CHAPTER 1

Introduction to AIS

Overview of Business Processes
(Study Objective 1)

The Real World example on the next page will help you understand the context of many concepts in this chapter. Please read that Real World example to begin effective reading and studying of this chapter. You might wonder how the Real World example relates to accounting information systems (AIS). An accounting information system must capture, record, and process all financial transactions. Prior to McDonald’s implementation of the experimental drive-through order systems, all in-store and drive-through orders were processed through the cash registers at each location. When the new, experimental systems were implemented, consider their effects on the system that recorded sales. The new technology had to be configured in such a way that

1. Order details were taken accurately
2. Those details were forwarded to the correct McDonald’s location so that the order could be handed to the customer at the drive-through
3. The order data had to be included with McDonald’s sales and cash received for the day
4. The correct McDonald’s location had to be properly credited with the sale so that the franchise and managers would be given credit for sales they generated

The point of this example is that there are many different ways that sales transactions can be conducted. The accounting information system must identify the transactions to record, capture all the important details of each transaction, properly process the transaction details into the correct accounts, and provide reports externally and internally. Many types of transactions that result from business processes must be captured, recorded, and reported.

A business process is a prescribed sequence of work steps performed in order to produce a desired result for the organization. A business process is initiated by a particular kind of event and has a well-defined beginning and end. In the McDonald’s
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The Real World

A few years ago, the fast-food restaurant industry experimented with remote order-taking at the drive-through. Fast-food chains such as Hardee’s, Wendy’s, Jack in the Box, and McDonald’s each experimented with remote order-taking at some of their drive-through windows. In the case of McDonald’s, an experimental order-taking center takes drive-through orders for several different McDonald’s locations. In addition, some McDonald’s locations use off-site order-takers such as stay-at-home moms. Order-takers under both arrangements use voice over Internet protocol, or VoIP technology, a T1 phone line, and instant photographs to process the orders. A car pulling up to the menu board trips a magnetic loop that alerts the order-taker, who takes and confirms the order, enters the details on a computer screen, and transmits it instantly to the restaurant. In-store employees focus on taking the cash and delivering the food. Using photos of diners allows stores to install multiple drive-through lanes, which can boost car counts. While the industry appears to have gotten away from this trend, this example illustrates how companies are always searching for new ways to conduct business more efficiently. Often, changes such as these affect the accounting system.

example, the business process is the taking and filling of a drive-through order. Organizations have many different business processes, such as completing a sale, purchasing raw materials, paying employees, and paying vendors. Each business process has either a direct or an indirect effect on the financial status of the organization. For example, completing a sale directly increases cash or other assets, while paying employees directly reduces cash or increases liabilities. Purchasing new, efficient equipment also directly affects assets and/or liability accounts; yet this transaction is also expected to indirectly increase sales and assets, as it provides for increased productivity and an expanded customer base. As business processes occur, the accounting information system must capture and record the related accounting information.

All of the possible business processes would be too numerous to list. The four general types of business processes typical in organizations and outlined in this text are as follows:

1. Revenue processes (Chapter 8)
   a. Sales processes
   b. Sales return processes
   c. Cash collection processes

2. Expenditure processes (Chapters 9 and 10)
   a. Purchasing processes
   b. Purchase return processes
   c. Cash disbursement processes
   d. Payroll processes
   e. Fixed asset processes

3. Conversion processes (Chapter 11)
   a. Planning processes
   b. Resource management processes
   c. Logistics processes
4. Administrative processes (Chapter 12)
   a. Capital processes
   b. Investment processes
   c. General ledger processes

In the example on the previous page, the remote drive-through processing is part of the revenue processes. The order-taking combines the sales process and the cash collection process. For a fast-food franchise such as McDonald’s, these processes are the most visible and obvious to customers. There are also many other business processes that occur that may not be as apparent to customers.

In addition to revenue processes to sell food to customers and collect the cash, McDonald’s must implement some or all of the remaining processes in the preceding list. To sell a Big Mac Extra Value Meal to a customer, McDonald’s must first engage in purchase processes to buy meat, vegetables, buns, soft drinks, and other food items, as well as operating supplies. In addition, it must have payroll processes to pay employees, and fixed asset processes to buy and maintain equipment and other fixed assets. McDonald’s must have conversion processes to convert the raw meat, vegetables, and buns into customer products that can be sold.

McDonald’s must have capital processes that raise funds to buy capital assets, and investment processes to manage and invest any extra cash flow. Finally, McDonald’s needs general ledger processes to ensure that all transactions are recorded into the appropriate general ledger accounts and that financial information is reported to external and internal users. Each sale to a customer must be recorded as a sale, and the results of the sale must eventually be posted to the general ledger accounts of cash and sales.

The purpose here of reviewing these processes is not to cover the entire set of details, but to emphasize that there must be prescribed work steps in every area. Employees, work steps, and transaction recording systems must be established in any organization to ensure that business processes occur and that any accounting effects of those processes are captured and recorded. For example, employees who work the cash register must be trained to apply company policies for customer payment (such as cash and credit cards accepted, but no personal checks). As these employees perform their work steps, the system in place should be capturing the relevant accounting information. In the case of McDonald’s, the cash register captures the in-store sales data, including the items sold, price paid, sales tax, and date of sale. The cash registers are connected to a computer system that feeds the sales and cash data to corporate headquarters so that management reports can be created and external financial statements can be prepared at the end of the period.

In addition to developing well-defined business processes, organizations must also implement internal control processes into their work steps to prevent errors and fraud. **Internal controls** are the set of procedures and policies adopted within an organization to safeguard its assets, check the accuracy and reliability of its data, promote operational efficiency, and encourage adherence to prescribed managerial practices. For example, McDonald’s probably requires that at the end of every day, a manager close each cash register and reconcile the cash in the register to the recorded total sold at that register. This is an internal control process to prevent and detect errors in cash amounts and to discourage employees from stealing cash. Reconciliation of cash to cash register records is a business process designed to control other processes. Thus, we begin to see that the accounting information system has many components, as explained further in the next section.
Overview of an Accounting Information System (Study Objective 2)

The accounting information system comprises the processes, procedures, and systems that capture accounting data from business processes; record the accounting data in the appropriate records; process the detailed accounting data by classifying, summarizing, and consolidating; and report the summarized accounting data to internal and external users. Many years ago, accounting information systems were paper-based journals and ledgers that were recorded manually by employees. Today, nearly every organization uses computer systems for maintaining records in its accounting information system. For many companies, computerized accounting information systems have evolved into full ERP systems that automate, integrate, and manage all aspects of an organization’s business. The accounting information system has several important components, listed next. An example from McDonald’s is used to describe each component.

1. **Work steps within a business process capture accounting data** as that business process occurs. When McDonald’s employees greet a customer at the cash register, they perform several work steps to complete a sale, some of which are accounting related and some of which are not. Greeting the customer with a smile may be an important step, but it has no impact on accounting records. However, using the touch screen at the cash register to conduct the sale does have an accounting effect: sales amounts in the sales records should be increased and cash amounts in cash records should be increased.

2. **Manual or computer-based records record the accounting data** from business processes. As is true of most companies, McDonald’s has a system of computers and computer processes to record the appropriate data from the sale process. These systems usually involve both manual and computerized steps. For McDonald’s, the manual process is that a person must operate the cash register. The remainder of the McDonald’s system is computer-based, and the computer records the sale and all related data.

3. **Work steps serve as internal controls** within the business process to safeguard assets and ensure accuracy and completeness of the data. As mentioned before, requiring a manager to close and reconcile the cash register at the end of the day is an example of an internal control within the sales processes.

4. **Work steps are used to process, classify, summarize, and consolidate the raw accounting data.** For example, sales at each McDonald’s franchise must be summarized and consolidated into a single total of sales revenue to be reported on the income statement. At McDonald’s, these steps are accomplished by the computer system and the accounting software. In some companies, there may be manual or handwritten accounting records, although currently all business organizations use information technology (IT) systems to conduct some or all of the accounting recording and summarizing processes.

5. **Work steps generate both internal and external reports.** McDonald’s needs many types of internal reports to monitor the performance of individual franchise locations and regions. In addition, year-end external financial statements such as the income statement, balance sheet, and statement of cash flows must be prepared for external users.

These five components are part of any accounting information system but are likely to be applied differently in different business organizations. Exhibit 1-1 shows an overview of an accounting information system. The circles represent the many
business processes that occur in the organization—revenue, expenditure, conversion, and administrative processes. As those processes occur, data is captured and becomes input into the accounting information system. The accounting information system classifies, summarizes, and consolidates the data. As input and processing occur, data must be added to or retrieved from data storage. From this stored data and processing, several types of output are prepared. Some of the outputs would be documents such as purchase orders, invoices, and customer statements; other output would be checks to vendors and employees. The output reports are feedback that managers within the organization use to monitor and control the business processes. The number of computerized versus manual work steps may vary across organizations, but every organization should have each of these component pieces. In some organizations, the processes may be manual steps performed by employees, and the accounting records may be paper journals and ledgers. At the other extreme are companies where many or all of these work steps are performed by computers, and the accounting records are in computer files. In most cases, there is a combination of manual and computerized work steps.

The accounting system internal controls are not pictured in Exhibit 1-1, but there should be internal controls throughout the system. As defined earlier, internal controls are the set of procedures and policies adopted within an organization to safeguard its assets, check the accuracy and reliability of its data, promote operational efficiency, and encourage adherence to prescribed managerial practices. Internal controls are described later in this chapter and covered in detail in the Control Environment section (Chapters 3–7) of this book.

EXHIBIT 1-1 Overview of an Accounting Information System
relationships with other organizations. For example, McDonald’s could not operate without its relationships with the many suppliers that provide the ingredients for its menu selections. There is an entire set of activities (business processes) that culminate when McDonald’s sells a Big Mac® to a customer. Consider the road that leads to this culminating sale—it stretches far back into many other organizations. To illustrate these activities, let’s trace just a small part of that Big Mac sale back as far as we can reasonably go. In order to sell a Big Mac, McDonald’s had to purchase and keep an inventory of hamburger meat. McDonald’s would have purchased this meat from a meat supplier called a vendor. A vendor provides materials or operating supplies to an organization. The terms “vendor” and “supplier” are usually used interchangeably.

For the McDonald’s meat vendor to supply meat, that vendor had to buy cattle to process into raw meat. Therefore, McDonald’s meat supplier must have relationships with vendors that sell cattle. The cattle seller can be called a secondary supplier to McDonald’s. To trace back one step farther, we could say that the cattle seller had to buy cattle from a rancher who raised cattle.

Likewise, the bun on the Big Mac can be traced back to a bakery, which had to purchase flour from another company, and that flour producer needed wheat to produce flour. Tracing back one step farther, we find that the wheat was sold by a wheat farmer. You might wonder what the purpose is of tracing a Big Mac back to the rancher who raised cattle and the farmer who grew wheat. The point is that for McDonald’s to operate efficiently, each of these interactive relationships between buyer and seller must operate efficiently. For example, a labor union strike at a bakery could interrupt the supply of buns for McDonald’s. Therefore, the top management at McDonald’s must ensure that it properly manages, monitors, and controls the internal processes, as well as those processes that are linked to outside parties such as vendors. McDonald’s may not be able to directly control all of these interrelated activities stretching back through the many suppliers, but McDonald’s may be able to influence those activities by the suppliers they choose and the expectations they place on those suppliers in terms of price, quality, and delivery timing. This set of linked activities is called the supply chain. The supply chain is the entities, processes, and information flows that involve the movement of materials, funds, and related information through the full logistics process, from the acquisition of raw materials to the delivery of finished products to the end user. The supply chain includes all vendors, service providers, customers, and intermediaries.

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An organization such as McDonald’s must have many different suppliers of the same product because of the need for fresh ingredients. For example, the regional bakery in the next exhibit provides buns for McDonald’s in a five-state area.

As you have traveled, you may have noticed that your Big Mac® is always the same, no matter where you go. Even the buns are exactly the same in each town and city. McDonald’s plans for this uniformity in buns and must have many suppliers throughout the world that can make and deliver a consistent quality bun.

East Balt, Inc. is one of the large bakeries that supplies McDonald’s with buns. East Balt’s mission (see http://www.eastbalt.com/) is to be “Bakery Industry Leaders in Quality, Service, and Innovation.” The company makes McDonald’s buns according to strict standards of size, shape, color, height, and sesame seed coverage. To maintain freshness, the buns have to be baked in regional locations. It would be much too difficult to have one central location bake all buns for McDonald’s. Therefore, McDonald’s must have many different suppliers of buns throughout the world.
The concept of monitoring and controlling the linked set of activities in the supply chain is called supply chain management. **Supply chain management** is the organization and control of all materials, funds, and related information in the logistics process, from the acquisition of raw materials to the delivery of finished products to the end user (customer). A simplified view of a supply chain for McDonald’s is shown in Exhibit 1-2.

The management at McDonald’s would find it in the best interest of its company to closely manage, monitor, and control the processes within the supply chain as much as possible. For example, a large organization such as McDonald’s can demand certain levels of quality from the bakery that supplies buns. In addition, McDonald’s can apply pressure to make sure that the bakery has reliable suppliers of high-quality flour. To the extent that McDonald’s can influence primary and secondary suppliers to maintain quality of supplies and efficiency of operations, the business processes within McDonald’s will operate more smoothly. As an example, McDonald’s bun purchasing process will operate more efficiently when the bakery’s bun selling processes run efficiently. This connection between the purchasing processes used by McDonald’s and the supplier’s selling processes represents a supply chain linkage. In order to increase the efficiency and effectiveness of these supply chain linkages, many organizations employ IT systems. Using IT systems to enhance efficiency and effectiveness of internal or supply chain processes is called **IT enablement**.

### IT Enablement of Business Processes (Study Objective 4)

Generally, IT comprises all types of technology used to create, store, exchange, and utilize information in its various forms, including business data, conversations, still images, motion pictures, and multimedia presentations. For the purposes of this book, **information technology** is defined as the computers, ancillary equipment,
software, services, and related resources as applied to support business processes. IT usage to support business processes accomplishes one or more of the following objectives:

1. Increased efficiency of business processes
2. Reduced cost of business processes
3. Increased accuracy of the data related to business processes

Any processes within an organization, including the linkages within its supply chain, may benefit by IT enablement. The touch-screen cash register at McDonald’s is an example of IT enablement that increases the efficiency of the sales process. The addition of customer terminals where customers place their own order is also a form of IT enablement that is reducing the number of cashiers needed in each location. A third example of IT enablement is e-commerce sales such as those in place at Amazon.com, Inc. Amazon.com uses complex IT systems to present a sales model that allows customers to place their orders on its website.

These three examples only scratch the surface of the types of processes that can be IT-enabled. Any business process has the potential to be improved by IT enablement. In many cases, using IT to enable processes leads to a completely different approach to those processes. For example, the remote order-taking system described at the beginning of this chapter is a completely different order-taking process from the usual drive-through system. Using more complex IT such as voice over IP and digital photos, McDonald’s is experimenting with improving the efficiency of drive-through order taking. In some companies, IT enablement has become so widespread that the term digital transformation is now a better explanation of the IT innovation occurring. Digital transformation describes the process of fully automating and integrating all business systems internally as well as with technology that integrates with information and processes from customers, suppliers, and other company affiliates. A company that embraces digital transformation incorporates IT enablement throughout its organization and business processes. Applying IT to business processes is an opportunity to “think outside the box” and consider new and different methods for business processes. This concept of revising processes as IT enabling and digital transformation occur is called business process reengineering.

Business process reengineering (BPR) is the purposeful and organized changing of business processes to make them more efficient. BPR not only aligns business processes with the IT systems used to record processes, it also improves efficiency and effectiveness of these processes. Thus, the use of these sophisticated IT systems usually leads to two kinds of efficiency improvements. First, the underlying processes are reengineered to be conducted more efficiently. Second, the IT systems improve the efficiency of the underlying processes. Through rethinking and redesigning a process, the organization may be able to improve, and thereby enhance, the process. This rethinking and redesign is especially aided by the use of IT. When technology or computers are introduced into processes, the processes can be radically redesigned to take advantage of the speed and efficiency of computers to improve processing efficiency. IT and BPR have a mutually enhancing relationship. IT capabilities should support the business processes, and any business process should be designed to match the capabilities that the IT system can provide. BPR should leverage the capabilities of IT to improve the efficiency of processes. This is exactly what McDonald’s has done in the remote drive-through example; it has taken advantage of the capabilities offered by technology to improve the process and match it to the capability of the IT system.

Exhibit 1-3 is a screen from Microsoft Dynamics GP®, an ERP system that this text will use to illustrate details in an accounting information system. The screen
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An example of business process reengineering with IT enablement occurred at Ford Motor Company several years ago. Ford used a purchasing process that required a three-part purchase order. One copy was sent to the vendor, one was kept by the purchasing department, and one was forwarded to the accounts payable department. When purchased parts were received, the receiving department prepared a two-part receiving report. The receiving department kept a copy, and the other copy was forwarded to accounts payable. The vendor mailed an invoice to Ford’s accounts payable department. Matching purchase orders, receiving reports, and invoices required more than 500 people. These employees spent a great deal of time investigating mismatched documents. For example, the quantity on the purchase order might not have agreed with the quantity on the invoice. These time-consuming steps of document matching and reconciling mismatches led to late payments to vendors and, therefore, unhappy vendors.

Using IT and business process reengineering, Ford changed its purchasing and payment processes. After a BPR, an online database replaced the manual matching of documents. No document copies were prepared or circulated internally. When parts were received, the receiving employee verified that the goods matched to an outstanding purchase order in the ERP system. The computer system verified the matching of the part number, unit of measure, and supplier code between the purchase order and receiving report. When they agree, the computer system prepared a check to pay the vendor. This reengineered process allowed Ford to reduce the number of employees in accounts payable by 75 percent. Today, automated matching of documents such as a purchase order, receiving report, and vendor invoice have become the normal process in many companies.

EXHIBIT 1-3 Microsoft Dynamics GP Receivings Transaction Entry Screen Used to Complete Automated Matching of a Purchase Order and Product Receipt
provided is the Receivings Transaction Entry window. The screen illustrates the concept of automated matching in an ERP system. This screen would be completed by a receiving clerk or someone responsible for entering inventory items received that had previously been ordered on a purchase order. When a receiving transaction is entered, the user can view all purchase orders placed with the vendor and all inventory items ordered. When the correct purchase order is selected, the items ordered by the company populate the Receivings Transaction Entry screen. The user can then identify how many items were received. If there is a discrepancy between what was ordered and what was received, the system will note the discrepancy and only receive the actual amount received. Later when the vendor invoice is received the received purchase order is retrieved again and a matching of the receiving report and vendor invoice is also completed electronically in the system. At that point the purchase order, receiving report, and vendor invoice would be electronically matched and the invoice would be able to be paid. As noted in the Ford example, automated matching of documents such as a purchase order, receiving report, and vendor invoice significantly increases the efficiency of a company’s transaction processing.

Each of the business process categories (revenue, expenditure, conversion, and administrative) described in the early part of this chapter has been affected by business process reengineering and IT enablement. In this book, the chapters in the section “Business Processes” provide more detail about those categories of common business processes. Parts of those chapters also provide details of IT enablement that allowed BPR to occur in organizations. The next sections of this chapter briefly describe basic IT concepts and IT enabling systems.

Basic Computer and IT Concepts (Study Objective 5)

Nearly all accounting information systems rely on computer hardware and software to track business processes and to record accounting data. Therefore, it is important to have some understanding of basic computer terminology and concepts. Many details about IT systems are described in later chapters of this book, but some of the basic concepts are included in this chapter.

Basic Computer Data Structures

Accounting data is stored in computer files, and an accountant should have some understanding of data structures in IT systems. Data is organized in a data hierarchy in computer systems, as follows:

1. Bit, or binary digit
2. Byte
3. Field
4. Record
5. File
6. Database

A bit is a shortened reference to binary digit. The bit is the smallest unit of information in a computer system. A bit can have only one of two values: zero or one. All data in a computer system is reduced to a set of bits, or zeros and ones. A byte is a unit of storage that represents one character. In most computer systems, a byte is made up of eight bits. For example, the character “A” would be represented in a
computer system by a set of eight bits. Every character, including letters, numbers, and symbols, are represented by a byte.

A **field** is one item within a record. For example, *last name* is a field in a payroll record, and *description* is a field in an inventory record. A **record** is a set of related fields for the same entity. All fields for a given employee form a payroll record. Such fields would be employee number, last name, first name, Social Security number, pay rate, and year-to-date gross pay. The entire set of related records forms a **file**. The set of all employee records forms a payroll file.

Thus, the data structure hierarchy is as follows: Eight bits are a byte, a collection of related bytes is a field, a set of related fields is a record, and a set of related records is a file. The entire collection of files is called a database. A **database** is a collection of data stored on the computer in a form that allows the data to be easily accessed, retrieved, manipulated, and stored. The term database usually implies a shared database within the organization. Rather than each computer application having its own files, a database implies a single set of files that is shared by each application that uses the data. A **relational database** stores data in several small two-dimensional tables that can be joined together in many varying ways to represent many different kinds of relationships among the data. An example of a relationship in data is a single customer having more than one order. A relational database is intended to allow flexibility in queries. This means that managers or users can query the database for information or reports as needed.

The computer files of traditional accounting software systems use master files and transaction files. The **master files** are the relatively permanent files that maintain the detailed data for each major process. For example, a payroll master file contains a record of each employee’s relatively permanent information necessary to process payroll transactions such as name, address, pay rate, and year-to-date amounts. Thus, the master file is much like a subsidiary ledger. The **transaction file** is the set of relatively temporary records that will be processed to update the master file. A payroll transaction file would contain the set of hours worked by each employee for a particular pay period. The transaction file is processed against the master file, and employee year-to-date balances are updated in the master file.

Many modern IT systems maintain master file and transaction file information in a large database. Information in the database is often shared by different operational departments in a company. Data is updated in the database as transactions occur. For example, a company that purchases and sells inventory products would have the receiving department update inventory files when purchased inventory is received, and then the billing department would access the same data and reduce the inventory when the items are sold. The company’s sales department might also utilize a customer relationship management system that accesses the same inventory database to identify units that the company has available to sell to customers. In legacy systems that were not fully integrated, separate systems and databases would be utilized and redundant steps performed to update the data in separate disparate systems. Fully integrated ERP systems that share a single database have enabled companies to improve their efficiency and reduce the number of individuals required to process transactions.

**File Access and Processing Modes**

In computer systems, data files are stored, organized, and accessed sequentially or randomly. **Sequential access** files store records in sequence, with one record stored immediately after another. The sequence is usually based on a key field such as employee number or customer number. Sequential files are read and written in
sequence. This means that for the user to access record number 500, the previous 499 records must first be read by the computer. Sequential access is faster when the records are always accessed and used in sequential order. Sequential access is advantageous when information is infrequently accessed or accessed in the same order all the time. For example, tape storage devices (used for offline backups) use sequential access. In general, this type of backup data is not often retrieved, so storing it in sequential order is quicker to back up the data and store a copy. If the data is frequently retrieved and restored, storing to a CD or DVD would be a better option.

**Random access** files (sometimes called direct access files) are not written or read in sequential order; rather, their records are stored in random order. Since records are distributed randomly on the disk surface, an underlying system enables the computer to find a record among the random records, using either an index, a formula, or a hashing scheme to assign a specific address to each record. CDs, DVDs, and hard drives store data randomly. Large databases are more quickly accessed when random access is used. Random access methods store data wherever there is space, resulting in a better solution when data is rapidly modified or accessed frequently. Data storage tools and utilities use smart algorithms to decide the most efficient way to store data. In most scenarios, random access would be selected. The exception being that tape drives with sequential access may be more optimal for backups and data archives that are seldom retrieved or used.

There are situations where the same files may sometimes be accessed either way, sequentially or randomly. In cases where both access methods are necessary, some systems use the **indexed sequential access method** (ISAM). ISAM files are stored sequentially, but can also be accessed randomly because an index allows random access to specific records.

There are also two modes of processing transactions in accounting systems: batch processing and online processing. **Batch processing** requires that all similar transactions be grouped together for a specified time; then this group of transactions is processed as a batch. Batch processing is best suited to applications having large volumes of similar transactions that can be processed at regular intervals. Payroll processing is a good example of a system well suited for batch processing. All time cards can be grouped together for a two-week pay period, and all payroll processing takes place on the entire set of time cards.

**Online processing** is the opposite of batch processing. Transactions are not grouped into batches, but each transaction is entered and processed one at a time. Some online processing systems are also **real-time processing** systems, meaning that the transaction is processed immediately, and in real time, so that the output is available immediately. Online processing is best suited to applications in which there is a large volume of records, but only a few records are needed to process any individual transaction.

Batch processing is best suited to sequential access files, and online processing is best suited to random access files. If transactions are to be processed online and in real time, then the computer must access a single record immediately. An online, real-time system requires direct access files. As an example, think about placing a telephone call to reserve an airline ticket. The airline employee must be able to access the specific flight that you request. If flight records were stored sequentially, the computer system would need to read all records in sequence until it reached the requested record. This system would be too inefficient. If the flight records are stored randomly, a hashing index exists to locate any single record quickly.

Online processing usually requires random access files, but batch processing can use either random or sequential access files. In many cases, ISAM files are used,
since they offer both random and sequential access. For example, payroll processing requires access to employee records in sequence. This operation would be most efficient as a batch processing system that accesses and processes records sequentially. However, the human resources department would occasionally need to access an individual employee records. For example, when an employee receives a raise, the employee record must be accessed to update the *pay rate* field. Random access would allow the system to quickly locate that single employee record.

**Data Warehouse and Data Mining**

A **data warehouse** is an integrated collection of enterprise-wide data that generally includes several years of nonvolatile data, used to support management in decision making and planning. The function of a data warehouse can be better understood by comparing it with an operational database. An **operational database** contains the data that is continually updated as transactions are processed. Usually, the operational database includes data for the current fiscal year and supports day-to-day operations and record keeping for the transaction processing systems. Each time a new transaction is completed, parts of the operational database must be updated. For example, recording a sale means that sales, inventory, and receivables balances must be updated. This type of update does not occur in a data warehouse.

The data in the data warehouse is said to be enterprise-wide because the data is pulled from each of the operational databases and maintained in the data warehouse for many fiscal periods—ideally, 5–10 years. The data in the data warehouse is retrieved from sales order processing, inventory systems, receivables, and many other transaction-processing systems within the organization. The data in a data warehouse is called nonvolatile because it does not change rapidly in the same way that operational data changes. Periodically, new data is uploaded to the data warehouse from the operational data; but other than this updating process, the data in the data warehouse does not change.

The data warehouse is used by management to complete data mining. **Data mining** is the process of searching data within the data warehouse for identifiable patterns that can be used to predict future behavior. Although there are many reasons a company might want to know future behavior, the most popular use of data mining is to predict the future buying behavior of customers. If businesses are able to more accurately predict customer buying trends, they can plan appropriately to produce, distribute, and sell the right products to customers at the right time. For example, by examining customer buying patterns from the past few periods of sales, a grocery chain might be able to more accurately predict which products sell better during hot weather periods. The company might find that ice cream sales increase by a large percentage when the temperature exceeds 80 degrees, and therefore it would be able to better plan the amount of ice cream to buy as the weather changes.

**Structured, Unstructured, and Big Data**

Data collected from transactions is in the form of structured data. **Structured data** easily fits into rows and columns. These columns usually are fields of fixed length. An example would be 10 digits for a phone number. Customer name, credit card number, and total dollar amount of sales are other examples of data that easily fits into rows and columns. Companies also collect unstructured data. **Unstructured data** does not easily fit into rows and columns of fixed length. An example
of unstructured data would be the free-form text of a customer’s online review of a product. It might include Facebook posts, tweets, video, and other free-form types of data. Since most accounting data is structured data, the remainder of this chapter describes the typical storage and processing techniques used in organizations to manage their structured data.

Organizations accumulate a mountain of structured accounting data resulting from their numerous business transactions. This includes account numbers, dollar amounts, and other financial data from business transactions. Sometimes, the volume of data may seem overwhelming; but as long as it is structured data, it can be easily stored and organized by most accounting systems. However, accountants are evolving toward using more unstructured data. As companies collect more data from more sources, Big Data becomes a critically important resource that accountants must use. **Big Data** is known as high-volume, high-speed information that may be so large and diverse that it demands innovative forms of IT processing. It is generally considered too large in size and scope to be analyzed with traditional database tools. Yet it is important to understand Big Data so it can be used to provide key insights to enhance decision-making. Later chapters will explore potential areas for accountants to use Big Data.

**Networks and the Internet**

A computer **network** is two or more computers linked together to share information and/or resources. There are several types of computer networks, but the types most important to the topic of accounting information systems are local area network (LAN), the Internet, extranet, and intranet. A **LAN** is a computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings and are intended to connect computers within an organization. However, one LAN can be connected to other LANs over any distance via other network connections. A system of LANs connected in this way is called a WAN, or wide area network.

The **Internet** is the global computer network, or “information super-highway.” The Internet developed from a variety of university- and government-sponsored computer networks that have evolved and are now made up of millions upon millions of computers and subnetworks throughout the world. The Internet is the network that serves as the backbone for the World Wide Web (WWW).

An **intranet** is a company’s private network accessible only to the employees of that company. The intranet uses the common standards and protocols of the Internet. However, the computer servers of the intranet are accessible only from internal computers within the company. The purposes of an intranet are to distribute data or information to employees, to make shared data or files available, and to manage projects within the company.

An **extranet** is similar to an intranet except that it offers access to selected outsiders, such as buyers, suppliers, distributors, and wholesalers in the supply chain. Extranets allow business partners to exchange information. These business partners may be given limited access to company servers and access only to the data necessary to conduct supply chain exchanges with the company. For example, suppliers may need access to data pertaining to raw material inventory levels of their customers, but they would not need access to customers’ finished product inventory levels. Conversely, a wholesaler within the supply chain may need access to the manufacturer’s finished product inventory, but it would not need access to raw material inventory levels.
A cloud computing environment is a contemporary type of computer infrastructure used by a growing number of companies. Cloud computing involves the use of shared services, software and/or data stored on servers at a remote location. These resources are accessible over a network such as the Internet.

These networks are an important part of the infrastructure that allows organizations to effectively use IT systems. The networks allow the IT enablement of business processes. For example, the remote order-taking system described at the beginning of this chapter employs Voice over Internet protocol (VoIP) technology. VoIP uses the Internet to transmit voice telephone data. The IT enabling technologies described in the next section utilize some or all of these types of networks.

The Real World

The changes to accounting and business systems are evolving rapidly due to the technological disruption that is occurring as a result of evolving trends in digital transformation. In January 2019, the American Institute of Certified Public Accountants (AICPA) reported that the majority of finance and accounting teams are not adjusting their skillsets and competencies sufficiently to address important industry changes that are occurring as a result of artificial intelligence, robotic process automation, and other digital transformation technologies. Their recent study of more than 5,500 finance professionals across 2,000 organizations in 150 countries provided the following insights.

The report outlined that over 50 percent of finance leaders globally indicated that the competencies of their staff members needed to change significantly over the next three years, as new technologies are resulting in many traditional tasks being automated.

The outcome is that many repetitive, routine tasks are being automated, requiring team members to evolve their skillsets and focus on higher level, value added activities such as data analytics and cyber risk management. To support the rapid change in technology and capabilities, the AICPA warned that professionals would need to be ready to continually learn new skills and technologies and embrace an increasingly complex, continually changing work environment.

The article indicated that:

• 61 percent of the professionals surveyed expect that 20 percent of current accounting/finance tasks will be automated in the next three years
• 55 percent have already started to automate processes that were previously completed by humans

Cloud computing, robotic process automation, artificial intelligence, and other technological advancements are radically changing corporate business systems and the way that entities are conducting business. Ash Noah, CPA, CGMA and managing director of CGMA Learning, Education & Development at the AICPA argues that “for finance professionals, this means there is an imperative to move beyond their comfort zones to develop digital intelligence to meet the new demands of business.”

In a second study, also released in January, 2019 by the AICPA, the Chartered Institute of Management Accountants (CIMA), and Oracle (an ERP vendor), it was reported that 90 percent of finance leaders do not believe their teams have the skills to support an organization’s digital transformation to help their businesses grow and make better decisions. For additional information on this report and how finance and accounting professionals can develop the skills and competencies to future-proof their careers, see cgma.org/future-finance-white-paper.
Examples of IT Enablement  
(Study Objective 6)

As described earlier, computers and IT can be used to enable business processes, and applying IT to business processes offers companies the opportunity to do business process reengineering. The manner in which companies complete their processes can be changed to take advantage of the efficiency, effectiveness, or cost savings inherent in IT systems. The examples that follow are systems applied by companies today that use IT-enabled business processes.

E-Business

E-business is the use of electronic means to enhance business processes. E-business encompasses all forms of online electronic trading—consumer-based e-commerce and business-to-business transactions, as well as the use of IT for process integration inside organizations. E-business is therefore a very broad concept that includes not only electronic trading with customers but also servicing customers and vendors, swapping information with customers and vendors, and electronic recording and control of internal processes. IT systems, Internet and websites, as well as wireless networks, are the common means of enabling e-business to occur. E-commerce is the type of e-business that we are familiar with as consumers. Buying a book at Amazon.com and clothes at Patagonia.com are examples of engaging in e-commerce. E-business has so many other forms that it is difficult to explain its entire breadth. Chapter 14 describes e-business in more detail.

Electronic Data Interchange

Electronic data interchange (EDI) is the intercompany, computer-to-computer transfer of business documents in a standard business format. Three parts of this definition highlight the important characteristics of EDI: (1) “Intercompany” refers to two or more companies conducting business electronically. For example, a buyer of parts may use EDI to purchase parts from its supplier. (2) The computer-to-computer aspect of the definition indicates that each company’s computers are connected via a network. (3) A standard business format is necessary so that various companies, vendors, and sellers can interact and trade electronically by means of EDI software. EDI is used to transmit purchase orders, invoices, and payments electronically between trading partners.

Point of Sale System

A point of sale system (POS) is a system of hardware and software that captures retail sales transactions by standard bar coding. Nearly all large retail and grocery stores use POS systems that are integrated into the cash register. As a customer checks out through the cash register, the bar codes are scanned on the items purchased, prices are determined by access to inventory and price list data, sales revenue is recorded, and inventory values are updated. All of these processes occur in real time, and through POS-captured data the store can provide to its managers or home office daily summaries of sales by cash register or by product. Many companies adopt POS
Examples of IT Enablement (Study Objective 6)

Automated Matching

Automated matching is a system in which the software matches an invoice to its related purchase order and receiving report. Exhibit 1-3 provided an example of automated matching in Microsoft Dynamics GP. Traditional systems rely on a person to do this matching, whereas an automated matching system does not. To institute an automated matching system, all of the relevant files must be online and constantly ready for processing; the purchase order and receiving files and records must be in online files or databases. When an invoice is received from a vendor, an employee enters the details into the accounting system by completing the fields in the invoice entry screen, including the purchase order number that usually appears on the invoice. The system can then access the online purchase order and receiving files and verify that the items, quantities, and prices match. The system will not approve an invoice for payment unless the items and quantities match with the packing slip and the prices match the purchase order prices. This ensures that the vendor has billed for the correct items, quantities, and prices. Automated matching reduces the time and cost of processing vendor payments. The real-world example of Ford Motor Company described earlier illustrated an automated matching system.

Evaluated Receipt Settlement

Evaluated receipt settlement (ERS) is an invoice-less system in which computer hardware and software complete an invoice-less match comparing the purchase order with the goods received. If the online purchase order matches the goods, payment is made to the vendor. This eliminates the need for the vendor to send an invoice, since payment is approved as soon as goods are received (when they match a purchase order). The name ERS signifies that the receipt of goods is carefully evaluated and, if it matches the purchase order, settlement of the obligation occurs through this system. This IT-enabled system reduces the time and cost of processing vendor payments.

E-Payables and Electronic Invoice Presentment and Payment

E-payables and electronic invoice presentment and payment (EIPP) are both terms that refer to Web-enabled receipt and payment of vendor invoices. EIPP enables a vendor to present an invoice to its trading partner via the Internet, eliminating the paper, printing, and postage costs of traditional paper invoicing.

Enterprise Resource Planning Systems

Enterprise resource planning (ERP) is a multi-module software system designed to manage all aspects of an enterprise. ERP systems are usually broken down into modules such as financials, sales, purchasing, inventory management, manufacturing, and human resources. The modules are designed to work seamlessly with the rest...
of the system and to provide a consistent user interface between modules. These systems usually have extensive set-up options that allow some flexibility in the customizing of functionality to specific business needs. ERP systems are based on a relational database system.

An ERP software system is much more comprehensive and encompassing than traditional accounting software. ERP systems include modules to handle accounting functions, but, as previously mentioned, they also incorporate modules for manufacturing, marketing, logistics, and human resources. Before ERP, these types of modules usually were in separate software systems and were not well integrated with accounting software. This caused the need for some data requests to be answered by accessing data or reports from several different systems. If a customer asked whether a particular product was in stock, the accounting system could be accessed to answer that request. If it was not in stock, the customer might ask when it is scheduled to be manufactured. To answer that request, a completely separate software system, the production planning and control system, would need to be accessed. Under this kind of operation, with separate and nonintegrated software systems, a single employee usually did not have access to the separate systems to answer such requests. Customers might have been bounced from department to department to get answers to questions that should be answered by one person. The integration of all modules and business processes into a single ERP system is intended to be a solution to these types of problems. (Chapter 6 provides more details about ERP systems.)

**Blockchain Technology**

Many accounting and finance professionals believe that blockchain technology will be used to revolutionize financial transactions, the accompanying financial records, and the auditing of those financial records. Currently, it is too early to determine if these expectations are accurate, but it is important for any accounting professional to become familiar with evolving technology that potentially changes accounting or auditing. Therefore, this chapter and a few other chapters describe aspects of how blockchain technology may affect accounting and auditing. You may be familiar with the term blockchain if you have heard of the cryptocurrency Bitcoin, a virtual currency. Blockchain is the underlying Internet-based technology and recording system that allows the virtual trading of Bitcoin and the records of Bitcoin trading and holding. The use and impact of blockchain technology is rapidly expanding into all aspects of financial transactions and banking.

Since the early days of accounting, it is customary that every company has owned and maintained its own accounting ledgers and journals (which today are computer-based). With each company maintaining its own separate accounting records, a transaction between Company A and Company B could possibly be recorded differently by each company with regard to the amounts, timing, or method. Blockchain would radically change this centuries-old practice of separate accounting ledgers. Experts in blockchain see it as an extensive improvement over current accounting systems. It is a shared ledger system where both parties (Company A and Company B) must agree on the amounts and details of a transaction before it is added to the blockchain data—a shared, encrypted, and secure database. Once added to the blockchain, it is not possible to alter it. This characteristic means that the blockchain data is immutable or unchangeable over time.
This single version of the truth (i.e., the actual details of a transaction that are immutable and up-to-date data) can be accessed by all networked organizations that are a party to the transaction. Therefore, differences in the recording of data between companies is reduced or eliminated. This reduces the need to reconcile differences between ledgers because there is only one “true” version of the transaction details in the shared, distributed ledger. Since all affected parties must agree before data is added to the blockchain, and because the data is immutable once recorded, it is nearly impossible to fraudulently alter it.

IBM describes this aspect of blockchain records in the following manner:

• Single, shared, tamper-evident ledger—once recorded, transactions cannot be altered
• All parties must give consensus before a new transaction is added to the network
• Eliminates or reduces paper processes, speeding up transaction times and increasing efficiencies

Experts in the future of accounting believe the blockchain technology will be used to alter accounting such that it becomes triple entry rather than double entry, with the third entry visible to all blockchain network participants. As that transition occurs, companies may still maintain separate ledgers, but also have a third entry for each transaction into the blockchain. A simple representation of a third entry in a blockchain system is shown in Exhibit 1-4.

This block of data is then “chained” to other blocks of data and hence, the name blockchain. This blockchain data is immutable and up-to-date. The entire blockchain is stored in distributed nodes, or servers, across the globe. Later chapters will describe aspects of the possible impacts on accounting and auditing.
interrupt operations or destroy buildings and equipment. However, managers can take steps to lessen the negative impact of an earthquake. For example, they can ensure that buildings are designed to be resistant to earthquake damage. In fact, management has the ability and responsibility to take action to reduce risks or to lessen the impact of nearly all risks that the organization faces. These processes are called controls.

Accountants have a long history of being the professionals within the organization who help design and implement controls to lessen risks that have an impact on the financial standing of the organization. Accountants are usually experts in controls that can reduce risks in the following broad categories:

1. The risk that assets will be stolen or misused
2. The risk of errors in accounting data or information
3. The risk of fraudulent activity by employees, managers, customers, or vendors
4. The risks inherent in IT systems, such as
   a. Erroneous input of data
   b. Erroneous processing of data
   c. Computer fraud
   d. Computer security breaches
   e. Hardware or software failure
   f. Natural disasters that can interrupt computer system operations

Although management has the ultimate responsibility to establish a control environment to mitigate these risks to the extent to which it can reasonably do so, accountants are heavily involved in assisting management in the creation, implementation, and ongoing monitoring of the control environment. Management should ensure that the following types of controls exist:

1. Enterprise risk management (summarized in the next subsection)
2. Code of ethics (Chapter 3)
3. COSO accounting internal control structure (Chapter 3)
4. IT system control structure (Chapter 4)
5. Corporate governance structure (Chapters 3 and 4)
6. IT governance structure (Chapter 5)

**Enterprise Risk Management**

In 2004, the Committee of Sponsoring Organizations (COSO) of the Treadway Commission issued a comprehensive report on enterprise risk management (ERM) that is still widely used in today’s business environment. The purpose of the report, and the many related thought papers that have been issued, is to assist managers in meeting the challenge of managing risk in their organizations. A proper response to risk that all organizations face is to establish formal processes and procedures to manage risk. ERM is defined as

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2 COSO is a voluntary, private-sector organization that was originally formed in 1985 to sponsor the National Commission on Fraudulent Financial Reporting. COSO is jointly sponsored by five major professional associations in the United States: the American Accounting Association, the American Institute of Certified Public Accountants, Financial Executives International, the Institute of Internal Auditors, and the Institute of Management Accountants. It sponsors and disseminates frameworks and guidance based on in-depth research, analysis, and best practices in the areas of enterprise risk management, internal controls, and fraud deterrence. The Treadway Commission was named for James C. Treadway, the National Commission’s first chairman and former Commissioner of the Securities and Exchange Commission (www.coso.org).
... a process, effected by an entity’s board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.³

This definition has several critical components. First, notice that ERM is put into place by top management and the board of directors. This emphasizes that ERM is the responsibility of management. Second, ERM is an ongoing process. Therefore, it is not something that occurs once and is forgotten—it is the continuous assessment of risks, determination of acceptable levels of risk, and management of risks to that acceptable level. Finally, ERM must involve not only management but also personnel across the enterprise.

ERM requires that management set policies and procedures related to⁴:

- **Internal Environment**—The internal environment encompasses the tone of an organization that sets the basis for how risk is viewed and addressed by an entity’s people, including risk management philosophy and risk appetite, integrity and ethical values, and the operational environment.

- **Objective Setting**—Objectives must exist before management can identify potential events affecting their achievement. ERM ensures that management has in place a process to set objectives that support and align with the entity’s mission and are consistent with its risk appetite.

- **Event Identification**—Internal and external events affecting the achievement of an entity’s objectives must be identified, with distinction made between risks and opportunities. Opportunities are channeled back to management’s strategy or objective-setting processes.

- **Risk Assessment**—Risks are analyzed by likelihood and impact, as a basis for determining how they should be managed. Risks are assessed on both an inherent and a residual basis, meaning that the likelihood of errors is considered both before and after the application of controls.

- **Risk Response**—Management selects risk responses—avoiding, accepting, reducing, or sharing risk—by developing a set of actions to align risks with the entity’s risk tolerances and risk appetite.

- **Control Activities**—Policies and procedures are established and implemented to help ensure that the risk responses are effectively carried out.

- **Information and Communication**—Relevant information is identified, captured, and communicated in a form and a time frame that enable people to carry out their responsibilities. Effective communication also occurs in a broader sense, flowing down, across, and up the entity.

- **Monitoring**—The entirety of ERM is monitored and modified as necessary. Monitoring is accomplished through ongoing management activities (including internal auditing), separate evaluations (such as those performed by external auditors), or both.

To achieve the objective of managing risk, management should establish control structures that include at least accounting internal controls, IT controls, corporate governance, and IT governance. These control structures are briefly sketched next and are described in more detail in later chapters.


⁴Ibid.
A company’s developing and adhering to a code of ethics should reduce opportunities for managers or employees to conduct fraud. This will only be true, however, if top management emphasizes this code of ethics and disciplines or discharges those who violate it. Managers who emphasize and model ethical behavior are more likely to encourage ethical behavior in their employees.

COSO Accounting Internal Control Structure

In addition to its ERM guidance, COSO is well known for its “Internal Controls—Integrated Framework,” which explains what has become the standard accepted by the accounting and business community as the definition and description of internal control. According to this framework, there are five interrelated components of internal control: the control environment, risk assessment, control activities, information and communication, and monitoring. Notice that to achieve ERM, an organization must include these five components of internal control in its ERM processes. (These five components are described in detail in Chapter 3.)

IT Controls

Threats and risks that interrupt or stop computer operations can be severely damaging to the organization. Not only can they halt or disrupt normal operations, but they can also lead to incorrect or incomplete accounting information. In addition, computer processing of accounting data leads to the risks of erroneous accounting data due to

The Real World

On April 20, 2010, an explosion aboard the Deep Water Horizon drilling platform forced millions of gallons of oil to spill into the Gulf of Mexico, wreaking havoc on marine life and upsetting the coastal economies. This event and the related problems have been disastrous for BP, the company most frequently blamed for this tragedy.

Although you may think this is an extreme example, it illustrates how critical it is for companies to manage risks. Risks lie in nearly every aspect of every business, and the task of identifying and mitigating them is a daily challenge. Certainly, any oil company would include an explosion, oil spill, or oil leak among its most serious risks, so how could it be that this risk was not prevented? In the case of BP and the other responsible companies, there were evidently breakdowns in the monitoring of controls surrounding this location.

You may also wonder how this is relevant to accounting information systems. Although many people are familiar with the BP oil spill, most have probably never considered the accounting implications of this disaster. Yet long after its occurrence, BP still struggled to account for the damages owed for environmental clean-up and legal claims, and its audit firm consistently used cautionary language in the audit opinion accompanying BP’s financial statements. Despite the anticipation of losses, the resulting outcomes were significant. In September 2014, the New York Times reported that a U.S. District Court judge ruled that BP was primarily responsible for the oil spill due to its gross negligence and reckless conduct. In July 2015, BP agreed to pay $18.7 billion in fines, resulting in the largest corporate settlement in U.S. history.
flawed or incomplete input or processing of data, computer fraud, and computer security breaches. An organization must institute controls to limit these risks in IT systems.

IT controls can be divided into two categories: general controls and application controls. General controls apply overall to the IT accounting system; they are not restricted to any particular accounting application. An example of a general control is the use of passwords to allow only authorized users to log into an IT-based accounting system. Without regard to processing data in any specific application, passwords should be employed in the IT system. Application controls are used specifically in accounting applications to control inputs, processing, and output. Application controls are intended to ensure that inputs are accurate and complete, processing is accurate and complete, and outputs are properly distributed, controlled, and disposed of. (General and application controls in IT systems are described in Chapter 4.)

**Corporate Governance**

Corporate governance is a concept that has evolved over recent years. It is generally recognized as involving many diverse aspects of business; thus, many definitions of corporate governance exist to cover each different aspect of interest. For instance, when economists define corporate governance, they recognize factors affecting the supply and demand of corporate leaders and tend to emphasize the importance of motivating leaders through the use of incentive programs. On the other hand, financiers tend to emphasize the role of corporate leaders to provide a good rate of return, while accountants focus on the responsibility of corporate leaders to provide effective internal controls and accurate records.

If forced to provide a single definition, accountants would characterize corporate governance as an elaborate system of checks and balances whereby a company’s leadership is held accountable for building shareholder value and creating confidence in the financial reporting processes. This system of checks and balances includes several interrelated corporate functions within the corporate governance system, including management oversight, internal controls and compliance, financial stewardship, and ethical conduct.

Corporate governance has been tremendously affected by the Sarbanes–Oxley Act of 2002. The purpose of the Act was to improve financial reporting and reinforce the importance of corporate ethics. The legislation was enacted in an effort to curb the corruption and accounting blunders that had been discovered in connection with the bankruptcies of such corporate giants as Enron Corp. and WorldCom Inc. The Sarbanes–Oxley Act places a huge responsibility on top management to establish and maintain internal controls.

**IT Governance**

The proper management, control, and use of IT systems are known as IT governance. The IT Governance Institute defines IT governance as

> the leadership, organizational structure, and processes that ensure that the enterprise achieve(s) its goals by adding value while balancing risk versus return over IT and its processes. IT governance provides the structure that links IT processes, IT resources, and information to enterprise strategies and objectives.\(^5\)

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\(^5\)Control Objectives for IT (COBIT) 4.1, Executive Summary and Framework p. 5 (www.isaca.org).
In summary, the board of directors and top-level, executive managers must take responsibility to ensure that the organization uses processes that align IT systems to the strategies and objectives of the organization. IT systems should be chosen and implemented to support the attainment of strategies and objectives. To fulfill the management obligations that are inherent in IT governance, management must focus on the following aspects:

- Aligning IT strategy with the business strategy
- Cascading strategy and goals down into the enterprise
- Providing organizational structures that facilitate the implementation of strategies and goals
- Insisting that an IT control framework be adopted and implemented

(IT governance is further described in Chapter 5.)

The Importance of Accounting Information Systems to Accountants (Study Objective 8)

Anyone pursuing an accounting career must study and understand accounting information systems (AIS) and the related concepts. Any career path within accounting will in some manner involve the use of an accounting information system. Accountants have several possible roles related to accounting information systems: They may be users of the AIS, part of the design or implementation team of an AIS, and/or auditors of an AIS.

Users of the AIS

Accountants within any organization must use the accounting information system to accomplish the functions of accounting, generating reports, and using accounting reports. For example, a controller in an organization must oversee a staff of accountants who record all accounting transactions, do the monthly closing of the accounting records, and generate the reports needed by management and external users. The accounting information system is the mechanism that allows the accounting staff to accomplish those functions. Accountants must therefore understand AIS concepts in order to perform these accounting jobs.

Design or Implementation Team

Accountants are usually part of a multidisciplinary team that designs and/or implements accounting information systems. When an organization considers a change to its AIS, accountants must be involved in decisions related to such matters as evaluating which software to purchase, how to design software or systems, and the implementation of software or systems.

Auditors of the AIS

Auditors conduct assurance services such as a financial audit. To conduct an audit, the auditor must collect evidence and make judgments regarding the completeness and accuracy of accounting information. The auditor cannot make informed decisions necessary to complete the audit without an understanding of the accounting
information system. The auditor cannot judge the reliability of accounting data without understanding how the data is entered, processed, and reported in the accounting information system.

The Relation of Ethics to Accounting Information Systems (Study Objective 9)

Unfortunately, there are many opportunities for unethical or fraudulent behavior related to accounting information systems. Accounting information systems can be misused to assist in committing or concealing unethical acts. That is, the AIS is often the tool used to commit or cover up unethical behavior.

This is only one example of how an accounting information system can be misused to conduct unethical acts. Other examples of some potential unethical behaviors, to name a few, are as follows:

- Fraudulent financial reporting
- Revenue inflation
- Expense account fraud
- Inflating hours worked for payroll purposes
- Computer fraud
- Hacking
- Browsing confidential data

In many cases, unethical acts have also been made illegal. For example, fraudulent financial reporting is unethical, and it is also illegal. However, using a three percent

The Real World

In an anonymous company that sold computer software, the following unethical behavior occurred:

Top management set very ambitious monthly targets in order to meet annual revenue goals. Sales could not be booked as revenue until the product was shipped to customers. As it got closer to the end of a month and it appeared that monthly goals would not be met, salespersons were asked to call customers and ask them to take receipt of their orders earlier than anticipated. If these efforts did not produce enough revenue, there were instances where products were shipped to customers who had not ordered, knowing that customers would immediately ship them back to the company.

The revenue, however, would already be recognized for the current month, which resulted in meeting the monthly sales goal. Notice that those who engaged in this scheme presumed that the accounting information system would record sales when orders were shipped to customers. These individuals were taking advantage of the AIS by forcing products to be shipped early and thereby artificially inflating revenue. Those involved in the deception knew that the shipping of goods to customers would trigger processes that would lead to revenue being recorded. They knew that the AIS would capture and record data as if a sale were proper, because the system is set up to record shipments to customers as sales.

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bad debt percentage as opposed to a more realistic four percent rate to “fudge the numbers” may not be criminal; yet it is unethical. For many reasons, accountants must become aware of the potential unethical behaviors. Some of those reasons are that accountants

1. Assist in developing and implementing internal control structures that should lessen the chance of unethical actions. Those in this role must understand the nature of the various kinds of unethical actions before they can design a system to lessen the risk.

2. Are often pressured to assist in, or cover up, unethical actions. Therefore, accountants must understand what actions are ethical and unethical so that they can avoid being coerced into unethical actions.

3. Deal with assets or records that could easily tempt accountants to engage in unethical behavior. For example, someone who handles cash every day may be tempted to steal some of the cash. Accountants have control over or recording responsibilities for many assets. When professional accountants face ongoing temptation, having a better understanding of which actions are unethical may help them to resist temptation to commit unethical acts.

(These unethical behavior examples and many other ethical issues related to AIS will be discussed in the remaining chapters.)

Summary of Study Objectives

An overview of business processes. Many different business processes occur in organizations. A business process is a prescribed sequence of work steps completed in order to produce a desired result for the organization. A business process is initiated by a particular kind of event, has a well-defined beginning and end, and is usually completed in a relatively short period. Business processes may have direct or indirect effects on accounting records, and these can be categorized into revenue processes, expenditure processes, conversion processes, and administrative processes.

An overview of an accounting information system. The accounting information system comprises the processes, procedures, and systems that capture accounting data from business processes; record the accounting data in the appropriate records; process the detailed accounting data by classifying, summarizing, and consolidating; and report the summarized accounting data to users. As business processes occur, accounting data from those processes is entered into the accounting information system, processed, and reported to the appropriate internal and external parties. The internal reports can be used as feedback to monitor and control business processes.

The business process linkage throughout the supply chain. Not only do business processes occur within an organization, but they can also be linked to related organizations throughout the supply chain. For example, when an organization buys raw materials, it is engaging in a business process linked to the vendor’s selling process. The supply chain is the organizations, processes, and information flows that involve the movement of materials, funds, and related information through the full logistics process, from the acquisition of raw materials to delivery of finished products to
the end user. Supply chain management controls all materials, funds, and related information in the logistics process.

The IT enablement of business processes. Processes throughout the supply chain can benefit from information technology enablement. IT enablement is the leveraging of IT capabilities to improve the efficiency of a process, reduce the cost of a process, or both. For example, when an organization sells goods on a website, it is using IT to improve the efficiency and reduce the costs of its sales processes.

Basic computer and IT concepts. To understand an AIS and IT enablement of processes, it is important to have an understanding of basic computer and IT concepts. These concepts include the data hierarchy, databases, relational databases, and networks.

Examples of IT enablement. Organizations use many different types of IT enablement. Some examples introduced in this chapter include E-business, EDI, point of sale systems, automated matching of purchasing documents, evaluated receipt settlement, e-payables, and enterprise resource planning systems. IT enablement is described in more detail in later chapters.

The internal control structure of organizations. To maintain a strong control environment, there are at least six control-related structures that management should develop and maintain. These are ERM, a code of ethics, a set of internal controls, a set of IT controls, a corporate governance structure, and an IT governance structure.

The importance of accounting information systems to accountants. Accountants must understand accounting information systems because they are users, participants in the design and implementation, and auditors of the AIS.

The relation of ethics to accounting information systems. The accounting information system can be misused to conduct or cover up unethical or fraudulent behavior. In order to fulfill their professional responsibilities, accountants must understand the types of behavior within an organization that are unethical.

Key Terms

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<tr>
<th>Accounting information system</th>
<th>Data mining</th>
<th>Data warehouse</th>
<th>Operational database</th>
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<td>Application controls</td>
<td>Digital transformation</td>
<td>E-business</td>
<td>Point of sale systems</td>
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<td>Automated matching</td>
<td>Electronic data interchange</td>
<td>E-payables</td>
<td>Random access</td>
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<td>Batch processing</td>
<td>Electronic invoice presentation and payment</td>
<td>Evaluated receipt settlement</td>
<td>Real-time processing</td>
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<td>Big Data</td>
<td>Enterprise resource planning</td>
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<td>Bit</td>
<td>Enterprise risk management (ERM)</td>
<td>General controls</td>
<td>Sequential access</td>
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<td>Blockchain technology</td>
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<td>Indexed sequential access method</td>
<td>Structured data</td>
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<td>Business process</td>
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<td>Information technology</td>
<td>Supply chain</td>
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<td>Business process reengineering</td>
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<td>Internal controls</td>
<td>Supply chain management</td>
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<td>Byte</td>
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<td>IT enablement</td>
<td>Transaction file</td>
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<td>Corporate governance</td>
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<td>IT governance</td>
<td>Unstructured data</td>
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<td>Database</td>
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<td>LAN</td>
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<td>Master file</td>
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<td>Online processing</td>
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End of Chapter Material

Concept Check

1. When a company receives returned goods from a customer, the business process to accept the return would most likely be a(n)
   a. administrative process
   b. conversion process
   c. expenditure process
   d. revenue process

2. Which of the following is least likely to be an output of the accounting information system?
   a. check
   b. A report
   c. An invoice
   d. A bar code

3. Which of the following is not true of the supply chain?
   a. The supply chain includes vendors.
   b. The supply chain excludes customers.
   c. The supply chain includes information flows.
   d. The supply chain includes secondary suppliers.

4. Which of the following is not an objective of IT enablement?
   a. Increased accuracy of data
   b. Reduced cost
   c. Reduced security problems
   d. Increased efficiency

5. The correct order of the computer data hierarchy is
   a. byte, bit, record, field, file, database
   b. bit, byte, record, field, file, database
   c. bit, byte, field, record, file, database
   d. bit, byte, field, record, database, file

6. The process of searching for identifiable patterns in data is called
   a. sequential processing
   b. data warehousing
   c. data mining
   d. real-time processing

7. An IT-enabled system for purchasing that is an “invoice-less” system is called a(n)
   a. automated matching system
   b. evaluated receipt settlement
   c. e-payables
   d. point of sale system

8. The COSO report written for the purpose of assisting managers in the challenge of managing risk in their organizations is entitled
   c. “Corporate Governance Guidance”
   d. “IT Governance Guidance”

9. Accountants have some form of use of the AIS in all but which role?
   a. User
   b. Programmer
   c. Auditor
   d. Designer

10. Which of the following is not true of unethical behavior?
    a. The only category of unethical behavior for accountants is inflating revenue.
    b. Accountants are often pressured to help commit or cover up unethical behavior.
    c. Hacking is an unethical behavior that accountants should be concerned about.
    d. An accounting information system can be used to cover up unethical behavior.

Discussion Questions

11. (SO 1) How might the sales and cash collection processes at a Walmart store differ from the sales and cash collection processes at McDonald’s?

12. (SO 1) Can you think of any procedures in place at McDonald’s that are intended to ensure the accuracy of your order?

13. (SO 1) How might the sales and cash collection process at Boeing Co. (maker of commercial passenger jets) differ from the sales and cash collection processes at McDonald’s?

14. (SO 1) Are there business processes that do not in some way affect accounting records or financial statements?

15. (SO 2) Briefly describe the five components of an accounting information system.

16. (SO 2) Describe how sales data is captured and recorded at a restaurant such as Applebee’s.

17. (SO 2) What occurs in an accounting information system that classifies accounting transactions?
Problems

18 (SO 2) What are the differences between internal reports and external reports generated by the accounting information system?

19 (SO 3) What types of businesses are in the supply chain of an automobile manufacturer?

20 (SO 3) When a company evaluates a supplier of materials, what kinds of characteristics might be evaluated?

21 (SO 3) How do you think a company may be able to influence a supplier to meet its business processing requirements?

22 (SO 4) Describe any IT enablement that you have noticed at a large retail store such as Walmart or Target.

23 (SO 4) How do you think the World Wide Web (WWW) has led to business process reengineering at companies such as Lands’ End or J. Crew?

24 (SO 4) What two kinds of efficiency improvements result from business process reengineering in conjunction with IT systems?

25 (SO 5) Explain the differences between a field, a record, and a file.

26 (SO 5) Explain why random access files would be preferable to sequential access files when payroll personnel are changing a pay rate for a single employee.

27 (SO 5) Why do real-time systems require direct access files?

28 (SO 5) Why is data contained in the data warehouse called nonvolatile?

29 (SO 5) How is an extranet different from the Internet?

30 (SO 6) Prepare a list of the types of businesses that you have been involved in that use point of sale systems.

31 (SO 6) Identify the advantages of an e-payables system over a traditional system that uses paper purchase orders and invoices?

32 (SO 7) Describe why enterprise risk management is important.

33 (SO 7) What is the difference between general controls and application controls?

34 (SO 7) In what way is a code of ethics beneficial to an organization?

35 (SO 8) What roles do accountants have in relation to the accounting information system?

36 (SO 1) For each category of business processes (revenue, expenditure, conversion, and administrative), give an example of a business process.

37 (SO 2) Think of a company that you have worked for or with which you have done business. Which departments within the company need reports generated by the accounting information systems?

38 (SO 3) Explain a supply chain linkage and give an example.

39 (SO 4) Explain how business process reengineering occurs. Also, explain how it differs from the typical changes in company policies.

40 (SO 4, 6) Describe automated matching in the purchasing process and explain how this IT enablement has improved efficiency in companies.

41 (SO 5) For an accounts receivable system, what kind of data would be found in the master files and transaction files, respectively? What type of structured and unstructured data might relate to an accounts receivable system?

42 (SO 5) Describe the differences in the following three types of processing:
   a. batch processing
   b. online processing
   c. real-time processing

43 (SO 5) The networks discussed in this chapter were LAN, Internet, intranet, and extranet. Explain each.

44 (SO 7) Give a brief summary of each of the following:
   a. enterprise risk management
   b. corporate governance
   c. IT governance

45 (SO 9) Describe why accountants should be concerned about ethics.

46 (SO 9) Melanie Gibson is currently pursuing her accounting degree at the Ohio State University. She has excelled in each of her major courses to date; however, she tends to struggle in her computer classes and with assignments requiring use of computer technology. Nevertheless, Melanie confidently claims that she will become an excellent accountant. Comment on the practical and ethical implications of her position.

Brief Exercises

47 (SO 2) If an accounting information system were entirely a manual system (no computers used), explain how data would be captured, recorded, classified, summarized, and reported. Discuss how the sophistication of the company’s computer system impacts the accounting output and, alternatively, how the requirements for accounting outputs impact the design of the accounting information systems.
48 (SO 1, 3) Classify each of the following as a revenue process, expenditure process, conversion process, or administrative process:

a. Selling common stock to raise capital
b. Purchasing electronic components to manufacture DVD players
c. Moving electronic components from the stockroom to the production floor to begin making DVD players
d. Paying employees at the end of a payroll period
e. Preparing financial statements
f. Receiving cash payments from customers
g. Buying fixed assets
h. Moving manufactured DVD players from the production floor to the warehouse

49 (SO 1) Business processes are composed of three common stages: an initial event, a beginning, and an end. For items a–h listed in Problem 48, identify the applicable initial event, beginning, and end of the process.

50 (SO 1, 2, 7) Each of the points listed next represents an internal control that may be implemented within a company’s accounting information system to reduce various risks. For each point, identify the appropriate business process (revenue, expenditure, conversion, and administrative). In addition, refer to the description of business processes under Study Objective 2 in this chapter, and identify the appropriate subprocess. (Some subprocesses may be used more than once, and others may not be used at all.)

a. Customer credit must be authorized before a business transaction takes place.
b. An authorized price list of goods for sale is provided.
c. A shipping report is prepared for all shipments of goods so that customers may be billed in a timely manner.
d. Access to personnel files and paycheck records is available only in accordance with management specifications.
e. New vendors are required to be authorized before a business transaction takes place.
f. Access to cash is restricted to those employees authorized by management.
g. Costs of goods manufactured is properly summarized, classified, recorded, and reported.
h. Amounts due to vendors are reconciled by comparing company records with statements received from the vendors.
i. Employee wage rates and paycheck deductions must be authorized by management.
j. Specific procedures such as the performance of a background check are carried out for all new employee hires.
k. The purchasing manager is notified when stock levels are low so that items may be restocked to prevent backorders.
l. Two signatures are required on checks for payments in excess of $5,000.
m. When excess cash is on hand, the funds are invested in short-term securities.
n. Goods received are inspected, and any damaged or unmatched items are promptly communicated to the vendor.
o. The monthly bank statement is reconciled to the company’s cash records by an outside accountant.

51 (SO 3) Using the Internet or other research tool, search for the terms “RFID” and “supply chain.” Put both of these terms in your search and be sure that “supply chain” is in quotation marks. Read some of the resulting websites you find and answer these questions:

a. What is RFID?
b. How is RFID related to the supply chain?
c. How will RFID improve the accuracy of data from the supply chain?

52 (SO 7) Go to the COSO website and locate the guidance on enterprise risk management. The executive summary of the article “Enterprise risk management—Integrated Framework” can be downloaded at no cost. Read the sections titled “Roles and Responsibilities” and “Use of this Report.” Describe the roles that various parties should play in enterprise risk management.

53 (SO 9) Using the Internet or other research tool, search for the term (in quotations) “earnings management.” From the items you read, answer the following questions:

a. Is earnings management always criminal?
b. Is earnings management always unethical?

54 (SO 9) Using the Internet or other research tool, search for “HealthSouth” and “fraud” or “Scrushy” (the name of the company’s CEO). Explain the fraud that occurred at HealthSouth Corporation. What was the ultimate result of the prosecution of HealthSouth officials?
Cases

55 The Gas and Java Mart (G & J) is a gas station and convenience market similar to any BP, Shell, or Speedway gas and convenience stores. G & J is a regional chain located in eastern Missouri, with 14 locations.

Required:
The section of this chapter identified as Learning Objective 2 describes five work steps, or processes, in the accounting information system. Based on your experience in using similar kinds of gas and convenience marts, briefly describe your impression of how these five work steps would be accomplished at G & J if you buy gas, a bottled soft drink, and a candy bar.

56 The fast-food industry has been dramatically altered through IT enablement. However, IT enablement has not completely eliminated manual processes in fast-food franchise restaurants such as McDonald's, Wendy's, and Burger King.

Required:
Using your experience in visiting fast-food restaurants, answer the two questions that follow:

a. List and describe four different activities that are manual parts of business processes at a restaurant such as Wendy's.

b. List and describe four different activities that are IT-enabled parts of business processes at a restaurant such as Wendy's.

57 Consider any recent purchase you made at a department store such as Target, Walmart, or TJ Maxx. A business process that occurred was the sale of a product to you. However, to make that sale, the department store had to engage in many other processes that support that sales process, or result from that sales process. These other processes may precede or occur after that sales process.

Required:
a. Describe any necessary supporting processes that precede the sale of a product to you.

b. Describe any necessary supporting processes that occur after a sale to you.

58 Cooper's Cues Company is a small manufacturing operation that makes and sells pool cues for sporting goods stores and billiard halls in Baltimore, Maryland, and the surrounding local area. Rob Cooper and his wife Stacy are the owners and only employees.

Rob Cooper purchases all of the materials needed to make pool cues, including wood, paint, hardware, and supplies. All purchases are made from local suppliers, and all payments are made in cash at the time of the purchase. Rob Cooper is responsible for making the pool cues. He also handles all telephone calls and replacements, and he personally delivers all finished products.

All sales are conducted on account via the Internet. Orders are received electronically through the company's website at www.cooperscues.com. Stacy Cooper prints the orders and forwards them to her husband in the workshop. Mrs. Cooper is also responsible for website design and maintenance, as well as all accounting and customer collections.

Address the following questions regarding Cooper's Cues:

a. What are the business processes that apply to this business?

b. How would the business processes change if Cooper's Cues expanded to a regional focus?

c. How would the business processes change if Cooper’s Cues began selling pool balls and other billiard equipment in addition to cues?

Solutions to Concept Check

1 (SO 1) The business process to accept a customer’s return would most likely be a d. revenue process. Customer returns are part of the sales return process, which is a revenue process.

2 (SO 2) Of the choices presented, d. a bar code would be least likely to be an output of the accounting information system. A bar code is usually an input to the accounting information system. For example, the bar code on a grocery product is scanned to process a sale. The other options are outputs of an accounting information system.

3 (SO 3) The following is not true of the supply chain: b. The supply chain excludes customers. The supply chain includes vendors, customers, and all intermediaries.

4 (SO 4) The following is not an objective of IT enablement: c. reduced security problems. IT systems usually have increased security problems. The other three answers are objectives of IT enablement.

5 (SO 5) The correct order of the computer data hierarchy is c. bit, byte, field, record, file, database.
6. (SO 5) The process of searching for identifiable patterns in data is called c. **data mining**.

7. (SO 6) An IT-enabled system for purchasing that is “invoice-less” is called b. **evaluated receipt settlement**.

8. (SO 7) The title of the COSO report that was written for the purpose of assisting managers in the challenge of managing risk in their organizations is b. “**Enterprise Risk Management—Integrated Framework**.”

9. (SO 8) Accountants have some form of use of the AIS in all of the given choices except b. **programmer**. The programming role involves formulation of the AIS to meet users’ needs. It uses input and feedback from a variety of people within the organization and the supply chain to determine its components.

10. (SO 9) The following is not true of unethical behavior: a. The only category of unethical behavior for accountants is inflating revenue. This is only one of the many forms of unethical behavior that may take place.