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Announcing the 8th edition:

Accounting Information Systems:
A Practitioner Emphasis

Cynthia D. Heagy
University of Houston—Clear Lake

Constance M. Lehmann
University of Houston—Clear Lake

Hui Du
University of Houston—Clear Lake

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- Special emphasis is given to the reporting requirements of accounting systems, as well as control activities typically found in the generic business processes.

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Chapter 2: Accounting Systems Documentation
Chapter 3: Essential Elements and Basic Activities of Accounting Systems
Chapter 4: Data Flows, Activities, and Structure of Accounting Systems
Chapter 5 Reporting Process, Coding Methods, and Audit Trails
Chapter 6 Internal Control and Risk Assessment
Chapter 7 Control Activities and Monitoring
Chapter 8 The Financial Process
Chapter 9 The Revenue Process
Chapter 10 The Purchasing Process
Chapter 11 The Inventory Process
Chapter 12 Database Structure of Accounting Systems
Chapter 13 Developing a Relational Database for an Accounting Information System
Chapter 14 Electronic Business
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More Differentiators:

- Includes numerous introductory scenarios and vignettes that can be assigned as cases.
- Because students learn best by doing, the authors have included several hands-on learning activities at the end of many chapters. These activities require students to apply the theoretical knowledge from the chapter to solve practical problems.
- Includes a chapter (Chapter 3) dedicated to reviewing the essential elements and basic activities of paper-based accounting systems, introduces the essential elements and basic activities of computerized accounting systems, and compares the two.
- Includes comprehensive coverage of internal controls that are built around the concepts reflected by COSO’s Enterprise Risk Management Framework, the Institute of Internal Auditors Research Foundation’s Systems Auditability and Control Report, the Information Systems Audit and Control Foundation’s Control Objectives for Information and Related Technology (COBIT), and the American Institute of Certified Public Accountants’ Statement of Auditing Standard No. 78–Consideration of Internal Control in a Financial Statement Audit: An Amendment to SAS No. 55.
- Chapter 14 explains how to conduct electronic business with electronic data interchange (EDI), an Extranet, and the Internet. The technical and legal aspects and security issues involved with electronic business are discussed as well as Web-assurance services.
- Chapter 15 serves as the capstone chapter; it applies the knowledge and skills gained from the first fourteen chapters in the selection and implementation of commercial off-the-shelf accounting software packages. The discussion of the software industry has been updated to reflect the recent changes.
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About the Authors:

Cynthia D. Heagy is professor of accounting at the University of Houston-Clear Lake. She earned her DBA degree from the University of Memphis and is a CPA, CMA, and CNA. Dr. Heagy entered higher education after working as a trust officer at a large national bank and later as a systems analyst. Dr. Heagy has published in several professional and academic journals, including *Journal of Information Systems*, *Advances in Accounting Education*, *Journal of the Academy of Business Education*, *Compendium of Classroom Cases and Tools for AIS Applications*, *The Journal of Accountancy*, *Issues in Accounting Education*, *International Journal of Accounting*, *Journal of Cost Management*, *Journal of Accounting Education*, *Accounting Educators’ Journal*, *EDP Auditing*, *Data Security Management*, *The Journal of Accounting Case Research*, *The CPA Journal*, *Journal of Accounting and Computers*, and *The Accounting Systems Journal*. She is coauthor of *Principles of Bank Accounting and Reporting*, published by the American Bankers Association.

Constance M. Lehmann is associate professor of accounting at the University of Houston-Clear Lake. She earned her PhD from Texas A&M University and her MBA from University of Texas at San Antonio. Dr. Lehman is also a CISA. She entered higher education after working as an internal auditor and branch manager for financial institutions including the Federal Reserve Bank (San Antonio, Texas branch) and various savings and loans in the San Antonio area. Dr. Lehmann has published in several professional and academic journals, including *Behavioral Research in Accounting*, *Journal of Information Systems*, *Advances in Accounting Education*, *Journal of Education for Business*, *Journal of Accounting Education*, *Internal Auditing Journal*, and *Journal of Financial Education*.

Hui Dui is an associate professor of accounting, teaching a range of accounting courses. Her research interests include the impact of new technologies on accounting and accounting professionals, financial accounting, auditing and corporate governance. She has published in the *Journal of Accounting and Public Policy*, *International Journal of Auditing*, *Journal of Accountancy*, and *The CPA Journal*. She participates in activities with professional organizations such as the Houston Chapters of the Information Systems and Audit and Control Association (ISACA) and the Texas Society of CPAs.
Learning Objectives

After studying this chapter you should be able to:

- Explain the nature of accounting data, who needs it, and why.

- Describe the nature, scope, and importance of accounting information systems.

- Explain why accounting information systems should be studied regardless of the accounting specialty you may choose.
“So you see, Jennifer, I feel really good about the growth of the business over the last 4 years. Since I bought the three restaurants, sales and profits have completely turned around. Two of the managers have worked very hard, putting in 60- to 70-hour weeks, and the manager who replaced Barker has also put his back into the job. They have all responded to the new leadership and like our new image. From ‘breakfast any time’ joints frequented mostly by truck drivers, we have upgraded the facilities to attract families eating out because both parents work. The ‘come for seconds’ buffet lines we set up in the evenings have proved to be a great success. We were able to cut back on staff requirements as well as let people see the food they are going to eat. Yes, a few folks abuse the privilege, but waste has been quite a bit lower than we expected.

“When I bought out the Sabatino sisters, they were $55,000 in debt and losing $3,500 a month. The first year, I paid off most of the debt, spent $180,000 to spruce up the restaurants, and almost broke even. We had a setback when we found that Barker was letting his friends eat for free—and there were a few other things he did that I never told you about, but since he left, we haven’t had many problems. And I really appreciate what you have done for us. The Sabatinos kept their own books and, as you know, made a real mess of them. I still don’t know how you managed to prepare that first P and L—uh, income statement. But I knew that we had to bring in an accountant, and I’m pleased with the work you’ve done for us.

“But all this leads up to what I wanted to ask you. So far you’ve done our taxes and prepared those financials for the bank. But we badly need a new accounting system here in the restaurants. I write the checks and take the cash deposits to the bank, but I really don’t know what’s going on until the end of the year. We carry a substantial inventory of canned and packaged foods and soft drinks. We always have a bunch of bills outstanding. And there is that depreciation on the new kitchen equipment, serving counters, and furniture—not to mention the two vans we bought for deliveries. I know I could ask you for quarterly statements, but that still wouldn’t solve my problem. I need to be able to see how we are doing on a week-by-week basis.

“I’ve thought about putting a little computer in the office. My staff could punch in the food and drinks when they are received and when they are used. At the end of the day, they could key in the day’s receipts from the cash-register tapes. Perhaps we could use it to run the payroll. The computer might even help you because I could give you more than just our check stubs and an old shoe box full of receipts. A couple of weeks ago, I saw some good-looking computers in an electronics store and they weren’t expensive. But someone said that I would need software as well. Could we use Excel, Quickbooks, or Visual Basic for that? So much software is in the electronics store, and I don’t know what we need. Can you take care of this sort of thing?”

“Sure, Marshall, I’m glad you brought this up. The important thing is to get an accounting software package for your kind of business—the restaurant business. You don’t want to see stuff on the screen like ‘Enter your factory overhead rate’ but you must be able to account for tips for the IRS. I think I can hook your cash registers up to the computer. Then, your daily sales data would be entered automatically. This would save us the job of keying in all the data and prevent mistakes too. First, we’ll need to spend 2 to 3 hours discussing exactly what you want the new system to do for you. Then, I’ll research accounting systems software and make some recommendations to you. After we decide on the software, I’ll work on a timetable for implementing the system.”
1.1a What Are Accounting Data?

Learning Objective 1: Explain the nature of accounting data, who needs it, and why.

Review the information below. These items are all examples of accounting information.

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income for the year</td>
<td>$24,965,831</td>
</tr>
<tr>
<td>Gross pay:</td>
<td>$593.80</td>
</tr>
<tr>
<td>Deductions:</td>
<td>$185.29</td>
</tr>
<tr>
<td>Net pay:</td>
<td>$408.51</td>
</tr>
<tr>
<td>It costs $50,000 a year to have our staff standing in line to use the copying machine.</td>
<td></td>
</tr>
<tr>
<td>Direct materials</td>
<td>$10.45</td>
</tr>
<tr>
<td>Direct labor</td>
<td>$2.85</td>
</tr>
<tr>
<td>Manufacturing overhead</td>
<td>$18.20</td>
</tr>
<tr>
<td>Total manufacturing cost per unit</td>
<td>$31.50</td>
</tr>
<tr>
<td>Next year’s sales budget</td>
<td>$105,560,000</td>
</tr>
<tr>
<td>Delivery equipment</td>
<td>$1,268,800</td>
</tr>
<tr>
<td>Less accumulated depreciation</td>
<td>$284,700</td>
</tr>
<tr>
<td></td>
<td>$984,100</td>
</tr>
<tr>
<td>Joe worked 42 hours this week.</td>
<td></td>
</tr>
<tr>
<td>If we close the Bridgeton plant, we will save $5,500,000 in avoidable operating costs but will lose $7,200,000 in company-wide revenue.</td>
<td></td>
</tr>
<tr>
<td>Total current assets:</td>
<td>$3,599,704</td>
</tr>
<tr>
<td>$25,000 was transferred to the special assessment fund.</td>
<td></td>
</tr>
<tr>
<td>We turn our inventory over 3.2 times per year, compared with an industry average of 4 times.</td>
<td></td>
</tr>
<tr>
<td>Pay this amount:</td>
<td>$804,525.10</td>
</tr>
</tbody>
</table>
While most of the information is expressed in traditional monetary terms, some is expressed as ratios, percentages, or units. Traditionally, accountants have limited their concern to monetary amounts. This was understandable for the era of manual accounting systems because the cost of capturing and processing data was far more expensive than is the case today. But a contemporary view of accounting must expand to include any data that are either directly or indirectly reflected in the financial statements whether in this or in future accounting periods. Thus, hours worked, units processed or even planned, employee vacation days earned, and customer telephone numbers are all data that are captured, processed, stored, and reported by the accounting system, and represent information used for decision making by managers.

1.1b Who Needs Accounting Information?

Accounting information meets the legitimate needs of external users, communicates among parties transacting business with one another, and provides a basis for informed management decision making. The external financial statements—presently consisting of the balance sheet, the income statement, the statement of changes in ownership equity, and the cash flow statement—are prepared for investors, creditors, labor unions, suppliers, customers, and other outside parties. Financial statements are routinely read and analyzed by stockbrokers and financial analysts. In the United States, corporations with securities listed on national exchanges are required to file 10K reports annually with the Securities and Exchange Commission (SEC). Also, organizations in certain industries, such as insurance, are required to file routine reports with government regulatory bodies. Tax returns must be filed with federal, state, and, in some cases, local revenue authorities.

Accounting information of a different nature provides a basis for an organization’s transactions with its vendors, customers, and employees. An organization purchases goods and services from vendors (suppliers) and purchases services from employees. The organization may then sell goods and/or...
services to customers. Accounting information communicates the need for these goods and services, requests payment, and facilitates the transfer of cash. Checks serve a dual purpose—providing accounting information and also disbursing cash. In addition to their paychecks, employees routinely receive statements on tax withholdings and may also receive reports on sick leave, insurance, and retirement account information.

The advent of e-commerce has led many companies to reduce the number of suppliers and/or customers with whom they do business. On the other hand, closer relationships have developed between companies and outside parties. Thus, many companies grant their suppliers and customers significant access to their computerized accounting systems. For example, sellers may interrogate their customers’ records, ascertain that certain inventory items are low, and then ship goods, notifying the customer of the expected arrival date. These relationships are clearly defined in written contracts, with customers and suppliers often referred to as trading partners (Vignette 1.1).

Vignette 1.1 Trading Partner Relationships

GenMart, a nationwide retailer of general merchandise, has numerous domestic and international suppliers. Ten years ago GenMart had approximately 4,600 suppliers, with many providing competitive goods. Purchasing and scheduling delivery of merchandise required about 400 employees, and competitive bids were taken for each significant order. As a cost reduction, the number of suppliers was reduced to 1,700 and all were required, with GenMart’s assistance, to implement electronic data interchange (EDI) as a means of automating sales to GenMart. Today, EDI has been implemented between GenMart and 99 percent of its suppliers and represents all except 0.3 percent of purchasing dollar volume.

Unit sales by product and store are collected by GenMart’s corporate headquarters daily and placed in computer files accessible to most suppliers’ computers each morning between 2 and 6 A.M. Thus, these suppliers maintain a record of GenMart inventory and sales by item and by store and are responsible for inventory replenishment at each store. The supplier is held responsible for stock-outs and, in the extreme, business with that supplier may be discontinued. When significant overstocking occurs, a formula agreed upon by GenMart and the supplier may result in penalty charge-backs to the supplier. Long-term negotiated contracts with suppliers have largely displaced competitive bidding. In spite of a fourfold increase in volume, the number of employees in purchasing and merchandise logistics has been cut by 50 percent. Suppliers no longer invoice GenMart. Rather, payments for purchases are based on quantities of merchandise received. Approval of payments to suppliers is entered in GenMart’s computer, which then dials their bank’s computer system, and directs cash transfers to the suppliers. Such electronic funds transfer (EFT) ordinarily occurs within 48 hours after merchandise is received. Because the receipt of merchandise is entered into GenMart’s computer systems on the receiving dock, no paperwork exists for the purchasing function.

Thought Questions
1. What are some of the benefits of reducing the number of suppliers?
2. What are some of the advantages of having electronic data interchanges (EDI) and electronic funds transfer (EFT) systems?

Contemporary accounting information systems include data that could not be economically collected before the current level of computerization. For example, a hospital system may input pollen readings in order to schedule the hours of allergy physicians in the outpatient clinic; such scheduling feeds into the daily/weekly cash budgeting (both revenues and expenses). When there is a significant delay between order receipt and fulfillment, the manager of a manufacturer’s sales force will find a weekly report of sales orders by salesperson to be more useful than sales reports. The sales order report will indicate what each salesperson accomplished last week, while a report of shipped sales may indicate what they did three months ago. Sales reports are more accurate, but sales orders are more relevant. Accounting systems should support statistical accounts so that physical data such as barrels, tons,
or hours worked can be accumulated and reported. To properly serve management, accounting system
designers must remove the blinders that restrict our vision to only dollar-denominated data representing
only consummated transactions. Rather, accounting systems should be designed to collect, process, and
report any physical or dollar-denominated data that are useful for enterprise management.

The largest volume of accounting information is prepared for managers at all levels in an or-
ganization. Some first-level managers require detailed accounting data on day-to-day operations. Middle
managers require somewhat broader data for control and performance evaluation responsibilities, and
upper managers require accounting data with the broadest perspective for strategic management. Ac-
counting data include historical data and estimates, budgets, and projections.

The role of accountants and accounting data in support of continuing operations and perfor-
mance evaluation are widely recognized. However, the notion that accounting information can or
should play a role in strategic management is comparatively new. An increasing number of large or-
ganizations recognize that financial—and particularly cost—information concerning the organization’s product
and its competitors’ products are essential for the development of successful strategies. An organization’s strategies
are attainable only if goods and services can be produced at costs comparable to or less than
those of its competitors. Accountants can provide valuable estimates of the effects of a strategy, such
as diversification, and can then monitor the actual effects over time. For this purpose, accountants
must extend the accumulation and analysis of cost data beyond the limits of the immediate organiza-
tional boundaries. In addition, accounting information is one of the organization’s most important strate-
gic resources, which is discussed later in this chapter.

Managers receive routine and non-routine paper reports of historical and budgeted data. Ac-
countants are often called on to make oral and visual presentations of accounting data at management
meetings. Increasingly, managers also have access to networked computer systems that permit both
downloading of accounting data to desktop and portable computers and further analysis of the data
using spreadsheets and reporting software.

The content and format of external reports are regulated by accounting rule-making bodies and
by government agencies. Purchase orders, invoices, and checks are constrained somewhat by industry
practices. Internal accounting information is determined by management’s needs. But rules and re-
quirements are not enough to explain the flow of information and certainly not enough to make it hap-
pen. From where does the information come? How is it processed? How is it communicated to the vari-
ous types of users? The answer to these questions is the accounting information system.

1.2 Accounting Information Systems

1.2a What Is an Accounting Information System?

Learning Objective 2: Describe the nature, scope, and importance of accounting information
systems.

A system is a framework that exists for the benefit of one or more defined objectives. Systems ordinar-
ily use resources and are subject to constraints. They operate within an environment requiring the
specification of the boundaries between the system and the environment. Most systems have both
inputs and outputs. Except for the most rudimentary instances, systems are composed of subsystems
that perform tasks contributing to the operation and goals of the greater system.

An automobile can be thought of as a system. The objective is to convey people and goods
from one location to another. Automobiles consume gasoline, lubricants, oxygen, and they require
the driver’s commands. Automobiles are constrained both physically and legally. They function on land
(not on water or in the air), must be operated on legal roadways, and are subject to traffic regulations
and customs. An automobile is composed of various subsystems such as the ignition system, the steering system, and the braking system.

An **accounting information system** is a delivery system for accounting information. Its purposes are:

- To meet an organization’s statutory reporting requirements.
- To provide relevant and accurate accounting information to those who need it when they need it.
- To conduct or at least enable most business processes ranging from the recording of sales orders to the reconciliation of bank accounts after liabilities have been paid.
- To protect the organization from possible risks stemming from abuse of accounting data or of the system itself.

The accounting system captures, stores, processes, and communicates information in accordance with applicable professional, industry, and government standards and also meets the organization’s own requirements. A well-designed accounting system enables an organization to manage one of its most valuable resources—information.

Accounting systems deal primarily with **economic events** that affect an organization’s accounting equation, that is, \( \text{ASSETS} = \text{LIABILITIES} + \text{OWNERSHIP EQUITY} \). Economic events fitting this definition are called **accounting transactions**. Some **accounting events** will have matured into accounting transactions while others may not have yet done so. Those that are accounting transactions require a conventional journal entry with at least one account debited and at least one account credited. Other events, such as the ordering of apples mentioned in the table at the beginning of the chapter, are events that have not matured into accounting transactions, but are nevertheless accounting events that must be captured and reported by the accounting system. These events provide useful information to managers tracking the activity of their apple purchase order agents. This information might be used to determine how quickly orders are filled, and how active the agents are.

The apple order, for example, requires an entry into the purchase order system. Thus, in addition to events qualifying as accounting transactions, other quantitatively measured events will likely mature into accounting transactions and therefore qualify as accounting data. This view of accounting systems is often referred to as **events accounting**. Many attributes of accounting events are captured by events accounting systems. The receipt of a sales order may require that the following be recorded: (1) time and place the order is received, (2) company and person placing the order, (3) salesperson responsible for the order, (4) when, where, and how the order is to be shipped, and (5) detailed description of the items being ordered, quantities, and the expected price.

Most accounting transactions result from an organization’s day-to-day operations, such as charging materials, labor, and overhead to production; selling goods or providing services to customers; receiving payments from customers; purchasing materials for inventory; and paying employees and vendors. Transactions can be divided into two main types: external transactions and internal transactions. **External transactions** arise from exchanges with outsiders, such as purchasing or selling goods and services. **Internal transactions** arise largely from the accumulation of cost data and the assignment of costs to products, business units, or activities.

Manual accounting systems included very little data beyond the basic elements. For example, a customer account included only the customer name, account identifier, and perhaps the customer address along with transaction data of the current period. The same data were usually stored in many departments. A customer’s address might be maintained by credit and collections, billing, shipping, and accounts receivable. Errors and inconsistencies were common because an address change would have
to be made in several different records. In contrast, well-designed computerized systems maintain such data in only one location that is available to all users. Thus, all relatively permanent data related to a customer, for example, name, address, telephone number, sales by month, credit limit, contact person, and perhaps even birthdays of key customer personnel, would be stored in one place. Human resource systems encompassing payroll ordinarily include all personnel data such as employee age, skill sets, vacation days earned, and accumulated sick leave.

In the past, accounting systems were designed primarily to process data for the financial statements and reports to external agencies, such as the Securities and Exchange Commission and the Internal Revenue Service. To the extent that the data also might be of interest to managers, the accounting system played a secondary role of decision support. Now, the emphasis is reversed. Accounting information systems still provide needed external information, but most systems are more heavily oriented toward supporting management decision making and operations (Vignette 1.2). Because of management’s need for information beyond just what is essential for external financial reporting, many systems are events-based. These systems can capture and store full information about each accounting event, making it available to authorized users in the organization. Accounting events other than transactions include sales orders and purchase orders.

The information used for external reporting and the information supporting management decision making and operations come from the same primary source: accounting events measured in monetary terms. Payroll, cost accounting, and accounts receivable data flow into the external financial statements. The same payroll data may form the basis of a decision regarding personnel levels. The same cost accounting data may provide input to a decision to add a new product or to discontinue an existing one. And the same accounts receivable data may support a decision concerning credit policy. Among their accounting data, many organizations have found strategically valuable information to increase their market share and competitive position (Vignette 1.3). On the other hand, meeting management’s de-

**Vignette 1.2 Volume of Accounting Reports**

Weller Corporation prepares quarterly and annual financial statements for its stockholders and annual 10K reports for the Securities and Exchange Commission. It files estimated corporate income tax returns each quarter and files its annual tax returns to the Internal Revenue Service and the state revenue agency on March 15 of each year. In addition, the corporation reports and pays payroll and withholding taxes after each semimonthly pay period and files a quarterly report of payroll tax withholdings.

Each month, Weller Corporation prepares 85 separate accounting reports required by managers in the organization. Some of these reports contain monetary values, some contain physical units, and some contain both. Examples are the daily cash receipts and disbursements reports (S), the weekly report of materials and labor usage (S and units), the weekly production backorder report (units), the weekly schedule of aged accounts receivable (S), the monthly inventory status (S and units) and reorder reports (units), and the monthly trial balance (S). These reports vary in length from 1 page to more than 100 pages and vary in distribution from 1 copy to 20 copies.

Each month, the corporation also issues an average of 675 purchase orders and 2,600 invoices. It writes more than 13,000 checks to vendors and employees and processes about 2,500 cash remittances from customers. At year-end, Weller issues roughly 23,000 W-2 forms to present and former employees.

**Thought Questions**

1. Which type of information (dollars, units, or both) do you think a manufacturing manager would find most useful when making staffing decisions and why?

2. Give some examples of the information the manager would want collected to help him/her with staffing decisions.
mands for decision-making information may require data from other internal and external sources and data measured in nonmonetary terms. Data expressed in labor hours, units of production, manufacturing reject rates, and customer satisfaction indices may be needed. Furthermore, more sophisticated analysis may be necessary before the information is delivered to management.

Vignette 1.3 Strategic Use of Accounting Information

Green Acres, Inc. is a leading supplier of yard and garden products. It distributes seed, fertilizers, gardening gloves, small tools, mulchers, yard tractors, and 2,417 other products needed by homeowners, nursery owners, and small farmers. Service support for its equipment is provided through local dealers.

Three years ago, a senior manager recognized that a gold mine of information lay in the company’s accounting records. Now, each month, Green Acres’ sales records are analyzed to identify customers who have bought products in each of several categories. Marketing personnel use the monthly list to target those customers who are most likely to buy additional products. For example, a customer who has recently bought a lawn mower is also likely to need grass seed, lawn care products, and equipment such as edgers and leaf blowers. Over time, complete profiles have been drawn up of customers and their needs.

Lists of customers may also be sold to firms in the industry that are not in direct competition. For example, names of customers who have bought garden equipment may be sold to nurseries. Green Acres has no immediate plans to sell live plants, but it can bring in additional revenue from firms that do not enjoy its large accounting database. Management has even contacted lawn service companies with similar propositions. Its reasoning is that some people who have purchased lawn mowers may have become tired of using them.

Thought Questions
1. What are some of the issues Green Acres should consider when analyzing or sharing information from its accounting information system?
2. Give some examples of information that could be extracted from the accounting information system for use in future planning.

The expanding role of accounting and the increasing presence of computerized data processing have led to difficulties in properly defining the boundaries of both accounting and accounting information systems. Several activities, including decision support, operations research, modeling, information management, and the planning and implementation of information systems, are “gray areas” in which the responsibilities of accountants may overlap those of other professionals.

For many years, leaders of the accounting profession have taken a broad view of the function of accounting. As far back as 1969, a committee of the American Accounting Association encouraged accounting involvement in such decision support areas as modeling and forecasting. And in 1971, another committee of the Association included the design and management of accounting systems in a list of an accountant’s principal and “traditional” responsibilities. The 1971 committee also expressed the following opinion:

The Committee believes that accounting, in the broad sense of the term, can and should rise to the challenge and opportunities of the developing information technologies and take the lead in the information management. In the narrowest sense of the term, the accountant is only a part of the organization’s formal information system and hence is both a user of information and a part of the operating and design group concerned with information as a whole.¹
1.2b Accounting Systems Technology

At one time, accounting data were captured and stored on paper documents and processed and reported manually. Accounting clerks transcribed data from paper source documents, such as time cards and customer purchase orders, to paper journals. The transaction data were then posted to paper ledgers. Checks, invoices, and other output documents were prepared by hand, and financial statements were typed from handwritten drafts. Manual accounting systems were slow, were prone to error, and severely limited in the volume of data that could be processed. With the rapid development of computers, the manual processing of accounting data has become rare. Today, most accounting systems—even in very small organizations—are computerized. Computerized accounting systems are faster, more accurate, and more reliable, and they can easily handle large volumes of data. They are also less expensive to operate than manual systems. More importantly, certain types of information processing and ways of communicating accounting information are only possible with the use of computers. For example, managing large databases, moving data rapidly to and from remote locations, and obtaining immediate feedback on the effects of transactions would be impossible without computer technology.

Computerized accounting systems include a number of key components. The first and most visible component is the computer equipment, or hardware. Computer hardware performs the essential functions of input, processing, storage, transmission, and output of data. The second component is the accounting activities that are used to process data. Most of these processes are embodied in accounting software, the sets of instructions that tell the hardware what to do. Such software includes general ledger, customer, and human resource accounting. Accounting procedures not automated include control of prenumbered documents (checks, for example) and operation of the accounting software.

The third component is people. Computers do certain things much better than people and complement those tasks at which people excel, such as making judgments and being creative. People no longer carry out routine processing tasks, but they continue to provide input data, monitor processing of that data, and interpret the output. Also, people are needed to manufacture the hardware, write the software, install the systems, and maintain the systems in working order. Finally, people are required to supervise and control the accounting function to ensure that it does its proper job. It is not an exaggeration to say that people remain the most important element of the accounting system, and they must be sold on the merits of any system for it to succeed (Vignette 1.4).

Organizations use computers to do more than just process accounting data. Computers are used in engineering departments to help design products and in manufacturing plants to control the machinery that makes the products. They are used in finance, marketing, and administrative departments. Computers are used by all levels of management. Computers form part of management information systems, decision support systems, administrative support systems, and executive support systems.

1.2c Importance of Accounting Systems

The accounting system touches most or all of an organization’s activities. It touches the organization’s external activities through the transaction documents sent to customers, vendors, and employees, through the financial statements prepared for the stockholders and creditors, and through the tax and regulatory reports sent to government agencies. The accounting system touches the internal activities through product costing, reflecting the conversion of raw materials into finished products. It also touches internal activities through budgets and budget tracking. Budgets are established to provide performance targets and to set limits on authorized expenses. Accounting data measure actual performance—at least in its financial aspects—and monitor compliance with the performance targets. However, the measurement system influences the activities being measured. People are aware that they are being monitored by accounting measurements and adjust their behavior accordingly.
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Significance of Accounting Information Systems and the Accountant’s Role

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Because of the pervasive influence of an accounting system, the quality of accounting information and the performance of the accounting system are of great concern to management. The accounting system is the organization’s “nervous system,” and most organizations would soon close their doors if it ceased to function. In fact, the Gartner Study (1998) and Disaster Recovery Journal quote some startling statistics: 68% of companies who lose their computer functions for more than 7 days NEVER REOPEN, while 93% of companies suffering a significant data loss are out of business within five years. 2 While a good accounting system may not guarantee an organization’s success, a bad one can destroy an organization. Untrustworthy accounting information, unreliable computer equipment, and incompetent or dishonest people carrying out accounting functions can also drive an organization into bankruptcy.

Vignette 1.4 Importance of People in Accounting Systems

Angus Associates’ new controller, Ryan Lehmann, soon set about replacing the firm’s obsolete computer equipment. He supervised the installation of a system of networked personal computers with flat-panel monitors and laser printers. After sifting through 2 years’ copies of a weekly microcomputer magazine and reading articles in The Journal of Accountancy, Lehmann ordered a complete line of highly recommended accounting software that would meet the firm’s information needs. Everything seemed to be going smoothly. Then Lehmann was seriously injured in a car accident on the way to work and was forced to take early retirement.

His replacement, Monica Kluger, had been with the company for a long time. From the start, she had been suspicious of her predecessor’s plans for a new accounting system. She liked the old minicomputer even though it was slow, particularly when all the terminals were in use. And she felt comfortable with the old accounting software even though significant manual processing was required to provide needed information. The new software looked good on paper, but she did not have the time to figure out how to operate it.

Kluger was stuck with the new system, but she decided to ignore it as best she could. She delegated all the computer operations to Jack Thompson, an eager but inept young man. He set about installing the new software and made a complete mess of it. Several of the packages were never installed, two because the CDs were damaged. Kluger and Thompson made no arrangements for training users to operate the network, so everybody treated the PCs as stand-alone computers.

Also, Kluger canceled the maintenance contract on the PCs, and when hardware problems—however trivial—arose, the inoperable machines were simply moved to a storage room to gather dust.

Within a year, one-half of the machines Lehmann had bought were out of commission.

When executive managers asked Kluger how the new accounting system was working out, she made disparaging remarks about the choice of hardware and software and about Lehmann’s wisdom in acquiring “such a complicated and unmaintainable system.”

Thought Questions

1. How could this situation been avoided?
2. What should Angus Associates do now?
The difference between good and bad systems lies in the way they are developed, operated, and controlled. An accounting system is expected to carry out its tasks without the need for upper management’s day-to-day intervention. It should operate so reliably that top management can safely forget about the system and devote its energy and attention to more pressing issues. Management should be confident, for example, that the payroll will be processed, customers will be billed, production will be controlled, and information will be readily available as needed for decision making.

The mode of acquiring accounting software systems has changed dramatically. In the past, purchasers of mainframes usually developed their own accounting systems internally, but today most new systems are licensed from companies specializing in the development, licensing, and support of accounting systems. (See Exhibit 1.1 regarding the licensing of software.) Locating, acquiring, and installing a suitable accounting system is costly and time-consuming. Consequently, the software should be expected to last long enough for the organization to recoup this very substantial investment. The acquisition of a new accounting system should be undertaken with much care to ensure that the system does its job, not just when it first goes into operation but over an extended useful life. The system’s job is to meet the accounting information needs of the organization and the users. Determining what these needs are requires much data gathering before the system can be selected and implemented. Control features (which minimize the opportunity for an individual to perpetrate and hide fraudulent activity) should be integrated into the accounting system to protect the accounting information and to ensure that the system cannot be abused. Before acquiring a new system, you should be assured that its developer has and will be able to provide continuing support. Moreover, employees who will operate and use the system must receive proper training.

Since the advent of the microcomputer in 1977, accounting software has become far more sophisticated and diverse. Just a handful of packages were available for microcomputers when the IBM-PC appeared in 1981. The widespread use of microcomputers and the software development environment provided by them have resulted in a deluge of accounting software.
Exhibit 1.2 gives a sample of the range of available accounting software solutions. As you can see from this exhibit, accounting software is generally categorized according to the size of the company it supports. The categories in this exhibit are labeled:

- Low-end Market
- Mid-market
- High-end Market

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low-end Market</strong></td>
<td></td>
</tr>
<tr>
<td>BusinessEssentials</td>
<td>MYOB Ltd.</td>
</tr>
<tr>
<td>NetSuite ERP</td>
<td>NetSuite Inc.</td>
</tr>
<tr>
<td>Sage 50</td>
<td>The Sage Group</td>
</tr>
<tr>
<td>QuickBooks Pro</td>
<td>Intuit Inc.</td>
</tr>
<tr>
<td>Sage BusinessVision</td>
<td>The Sage Group</td>
</tr>
<tr>
<td>Sage Simply Accounting</td>
<td>The Sage Group</td>
</tr>
<tr>
<td><strong>Mid-Market</strong></td>
<td></td>
</tr>
<tr>
<td>CMS Professional Accounting</td>
<td>Cougar Mountain Software</td>
</tr>
<tr>
<td>Epicor Enterprise</td>
<td>Epicor Software Corp.</td>
</tr>
<tr>
<td>Microsoft Dynamics AX</td>
<td>Microsoft</td>
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<tr>
<td>Microsoft Dynamics GP</td>
<td>Microsoft</td>
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<tr>
<td>Microsoft Dynamics NAV</td>
<td>Microsoft</td>
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<tr>
<td>Microsoft Dynamics SL</td>
<td>Microsoft</td>
</tr>
<tr>
<td>QuickBooks Enterprise Solutions</td>
<td>Intuit Inc.</td>
</tr>
<tr>
<td>Sage 100 Standard ERP (Sage ERP MAS 90)</td>
<td>The Sage Group</td>
</tr>
<tr>
<td>Sage 100 Premium ERP (Sage ERP MAS 200)</td>
<td>The Sage Group</td>
</tr>
<tr>
<td><strong>High-end Market</strong></td>
<td></td>
</tr>
<tr>
<td>SAP ERP</td>
<td>SAP AG</td>
</tr>
<tr>
<td>Oracle E-Business Suite</td>
<td>Oracle Corp.</td>
</tr>
<tr>
<td>PeopleSoft Enterprise</td>
<td>Oracle Corp.</td>
</tr>
</tbody>
</table>
Many mergers and consolidations have been occurring in the accounting software industry. When this happens, the purchasing company may shelve a program until it decides what to do with it. Many of the companies that fall into the mid-market and above category use Enterprise Resource Planning (ERP) software. This software groups an organization’s accounting function with finance, sales, manufacturing, and human resources into a coherent, integrated system making financial and operational data available to personnel throughout the organization. Accounting software is discussed more fully in Chapter 15.

### 1.3 Why Study Accounting Information Systems?

**Learning Objective 3:** Explain why accounting information systems should be studied regardless of the accounting specialty you may choose.

During its useful life, the accounting system must be given adequate care to ensure that the accounting system continues to operate satisfactorily. Software corrections and updates should be installed and monitored on a controlled basis. Computer equipment must be maintained properly, new people must be trained, and existing people must be supervised. Control features should be monitored to ensure their continued performance and, where necessary, they should be strengthened. Periodically, the system should be evaluated to determine whether it continues to provide the required service. From time to time, the system may need to be upgraded or enhanced to improve its performance.

As an accountant, you need to be, at a minimum, a capable user of an accounting system. You may also be an auditor or perhaps a consultant. The most recent edition of the *Occupational Outlook Handbook* of the U.S. Department of Labor says that “Employment of accountants and auditors is expected to grow by 16 percent between 2010 and 2020. The focus on accounting has increased in response to corporate scandals and recent financial crises. Stricter laws and regulations, particularly in the financial sector, will likely increase the demand for accounting services as organizations seek to comply with new standards.”

### 1.3a Accountants as Users of Accounting Systems

Users of accounting systems include financial, managerial, governmental, and tax accountants. As users, accountants depend on accounting systems to provide information in a timely manner. First and foremost, accountants need to understand how an accounting system works so as to be able to determine that the outputs are trustworthy. In addition, because accountants’ duties encompass business analysis, they need to know what, how, and where data are stored so that they can retrieve and evaluate appropriate data. Research findings from an Institute of Management Accountants study—*Counting More Counting Less: Transformations in the Management Accounting Profession*—showed that “accounting software was the second most important (behind computer skills/technology) knowledge, skills, and abilities learned by corporate accountants over the past 5 years.”

Often, end users are asked to participate as project team members in the evaluation of an existing accounting information system, the acceptability of a new system, and the implementation of a new system (Vignette 1.5). Their primary role in such projects is to offer advice on matters of concern to users, such as:

- How easy is the system to operate?
- How are data entered?
- How is access limited to authorized users?
- What interaction is possible between the user and the system?
• What outputs are generated?
• Is “on demand” reporting available?
• Is the output reliable?
• Can the data be lost or contaminated?
• What should be done if the system crashes?
• Can the system be abused and in what ways?
• What controls are necessary?

To provide such advice, accountants need to have systems skills as well as a sufficient understanding of the activities of the users whom they represent. Tax specialists need sufficient knowledge of computerized accounting systems to extract required information for tax returns and to understand what has happened to data in processing to ensure that extracted information is presented according to tax requirements. Most controllers and chief financial officers are responsible for operation of the accounting system and thus must possess sufficient knowledge of computerized accounting systems to judge the accuracy of statements about the system made to them by their employees and peers, particularly if they are required to attest to the controls over the generation of financial statement information in their Sarbanes-Oxley Section 404 report.

1.3b Accountants as Auditors of Accounting Systems

External, internal, and governmental auditors also require a high level of accounting systems expertise to perform their jobs. **External auditors** perform a public service by expressing an opinion about the “fairness” of a client’s financial statements, to include their assessment of management’s attestation of the control system based on their own testing. The auditor’s opinion gives stockholders, creditors, and

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**Vignette 1.5 Accounting User Concerns in AIS Design**

Charles Hardin is the manager of a software division of Conglomerates, Inc., a manufacturer of marine pumps and motors. Some years ago the software division was acquired along with several recreational boat dealerships. While the dealerships were subsequently sold, the software division was retained by Conglomerates. The division has an accounting system—Boat Accounting Software System (BASS)—developed specifically for boat dealers and marine docking facilities. BASS is sold to recreational boat dealers and operators of boat docking facilities and is supported by five employees staffing a help desk. BASS is presently written in COBOL and runs on a UNIX operating system. Charles is heading up a team to update and convert BASS to C++ and the Windows Vista operating system. His development team includes three C++/Vista programmers from the parent company, a COBOL/UNIX programmer from Charles’ division who is learning the new software tools, and an accountant who previously worked for both boat dealers and docking/storage companies. Charles has an accounting degree, picked up some COBOL programming early in his career, and participated heavily in the design (not programming) of BASS in recent years.

Considerable tension has arisen in Charles’ team concerning redesign of the product. The decision has been made to use the Oracle database product to manage data for the accounting system. Charles knows how the current product works and has always felt comfortable with the audit trail produced and with built-in software controls. He believes he represents the users of the software and feels that audit trails and controls are essential and must be built into the software at the design phase and before any programming begins. This concern has been expressed to the lead programmer from corporate who only responds that Charles should only tell her what outputs are desired and leave the question of “how to do it” up to the programmer.

**Thought Question**

1. As a representative of the users of the software, how can Charles improve the redesign process to help ensure its success?
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others confidence that an organization’s financial statements provide a basis for investment decisions. External auditors are independent of the client organizations, working individually or for accounting firms, and regulated by the Public Company Accounting Oversight Board (PCAOB). The auditors are part of the quality assurance program that organizations and the accounting profession mutually seek to establish for financial information.

An auditor who performs a financial statement audit is required by professional standards to gain an understanding of a client’s accounting information system before expressing an opinion. The auditor’s concern is to determine whether the processing of accounting data conforms to generally accepted accounting principles and whether the system’s control features are adequate to reduce the likelihood of errors in the financial statements to an acceptable level. If an auditor finds the controls to be adequate, he or she may be able to reduce the amount of testing of transactions and account balances necessary to support an opinion on the fairness of the financial statements.

External auditors must adhere to standards issued by the Auditing Standards Board of the American Institute of Certified Public Accountants, as well as standards issued by the Public Company Accounting Oversight Board. In its Statement on Auditing Standards No. 3, the board requires auditors to acquire the necessary knowledge of computer concepts. In addition, the board has issued several SASs (e.g., Nos. 55, 78, 94, 95) relating to the need for external auditors to understand a client’s internal controls and assess the likelihood of fraudulent financial information (SAS 99). SAS 94 states that in obtaining this understanding of internal controls, the auditor must consider how an entity’s use of information technology may affect controls relevant to a financial statement audit. The Public Company Accounting Oversight Board (PCAOB) has also issued 16 standards (so far) for auditors related to identifying controls and planning the audit of an organization’s accounting system. As a result, external auditors need substantial technical knowledge about accounting systems to be able to carry out their responsibilities.

Internal auditors are employed by business organizations to perform auditing work for corporate management, and governmental auditors are employed by government agencies to report to government officials and the public. Internal auditors perform compliance and operational audits, as well as participate in special projects to aid management’s quality assurance program. They ensure that accounting systems are properly designed to meet the organization’s present and future needs, they monitor the effectiveness of internal controls, and they provide advice on operational efficiency within the organization.

Obviously, auditors need to have a good understanding of an accounting system and its technology. To address the complexity of today’s advanced technology, a highly specialized group of auditors has emerged, called “IT auditors.” These auditors can work as external, internal, or governmental auditors. The job market for IT auditors has exploded in the past few years due to documentation requirements demanded for compliance with the Sarbanes-Oxley Act of 2002, and companies’ heavy reliance on information technology. In the near future, all types of auditors will be called on to work more closely with technology.

Several professional organizations provide support to auditors by offering certifications, education, research, and technological guidance. These organizations include the American Institute of Certified Public Accountants (AICPA), the Institute of Internal Auditors (IIA), the Information Systems Audit and Control Association (ISACA), the Association of Certified Fraud Examiners (ACFE), and the Association of Government Accountants (AGA). The certifications sponsored by these organizations are outlined later in this chapter.

1.3c Accountants as Consultants for Accounting Systems

The addition of systems consulting services to the typical services of audit and tax was a natural progression for public accounting firms. Indeed, the accountant already had a wealth of knowledge about
the client’s operations. When a company had a question about implementing or updating its accounting system, the company turned to its trusted CPA for informed, objective advice, as described in the Introductory Scenario. Accounting firms quickly recognized systems consulting as an attractive way to enhance revenues. During the 1990s, systems consulting grew at a rapid rate. This growth was primarily attributable to the implementation of ERP systems to avoid the Y2K problem (the bug that was supposed to crash all the computers when the year changed to 2000). With the passage of the Sarbanes-Oxley Act of 2002, external auditors were no longer permitted to perform consulting services for their audit clients. Consequently, many of the public accounting firms sold off their consulting branches. For example, before the collapse of Arthur Andersen, it spun off Andersen Consulting, which is now called Accenture. Ernst and Young’s consulting arm became Ernst and Young Consulting, was acquired by Cap Gemini, and became Cap Gemini Ernst and Young. The name was changed to Capgemini. Deloitte formed Deloitte Consulting, changed its name to Braxton, and then back to Deloitte Consulting. PriceWaterhouseCoopers spun off PWC Consulting, which was bought by IBM in 2002 to create IBM Global Business Services. The KPMG spin-off of KPMG Consulting changed its name in 2002 to BearingPoint to further differentiate itself from its former parent. Consulting firms often form alliances with vendors to provide full coverage, fill in technology gaps, improve positioning, and strengthen capabilities. (See Exhibit 1.3.)

Despite the Sarbanes-Oxley Act of 2002 that bans accounting firms to do consulting work for their audit clients, accounting firms soon realized that they can still do consulting work for many companies as long as these companies are not their audit clients. Today, business consulting ranging from management and risk consulting to financial and tax advisory remains a significant service provided by public accounting firms, small or large. Many accounting professionals enjoy working with their consulting clients to help them solve problems and improve business operation.

**EXHIBIT 1.3: Consulting Firm Alliance**

BearingPoint (formerly KPMG Consulting) Alliance Partners’ commitment to deliver customer value:

BearingPoint works with a select group of technology and software alliance partners who enhance our market offerings, bring value to our clients, and align with our market strategy. Our Alliance Partners enhance BearingPoint’s ability to solve client challenges by helping us to deliver:

- Deep industry and technology experience
- New technology across a range of industries
- Industry-leading solutions created with global authorities in their field

The result is a stronger ability to deliver long-term value to our clients.

*Note: These partners include, for example, HP, IBM, Microsoft, Oracle, and SAP.*

Source: http://www.bearingpoint.com/

Other services prohibited by Sarbanes-Oxley for audit clients include bookkeeping functions, internal audit outsourcing, and information systems design/implementation. This Act does not directly apply to nonpublic companies. Consulting firms outside of public accounting also provide systems consulting, and other services previously provided by public accounting firms; many accounting graduates follow career paths with these firms.
The extent of implementation engagements varies widely depending on the size of the client company, the way the client company is organized, and the scope of the engagement. Implementations of the SAP system (Exhibit 1.2) average about 2 years, while a typical implementation of Sage 50 (formerly known as Peachtree) (Exhibit 1.2) might be 4 to 6 weeks and require a smaller staffing effort than SAP. Accountants taking part in systems evaluation must be able to assess different approaches to the capture, storage, processing, transmission, and output of data, and they must be able to estimate the level of assurance provided by different types of controls.

1.3d Professional Certifications and AIS Knowledge

Accountants frequently acquire professional certification, either as a requirement for their particular area of practice or to enhance their professional status and career prospects. Generally, certification requires passing an examination, meeting specified experience and educational requirements, and agreeing to be bound in their professional conduct by a code of ethics established by the respective certifying body. In addition, certifications require holders to complete a minimum number of hours of continuing education in approved fields to maintain certification.

Exhibit 1.4 lists professional certifications in the U.S. that require knowledge of accounting information systems, the sponsoring organizations, and a brief statement of their purposes. However, this list is not all-inclusive as the professional organizations continually add new certifications to meet new areas of expertise needed in the accounting profession.

<table>
<thead>
<tr>
<th>Certification Designation</th>
<th>Sponsoring Organization</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified Public Accountant</td>
<td>American Institute of CPAs and State Boards of Public Accountancy</td>
<td>Only certification awarded by state agencies; necessary to express opinions on financial statements.</td>
</tr>
<tr>
<td>Certified Information Technology Professional</td>
<td>American Institute of CPAs</td>
<td>Designed for AICPA members involved in IT strategic planning, implementation, management, and business strategies.</td>
</tr>
<tr>
<td>Certified Management Accountant</td>
<td>Institute of Management Accountants</td>
<td>Designed for accountants employed in the corporate world.</td>
</tr>
<tr>
<td>Certified Internal Auditor</td>
<td>Institute of Internal Auditors</td>
<td>Designed for those working as internal auditors in corporations and non-profit organizations.</td>
</tr>
<tr>
<td>Certified Information Systems Auditor</td>
<td>ISACA (formerly Information Systems Audit and Control Association )</td>
<td>Designed for individuals who work in the information systems audit, control, and security professions.</td>
</tr>
<tr>
<td>Certified Information Security Manager</td>
<td>ISACA (formerly Information Systems Audit and Control Association )</td>
<td>Designed for individuals who provide information security management and consulting.</td>
</tr>
<tr>
<td>Certified Fraud Examiner</td>
<td>Association of Certified Fraud Examiners</td>
<td>Emphasizes investigation and deterrence of fraud.</td>
</tr>
</tbody>
</table>

EXHIBIT 1.4: Professional Certifications Requiring AIS Knowledge
Accounting information is needed to transact business, support management decision making and operations, and meet statutory requirements for external reporting. While most accounting data are expressed in monetary terms, significant other accounting data necessary for effective reporting include units of product, ratios, percentages, or other terms.

Accounting systems are the delivery systems that provide accounting information to users within an organization and to stockholders, creditors, government agencies, labor unions, and others outside the organization. They process transactions, provide routine and non-routine reports, and support an accounting database from which information can be retrieved when needed for decision-making purposes.

Accountants in all branches of the profession must have a basic understanding of accounting systems to do their jobs. But an increasing number of accountants, in public practice as well as in industry and government, are systems professionals who require a more detailed knowledge of accounting systems topics. CPAs offer auditing services to their clients, providing an independent assessment of the controls and reliability of the financial statements. Consulting services, internal auditing, and many management and government accounting positions require special technical competence to carry out their ongoing responsibilities. This type of competence is provided by AIS courses, by textbooks, by practical experience, and by continuing professional education.

Several professional certifications, such as the Certified Public Accountant designation in the U.S. and the Certified Information Systems Auditor (international), are available to entrants to the accounting profession. These certifications provide evidence that the holders have met certain minimum standards of competence in their areas of accounting or accounting-related practice. Success in passing the qualifying examinations for all of the professional certifications requires a significant level of competence in accounting information systems.

**Key Terms**

accounting information  
accounting information system  
accounting software  
accounting systems implementation  
accounting transaction  
Business Software Alliance  
computer hardware  
consulting services  
economic events  
Enterprise Resource Planning (ERP) software  
events accounting  

events-based  
external auditor  
external reporting  
external transaction  
governmental auditor  
internal auditor  
internal transaction  
manual  
systems implementation  
trading partners  
transaction
DISCUSSION QUESTIONS, PROBLEMS, AND ACTIVITIES

1. Arnold Finkelstein and Associates owns a shopping mall in a city of 50,000 people. The mall, containing 240,000 square feet of retail space, was built more than 10 years ago and is in need of repairs and decoration. However, Finkelstein is considering a larger project to upgrade the mall’s image and install a “food court.” The project might also include a 40-percent expansion to bring in more specialty shops and another big-name retail store. At present, 65 small and 2 major retailers lease space in the mall. The owner is responsible for the mall’s upkeep and promotion and for all janitorial and security services.

**Required:**
What types of accounting information does Finkelstein need to make a decision on the proposed project? How much of this information can be extracted from the owner’s accounting records? What additional accounting and non-accounting information is needed?

2. Vignette 1.3 illustrates the potential strategic value of accounting information in increasing an organization’s market share and profitability.

**Required:**

a. Suggest possible strategic uses of the types of accounting data listed below:
   - Purchasing data
   - Perpetual inventory records
   - Manufacturing cost data
   - Customer credit and accounts receivable data
   - Personnel and payroll records

b. Are any legal or ethical issues involved in the use of accounting data for such purposes?

3. Both external auditors and accountants engaged in systems implementation need a basic understanding of accounting information systems.

**Required:**

Compare the needs of the two groups, identifying the areas where both need the same kind of understanding and the areas where one group has essentially different needs.

4. Explain the impact the Sarbanes-Oxley Act of 2002 has on the ability of public accounting firms to provide systems consulting services.

5. The chapter indicates that users may be represented on project teams organized to find and select new accounting information systems.

**Required:**

Do users belong on systems projects? Recognizing the complexity and sophistication of today’s accounting systems, is it not better to leave systems selection and implementation to professionals, such as consulting specialists or computer scientists?

6. “All those certifications like the CMA and CIA are a waste of time, effort, and money. Every accounting student should sit for the CPA examination, regardless of where he or she intends to finish up, because the CPA license is the only one that’s recognized. Getting some other certification is like going to a school that’s not accredited.”

**Required:**
Discuss this statement.
7. Classroom Activity:

You are the controller for Aspen Ski Equipment Co. Snowmass Ski Village has sent you their purchase order for 50 ski poles. Assume you have the ski poles in stock and assume a manual accounting system. Make a list of all the processes, documents, and journal entries necessary for the sale transaction to work its way through the accounting system and appear on the financial statements. It is not necessary for you to include amounts.

One team will be selected randomly to present its solution to the class.

NOTES


2. We thank Freeman Mendell for providing us with this information as part of his presentation April 4, 2013.


Chapter 2

Accounting Systems Documentation

**Learning Objectives**

- Understand what documentation is and why it is needed.
- Explain the importance of documentation standards.
- Recognize the appropriate use of the various types of system documentation.
- Describe, read, and prepare a system narrative description.
- Describe, read, and prepare a block diagram.
- Describe, read, and prepare a data flow diagram.
- Describe, read, and prepare a system flowchart.
- Discuss business process modeling and how business processes are mapped using the Unified Modeling Language (UML). Appreciate the advantages of computer-assisted systems documentation tools.
### INTRODUCTORY SCENARIO

An American subsidiary of a large international oil company had undertaken a project to consolidate its computer operations in the United States. A major part of the consolidation was the transfer of the company’s personnel systems, all of which resided on the computers in Houston, Texas, to its computers in Anchorage, Alaska. The company hired a consultant, Jon Tran, to be responsible for this transfer.

Within the first few days of the engagement, Tran developed a plan to ensure a successful relocation of all personnel systems to Anchorage and presented his plan to the oil company's representative, Victoria McNichols. The plan consisted of the following tasks:

- Identify all supporting software products driving the personnel systems, such as operating systems, compilers, file and database management systems, telecommunications systems, and general purpose utility packages.
- Identify all personnel systems; the users; all components, including computer programs, screens, files and databases, reports; along with documentation on how to use the systems, what the systems do, and how the systems operate.
- Understand three types of relationships: (a) between each personnel system and its users, i.e., how to use each system; (b) among components of each system (e.g., computer programs, screens, files, and databases, reports); and (c) among all the personnel systems.
- Transmit electronically, using a satellite transmission program, computer programs, screens, and test data from Houston to Anchorage.
- Test each personnel system on Anchorage’s computer system.
- Transfer all production data in Houston onto storage media on a Friday night, fly them to Anchorage on Saturday, load them in files and databases residing on Anchorage’s computers on Saturday night, and test them on Sunday. On Monday, users of all personnel systems throughout the nation should not notice the massive relocation of their systems undertaken during the weekend.

The above tasks were carried out by Tran and another consultant, Nina Merchant. Of the six tasks, the easiest ones were Tasks 1, 2, 4, and 6, which consumed one person-month. The most difficult ones were Tasks 3 and 5, which consumed eleven person-months due to a severe lack of documentation.

The identification of supporting software products was accomplished quickly by interviewing personnel in the Houston information center who were very familiar with all supporting software products. These products were IMS, CICS, FOCUS, ISPF dialog, VSAM, and COBOL. A list of all personnel systems and their users was quickly provided by McNichols. The systems included a personnel record-keeping system, an employee skills inventory system, a personnel training-scheduling system, and a series of personnel reporting systems including Equal Employment Opportunity Commission, salary administration, employee performance evaluation, and employee performance tracking. The identification of computer programs, screens, files, and databases was also simple because the Houston information center adhered rigidly to a naming convention for these components. Their names typically started with “PER,” standing for “personnel.” With the use of a utility program called FILE-AID, lists of 1,000+ program names, 100+ screen names, and 300+ file and database names were developed within 2 weeks.
Documentation on how to use the personnel systems was available and adequate. However, documentation describing what the systems did and how they operated did not exist, creating a very difficult situation for Tran and Merchant in understanding the relationships among the components of each personnel system and among all the personnel systems. The two consultants conducted lengthy and exhausting user interviews to obtain a general understanding of these systems. Furthermore, they had to trace the flows of data through each system and document them by creating flowcharts and diagrams. This effort cost about nine person-months. If documentation had been available and adequate, this task would have taken only one person-month, saving the client $60,000.

The satellite transmission of computer programs, screens, and test data was a simple task with the use of an in-house-developed satellite transmission program. This task cost the company $20,000. The testing of all personnel systems on Anchorage’s computer took two person-months. McNichols was very surprised at the high cost of documenting the personnel systems to assist in understanding them. Her comment was:

“It cost us $60,000 for you two consultants to gain an understanding of our personnel systems. Over the years, it has probably cost the company hundreds of thousands of dollars for all our company accountants and auditors and our external auditors to obtain a working knowledge of these systems. Adequate documentation would have saved us a lot of money. What a waste!”

Introductory Scenario Thought Questions:

1. Why would proper documentation have been helpful in this systems consolidation project?
2. Why do you suppose documentation describing what the systems did and how they operated did not exist?
3. What measures do you think organizations can take to ensure that systems are adequately documented?
4. What types of documentation of the personnel systems would have been helpful to the consultants and what knowledge about the systems would the consultants have gained from each type?

Learning Objective 1: Understand what documentation is and why it is needed.

Documentation as it relates to accounting systems is a communication device that describes in pictures, words, or both how to use the system, what the system does, and how the system operates. Without documentation, a system is nothing but a “black box” with inner workings and relationships between inputs and outputs, which may be only partially understood. When adequately prepared, documentation provides a rich source of information to help people in doing their jobs.

Documentation is a critical business activity today because of the Sarbanes-Oxley Act of 2002. This Act requires that a company’s internal control be documented in detail for use by both management and the external auditors in their review of the control system. In addition, internal auditors performing operational audits also require documentation of business processes to perform their reviews. Examples of the items that should be documented include:

- The design of controls on which management financial reporting assertions and disclosures will be based; this provides a basis for management’s testing of the controls
• Descriptions of how transactions significant to financial reporting are initiated, authorized, recorded, processed, and reported to document proper authorization
• Establishment and continued assessment/testing of fraud prevention controls
• Controls over the financial reporting process that provide management with confidence that the information in the financial statements can be relied upon
• Controls over the safeguarding of assets, whether obvious (e.g., locked warehouses for inventory) or not (e.g., security for information assets)
• Controls over the information technology environment (e.g., access security, program changes)

Therefore, it is more important than ever that accounting students understand how to document accounting systems.

The documentation of an accounting information system can be divided into two types according to its intended recipients. One, addressed to the system’s operators, is appropriately referred to as **user documentation**. The second, addressed to technical personnel involved with the system, is referred to as **system documentation**. User documentation describes the system “from the outside, looking in.” Different classes of users have different capabilities and needs and require different types of user documentation. Instructions in interpretation may be all that is necessary for users who simply receive output from the system. Documentation addressed to end users emphasizes how to operate the system and includes instructions for executing the various programs and instructions for handling data (e.g., to create reports). Typically, end-user documentation would include the following:

• Brief narrative description covering the objectives of the system, the overall mode of operation, and the structure of the major subsystems
• Graphical descriptions showing information flows among the subsystems
• List of programs with operating instructions
• Description of principal files used by programs
• Sample input illustrating what is required by each program
• Sample output showing what is produced by each program
• Control procedures
• Error recovery procedures
• Crash recovery procedures

In contrast, **system documentation** offers an inside view of the accounting system and is written in precise technical language. It is prepared by and for the benefit of system implementers, auditors, accountants, programmers, systems analysts, and other systems professionals and is needed to help:

• Understand complex accounting systems.
• Understand what internal controls are in place and how effectively they are working.
• Identify and solve problems in existing accounting systems.
Learning Objective 2: Explain the importance of documentation standards.

Good documentation is not generated by accident. Rather, it is produced as a result of careful planning by an organization that takes seriously the need for good documentation. The preparation of documentation should be governed by appropriate standards. **Documentation standards** are written policies and procedures that govern the preparation, use, and maintenance of documentation. The standards should include (at a minimum) the following:

- Identification of the preparer
- Information included and omitted
- The manner in which the material is to be presented
- Authorizations required for each type of documentation
- Instructions for preparation of the documentation
- Distribution and use of the documentation
- Review and maintenance procedures for the various types of documentation

People who prepare documentation should conform to applicable industry, national, or international documentation conventions to improve clarity and consistency in interpretation. Each item of documentation should be dated and bear the name of the person who prepared it so that, if possible, future questions can be directed to that individual. The documentation should also bear the name of the person who checked it and the person who authorized it for use. Any unauthorized/informal documentation circulating in an organization should be reviewed to determine whether it should be formalized or destroyed.

Reproduction and distribution methods should reflect the environment in which the documentation is to be used. Traditionally, documentation has been on paper, but the trend today is to store documentation in machine-readable form for retrieval and editing on personal computers or interactive workstations. Distribution of or access to documentation should be on a “need to know” basis. The purpose of documentation is to inform, but security should be provided to ensure that this purpose is not abused by unauthorized access. Documentation should not be the means by which individuals gain information—particularly about the workings of internal controls—to perpetrate irregularities.

Designated persons should be responsible for ensuring that documentation is properly maintained to reflect updates, additions, or deletions. These individuals should receive copies of all authorizations for system modifications so they can verify that system documentation has been updated. As new documentation is made available, old versions should be destroyed or taken out of circulation and archived. This process is aided by electronic methods of preparing and indexing documentation. Persons responsible for documentation should also conduct periodic reviews of system documentation to ensure that it is up to date (see Vignette 2.1). These periodic reviews should be documented to provide evidence that the review was performed as required.
The auditor spent several days reviewing the documentation of the organization’s purchase-order processing subsystem. The documentation was extensive, complete, and properly authorized by management. It was stored in carefully labeled file boxes in the information services library and was duly signed out to the auditor. The documentation appeared to provide much of the information needed by the auditor to evaluate the existing subsystem.

However, something puzzled the auditor. He noticed a small discrepancy between an actual purchase requisition form and the description of the form as it appeared in the documentation. Further investigation revealed discrepancies in other forms and then in computer program listings. Eventually, it emerged that substantial changes had been made to the subsystem two years after it went into operation. None of these changes had been documented.

Inquiries revealed that a new controller had taken over between development of the original subsystem and the subsequent modifications. The former controller had insisted on careful preparation and maintenance of accounting system documentation. But her successor had been under pressure to reduce costs and to correct the problems in the purchase-order processing subsystem by making some changes. He had delayed documenting the changes. Then other problems had arisen that needed correcting; five years later, the documentation had still not been corrected. Unfortunately, the cost of the audit increased by 20 percent because the auditor had to create correct documentation for the existing system—documentation that should have been available when the audit started.

Thought Questions:
What should the auditor recommend to the client with regard to documentation?
How could the auditor have approached the problem in a way that might have encouraged cooperation from the client as well as reduced the cost of the audit?

2.3 Types of System Documentation

Learning Objective 3: Recognize the appropriate use of the various types of system documentation.

System documentation can range from information that provides a broad overview of the entire system, or a subsystem, to information that provides the details of a computerized process, such as the computation of net income or the calculation of gross pay. Documentation of the details of computerized processes can take the following forms:

- Task description
- HIPO (hierarchy plus input/processing/output) chart
- Pseudocode
- Program flowchart
- Decision table
- Program source code

Because these types of documentation are used primarily by systems analysts and computer programmers, as opposed to accountants, they are not included in this discussion of the types of system documentation. Instead, this section focuses on those types of documentation that are used most frequently by accountants.

System documentation can take one or more of the following forms:

- Narrative description
- Block diagram
- Data flow diagram
- System flowchart (not to be confused with “program” flowchart in the above list)
- Business process modeling

These forms of documentation are arranged from the least amount of detail provided to the most amount of detail. A narrative description provides the most general overview and correspondingly shows the fewest details. At the other end of the spectrum, a system flowchart provides the most detail and less of an overview. However, depending on how it is prepared, each type of documentation can cover a range of detail creating considerable overlap between neighboring types and their flexibility in accommodating users’ needs. In the following discussion of the various types of systems documentation, the appropriate use of each will become evident.

### 2.3a System Narrative Description

**Learning Objective 4: Describe, read, and prepare a system narrative description.**

A *system narrative description* provides the highest level and broadest form of system documentation. This description is the basic source of information regarding the system’s goals and objectives and helps accountants and others quickly understand the system without being involved with the details of each file or database table and each program. A system narrative description should cover the following:

- Reasons for having the accounting system, including the background, the objectives of the system, and the scope of the system
- System specifications describing the major tasks performed by the system
- Evidence of the users’ approval of the accounting system
- Staffing requirements for operating and maintaining the system with an explanation of the different roles and responsibilities of those involved

The appropriate use of a narrative description would be as a companion to a graphical representation that explains the system in greater detail. Notwithstanding, a narrative description is sometimes used to describe the details of a system. However, if used to show details of a complex system, a narrative description can be cumbersome and ambiguous and packed with technical jargon.
2.3b System Graphical Representation

Graphical representations are the dominant choice for showing details because most people are visually oriented. Pictures, diagrams, and other visual aids can communicate concepts that are difficult or inefficient to convey by other means. Thus, providing a diagram or “picture” of an accounting system helps people understand the accounting system better. Four types of graphical representation are the block diagram, data flow diagram, system flowchart, and business process modeling.

**Block Diagram**

Learning Objective 5: *Describe, read, and prepare a block diagram.*

A *block diagram* is commonly used to provide an overview of an accounting system in terms of its major subsystems. Thus, a block diagram helps a person understand the system being depicted without being presented with needless details. A block diagram is easy to draw and easy to understand.

Two types of block diagrams are noteworthy. One is the *horizontal block diagram* that shows the subsystems of an accounting system and the direction of the information flows among the subsystems. The blocks represent the various subsystems and the connecting lines represent the major information flows. *Exhibit 2.1* illustrates this type of block diagram.

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**EXHIBIT 2.1: Horizontal Block Diagram of an Entire Accounting System**

[Diagram showing various accounting system subsystems connected by lines indicating information flows]
A second type of block diagram is the **hierarchical block diagram** that typically shows the analysis of an accounting system into successive levels of subsystems or, alternatively, the synthesis of subsystems into a complete system. The connecting lines in hierarchical block diagrams represent not the flow of information but the associations among the levels, which take the form of “parent-child” relationships. Hierarchical block diagrams, often referred to as structure charts, are commonly used to provide a general view of accounting systems and their subsystems.

An example of a hierarchical block diagram is shown in **Exhibit 2.2**. It shows the division of the revenue process (one of the several processes in an accounting system) for a sales-supported organization into the sales order processing, shipping, and accounts receivable subsystems. In turn, accounts receivable is divided into customer invoicing and cash receipts.

Both horizontal and hierarchical block diagrams are useful documents to explain how subsystems relate to one another. However, they only show a few aspects of the system and do not contain enough detail to be used as system blueprints. Therefore, block diagrams are used typically in conjunction with other documents that show complementary aspects of the system. A block diagram frequently is drawn as a preliminary step in the preparation of a data flow diagram or a system flowchart.

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**EXHIBIT 2.2: Hierarchical Block Diagram of the Revenue Process**

A logical **data flow diagram** (also called DFD or bubble chart) provides a more detailed representation of an accounting system than a block diagram can provide, but it has fewer technical details than does a system flowchart. A data flow diagram only shows what an accounting system is doing, whereas a flowchart shows what an accounting system is doing and how the system is doing it. Because a data flow diagram shows few technical details, it may be used to obtain an overall understanding of the sys-
A data flow diagram uses four basic symbols (see Exhibit 2.3). A square represents an external entity with an entity being a person, place, or thing. The “thing” is usually another subsystem. An external entity is a source, or originator, of data going into the system being modeled in the data flow diagram. Or an external entity may be the destination, or receiver, of data coming out of the system being modeled. The criterion for being an “external” entity is not whether the entity is outside the organization. Rather, an entity is external if it resides outside of the system being modeled. The name of the external entity, for example, customer, vendor, accounts receivable subsystem, is written inside the entity symbol.

A circle represents a process, or operation, that changes the data coming into that process. In other words, a process identifies the activities, procedures, or both that change the data coming into it. The process may change the content (what the data consists of) or the status (condition, state, classification) of the data. An example is data that confirms the shipment of a customer’s order is changed into the amount owed by the customer by the activity – prepare customer invoice. Another example is a check that is changed into an endorsed check by the activity – endorse check.

An active verb and an object, such as “prepare customer invoice,” is written inside the process symbol. This process with the inflow and outflow of data might appear as shown in Exhibit 2.4. If more than one process symbol is used in a data flow diagram, a unique identification number, such as 1.0, is written inside the process symbol along with the verb and object. The circle is used as the process symbol whether the process is computerized or manual because a data flow diagram illustrates what an accounting system is doing, but not how the processing activities are performed.

An open-ended rectangle is a data store where data resides. For example, data about customers, such as name, address, credit limit, and outstanding balance, are stored in a customer master file. Data about inventory, such as description, selling price, quantity on hand, and reorder point, are stored in an inventory master file. Data can be stored in a paper file or a file on magnetic medium, but this aspect is not important in a data flow diagram. A label should be written inside the symbol to identify the file.

**EXHIBIT 2.3: Data Flow Diagram Symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="External entity" /></td>
<td>External entity (a source or destination of data).</td>
</tr>
<tr>
<td><img src="image" alt="Process" /></td>
<td>Process, or operation, that changes the content or status of data.</td>
</tr>
<tr>
<td><img src="image" alt="Data store" /></td>
<td>Data store.</td>
</tr>
<tr>
<td><img src="image" alt="Data flow" /></td>
<td>Data flow.</td>
</tr>
</tbody>
</table>
A flow line with an arrow is used to identify the direction in which the data flow. Each flow line is labeled to identify the data that are moving from one point to another. Data must flow into or out of a process. Therefore, one end of the flow line must be connected to a process. Data cannot flow, for example, between two entities or between an entity and a data store. Data can be physical, such as a customer invoice or a schedule of aged accounts receivable. Data can take other forms, however, such as a customer’s inquiry, a verbal message, or an electronic message.

For a complex accounting system, multiple data flow diagrams may be needed to represent the entire system. An initial diagram, called a context diagram, shows a high-level overview of the system in which only the system being diagrammed and its relevant environment are displayed. An example of a context diagram for a cash receipts system is shown in Exhibit 2.5. This diagram shows that the system of interest is the cash receipts system. The relevant aspects of the system’s environment are the customer, the general ledger system, and the bank. Note that a context diagram has only one process. The name of the system of interest is printed inside the process symbol.

The next diagram is the level 0 data flow diagram. It describes the entire system on a single sheet of paper. All major processes, data stores, data flows, and external entities are shown.
Subsequently, each process in the level 0 diagram can be further detailed by another data flow diagram. This process is called “explosion.” Each broad process can be exploded further into subprocesses using additional data flow diagrams. A level 0 data flow diagram is shown in Exhibit 2.6.

Please note the introduction of several processes and data stores that were not shown in the related context diagram. This level 0 diagram shows that data originate with the customer; are changed by five processes; and finally reach their destinations—the general ledger system and the bank. The level 0 data flow diagram can be read and interpreted as follows:

- **Customer-Compare customer check and remittance advice (1.0).** A customer sends a check and a remittance advice. A remittance advice is a document that shows the invoice or invoices to which a customer’s payment is to be applied. Generally, a remittance advice is attached to the customer’s invoice or statement so it can be conveniently torn off and sent back to the organization with a check, such as the bill you receive for your cell phone and utility statements. In the first process, the check and remittance advice are compared to ascertain whether they match. If not, the check and remittance advice are filed away to be investigated later. If a match occurs, that information flows to the next process.

- **Compare check and remittance advice (1.0) to Separate check and remittance advice (2.0).** The status of the check and the remittance advice are changed in process 2.0 from being attached to being separated with the check taking one path and the remittance advice taking another.

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**EXHIBIT 2.6: Level 0 Data Flow Diagram for Cash Receipts System**

- **Customer**
- **Check and remittance advice**
- **Cash receipts transaction file**
- **Open invoice file**
- **Customer master file**
- **Remittance advices file**
- **1.0 Compare check and remittance advice**
- **2.0 Separate check and remittance advice**
- **3.0 Endorse check**
- **4.0 Prepare deposit slip**
- **5.0 Record customer payment**
- **General Ledger System**
- **Deposit slip and endorsed checks**
- **Endorsed check**
- **Remittance advice**
- **Cash receipts amount**
- **Unmatched checks and remittance advices file**
- **Check and remittance advice**
- **Bank**
We will first follow the path of the check.

- Separate check and remittance advice (2.0) to Endorse check (3.0). The status of the check is changed in process 3.0 from being an unendorsed check to being an endorsed check.
- Endorse check (3.0) to Prepare deposit slip (4.0). The information on the endorsed check is transcribed onto a deposit slip.
- Prepare deposit slip (4.0) to Bank. The check reaches its final destination — the bank.

We continue reading the data flow diagram by going back to process 2.0, where the check and the remittance advice are separated, and follow the path of the remittance advice.

- Separate check and remittance advice (2.0) to Record customer payment (5.0). The information on the remittance advice is changed into information that is stored in the cash receipts transaction file, the open invoice file (a file that holds unpaid invoice information), and customer master file. The remittance advice itself is stored in the remittance advice file.
- Record customer payment (5.0) to General ledger system. Finally, the information from the remittance advice reaches its final destination — the general ledger system.

As discussed earlier, processes can often be further detailed by another data flow diagram—one for process 1.0, another for process 2.0, and so on. For example, if we were going to provide more detail with regard to process 4.0, the next level diagram would be 4.1 (a level 1 data flow diagram). However, exploding this process to a lower level would require you to think about how you are going to implement the process. That is, if we were to explode 4.0 — Prepare deposit slip, we would be getting into the details of how to prepare the deposit slip. Consequently, this is the point where you probably would decide not explode this particular data flow diagram further.

Data flow diagrams tend to be easy for even nontechnical people to understand, and thus serve as an excellent communication tool. Most accountants prefer to convert data flow diagrams into system flowcharts; however, a small but increasing number regard data flow diagrams as permanent documentation. The main disadvantage of data flow diagrams lies in the difficulty or inability to represent points of detail.

**System Flowchart**

**Learning Objective 7: Describe, read, and prepare a system flowchart.**

A *system flowchart* is a graphic that shows what a system does and how the system does it. It is the type of documentation most frequently used by accountants. System flowcharts document complex activities and detail the sources of information, the processes involved, and the disposition of the information. Flowcharts make processes and interrelationships easy to grasp. A flowchart has more of an “if-then” format, allowing you to see what happens if something else happens. It allows you to see very clearly what a process really is, versus what it should be, and to see where the problems or weaknesses are in the process. Because of the amount of detail that can be shown in a system flowchart, it is used extensively throughout this textbook to clarify many explanations.

The symbols in a flowchart represent the sources of data, the processes to move data through the system, and the disposition of the data. Lines connecting these symbols provide the paths. You can think of a flowchart as a map that outlines the processes necessary to achieve a goal. Although our interest is in flowcharts of accounting systems, you can flowchart almost any activity, for example, an internal control review, audit, accounting system installation, inventory count, manufacturing process, or bidding process.
Although a system flowchart emphasizes the flow of data elements through the system and the role of computer programs and human beings in the processing of accounting data, it may also show which functional areas are responsible for the various processes. The inclusion of this additional information, however, makes a flowchart more complex and difficult to understand.

A variation of the system flowchart is the internal control flowchart. The difference between the two is that an internal control flowchart shows the functional areas to permit identification of the authorization of transactions and other events, the custody of assets, and the recording functions—the functions that need to be segregated for good internal control to prevent irregularities from occurring. In addition, an internal control flowchart identifies all existing control procedures for preventing or detecting errors and irregularities.

In contrast to other types of graphical representation, system flowcharting is governed by national and international standards. The purpose of these standards is to provide uniformity in order to minimize misinterpretation among users of system flowcharts throughout the world. The national standards are accredited by the American National Standards Institute (ANSI). International standards are set by the International Organization for Standardization (ISO). Adherence to standards helps reduce ambiguities and makes system flowcharts more useful and easier to interpret.

The common system flowcharting symbols are shown in Exhibit 2.7a. Examples of various ways to use some of the symbols in Exhibit 2.7a are illustrated in Exhibit 2.7b–f. For example, the first symbol in Exhibit 2.7a is the process, or operation, symbol. Exhibit 2.7b illustrates eight ways that this symbol can be used. Another example is the paper file symbol in Exhibit 7.2a; Exhibit 2.7c shows three different ways that this symbol can be used. You will notice in Exhibit 2.7b that example (8) is the predefined operation symbol. The example is for a predefined file maintenance process, which would actually require several symbols to describe. This one symbol can be used as shorthand for a group of symbols for a process that may be repeated at several different locations in a flowchart. The predefined operation symbol must be defined—that is, exploded into its constituent symbols—elsewhere in the flowchart, possibly on a separate page.

The decision symbol, illustrated in Exhibit 2.7a, is further illustrated in Exhibit 2.7d. Notice the first decision has two exit paths, and the second decision has three exit paths. The important thing to remember with the decision symbol is to be certain all possible results of the decision have an exit path. An example of the use of the document symbol in Exhibit 2.7a is shown in Exhibit 2.7e, where six copies of the sales order are distributed. The use of the on-page connector symbol in Exhibit 2.7a is illustrated in Exhibit 2.7f. Notice the connector symbol and the document it refers to are both repeated on the page to reduce confusion.
EXHIBIT 2.7b: Examples of Process, or Operation, Symbol Usage

*If a flowchart contains both computerized and manual processes, this symbol should be used for the computerized processes only.

EXHIBIT 2.7c: Examples of Paper File Symbol Usage

EXHIBIT 2.7c: Examples of Decision Symbol Usage
As simple as it is, flowcharting is not always easy to do. Adhering to the following four steps prior to actually creating a flowchart can help produce an accurate, usable flowchart:

- Determine the system to be flowcharted, for example, sales order processing, purchase order processing, or payroll processing.
- Determine the level of detail required; in other words, determine the purpose of the flowchart.
- Gain an understanding of the inputs, processes, outputs, files or database tables, and controls in the system by interviewing personnel involved in the system, observing the activities of these personnel, examining the inputs and outputs of the system, and tracing transactions and other events of different types through the system.
- List the steps in the processes.

Some useful guidelines for drawing a system flowchart are listed in Exhibit 2.8. They are not hard-and-fast rules, but they will help preparers represent systems more clearly and make the flowcharts easier to understand.

As mentioned earlier, system flowcharting is governed by national and international standards. The purpose of these standards is to provide uniformity in order to minimize misinterpretation among users of system flowcharts throughout the world. Flowcharting is by no means a science; individual style, particularly as it helps achieve a clear, orderly, and pleasing layout, is most welcome. But adherence to the accepted rules helps reduce ambiguities and makes system flowcharts more useful.

Exhibit 2.9 shows a system flowchart of a cash receipts system. A first step that will help you in reading this and any flowchart is to look for the first activity, which will be a process symbol or a decision symbol. Next, observe the input symbol(s) shown for this activity. Next, observe the output symbol(s) of this same activity. Then proceed to the next symbol, the next, and so on. An interpretation of the flowchart in Exhibit 2.9 is given. It is too early in this course for you to be able to understand all the terms (particularly the file names) used in the following interpretation. Do not be concerned; you will learn them later. The purpose of this exercise is to give you some guidance and practice in reading a flowchart.

- The first activity is a decision as to whether documents match. According to the input symbols for this decision, the documents in question are the customer’s check and the remittance advice that were submitted by the customer.
EXHIBIT 2.8: Guidelines for Effective System Flowcharting

1. Start with the entry of data into the system you are flowcharting.
2. Show all working files or database tables.
3. Show the source and disposition of all major documents and reports. This does not apply to paper journals and ledgers because they do not flow anywhere.
4. Use arrowheads on all flow lines to indicate the direction of the flow.
5. Make the direction of the flow lines primarily from left to right and top to bottom. Occasionally, these directions can be reversed when it makes the flowchart more concise, but this should be done sparingly.
6. Avoid crossing flow lines to the extent possible.
7. Put the entire system on one page unless it is impractical to do so.
8. Use on-page and off-page connectors sparingly. An overuse of connectors indicates poor layout and makes the flowchart hard to follow.
9. Use telegraphic, keyword active style in the words on the flowchart, leaving out nonessential words, such as “a,” “an,” and “the”.
10. When abbreviating is necessary, use standard abbreviations only, or use a footnote or legend to explain nonstandard abbreviations.
11. Include written comments whenever it helps make a flowchart more complete or easier to understand. Comments can be included within the flowchart using the comment symbol, or they can be included as footnotes at the bottom or on one side.
12. If showing segregation of duties, use vertical columns, horizontal rows, or the organizational change symbol.
13. Do not leave dangling branches. A dangling branch occurs when a process suddenly stops on the flowchart, but obviously needs other activities to complete the process. Explain what happens with a note or show data going into another system.
14. Place a title, the preparer’s name, and the date on all pages of the flowchart. Number pages as “page x of n,” for example, “page 1 of 3,” so the reader will know when the flowchart is complete.
15. Use a template for symbols if drawing the flowchart by hand.

- The possible exit paths from this decision are yes and no. If the conclusion is no, the documents do not match, then both documents are filed in a paper file by date.
- If the conclusion is yes, the documents do match, and the check and the remittance advice are separated.

We will follow the path for the customer’s check first and then will come back to follow the path for the remittance advice.
• The customer’s check is endorsed and a deposit slip is prepared for it as well as all other checks that have reached this point in the system.

• The endorsed checks and deposit slip are taken to the bank.

We now can go back to the point in the flowchart where the customer’s check and remittance advice were separated and follow the path for the remittance advice.

• Data from the remittance advice are entered into the cash receipts transaction file in the computerized system, and the data are verified for accuracy.

Two paths flow from this last process. We can either follow what happens to the remittance advice or to the cash receipts transaction file. We will follow the remittance advice first.

• The remittance advice whose data have now been captured in the computerized system are filed away by date.

Now, we can follow what happens with the cash receipts transaction file. As you can see, three paths flow from this file.

EXHIBIT 2.9: Guidelines for Effective System Flowcharting
• A computer program sorts the records in the cash receipts transaction file by customer number and then uses the sorted file to update (makes changes to) the customer master file.

• A computer program sorts the records in the cash receipts transaction file by invoice number and then uses the sorted file to update (make changes to) the open (unpaid) invoice file.

• A computer program summarizes the data in the cash receipts transaction file and transfers the summarized data to the general ledger system.

When comparing this flowchart to the level 0 data flow diagram in Exhibit 2.6, you can observe the differences in the two graphical representations since they are for the same system. The system flowchart depicts a greater level of detail and could be presented at an even greater level of detail by using more symbols to show the cash receipts transaction file is archived, to show the various reports that are generated in the system, and to show how the data that have been entered into the system are verified for accuracy. It could also show who performs the matching of the documents, who endorses the checks, who prepares the deposit slips, and who takes the deposits to the bank. Comment symbols could also be included to explain the decision procedures, to explain what happens to customer checks and remittance advices that do not match, to explain document and archive file retention policies, and to indicate how frequently the updating of files takes place and how frequently deposits are made. Alternatively, these explanations could be provided in footnotes.

System flowcharts can be as simple or as complicated as is necessary to convey the intended description of the accounting system. An overview presentation may be all that is needed as a visual aid for presentation to upper management. Its purpose may be to show how the system cuts across organizational boundaries, how it affects management responsibilities, and what coordination is required. On the other hand, a detailed representation may be necessary, for example, for an auditor to evaluate the internal controls in a system to determine whether data are being processed error-free. In addition, the detailed representation also provides a means for management and auditors to review the control system of a process. Frequently, a set of related flowcharts is prepared, each providing a different view of the system and incorporating a different level of detail. An overview flowchart may be expanded by providing several charts with more details of the system. System flowcharting provides considerable flexibility in representing systems for multiple purposes (Vignette 2.2).

Business Process Modeling

Learning Objective 8: Discuss business process modeling and how business processes are mapped using the Unified Modeling Language (UML)

Business Process Modeling is another form of graphical representation. Common languages used to illustrate the business process include the Business Process Modeling Notation (BPMN) and the Unified Modeling Language (UML). Business process modeling has the advantage of allowing communication to stakeholders and others regarding how the process operates and some tools offer the ability to run simulations (e.g., Provision, TIBCO).

One of the benefits of process modeling is to steer organizations away from a function or procedure focus and encourage organizations to evaluate their operations in terms of the total process (e.g., the revenue process in a sales-supported organization begins with a call to a customer by a sales representative and ends with collection of cash from the customer and the sales analysis function). Process orientation allows management to focus on measurements and improvement solutions that take into account interdependencies among activities within a process. Examples of interdependencies among processes includes the interaction of the revenue process with the purchasing and inventory processes (Exhibit 2.10).
While reviewing a client’s system documentation, an auditor noticed a reference to a programmed control procedure in a system flowchart. The control was supposed to screen transaction dates and to accept transactions and other events only if they were dated in the current month. The flowchart indicated that transactions and other events with past or future dates would be rejected and listed on an exception report. The auditor examined the source code for the input program and saw that it contained a subroutine to segregate offending transactions and other events and generate the exception report. She made a note to test the control later and then continued to review the documentation.

A test run failed to verify the existence of the control. When transactions and other events were entered with past or future dates—or even ones with invalid dates such as 13/35/2014—they were all processed, and no exception report was generated. Inquiries revealed that the control had indeed been built into the system, but it never worked successfully and was removed so that the system could be implemented on schedule. The developers intended to go back later to fix the control, but they never had time. Also, they forgot that the control was still referred to in the system flowchart.

The auditor concluded not only that the control was missing, but also that the client’s organization was lax in its systems development and documentation procedures. In the letter addressed to management at the end of the audit engagement, the accounting firm recommended that both weaknesses be remedied. In particular, the accounting firm recommended that the client establish documentation standards to guide the future preparation and maintenance of system documentation.

**Thought Questions:**

What recommendations would you list in your report?

What actions should the firm take to avoid documentation problems in the future?
A business process model describes more than just the flow of information or activities. It can also include descriptions of other aspects of the business such as infrastructure, trading practices, and operational policies and procedures. Business processes can be 1) operational (such as those illustrated in Exhibit 2.10), 2) governance/strategic (such as IT governance), or 3) sustaining/support (such as technical support or hiring practices). A business process can have several sub-processes (or sub-systems). Review of Exhibit 2.10 illustrates the sub-processes in the revenue process that include Sales Order Processing, Shipping, Customer Invoicing, and Cash Receipts. All business processes and sub-processes should be structured to allow the organization to meet its business objectives.

**Business Process Mapping** is a form of business process modeling that can be described as an enhanced flowchart—a graphical representation of a business process that includes 1) descriptions of exactly what the process does to promote the organization’s strategy, 2) who is responsible for what, 3) standards to be maintained in the process, and 4) performance indicators or other measures of process success. Business process mapping can help an organization comply with standards such as ISO 9001, which requires the organization to use a process-focused approach in managing the business. The purpose of standards such as ISO 9001 is to provide assurance that the process(es) is (are) in compliance with the related standard and that the process(es) are consistently performing procedures, using resources efficiently. Business process maps can include drivers and triggers for activities within a process, as well embedded key performance indicators to evaluate operations. Consequently, business process mapping can assist the organization in reaching multi-dimensional goals such as improved service level agreement (SLA) transparency, achievement of business process reengineering, compliance with laws and regulations, and activity analysis.

A simple example of a business process map using Unified Modeling Language (UML) can be found in Exhibit 2.11. The narrative for this business process map is as follows: our customers send us purchase orders for the items they need. This information enters our sales order process through an interface with the sales order process subsystem, which converts the customer’s purchase order information to a sales order in a format our system can translate/understand. If the items ordered are available, the sales order is processed and the information is sent to the warehouse personnel for processing of the shipment of items. If the items ordered are not available, the customer has the option to agree to wait for the items to come in or can cancel the order. If the customer agrees to wait, a sales order is processed as a backorder. If the customer wants to cancel the order, a sales representative notifies the customer by phone that the order will be cancelled; the call includes recommendations for other items that might be substituted for the originally ordered items. Once the sales order is processed, the open sales order repository is updated and relevant reports (such as aging reports) are generated and sent to the Sales Manager. Information from the processed sales orders is used to prepare an invoice, which is processed in the Billing department. Note that the Sales Order Aging Report is a performance measure of the effectiveness/efficiency of the inventory management system and the sales order processing system. The notification of order cancellation and options for alternative items communicated by a phone call to the customer is an example of how follow-up to maintain customer relationships is accomplished.

The Sarbanes-Oxley Act (SOX) has encouraged a process-oriented approach to auditing and managing the controls affecting financial statement disclosure. The identification of key financial reporting controls required by SOX demands an understanding of business processes so that the auditor and management can focus on the true key controls when developing, maintaining, and testing a business unit’s control system.
Learning Objective 9: Appreciate the advantages of computer-assisted systems documentation tools.

Flowcharting software programs offer a major breakthrough in productivity by significantly reducing the time and effort needed to create and maintain system documentation. Microsoft’s Visio is a popular program for microcomputers. Flowcharting software programs come with many standardized flowchart and diagram symbols. The symbols are categorized into templates that are shown on the computer screen in the same way as toolbars. Symbols are easily placed on a drawing page on the screen by using a mouse. They can be moved from one part of the drawing page to another and can be enlarged or reduced. Straight or curved flow lines connecting symbols are added with a mouse. Titles, legends, footnotes, and other textual material can be added as needed. Completed charts or diagrams are stored in electronic files and can be retrieved quickly for future use.

Once a chart or diagram is created and stored, it can be edited quickly and efficiently without redrawing the chart. Frequently used components of charts—such as a data input routine or a file maintenance routine, for example, changing a customer’s address—can be stored for insertion into a number of charts. The charts or diagrams can be printed using a high-quality printer. The low cost of editing and printing graphical documentation is an important advantage of the use of these software programs.

Software programs for preparing charts and diagrams are rudimentary forms of CASE software. CASE, which stands for Computer-Assisted Software Engineering, consists of a number of software tools that assist in the development of information systems. Among these tools are aids for the preparation of various types of system documentation, including block diagrams, data flow diagrams, and system and program flowcharts. CASE software automatically indexes and cross-references documentation to facilitate retrieval and exchange of information.

Documentation stored in machine-readable form—whether using simple flowcharting programs or sophisticated CASE software—can also be distributed electronically to others. Documentation files can be shared or transferred to other computers over a common network.
Charles Meyer Associates was a leading producer of high-quality accounting software. It marketed a full range of prepackaged software and also developed accounting software to customers’ specifications. The use of a CASE system greatly accelerated the development of software. Systems developers prepared documentation using interactive workstations. As soon as one designer released a document into the common database, it was available for others to use. The CASE system made possible the review and evaluation of systems designs as soon as they were produced.

During the development of a payroll package, Dan Geiger pulled up the specifications for the payroll transaction file. Dan was trained as an auditor, and his job was to review the control effectiveness of the programs sold by the company. He immediately noticed that the transaction type code would fail to distinguish between hourly and piecework employees.

Dan entered a message through his terminal, alerting the designer of the file about his concern. A few minutes later, a message flashed up on Dan’s screen:

Thanks for the tip. I had forgotten the problem of employee crossover. By the way, you auditors are really on the ball. I only designed that file 20 minutes ago!

Cheers, Ruth

Thought question:
Why would it be important to distinguish between hourly and piecework employees?

Narrative descriptions are easily prepared and maintained using word-processing software. All of the word-processing programs available for use on PCs are suitable for this task and permit the importation of graphics material prepared in other software programs. CASE software often includes word-processing functions that can be interfaced with graphics functions and canned functions for preparing specific types of documentation such as file and database specifications.

Summary

This chapter has presented the concepts, types, and uses of graphical and narrative techniques in documenting accounting systems. The Sarbanes-Oxley Act of 2002 requires companies to document their internal control in detail.

System narrative descriptions, block diagrams, data flow diagrams, and system flowcharts are used frequently by accountants. Flowcharts and other types of system documentation are essential tools for accountants, whether they are system implementers, auditors, end users, systems designers, managers, or others who are involved with accounting systems in performing their work. To be effective, accountants should acquire the basic skills necessary to read and prepare system flowcharts and other types of diagrams.

Business process modeling is an extended form of system flowcharting, as it shows what the process does to promote the organization’s strategy, who is responsible for what, and indicates standards and key performance measure for process success.

Software packages have made creating and maintaining graphical documentation considerably easier and less expensive. These packages also make updating and changing flowcharts much easier. Available tools range from simple flowcharting packages for personal computers to elaborate CASE software operated on large computers with interactive workstations.
Key Terms

Block diagram (horizontal and hierarchical) Documentation (as it relates to accounting systems)
Business process mapping Documentation standards
Business process modeling Internal control flowchart
CASE (computer-aided software engineering) Level 0 data flow diagram
Computer-Assisted Software Engineering Remittance advice
Context diagram System narrative description
Data flow diagram System documentation

Discussion Questions, Problems, and Activities

1. What symbol would be used in a data flow diagram to represent the processing of employees’ time cards?

   A. ![Symbol A]
   B. ![Symbol B]
   C. ![Symbol C]
   D. ![Symbol D]

2. What symbol would be used in a data flow diagram to represent employees’ payroll data stored on magnetic disk?

   A. ![Symbol A]
   B. ![Symbol B]
   C. ![Symbol C]
   D. ![Symbol D]

3. Flowcharting as a prelude to internal control evaluation provides what advantage over the use of narrative descriptions?
   a. Ease of preparation.
   b. Comprehensive coverage of controls.
   c. Cost effective.
   d. Ease in following information flow.

   [CIA adapted]
4. The flowchart of a client’s accounting system is a diagrammatic representation that depicts the:
   a. way the system should be.
   b. way the system currently is.
   c. the types of irregularities that are probable, given the present system.
   d. key controls of the business process represented.

5. Exhibit 2.8 lists some recommended guidelines for effective system flowcharting. Which of the following describes the normal flow of documents and operations on a well-prepared systems flowchart?
   a. Top to bottom and left to right.
   b. Bottom to top and left to right.
   c. Top to bottom and right to left.
   d. Bottom to top and right to left.

6. What does the diamond-shaped symbol commonly used in flowcharting show or represent?
   a. Process or single step in a procedure or program.
   b. Display device.
   c. Decision point.
   d. Predefined process.

7. Which of the statements below properly describes the section of the flowchart illustrated below?
   a. A master file has been created by a manual operation.
   b. A master file has been created by a computer operation.
   c. A document has been generated by a computer operation.
   d. A document has been generated by a manual operation.

8. What is the correct labeling, in order, for the following flowchart symbols?
   a. Document, display device, magnetic disk storage, and manual process.
   c. Display device, document, magnetic disk storage, and computerized process.
   d. Manual process, document, magnetic disk storage, and computerized process. [CMA adapted]

9. What is the symbol that would be used for determination of whether an employee’s wages are above or below the maximum limit for FICA taxes?
   [CMA adapted]
10. In a system flowchart, what symbol would be used to represent the printing of the employees’ paychecks by the computer?

![Symbol Options]

[CMA adapted]

11. In a system flowchart, what symbol would be employed to represent that the employees’ checks have been printed by the computer?

![Symbol Options]

[CMA adapted]

12. In a systems flowchart, the symbol that would be used to represent the physical act of collecting employees’ time cards for processing is:

![Symbol Options]

[CMA adapted]

13. In a systems flowchart, the symbol that would be used to represent the employees’ payroll records stored on magnetic disk is:

![Symbol Options]

[CMA adapted]
14. In a systems flowchart, the symbol that would be used to represent the weekly payroll register generated by the computer is:

A.  
B.  
C.  
D.  

[CMA adapted]

15. Which of the following flowcharts indicates that new sales transactions and the customer master file have been used to prepare sales orders, a sales journal has been printed, and the customer master file has been updated?

A.  
B.  
C.  
D.  

16. Which of the representations below illustrates that a sales invoice has been filed?

A.  
B.  
C.  
D.  
The following flowchart applies to questions 17 and 18.

17. The symbol at Point A represents:
   a. input or output processing.
   b. a decision.
   c. operations.
   d. a computer program.
   [CMA adapted]

18. The symbol at Point B represents a:
   a. magnetic storage device.
   b. connector.
   c. floppy disk drive.
   d. display device.
   [CMA adapted]

19. Draw the correct flowcharting symbol for each of the following decision situations:
   a. Does the account have a zero balance?
   b. Is the quantity on hand less than or equal to the reorder point?
   c. Is the age of the account less than or equal to 30 days old, 31 to 60 days old, or over 60 days old?

20. Draw the correct flowcharting symbols for the following storage activities:
   a. A paper purchase order going into a file arranged by date.
   b. A sales transaction file stored on magnetic disk.

21. Draw the correct flowcharting symbol for each of the following processing activities. If a legend is noted in parentheses beside a process, include the legend in some suitable manner.

   **Manual processes:**
   a. Prepare invoice.
   b. Make bank deposit (First National Bank).
   c. Verify transaction entries (assistant controller).
   d. Post transactions to the ledger (reference E9).
Computerized processes:
e. Sort customer file alphabetically.
f. Retrieve all open accounts (program #RTVOPN).
g. Copy the sales transaction file (Computer #20).
h. Perform file maintenance on inventory file (operator #J-2).

22. Draw the correct symbol for each of the following documents:
   a. A monthly open order report
   b. Four copies of a materials requisition form, all of which go to the stores clerk
   c. Five copies of a customer invoice distributed as follows: Copies 1 and 2 to the customer, Copy 3 to accounting, Copy 4 to sales, and Copy 5 to shipping

23. Aquamarine Company, a manufacturer of heavy machinery, uses materials requisition forms to control the release of raw materials into production. Four copies of a materials requisition form are prepared by personnel in the production department. The supervisor in the production department must authorize each materials requisition before it can be used to withdraw materials from the stores department. If the supervisor does not authorize the requisition, all four copies are marked “not authorized” and filed in a paper file by number. If the supervisor authorizes the requisition, all four copies are taken to the stores department.
   Required:
   Prepare a detailed systems flowchart of the portion of the production system described. Show who does what by making one column for the production department and one column for the stores department.

24. Adam Company uses a job costing system to keep track of the 2,000 jobs that typically are in the factory at any one time. The direct materials, direct labor, manufacturing overhead costs are stored in a production cost transaction file on magnetic disk. A computer program sorts this transaction file by job number and then uses the sorted file to update the open (unfinished) job file, which is also maintained on magnetic disk. An unfinished jobs report is prepared from the open job file and is delivered to the production manager.
   Required:
   Prepare a detailed systems flowchart of the portion of the production system described.

25. Mason Company uses a purchase order processing system to handle its purchase orders. The broad perspective of the system is that an authorized purchase requisition comes into the system from the warehouse. A purchase order flows out of the system and goes to the vendor.
   Required:
   Prepare a context diagram to show the high-level overview of this system as described.

26. Mason Company’s purchase order processing system can be described in more detail than it was in the previous question. When an authorized purchase requisition comes into the system, it is checked to see that it has been authorized. Furthermore, the budget master file is accessed to ensure the purchase is covered by the authorizer’s budget. After the purchase requisition has been validated, a vendor is selected from those in the vendor master file. At this time, a purchase order is prepared and the purchase requisition is filed away in the purchase requisition file.
   All the departments in the organization that will be affected by this purchase are notified. These departments are the warehouse, receiving department, and accounts payable department.
   The purchase order is submitted to the vendor. The purchase order data are recorded in the open purchase order file, which is a file that stores unfilled purchase orders. The vendor sends back an acknowledgment that the order will be filled. That information is also entered into the open purchase order file.
   Required:
   Prepare a level 0 data flow diagram for Mason Company’s purchase order processing system.

27. What are some of the advantages of business process mapping over system flowcharts?

NOTES
1. For more information about business process mapping, refer to talk.bmc.com/blogs/blog-wiles/van-wiles/PROCESSDOC1