CHAPTER

2

Overview of Transaction Processing and Enterprise Resource Planning Systems

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

1. Describe the data processing cycle used to process transactions, including how data is input, stored, and processed and how information is output.
2. Discuss how organizations use enterprise resource planning (ERP) systems to process transactions and provide information.

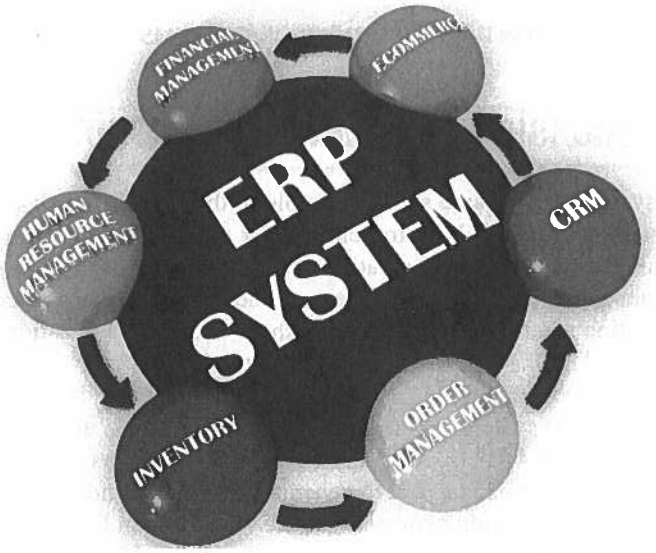
INTEGRATIVE CASE S&S

The grand opening of S&S is two weeks away. Scott Parry and Susan Gonzalez are working long hours to make the final arrangements for the store opening. Most of the employees have already been hired; training is scheduled for next week.

Susan has ordered inventory for the first month. The store is being remodeled and will have a bright, cheery decor. All seems to be in order—all, that is, except the accounting records.

Like many entrepreneurs, Scott and Susan have not given as much thought to their accounting records as they have to other parts of their business. Recognizing they need qualified accounting help, they hired a full-time accountant, Ashton Fleming. Scott and Susan think Ashton is perfect for the job because of his three years of experience with a national CPA (Certified Public Accountants) firm. Ashton is looking forward to working for S&S because he has always wanted to be involved in building a company from the ground up.

During Ashton's first day on the job, Susan gives him the invoices for the inventory she purchased and a folder with their bank loan documentation, with the first payment due after the grand opening. She also hands him a folder containing information on rental payments, utilities, and other expenses. Susan tells Ashton that she and Scott know little about accounting and he will run the accounting end of S&S. She adds that the only thing they have done so far is to open a checking account for S&S and that they have kept the check register updated to monitor their cash flow.



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Scott explains that the sales staff is paid a fixed salary and commissions and that all other employees are paid hourly rates. Employees are paid every two weeks, with their first paychecks due next week. Ashton asks Scott what accounting software the company is using. Scott replies that he and Susan have not had time to tackle that aspect yet. Scott and Susan looked at some of the popular packages but quickly realized that they did not know enough about accounting to make an intelligent choice. Scott then tells Ashton that his first task should be to purchase whatever accounting software he thinks will be best for S&S.

After Scott leaves, Ashton feels both excited and a little nervous about his responsibility for creating an accounting information system (AIS) for S&S. Although Ashton has audited many companies, he has never organized a company's books and is unsure how to go about it. A million questions run through his head. Here are just a few of them:

1. How should I organize the accounting records so that financial statements can be easily produced?
2. How am I going to collect and process data about all of S&S's transactions?
3. How do I organize all the data that will be collected?
4. How should I design the AIS so that the information provided is reliable and accurate?
5. How can I design procedures to ensure that they meet all government obligations, such as remitting sales, income, and payroll taxes?

Introduction

This chapter is divided into two major sections. The first section discusses the data processing cycle and its role in organizing business activities and providing information to users. It explains how organizations capture and enter data about business activities into their accounting information system (AIS) and how companies process data and transform it into useful information. It also discusses basic data storage concepts, showing how data are stored for further use. Finally, information output is discussed, including the different ways information is provided to users.

The second section discusses the role of the information system in modern organizations and introduces the concept of an enterprise resource planning (ERP) system. An ERP can help integrate all aspects of a company's operations with its traditional AIS. This section also describes the significant advantages of an ERP as well as significant challenges that must be overcome to implement an ERP system.

Transaction Processing: The Data Processing Cycle

Accountants and other system users play a significant role in the data processing cycle. For example, they interact with systems analysts to help answer questions such as these: What data should be entered and stored by the organization, and who should have access to them? How should data be organized, updated, stored, accessed, and retrieved? How can scheduled and unanticipated information needs be met? To answer these and related questions, the data processing concepts explained in this chapter must be understood.

One important AIS function is to process company transactions efficiently and effectively. In manual (non-computer-based) systems, data are entered into journals and ledgers maintained on paper. In computer-based systems, data are entered into computers and stored in files and databases. The operations performed on data to generate meaningful and relevant information are referred to collectively as the **data processing cycle**. As shown in Figure 2-1, this process consists of four steps: data input, data storage, data processing, and information output.

data processing cycle - The four operations (data input, data storage, data processing, and information output) performed on data to generate meaningful and relevant information.

DATA INPUT

The first step in processing input is to capture transaction data and enter them into the system. The data capture process is usually triggered by a business activity. Data must be collected about three facets of each business activity:

1. Each activity of interest
2. The resource(s) affected by each activity
3. The people who participate in each activity

For example, the most frequent revenue cycle transaction is a sale, either for cash or on credit. S&S may find it useful to collect the following data about a sales transaction:

- Date and time the sale occurred.
- Employee who made the sale and the checkout clerk who processed the sale.
- Checkout register where the sale was processed.
- Item(s) sold.
- Quantity of each item sold.
- List price and actual price of each item sold.
- Total amount of the sale.
- Delivery instructions.
- For credit sales: customer name, customer bill-to and ship-to addresses.

source documents - Documents used to capture transaction data at its source – when the transaction takes place. Examples include sales orders, purchase orders, and employee time cards.

Historically, most businesses used paper **source documents** to collect data about their business activities. They later transferred that data into the computer. When data are entered using computer screens, they often retain the same name and basic format as the paper source document. Table 2-1 lists some common transaction cycle activities and the source document or form used to capture data about that event. Examples of many of these documents can be found in Chapters 14 through 18. For example, a purchase order, used to request merchandise from suppliers, is shown in Chapter 15.

turnaround documents - Records of company data sent to an external party and then returned to the system as input. Turnaround documents are in machine-readable form to facilitate their subsequent processing as input records. An example is a utility bill.

Turnaround documents are company output sent to an external party, who often adds data to the document, and then are returned to the company as an input document. They are in machine-readable form to facilitate their subsequent processing as input records. An example is a utility bill sent to the customer, returned with the customer's payment, and read by a special scanning device when it is returned.

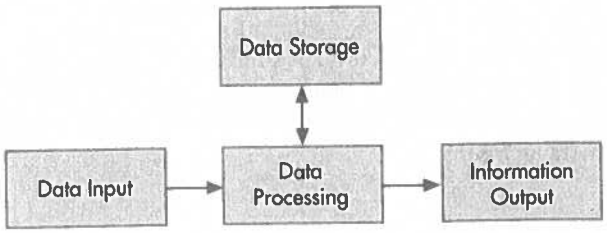


FIGURE 2-1
The Data Processing Cycle

TABLE 2-1 Common Business Activities and Source Documents

Business Activity	Source Document
Revenue Cycle	
Take customer order	Sales order
Deliver or ship order	Delivery ticket or bill of lading
Receive cash	Remittance advice or remittance list
Deposit cash receipts	Deposit slip
Adjust customer account	Credit memo
Expenditure Cycle	
Request items	Purchase requisition
Order items	Purchase order
Receive items	Receiving report
Pay for items	Check or electronic funds transfer
Human Resources Cycle	
Collect employee withholding data	W-4 form
Record time worked by employees	Time cards
Record time spent on specific jobs	Job time tickets or time sheet

Source data automation devices capture transaction data in machine-readable form at the time and place of their origin. Examples include ATMs used by banks, point-of-sale (POS) scanners used in retail stores, and bar code scanners used in warehouses. Another good example of source data automation is the use of XBRL. Before XBRL, financial reports were submitted electronically to the SEC and others who wanted to use the information had to enter it into their system. With XBRL, financial data is encoded to make it machine readable, allowing other computers to use and analyze the information. This saves time, reduces errors, and makes much more information available for analytics. XBRL is discussed in more depth in Chapter 18.

source data automation - The collection of transaction data in machine-readable form at the time and place of origin. Examples are point-of-sale terminals and ATMs.

The second step in processing input is to make sure captured data are accurate and complete. One way to do this is to use source data automation or well-designed turnaround documents and data entry screens. Well-designed documents and screens improve accuracy and completeness by providing instructions or prompts about what data to collect, grouping logically related pieces of information close together, using checkoff boxes or pull-down menus to present the available options, and using appropriate shading and borders to clearly separate data items. Data input screens usually list all the data the user needs to enter. Sometimes these screens resemble source documents, and users fill out the screen the same way they would a paper source document.

Users can improve control either by using prenumbered source documents or by having the system automatically assign a sequential number to each new transaction. Prenumbering simplifies verifying that all transactions have been recorded and that none of the documents have been misplaced. (Imagine trying to balance a checkbook if the checks were not prenumbered.)

The third step in processing input is to make sure company policies are followed, such as approving or verifying a transaction. For example, S&S would not want to sell goods to a customer who was not paying his bills or to sell an item for immediate delivery that was out of stock. These problems are prevented by programming the system to check a customer's credit limit and payment history, as well as inventory status, before confirming a customer sale.

DATA STORAGE

A company's data are one of its most important resources. However, the mere existence of relevant data does not guarantee that they are useful. To function properly, an organization must have ready and easy access to its data. Therefore, accountants need to understand how data are organized and stored in an AIS and how they can be accessed. In essence, they need to know how to manage data for maximum corporate use.

Imagine how difficult it would be to read a textbook if it were not organized into chapters, sections, paragraphs, and sentences. Now imagine how hard it would be for S&S to find an invoice if all documents were randomly dumped into file cabinets. Fortunately, information

in an AIS is organized for easy and efficient access. This section explains basic data storage concepts and definitions.

general ledger - A ledger that contains summary-level data for every asset, liability, equity, revenue, and expense account of the organization.

subsidiary ledger - A ledger used to record detailed data for a general ledger account with many individual subaccounts, such as accounts receivable, inventory, and accounts payable.

control account - A title given to a general ledger account that summarizes the total amounts recorded in a subsidiary ledger. For example, the accounts receivable control account in the general ledger represents the total amount owed by all customers. The balances in the accounts receivable subsidiary ledger indicate the amount owed by each specific customer.

LEDGERS Cumulative accounting information is stored in general and subsidiary ledgers. A **general ledger** contains summary-level data for every asset, liability, equity, revenue, and expense account. A **subsidiary ledger** contains detailed data for any general ledger account with many individual subaccounts. For example, the general ledger has an accounts receivable account that summarizes the total amount owed to the company by all customers. The subsidiary accounts receivable ledger has a separate record for each individual customer, with detailed information such as name, address, purchases, payments, account balance, and credit limit. Subsidiary ledgers are often used for accounts receivable, inventory, fixed assets, and accounts payable.

The general ledger account corresponding to a subsidiary ledger is called a **control account**. The relationship between the general ledger control account and the total of individual subsidiary ledger account balances helps maintain the accuracy of AIS data. Specifically, the sum of all subsidiary ledger account balances should equal the amount in the corresponding general ledger control account. Any discrepancy between them indicates that a recording error has occurred.

coding - The systematic assignment of numbers or letters to items to classify and organize them.

sequence codes - Items are numbered consecutively so that gaps in the sequence code indicate missing items that should be investigated. Examples include prenumbered checks, invoices, and purchase orders.

block code - Blocks of numbers reserved for specific categories of data, thereby helping to organize the data. An example is a chart of accounts.

group codes - Two or more subgroups of digits used to code an item. A group code is often used in conjunction with a block code.

CODING TECHNIQUES Data in ledgers is organized logically using coding techniques. **Coding** is the systematic assignment of numbers or letters to items to classify and organize them.

- With **sequence codes**, items are numbered consecutively to account for all items. Any missing items cause a gap in the numerical sequence. Examples include prenumbered checks, invoices, and purchase orders.
- With a **block code**, blocks of numbers are reserved for specific categories of data. For example, S&S reserved the following numbers for major product categories:

Product Code	Product Type
1000000–1999999	Electric range
2000000–2999999	Refrigerator
3000000–3999999	Washer
4000000–4999999	Dryer

Users can identify an item's type and model using the code numbers. Other examples include ledger account numbers (blocked by account type), employee numbers (blocked by department), and customer numbers (blocked by region).

- **Group codes**, which are two or more subgroups of digits used to code items, are often used in conjunction with block codes. If S&S uses a seven-digit product code number, the group coding technique might be applied as follows.

Digit Position	Meaning
1–2	Product line, size, style
3	Color
4–5	Year of manufacture
6–7	Optional features

There are four subcodes in the product code, each with a different meaning. Users can sort, summarize, and retrieve information using one or more subcodes. This technique is often applied to general ledger account numbers.

mnemonic codes - Letters and numbers interspersed to identify an item. The mnemonic code is derived from the description of the item and is usually easy to memorize.

- With **mnemonic codes**, letters and numbers are interspersed to identify an item. The mnemonic code is derived from the description of the item and is usually easy to memorize. For example, Dry300W05 could represent a low end (300), white (W) dryer (Dry) made by Sears (05).

The following guidelines result in a better coding system. The code should:

- Be consistent with its intended use, which requires that the code designer determine desired system outputs prior to selecting the code.
- Allow for growth. For example, don't use a three-digit employee code for a fast-growing company with 950 employees.

- Be as simple as possible to minimize costs, facilitate memorization and interpretation, and ensure employee acceptance.
- Be consistent with the company's organizational structure and across the company's divisions.

CHART OF ACCOUNTS A great example of coding is the **chart of accounts**, which is a list of the numbers assigned to each general ledger account. These account numbers allow transaction data to be coded, classified, and entered into the proper accounts. They also facilitate the preparation of financial statements and reports because data stored in individual accounts can easily be summed for presentation.

chart of accounts - A listing of all the numbers assigned to balance sheet and income statement accounts. The account numbers allow transaction data to be coded, classified, and entered into the proper accounts. They also facilitate financial statement and report preparation.

However, data stored in summary accounts cannot be easily analyzed and reported in more detail. Consequently, it is important that the chart of accounts contain sufficient detail to meet an organization's information needs. To illustrate, consider the consequences if S&S were to use only one general ledger account for all sales transactions. It would be easy to produce reports showing the total amount of sales for a given time period, but it would be very difficult to prepare reports separating cash and credit sales. Indeed, the only way to produce these latter reports would be to go back to original sales records to identify the nature of each sales transaction. If S&S used separate general ledger accounts for cash and credit sales, then reports showing both types of sales could be easily produced. Total sales could also be easily reported by summing each type of sale.

Table 2-2 shows the chart of accounts Ashton developed for S&S. Each account number is three digits long. The first digit represents the major account category and indicates where

TABLE 2-2 Sample Chart of Accounts for S&S

Account Code	Account Name
100–199	**Current Assets**
101	Checking Account
102	Savings Account
103	Petty Cash
120	Accounts Receivable
125	Allowance for Doubtful Accounts
130	Notes Receivable
150	Inventory
160	Supplies
170	Prepaid Rent
180	Prepaid Insurance
200–299	**Noncurrent Assets**
200	Land
210	Buildings
215	Accumulated Depreciation—Buildings
230	Equipment
235	Accumulated Depreciation—Equipment
240	Furniture & Fixtures
245	Accumulated Depreciation—Furniture & Fixtures
250	Other Assets
300–399	**Liabilities**
300	Accounts Payable
310	Wages Payable
321	Employee Income Tax Payable
322	FICA Tax Payable
323	Federal Unemployment Tax Payable
324	State Unemployment Tax Payable
330	Accrued Interest Payable
360	Other Liabilities
400–499	**Equity Accounts**
400	Common Stock
410	Retained Earnings
500–599	**Revenues**
501	Cash Sales
502	Credit Sales
510	Sales Returns & Allowances
511	Sales Discounts
520	Interest Revenue
530	Miscellaneous Revenue
600–799	**Expenses**
600	Cost of Goods Sold
611	Wages Expense
612	Commissions Expense
613	Payroll Tax Expense
620	Rent Expense
630	Insurance Expense
640	Supplies Expense
650	Bad Debt Expense
701	Depreciation Expense—Buildings
702	Depreciation Expense—Equipment
703	Depreciation Expense—Furniture & Fixtures
710	Income Tax Expense
900–999	**Summary Accounts**
910	Income Summary

it appears on S&S's financial statements. Thus, all current assets are numbered in the 100s, noncurrent assets are numbered in the 200s, and so on.

The second digit represents the primary financial subaccounts within each category. Again, the accounts are assigned numbers to match the order of their appearance in financial statements (in order of decreasing liquidity). Thus, account 120 represents accounts receivable, and account 150 represents inventory.

The third digit identifies the specific account to which the transaction data will be posted. For example, account 501 represents cash sales, and account 502 represents credit sales. Similarly, accounts 101 through 103 represent the various cash accounts used by S&S.

A chart of accounts is tailored to the nature and purpose of an organization. For example, the chart of accounts for S&S indicates that the company is a corporation. In contrast, a partnership would include separate capital and drawing accounts for each partner, instead of common stock and retained earnings. Likewise, because S&S is a retail organization, it has only one type of general ledger inventory account. A manufacturing company, in contrast, would have separate general ledger accounts for raw materials, work in process, and finished goods inventories.

Ashton left gaps in S&S's chart of accounts to allow for additional accounts. For example, when S&S has excess cash to invest in marketable securities, a new general ledger account can be created and assigned the number 110. When S&S opens stores in the future, he will add three digits to the chart of accounts to represent each store in the chain, so that S&S can track items in each store.

Subsidiary ledger accounts often have longer account codes than general ledger accounts. At S&S, each account receivable will have a seven-digit code. The first three digits are 120, the code for accounts receivable. The next four digits identify up to 10,000 individual customers.

JOURNALS Transaction data are often recorded in a journal before they are entered into a ledger. A journal entry shows the accounts and amounts to be debited and credited. A **general journal** is used to record infrequent or nonroutine transactions, such as loan payments and end-of-period adjusting and closing entries. A **specialized journal** records large numbers of repetitive transactions such as sales, cash receipts, and cash disbursements.

general journal - A journal used to record infrequent or nonroutine transactions, such as loan payments and end-of-period adjusting and closing entries.

specialized journal - A journal used to record a large number of repetitive transactions such as credit sales, cash receipts, purchases, and cash disbursements.

Table 2-3 is a sample sales journal. All transaction information is recorded in one line, with every entry a debit to accounts receivable and a credit to sales. There is no need to write an explanation of each entry, as is the case with general journal entries. Given the high number of daily sales transactions, the time saved by recording these transactions in a sales journal, rather than in the general journal, is considerable.

The Post Ref column indicates when transactions are posted to the appropriate ledger. In a manual system, ledgers are books; hence, the phrase "keeping the books" refers to the process of maintaining the ledgers.

Figure 2-2 shows how to journalize and post sales transactions. First, each credit sale is recorded in the sales journal. Then each sales journal entry is posted to the appropriate customer account in the accounts receivable subsidiary ledger (note the arrow linking the $1,876.50 sale to KDR Builders in the sales journal to the debit for $1,876.50 in the accounts

TABLE 2-3 Sample Sales Journal

		Sales Journal			Page 5
Date	Invoice Number	Account Debited	Account Number	Post Ref	Amount
Oct. 15	151	Brown Hospital Supply	120–035	✓	798.00
15	152	Greenshadows Hotel Suites	120–122	✓	1,267.00
15	153	Heathrow Apartments	120–057	✓	5,967.00
15	154	LMS Construction	120–173	✓	2,312.50
15	155	Gardenview Apartments	120–084	✓	3,290.00
15	156	KDR Builders	120–135	✓	1,876.50
		TOTAL	120/502		15,511.00

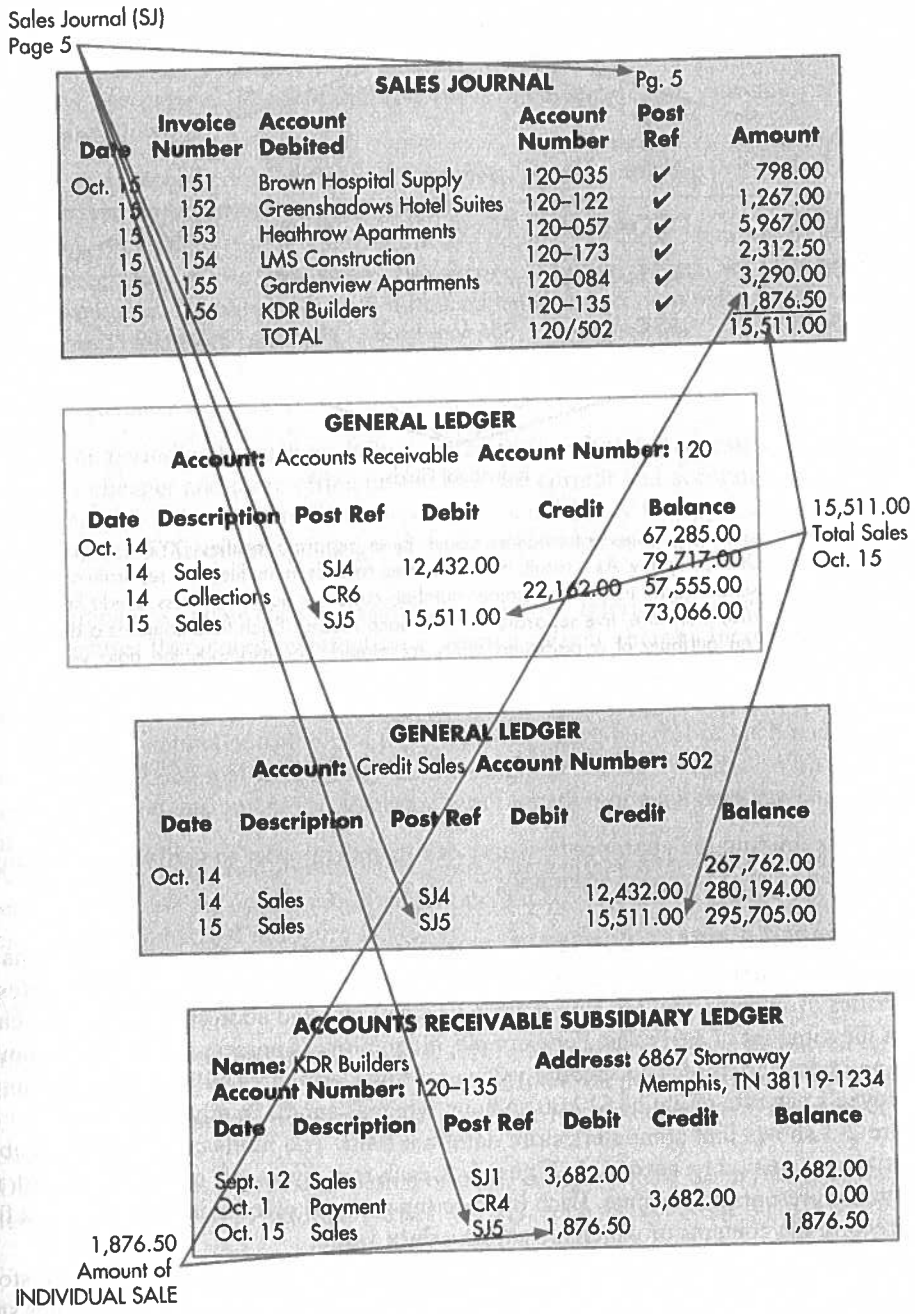


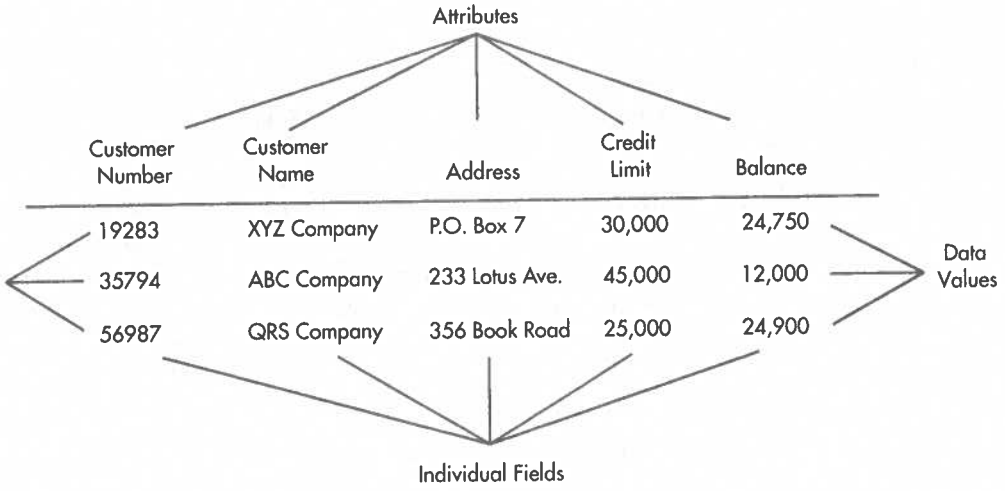
FIGURE 2-2
Recording and Posting a Credit Sale

receivable subsidiary ledger). Periodically, the total of all sales journal entries is posted to the general ledger (note the arrow showing the daily sales journal total of $15,511.00 posted to both the Accounts Receivable and the Credit Sales general ledger accounts).

AUDIT TRAIL Figure 2-2 shows how the posting references and document numbers provide an audit trail. An **audit trail** is a traceable path of a transaction through a data processing system from point of origin to final output, or backward from final output to point of origin. It is used to check the accuracy and validity of ledger postings. Observe that the SJ5 posting reference for the $15,511 credit to the sales account in the general ledger refers to page 5 of the sales journal. By checking page 5 of the sales journal, it is possible to verify that $15,511 represents the total credit sales recorded on October 15. Similarly, the posting reference for the $1,876.50 debit to the KDR Builders' account in the subsidiary accounts receivable ledger also refers to page 5 of the sales journal as the source of that entry. Furthermore, note that the sales journal lists the invoice numbers for each individual entry. This provides the means for

audit trail - A path that allows a transaction to be traced through a data processing system from point of origin to output or backwards from output to point of origin. It is used to check the accuracy and validity of ledger postings and to trace changes in general ledger accounts from their beginning balance to their ending balance.

FIGURE 2-3
Data Storage Elements



This accounts receivable file stores information about three separate entities: XYZ Company, ABC Company, and QRS Company. As a result, there are three records in the file. Five separate attributes are used to describe each customer: customer number, customer name, address, credit limit, and balance. There are, therefore, five separate fields in each record. Each field contains a data value that describes an attribute of a particular entity (customer). For example, the data value 19283 is the customer number for the XYZ Company.

entity - The item about which information is stored in a record. Examples include an employee, an inventory item, and a customer.

attributes - The properties, identifying numbers, and characteristics of interest of an entity stored in a database. Examples are employee number, pay rate, name, and address.

field - The portion of a data record where the data value for a particular attribute is stored. For example, in a spreadsheet, each row might represent a customer and each column an attribute of the customer. Each cell in a spreadsheet is a field.

record - A set of fields whose data values describe specific attributes of an entity, such as all payroll data relating to a single employee. An example is a row in a spreadsheet.

data value - The actual value stored in a field. It describes a particular attribute of an entity. For example, the customer name field would contain "ZYX Company" if that company were a customer.

file - A set of logically related records, such as the payroll records of all employees.

master file - A permanent file of records that stores cumulative data about an organization. As transactions take place, individual records within a master file are updated to keep them current.

transaction file - A file that contains the individual business transactions that occur during a specific fiscal period. A transaction file is conceptually similar to a journal in a manual AIS.

database - A set of interrelated, centrally controlled data files stored with as little data redundancy as possible. A database consolidates records previously stored in separate files into a common pool and serves a variety of users and data processing applications.

locating and examining the appropriate source documents in order to verify that the transaction occurred and it was recorded accurately.

COMPUTER-BASED STORAGE CONCEPTS An **entity** is something about which information is stored, such as employees, inventory items, and customers. Each entity has **attributes**, or characteristics of interest, that are stored, such as a pay rate and address. Each type of entity possesses the same set of attributes. For example, all employees possess an employee number, pay rate, and home address. The specific values for those attributes will differ. For example, one employee's pay rate might be $12.00 an hour, whereas another's might be $12.25.

Figure 2-3 shows that computers store data in a **field**. The fields containing data about entity attributes constitute a **record**. In Figure 2-3, each row represents a different record, and each column represents an attribute. Each intersecting row and column in Figure 2-3 is a field within a record, the contents of which are called a **data value**.

A **file** is a group of related records. A **master file**, like a ledger in a manual AIS, stores cumulative information about an organization. The inventory and equipment master files store information about important organizational resources. The customer, supplier, and employee master files store information about important agents with whom the organization interacts.

Master files are permanent; they exist across fiscal periods. However, individual master file records may change frequently. For example, individual customer accounts balances are updated to reflect new sales transactions and payments received. Periodically, new records are added to or removed from a master file, for example, when a new customer is added or a former customer deleted.

A **transaction file** contains records of individual business transactions that occur during a specific time. It is similar to a journal in a manual AIS. For example, S&S will have a daily sales transaction file and a cash receipts file. Both files will update individual customer account balances in the customer master file. Transaction files are not permanent and may not be needed beyond the current fiscal period. However, they are usually maintained for a specified period for backup purposes.

A set of interrelated, centrally coordinated files is referred to as a **database**. For example, the accounts receivable file might be combined with customer, sales analysis, and related files to form a customer database. Chapter 4 discusses database technology.

DATA PROCESSING

Once business activity data have been entered into the system, they must be processed to keep the databases current. The four different types of data processing activities, referred to as CRUD, are as follows:

1. ***Creating*** new data records, such as adding a newly hired employee to the payroll database.
2. ***Reading***, retrieving, or viewing existing data.
3. ***Updating*** previously stored data. Figure 2-4 depicts the steps required to update an accounts receivable record with a sales transaction. The two records are matched using the account number. The sale amount ($360) is added to the account balance ($1,500) to get a new current balance ($1,860).
4. ***Deleting*** data, such as purging the vendor master file of all vendors the company no longer does business with.

Updating done periodically, such as daily, is referred to as **batch processing**. Although batch processing is cheaper and more efficient, the data are current and accurate only immediately after processing. For that reason, batch processing is used only for applications, such as payroll, that do not need frequent updating and that naturally occur or are processed at fixed time periods.

batch processing - Accumulating transaction records into groups or batches for processing at a regular interval such as daily or weekly. The records are usually sorted into some sequence (such as numerically or alphabetically) before processing.

Most companies update each transaction as it occurs, referred to as **real-time processing** because it ensures that stored information is always current, thereby increasing its decision-making usefulness. It is also more accurate because data input errors can be corrected in real time or refused. It also provides significant competitive advantages. For example, FedEx updated its mission statement to include the phrase "Positive control of each package will be maintained by utilizing real-time electronic tracking and tracing systems." With FedEx's system, employees and customers can track the exact location of each package and estimate its arrival time.

real-time processing - The computer system processes data immediately after capture and provides updated information to users on a timely basis.

A combination of the two approaches is online batch processing, where transaction data are entered and edited as they occur and stored for later processing. Batch processing and real-time processing are summarized in Figure 2-5.

INFORMATION OUTPUT

The final step in the data processing cycle is information output. When displayed on a monitor, output is referred to as "soft copy." When printed on paper, it is referred to as "hard copy." Information is usually presented in one of three forms: a document, a report, or a query response.

Documents are records of transaction or other company data. Some, such as checks and invoices, are transmitted to external parties. Others, such as receiving reports and purchase

documents - Records of transaction or other company data. Examples include checks, invoices, receiving reports, and purchase requisitions.

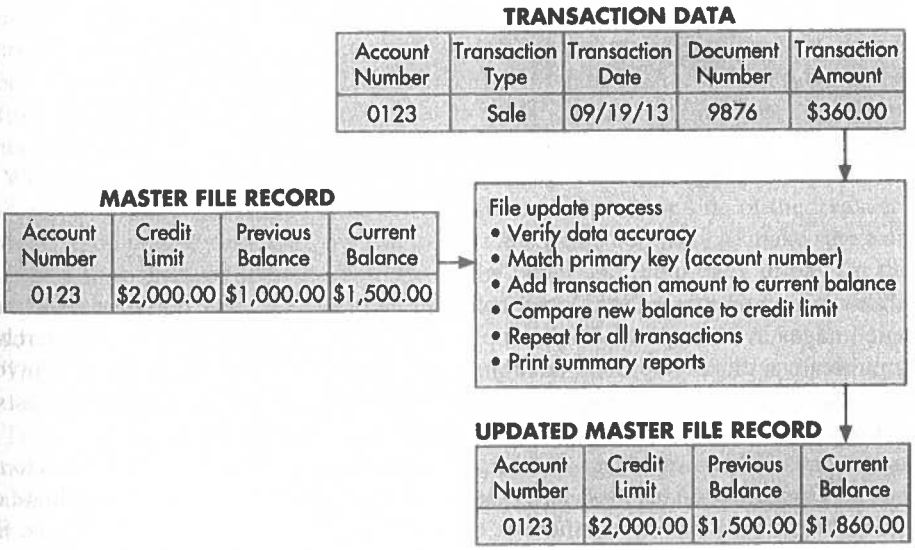
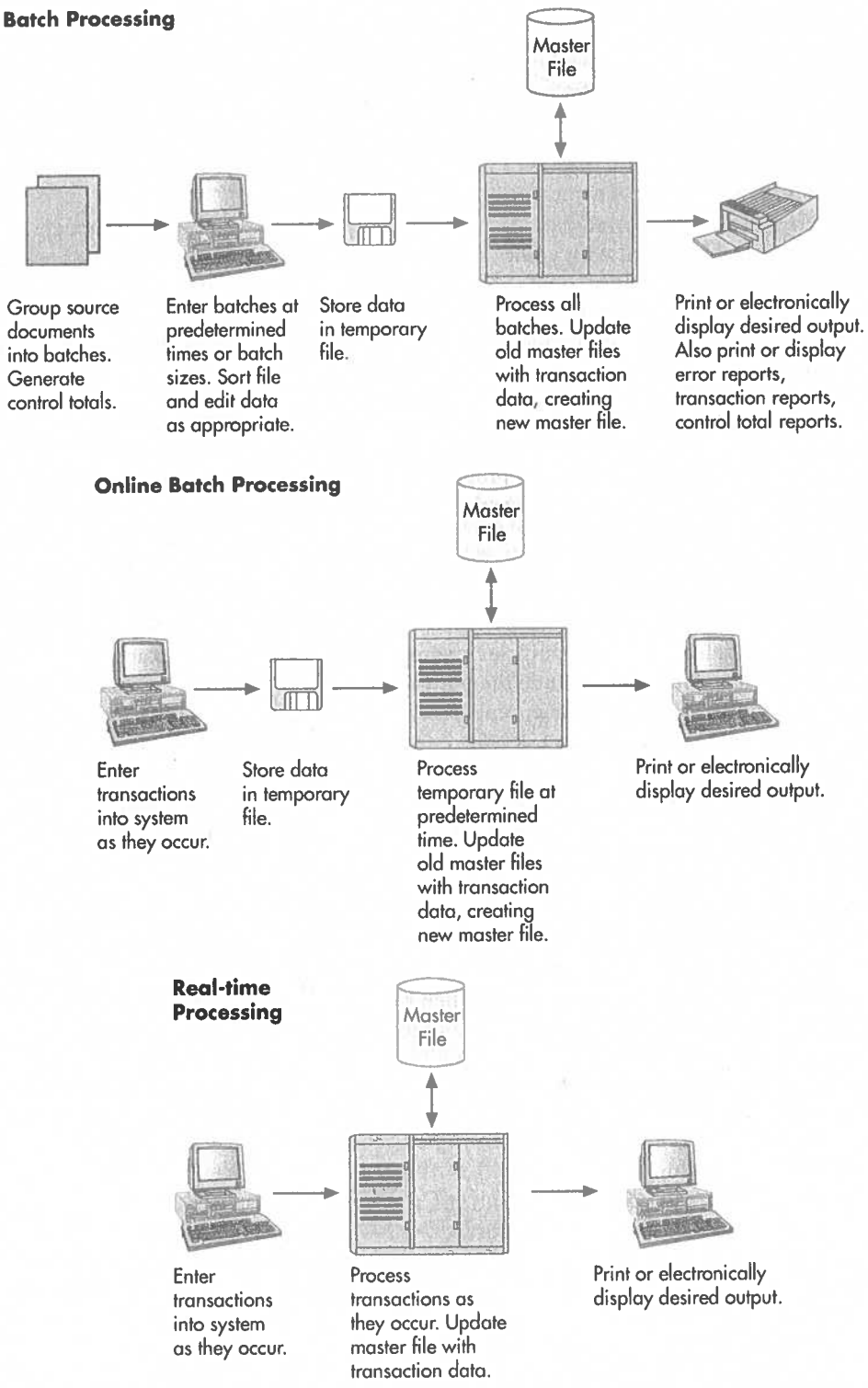


FIGURE 2-4
The Accounts Receivable File Update Process

FIGURE 2-5
Batch and Real-time Processing



reports - System output organized in a meaningful fashion used by employees to control operational activities, by managers to make decisions and design strategies, and by investors and creditors to understand a company's business activities.

requisitions, are used internally. Documents can be printed out, or they can be stored as electronic images in a computer. For example, Toys 'R' Us uses electronic data interchange to communicate with its suppliers. Every year it processes over half a million invoices electronically, thereby eliminating paper documents and dramatically reducing costs and errors. This has resulted in higher profits and more accurate information.

Reports are used by employees to control operational activities and by managers to make decisions and to formulate business strategies. External users need reports to evaluate company profitability, judge creditworthiness, or comply with regulatory requirements. Some

reports, such as financial statements and sales analyses, are produced on a regular basis. Others are produced on an exception basis to call attention to unusual conditions. For example, S&S could have its system produce a report to indicate when product returns exceed a certain percentage of sales. Reports can also be produced on demand. For example, Susan could produce a report to identify the salesperson who sold the most items during a specific promotional period.

The need for reports should be periodically assessed because they are often prepared long after they are needed, wasting time, money, and resources. For example, NCR Corporation reduced the number of reports from 1,200 to just over 100. Another company eliminated 6 million pages of reports, a stack four times higher than its 41-story headquarters building. One 25-page report took five days to prepare and sat unread.

A database **query** is used to provide the information needed to deal with problems and questions that need rapid action or answers. A user enters a request for a specific piece of information; it is retrieved, displayed, or analyzed as requested. Repetitive queries are often developed by information systems specialists. One-time queries are often developed by users. Some companies, such as Walmart, allow suppliers to access their databases to help them better serve Walmart's needs. Suppliers can gauge how well a product is selling in every Walmart store in the world and maximize sales by stocking and promoting items that are selling well.

query - A request for the database to provide the information needed to deal with a problem or answer a question. The information is retrieved, displayed or printed, and/or analyzed as requested.

Additional information about system output is contained in Chapters 14–18.

Transaction Processing: Blockchain

People have been engaging in business transactions for thousands of years. Originally, people kept track of, or accounted for, these transactions using a single-entry accounting system. We eventually graduated to the double entry bookkeeping system with the journals and ledgers and paper-based financial reports that have been used for hundreds of years. When computers were invented, we digitized the journals and ledgers and created transaction files and master files that did the job of paper-based journals and ledgers.

When the number of master files proliferated with its attendant data redundancies and inaccuracies, we combined multiple files into databases, which have grown larger and more complex over time. Each company involved in the transaction had its own way of capturing transaction data and storing transactions, often in centralized databases that provided better control and security. Customers and vendors must periodically reconcile its records to the other party in the transaction.

With computers also came a large variety of software programs to capture, store, process, and report accounting data. But these programs often did not capture non-financial data very well. Over time, accounting software has improved significantly. We now have intelligent or automated accounting products that provide automatic transaction recording, on demand accounting functions, and the automatic distribution of data, thereby doing away with many of the bookkeeping functions of old. These systems, which have machine learning and artificial intelligence embedded in them, store the data in the cloud. They also use smart portals for clients to transfer data and information back and forth.

When the parties to a transaction do not trust each other, a third-party steps in to hold the items of value being exchanged until both parties complete their side of the transaction. For example, when you buy a house, you use realtors and a title company to make sure a clear title is passed and to ensure the house conveys to the buyer and the money to pay for the house conveys to the seller. The titles are then recorded by county governments, creating a public record of what is owned by whom.

The advent of the Internet has had a tremendous impact on people and businesses. The Internet has many uses, including the ability to share information with large groups of people. There are many people-to-people interactions such as social media. There are also many business-to-consumer applications such as online shopping. Business-to-business transactions are also facilitated by the Internet. Many Internet transactions are processed and stored by older, traditional legacy systems.

With the advent of cryptocurrencies, a new technology called blockchain is changing the way financial transactions as well as many other types of transactions are recorded, processed, and stored. While the Internet is a network of information, a blockchain is a network of value and of trust. That is, items of value can be exchanged in a secure and trusted manner. Blockchain is more than a database; it is a new way to process, store, share, and search information. Blockchain, and how it works, is discussed in Chapters 1 and 11.

smart contract - A regular contract with the terms and agreed upon details built into the blockchain. Rules govern the blockchain's interaction with users. A smart contract can be automated and executed based on external triggers.

One use that was not profiled in Focus 1-3 is smart contracts. They are discussed briefly here as they are relevant to transaction processing. A **smart contract** is a regular contract with the terms and agreed upon details built into a blockchain. The organizations using the blockchain can establish the rules that govern the blockchain's interaction with its users. Among those rules would be who is authorized to review, mine, analyze, and audit the blockchain transaction details. These interactions can be automated and presented to users in data dashboards.

An organization can automate the execution of a smart contract based on external triggers. For example, sensors in a warehouse could recognize when ordered goods are delivered and the system could then trigger the payment of the agreed upon transaction amount. These transactions could also have the advantages described in Chapter 1 such as transparency, immutability, security, trust, and the elimination of third-party verification.

Enterprise Resource Planning (ERP) Systems

Traditionally, the AIS has been referred to as a transaction processing system because its only concern was financial data and accounting transactions. For example, when a sale took place, the AIS would record a journal entry showing only the date of the sale, a debit to either cash or accounts receivable, and a credit to sales. Other potentially useful nonfinancial information about the sale, such as the time of day that it occurred, would traditionally be collected and processed outside the AIS. Consequently, many organizations developed additional information systems to collect, process, store, and report information not contained in the AIS. Unfortunately, the existence of multiple systems creates numerous problems and inefficiencies. Often the same data must be captured and stored by more than one system, which not only results in redundancy across systems but also can lead to discrepancies if data are changed in one system but not in others. In addition, it is difficult to integrate data from the various systems.

enterprise resource planning (ERP) systems - Systems that integrate all aspects of an organization's activities—such as accounting, finance, marketing, human resources, manufacturing, inventory management—into one system. An ERP system is modularized; companies can purchase the individual modules that meet their specific needs. An ERP facilitates information flow among the company's various business functions and manages communications with outside stakeholders.

Enterprise resource planning (ERP) systems overcome these problems as they integrate all aspects of a company's operations with a traditional AIS. Most large and many medium-sized organizations use ERP systems to coordinate and manage their data, business processes, and resources. The ERP system collects, processes, and stores data and provides the information managers and external parties need to assess the company.

As shown in Figure 2-6, a properly configured ERP system uses a centralized database to share information across business processes and coordinate activities. This is important because an activity that is part of one business process often triggers a complex series of activities throughout many different parts of the organization. For example, a customer order may necessitate scheduling additional production to meet the increased demand. This may trigger an order to purchase more raw materials. It may also be necessary to schedule overtime or hire temporary help. Well-designed ERP systems provide management with easy access to up-to-date information about all of these activities in order to plan, control, and evaluate the organization's business processes more effectively.

ERP systems are modular, with each module using best business practices to automate a standard business process. This modular design allows businesses to add or delete modules as needed. Typical ERP modules include:

- Financial (general ledger and reporting system)—general ledger, accounts receivable, accounts payable, fixed assets, budgeting, cash management, and preparation of managerial reports and financial statements

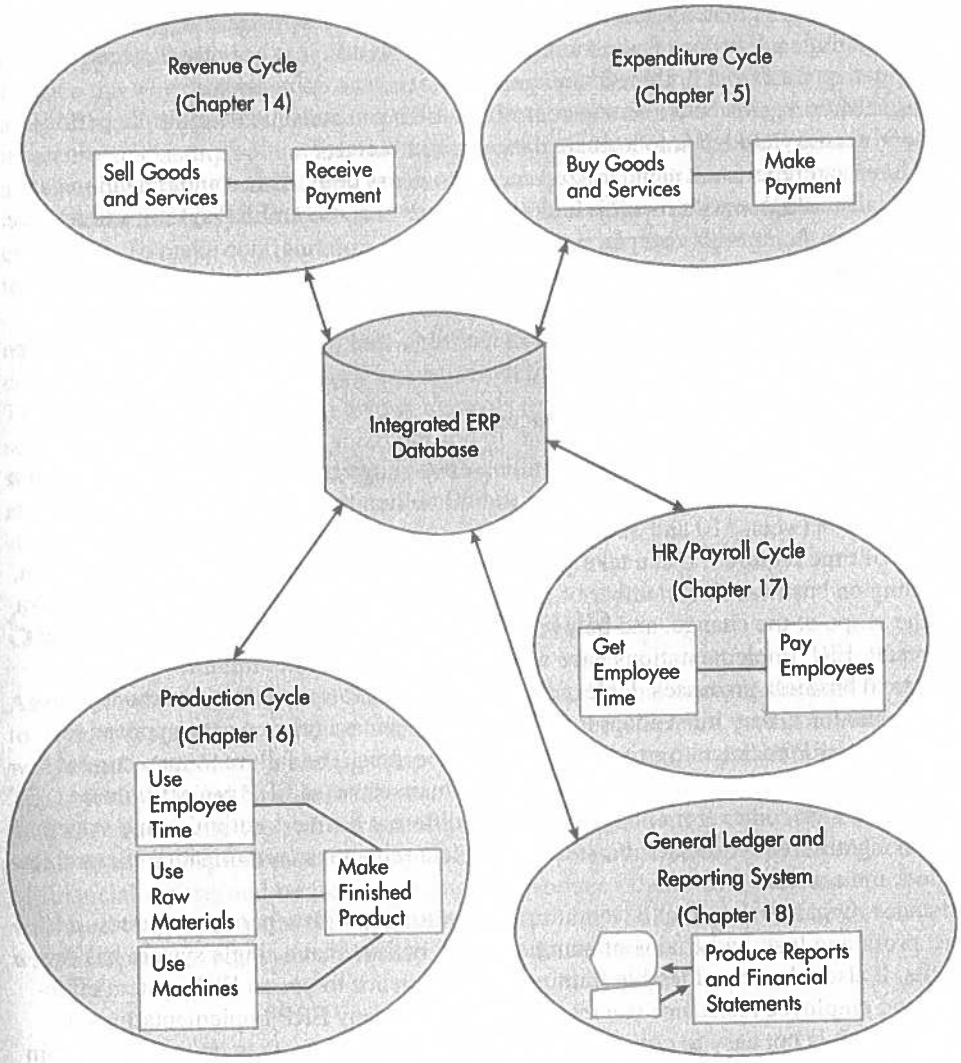


FIGURE 2-6
Integrated ERP System

- Human resources and payroll—human resources, payroll, employee benefits, training, time and attendance, benefits, and government reporting.
- Order to cash (revenue cycle)—sales order entry, shipping, inventory, cash receipts, commission calculation.
- Purchase to pay (disbursement cycle)—purchasing, receipt and inspection of inventory, inventory and warehouse management, and cash disbursements.
- Manufacturing (production cycle)—engineering, production scheduling, bill of materials, work-in-process, workflow management, quality control, cost management, and manufacturing processes and projects.
- Project management—costing, billing, time and expense, performance units, activity management.
- Customer relationship management—sales and marketing, commissions, service, customer contact, and call center support.
- System tools—tools for establishing master file data, specifying flow of information, access controls, and so on.

An ERP system, with its centralized database, provides significant advantages:

- An ERP provides an integrated, enterprise-wide, single view of the organization's data and financial situation. Storing all corporate information in a single database breaks down barriers between departments and streamlines the flow of information.
- Data input is captured or keyed once, rather than multiple times, as it is entered into different systems. Downloading data from one system to another is no longer needed.

- Management gains greater visibility into every area of the enterprise and greater monitoring capabilities. Employees are more productive and efficient because they can quickly gather data from both inside and outside their own department.
- The organization gains better access control. An ERP can consolidate multiple permissions and security models into a single data access structure.
- Procedures and reports are standardized across business units. This standardization can be especially valuable with mergers and acquisitions because an ERP system can replace the different systems with a single, unified system.
- Customer service improves because employees can quickly access orders, available inventory, shipping information, and past customer transaction details.
- Manufacturing plants receive new orders in real time, and the automation of manufacturing processes leads to increased productivity.

ERP systems also have significant disadvantages:

- Cost. ERP hardware, software, and consulting costs range from $50 to $500 million for a Fortune 500 company and upgrades can cost $50 million to $100 million. Midsized companies spend between $10 and $20 million.
- Amount of time required. It can take years to select and fully implement an ERP system, depending on business size, number of modules to be implemented, degree of customization, the scope of the change, and how well the customer takes ownership of the project. As a result, ERP implementations have a very high risk of project failure.
- Changes to business processes. Unless a company wants to spend time and money customizing modules, they must adapt to standardized business processes as opposed to adapting the ERP package to existing company processes. The failure to map current business processes to existing ERP software is a main cause of ERP project failures.
- Complexity. This comes from integrating many different business activities and systems, each having different processes, business rules, data semantics, authorization hierarchies, and decision centers.
- Resistance. Organizations that have multiple departments with separate resources, missions, profit and loss, and chains of command may believe that a single system has few benefits. It also takes considerable training and experience to use an ERP system effectively, and employee resistance is a major reason why many ERP implementations do not succeed. It is not easy to convince employees to change how they do their jobs, train them in new procedures, master the new system, and persuade them to share sensitive information. Resistance, and the blurring of company boundaries, can cause problems with employee morale, accountability, and lines of responsibility.

Reaping the potential benefits of ERP systems and mitigating their disadvantages requires conscious effort and involvement by top management. Top management's commitment to and support for the necessary changes greatly increase the chances of success.

Because ERP systems are complex and expensive, choosing one is not an easy task. In doing so, you must take great care to ensure that the ERP system has a module for every critical company process and that you are not paying for software modules that you do not need. One way to choose a suitable system is to select a package designed for your industry. Although cost is a huge concern, buying too cheaply can cost more in the long run if the system does not meet your needs because modification costs can be quite high. You can minimize the risk of buying the wrong package by researching the best ERP vendors. There are many ERP vendors, the two largest being SAP and Oracle. Other leading vendors are The Sage Group, Microsoft, and Infor.

Because it is too difficult for most companies to implement ERP software by themselves, they often hire an ERP vendor or a consulting company to do it for them. These firms usually provide three types of services: consulting, customization, and support. For most midsized companies, implementation costs range from the list price of the ERP user licenses to twice that amount. Large companies with multiple sites often spend three to five times the cost of the user license.

Because many processes automatically trigger additional actions in other modules, proper configuration is essential. This requires a sound understanding of all major business processes

and their interactions so they can be defined. Examples include setting up cost/profit centers, credit approval policies, and purchase approval rules. In the configuration process, companies balance the way they want the system to operate with the way it lets them operate. If the way an ERP module operates is unacceptable, the company can modify the module. Alternatively, it can use an existing system and build interfaces between it and the ERP system. Both options are time consuming, costly, and result in fewer system integration benefits. In addition, the more customized a system becomes, the more difficult it is to communicate with suppliers and customers. To make configuration easier, ERP vendors are developing built-in "configuration" tools to address most customers' needs for system changes.

The importance of sound internal controls in an ERP cannot be overstated. The integrated nature of ERP systems means that unless every data item is validated and checked for accuracy at the time of initial entry, errors will automatically propagate throughout the system. Thus, data entry controls and access controls are essential. Most managers and employees see and have access to only a small portion of the system. This segregation of duties provides sound internal control. It is important to separate responsibility for custody of assets, authorization of activities that affect those assets, and recording information about activities and the status of organizational assets.

Summary and Case Conclusion

Ashton is aware that Scott and Susan plan to open additional stores in the near future and want to develop a website to conduct business over the Internet. Based on this information, Ashton will select an accounting package that will satisfy S&S's current and anticipated future needs. The software should be able to take care of all data processing and data storage tasks. Ashton will also make sure the software can interface with the source data automation devices he wants to use to capture most data input. The software must be capable of producing a full set of financial reports and be flexible enough to produce other useful information the company will need to be successful. Finally, Ashton realized his next step would be to select the software and produce some documentation of how the system worked.

KEY TERMS

data processing cycle 32
source documents 32
turnaround documents 32
source data automation 33
general ledger 34
subsidiary ledger 34
control account 34
coding 34
sequence codes 34
block code 34
group codes 34
mnemonic codes 34
chart of accounts 35
general journal 36
specialized journal 36
audit trail 37
entity 38
attributes 38
field 38
record 38
data value 38
file 38
master file 38
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database 38
batch processing 39
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documents 39
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AIS in Action

CHAPTER QUIZ

1. Which of the following is NOT a step in the data processing cycle?
   a. data collection
   b. data input
   c. data storage
   d. data processing

2. All of the information (name, GPA, major, etc.) about a particular student is stored in the same
   a. file
   b. record
   c. attribute
   d. field

3. Which of the following would contain the total value of all inventory owned by an organization?
   a. source document
   b. general ledger
   c. cash budget

4. Which of the following is most likely to be a general ledger control account?
   a. accounts receivable
   b. petty cash
   c. prepaid rent
   d. retained earnings

5. Which of the following documents is most likely to be used in the expenditure cycle?
   a. sales orders
   b. credit memo
   c. receiving report
   d. job time ticket

6. Which of the following is LEAST likely to be a specialized journal?
   a. sales journal
   b. cash receipts journal
   c. prepaid insurance journal
   d. cash disbursements journal

7. How does the chart of accounts list general ledger accounts?
   a. alphabetical order
   b. chronological order
   c. size order
   d. the order in which they appear in financial statements

8. Which of the following is NOT an advantage of an ERP system?
   a. better access control
   b. standardization of procedures and reports
   c. improved monitoring capabilities
   d. simplicity and reduced costs

9. Records of company data sent to an external party and then returned to the system as input are called
   a. turnaround documents
   b. source data automation documents
   c. source documents
   d. external input documents

10. Recording and processing information about a transaction at the time it takes place is referred to as which of the following?
    a. batch processing
    b. real-time processing
    c. captured transaction processing
    d. chart of accounts processing

DISCUSSION QUESTIONS

2.1 Table 2-1 lists some of the documents used in the revenue, expenditure, and human resources cycle. What kinds of input or output documents or forms would you find in the production (also referred to as the conversion) cycle?

2.2 With respect to the data processing cycle, explain the phrase "garbage in, garbage out." How can you prevent this from happening?

2.3 What kinds of documents are most likely to be turnaround documents? Do an Internet search to find the answer and example turnaround documents.

2.4 The data processing cycle in Figure 2-1 is an example of a basic process found throughout nature. Relate the basic input/process/store/output model to the functions of the human body.

2.5 Some individuals argue that accountants should focus on producing financial statements and leave the design and production of managerial reports to information systems specialists. What are the advantages and disadvantages of following this advice? To what extent should accountants be involved in producing reports that include more than just financial measures of performance? Why?

PROBLEMS

2.1 The chart of accounts must be tailored to an organization's specific needs. Discuss how the chart of accounts for the following organizations would differ from the one presented for S&S in Table 2-2.

a. university
b. bank
c. government unit (city or state)
d. manufacturing company
e. expansion of S&S to a chain of two stores

2.2 This chapter discusses the current and future uses of blockchain to process transactions and store data. Research the use of blockchain and find a non-cryptocurrency company that uses it. Also, research how people predict blockchain will be used to process transactions and store company data. Write a 3–4 page report about what you found about the current and future uses of blockchain.

2.3 An audit trail enables a person to trace a source document to its ultimate effect on the financial statements or work back from financial statement amounts to source documents. Describe in detail the audit trail for the following:

a. Purchases of inventory
b. Sales of inventory
c. Employee payroll

2.4 This chapter discusses the use of smart contracts. Research their use and write a 3–4 page report that describes one or more companies that use them. Include how the smart contract works as well as its advantages and disadvantages. Also, explain how people are predicting that smart contracts will evolve and how they will be used in the future.

2.5 Match the following terms with their definitions.

Term	Definition
___ 1. attribute	a. Contains summary-level data for every asset, liability, equity, revenue, and expense account
___ 2. audit trail	b. Items numbered consecutively to account for all items; missing items cause a gap in the numerical sequence
___ 3. batch processing	c. Path of a transaction through a data processing system from point of origin to final output, or backward from final output to point of origin
___ 4. block code	d. List of general ledger account numbers; allows transaction data to be coded, classified, and entered into proper accounts; facilitates preparation of financial statements and reports
___ 5. chart of accounts	e. Contents of a specific field, such as "George" in a name field
___ 6. coding	f. Portion of a data record that contains the data value for a particular attribute, like a cell in a spreadsheet
___ 7. control account	g. Company data sent to an external party and then returned to the system as input

____ 8. data processing cycle	h. Used to record infrequent or nonroutine transactions
____ 9. data value	i. Characteristics of interest that need to be stored
____ 10. database	j. Steps a company must follow to efficiently and effectively process data about its transactions
____ 11. entity	k. Something about which information is stored
____ 12. field	l. Stores cumulative information about an organization; like a ledger in a manual AIS
____ 13. general journal	m. Contains detailed data for any general ledger account with many individual subaccounts
____ 14. general ledger	n. Contains records of individual business transactions that occur during a specific time period
____ 15. group code	o. Updating each transaction as it occurs
____ 16. master file	p. Devices that capture transaction data in machine-readable form at the time and place of their origin
____ 17. mnemonic code	q. Used to record large numbers of repetitive transactions
____ 18. real-time processing	r. Set of interrelated, centrally coordinated files
____ 19. record	s. Two or more subgroups of digits used to code items
____ 20. sequence code	t. Updating done periodically, such as daily
____ 21. source data automation	u. Systematic assignment of numbers or letters to items to classify and organize them
____ 22. source documents	v. Letters and numbers, derived from the item description, interspersed to identify items; usually easy to memorize
____ 23. specialized journal	w. Initial record of a transaction that takes place; usually recorded on preprinted forms or formatted screens
____ 24. subsidiary ledger	x. Fields containing data about entity attributes, like a row in a spreadsheet
____ 25. transaction file	y. Sets of numbers reserved for specific categories of data
____ 26. turnaround documents	z. The general ledger account corresponding to a subsidiary ledger, where the sum of all subsidiary ledger entries should equal the amount in the general ledger account

2.6 For each of the following scenarios, identify which data processing method (batch or real-time) would be the most appropriate.

a. Query the database to accumulate the day's production costs for a single automobile part.
b. Identify and order a replacement drill bit broken during production.
c. Make an airline reservation.
d. Prepare a local utility's customer bills.

e. Prepare a bank deposit for customer checks received in the mail.
f. Process an order through an e-commerce website.
g. Process biweekly payroll checks.
h. Register for a university course.
i. Select and purchase tickets for a movie.
j. Take a customer order.
k. Make monthly customer payments.
l. Update inventory quantities for fast-moving inventory.

2.7 On their websites, you will find several online demonstrations for the SAP and Oracle ERP systems. Visit these websites and explore their content by doing the following:
a. Search the SAP site for corporate videos, and watch two of them. Explore the industries, services, solutions, and platforms that SAP offers. Read several of the articles, such as the ones about customer successes.
b. Explore the Oracle website just as you explored the SAP site.

REQUIRED

After viewing the websites, and based on your reading of the chapter, write a two-page paper that describes how an ERP can connect and integrate the revenue, expenditure, human resources/payroll, and financing cycles of a business.

2.8 Which of the following actions update a master file and which would be stored as a record in a transaction file?
a. Update customer address change
b. Update unit pricing information
c. Record daily sales
d. Record payroll checks
e. Change employee pay rates
f. Record production variances
g. Record sales commissions
h. Change employee office location
i. Update accounts payable balance
j. Change customer credit limit
k. Change vendor payment discount terms
l. Record purchases

2.9 You were hired to assist Ashton Fleming in designing an accounting system for S&S. Ashton has developed a list of the journals, ledgers, reports, and documents that he thinks S&S needs (see Table 2-4). He asks you to complete the following tasks:
a. Specify what data you think should be collected on each of the following four documents: sales invoice, purchase order, receiving report, employee time card.
b. Design a report to manage inventory.
c. Design a report to assist in managing credit sales and cash collections.
d. Visit a local office supply store and identify what types of journals, ledgers, and blank forms for various documents (sales invoices, purchase orders, etc.) are available. Describe how easily they could be adapted to meet S&S's needs.

2.10 Answer the following 10 multiple choice questions.

1. Which of the following statements is (are) true?
   a. Well-designed documents and screens improve accuracy and completeness by providing instructions or prompts about what data to collect.
   b. Online batch processing is where transaction data are entered, edited, and processed as they occur.
   c. ERP implementation costs for large companies with multiple sites are usually about half the cost of the ERP user license.
   d. In an ERP system, data entry controls such as validating data items and checking them for accuracy at the time of initial entry are not needed.
   e. Data in ledgers is organized logically using coding techniques that assign numbers or letters to items to classify and organize them.

TABLE 2-4 Documents, Journals, and Ledgers for S&S

Title	Purpose
Documents	
Sales Invoice	Record cash and credit sales of merchandise
Service Invoice	Record sales of repair services
Delivery Ticket	Record delivery of merchandise to customers
Monthly Statement	Inform customers of outstanding account balances
Credit Memo	Support adjustments to customer accounts for sales returns and allowances and sales discounts; also support write-off of uncollectible accounts
Purchase Order	Order merchandise from vendors
Receiving Report	Record receipt of merchandise from vendors, indicating both quantity and condition of items received
Time Card	Record time worked by employees
Specialized Journals	
Sales	Record all credit sales
Cash Receipts	Record cash sales, payments from customers, and other cash receipts
Purchases	Record all purchases from vendors
Cash Disbursements	Record all cash disbursements
General Journal	Record infrequent, nonroutine transactions; also record adjusting and closing entries
Subsidiary Ledgers	
Accounts Receivable	Maintain details about amounts due from customers
Accounts Payable	Maintain details about amounts due to vendors
Inventory	Maintain details about each inventory item
Fixed Assets	Maintain details about each piece of equipment and other fixed assets
General Ledger	Maintain details about all major asset, liability, equity, revenue, and expense accounts

2. Which of the following statements is (are) true?
   a. With sequence codes, items are numbered consecutively to account for all items, and missing items cause a gap in the numerical sequence.
   b. The data capture or input process is usually triggered by a top management decision.
   c. Updating done periodically, such as daily or weekly, is referred to as batch processing.
   d. Cumulative accounting information is stored in general and subsidiary journals.
   e. Computers store data in a field; the fields containing data about entity attributes constitute a record.

3. Which of the following statements is (are) true?
   a. A chart of accounts facilitates preparing financial statements because data stored in individual accounts can easily be summed for presentation.
   b. Repetitive and frequently used database queries are usually developed by users; one-time queries are usually developed by information systems specialists.
   c. A database query can provide the information needed to deal with problems and questions that need rapid action or answers.
   d. A journal entry shows the accounts and amounts to be debited and credited.
   e. Transaction files are permanent and must be maintained for several years for backup purposes.

4. Which of the following statements is (are) true?
   a. A group code is derived from the description of the item and is usually easy to memorize.
   b. Using source data automation or well-designed turnaround documents and data entry screens helps ensure captured data are accurate and complete.

c. It is usually best to let a user determine what data to input rather than have data input screens list the data the user needs to enter.
d. If the sum of all subsidiary ledger account balances does not equal its general ledger control account balance, a recording error has occurred.
e. Real-time processing updates transactions as they occur, helping ensure stored information is current and useful in making decisions.

5. Which of the following statements is (are) true?
a. With mnemonic codes, blocks of numbers are reserved for specific categories of data.
b. Input controls are improved by using pre-numbered source documents or by the system automatically assigning a sequential number to each transaction.
c. In an integrated ERP system, undetected data entry errors can automatically propagate throughout the system.
d. As ERP modules do not automatically trigger additional actions in other modules, it is less important to understand business processes and their interactions.
e. A purchase to pay ERP module facilitates production scheduling, work-in-process, quality control, cost management, and manufacturing processes.

6. Which of the following statements is (are) true?
a. Data is one of a company's most important resources but to function properly most organizations do not have to have the data readily and easily accessible.
b. Turnaround documents are company output sent to an external party and returned as an input document.
c. Each type of entity possesses the same set of attributes or characteristics of interest that are stored, but the specific data values for those attributes will differ depending on the entity.
d. Reaping the potential benefits of ERP systems and mitigating their disadvantages requires conscious effort and involvement by top management.
e. Real-time data processing is almost always cheaper and more efficient than batch processing.

7. Which of the following statements is (are) true?
a. Source data automation devices capture transaction data in paper form at the time and place of their origin.
b. Master files are permanent and exist across fiscal periods; individual master file records may change frequently.
c. General ledgers are often used for accounts receivable, inventory, fixed assets, and accounts payable.
d. If an ERP system does not meet your needs, it can almost always be inexpensively modified to meet your unique needs.
e. When choosing an ERP system, make sure it has a module for every critical company process and you are not paying for modules you do not need.

8. Which of the following statements is (are) true?
a. Documents are records of transaction or other company data that can be printed out or stored as electronic images in a computer.
b. Transaction data are almost always recorded in a ledger before they are entered into a journal.
c. Since batch processing data are current and accurate only immediately after processing, it is used for applications that do not need frequent updating.
d. ERP systems are not effective in integrating non-financial company operations with a traditional accounting system.
e. Well-designed screens improve accuracy and completeness by using checkoff boxes or pull-down menus to present the available options.

9. Which of the following statements is (are) true?
a. A transaction file contains records of individual business transactions and is similar to a general ledger in a manual AIS.

b. To ensure credit sales policies are followed, the system can be programmed to check a customer's credit limit and payment history.
c. Use of pre-numbered documents makes it harder to verify that all transactions have been recorded and that none has been misplaced.
d. An ERP system uses a centralized database to share information across business processes and coordinate activities.
e. It is difficult for an ERP system to provide management with the up-to-date information needed to plan, control, and evaluate an organization's business.

10. Which of the following statements is (are) true?
a. The need for reports should be periodically assessed because they are often prepared long after they are needed—wasting time, money, and resources.
b. An audit trail is a transaction path through a data processing system from point of origin to final output, but not backward from final output to point of origin.
c. Accountants and systems developers do not need to understand how data are captured, organized, stored, processed, or accessed.
d. An AIS has traditionally been referred to as a transaction processing system because its only concern was financial data and accounting transactions.
e. A master file, like a ledger in a manual AIS, stores cumulative information about an organization.

CASE 2-1 Bar Harbor Blueberry Farm

The Bar Harbor Blueberry Farm is a family-owned, 200-acre farm that grows and sells blueberries to grocery stores, blueberry wholesalers, and small roadside stands. Bar Harbor has 25 full-time employees and hires 150 to 200 seasonal workers for the harvest.

For the past six summers, you have picked berries for Bar Harbor. When you graduated, you were hired as the full-time accountant/office manager. Until now, Bar Harbor kept most of its accounting records in a big file box. Jack Phillips, the owner, would like a more organized approach to the farm's accounting records. He has asked you to establish a proper set of books. You decide to start by establishing appropriate journals and ledgers for these transactions.

Presented below are a set of vendor invoices and a few partially completed journals and ledgers. Your job is to record these transactions and update the appropriate ledgers. Be sure to leave a proper audit trail. You may also use Excel, Great Plains, Peachtree, QuickBooks, or another accounting software package of your choosing to complete this problem.

VENDOR INVOICES

DATE	SUPPLIER INVOICE	SUPPLIER NAME	SUPPLIER ADDRESS	AMOUNT
March 7	AJ34	Bud's Soil Prep	PO Box 34	$2,067.85
March 11	14568	Osto Farmers Supply	45 Main	$ 67.50
March 14	893V	Whalers Fertilizer	Route 34	$5,000.00
March 21	14699	Osto Farmers Supply	45 Main	$3,450.37
March 21	10102	IFM Wholesale	587 Longview	$4,005.00
March 24	10145	IFM Wholesale	587 Longview	$ 267.88

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DATE	SUPPLIER	SUPPLIER INVOICE	ACCOUNT NUMBER	POST REF	AMOUNT
March 7	Bud's Soil Prep	AJ34			$2,067.85

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DATE	SUPPLIER	SUPPLIER INVOICE	ACCOUNT NUMBER	POST REF	AMOUNT

GENERAL LEDGER

ACCOUNTS PAYABLE **ACCOUNT NUMBER: 300**

DATE	DESCRIPTION	POST REF	DEBIT	CREDIT	BALANCE
March 1	Balance Forward				$18,735.55

GENERAL LEDGER

PURCHASES **ACCOUNT NUMBER: 605**

DATE	DESCRIPTION	POST REF	DEBIT	CREDIT	BALANCE
March 1	Balance Forward				$54,688.49

ACCOUNTS PAYABLE SUBSIDIARY LEDGER

ACCOUNT NO: 23 **BUD'S SOIL PREP** **PO BOX 34** **TERMS: 2/10, NET 30**

DATE	DESCRIPTION	DEBIT	CREDIT	BALANCE

ACCOUNT NO: 24 **OSTO FARMERS SUPPLY** **45 MAIN** **TERMS: 2/10, NET 30**

DATE	DESCRIPTION	DEBIT	CREDIT	BALANCE

ACCOUNT NO: 36 **WHALERS FERTILIZER** **ROUTE 34** **TERMS: 2/10, NET 30**

DATE	DESCRIPTION	DEBIT	CREDIT	BALANCE

ACCOUNT NO: 38 **IFM WHOLESALE** **587 LONGVIEW** **TERMS: 2/10, NET 30**

DATE	DESCRIPTION	DEBIT	CREDIT	BALANCE

CASE 2-2 SDC

Ollie Mace is the controller of SDC, an automotive parts manufacturing firm. Its four major operating divisions are heat treating, extruding, small parts stamping, and machining. Last year's sales from each division ranged from $150,000 to $3 million. Each division is physically and managerially independent, except for the constant surveillance of Sam Dilley, the firm's founder.

The AIS for each division evolved according to the needs and abilities of its accounting staff. Mace is the first controller to have responsibility for overall financial management. Dilley wants Mace to improve the AIS before he retires in a few years so that it will be easier to monitor division performance. Mace decides to redesign the financial reporting system to include the following features:

- It should give managers uniform, timely, and accurate reports of business activity. Monthly reports should be uniform across divisions and be completed by the fifth day of the following month to provide enough time to take corrective actions to affect the next month's performance. Company-wide financial reports should be available at the same time.
- Reports should provide a basis for measuring the return on investment for each division. Thus, in addition to revenue and expense accounts, reports should show assets assigned to each division.
- The system should generate meaningful budget data for planning and decision-making purposes. Budgets should reflect managerial responsibility and show costs for major product groups.

Mace believes that a new chart of accounts is required to accomplish these goals. He wants to divide financial statement accounts into major categories, such as assets, liabilities, and equity. He does not foresee a need for more than 10 control accounts within each of these categories. From his observations to date, 100 subsidiary accounts are more than adequate for each control account.

No division has more than five major product groups. Mace foresees a maximum of six cost centers within any product group, including both the operating and nonoperating groups. He views general divisional costs as a non-revenue-producing product group. Mace estimates that 44 expense accounts plus 12 specific variance accounts would be adequate.

REQUIRED

Design a chart of accounts for SDC. Explain how you structured the chart of accounts to meet the company's needs and operating characteristics. Keep total account code length to a minimum, while still satisfying all of Mace's desires. *(CMA Examination, adapted)*

AIS in Action Solutions

QUIZ KEY

1. Which of the following is NOT a step in the data processing cycle?

► a. data collection [Correct. Data collection is a part of data input and is therefore not a step in the data processing cycle.]

b. data input [Incorrect. Data input is the first step in the data processing cycle. This is the step where data is captured, collected, and entered into the system.]

c. data storage [Incorrect. Data storage is the data processing cycle step where data is stored for future use by the company.]

d. data processing [Incorrect. Data processing is the data processing cycle step where stored data is updated with new input data.]

2. All of the information (name, GPA, major, etc.) about a particular student is stored in the same _____.
   a. file [Incorrect. A file is designed to include information about many students.]
   ▶ **b.** record [Correct. A record should include all information maintained by the system about a particular entity, such as a student.]
   c. attribute [Incorrect. An attribute is a descriptor or a characteristic of an entity—in this example, the student's major is an attribute.]
   d. field [Incorrect. A field represents a data storage space—in this example, an accounting student would have "Accounting" stored in the major field.]

3. Which of the following would contain the total value of all inventory owned by an organization?
   a. source document [Incorrect. A source document contains data about a particular event or transaction.]
   ▶ **b.** general ledger [Correct. The general ledger maintains summary information on inventory and every other general ledger account.]
   c. cash budget [Incorrect. A cash budget provides information only on projected cash inflows and outflows.]

4. Which of the following is most likely to be a general ledger control account?
   ▶ **a.** accounts receivable [Correct. Accounts receivable is typically made up of many individual customer accounts maintained in a subsidiary ledger. The total of all individual customer accounts in the subsidiary ledger is maintained in the accounts receivable control account in the general ledger.]
   b. petty cash [Incorrect. Petty cash is made up of only one account.]
   c. prepaid rent [Incorrect. A subsidiary ledger containing multiple prepaid rent accounts is usually not necessary.]
   d. retained earnings [Incorrect. Retained earnings is typically comprised of only one account.]

5. Which of the following documents is most likely to be used in the expenditure cycle?
   a. sales order [Incorrect. The sales order is a revenue cycle document that captures the information about a customer's order.]
   b. credit memo [Incorrect. A credit memo is a revenue cycle document used to give a credit to a customer for damaged or returned goods.]
   ▶ **c.** receiving report [Correct. A receiving report is an expenditure cycle document used to record the receipt of goods from suppliers. Companies pay their suppliers based on the goods received and recorded on the receiving report.]
   d. job time ticket [Incorrect. A job time ticket is a production cycle document used to record time spent on specific jobs.]

6. Which of the following is LEAST likely to be a specialized journal?
   a. sales journal [Incorrect. A specialized journal is used to record large numbers of repetitive transactions. Most companies have a large number of sales.]
   b. cash receipts journal [Incorrect. A specialized journal is used to record large numbers of repetitive transactions. Most companies have a large number of cash receipts.]
   ▶ **c.** prepaid insurance journal [Correct. A specialized journal is used to record large numbers of repetitive transactions, and most companies have very few prepaid insurance transactions.]
   d. cash disbursements journal [Incorrect. A specialized journal is used to record large numbers of repetitive transactions. Most companies have a large number of cash disbursements.]

7. How does the chart of accounts list general ledger accounts?
   a. alphabetical order [Incorrect. General ledger accounts are listed in the order in which they appear in the financial statements, not in alphabetical order.]
   b. chronological order [Incorrect. General ledger accounts are listed in the order in which they appear in the financial statements, not according to the date they were created.]
   c. size order [Incorrect. General ledger accounts are listed in the order in which they appear in the financial statements, not according to their size.]
   ► **d.** the order in which they appear in financial statements [Correct.]

8. Which of the following is NOT an advantage of an ERP system?
   a. better access control [Incorrect. Better access control is an advantage because an ERP can consolidate multiple permissions and security models into a single data access structure.]
   b. standardization of procedures and reports [Incorrect. Standardization of procedures and reports is an advantage because procedures and reports can be standardized across business units, and in mergers and acquisitions they can replace the different systems with a single, unified system.]
   c. improved monitoring capabilities [Incorrect. Improved monitoring capabilities are an advantage because management gains greater visibility into every area of the enterprise that allows them to better monitor the organization.]
   ► **d.** simplicity and reduced costs [Correct. ERP systems are quite complex and costly; they do not offer the advantages of simplicity and reduced costs.]