-8.

Figure 5-8



XML AND XBRL AS TOOLS TO ENABLE E-BUSINESS

Within the environment of the Internet, intranets, and extranets, two languages have emerged as important tools to enable e-business: XML and XBRL. Both languages have important uses.

XML, short for eXtensible Markup Language, is designed specifically for Web documents. Using XML, designers create customized tags for data that enable the definition, transmission, validation, and interpretation of data

between applications and between organizations. XML is a rich language that facilitates the exchange of data between organizations via Web pages.

XBRL, short for eXtensible Business Reporting Language, is an XML-based markup language developed for financial reporting. XBRL provides a standards-based method to prepare, publish, reliably extract, and automatically exchange financial statements. In XBRL, dynamic financial statements can be published and manipulated on websites. The next sections explain the uses of XML and XBRL.

XML IN INTERNET EDI

EDI (electronic data interchange) is described as a method to conduct purchase transactions electronically. Traditional EDI is a technology that companies began to implement in the late 1960s. EDI was especially popular in industries such as rail and road transportation, auto manufacturing, and health care. Over the years, EDI came to be the form of conducting electronic business for large companies. However, two limiting factors have made it difficult for small to medium-size businesses to implement EDI. First, traditional EDI requires establishing very expensive networks such as private leased lines or value-added networks (VANs), and small and medium-sized companies in many cases could not justify the cost. Usually, small to medium-sized businesses adopted EDI only when forced to by a large company that they dealt with. For example, if a small company were a supplier to Ford Motor Company, it would have no choice but to implement an EDI system, since Ford conducts purchases only via EDI. The second limiting factor is that traditional EDI in the United States is based on an old document standard (ANSI X.12) that limits the kind of data that can be exchanged via EDI. The ANSI X.12 standard for EDI defines standards for common business documents such as purchase orders and invoices.

However, the standard was never intended to cover the more extensive and complex exchange of information, such as shared files or databases, that occurs when two companies collaborate on a project. Given these two limitations, traditional EDI was never widely adopted by small to medium-sized businesses.

The growth of the Internet over the last two decades has provided a powerful and inexpensive alternative to traditional EDI. **Internet EDI** uses the Internet to transmit business information between companies. Internet EDI is also referred to as EDIINT. There are several advantages to using the Internet or extranets to transmit EDI, compared with private leased lines or VANs. By far the biggest advantage is that the Internet or extranets allow cost-free exchange of data. The companies using the Internet or extranets avoid the cost of leasing private lines and paying fees to VANs. This allows any business, including small and medium-sized businesses, to employ EDI at a relatively low cost.

The Internet EDI method of transmission is a relatively new development, but some companies have implemented it throughout their supply chain. A partial list of companies using Internet EDI extensively includes General Electric, Procter & Gamble, Walmart, Kohl's, and Meijer. figure 5-9 summarizes the advantages of Internet EDI in comparison with traditional EDI employing value added networks.

A value-added network is expensive because a company must pay monthly fees or transaction fees to use the VAN. Internet EDI is much less costly because the Internet network can be used without fees. In addition, the hardware and IT systems necessary to support traditional EDI via a VAN are very complex and expensive. Much computer hardware and software must be dedicated to providing traditional EDI. Internet EDI is much less

complex and requires only minimal computer hardware and software. Internet EDI can be operated with only a PC or network of PCs that are Internet connected. This allows the easy adoption of Internet EDI by small and medium-sized businesses.

Traditional EDI is a batch-oriented system that processes transactions in batches. This means there is some delay while transactions are batched, temporarily stored, and then finally transmitted when the batch is complete. Internet EDI operates in a real-time environment, just as B2C commerce is in real time. Because of these problems with EDI, traditional EDI is limited to larger organizations and to the type of data included in standard business documents. The low cost and communication capabilities of the Internet remove those limitations for Internet EDI. All companies in the supply chain are more likely to be able to afford Internet EDI, and they will be able to transmit more types of

data than simply standard business documents. The Walmart example at the beginning of this chapter is an example of a company changing from traditional EDI to Internet EDI.

The network of computers connected to the Internet does allow for more types of data to be communicated between business partners. However, the traditional EDI data format of ANSI X.12 would not accommodate more rich data types such as graphics or spreadsheets. Therefore, Internet EDI can be more flexible if a different data format is used to transmit data. The format used in Internet EDI is eXtensible Markup Language, or XML.

Figure 5-9

VAN	Internet EDI
Expensive	Low-cost
Transaction fees	Zero transaction fees
Complicated	Easy to use
Heavy infrastructure	Minimal infrastructure
Proprietary	Industry standard
Batch-related store and forward	Real-time
Limited usage	Entire supply chain
Limited data transport	All data transport
Limited access	Web browser

Traditional EDI is capable of transmitting many standard business documents between companies, such as purchase orders, invoices, and even payments by electronic funds transfer (EFT). However, given the capabilities of the Internet and extranets for sharing information, this traditional EDI data format is too limited. In addition to business documents, companies may need to transmit or share product descriptions, pictures of products, or even databases of information. Traditional EDI cannot accomplish such sharing of data. Internet EDI does provide the capability of sharing much richer forms of data through the use of XML. XML is a metalanguage, which means that it is a computer language that defines a language. XML is a tagged data format in which each data piece is preceded by a tag that defines the data piece. The same tag then marks the end of that piece of data. Thus, a tag surrounds each piece of data. XML is the standard markup language utilized in Internet EDI.

XML allows businesses to exchange transaction data over the Internet in a rich format. As XML becomes the accepted standard in Internet EDI, it will enable companies to exchange more than standard business

documents. Spreadsheets, graphs, and databases could all be exchanged between businesses by the use of XML documents to tag the data and the manner in which the data should be presented. Those who predict the future of the IT environment predict that XML will revolutionize the way in which businesses share data with each other and with customers.

Although EDI through a value-added network or Internet EDI provide significant cost savings and efficiency, it has not led to every company using EDI. There are still businesses that use paper purchase orders or invoices. The number of companies using EDI is on the rise, yet some estimate that up to 35 percent of purchase orders processed in the United States are still paper based. In addition, some companies still use value-added-networks to facilitate EDI communication rather than Internet EDI.

XBRL FOR FINANCIAL STATEMENT REPORTING

A special variant of XML called eXtensible Business Reporting Language, or XBRL, is predicted to revolutionize business reporting to creditors, stockholders, and government agencies. In 2009, the Securities Exchange Commission (SEC) began requiring companies to provide annual reports and financial statements in XBRL format. The idea behind XBRL is that financial data are tagged in a computer readable format that allows the users to readily obtain, analyze, exchange, and display the information.

XBRL financial statements have two major advantages over paper-based financial statements. Financial statements that are coded in XBRL can easily be used in several formats. They can be printed in paper format, displayed as an HTML Web page, sent electronically to the SEC, and transmitted to banks or regulatory agencies as an XML file. When a financial statement is prepared in XBRL, a computer program such as a Web browser can extract pieces of information from the XBRL file. The underlying financial

data can be loaded into spreadsheets or other financial analysis software. This is not possible with an HTML file. For example, while a financial statement in HTML format can be viewed on a website, the computer cannot extract sales. However, a XBRL financial statement would tag the dollar amount of sales with the tag that names that number sales. The computer can then extract specific pieces of data.

This capability allows investors and creditors to more easily analyze financial statements, which should result in better investment and credit decisions.

For XBRL to be implemented widely, common standards regarding the tags that identify data must be developed and accounting software vendors must use these tags within the software.

ETHICAL ISSUES RELATED TO E-BUSINESS AND E-COMMERCE

Companies that engage in e-commerce, B2C sales with consumers have the same kind of obligations to conduct their business ethically as companies transacting business any other way. However, the lack of geographic boundaries and the potential anonymity of Web-based commerce suggest that B2C companies have an even greater necessity to act ethically. A customer who orders merchandise or services on a website may not be able to easily assess the ethics or trustworthiness of a company who sells online. For example, if you buy a defective or spoiled product from your local grocery store, you can simply return it quickly. Your grocery store has a local presence, and you buy there because you know the company is real and trustworthy. However, anyone can establish a website that looks like a bona fide company but may be just a false storefront used to defraud customers. In B2C e-commerce, customers do not have the same capability to visit and become familiar with the company as they do when they are buying from a local store.

In a previous section of this chapter, the “Online Privacy” section of the AICPA Trust Services Principles was described. For the most part, these types of practices are an ethical obligation, but not necessarily a legal requirement. For example, there is no legal requirement to disclose privacy policies on a company’s website. However, ethical obligations would suggest that customers should be so informed regarding customer privacy. The practices described in the Trust Services Principles are more than good business practices. The online privacy policies represent ethical obligations to customers. As a reminder, the privacy practices include the following concepts:

a. Management

b. Notice

c. Choice and consent

d. Collection

e. Use and retention

f. Access

g. Onward transfer and disclosure

h. Security

i. Quality

j. Monitoring and enforcement

These principles can be distilled into the ethical concept that management has an obligation to treat customer information with due care. Companies should honestly and fully disclose to customers the information they will collect and how they will protect it, use it, and share it. Management has an ethical obligation to create and enforce policies and practices which ensure that private customer data are not misused. Unfortunately, the profit

motive sometimes leads management to focus too much on potential revenue and not enough on customer privacy.

When a customer engages in e-commerce, she is sharing data such as name, address, e-mail address, credit card number, and buying habits. These data have potential value to many other companies and are sometimes sold to other companies. You may have even received a mail or e-mail solicitation and wondered how that company ever came to know your name and address. This might mean that your name and address have been sold to another company or shared with a related company or subsidiary. There are many, many examples of companies who have compromised customer privacy to earn revenue. Customer lists or other private data about customers are a valuable resource. Too often, companies are willing to sell or share customer lists or customer data. In some cases, companies have no policies about the privacy of customer data and are thus willing to sell or share the data. In other cases, companies with policies regarding the privacy of customer data have violated their own policies.

While there is no requirement to disclose a privacy policy on a website, it is an ethical obligation to disclose and follow the policy. Moreover, when a policy is disclosed, the Federal Trade Commission holds companies to a legal standard of following their stated policy.

There are also regulations passed by the U.S. government regarding the privacy of medical information. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) includes a section on the security of health care information. The Act requires health care providers, health plans, hospitals, health insurers, and health clearinghouses to follow regulations that protect the privacy of medical-related information.

As the issue of consumer privacy continues to become more important, there may be new regulations and requirements affecting companies. Even if there were no new regulations, ethical obligations would dictate that companies take adequate care to guard the security and privacy of data collected through e-commerce.

SUMMARY OF STUDY OBJECTIVES

An introduction to e-commerce and e-business**.** E-business is the use of electronic means to enhance business processes. E-business encompasses all forms of online electronic trading, consumer-based e-commerce, business-to-business electronic trading and process integration, as well as the internal use of IT and related technologies for process integration inside organizations. There is an overlap between e-commerce and e-business, which leads some to confuse the two concepts. E-commerce is electronically enabled transactions between a business and its customers. E-business is a broader concept that includes e-commerce, as well as all forms of electronic means of servicing customers and vendors, trading information with customers and vendors, and recording and control of internal processes.

The physical structure and standards of the Internet**.** Backbone providers, regional Internet service providers, and local Internet service providers make up the physical structure of the Internet that connects global users. The common standards that allow computers to communicate with each other over the Internet are TCP/IP, HTML, domain names, addresses based on uniform resource locater (URL), and SSL encryption.

E-commerce and its benefits**.** The most well-known form of e-commerce is business-to-consumer (B2C) transactions using the World Wide Web. B2C

sales transactions offer many benefits to both the consumer and the business.

Privacy expectations in e-commerce**.** Businesses have an ethical obligation to establish systems and procedures to protect the privacy of customers. The AICPA Trust Services Principles establish nine privacy practices that companies should follow: notice, choice and consent, collection, use and retention, access, onward transfer and disclosure, security, integrity, and management and enforcement.

E-business and IT enablement**.** E-business is the use of IT to enable processes within the supply chain. The supply chain is the set of linked processes that take place from the acquisition and delivery of raw materials through the manufacturing, distribution, wholesale, and delivery of the product to the customer. There are many benefits to the IT enablement of processes within the supply chain. E-business includes business-to-business (B2B) electronic transactions.

E-business enablement examples**.** There are many forms of e-business. This section provides examples of ways that businesses streamline business processes, reduce operational costs, and enhance efficiency through e-business.

Intranets and extranets to enable e-business**.** An intranet is a private network accessible only to the employees of that company. The intranet uses the same common standards and protocols of the Internet. An intranet uses TCP/IP protocol and the same type of HTML Web pages as the Internet. However, the computer servers of the intranet are accessible only from internal computers within the company. An extranet is similar to an intranet, except that it offers access to selected outsiders, such as buyers, suppliers, distributors, or wholesalers in the supply chain. Extranets are the networks

that allow business partners to exchange information. These business partners will be given limited access to company servers and data.

Internal controls for the Internet, intranets, and extranets. The Internet, intranets, and extranets are all networks that are intended to share information and conduct transactions. In all three networks, controls must be in place to allow the intended users access, but also limit access to unauthorized users. Therefore, proper user authentication and hacking controls must be implemented in these networks.

XML and XBRL as e-business tools**.** XML and XBRL are markup languages that allow designers to create customized tags for data that enable the definition, transmission, validation, and interpretation of data between applications and between organizations. XML is a rich language that facilitates the exchange of data between organizations via Web pages. XML is used in Internet EDI. XBRL is a business reporting language that allows businesses to provide dynamic financial statements to users over the World Wide Web.

Ethical issues related to e-business and e-commerce. The online privacy policies of the AICPA Trust Services Principles represent ethical obligations to customers. These are ethical, but not necessarily legal, obligations. However, if a company does choose to disclose privacy practices on its website, it is then legally obligated to follow those practices.

Exercises

1. Which of the following statements is true?

a. E-business is a subset of e-commerce.

b. E-commerce is a subset of e-business.

c. E-business and e-commerce are exactly the same thing.

d. E-business and e-commerce are not related.

2. An electronic hardware device that is located at the gateway between two or more networks is a

a. packet switch

b. URL

c. router

d. protocol

3. The type of organization that serves as the main trunk line of the Internet is called a

a. local ISP

b. regional ISP

c. global ISP

d. backbone provider

4. Which of the following is not a direct advantage for the consumer from e-commerce?

a. Access to a broader market

b. More shopping convenience

c. Reduced order-processing cost

d. Information sharing from the company

5. Each of the following represents a characteristic of B2B commerce except

a. electronic data interchange

b. electronic retailing

c. data exchanges

d. preexisting business relationships

6. Each of the following represents an application of B2C commerce except

a. software sales

b. electronic retailing

c. data exchanges

d. stock trading

7. Before forwarding customer data, an organization should receive explicit or implicit consent of the customer. This describes which of the AICPA Trust Services Principles online privacy practices?

a. Consent

b. Use and retention

c. Access

d. Onward transfer and disclosure

8. Which of the following processes within a supply chain can benefit from IT enablement?

a. All processes throughout the supply chain

b. Only internal processes within the supply chain

c. Only external processes within the supply chain

d. Exchange processes between a company and its suppliers

9. When a company has an e-business transaction with a supplier, it could be using

a. the Internet

b. an intranet

c. an extranet

d. either the Internet or an extranet

10. Intranets are used for each of the following except

a. communication and collaboration

b. business operations and managerial monitoring

c. Web publishing

d. customer self-service

11. When there is no necessity for a preexisting relationship between buyer and seller, that transaction is more likely to be classified as

a. B2B

b. B2C

c. B2E

d. either B2B or B2C

12. Which of the following IT controls would not be important in an extranet?

a. Encryption

b. Password

c. Antivirus software

d. Penetration testing

e. All of the above are important IT controls.

13. A company's computer network uses Web servers, HTML, and XML to serve various user groups. Which type of network best serves each of the following users?

Employees	*Suppliers*
a. Intranet	Extranet
b. Intranet	Internet
c. Internet	Extranet
d. Internet	Internet

14. An extensible markup language designed specifically for financial reporting is

a. Internet EDI

b. XML

c. XBRL

d. XFRL

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