
Chapter 1

Accounting Information Systems and the Accountant

After studying this chapter, you will be able to:

1. Describe the significant impact of information technology (IT) on the accounting profession and *explain* why you need to study accounting information systems.
2. *Identify* career opportunities that combine accounting and IT knowledge and skills.
3. *Explain* how IT influences accounting systems.
4. *Give examples of* how financial reporting is changing with advances in IT.
5. *Give examples of* how accountants use business intelligence for decision-making.
6. *Identify* what is new in the area of accounting information systems.
7. *Distinguish* between terms such as “systems,” “information systems,” “information technology,” and “accounting information systems.”

“In the accounting profession, for example, firms working with clients that own large mineral deposits or mining operations can now use drones to fly over the area, taking thousands of pictures and measurements. CPAs can then use that data to provide exact estimates of holdings. “Their balance sheets and their assets are literally sitting on the ground,” and drones can quickly calculate inventory estimates by flying over the area ...”

Ovaska-Few, S. 2017. Drones set to invade accounting profession. CPA Insider, *Journal of Accountancy* (January 23): Available online.

1.1 INTRODUCTION: WHY STUDY ACCOUNTING INFORMATION SYSTEMS?

This chapter begins by answering the question “why should you study accounting information systems?” There are so many reasons, but one of the most important is because of the special career opportunities that will enable you to combine your study of accounting with your interest in computer systems. In today’s job market, accounting employers expect new hires to be computer savvy. A large number of specialized and highly compensated employment opportunities are only available to those students who possess an integrated understanding of accounting and information systems and can bring that understanding to bear on complicated business decisions.

Think about it. When is the last time you went into a bank, filled out a piece of paper to withdraw cash from your bank account, and then stood in line waiting for a

teller to help you? When is the last time you went to a travel agency to ask someone to find you an airline ticket for your spring break vacation to Florida or the Virgin Islands?

Or when is the last time you stood in line to fill out paperwork for the courses you wanted to take for next semester? Most likely, the answer to each of these questions is “never.” And that is because of information technology (IT). Information technology is so pervasive today that it is nearly impossible to do anything that does not in some way involve technology. So ask yourself the question “how can you possibly be a successful accountant if you do not have a basic understanding of how technology influences the profession?”

1.2 CAREERS IN ACCOUNTING INFORMATION SYSTEMS

Our introductory remarks to this chapter suggest a variety of reasons why you should study **accounting information systems (AISs)**. Of them, perhaps the most interesting to students is the employment opportunities available to those who understand accounting, information systems, and the applicable technologies.

Traditional Accounting Career Opportunities

Certainly, a number of traditional accounting jobs in corporate and public accounting are available to those who choose to study accounting and information systems. Technology plays a very strong role in public accounting and auditing, internal auditing, managerial accounting, fraud examination, and taxation. Recognizing the importance to accountants of knowledge about IT and information systems, the American Institute of Certified Public Accountants (AICPA) developed a new designation, the **Certified Information Technology Professional (CITP)**, that accountants can earn with business experience and if they pass an examination. This certification signifies superior knowledge in IT, information systems, and specialized information management systems.

Case-in-Point 1.1 The AICPA has an Information Management and Technology Assurance (IMTA) Section that supports CPAs who offer assurance services and information management support for their clients. This section provides access to resources to help CPAs understand how the use of data and reports from information systems can lead to better business decisions. Members also gain an understanding of how they can use IT and information systems skills combined with financial insight to evaluate technology risks.¹

Employer demand is high for employees with a combination of accounting and IT/systems skills. For example, in 2017 in the corporate world, financial systems administrators generally earned between \$61,250 and \$84,000, while project managers ranged from \$80,250 to \$110,250, and managers from \$98,000 to \$130,750.²

Systems Consulting

A consultant is an outside expert who helps an organization solve problems or provides technical expertise on an issue. **Systems consultants** provide help with issues

¹ American Institute of Certified Public Accountants, accessed from www.aicpa.org, March 2017.

² Robert, H. 2017. “Salary guide for accounting and finance,” accessed from www.roberthalf.com, March 2017.

concerning information systems—for example, by helping an organization design a new information system, select computer hardware or software, or reengineer business processes so that they operate more effectively.

One of the most important assets a consultant brings to the job is an objective view of a client's organization and its processes and goals. Students who are skilled in both accounting and information systems are particularly competent systems consultants because they understand how data flow through accounting systems as well as how business processes function. Systems consultants can help a variety of organizations, including professional service organizations, public and private corporations, and government agencies. This broad work experience, combined with technical knowledge about hardware and software, can be a valuable asset to CPA clients. Because it is likely that a newly designed system will include accounting-related information, a consultant who understands accounting is particularly helpful. Many systems consultants work for large professional service organizations, such as Accenture, Protiviti, or Capgemini, as well as for the consulting divisions of CPA firms. Others may work for specialized organizations that focus on the custom design of AISs.

Consulting careers for students knowledgeable in AISs also include jobs as **value-added resellers (VARs)**. Software vendors license VARs to sell a particular software package and provide consulting services to companies, such as help with their software installation, training, and customization. That is, VARs are individuals who take a product and add value to the product for their customers, which might include services such as strategic planning, system design and implementation, technical support, database development, and other similar services. A VAR may also set up a small one-person consulting business or may work with other VARs and consultants to provide alternative software solutions to clients.

Fraud Examiner or Forensic Accountant

Due to increased concerns about terrorism and corporate fraud, forensic accounting and fraud examination are important areas for accountants to study and develop their skills. An accountant can acquire the **Certified Fraud Examiner (CFE)** certification by meeting the qualifications of the Association of Certified Fraud Examiners (ACFE). To become a CFE, an individual must first meet the following qualifications: have a bachelor's degree, at least 2 years of professional experience in a field either directly or indirectly related to the detection or deterrence of fraud, be of high moral character, and agree to abide by the bylaws and code of professional ethics of the ACFE. If a person meets these requirements, then she or he may apply to sit for the CFE examination.

You might be asking yourself what sort of professional experience might be useful if you wish to satisfy the 2-year requirement for certification. Not surprisingly, these jobs may be located within CPA firms across the United States, as well as within international public accounting firms. Other such positions might include working for a business organization as an internal auditor, with a valuation expert in a law firm, with an FBI or CIA agent, or as an auditor for Medicaid, Medicare, or many other government organizations.

The AICPA also offers the Certified in Financial Forensics (CFF) designation for CPAs who want to specialize in the area of Forensic Accounting. The knowledge base for this certification includes computer forensic analysis. A forensic accountant with an IT background is very helpful in the investigation of cyber crime and breaches in cyber security.

Fraud examiners and forensic accountants use software data analytical tools like ACL Analytics and IDEA Data Analysis to analyze large quantities of data and to

Job Title	Salary Range
Fraud Investigator	\$39,551–91,715
Senior Internal Auditor	\$53,424–90,613
Internal Auditing Manager	\$74,441–111,778
Internal Auditor	\$42,971–76,480
Senior Auditor	\$50,848–95,600

FIGURE 1-1 Examples of job titles and pay range for Fraud Examiners and Forensic Accountants. Source: 2017 Salary guide for accounting and finance, www.roberthalf.com, accessed March 2017.

perform advanced digital forensics. The objective is to reduce fraud risk and to detect fraud.

The salary ranges and possible job locations are varied. Most positions will likely be located in larger metropolitan areas, but may also be found in mid-sized cities. From the chart for 2017 (Figure 1-1), you can see the salary ranges for several types of positions.

Essentially, fraud occurs where there are weak internal controls or when a manager or employee circumvents the internal controls that are in place. A more detailed explanation of internal controls is contained in Chapters 6 and 7.

Information Technology Auditing and Security

Information technology (IT) auditors focus on the risks associated with computerized information systems. These individuals often work closely with financial auditors to assess the risks associated with automated AISs—a position in high demand because almost all systems are now computerized. Information systems auditors also help financial auditors decide how much time to devote to auditing each segment of a company's business. This assessment may lead to the conclusion that the controls within some portions of a client's information systems are reliable and that less time needs to be spent on them—or the opposite. Due to the growing need for this type of auditor, we devote an entire chapter to IT auditing—Chapter 11.

IT auditors are involved in a number of activities apart from assessing risk for financial audit purposes. Many of these auditors work for large CPA firms, such as Ernst & Young, PwC, Deloitte, or KPMG. Figure 1-2 identifies a partial listing of the types of services offered by Ernst & Young.

Assurance Services

- Financial statement attestation
- Internal control reporting
- Assess procedures and controls concerning privacy and confidentiality, performance measurement, systems reliability, outsourced process controls, information security

Business Risk Services

Fraud Investigation and Dispute Services

Technology and Security Risk Services

Specialty Advisory Services

FIGURE 1-2 A sample of the many types of services offered by Ernst & Young LLP, one of the largest international professional service organizations.

IT auditors might be CPAs, or they might be licensed as **Certified Information Systems Auditors (CISAs)**—a certification given to professional information systems auditors by the **Information Systems Audit and Control Association (ISACA)**. To become a CISA, you must take an examination and obtain specialized work experience. Many CISAs have accounting and information systems backgrounds, although formal accounting education is not required for certification. IT auditors help in documenting and evaluating IT controls.

According to the ISACA website, there is a growing demand for employees who have IS audit, control, and security skills. The CISA certification is therefore in high demand because CISA employees are highly qualified, experienced professionals who provide the enterprise with certification for IT assurance that has global recognition. These employees have proficiency in technology controls. They demonstrate competency in standards and practices, organization and management, processes, integrity, confidentiality, availability, and software development, acquisition, and maintenance. They also demonstrate a commitment to providing the enterprise with trust in and value from its information systems.³

Case-in-Point 1.2 According to Cindy Wyatt, Managing Member at Insyte CPAs, LLC in Birmingham, Alabama, who herself has passed the CISA certification examinations, “Technology is paramount in today’s business environment. Accountants who understand information technology controls are far more effective in their careers, and thus, far more valuable to the organizations they serve.”

Sometimes the best way to assess the risks associated with a computerized system is to try to penetrate the system, which is referred to as **penetration testing**. These tests are usually conducted within a systems security audit from which the organization attempts to determine the level of vulnerability of their information systems and the impact such weaknesses might have on the viability of the organization. If any security issues are discovered, the organization will typically work swiftly to correct the problems or at least mitigate the impact they might have on the company. But what if someone else penetrates an organization’s systems? That is commonly called “hacking” and is usually a very serious problem for any company. We cover hacking in more detail in Chapter 10.

Case-in-Point 1.3 In 2013 and 2014, Yahoo Inc. had its systems hacked, affecting over a billion user accounts. The hacker(s) penetrated Yahoo’s network and were able to steal user names, email addresses, dates of birth, telephone numbers, and encrypted passwords. Yahoo disclosed that it had spent \$11 million in legal fees and \$5 million to investigate the breach and patch the security holes. The CEO, Marissa Mayer had to also forego her 2016 cash bonus of around \$2 million and her 2017 equity award of no less than \$12 million.⁴

Predictive Analytics

What you will soon learn from studying this book, and hopefully through reading professional accounting journals, is that the accounting profession is constantly changing. To be successful as an accounting professional, you will need to stay abreast of these

³ The Benefits of CISA, accessed from ISACA (www.isaca.org), March 2014.

⁴ Seetharaman, D. and R. McMillan. Yahoo CEO Marissa Mayer takes pay cut over security breach. March 1, 2017, *Wall Street Journal*, accessed March 2017.

changes, or better yet get out in front of some of the expected trends in the profession. One of those trends that we want to alert you to is the rapidly growing opportunities in the field of predictive analytics, which is the result of the tremendous amount of data that is now available within organizations (e.g., data warehouses, which offer opportunities for data mining). In the future, this is the most likely area where you can add value—by being able to analyze that data and make useful business predictions for your clients.

You might be surprised to learn that a number of accounting jobs already require this type of skill set—for example, jobs such as client service analyst, quantitative analyst, risk analyst, and financial planner and analyst (responsible for preparing the annual plan and long-range or 5-year plan for a company and usually reports to the CFO).⁵ So what exactly is predictive analytics, and what does this type of professional do? The predictive analytics professional uses a variety of skills and abilities, ranging from statistical analysis, data modeling, and data mining used by management to make predictions about the future.

This might require a mind shift for some accounting majors. Rather than seeking an MBA degree or an MS in accounting, consider an MS degree in analytics or business analytics. There are now over 100 such degree programs in the United States, offering full-time, part-time, and online delivery. So that you can appreciate the strong demand for this new type of credential, the first MS in Analytics program was available in 2007, and around 25% of these programs just started since 2016.⁶ If you go to the website at footnote 6, you can find the universities that offer these programs, the length of each program, the cost, and the curriculum. You might also be interested in the 2016 median starting salary of \$87,700 *with no experience* (see Institute for Advanced Analytics, MSA Infographic, analytics.ncsu.edu, accessed March 2017).

1.3 ACCOUNTING AND IT

IT is pervasive and impacts every area of accounting. Instantaneous online access is available via mobile communication devices such as cell phones, iPads, smartphones, and so on, which enable activities to take place anytime, anywhere. For example, managerial accountants can complete important work tasks while traveling in the field, auditors can communicate with each other from remote job sites (while auditing the same client), staff accountants can text message one another from various locations, and tax experts can download current information on tax rulings.

Figure 1-3 provides an overview of the major areas within the field of accounting impacted by information technology. This section of the chapter considers the influence of IT on each of them.

Financial Accounting

The major objective of the **financial accounting information system** is to provide relevant information to individuals and groups *outside* an organization's boundaries, for example, investors, federal and state tax agencies, and creditors.

⁵ icrunchdata.com, accessed March 2014.

⁶ "Survey of graduate degree programs in analytics," Institute for Advanced Analytics, analytics.ncsu.edu, accessed March 2017.

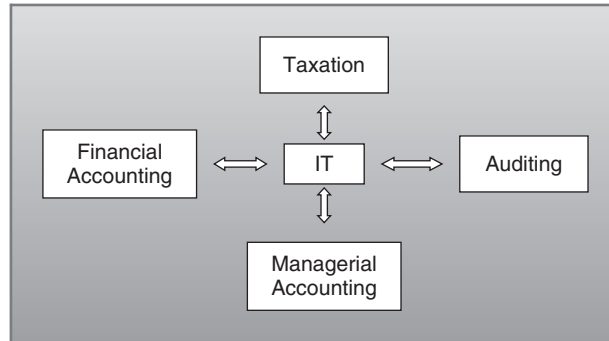


FIGURE 1-3 Overview of the major areas of accounting impacted by information technology.

Accountants achieve these informational objectives by preparing financial statements such as income statements, balance sheets, statements of stockholders' equity, and cash flow statements. Of course, managers *within* a company might also use these financial reports for planning, decision-making, and control activities. However, for most decisions within the firm, managers likely use managerial accounting reports.

Recall from your introductory financial accounting course that an organization's financial accounting cycle begins with analyzing and journalizing transactions (e.g., this data is captured when a business event occurs that has a monetary impact on the financial statements) and ends with its periodic financial statements. Accounting clerks, store cashiers, or even the customers themselves input relevant data into the system that stores these data for later use. In financial AISs, the processing function also includes posting these entries to general and subsidiary ledger accounts, preparing a trial balance from the general ledger account balances, and preparing financial statements.

Nonfinancial Data. The basic inputs to, and outputs from, traditional financial accounting systems are usually expressed in monetary units. This can be a problem if the AIS ignores nonmonetary information that is also important to users. For example, an investor might like to know what the prospects are for the future sales of a company, but many financial AISs do not record information such as unfulfilled customer sales because such sales are not recognizable financial events for accounting purposes, even though they represent important business events. The AIS is a subset of the management information system of an organization, which also stores important nonfinancial information about organizational resources, business events, and agents (customers, vendors, banks, etc.) in databases precisely because they are relevant to the decision-making processes of their users.

Inadequacies in financial performance measures have encouraged companies to consider nonfinancial measures when evaluating performance. Some of the advantages include the following: (1) nonfinancial measures can provide a closer link to long-term organizational strategies; (2) drivers of success in many industries are “intangible assets” such as intellectual capital and customer loyalty, rather than the “hard assets” that are recorded on balance sheets; (3) such measures can be better indicators of future financial performance; and (4) investments in customer satisfaction can improve subsequent economic performance by increasing revenues and loyalty of existing customers, attracting new customers, and reducing transaction costs.⁷

⁷ Ittner, C. and D. Larcker. “Non-financial performance measures: What works and what doesn't,” December 6, 2000, Knowledge@Wharton (knowledge.wharton.upenn.edu), accessed March 2017.

Several professional associations now formally recognize that nonfinancial performance measures enhance the value of purely financial information. For example, in 1994 a special committee of the AICPA recommended several ways that businesses could improve the information they were providing to external parties by including management analysis data, forward-looking information such as opportunities and risks, information about management and shareholders, and background information about the reporting entity. Similarly, in 2002, the American Accounting Association (AAA) Financial Accounting Standards Committee recommended that the *Securities and Exchange Commission (SEC)* and the *Financial Accounting Standards Board (FASB)* encourage companies to voluntarily disclose more nonfinancial performance measures.

There are several suggestions that are important to keep in mind if a company chooses to collect metrics around nonfinancial performance measures. For example, keeping track of the information, such as using a dashboard, is very helpful. (We discuss dashboards in more depth in the next section of this chapter and in Chapter 5.) Also, limiting the number of measures is important so that a company remains focused on those that are truly critical to the performance of the company. And finally, management should closely monitor the nonfinancial performance measures to make sure that they are relevant to the company's success.

Case-in-Point 1.4 The ThyssenKrupp company uses nonfinancial performance indicators to monitor sustainability, innovations, employees, environment and climate, and corporate citizenship. The company summarizes their goal in the following statement. “Our performance is reflected not only in our financial results, but also in the sustainability of our actions. We develop efficient solutions that conserve resources and protect the climate and the environment. For this we need capable employees—so we place strong emphasis on training and development and health and safety.”⁸

Real-Time Reporting. Another impact of IT on financial accounting is the timing of inputs, processing, and outputs. Financial statements are periodic, and most large companies traditionally issue them quarterly, with a comprehensive report produced annually. With advances in IT that allow transactions to be captured immediately when the business activity occurs, the AIS can produce financial statements almost in real time. Of course, some of the adjustments that accountants must make to the records are not done minute-by-minute, but a business can certainly track sales and many of its expenses continuously. This is especially useful to retailing executives, many of whom now use dashboards.

Interactive Data and XBRL. A problem that accountants, investors, auditors, and other financial managers have often faced is that data used in one application are not easily transferable to another. This means that accountants may spend hours preparing spreadsheets and reports that require them to enter the same data in different formats over and over. **Interactive data** are data that can be reused and carried seamlessly among a variety of applications or reports. Consider, for example, a data item such as total assets. This number might need to be formatted and even calculated several different ways (e.g., at cost, net realizable value, book value, replacement value) for reports

⁸ ThyssenKrupp, A.G., “Non-financial Performance Indicators,” Online Annual Report 2010/2011, accessed March 2017.

such as filings with the SEC, banks, and performance reports. With interactive data, the data are captured in the database only once and can be used wherever needed.

Interactive data require a language for standardization that “tags” the data at its most basic level. As an example, for total assets, this would be at the detail level for each asset. **Extensible business reporting language (XBRL)** is the language of choice for this purpose. As of 2010, the SEC requires public companies to file their financial reports in XBRL format. In addition, many companies, software programs, and industries are beginning to incorporate XBRL for creating, transforming, and communicating financial information.

We will discuss cloud computing later in this chapter, but at this point, we want to make you aware of this technology with respect to XBRL. XBRL Cloud made a viewer available that allows anyone to examine SEC XBRL financial filings, and it is called the XBRL Cloud EDGAR Dashboard.⁹ When a filing is posted on the SEC website, XBRL Cloud takes the information and adds a new line to the Dashboard that indicates the name of the filing company, the form type and date filed, the percentage of extended elements, the creation software that was used to prepare the filing, and free validation checking. A description of some of the Dashboard’s features can be found at xbrl.squarespace.com. We discuss XBRL in more detail in Chapter 2, and you can learn about the current status of XBRL at www.XBRL.org.

Case-in-Point 1.5 The Federal Deposit Insurance Corporation (FDIC) insures bank deposits over a specific amount. FDIC wanted to create an Internet-based Central Data Repository that stored all the quarterly data they received from more than 7,000 banks. They convinced their software vendors to incorporate XBRL to standardize the data. The tagged data that the FDIC receives from banks now has improved accuracy and can be published and made available to users much more quickly than before.¹⁰

Managerial Accounting

The principal objective of managerial accounting is to provide relevant information to organizational managers, that is, users who are internal to a company or government agency. Cost accounting and budgeting are two typical parts of a company’s managerial accounting system. Let us examine each of them in turn.

Cost Accounting. Due to globalization, decentralization, deregulation, and other factors, companies continue to face stiff competition. The result is that companies must be more efficient and be more adept at controlling costs. The **cost accounting** part of managerial accounting specifically assists management in measuring and controlling the costs associated with an organization’s various acquisition, manufacturing, distribution, and selling activities. In the broadest sense, these tasks focus on the *value added* by an organization to its goods or services, and this concept remains constant whether the organization is a manufacturer, a bank, a hospital, or a police department.

Take health care for an example. Although much controversy still surrounds the health-care legislation that was signed into law in 2010, there is one fact that most currently agree upon—the health care industry is a very large portion of the US economy and it is growing rapidly as the “baby boomer generation” reaches retirement age.

⁹ See <https://edgardashboard.xbrlcloud.com/edgar-dash-board>. Accessed March 2017.

¹⁰ Improved business process through XBRL: A use case for business reporting, Federal Financial Institutions Examination Council, White Paper, January 31, 2006. Accessed from XBRL.org in March 2017.

These facts, coupled with increased regulatory demands on health-care providers and hospitals, suggest the need for sophisticated accounting systems to maintain critical data, as well as the need for up-to-date reports for decision-making.

Case-in-Point 1.6 Survey data from more than 100 hospital CFOs suggests five major themes regarding the evolution of financial practices in health care. Two of those themes are (1) a greater focus on internal controls (supported by information and management systems) and (2) an increased reliance on business analysis (requirement to develop and measure business performance).¹¹

Activity-Based Costing. One example of an AIS in the area of cost accounting is an **activity-based costing (ABC) system**. Traditionally, cost accountants assigned overhead (i.e., indirect production costs) on the basis of direct labor hours because the number of labor hours was usually directly related to the volume of production. The problem with this traditional system is that, over time, increased reliance on automation has caused manufacturers to use less and less direct labor. Thus, managers became frustrated using this one method of assigning overhead costs when a clear relationship between labor and these overhead expenses no longer seemed to exist. Instead, managers in a variety of manufacturing and service industries now identify specific activities involved in a manufacturing or service task and then assign overhead costs based on the resources directly consumed by each activity.

Although ABC techniques have been available for several decades, they are more common now that computerized systems can track costs. These systems can move an organization in new strategic directions, allowing corporate executives to examine fundamental business processes and enabling them to reengineer the way they do business. ABC systems can also play an essential strategic role in building and maintaining a successful e-commerce business because they can answer questions about production costs and help managers allocate resources more efficiently and effectively.

Case-in-Point 1.7 Dr. Robert Kaplan, Harvard Business School, discusses how surgery centers can use ABC to improve efficiency. He explains how to look at each surgical activity and to identify the cost of that activity, how costs can be eliminated or reduced, and how ABC data can be used to make operational changes for more cost efficiency.¹²

Corporate Performance Measurement and Business Intelligence. Another example of an AIS used in the area of cost accounting is in corporate performance measurement. In a **responsibility accounting system**, for example, managers trace unfavorable performance to the department or individuals that caused the inefficiencies. Under a responsibility accounting system, each subsystem within an organization is only accountable for those items over which it has control. Thus, when a particular cost expenditure exceeds its standard cost, managers can take immediate corrective action.

In addition to the traditional financial measures, cost accountants also collect a variety of nonfinancial performance measures to evaluate things such as customer satisfaction, product quality, business innovation, and branding effectiveness. The **balanced scorecard** measures business performance in four categories: (1) financial

¹¹ Langabeer, J., J. DellliFraine, and J. Helton. 2010. Mixing finance and medicine. *Strategic Finance* 92(6): 27–34.

¹² AHC Media. “Activity-based costing can save money for surgery centers,” January 1, 2017, accessed from ahcmedia.com, March 2017.

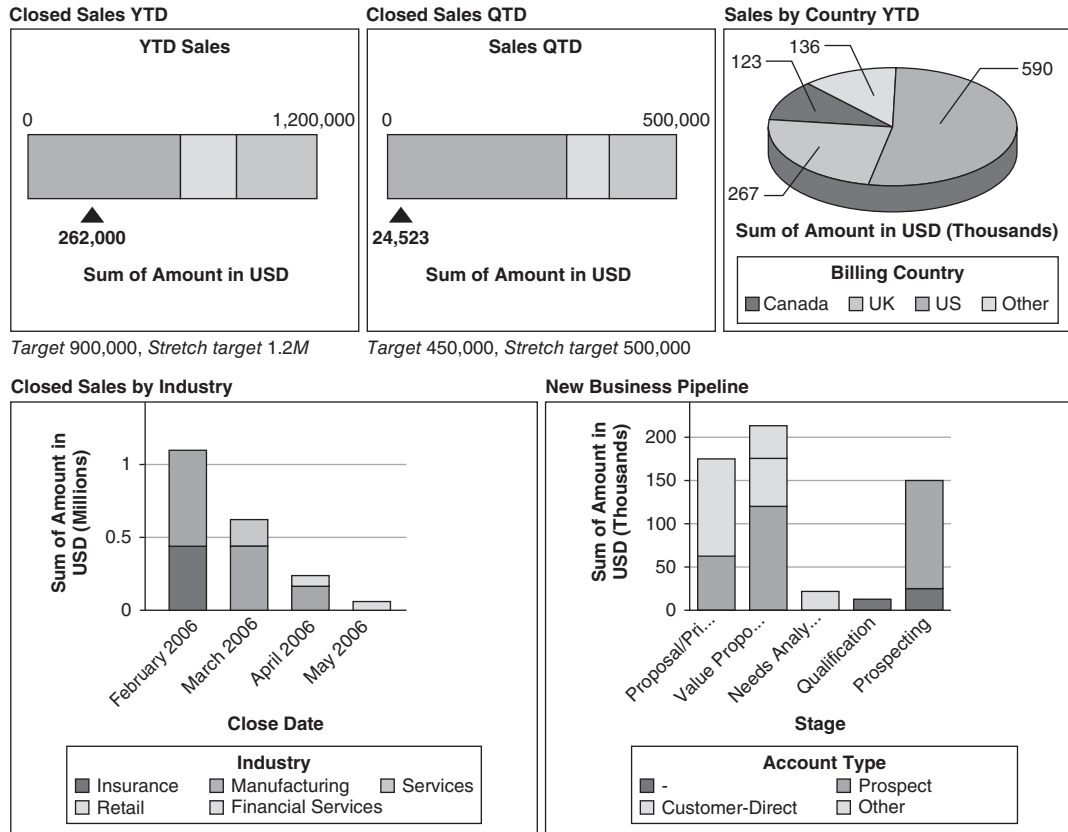


FIGURE 1-4 An example of an executive dashboard.

performance, (2) customer knowledge, (3) internal business processes, and (4) learning and growth. A company may choose to rank these categories to align with their strategic values. For example, a company may stress “customer knowledge” because customer satisfaction is important to its market position and planned sales growth.

Balanced scorecards and corporate performance measurement are not new ideas. But with the Internet, integrated systems, and other advanced technologies, balanced scorecards and other approaches to Cost Performance Management are becoming increasingly valuable **business intelligence** tools. Businesses use **key performance indicators (KPIs)** to measure and evaluate activities in each quadrant of the balanced scorecard. For example, a financial KPI might be return on investment. In the customer area, a company might track the number of new customers per month.

Dashboards (Figure 1-4) are commonly used to monitor key performance metrics. Dashboards usually appear in color, so that red, for example, might indicate a failure to meet the goal. Another indicator might be up and down arrows to show how a key activity performs over a certain time period. Dashboards are especially useful to managers who appreciate the presentation of important performance data in easy-to-understand graphic formats.

Case-in-Point 1.8 Accounting and advisory firms often work with organizations to select appropriate software to serve their information and IT needs. Most dashboards can be adapted for use at the highest level of the firm—even at the board of directors’ level—or at

any level below. Four of the industry leaders that offer software that can design a dashboard are IBM (Cognos), Actuate (PerformanceSoft), SAP (Business Objects/Pilot Software), and iDashboard.¹³

Budgeting. A budget is a financial projection for the future and is thus a valuable managerial planning aid. Companies develop both short- and long-range budget projections. Short-range budget projections disclose detailed financial plans for a 12-month period, whereas long-range budgets are less-detailed financial projections for 5 or more years into the future. Management accountants are normally responsible for an organization's budget.

A good budgetary system is also a useful *managerial control* mechanism. Because managers use budgets to predict future financial expectations, they can compare the causes of significant variations between *actual* and *budgeted* results during any budget period. Through timely performance reports that compare actual operating results with prescribed norms, managers are able to identify and investigate significant variations. While negative variations are normally cause for concern, favorable budget variations are not always good news either. For example, managers might find cheaper inputs and have a positive variation from the standard cost, but such a savings might cause quality problems with the finished product. Regardless of whether variations are positive or negative, managers can use the information for better decision-making.

Auditing

The two most popular career paths in auditing are external auditing and internal auditing. We briefly examine each path and the related impact of IT in the following sections.

External Auditing. The traditional role of external auditing has been to evaluate the accuracy and completeness of a corporation's financial statements. In recent years, however, the individuals working in CPA firms would probably argue that they are actually in the assurance business—that is, the business of providing third-party testimony that a client complies with a given statute, law, or similar requirement. Historically, the growth of such assurance services can be traced to a conference of the AICPA in 1993, which created a Special Committee on Assurance Services to identify and formalize some other areas (besides financial audits) in which accountants could provide assurance services. Figure 1-5 describes the first six areas identified by the committee.

Today, there are several additional areas in which auditors can perform assurance work, many involving AISs. One example is to vouch for a client's compliance with HIPAA laws, the privacy requirements of the Health Insurance Portability and Accountability Act. Another example is **CPA Trust Services**, a set of professional service areas built around a set of common principles and criteria related to the risks and opportunities presented by IT environments. Trust services include online privacy evaluations, security audits, tests of the integrity of information processing systems, verification of the availability of IT services, and tests of systems confidentiality.

Despite the rise in ancillary assurance services, auditors mainly focus on traditional financial auditing tasks. As noted earlier, computerized AISs have made these tasks more challenging. For example, automated data processing also creates a need for

¹³ Ballou, B., D. Heitger, and L. Donnell. 2010. Creating effective dashboards. *Strategic Finance* 91(9): 27–32.

Risk Assessment

Provide assurance that an organization's set of business risks is comprehensive and manageable.

Business Performance Measurement

Provide assurance that an organization's performance measures beyond the traditional measures in financial statements are relevant and reasonable for helping the organization to achieve its goals and objectives.

Information Systems Reliability

Provide assurance that an organization's information system has been designed to provide reliable information for decision-making.

Electronic Commerce

Provide assurance that organizations doing business on the Internet can be trusted to provide the goods and services they promise and that there is a measure of security provided to customers.

Health-Care Performance Measurement

Provide assurance to health-care recipients about the effectiveness of health care offered by a variety of health-care providers.

Eldercare Plus

Provide assurance that various caregivers offering services to the elderly are offering appropriate and high-quality services.

FIGURE 1-5 Assurance services identified by the AICPA Special Committee on Assurance Services.

auditors to evaluate the risks associated with such automation. Chapter 11 discusses the audit of computerized AISs and the ways in which auditors use IT to perform their jobs.

In addition to the auditing and assurance businesses mentioned above, many CPA firms also perform management consulting tasks—for example, helping clients acquire, install, and use new information systems. The AIS at Work feature at the end of this chapter describes one such consulting area. However, the corporate accounting scandals in the early 2000s led members of the SEC and the US Congress to question whether a CPA firm can conduct an independent audit of the same systems it recently assisted a client in installing and using—a concern intensified when audit staff at Arthur Andersen LLP apparently deliberately destroyed auditing papers for the Enron corporation. Thus, the Sarbanes–Oxley Act of 2002 (SOX) expressly forbids such potential conflicts of interest by not allowing CPA firms to simultaneously act as a “management consultant” and the “independent auditor” for the same firm.

Despite this requirement, there are still many areas in which CPA firms provide consulting services to clients. Examples include business valuations, litigation support, systems implementation, personal financial planning, estate planning, strategic planning, health-care planning, making financing arrangements, and performing forensic (fraud) investigations.

Internal Auditing. According to the Institute of Internal Auditors (IIA), the definition of internal auditing is “an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes.” Large companies have Internal Audit Departments to carry out these duties. Internal auditors in public companies report to the Audit Committee of the Board of

Directors, as it is important for them to be independent and to have wide access to all areas of the organization.¹⁴

Internal auditors make extensive use of technology. For example, they use electronic audit workpapers, computer-assisted audit techniques (CAATs), and software tools for data mining, data analysis, documenting business processes and systems, monitoring audit exceptions and remediation.

Taxation

Although some individuals still complete their income tax returns manually, many now use computer programs such as *TurboTax* for this task. Such tax preparation software is an example of an AIS that enables its users to create and store copies of trial tax returns, examine the consequences of alternative tax strategies, print specific portions of a return, and electronically transmit complete copies of a state or federal tax return to the appropriate government agency.

Similarly, IT also helps tax professionals research challenging tax questions—for example, by providing access to online tax libraries. Tax professionals typically subscribe to online tax services by paying a fee for the right to access databases of tax information. Online services can provide tax researchers with databases of federal and state tax laws, tax court rulings, court decisions, and technical advice.

1.4 WHAT ARE ACCOUNTING INFORMATION SYSTEMS?

Now that you know the exciting career opportunities that are available to accountants who also have technology skills and understand the impact of technology on the profession, let us now focus on the terminology surrounding AISs. What exactly do we mean by information systems, and why do we care about the difference between information and data?

Accounting Information Systems

Accounting information systems stand at the crossroads of two disciplines: “accounting” and “information systems.” As a result, the study of AISs is often viewed as the study of computerized accounting systems. Thus, we define an accounting information system as a collection of data and processing procedures that creates needed information for its users. Let us examine in greater detail what this definition really means. For our discussion, we’ll examine each of the words in the term “accounting information systems” separately.

Accounting. You probably have a pretty good understanding of accounting because you have already taken one or more courses in the area. You know that the accounting field includes financial accounting, managerial accounting, auditing, taxation, and so forth. AISs are used in all these areas—for example, to perform tasks in areas such as payroll, accounts receivable, accounts payable, inventory, and budgeting. In addition,

¹⁴ The Institute of Internal Auditors. “All in a day’s work: A look at the varied responsibilities of internal auditors (theiit.org),” accessed March 2017.

Applications	Examples of AIS information
Finance	Cash and asset management, multicompany and multicurrency management
Human resources	Payroll and benefits summaries and management
Marketing and sales	Customer management, sales management, sales forecasts, and annual summaries
Production	Inventory management and summaries, product cost analysis
Supply chain management	Supplier management, inventory management

FIGURE 1-6 Examples of information an AIS can generate for various business functions.

AISs help accountants maintain general ledger information, create spreadsheets for strategic planning, and distribute financial reports.

It is difficult to think of a business task that is not integrated, in some way, with an AIS. As a result, accountants must determine how best to provide the information contained in an AIS to support business decisions. AISs also create information that is useful to nonaccountants, such as individuals working in marketing and sales, production, or human resources. Figure 1-6 provides some examples. For this information to be effective, the individuals working in these subsystems must help the developers of an AIS identify what information they need for their planning, decision-making, and control functions. These examples illustrate why an AIS course is useful not only for accounting majors but for all business majors.

Information (vs. Data). Although the terms **data** and **information** are often used interchangeably, they do not have the same meaning. *Data* (the plural of *datum*) are raw facts about events that have little organization or meaning—for example, a set of raw scores on a class examination. To be useful or meaningful, most data must be processed into useful *information*. An example might be to take the raw scores of a class exam and compute the class average.

Do raw data *have* to be processed in order to be meaningful? The answer is no. Imagine, for example, that *you* take a test in a class. Which is more important to you—the average score for the class as a whole (a processed value) or *your* score (a raw data value)? Similarly, suppose you own shares of stock in a particular company. Which of these values would be *least* important to you: (1) the *average* price of a stock that was traded during a given day (a processed value), (2) the price *you* paid for the shares of stock (an unprocessed value), or (3) the *last* price trade of the day (another unprocessed value)?

Raw data are also important because they mark the starting point of an **audit trail**—the path that data follow as they flow through an AIS. In a payroll system, for example, an input clerk enters the data for a new employee, and the AIS keeps track of the wages earned by that employee each pay period. An auditor can verify the existence of employees and whether each employee received the correct amount of money.

Case-in-Point 1.9 A former payroll manager at the Brooklyn Museum pleaded guilty to embezzling \$620,000 by writing paychecks to “ghost employees.” Dwight Newton, 40, admitted committing wire fraud by adding workers to the payroll who did not exist and then wiring their wages directly into a joint bank account that he shared with his wife. Under a plea agreement, Newton must repay the museum the stolen funds. He was ordered to forfeit \$77,000 immediately, sell his Barbados timeshare, and liquidate his pension with the museum.¹⁵

¹⁵ Brooklyn Museum Embezzlement in *New York Magazine* (nymag.com), accessed March 2014.

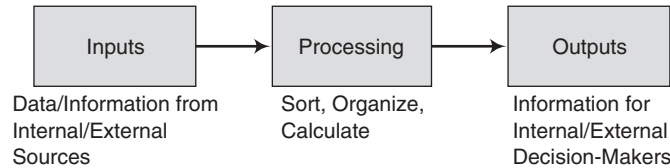


FIGURE 1-7 An information system's components. Data or information is input, processed, and output as information for planning, decision-making, and control purposes.

Despite the potential usefulness of some unprocessed data, most end users need financial totals, summary statistics, or exception values—that is, processed data—for decision-making purposes. Figure 1-7 illustrates a model for this—a three-stage process in which (1) raw and/or stored data serve as the primary inputs, (2) processing tasks process the data, and (3) meaningful information is the primary output. An AIS typically performs the necessary tasks in each step of the process. For example, a catalog retailer might use Web pages on the Internet to gather customer purchase data, then use central file servers and data storage to process and store the purchase transactions, and finally employ other Web pages and printed outputs to confirm and distribute information *about* the order to appropriate parties.

While computers are efficient and useful tools, they can also create problems. One is that computers may not automatically catch the simple input errors that humans do. For example, if you were performing payroll processing, you would know that a value of “-40” hours for the number of hours worked was a mistake—the value should be “40.” A computer can be programmed to look for (and reject) bad input, but it is difficult to anticipate all possible errors.

Another problem created by computers is that they make audit trails more difficult to follow. This is because the path that data follow through computerized systems is electronic. However, a well-designed AIS can still document its audit trail with listings of transactions and account balances both before and after the transactions are processed and the accounts are updated. A major focus of this book is on developing effective internal control systems for companies, and audit trails are important elements. Chapters 6, 7, and 11 discuss these topics in detail.

In addition to collecting and distributing large amounts of data and information, AISs must also organize and store data for future uses. In a payroll application, for example, the system must maintain running totals for the earnings, tax withholdings, and retirement contributions of each employee in order to prepare end-of-year tax forms. These data-organization and storage tasks are major challenges and is one of the reasons why this book contains three chapters on the subject (see Chapters 6, 7, and 11).

Besides deciding *what* data to store, businesses must also worry about how best to *integrate* the stored data for end users. An older approach to this problem was to maintain independently the data for each of its traditional organization functions—for example, finance, marketing and sales, human resources, and production. A problem with this approach is that, even if all the applications are maintained internally by the same IT department, there will be separate data gathering and reporting responsibilities within each subsystem, and each application may store its data independently of the others. This often leads to a duplication of data collecting and processing efforts, as well as conflicting data values when specific information (e.g., a customer's address) is changed in one application but not another.

Organizations recognize the need to integrate the data associated with their functions into large, seamless data warehouses. This integration allows internal managers and possibly external parties to obtain the information needed for planning, decision-making, and control, whether or not that information is for marketing, accounting, or some other functional area in the organization. To accomplish this task, many companies are now using large, expensive **enterprise resource planning (ERP) systems** to integrate their information subsystems into one application. An example of such a software product is *SAP R/3*, which combines accounting, manufacturing, human resource, and other subsystems into an enterprise-wide information system, that is, a system that focuses on the *business processes* of the organization as a whole. We discuss these systems in more depth in Chapter 5.

SAP, SAS Institute, IBM, and Oracle have recognized the need for integrated information and therefore developed business intelligence software to meet this need. As a result, software developers are including **predictive analytics** features into their main software suites. These analytics tools include a variety of methodologies that managers might use to analyze current and past data to help predict future events or trends. In March 2010, IBM opened a predictive analytics lab in China, which is part of estimated \$12 billion commitment to build out IBM's analytics portfolio.¹⁶

Case-in-Point 1.10 Accountants and other managers are using predictive and real-time analytics, which take advantage of data stored in data warehouses to create systems that allow them to use their data to improve performance. For example, for 2 weeks every August and September, the United States Tennis Association welcomes hundreds of thousands of spectators to the US Open tennis tournament. Predictive and real-time analytics drive IBM's SlamTracker, which identifies key actions players must take to enhance their odds of winning. These same technologies are being used by police departments to prevent crime, retailers to drive sales, and financial firms to reduce fraud.¹⁷

It is no secret that the amount of data in data warehouses around the globe has been exploding. As a result, managers are grappling with how best to analyze these large data sets (called "**big data**") for competitive advantage, to identify consumer trends, and for other critical decisions. In a 2012 white paper from Intel, the authors claim that "the ability to mine and analyze big data gives organizations deeper and richer insights into business patterns and trends, helping drive operational efficiencies and competitive advantage in manufacturing, security, marketing, and IT."¹⁸

Systems. Within the accounting profession, the term "systems" usually refers to "computer systems." As you know, IT advances are changing the way we do just about everything. Less than a decade ago, the authors never imagined that people could someday purchase a book from a "virtual bookstore" on the Internet using a wireless device, while enjoying a latte in a Starbucks! The explosion in electronic connectivity and commerce are just some of the many ways that IT influences how people now access information or how firms conduct business. Today, IT is a vital part of what accountants must know to be employable.

¹⁶ Vance, J. "Business intelligence software and predictive analytics," Datamation (www.datamation.com), accessed March 2017.

¹⁷ "Data is a game changer," IBM Smarter Enterprise, U.S. Open Case Study (www.ibm.com), accessed March 2017.

¹⁸ Fania, M. and J. D. Miller. July 2012. IT@Intel White Paper, IT Best Practices. "Mining big data in the enterprise for better business intelligence," accessed from www.intel.com, March 2017.

Returning to our definition, you probably noticed that we did *not* use the term “computer,” although we did use the term “processing procedures.” You already know the reason for this—not all AISs are computerized or even need to be. But most of the ones in businesses today are automated and thus the term “processing procedures” could be replaced by the term “computerized processing” for almost all AISs.

In summary, it is convenient to conceptualize an AIS as a set of components that collect accounting data, store it for future uses, and process it for end users. This abstract model of data inputs, storage, processing, and outputs applies to almost all the traditional accounting cycles with which you are familiar—for example, the payroll, revenue, and expenditure cycles—and is thus a useful way of conceptualizing an AIS. Again, we stress that many of the “end users” of the information of an AIS are not accountants, but include customers, investors, suppliers, financial analysts, and government agencies.

The Role of Accounting Information Systems in Organizations

IT refers to the hardware, software, and related system components that organizations use to create computerized information systems. IT has been a major force in our current society and now influences our lives in many personal ways—when we use digital cameras to take pictures, access the Internet to make a purchase or learn about something, or email friends and family. It is perhaps less clear that computer technology has also had profound influences on commerce. In our current **information age**, fewer workers actually make products while more of them produce, analyze, manipulate, and distribute information *about* business activities. These individuals are often called **knowledge workers**. Companies find that their success or failure often depends upon the uses or misuses of the information that knowledge workers manage.

Case-in-Point 1.11 The Wall Street Journal reports that the rise of knowledge workers is accelerating, while routine jobs have been replaced by automation and technology. The number of knowledge workers has more than doubled over the past three decades and shows no signs of slowing down.¹⁹

The information age has important implications for accounting because that is what accountants are—knowledge workers. In fact, accountants have always been in the “information business” because their role has been, in part, to communicate accurate and relevant financial information to parties interested in how their organizations are performing. And this includes the increasing importance and growth of **e-business**, conducting business over the Internet or dedicated proprietary networks and **e-commerce**, a subset of e-business, which refers mostly to buying and selling on the Internet.

In many ways, accounting is itself an information system—that is, a communicative process that collects, stores, processes, and distributes information to those who need it. For instance, corporate accountants develop financial statements for external parties. But users of accounting information sometimes criticize AISs for only capturing and reporting *financial* transactions. They claim that financial statements often ignore some of the most important activities that influence business entities. For example,

¹⁹ Zumbun, J. “The rise of knowledge workers is accelerating despite the threat of automation,” (wsj.com) May 4, 2016, accessed March 2017.

the financial reports of a professional basketball team would not include information about hiring a new star because this would not result in journal entries in the franchise's double-entry accounting system.

Today, however, AISs are concerned with nonfinancial as well as financial data and information. Thus, our definition of an AIS as an enterprise-wide system (described further in Chapter 5) views accounting as an organization's primary producer and distributor of many different types of information. This matches the contemporary perspective that accounting systems are not only financial systems.

1.5 WHAT'S NEW IN ACCOUNTING INFORMATION SYSTEMS?

The last few years have witnessed some of the most startling changes in the uses and applications of AISs, causing us to reassess our understanding and uses of accounting data. Below are a few examples.

Cloud Computing—Impact for Accountants

Cloud computing is in its second decade and impacts many aspects of IT. In Chapter 2 we identify the basics of cloud computing, but in this section we want to discuss why this technology is important to accountants and then describe some of the current issues surrounding cloud computing as it relates to accounting professionals. According to Ron Gill, **cloud computing** is a way of using business applications over the Internet—like you use the Internet for your bank transactions. Think of cloud computing as a way to increase IT capacity or add capabilities without investing in new infrastructure, training new people, or licensing new software. Mostly, we're talking about a subscription-based or pay-per-use service that makes IT's existing capabilities scalable whenever the need exists, using the Internet. Gartner predicts that for 2017, \$247 billion will be spent on cloud services worldwide, with a 5-year compound annual growth rate (CAGR) of 16.5%.²⁰

Cloud computing resources may be categorized as data storage, infrastructure and platform, and application software (i.e., business applications such as purchases, human resources, sales). If a firm would like to take advantage of cloud computing, it would most likely need to subscribe to all three of these categories from the service provider. For example, business applications depend on company data that is stored in the database, and data storage depends on the appropriate infrastructure.²¹

Experts identify a number of important benefits of using the cloud. One is the ability to only pay for the applications that you use, and those applications are offered over the Internet. Of course, this sort of flexibility also suggests that a firm has the ability to quickly modify the scale of its IT capability. Another benefit is that an organization may not have to purchase or operate expensive hardware and software—providers own and operate the equipment and software, much as a taxi company owns and operates its own fleet of vehicles. Also, cloud computing providers offer only one (current) version of an application, so individual firms no longer have to deal with expensive, time-consuming upgrades for software. See Figure 1-8.

²⁰ Gartner (www.gartner.com). "Forecast: Public cloud services, worldwide, 2014–2020, 4Q16. Update." Stamford, CT. January 5, 2017, accessed March 2017.

²¹ Du, H. and Y. Cong. 2010. Cloud computing, accounting, auditing, and beyond. *The CPA Journal* 80(10): 66–70.

Why Is Everyone Choosing Cloud Computing?	
• Support 24/7	• Only Pay for What You Use
• Lower Total Cost of Owning	• Reliable, Sustainable, Scalable
• Secure Storage Management	• Lowers Capital Expenditures
• Freed-Up Internal Resources	• Highly Automated
• Utility Based	• Easy Deployment
• Independent of Location	• Independent of Devices

FIGURE 1-8 Some of the reasons why cloud computing is becoming so pervasive.

Case-in-Point 1.12 Food for thought: if you have used Facebook, Twitter, or LinkedIn in the recent past, you have made use of cloud computing. The same goes for your Gmail or Yahoo email account.

Accountants always talk about cost–benefit trade-offs. We just identified several possible benefits surrounding this new technology, so it is appropriate to mention that there are also costs and/or concerns. The first potential concern is reliability of the Internet since this is the medium for delivering all cloud services. Other issues include (1) data security measures that the provider offers (i.e., appropriate internal controls), (2) the quality of service that the provider gives the firm (i.e., careful crafting of the service contract is similar to that of any outsourcing contract, which includes vigilant monitoring of services for quality purposes), and (3) the reliability of the service provider (i.e., going concern issues). Accordingly, management accountants, internal auditors, and external auditors will need to evaluate the different risks that a firm may face if it decides to “use the cloud.”

Corporate Responsibility Reporting

Corporate Responsibility Reporting (also called Sustainability Reporting) is voluntary and focuses on nonfinancial environmental and social measures that might impact an organization’s income, value, or future performance. A 2015 KPMG survey of 4,500 companies in 45 countries produced interesting results. The current rate of corporate responsibility reporting among the world’s largest 250 companies (in terms of revenue) exceeds 90%. Surprisingly, four emerging economies (India, Indonesia, Malaysia, and South Africa) have the highest reporting rates in the world. Also, including corporate responsibility data in annual reports has become a global trend, with almost three in five companies doing so.²²

Case-in-Point 1.13 In IKEA Group’s 2015 corporate responsibility report, an innovative feature is the inclusion of external stakeholder perspectives presented as challenges to senior management and management’s responses. Topics include corporate growth and environmental impact, fueling a throwaway culture, and combating child labor deep in the supply chain.

You might be asking yourself how this is an AIS issue if the information is “non-financial” in nature. As you will discover in Chapter 5, enterprise-wide systems are

²² KPMG. 2015. “Current of Change: The KPMG Survey of Corporate Responsibility Reporting 2015.” (www.kpmg.com/crreporting). Accessed March 10, 2017.

Employee Health Indicators	Employee Safety Factors	Environment
Tobacco use	Fleet car accidents	Carbon emissions
High cholesterol	Lost workdays	Waste recycled
Absenteeism	Employee accidents	Biodiversity impact

FIGURE 1-9 Examples of corporate responsibility items of interest to a firm and data that would be collected to report on each item of interest.

widely used to collect qualitative as well as quantitative information for decision-making within organizations. In fact, management control systems are the backbone of corporate responsibility reports. That is, organizations need to establish well-defined corporate responsibility strategies that identify achievable and measurable goals.²³ Figure 1-9 identifies examples of corporate responsibility items of interest to firms and their stakeholders, as well as some of the data that would be collected to report on each item of interest.

Suspicious Activity Reporting

A number of **suspicious activity reporting (SAR)** laws now require accountants to report questionable financial transactions to the US Treasury Department. Examples of such transactions are ones suggestive of money laundering, bribes, or wire transfers to terrorist organizations. Federal statutes that mandate SARs include sections of the Annunzio-Wylie Anti-Money Laundering Act (1992), amendments to the Bank Secrecy Act of 1996, and several sections of the Patriot Act (2001). Institutions affected by these laws include (1) banks, (2) money service businesses such as currency traders, (3) broker dealers, (4) casinos and card clubs, (5) commodity traders, (6) insurance companies, and (7) mutual funds. Over the years, such filings have enabled the federal government to investigate a wide number of criminal activities, gather evidence, and, in some cases, repatriate funds sent overseas. Testimony to the importance of SAR is the growth of SAR filings—from about 62,000 reports in 1996 to almost 2.0 million reports in 2016.

Case-in-Point 1.14 A cooperating witness indicated that a pharmaceutical network was selling controlled drugs through affiliated websites to customers without authorized prescriptions. To evade US laws, the owners located their headquarters in Central America and their Web servers in the Middle East. A federal investigation and a SAR filed by a financial institution involved in the matter documented almost \$5 million in suspicious wire transfers. The result: indictments against 18 individuals and the repatriation of over \$9 million from overseas accounts as part of the forfeiture proceedings.²⁴

SAR impacts AISs in several ways. Because so much of the information within AISs is financial, these systems are often used to launder money or fund criminal activities. As a result, AISs become important sources of SAR evidence and subsequent legal action. Finally, SAR can act as a deterrent to criminal or terrorist activities—and is therefore an important control for AISs.

²³ Busco, C., M. Frigo, E. Leone, and A. Riccaboni. 2010. Cleaning up. *Strategic Finance* 92(1): 29–37.

²⁴ “BSA documents lead to repatriation & seizure of over \$9 million generated by illegal internet pharmacy,” published in *The SAR Activity Review—Trends, Tips & Issues*, Issue 14, October 2008.

Forensic Accounting, Governmental Accountants, and Terrorism

As we discussed in the beginning section of this chapter, **forensic accounting** is a career field that is important and growing. This area of accounting has become a popular course at many universities and some universities now have a number of specialized courses that are included in a fraud examination or forensic accounting path so that students may specialize in this area of accounting.²⁵ In general, a forensic accountant combines the skills of investigation, accounting, and auditing to find and collect pieces of information that collectively provide evidence of criminal activity in progress or that has happened.

Terrorists need money to carry out their criminal activities, and, as a result, forensic accountants have become increasingly important in the fight against such activities because these accountants use technology for data mining. For example, Audit Command Language (ACL) and Interactive Data Extraction and Analysis (IDEA) are popular data extraction software tools that auditors can use to spot anomalies and trends in data.

One example of the use of AISs for this purpose is using banking systems to trace the flow of funds across international borders. Other examples include (1) identifying and denying financial aid to terrorist groups and their sympathizers, (2) tracing arms and chemical orders to their final destinations, thereby identifying the ultimate—perhaps unauthorized—purchasers, (3) using spreadsheets to help plan for catastrophic events, (4) using security measures to control cyber terrorism, and (5) installing new internal controls to help detect money laundering and illegal fund transfers.

But where do terrorists get the money to finance their activities? Generally speaking, they rely on the following sources for funding: state sponsors, individual contributions, corporate contributions, not-for-profit organizations, government programs, and illegal sources—and here is where government accountants can play an important part in the fight against terrorism. Apparently, terrorists choose to live unpretentiously, they exploit weaknesses in government assistance programs, and they are skillful at concealing their activities.²⁶ Similar to forensic accountants, government accountants should use data extraction software to spot anomalies, suspicious activity, or red flags that might suggest illegal transactions.

Corporate Scandals and Accounting

Although corporate frauds and scandals are hardly new, more recent ones have set records for their magnitude and scope. Of particular note are the Enron scandal and the case against Bernard Madoff. The Enron scandal is important because of the amount of money and jobs that were lost, and also because so much of it appears to be directly related to the adroit manipulation of accounting records. Although the details of these manipulations are complex, the results were to understate the liabilities of the business entities and to inflate earnings and net worth. The opinion of most experts today is that the mechanics of these adjustments might not have been illegal, but the intent to defraud was clear and therefore criminal.

²⁵ Examples include University of Alabama at Birmingham and West Virginia University.

²⁶ Brooks, R., R. Riley, and J. Thomas. 2005. Detecting and preventing the financing of terrorist activities. *Journal of Government Financial Management* 54(1): 12–18.

Accounting rules allow for some flexibility in financial reporting. Unfortunately, some financial officers have exploited this flexibility to enhance earnings reports or present rosier forecasts than reality might dictate—that is, they “cooked the books.” Examples are Scott Sullivan, former Chief Financial Officer at WorldCom, Inc., Mark H. Swartz, former Chief Financial Officer at Tyco International, Inc., and Andrew Fastow, Enron’s former Chief Financial Officer. While some accountants have been guilty of criminal and unethical behavior, others have emerged from the scandals as heroes. These include Sherron Watkins, who tried to tell Ken Lay that the numbers at Enron just didn’t add up, and Cynthia Cooper, an internal auditor at WorldCom, who blew the whistle on the falsified accounting transactions ordered by her boss, Scott Sullivan.

As the credit crunch worked its way through the economy in 2008, a number of financial institutions either collapsed or narrowly avoided doing so and accounting was in the news once again. In March 2009, Bernard Madoff pleaded guilty to 11 federal felonies and admitted that he turned his wealth management business into a **Ponzi scheme** that defrauded investors of billions of dollars. Named for Charles Ponzi, this is a pyramid fraud in which new investment funds are used to pay returns to current investors. The fraud relies on new money continuously entering the system so that investors believe their money is actually earning returns. The problem is that when new money stops flowing, the pyramid collapses.

AIS AT WORK

The Cost of Not Filing a SAR²⁷

The name Madoff has become a household name in the United States. Bernard Lawrence “Bernie” Madoff, discussed in the previous section, was a stockbroker, investment advisor, and financier. Even before Madoff pleaded guilty to the largest Ponzi scheme in history, countless informed individuals wondered how in the world he could deceive so many people for decades—and many of these people were financial experts, including the staff at JPMorgan, where Madoff banked. In fact, as early as 1999 a man by the name of Harry Markopolos repeatedly tried to warn the authorities over a 10-year period.

As it turns out, the bank’s London desk did circulate a memo describing JPMorgan’s inability to validate his trading activity or custody of any assets. The memo also noted Madoff’s odd choice of a one-man accounting firm. Think about that—a wealth management firm with assets estimated to be \$65 billion—and Madoff employed a sole proprietor (with two nonaccounting employees) to audit his firm. That’s more assets than that of Etrade (\$45.5B), JPMorgan Asset Management (\$63.4B), Principal Financial Group (\$44.8B), or Charles Schwab (\$34.2B)! Each of these firms uses the following independent audit firms, respectively: Deloitte & Touche, PricewaterhouseCoopers LLP, Ernst & Young LLP, and Deloitte & Touche.

But to the point—SARs are not optional. There are a number of laws that require a SAR filing if individuals are concerned about any suspicious financial activities.

²⁷ The Associated Press. 2014. JPMorgan to pay \$2.5B for ignoring “alarm bells” on fraud. *Richmond Times-Dispatch*. January 8: D3. Also: Fitzpatrick, D. 2013. JPMorgan is in talks with US over Madoff warnings. *Wall Street Journal (online)*, December 6, 2013.

JPMorgan filed a SAR with UK regulators about 1 month prior to Madoff's arrest—but did not file a SAR with US regulators. This is especially curious since JPMorgan typically files 150,000 to 200,000 such reports every year. How can it be the case that Madoff's activities did not alert bank employees? The bank had been doing business with Madoff for more than two decades prior to his arrest in December 2008.

As you might imagine, the Justice Department was not amused! The result of JPMorgan's silence to the American authorities will cost them dearly—\$2.5 billion to be exact. This is the largest forfeiture by a US bank and largest Department of Justice penalty for a Bank Secrecy Act violation. Although JPMorgan is negotiating a settlement to avoid criminal charges, that's a huge price for not filing a SAR with US regulators!



SUMMARY

- ✓ There are many reasons to study AISs, and one of the most important is the availability of many exciting career opportunities.
- ✓ Information technology affects virtually every aspect of accounting, including financial and managerial accounting, auditing, and taxation.
- ✓ Financial accounting information is becoming increasingly relevant and important as advances in IT allow for creation of new reporting systems.
- ✓ Managerial accounting is impacted by IT in the following areas: balanced scorecards, business intelligence, dashboards, and other KPIs.
- ✓ External auditors perform many types of assurance services, in addition to financial statement attestation.
- ✓ Internal auditors provide assurance that corporate governance, internal control, and risk management processes are operating effectively.
- ✓ The availability of tax software and extensive tax databases influences both tax preparation and tax planning.
- ✓ IT refers to the hardware, software, and related system components that organizations use to create computerized information systems.
- ✓ Computerized information systems collect, process, store, transform, and distribute financial and nonfinancial information for planning, decision-making, and control purposes.
- ✓ Data are raw facts; information refers to data that are meaningful and useful.
- ✓ Accountants and other managers are using predictive analytics, a technique that takes advantage of data stored in data warehouses to improve performance.
- ✓ Cloud computing is a way of using business applications over the Internet.
- ✓ The basic concept of corporate responsibility reporting is that a company focuses on nonfinancial performance measures that might impact its income, value, or future performance.
- ✓ By law, the accountants in many specific financial institutions must now file SARs that document potential instances of fraud, money laundering, or money transfers to terrorist organizations.
- ✓ A forensic accountant combines the skills of investigation, accounting, and auditing to find and collect pieces of information that collectively provide evidence of criminal activity in progress or that has happened.
- ✓ Some of the recent corporate scandals involved manipulation of accounting data, which led to the passage of legislation to protect investors.

KEY TERMS YOU SHOULD KNOW

accounting information systems (AISs)	cost accounting	Information Systems Audit and Control Association (ISACA)
activity-based costing (ABC) systems	CPA Trust Services	information technology (IT) auditors
audit trail	dashboards	interactive data
balanced scorecard	data	key performance indicators (KPIs)
big data	e-business	knowledge workers
business intelligence	e-commerce	penetration testing
Certified Fraud Examiner (CFE)	enterprise resource planning (ERP) system	Ponzi scheme
Certified Information Systems Auditors (CISAs)	Extensible business reporting language (XBRL)	predictive analytics
Certified Information Technology Professional (CITP)	financial accounting information systems	responsibility accounting system
cloud computing	forensic accounting	suspicious activity reporting (SAR)
Corporate Responsibility Reporting	information	systems consultants
	information age	value-added resellers (VARs)

TEST YOURSELF

- Q1-1.** Which of the following is NOT true about AISs?
- All AISs are computerized.
 - AISs may report both financial and nonfinancial information.
 - AISs, in addition to collecting and distributing large amounts of data and information, also organize and store data for future uses.
 - A student who has an interest in both accounting and IT will find many job opportunities that combine these knowledge and skills areas.
- Q1-2.** Which of the following is likely to be information rather than data?
- sales price
 - customer number
 - net profit
 - employee name
- Q1-3.** With respect to computerized AISs, computers:
- turn data into information
 - always make audit trails easier to follow
 - always catch input errors
 - do not generally process information more quickly than humans
- Q1-4.** A dashboard in an information system is:
- a computer screen used by data entry clerks for input tasks
 - a physical device dedicated to AIS processing tasks
 - a summary screen of key performance metrics typically used by managers
 - a cloud storage summary
- Q1-5.** The Sarbanes–Oxley Act of 2002:
- enables US officers to wiretap corporate phones if required
 - was enacted as a reaction to major corporate accounting scandals
 - allows CPA firms to simultaneously act as management consultants and external auditors for the same organization
 - does not require that senior executives of public companies take individual responsibility for financial reporting.
- Q1-6.** The acronym SAR stands for:
- simple accounting receipts
 - suspicious accounting revenue
 - suspicious activity reporting
 - standard accounts receivable

- Q1-7.** Which of the following is FALSE regarding assurance services provided by CPA firms?
- Auditors of public companies are no longer allowed to provide assurance services to any public company as a result of the Sarbanes–Oxley Act of 2002
 - Assurance services may include information systems reliability
 - ABC is not a type of assurance service
 - Only CPAs can provide external audit assurance services to clients
- Q1-8.** Assigning overhead costs based on the resources, rather than only direct labor, used in manufacturing is an example of:
- ABC
 - budgeting
 - cost-plus accounting
 - financial, rather than managerial, accounting
- Q1-9.** Which of these acronyms represents a law involving health assurance and privacy?
- ABC
 - HIPAA
 - CPA
 - SOX
 - XBRL
- Q1-10.** Which of these acronyms stands for a computer language used for reporting business activities?
- ABC
 - HIPAA
 - CPA
 - SOX
 - XBRL
- Q1-11.** Which of these acronyms is a certification for information professionals?
- ABC
 - HIPAA
 - CBA
 - CITP
 - XBRL
- Q1-12.** Which of the following describes “cloud computing”?
- business applications over the Internet
 - it is a subset of e-business
 - the ability of a company to exchange data with its subsidiaries
 - none of the above
- Q1-13.** How would you describe “big data”?
- Cloud computing can be used to support data analytics projects
 - A combination of large, complex data sets
 - The definition depends on the capabilities of the organization that manages the data
 - All of the above
- Q1-14.** A forensic accountant is one who:
- has a variety of skills, such as investigation, accounting, and auditing
 - can find and collect pieces of information that provide evidence of criminal activity
 - might be certified big data
 - all of the above

DISCUSSION QUESTIONS

- 1-1.** Take a survey of the students in your class to find out what jobs their parents hold. How many are employed in manufacturing? How many are employed in service industries? How many could be classified as knowledge workers?
- 1-2.** Hiring an employee and taking a sales order are important business activities, but are not accounting transactions requiring journal entries. Make a list of some other business activities that would not be captured as journal entries in traditional AISs. Do you think managers or investors would be interested in knowing about these activities? Why or why not?
- 1-3.** Advances in IT are likely to have a continuing impact on financial accounting. What are some changes that are occurring in the way financial information is gathered, processed, and communicated as a result of increasingly sophisticated information technology?
- 1-4.** XBRL is becoming established as the language to create interactive data that financial managers can use in communication. How do you think the use of interactive data might enhance the value of a company's financial statements?
- 1-5.** Discuss suspicious activity reporting. For example, should such reporting be a legal requirement, or should it be just an ethical matter? Is the majority of SAR activity illegal, or are these just mostly false alarms?

- 1-6.** Managerial accounting is impacted by IT in many ways, including enhancing corporate performance measurement. How might a university use a scorecard or dashboard approach to operate more effectively?
- 1-7.** Look again at the list of assurance services shown in Figure 1-5. What other assurance services can CPAs offer which would take advantage of their AIS expertise?
- 1-8.** Interview a sample of auditors from professional service firms in your area. Ask them whether or not they plan to offer any of the assurance services suggested by the AICPA. Also, find out if they offer services other than financial auditing and taxation. Discuss your findings in class.
- 1-9.** This chapter described several career opportunities available to students who combine a study of accounting with course work in information systems, and/or computer science. Can you think of other jobs where these skill sets would be desirable?
- 1-10.** This chapter stressed the importance of IT for understanding how AISs operate. But is this the only skill valued by employers? How important do you think “analytical thinking skills” or “writing skills” are? Discuss.
- 1-11.** In this chapter we talked about predictive analytics and big data. Using the Internet and your research skills, identify the skills and abilities accounting majors might need (i.e., what type of courses should you take while at your university) to leverage these skills in entry-level accounting positions such as (1) public accountants, (2) internal auditors, and (3) management accountants. Discuss specifically how you would use these skills to impress your supervisor.

PROBLEMS

- 1-12.** What words were used to form each of the following acronyms?
- | | | |
|----------|----------|---------|
| a. ABC | h. CPM | n. KPI |
| b. AICPA | i. ERP | o. SAR |
| c. AIS | j. FASB | p. SEC |
| d. CFO | k. HIPAA | q. SOX |
| e. CISA | l. ISACA | r. VAR |
| f. CITP | m. IT | s. XBRL |
| g. CPA | | |
- 1-13.** Choose three or four issues of one of these journals: *Journal of Accountancy*, *Internal Auditor*, *Strategic Finance*, and *Management Accounting*. Next, count the number of articles that are related to IT. In addition, make a list of the specific technology discussed in each article (where possible). When you are finished, discuss the impact you think IT is having on the accounting profession.
- 1-14.** Shervonne Thomas is the controller at a large manufacturing company located in Chesterfield, Virginia. The company has several divisions that evaluate their performance using a return on assets (ROA) formula (calculated by dividing net profit by the book value of total assets). In a meeting with the company president, Shervonne warned that ROI might not accurately reflect each division’s performance.

Shervonne is concerned that managers might be too focused on short-term results.

The president asked Shervonne to identify a better way to evaluate each division’s performance. Shervonne told the president that the company allocates a lot of overhead costs to the divisions on what some managers consider an arbitrary basis. She agreed to discuss this problem with the managers and to get back to the president very soon.

Requirements

- a.** Explain what managers can do in the short run to maximize return on assets. What other accounting measures could the company use to evaluate the performance of its divisional managers?
- b.** Describe other instances in which accounting numbers might lead to dysfunctional behavior in an organization.
- c.** Search the Internet and find at least one company that offers an information system (or software) that might help Shervonne and the managers do a better job of evaluating performance.
- 1-15.** Select one new trend in the field of accounting information systems today that is not mentioned

in the chapter, but that you feel is important. Write a short report describing your findings. Be sure to provide reasons why you feel that your choice of topics is important and therefore of interest to others in your class.

- 1-16.** The participants of such recreational activities as hang gliding, soaring, hiking, rock collecting, or skydiving often create local “birds-of-a-feather” (affinity) organizations. Two examples are the Chicago sky divers (www.chicagoskydivers.com) or the soaring club of western Canada (www.canadianrockiessoaring.com). Many of these clubs collect dues from members to pay for the printing and mailing costs of monthly newsletters. Some of them maintain only minimal accounting information on manual pages or, at best, in spreadsheets.
- What financial information are such clubs likely to collect and maintain?
 - Assuming that the club keeps manual accounting records, would you consider such systems “accounting information systems?” Why or why not?
 - Assume that the club treasurer of one such organization is in charge of all financial matters, including collecting and depositing member dues, paying vendor invoices, and preparing yearly reports. Do you think that assigning only one person to this job is a good idea? Why or why not?
 - What benefits would you guess might come from computerizing some or all of the club’s financial information, even if there are less than 100 members? For example, do you think that such computerization is likely to be cost-effective?
- 1-17.** Many companies now provide a wealth of information about themselves on their websites. But how much of this information is useful for investment purposes? To help you answer this question, imagine that you have \$10,000, which you *must* invest in the common stock of a publicly held company.
- Select a company as specified by your instructor and access its online financial reports. Is the information contained in the reports complete? If not, why not? Is the information contained in these reports sufficient for you to decide whether or not to invest in the company? If not, why not? What additional information would you like?
 - Now select an online brokerage website such as E*TRADE and look up the information of that same company. Does the information provided by the brokerage firm differ from that of the company itself? If so, how? Again, answer the question: Is the information contained in these reports sufficiently detailed and complete for you to decide whether to invest in it? If not, why not?
 - Access the website of an investment rating service such as Value Line. How does the information on this third site differ from that of the other two? Again, answer the question: “Is the information contained on the site sufficiently detailed and complete for you to decide whether to invest in the stock? If not, why not?”
 - What do these comparisons tell you about the difference between “data” and “information?”
- 1-18.** The website of FinCen—the Financial Crimes Enforcement Center Network (a department of the US Treasury)—maintains a website at www.fincen.gov. Under “RESOURCES”, you will find links to information for various types of financial institutions including banks, casinos, money service businesses, insurance companies, security and futures traders, and dealers in precious metals and jewelry, that is, the companies mandated by various federal laws to file SARs. Select three of these types of companies, and for each type, use the information provided on these secondary pages to list at least two types of financial transactions or activities that should be considered “suspicious.”
- 1-19.** In this chapter’s “AIS at Work” feature, we discuss the events and SAR surrounding the case of Bernard Madoff. A financial analyst by the name of Harry Markopolos believed it was legally and mathematically impossible for Madoff to be posting such outrageous returns on investments. Mr. Markopolos notified the Boston SEC in 2000.
- What happened when Mr. Markopolos notified the SEC in 2000?
 - How many more times did Mr. Markopolos notify the SEC of his concerns?
 - What was the result of Mr. Markopolos’ efforts to notify the authorities about his suspicions regarding Madoff?

CASE ANALYSES

1-20. Berry & Associates, LLP

Robert Berry is the managing partner for Berry & Associates (B&A), LLP. He was recently reviewing the firm's income statement for the previous quarter, which showed that auditing revenues were about 5% below last year's totals while tax revenues were about the same. Robert also noted that the income from auditing was 10% less than for the previous year. During the past few years, competition for new audit clients has been intense, so B&A partners decided that it would be wise for the firm to lower its hourly billing rates for all levels in the firm.

The firm's client base is closely held firms that are mostly very successful sole proprietors, as well as a number of small- and medium-sized companies. Robert and the other partners have been brainstorming ways to expand the revenue base of the organization. The partners know that information technology is a tool that the firm can use to develop new lines of business. Accordingly, the firm hired several college graduates over the past few years with dual majors in accounting and information systems or computer science. Given the recent financial results, Robert wants to encourage the other partners to consider the potential to the firm of offering additional professional services.

Requirements

1. Would it make the most sense for Robert to consider developing new types of clients or to consider offering different types of services to the types of clients typically served by B&A?
2. Robert remembers that the AICPA developed a list of various types of assurance services that auditing firms might consider offering. Describe three of these assurance services that might be a good fit for this CPA firm. (Hint: Visit the AICPA's Web page or a website of a large accounting firm for a listing of assurance services.)
3. What might B&A do to fully use the combined strengths in accounting and information systems/computer science of its new staff auditors?

1-21. Organizational Reports to Stakeholders

The annual report is considered by some to be the single most important printed document that companies produce. In recent years, annual reports have become large documents. They now include sections such as letters to the stockholders, descriptions of the business, operating highlights, financial review, management discussion and analysis, segment reporting, and inflation data as well as the basic financial statements. The expansion has been due in part to a general increase in the degree of sophistication and complexity in accounting standards and disclosure requirements for financial reporting.

The expansion also reflects the change in the composition and level of sophistication of users. Current users include not only stockholders but also financial and securities analysts, potential investors, lending institutions, stockbrokers, customers, employees, and (whether the reporting company likes it or not) competitors. Thus, a report that was originally designed as a device for communicating basic financial information now attempts to meet the diverse needs of an expanding audience.

Users hold conflicting views on the value of annual reports. Some argue that annual reports fail to provide enough information, whereas others believe that disclosures in annual reports have expanded to the point where they create information overload. The future of most companies

depends on acceptance by the investing public and by their customers; therefore, companies should take this opportunity to communicate well-defined corporate strategies.

Requirements

1. The mission of the US SEC is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation. Identify several ways that the SEC accomplishes its mission.
2. The goal of preparing an annual report is to communicate information from a company to its targeted users. (a) Identify and discuss the basic factors of communication that must be considered in the presentation of this information. (b) Discuss the communication problems a company faces in preparing the annual report due to the diversity of the users being addressed.
3. Select two types of information found in an annual report, other than the financial statements and accompanying footnotes, and describe how they are useful to the users of annual reports.
4. Discuss at least two advantages and two disadvantages of stating well-defined corporate strategies in the annual report.
5. Evaluate the effectiveness of annual reports in fulfilling the information needs of the following current and potential users: (a) shareholders, (b) creditors, (c) employees, (d) customers, and (e) financial analysts.
6. Annual reports are public and accessible to anyone, including competitors. Discuss how this affects decisions about what information should be provided in annual reports.

1-22. North Gate Manufacturing

Neil Rogers is the controller for North Gate Manufacturing (NGM), a company with headquarters in College Station, Texas. NGM has seven concrete product plants located throughout the South-west region of the United States. The company recently switched to a decentralized organizational structure. In the past, all revenues and expenses were consolidated to produce just one income statement.

Under the new organizational structure, each plant is headed by a general manager, who has responsibility for operating the plant like a separate company. Neil asked one of his accountants, Scott McDermott, to organize a small group to be in charge of performance analysis. This group is to prepare monthly reports on performance for each of the seven plants. These reports consist of budgeted and actual income statements. Written explanations and appraisals are to accompany variances. Each member of Scott's group has been assigned to a plant and is encouraged to interact with management and staff in that plant to become familiar with operations.

After a few months, Neil began receiving complaints from the general managers at several of the plants, claiming that the reports were slowing down operations and they felt like someone was constantly "looking over their shoulders" to see if they are operating in line with budget. They pointed out that the performance analysis staff is trying to do its job (i.e., explanation of variances). The most vocal plant manager claimed that "those accountants can't explain the variances—they don't know anything about the industry!"

The president of NGM, Ross Stewart, also complained about the new system for performance evaluation reporting. He claims that he is unable to wade through the seven detailed income statements, variances, and narrative explanations of all variances each month. As he put it, "I don't have time for this, and I think much of the information I am receiving is useless!"

Requirements

1. Is it a good idea to have a special staff in charge of performance evaluation and analysis? Explain.
2. In a decentralized organization such as this one, what would seem to be the best approach to performance evaluation?
3. What information would you include in a performance evaluation report for Mr. Stewart?

READINGS AND OTHER RESOURCES

Camgeni, M.P. 2015. Staying a step ahead: Internal audit's use of technology. The IIA Research Foundation. Download from theiia.org.

Collins, J.C. 2017, January. Data mining your general ledger with Excel: Learn how to use Microsoft's ubiquitous spreadsheet application to unlock the wealth of information stored in your company's financials. *Journal of Accountancy* 223(1): 27.

Drew, J. 2015, October. CPAs: Criminal-pursuing agents. *Journal of Accountancy* 220(4): 54.

Drew, J. 2016, June. Should CPAs switch to Windows 10 or Office 2016? The JofA's annual gathering of accounting technology experts examines the newest major Microsoft releases and identifies the most exciting technologies on the horizon. *Journal of Accountancy* 221(6): 48.

Tysiac, K. 2016, November. New path for CPAs in cyber risk management: AICPA proposals would guide companies in designing and describing cybersecurity risk management programs and create a 'cybersecurity examination' engagement. *Journal of Accountancy* 222(5): 16.



Go to www.wiley.com/go/simkin/videos to access videos on the following topics:

- Accounting Songs**
- Cyber Net Fraud**
- Identity Theft**
- Sustainability**
- Accounting for Sustainability**

ANSWERS TO TEST YOURSELF

1. a 2. c 3. a 4. c 5. b 6. c 7. a 8. a 9. b 10. e 11. d 12. a 13. d 14. d