CHAPTER 3

ELECTRONIC BUSINESS (E-BUSINESS) SYSTEMS

LEARNING OBJECTIVES

AFTER READING THIS CHAPTER, YOU SHOULD BE ABLE TO:

- APPRECIATE THE POSSIBLE CHANGES TO ORGANIZATIONAL PROCESSES THAT OCCUR WHEN ELECTRONIC BUSINESS IS INTRODUCED.
- UNDERSTAND THE MAJOR APPROACHES USED TO TRANSFER ELECTRONIC DATA DURING BUSINESS EVENTS PROCESSING.
- UNDERSTAND THE COMPLEXITIES SURROUNDING ELECTRONIC DATA INTERCHANGE THAT ARE INTRODUCED WHEN LINKING TWO DIFFERENT ORGANIZATIONS' COMPUTER SYSTEMS FOR JOINT BUSINESS EVENT DATA PROCESSING.
- APPRECIATE THE CHALLENGES FACED BY ORGANIZATIONS WHEN THEY PURSUE DIRECT BUSINESS LINKS WITH CUSTOMERS VIA THE INTERNET OR OTHER NETWORKS.
- APPRECIATE THE BUSINESS ADVANTAGES GAINED THROUGH EFFECTIVE USE OF ELECTRONIC BUSINESS.

For the quarter ending March 31, 1996, Amazon.com reported sales of $875,000. Fast-forward 10 years . . . for the quarter ending March 31, 2006, Amazon.com reported sales of over $2.2 BILLION.[1] The amazing part of the story is that in 1996, very little retail business was taking place on the Internet. Amazon.com began business with only a few workstations and no physical sales locations (i.e., no "bricks and mortar"). Because it began early in the era of business-to-consumer (B2C) e-business, many customers were skeptical of providing credit card information online. To provide comfort to these customers, Amazon.com processed credit card orders by receiving orders on one computer, writing the information to a floppy disk and physically walking the order to a separate computer. Amazon.com could not have grown to nearly $8.5 billion in annual sales[2] on such primitive systems. Instead, Amazon.com grew by developing and implementing secure transaction software, online shopping carts, and sophisticated data-analysis programs.

1 From historical SEC filings obtained at http://www.amazon.com.

2 Taken from the company's 2005 income statement at http://www.amazon.com.

Amazon.com's e-business model would not be feasible without this software. The model is based on Amazon.com's "almost-in-time" inventory concept, which supplements the B2C interface that you see as a customer with an innovative business-to-business (B2B) interface for quick acquisition and shipment of nonstocked items. That is, if the item that you order is not in stock, the company gets it from its supplier for shipment to you, the customer.

Through the development of technology, Amazon.com has been able to develop its e-business model as well as use its technology to provide similar services to companies such as Target and Office Depot, which traditionally would have been its competitors. Additionally, Amazon.com is promoting Web Services, which will allow access to many of the company's internal functions.[3] Amazon.com's future may revolve around its B2C and B2B technology capabilities, rather than its capability to sell books.

Synopsis

This chapter introduces the concept of **electronic business (e-business)**, which was defined in the Preface and Chapter 1 as the application of electronic networks (including the Internet) to exchange information and link business processes among organizations and/or individuals. These processes include interaction between back-office (i.e., internal) processes, such as distribution, manufacturing, and accounting; and front-office (i.e., external) processes, such as those that connect an organization to its customers and suppliers.[4] We also explore how communications technology is revolutionizing the way individuals and organizations conduct business.

E-BUSINESS

As organizations venture down this trail of electronic communications-driven business processes, the trail of paper, including invoices, check payments, and so forth, quickly disappears by capturing business event data at the e-business connection with a customer or supplier and by using *enterprise systems* to store data and make it accessible. The evolution to e-business has been slow in the past, but advances in Internet communication have switched the evolution into high gear. As you read and study this chapter, you will learn about the underlying technologies that facilitate e-business, the complexities of displacing paper records with electronic ones, the challenges faced in overcoming differences in technology and accounting systems design to link two companies' computer systems, and finally the barriers that must be overcome for successful execution of secure business events over the Internet. All these technologies, along with the flexible processes they allow to exist, are fundamental to providing traditional companies with the capability to implement new streamlined processes and new services for their customers. These new technologies also have enabled e-businesses such as Amazon.com to exist and prosper. Amazon.com's business processes are dependent on technology to provide efficient processing and the analysis of information to support product sales, product delivery, and replacement product acquisitions—virtually all of the company's *value chain*.

ENTERPRISE SYSTEMS

CONTROLS

3 Web Services will be discussed later in this chapter. See http://solutions.amazonwebservices.com/connect/index.jspa for Amazon.com's current offerings.

4 Some would distinguish the terms e-business, the comprehensive concept we have defined, and e-commerce, the external e-business processes (i.e., the buying and selling of products and services electronically, typically on the Internet). For simplicity, we do not distinguish the terms e-business and e-commerce in this text.

Introduction

The power of computers in transforming society is perhaps most obvious today in the way communications have changed. Our society has evolved from one that relied on face-to-face communication, to one in which phones became the primary medium, to a contemporary society that is dependent on electronic messages (i.e., e-mail and instant messaging). In essence, the richness of the media has been sacrificed for efficiency and effectiveness. In other words, the phone took away the ability to detect emotions through an individual's appearance, including smiles, frowns, or other facial expressions. E-mail went a step beyond the phone and also took away the ability to detect emotions through voice inflection and context sounds such as a chuckle. For example, you may have chosen in the past to send a family member or friend a voice mail, e-mail,or fax when you wanted to get them a message quickly but didn't really have time to talk beyond what you could deliver in the message. In effect, you used technology to make the delivery of the message more efficient. Through these actions, you made the completion of the necessary activities a more efficient process—much like the objectives of most business organizations in today's heavily competitive business environment.

E-BUSINESS
ENTERPRISE SYSTEMS
CONTROLS

From a business perspective, the shift toward increasingly automated business processes and communications based on the transfer of electronic data is designed to achieve greater efficiencies in business processing. When an organization engages in *e-business*, they complete electronic-based business events (i.e., the partial or complete elimination of paper documentation during business processes in favor of more efficient electronic-based communication). These electronic-based business events entail the interconnection of the underlying back-office processes of both organizations, effectively eliminating the errors associated with a paper-driven process. A by-product of e-business is often the elimination of the sales staff that would normally serve as the intermediary between the two parties to the business event. Bypassing the sales staff speeds up the business event by eliminating the interaction with a salesperson, establishing a direct and therefore immediate linkage to the vendor's computerized information system (which for many organizations participating in e-business today will be their *enterprise systems*) for faster communication of an order, and facilitating the electronic transfer of funds for immediate payment. The business event is completed more rapidly than in a traditional manual business model. Additionally, the purchaser will normally electronically solicit pricing and quickly determine the best price, which increases price efficiency as well. The computer can even check prices automatically, which eliminates the waste of the purchaser's time on such activities.

Amazon.com's success is not solely driven by its B2C sales systems. As we mentioned earlier, sophisticated B2B systems that are integrated with Amazon.com's suppliers' systems must exist to support acquiring products that consumers want. When Amazon.com needs to obtain a book or other item, it electronically sends a purchase order to the manufacturer or distributor of the item. The vendor will provide Amazon.com with the product (a physical flow) and also the expected warehouse delivery time—information that is ultimately used to provide the expected shipping and delivery dates to its customer.

B2B systems are not limited to companies that sell predominately over the Internet. Using processes similar to Amazon.com, companies such as Wal-Mart, which sell most of their merchandise in retail stores, also rely heavily on B2B. When the cashier at Wal-Mart scans an item, not only are sales recorded, but the inventory balance in the warehouse is also updated. Wal-Mart's vendors read that data and, if the warehouse quantities fall below the desired reorder point for the item, the vendor ships

replenishment stock to Wal-Mart automatically.[5] Today, the majority of e-business volume is conducted between business trading partners rather than consumers and businesses. That is, B2B is much bigger than B2C.

Big organizations aren't the only ones using such technologies to quicken the process. For instance, your favorite pizza joint or sandwich shop may accept e-mail or online ordering[6]—basically allowing you to avoid being put on hold when you place your order and avoid the risk of the employee taking orders hearing the wrong ingredients for your pizza or sandwich. You simply create the order yourself and ship it off, reducing the need for people to answer the phones and take orders.

With the Internet, many organizations have the opportunity to directly reach customers through electronic communication. The potential in this market has led to the explosion of e-business over the Internet. Airlines had such success with ticket sales over the Internet that they discontinued paying commissions to travel agents. In this chapter, we will explore a variety of technologies that enable e-business. You also will learn about the various forms of e-business that are used by organizations in today's business environment.

Throughout this text, the discussion of e-business is highlighted as it relates to various business processes, controls, and systems-development issues. Because this chapter is specifically on e-business, we will reserve use of the e-business icon to those places in the chapter where a particularly critical e-business technology or concept is discussed.

Applying E-Business to the Value Chain

Amazon.com has grown because it has used technology to enhance the company's *value chain* and to satisfy customer needs. The basic function of providing a book to a customer is not new; booksellers have been in existence for centuries. Historically, booksellers have stocked books that are consistent with their target customers. The customers personally visited the store for their selection, or perhaps in the case of a specialty store, corresponded by mail. Amazon.com's primary innovation was to offer a vast selection of books that were not necessarily in stock and to have the systems in place to acquire the nonstocked items quickly and relatively inexpensively. This concept allows a customer to shop at one "location" (although it may not be a physical location) for many different items without burdening Amazon.com with the inventory-carrying expenses of traditional retailers.

A second major innovation from Amazon.com is the collection and analysis of customer purchase data. The analysis uses sophisticated software to identify patterns and trends in customer preferences. When such information is identified, Amazon.com suggests items that customers with similar buying patterns have purchased; in other words, items that the customer has not purchased but might want. This process can obviously benefit Amazon.com through increased sales but may also increase customers' satisfaction by offering additional products they may enjoy.

Amazon.com has used each of these technological innovations to enhance its value chain and value system. By offering a wide variety of books (and ultimately other products) online and having the procurement and delivery systems in place to satisfy orders in a timely manner, Amazon.com has been able to grow substantially. This

5 This process, called Vendor Managed Inventory (VMI), is described in Chapter 12.

6 Most of the major pizza chains now accept orders online.

growth has come without having a physical retail presence or vast numbers of items in inventory.[7] Another major component of Amazon.com's value chain is the capability to market and sell items to customers based on customer interest. Each of these items has provided Amazon.com a competitive advantage in the online retailers' marketplace. Technology not only helps create efficient operations but can also enable organizations to become part of new value chains that were previously not available to them.

The Changing World of Business Processing

ENTERPRISE SYSTEMS

For centuries, the basic manner in which commerce transpired changed very little. In the past, a merchant would meet with a customer or another merchant and form an agreement to provide goods to customers in exchange for cash or other goods and services. The merchant would then record these exchanges in books of accounts and periodically consolidate the entries recorded in the books to determine how much various individuals owed the merchant, how much the merchant owed other people, and the excess cash and assets that the merchant owned.

Over the past three decades, the relative change in commercial practices has been exponential. At the leading edge of technological advance, cottage industries now are springing up on the Internet where personal contacts and face-to-face negotiations do not occur. Online catalogs can be viewed through an Internet browser, and orders can immediately be placed and paid for over the Internet. Of course, the bookkeeping functions may be done in much the same way as the historical merchant did them, but in many cases, the system will automatically trigger collection from the credit card company, automatically record the business event in the electronic database, and automatically update all of the related accounts. Indeed, many companies are using Web development tools from their ERP vendors to build Web sites that are linked to the ERP system's processing and central database.

Although it may appear that companies have switched from an old way of doing commerce to a brand new way, both methods are actually used by many organizations. The evolution of information technology has simply provided for alternative forms of business processes and business event data processing that enable some organizations to become more efficient and effective by altering the traditional means by which they have done business. To fully understand how technology can enable an organization to reengineer its business processes and more effectively enter into commerce activities, you first must have a solid understanding of how business event data processing can be completed. After you understand how processing is done, then the exploration of the technologies that enable improved efficiencies in business event data processing will be more meaningful to you.

In this chapter, the evolution of business event data processing is examined to help you understand and appreciate the evolution of business, including the different stages of e-business.

A Comparison of Manual and Automated Accounting Information Systems

Over the past several decades, there has been a major shift from manual to automated accounting information systems. In your work-life, you may never have to make a pencil entry into a sales journal, but it is very important to understand the flow of data through

7 In recent years, Amazon.com has increased the items stocked in inventory.

a manual system and how those manual steps have become automated. Although many similarities exist, there are differences in terminology between manual and automated accounting information systems. In this section, we compare portions of a manual AIS with an automated AIS. We describe the terminology used in these processes and show that computerizing an AIS merely changes *how* the data are processed not what tasks are performed. Figure 3.1 (pg. 68) depicts the journal, ledgers, and trial balance for Waltham Company for the month of June 20X1, the first month of operations. As we describe the activities depicted in the figure, assume that prior to these activities, we prepared two sales invoices:

- Number 601, dated June 5, 20X1 to Stan Smith for $75.00
- Number 602, dated June 16, 20X1 to Julie Jones for $50.00

1. The first activity in the manual accounting process is to **journalize** the business event (i.e., accounting transaction) in a book of original entry (i.e., a special or general journal). In Figure 3.1, two entries are made in the sales journal, one for the Smith sale and one for the Jones sale.
2. The second activity is to **post** the business event from the journal to a subsidiary ledger. In this case, we post the sales to the AR subsidiary ledgers by increasing Smith's AR balance by $75 and Jones' AR balance by $50. Notice the posting reference in the sales journal to the subsidiary ledger numbers 10 and 4 and in the AR subsidiary ledger to the relevant page (page 1) in the sales journal (SJ). (If there is no subsidiary ledger for the event, this step would be skipped.)
3. The third activity is to post the total from the journal to the general ledger. In Figure 3.1, the general ledger sales and AR accounts are each increased by $125.
4. The fourth activity is to **summarize** the business events by preparing a trial balance. As you can see in Figure 3.1, the debit and credit balances in the only two general ledger accounts considered in our example are listed in the trial balance. (Additional steps in the manual accounting process usually include adjusting entries, preparing financial statements, and closing entries.)

Figure 3.2 (pg. 69) depicts the automated equivalent of the Waltham Company's manual accounting system. Let's compare the activities and related terminology used in Figures 3.1 and 3.2. We also repeat the terms introduced in Chapter 1 with Figure 1.3 (pg. 13), *input*, *process(ing)/update*, *storage*, and *output*. The four numbered boxes in Figure 3.2 are equivalent to the four activities in the manual accounting process.

The first process, *record invoice*, is equivalent to the *journalizing* activity in the manual system (Figure 3.1) and to the *input* stage in Figure 1.3. This stage includes capturing data (for example, completing a source document such as the sales invoice) and, if necessary, converting the data to machine-readable form, such as the keying depicted in Figure 3.2.[8] In the same manner that accounting transactions are recorded in a general or special journal, data input to a computer are normally recorded in a business event data store such as the sales event data store in Figure 3.2. A **business event data** store (also known as a *transaction file*) is a book of original entry used for recording business events. These business events comprise the activities of the organization, such as purchasing goods from vendors and collecting cash from customers. The general and special journals used in manual accounting systems become automated as these business

8 When inputs are keyed into a computer directly without the use of a source document, the capture and conversion steps are combined. For instance, order entry clerks might key in a customer's telephone order without first transcribing it onto an order form. When inputs are received electronically, such as when an order is sent from a customer via the Internet, the capture and conversion steps do not involve any keying within the capturing organization.

FIGURE 3.1 Journalizing, Posting, and Summarizing in a Manual Accounting System

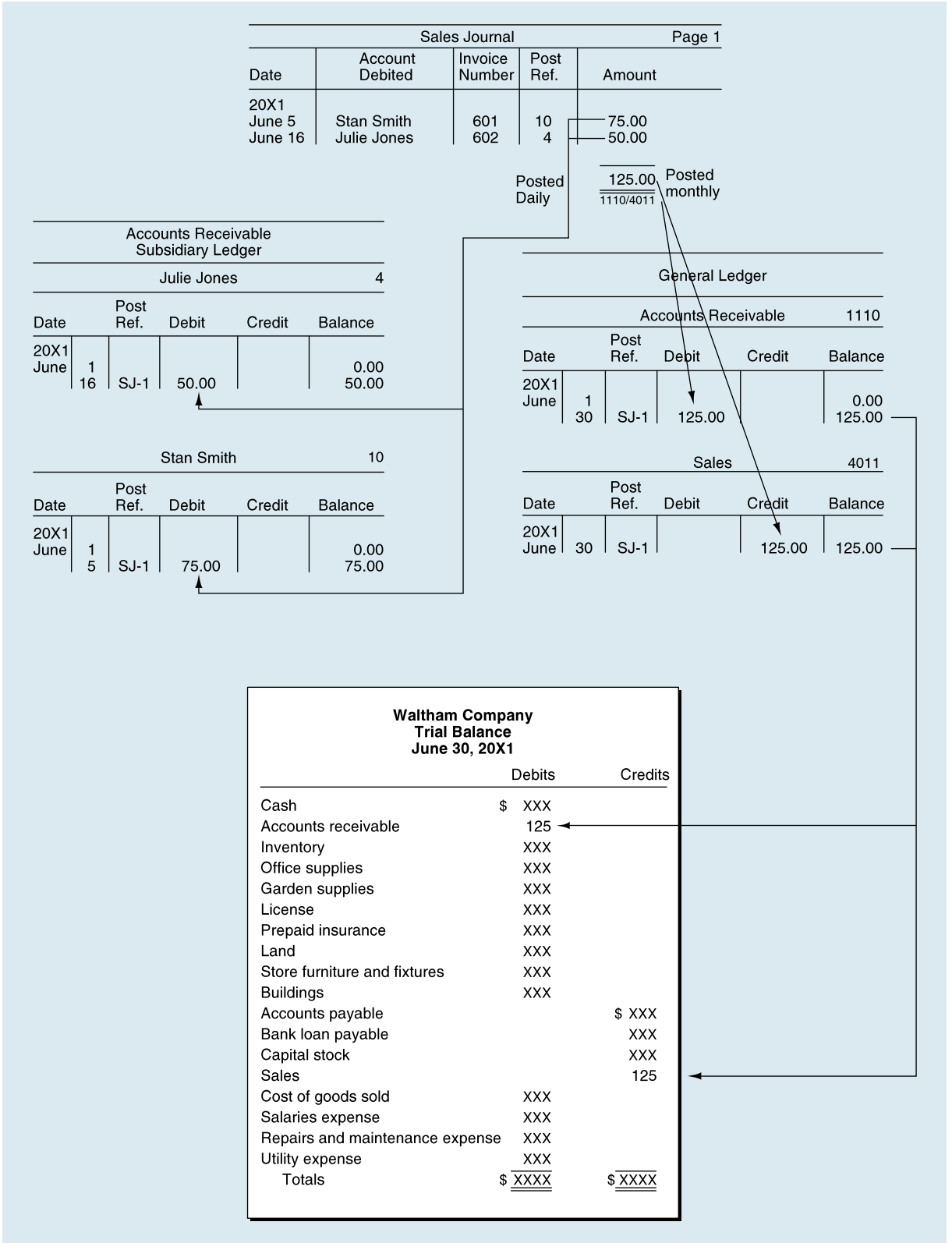
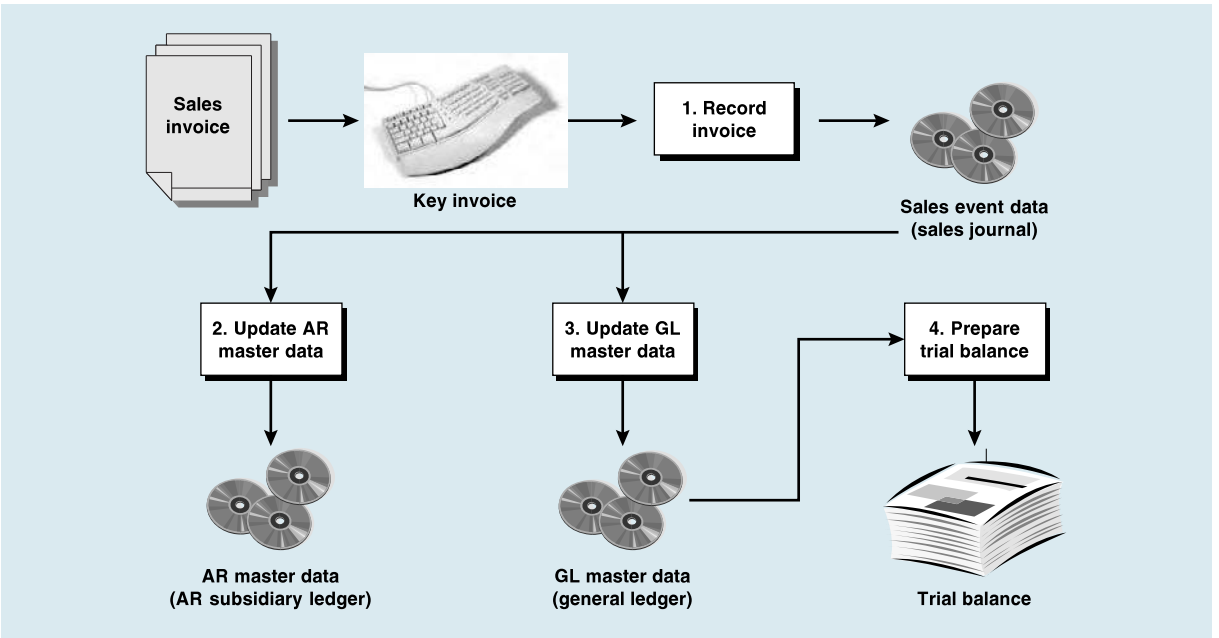


FIGURE 3.2 Automated Accounting System



event data stores. It should be noted that some events do not automatically generate traditional accounting journal entries. For example, issuing a purchase order is a business event, but generally, until title of the goods passes, no debit or credit is recorded. Business event data reflect the business events for a certain time period, such as one day. When automated, this data store can include more data than we see in the sales journal in Figure 3.1. For example, we could include salesperson, customer purchase order number, order date, terms, and description, price, and quantities of the items sold.

The second process, *update AR master data*, is equivalent to the *post* of business event data to the subsidiary ledger activity in Figure 3.1 and to the *processing/update* stage of Figure 1.3. This process can be performed for each invoice as it is recorded on the sale event data store or periodically for a group (or batch) of invoices. When automated, this data store can include more data than you see in the AR subsidiary ledger in Figure 3.1. Such additional data could include salesperson, customer purchase order number, order date, terms, amounts paid, discounts taken, and description, price, and quantities of the items sold.

The third process, *update GL master data*, is equivalent to the *post* of the total from the journal to the general ledger activity in Figure 1.3 and to the *processing/update* stage in Figure 1.3. As with process 2, this process can be performed for each invoice as it is recorded on the sales event data store or periodically for a group (or batch) of invoices. When recorded on an individual basis, the general ledger data may include a summary of *each* sale rather than totals from a journal.

Business event data are used often as a key source to update various master data. These master data updates incorporate new master data into existing master data by adding, deleting, and replacing master data and/or records. In this case, the sales event data are used to update the accounts receivable master data by adding new accounts receivable records.

Master data are repositories of relatively permanent data maintained over an extended period of time.[9] Master data contain data related to *entities*—persons and organizations (e.g., employees, customers), places (e.g., buildings), and things (e.g., accounts receivable, inventory). Master data include such data as the accounts receivable master data (that is, the accounts receivable subsidiary ledger), the customer master data, and the general ledger master data (that is, the general ledger).

Two types of updates can be made to master data: information processing and data maintenance. **Information processing** includes data processing functions related to economic events such as accounting events, internal operations such as manufacturing, and financial statement preparation such as adjusting entries. The updates in Figure 3.2 are information processing updates related to a sales event. **Data maintenance**, on the other hand, includes activities related to adding, deleting, or replacing the standing data portions of master data. **Standing data** include relatively permanent portions of master data, such as the credit limit on customer master data and the selling price and warehouse location on inventory master data. In this textbook, we emphasize information processing, and our analysis of the internal controls related to master data updates is restricted to master data updates from information processing. However, at appropriate points in the text, we refer to controls related to data maintenance.

The fourth process, *prepare trial balance*, is equivalent to *summarizing* the business events by preparing a trial balance activity in Figure 3.1 and to the *process* of preparing *output* in Figure 1.3. To do so, this process retrieves general ledger master data from storage and prints the trial balance.

To summarize, a computerized AIS automates the manual accounting process, with which you are already familiar, to make the automated process roughly equivalent to the manual process. That is, when an AIS is computerized, we change *how* the data are processed, but we do not change *what* tasks are performed.

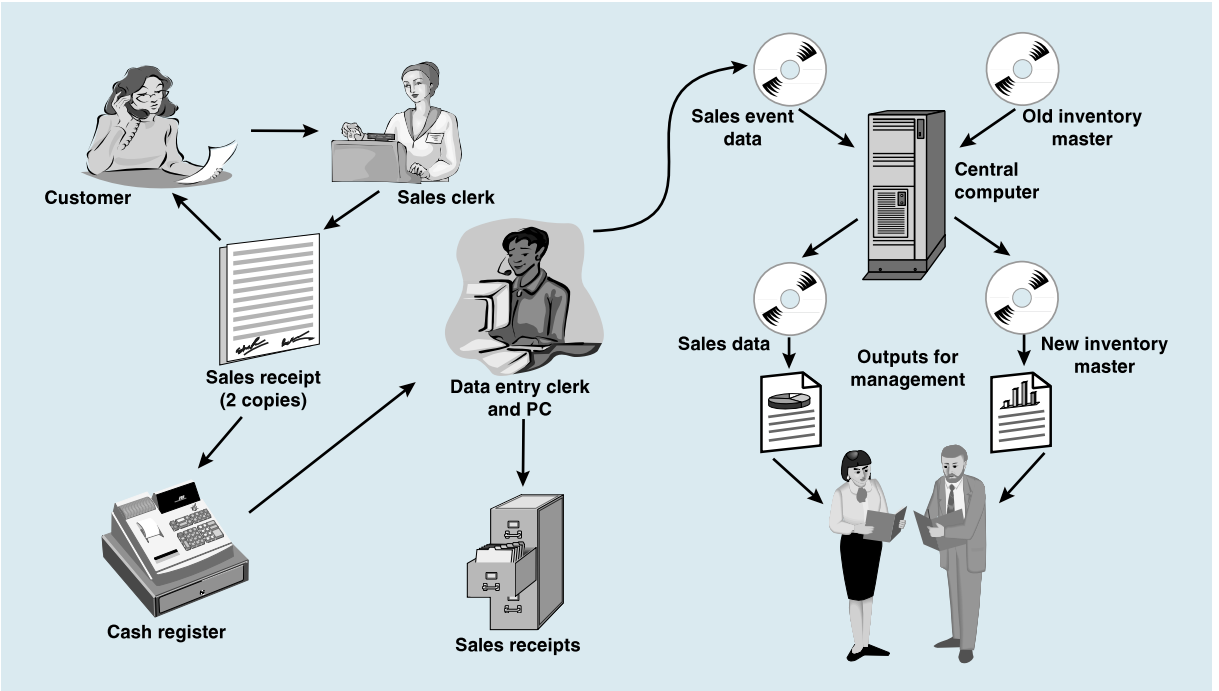
Automating an Accounting Information System

Since the earliest days of manual accounting information systems, accountants recognized that the cheapest and most efficient way to do data processing on large volumes of similar business event data was to aggregate (i.e., batch) several events together and then periodically complete the processing on all the event data at once. **Batch processing** is the aggregation of several business events over some period of time with the subsequent processing of these data as a group by the information system. The **periodic mode** is the processing mode in which a delay exists between the various data processing steps. Although technically not the same, the periodic mode is heavily dependent on the use of batch processing, and the two terms are often used interchangeably. Periodic mode can be contrasted with immediate mode, in which master files are updated immediately, each time an event is recorded. Figure 3.3 depicts the automation of our manual accounting system using the batch/periodic mode of processing. The batch mode was originally chosen as the automation technique because it so closely resembled the steps in the manual process.

The manual accounting system that we described previously and many automated systems use the *periodic mode*. We start by recording a set of journal entries that represent the business activities that have occurred. These journal entries are then transferred as a group (posted) to the general ledger and then to the trial balance. Executing the journal entry transfers as a *batch* is a more efficient way of maintaining the financial statements

9 As we will discuss later in this chapter, business event data and master data represent the relevant portions (or views) of the enterprise database being used for a particular application.

FIGURE 3.3 Batch Processing of Accounting Data



than transferring each business event individually to create a complete set of financial statements after each event was recorded (i.e., after each journal entry you would have to post to the general ledger and recreate the trial balance). In a computerized environment, the easiest approach to automating the accounting process is to simply mirror these manual batch-processing systems, which are relatively simple to develop, and provide for the most efficient use of employees and computer hardware.

Batch processing systems typically require four basic subprocesses to be completed before an event is converted into information reports that can be used by decision makers. Follow along with Figure 3.3 to see how each of these four subprocesses is typically completed.

1. *Business event occurs.* At the point of occurrence for the business event, the information for the event is recorded on a source document (by the sales clerk in Figure 3.3). For example, if you think of one of the small businesses you might frequent, such as a used books and CDs shop, they often have you bring the books and CDs you want to purchase to a clerk at the front of the store. The clerk then writes a description of the items purchased on a sales slip (prepared in duplicate) and totals the sale. The clerk returns one copy to you and stuffs the other copy into the cash register drawer.
2. *Record business event data.* A batch of source documents is transferred (taken out of the cash register and sent) to a data entry operator who takes the information from the source documents and enters the data in a computerized format. The business event data are usually entered using an **offline** device (i.e., one, such as the PC in Figure 3.3, which is not directly connected to a central computer or network). The resulting computerized format becomes the sales event data store. In the example used books and CDs store, the owner-manager or the employee closing up at the end of the day may take responsibility for keying all the sales slips into a PC for

storage on a disk. The PC becomes simply a data entry device for keying in the sales data. Upon completing the entry, the copies of the sales receipts are clipped together and stored in a file cabinet for possible future reference.

3. *Update master data.* After all the data have been entered into the system, the sales event data store is brought to the computer (using a disk or CD) to be processed and any calculations and summarizations completed (represented by the central computer symbol in Figure 3.3). This information is used to update the master data. In the sales example, this might include taking prior inventory totals and subtracting the items sold to derive the new inventory levels. The new inventory levels are accordingly written to an updated master data store. The sales event data also is stored in a more permanent data store, such as the sales data store. It is not uncommon for the owner-manager of the used books and CDs store to either take the data stores home and process them on a computer or, perhaps even more likely, to take the information to a public accountant for processing.
4. *Generate outputs.* After all the calculations have been completed and the data updated, the system periodically generates the applicable reports (the report generator program in Figure 3.3). For the used books and CDs store, this might include such documents as a sales report and an inventory update report. For this small store, both reports would probably go to the owner-manager.

Note that between each step is a time delay before the next step occurs. We might think of this form of automated system as a *pure* periodic system in that the entire process uses a periodic mode for processing. For instance, in the example used books and CDs store, the day's sales documents are collected before being passed on for keying. After keying, the sales data are held until the data can be transferred to the location and person where the data can be used to update the master data. After the data are updated each day, the reports still may not be generated until later—perhaps on a weekly or monthly basis.

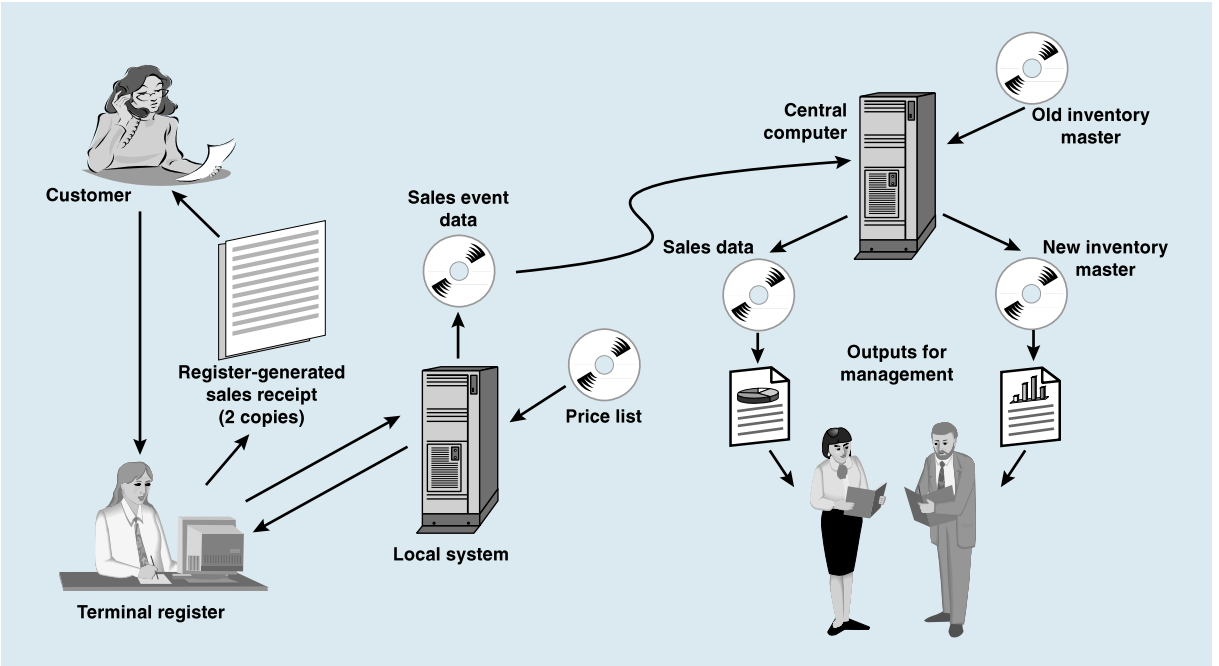
A disadvantage of periodic mode systems is that the only time the master data are up to date is right after the processing has been completed. As soon as the next business event occurs, the master data are no longer up to date. As a result, little reason exists to provide a query capability (discussed in Chapters 5 and 6) for data that are used in a periodic mode system. Usually, systems users will simply get a copy of the reports generated at the end of a processing run and use this information to make their decisions until the next processing run, and a new set of reports is available. Only in rare situations will a query capability be provided and then only to eliminate the needless printing of reports for occasional users of the information generated by the system.

Technology has also provided other choices for accounting system internal processes. Independent of how a system is implemented (manually or automated), you need to consider how information is aggregated within the system. The last comparison of manual and automated systems includes reporting. In a manual system, periodically, accounts are summarized, a trial balance is prepared, and financial statements are produced. In contrast, an automated system allows a user to retrieve the trial balance and financial statements with all data that have been processed at the time the report is desired. More frequent reporting is available concurrently with the elimination of many of the compilation tasks. Technology has provided many opportunities for improved processes that yield improvements in systems, such as increased reporting frequency.

Online Transaction Entry (OLTE)

Information technology improvements in recent years have provided a low-cost means for improving the efficiency of these traditional automated equivalents to manual accounting

FIGURE 3.4 Online Transaction Entry (Batch Processing Environment)



systems. The most prevalent change has been the increasing use of online transaction entry to reduce redundancies in pure periodic mode processing (see Figure 3.4). In an **online transaction entry (OLTE)** system, use of data entry devices allows business event data to be entered directly into the information system at the time and place that the business event occurs. These systems merge the traditional subprocesses of business event occurrences (which includes completion of the source document) and record business event data into a single operation. At the point of the business event, a computer input device or PC is used to enter the event data into the data entry system rather than onto a source document. Generally, prices are automatically generated by the system as the computer retrieves the data from the system data stores. Such a system is considered **online** because the data entry device is connected to the computer. The input system prints documents because source documents are still required. As business events occur, they are accumulated either on magnetic tape or on disk.

If we go back to our used books and CDs store scenario, it may be that you prefer to buy your books and CDs at one of the chain stores such as those found in shopping malls. When you take your books and CDs to the clerk at the counter in these types of stores, the clerk generally keys the purchase straight into the cash register. As noted in Figure 3.4, at this point, the sales items are being entered into a terminal that is creating (recording) a log of the sales event (the sales event data store), retrieving price list information, and generating duplicate copies of the sales receipt. One copy of the sales receipt is given to you (the customer), and the other is placed in the cash register drawer (for filing in the audit file). Note the differences between Figures 3.3 (pg. 71) and 3.4. The manual preparation of the sales receipt and entry into the cash register by the sales clerk in Figure 3.3 becomes one process (keying at the terminal register) in Figure 3.4. After that, the two processes are the same.

The use of OLTE eliminates the need to have one person enter business event data on a source document and then have a second person perform the data entry to convert

the business event data to a computer-ready form. In an OLTE system, one person performs both operations. In many contemporary systems, this data entry will be completed using *bar code readers*, *scanners*, (see Chapter 10), or *RFID (Radio-Frequency Identification) readers* (see Chapter 12). The use of such technologies eliminates the human error that can result from entering the data manually. Thus, in many OLTE systems, the only human impact on the accuracy of the input data is the necessity to properly scan items into the system. Various control procedures that are used to ensure data accuracy are discussed in detail in Chapter 9.

It should be noted that the processing of the data in Figure 3.4 is still completed on a batch of event data at a later time. In the case of many sophisticated systems in use by businesses today, sales event data are aggregated by cash register terminals or PCs for the entire day; after the store has closed, the data is electronically transferred over phone lines to a central computer system where the business event data are processed. This is reflected in Figure 3.4 by the communications line connecting the sales event data in the local system to the central computer. The processing is typically completed overnight while all stores in a region are closed, and updated reports are periodically generated to reflect the sales event updates to the master data.

Note that the use of electronic communication technology does not change the traditional periodic approach but rather makes the approach more efficient. Hence, we encounter one of the first steps in the evolution toward advanced-level e-business systems.

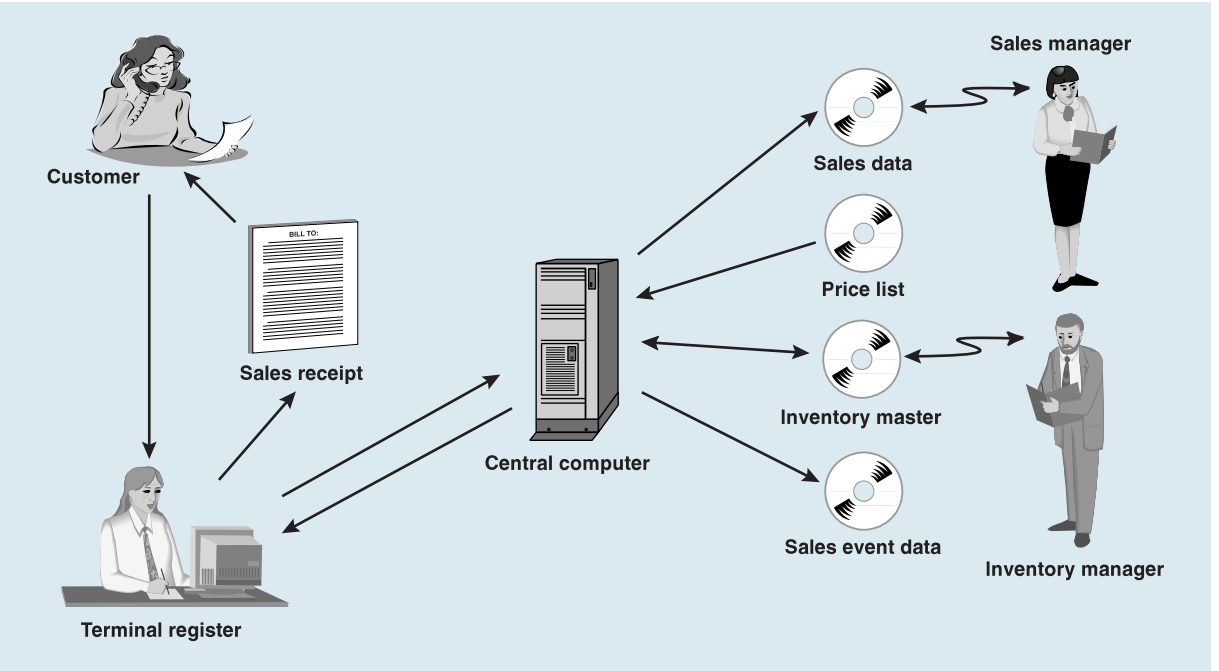
Periodic mode systems traditionally have been the most common method for completing business event data processing. Nonetheless, with accounting information systems being transferred almost exclusively to computerized systems and given the rapid improvements in information technologies, periodic mode systems are becoming less common for most activities. However, for some applications periodic mode processing is the preferred approach. For instance, payroll systems are a natural match with the batching of business event data because all employees are generally paid on a periodic basis and at the same time. It is unrealistic to think that such an application will eventually be processed using systems other than periodic mode.

Online Real-Time (OLRT) Processing

Among the many clichés that you hear in today's rather harried business environment is the phrase "time is money." Although somewhat worn out, the phrase is descriptive of the current demands on information systems. Traditional periodic mode systems that provide information primarily through periodic reports that are hours, days, or weeks out of date can put an organization's decision makers at a disadvantage if its competitors are using up-to-date information to make the same decisions (e.g., recall the importance placed on *timeliness* and *relevance* in Chapter 1). The pressures for timely information flows coupled with significant advances in available information technologies have led to a rapid migration toward online real-time systems. **Online real-time (OLRT) systems** gather business event data at the time of occurrence, update the master data essentially instantaneously, and provide the results arising from the business event within a very short amount of time—that is, in *real-time*. OLRT systems complete all stages of business event data processing in immediate mode. **Immediate mode** is the data processing mode in which little or no delay occurs between any two data processing steps (as opposed to periodic mode where a significant delay occurs between two or more data processing steps).

OLRT systems typically require three basic subprocesses to be completed before an event is converted into information that can be used by decision makers. Follow along with Figure 3.5 as we discuss each of these subprocesses.

FIGURE 3.5 Online Real-Time Processing



1. *Business event occurs and record business event data.* At the time of the business event, the related data are entered directly into the system. Source documents are almost never used because they significantly slow the process and remove some of the advantages of nonredundant data entry. Notice that the data entry process where the sale is entered into the system is the same as in Figure 3.4 (other than the absence of the filed copy of the sales receipt). This is consistent with the use of online transaction entry (OLTE) for OLRT systems.
2. *Update master data.* Each business event that has been entered into the system is processed individually and any calculations and summarizations completed. This information is then used to update the master data. Note in Figure 3.5 that the processing is now being done on-site where the sales event data are entered. Because each business event is processed independently and immediately, the master data at any given point in time will be within minutes or seconds of being up to date. When your books and CDs store is entering your information into the terminal, it may actually be using an OLRT system if it is important to the store to know whether a given book or CD title is in stock at a given point in time—perhaps to answer a customer's question.
3. *Generate reports* (*and support queries*). It is neither practical nor desirable that reports be generated after each business event is recorded and master data have been updated. Typically, applicable reports will still be generated by the system on a periodic basis. At the same time, however, these reports will usually be instantaneously available through access of the system on an as-needed basis, as demonstrated in Figure 3.5 with the communications links to the sales and inventory managers. One of the main advantages provided by many OLRT systems is an ability to check the current status of master data items at any point in time. In the books and CDs store, it allows the sales staff to quickly check whether a certain book or CD is in stock. In many cases, rather than using prespecified reports that

may not necessarily provide the information that decision makers need, these information systems users will use a query language (as discussed in Chapters 5 and 6) to dynamically create unique reports that provide the one-time information they need to make key decisions. For instance, the store manager may want to run a report on the inventory stock for the 10 top-selling CDs and books.

OLRT systems allow users to nearly eliminate the delay in accessing up-to-date information. However, the primary disadvantage of real-time systems is clearly the cost. To efficiently operate an OLRT system, it is imperative that the point of the business event be linked directly with the computer system—that is, online. Accordingly, to operate an OLRT system, OLTE methods must also be used.

It was noted previously that OLTE systems are increasingly being used with systems that use the periodic mode. Although the data entry performed in all OLTE systems is essentially the same, the mode of processing may vary. Whereas a pure periodic mode system still processes business event data in batches, an OLRT system using OLTE processes each recorded business event in real time. In a real-time system, business event data cannot be aggregated on a local computer to be transferred later to the data processing center. Rather, each business event must be communicated for processing at the time the event occurs. This results in a more expensive approach to OLTE. In essence, rather than creating a temporary electronic communications connection to download the data to the central computer, an OLRT system generally requires a continuous electronic communication connection that will usually necessitate the use of some form of network. This will be addressed later in this chapter.

Automated systems that model manual systems and OLRT systems are the two extremes in business event data processing. The systems that mimic manual systems are what we might term pure periodic mode systems in that a delay occurs between every step of the processing. On the other hand, OLRT systems represent pure immediate mode systems in that little or no delay occurs between any steps in the processing. We note these as the extremes because many systems lie somewhere between these two extremes by exhibiting a mix of periodic and immediate mode processes at various stages. For example, OLTE used with batch processing results in an immediate mode approach for combining the *business event occurrence* and *record event data* steps, whereas periodic mode processing might be used for the remainder of the steps.

Each of the described processing methods requires data communications pathways among PCs, terminals, and/or other systems. Technology Summary 3.1 describes the interconnectivity of such systems.

Methods for Conducting E-Business

To this point, the discussion has focused on the modes of business event data processing and related communication technologies that underlie the capability of organizations to enter into e-business. In this segment of the chapter, we redirect the discussion to specific methods for conducting e-business and how these methods use alternative modes of business event data processing and available electronic communication technologies.

The four methods of e-business that we will discuss are fairly diverse. First, we provide an overview of the role of *electronic mail* (e-mail) in e-business—a lesser used but more directed approach. Second, we discuss *electronic document management* (EDM). Many would not include EDM as part of e-business because the majority of such applications support events that are not e-business related. We chose to include it in this section because of the integral role it plays in supporting the last two stages. *Electronic*

Technology Summary 3.1

COMMUNICATION NETWORKS

The key component for electronic communication systems is the network that provides the pathways for transfer of the electronic data. Communication networks range from those designed to link a few computers together to the Internet where the goal is to link most of the computers in the world together.

Within organizations, a major focus of network computing has been on client/server technology. **Client/server technology** is the physical and logical division between user-oriented application programs that are run at the client level (i.e., user level) and the shared data that must be available through the server (i.e., a separate computer that handles centrally shared activities—such as databases and printing queues—between multiple users). The enabling networks underlying client/server technologies are **local area networks (LANs)** and **wide area networks (WANs)**. LANs are communication networks that link several different local user machines with printers, databases, and other shared devices. WANs are communication networks that link distributed users and local networks into an integrated communications network. Such systems have traditionally been the backbone of enterprise systems technology, but recent advances in communications technology are rapidly changing the underlying infrastructure models.

These emerging network technologies are driving the future of e-business. These technologies allow for more simplified user interaction with networks and empower users to access broad arrays of data for supplementing management decision making as well as opening new avenues for direct commerce linkages. The leading technology in this arena is the Internet. As you likely know, the **Internet** is a massive interconnection of computer networks worldwide that enables communication between dissimilar technology platforms. The Internet is the network that connects all the WANs to which organizations choose to allow access. With the expansion of the Internet also has come increased accessibility to public databases that provide rich information sources that are searchable either for free or on a for-fee basis.

Web browsers are software programs designed specifically to allow users to easily view various documents and data sources available on the Internet. The advent of this easy-to-use software has rippled through organizations and caused a rethinking of how companies can set up their own internal networks to be more accessible to decision makers. The result has been the growing development of **intranets**, which are essentially mini-internal equivalents to the Internet that link an organization's internal documents and databases into a system that is accessible through Web browsers or, increasingly, through internally developed software designed to maximize the benefits from utilization of organizational information resources.

By combining the benefits of the Internet and intranets, many organizations have begun to allow customers, vendors, and other members of their value system access to the company's intranet. This type of network, which has been extended to limited external access, is referred to as an **extranet**.

The by-product of the expansion in intranets, extranets, and the Internet is a rich medium for e-business. These networks provide the foundation for what likely will be exponential growth in e-business—both at the resale level and in supplier-buyer relationships.

data interchange (EDI) is the third area, which currently represents the predominant form of e-business. The fourth method is *Internet commerce*, which represents the fastest-growing segment of e-business. Concurrent with the development of Internet businesses that sell physical products, new organizations have surfaced existing solely to provide data through the Internet

Commerce Through E-Mail

Electronic mail (e-mail) is the electronic transmission of nonstandardized messages between two individuals who are linked via a communications network (usually an intranet or the Internet). E-mail represents a weak form for e-business because of the nonstandardized format by which messages are transmitted. Before exploring the use of

e-mail as a mode for e-business, let's briefly examine the limitations of using a non-standardized format.

If you think back to our earlier discussions in this chapter related to various technologies that can be used to automate the data entry process, all the technologies relied on a standardized format for the data (e.g., a bar code or a printed response such as *amount paid* on the sales receipt). This is almost the antithesis of e-mail. E-mail tends to be a very free-form mode of expression and, for the most part, a fairly casual and informal mode of communication. This unstructured nature of the communication mode makes data capturing more difficult and generally requires human translation and entry of the data. This increases the likelihood of error and requires more stringent data control procedures to be in place. The e-mail essentially becomes a source document for use in the business event data processing. Organizations using e-mail as source documents also must have a mechanism in place to deal with unsolicited, nondocument mail (spam).

Despite the limitations, e-mail does have several characteristics that make it tolerable for some e-business events. From a sales standpoint, a targeted market can often be identified by locating an appropriate e-mail list. Much like their mailing list counterparts that are used for postal delivery, lists of e-mail addresses for individuals that are likely to be interested in a given product can be useful. Generally, if the marketing medium is e-mail, then the purchase request also will be transmitted in this manner.

As a means of getting around the unstructured nature of e-mail transmissions, marketers frequently provide an electronic order form that adds structure to the information content of the message. However, even with the electronic order form, entry of the data into the system generally requires some keying by data entry personnel. Thus, the general objectives of e-business—to avoid the need for a salesperson to make the contact and to avoid the business event recording activities during business event data processing—are not achieved.

Electronic Document Management

Electronic document management (EDM) is the capturing, storage, management, and control of electronic document images for the purpose of supporting management decision making and facilitating business event data processing. The capturing and storage of document images typically relies on the digital image processing approaches (see Chapter 10). The added dimensions of management and control are critical to maintaining the physical security of the documents while at the same time assuring timely distribution to users requiring the information. Technology Application 3.1 discusses some general uses of EDM.

In general, business applications of EDM fall into two categories:

- **Document storage and retrieval:** For example, mortgages, deeds, and liens are archived and made available to the public for such uses as title searches. Other documents in this category include birth certificates, death certificates, marriage licenses, banking-account signature cards, user manuals, price lists, and catalogs. An EDM system stores the images (e.g., PDF files) of these items and displays or prints a copy of them upon request. Document storage and retrieval also could be implemented using micrographic-based image processing systems (i.e., microfilm).
- **Business event data processing:** For example, loan and insurance applications must pass through several stages, such as origination, underwriting, and closing. The EDM system can manage the workflow and route the documents to the appropriate people—even if these people are geographically dispersed. *Electronic-based* image processing systems must be used for this type of application. An

TECHNOLOGY APPLICATION 3.1

GENERAL USES OF ELECTRONIC DOCUMENT MANAGEMENT SYSTEMS

Case 1

The need to organize client files for quick access and processing leads many accounting firms to adopt document management systems. One such system was developed by Integrated Computer Management (ICM). The Electronic Compliance File (ECF) created for Ernst & Young LLP lets thousands of tax professionals in 100 cities manage their documents and images in one structured folder. In addition to eliminating the loss of critical paper-based information, the folder provides secure, distributed, online access, regardless of a staff member's location. The program reduced shipping costs and paperwork while increasing overall efficiency. Today, through continued development, ECF remains an integral part of managing the firm's tax practice.

Case 2

The Check Clearing for the 21st Century Act (Check 21) became effective on October 28, 2004. The Check 21 Act allows (but does not require) banks to substitute electronic images for paper checks in the check clearing and settlement process. The legislation is expected to save the banking industry billions of dollars. Although the law allows for "electronic replacement documents" to be in use now, industry experts caution that it will take years for the clearance process to include the entire financial industry. One of the main issues that will determine the success of the electronic processes is the attitude of consumers. Consumers willing to accept copies, rather than their original checks, will be one determining factor for the success of the implementation of the new processes. The success of technology, such as document processing, is heavily dependent on the acceptance of those receiving outputs.

Sources: "Microsoft Names Solution Provider Award Winners," Microsoft press release, http://www.microsoft.com/presspass, May 5, 1997; Lucas Mearian, "Check 21 Becomes Law: Allows Speedier Electronic Settlements," *Computerworld Online* (November 3, 2003); Federal Reserve Board "Check Clearing for the 21st Century Act," http://www.federalreserve.gov/paymentsystems/truncation/, March 1, 2006.

organization's communications networks also must be interconnected in a manner that facilitates access and transmission of document images.

EDM systems provide a relatively inexpensive alternative to paper documentation. Although computer storage and processing requirements are much greater than for key-entered documents, the ability to access and manipulate real images of business documents offers great opportunities for improving the efficiency and effectiveness of many business applications and can create significant competitive advantages for an organization. For instance, fast access to imaged documents often translates into faster, better customer service and results in increased customer loyalty—themes we explore in some depth in Chapter 10. The typical benefits include the following:

- Reduced cost of handling and storing paper.
- Improved staff productivity.
- Superior customer service.
- Enhanced management of operational workflow.
- Faster processing.

However, as with any technology, the applications selected for EDM should be chosen wisely. Applications with a high chance of success might be those in which the following is true:

- A large amount of paper is produced and stored. We know of an organization that adopted EDM because it had no more room to store paper within its existing office

space. In fact, the engineers said the floor could not support another file cabinet! Imaging systems also can produce economies in situations where paper documents are not abandoned altogether but are moved from storage in expensive office locations to cheaper off-site warehouse storage.

CONTROLS

- Data, such as signatures, must be scanned. For example, banks use image processing for signature verification cards.
- Frequent access to the stored data from geographically dispersed locations is needed. For example, clerks at every branch of a bank must be able to view signature verification cards.
- Processing of the stored data are extensive and complex and takes place from multiple locations, as in the case of loan and insurance applications that must be processed, reviewed, and approved by many people.

EDM also is becoming an increasingly important component of electronic data interchange (EDI). In many cases, organizations are requiring document and image support for EDI data. Most notable are manufacturing- and engineering-related event data where specifications may need to be more clearly defined with computer-aided design/computer-aided manufacturing drawings.

Electronic Data Interchange

Computer and communications technology have been successfully applied by organizations to improve accuracy and control and to eliminate paper *within* their information systems applications. However, direct, paperless, business communication *between* organizations has been slowed by the lack of transmission and presentation standards. What this often means is that an organization uses its computer technology to prepare a purchase order (PO), for example, completely without paper and human intervention—an efficient, fast, and accurate process. But the PO must then be printed and mailed to the vendor. Then, at the vendor, the PO must be sorted from other mail in the mailroom, routed to the appropriate clerk, and entered in the vendor's computer. The efficiency, timeliness, and accuracy gained by the automated purchasing process at the originating organization are lost through the mailing and reentry of the data at the vendor.

One technology that has had a significant impact on streamlining data communication among organizations is that of electronic data interchange (EDI). **Electronic data interchange (EDI)** is the computer-to-computer exchange of business data (i.e., documents) in structured formats that allow direct processing of those electronic documents by the receiving computer system. Figure 3.6 depicts the typical EDI components. Follow along as we describe those components; the numbers in circles are cross-references to corresponding locations in the narrative description.

Application Software (Circles 1 and 7)

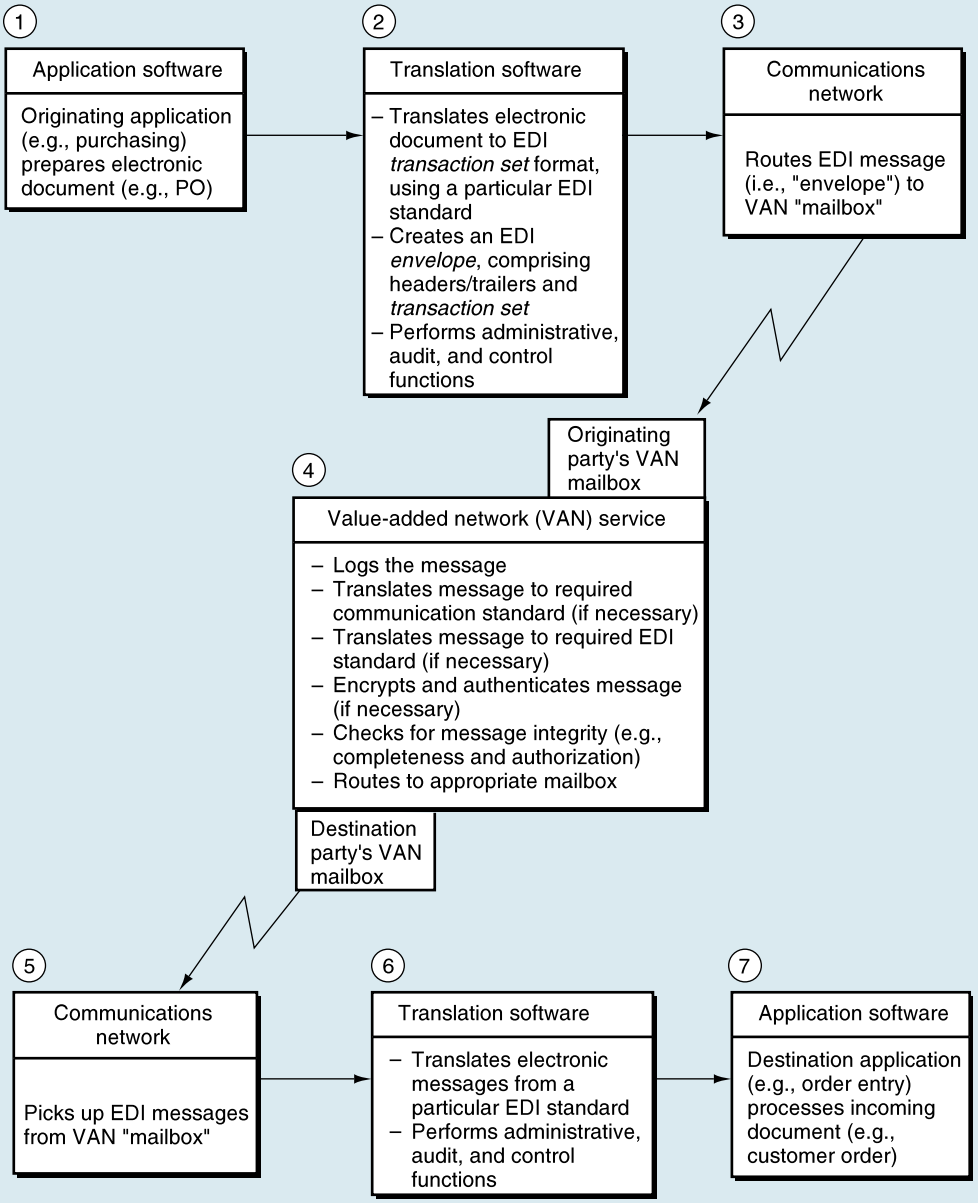
An originating application prepares an electronic business document, such as a purchase order (PO). At the destination organization, an application processes the business data. For example, the originating application's PO would be processed as a customer order by the destination organization's order entry/sales (OE/S) process.

Translation Software (Circles 2 and 6)

An application's electronic business document must be translated to the structured EDI format that will be recognized by the receiving computer. Presently, two major, nonproprietary public translation standards exist:

- In the United States and Canada, the American National Standards Institute (ANSI) X12 standard has been used.

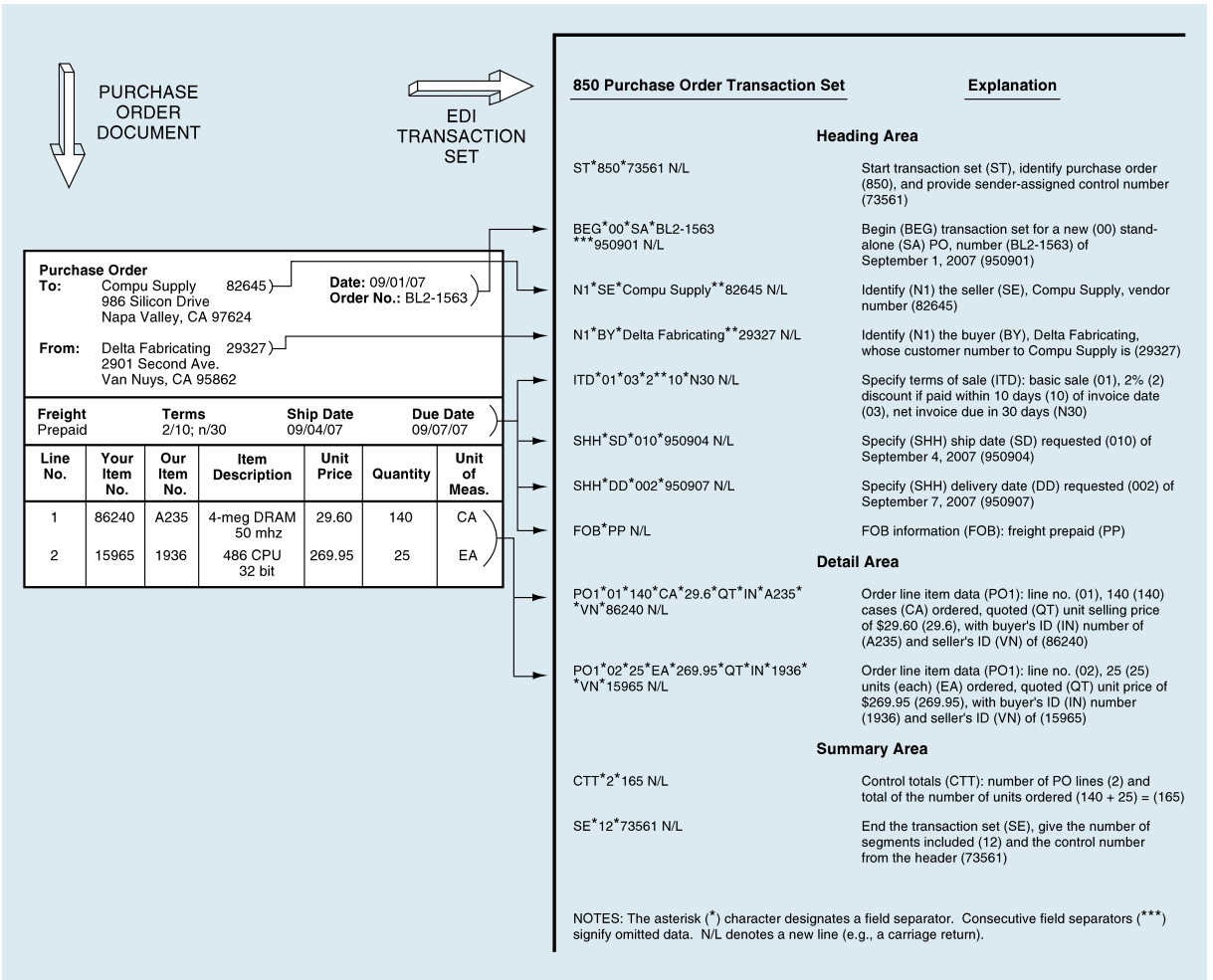
FIGURE 3.6 Electronic Data Interchange Components



- EDIFACT (EDI for Administration, Commerce, and Transport) is the predominant standard for international EDI transactions. Actively promoted by the United Nations for member nations, this standard includes some aspects of ANSI X12 and permits global communication between trading partners.

In addition, several standards are specific to particular industries, such as the Automotive Industry Action Group (AIAG), Transportation Data Coordinating Committee (TDCC), and Chemical Industry Data eXchange (CIDX). Some of these industry standards are compatible with the public, inter-industry standards (e.g., ANSI X12); some are not compatible.

FIGURE 3.7 Electronic Data Interchange Transaction Set



Source: Adapted with permission from A. Faye Borthick and Harold P. Roth, "EDI for Reengineering Business Processes," *Management Accounting* (October 1993): 35–36.

Translation standards include formats and codes for each transmission type, called a *transaction set*, as well as standards for combining several transaction sets for transmission. For example, under the ANSI X12 standard, a PO is a transaction set "850," a shipping notice is a transaction set "856," an invoice is a transaction set "810," and so forth. The ANSI *data dictionary* for transaction set 850 defines the length, type, and acceptable coding for each data element in an EDI purchase order. For example, ANSI X12 describes the format and location within the message of the customer name and address, the part numbers and quantities ordered, the unit of measure of the items ordered (e.g., each, dozen, ton), and so on. Figure 3.7 depicts the translation process and includes an example of the PO transaction set. The figure shows a sample PO as it might appear as a conventional paper document and then illustrates how the PO is transformed into EDI transaction set 850.

CONTROLS

For a PO example, the translation software translates an outgoing PO to a standard message format (e.g., ANSI X12) and translates the standard formatted message incoming to the receiver of the PO into the form understood by the receiver's application system. This intermediate translation to/from the EDI format prevents the need

for an organization to reprogram its application so that it can communicate with *each* trading partner's application.

Communications Network (Circles 3 and 5)

The two trading partners must have a method of communicating the electronic messages to each other. One method is to establish a direct computer-to-computer link between the origination computer and one or more destination computers. However, communications system incompatibilities may require that one partner or the other purchase communications hardware or software, which makes this a costly option. Further, agreeing on such details as what time of day to send and receive data from trading partners makes this option difficult to manage.

To overcome some of the shortcomings of direct connections, organizations may use either EDI service bureaus or the Internet. The EDI *service bureau* is an organization that acts as an intermediary between a large hub company (Circle 4) and its suppliers. The EDI service bureau generally works with smaller suppliers that are reluctant to acquire in-house translation and communications software. In such a case, the translation software and communications software reside on the service bureau's computer system. For a fee, the service bureau takes EDI messages from the hub, translates the messages into formats that are usable by the suppliers' computer applications, and forwards them to the hub. In the other direction, the bureau translates suppliers' documents—such as shipping notices or invoices—into a standard EDI format and sends the electronic documents to the hub. The Internet provides organizations with a modern network infrastructure to accomplish direct communications and has increasingly become the communication method of choice for EDI transmissions. (We discuss Internet connections later in this chapter.)

Value-Added Network (VAN) Service (Circle 4)

Rather than connecting to *each* trading partner, an organization can connect to a **value-added network (VAN)** service. A VAN service acts as the EDI "post office." An organization can connect to the VAN when it wants, leave its outgoing messages, and, at the same time, pick up incoming messages from its "mailbox." A VAN generally operates as a hub by linking many business partners together. Technology Summary 3.2 presents some management, operational, and control issues associated with EDI.

EDI and Business Event Data Processing

If we consider the implications of EDI to business event data processing, one of the main advantages is the significant reduction in need for interaction between purchasers and salespeople, coupled with the standard implementation of OLTE. You should recall from our earlier discussion in this chapter that OLTE eliminates the redundancy between source document capture of business event data and subsequent keying in of the source document. With EDI, both activities are eliminated for the selling organization as OLTE activities are initiated and completed by the linking purchaser. This eliminates any risk of erroneous data entry from within the selling organization. As we go forward, keep in mind that EDI may be completed through traditional modes using dedicated communications lines, but EDI is increasingly moving to the Internet. Recent evidence of this move suggests that Internet EDI is increasing by 50 to 60 percent per year, whereas traditional EDI modes are relatively flat.[10]

Be careful, however, not to draw any assumptions as to the mode of business event data processing. You will recall from our earlier discussion that OLTE can be used with

10 Ann Bednarz, "Internet EDI: Blending Old and New," *Network World*, Volume 21:8, pages 29–30 February 23, 2004.

Technology Summary 3.2

EDI MANAGEMENT, OPERATIONS, AND CONTROL CONSIDERATIONS

Benefits of EDI include the following:

- Many organizations have survived by being "forced" to implement EDI if they wanted to continue doing business with certain customers. For instance, Wal-Mart Stores and Kmart Corporation require EDI capabilities of all their vendors.
- Responsiveness to customers' needs has improved. In many cases, trading partners have discovered that the cooperation engendered by EDI has reduced conflicts between them, improved communication, and fostered trust. In some cases, customers give suppliers access (through EDI communication links) to real-time, point of sale (POS) information about what is and is not selling at its various retail outlets. With that information available, the suppliers can forecast customer demand more accurately, fine-tune their production schedules accordingly, and meet that demand in a highly responsive manner. This is discussed further in Chapter 12.
- By not reentering data at the receiving organization, processing costs are reduced, and accuracy is improved. To better appreciate the potential impact of this benefit, consider the fact that, according to one estimate, 70 percent of the data processed by a typical company's mainframe computer had been output by another computer system.
- Mailroom and other document preparation and handling costs are eliminated. For example, in the automobile industry, it is estimated that $200 of the cost of each car is incurred because of the amount of paper shuffling that has to be done.
- By providing timely and accurate data, forecasting, analysis, and cash flow are improved, and the occurrence of stock-outs is reduced.
- In the course of implementing EDI, an organization has the chance to rethink and redesign existing processes and controls.

Costs of EDI include the following:

- Modifying trading relationships and negotiating contracts
- Buying or leasing hardware and software
- Establishing relationships with VANs and negotiating contracts
- Training employees
- Reengineering affected applications
- Implementing security, audit, and control procedures

Control considerations include the following:

- Because signatures will no longer evidence authorizations, controls must ensure proper authorization. At some point during the process, we must authenticate that the message is sent to—and received from—the party intended and is authorized by someone having the proper authority.
- Without external, visual review, some business event data can be significantly in error. For example, a payment could be off by one decimal point! Therefore, controls must *prevent* rather than *detect* such errors.
- Given that the computer will initiate and authenticate messages, controls over the computer programs and data—*program change controls* and *physical security* (see Chapter 8)—become even more important than in non-EDI systems.
- If a VAN is used for communicating between partners, security procedures must prevent compromise of sensitive data, and controls must ensure correct translation and routing of messages.

Therefore, controls must be in place to ensure the following:

- All transaction sets are delivered to/received from authorized trading partners.
- All recorded business event data are recorded once and only once.
- Data are accurately received (sent).
- Data are accurately translated.
- Data are accurately translated in the application interface.
- Senders are authorized to send the transaction type.
- Messages are not intercepted or altered during transmission.
- The log of business event data is protected.
- Unauthorized messages are prevented from being sent.

To attain these control goals, organizations have implemented the following control plans, among others:

(continued)

- Some control plans are inherent in the very nature of the way that EDI is implemented. As we noted, the EDI headers and trailers accompanying transaction sets contain important control data. For example, the next to last line in Figure 3.7 (pg. 82) contains an item/line count and a hash total of the number of units ordered. The last line includes a control total of the number of segments comprising the transaction set (12) and a control number (73561) that should agree with the corresponding number from the header on line one of the table. Functional acknowledgments (FAs) also help to ensure the integrity of EDI messages (i.e., that data have not been lost or garbled in transmission).
- Expert systems (see Chapter 5) may be used to determine that incoming messages are reasonable—consistent with normal message patterns—to authenticate the source and authorization for the message.
- Access to EDI applications may require a *biometric security system*, a *smartcard*, or a physical key as well as a *password* (see Chapter 8).
- *Data encryption* (see Chapter 9) may be employed to protect data during transmission.
- *Digital signatures* (see Chapter 9) may be used. Much like a password or other access code, the digital signature uniquely identifies who approved a business event and also helps to ensure that the EDI message was not altered during transmission.
- "Continuous auditing" may be implemented through the use of *integrated test facilities (ITF)* or *imbedded audit modules*. An ITF creates dummy corporations or branches in the system data and processes test data for these dummy entities at the same time that live data are being processed for real entities. An imbedded audit module acts like an audit "alarm" that is programmed to alert the auditor—by printing an audit log—to suspect data (e.g., business event data of an unusually high dollar amount) or to unauthorized attempts to access the system.

Finally, contracts between trading partners and with the VANs must specify responsibility for controls and for erroneous transmissions. For example, who is responsible for authenticating the source and destination of messages? If a message is garbled by the VAN, who is responsible for any resulting financial loss—the sender, the receiver, or the VAN? Contracts might address the following issues:

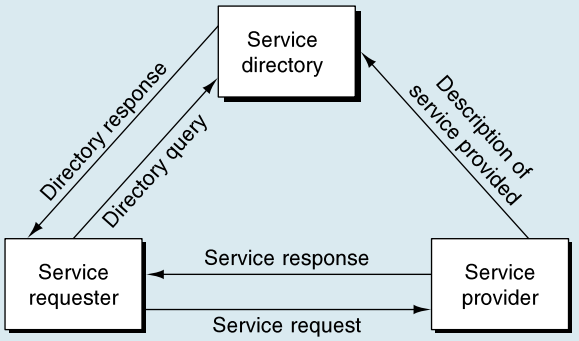
- When is a message considered received? When it is sent, when it is transmitted, when it gets to the mailbox, or when it is picked up? The answers to such questions are important in establishing the point at which an agreement, such as a purchase, legally exists between trading partners. Resolving such questions also is critical in situations where the message is a bid with a time deadline.
- Who is responsible for data integrity, audit trails, security, and so on?
- What are the penalties for failing to perform as required?

both periodic and immediate modes of processing. The same holds true for the core business processing activities in an EDI environment.

When trading partners communicate with each other electronically, they also discover that they have to communicate *internally* in new ways to achieve the full benefit of EDI. That is, EDI forces an organization to assume that all information flows—both internally and externally—are instantaneous. Accordingly, for many, EDI—along with other enabling technologies such as electronic document management (EDM)—has been the catalyst for change in a firm's basic business processes. In other words, EDI has been the forerunner to significant technology innovations for those companies.

To date, EDI has clearly been the dominant domain in e-business. In fact, a mere decade or so ago, e-business was basically EDI. The Internet is radically changing the nature of e-business to the point that in the not-too-distant future, the Internet will become the dominant platform for not only e-business but EDI as well. Does this mean EDI is dying? Well, not exactly. Many experts believe EDI is here to stay, and currently EDI volume while not growing substantially, is still heavily used in many industries.

FIGURE 3.8 A Web Service Implementation of a SOA Application



Still, the Internet shows far more potential growth—primarily from the potential seen in the emerging replacement language for HTML on the Web: XML. *XML (eXtensible Markup Language)* is an environment using tags to describe data for the purpose of easy transmission over networks. XML is currently being used to develop technologies known as Web Services and Service Oriented Architecture (SOA) applications.

Web Services and Service Oriented Architectures

What exactly is meant by the term *Web Services*? When talking about Web Services, most people are referring to a set of technologies used for connecting two systems and allowing the implementation of a service-oriented architecture. The technologies normally included are WSDL, UDDI, and SOAP[11,12]. Our working definition of **Web Services** is a software application that supports direct interactions with software objects over an intranet or the Internet.[13] In this section, we describe service-oriented architectures from the perspective of Web Services.

Service-oriented architectures (SOA) refer to well-defined, independent functions (or applications) that can be distributed over a network via Web Services. The SOA applications are essentially plug-and-play components that are available over the Internet. To be plug and play, they must be for a well-defined process, as well as self-contained and independent of other processes.

An SOA application may be implemented as a Web Service with existing technology. Consider the system displayed in Figure 3.8. A Service Directory lists available services and the provider of each service. A Service Provider must register with the directory and provide the description of the service provided. When a Service Requester needs a service, the requestor queries the Service Directory. The Service Directory then responds with information on a Service Provider that meets the need. That response will include how to contact the provider and in what form the information must be requested. The next step is for the Service Requester to contact the Service Provider with the request. The Service Provider responds to meet the requester's needs.

Next, consider a simple example of a SOA application, implemented as a Web Service. Suppose you are planning a trip to the XXI Winter Olympic Games in

11 WSDL (Web Service Definition Language), UDDI (Universal Description, Discovery and Integration), and SOAP (Simple Object Access Protocol).

12 A good source of information on Web Services is http://www.service-architecture.com.

13 When this text was published, varied definitions for the term were available. Our definition takes into account the direction to which we believe the definitions are converging.

Vancouver, Canada. Your first concern is the weather. What are your options for accessing the weather? You can use a computer attached to the Internet. You can use your mobile phone. You may be able to use your cable or satellite television connection. Think of the Meteorological Service of Canada's (MSC) Information system operating as an SOA. You can request the weather (from the MSC) at any point during your trip via mobile phone, computer, television, or practically any other device, and receive an updated weather forecast. Separate applications are not required for each device used. This trivial example should show you the potential of SOAs to help reach many users of a service at a much lower cost than building application interfaces for every device. At the same time, you can see how easy it would be to switch to another service if a different service provider has a preferable product (more accurate, faster, or an improvement in any dimension that is important to you.)

Web Services, combined with SOA, are growing rapidly. Currently, many applications are under development and using Web Services to connect dissimilar technologies. This application growth has the potential for a major impact on e-business. As the numbers of these applications increase, so will the business potential. As applications become modular and generic, there is the possibility of reduced cost and better integration within and among organizations. Improved integration among organizations may someday replace much of the EDI applications that are required for e-business in today's environment.

Internet Commerce

Internet commerce is the computer-to-computer exchange of business event data in structured or semistructured formats via Internet communication that allows the initiation and consummation of business events. In many cases, the goods or services that are contracted for through the Internet are immediately (or soon thereafter) forwarded back to the consumer via the Internet as well (i.e., when the goods or services can be provided in electronic format, such as with software and music). Internet commerce radically simplifies e-business by allowing the organization that is receiving and processing business event data to project template formats across the Internet to business partners for easy data entry and data transmission. For instance, if you connect across the Internet with Lands' End (a direct merchandiser of clothing), it has the "catalog quick order" form. With this form, you are provided an entry box to key the product number for the item you want to order. The Web page automatically takes the number and identifies what additional information is needed (e.g., for most clothing, it will be size, color, and quantity). The additional information is presented in menu form for you to select from the options that are available (e.g., for color, the menu might show red, navy, black, white, and green). As you enter the responses on your computer, the data are automatically captured and recorded on the Lands' End computer. Technology Summary 3.3 (pg. 88) provides some management, operational, and control issues associated with Internet commerce.

Two primary categories of e-business exist over the Web: business-to-consumer, or B2C (e.g., Lands' End), and business-to-business, or B2B. Figure 3.9 (pg. 89) depicts a typical secure Internet commerce arrangement. Follow along as we describe the components in the commerce relationship. Note that the numbers in the circles are cross-references to corresponding locations in the narrative description.

Client/Server Relationship (Circles 1 and 7)

The connection created between the customer and the vendor is an extended form of client/server applications. The customer (circle 1) is the client node—dictating that during connection, the customer computer environment should be secure and essentially nonaccessible via the network. The vendor (circle 7) is the server node and

Technology Summary 3.3

INTERNET COMMERCE MANAGEMENT AND OPERATIONS CONSIDERATIONS

Benefits of Internet commerce include the following:

- Many organizations have survived by being ''forced'' to implement Internet commerce to compete in the changing nature of their industry. If they want to remain competitive with other industry companies that may be taking advantage of the cost savings accruing from use of the Internet for commerce, they may need to venture to the Web.
- Responsiveness to customers' needs has improved. Increasingly, customers are expecting immediate feedback and easy availability of information and help. The Internet can be a useful tool for servicing customer and client needs—forming the communications medium for distributing information and support services.
- Many organizations have achieved global penetration. The Internet is generally the easiest and least expensive way to reach global customers that an organization may never have been able to reach before. The Internet commerce marketplace is truly global.
- By not reentering data at the organization receiving the electronic transmission, processing costs are reduced and accuracy is improved. Customers now provide most of the data entry themselves, removing the need for the selling organization to key most of the business event data.
- Mailroom and other document preparation and handling costs are eliminated. The business event data processing side of a business can operate with virtually no human intervention until it is time to prepare and deliver goods.
- In the course of implementing Internet commerce, an organization has the opportunity to rethink and redesign existing business processes and controls.

Costs of Internet commerce include the following:

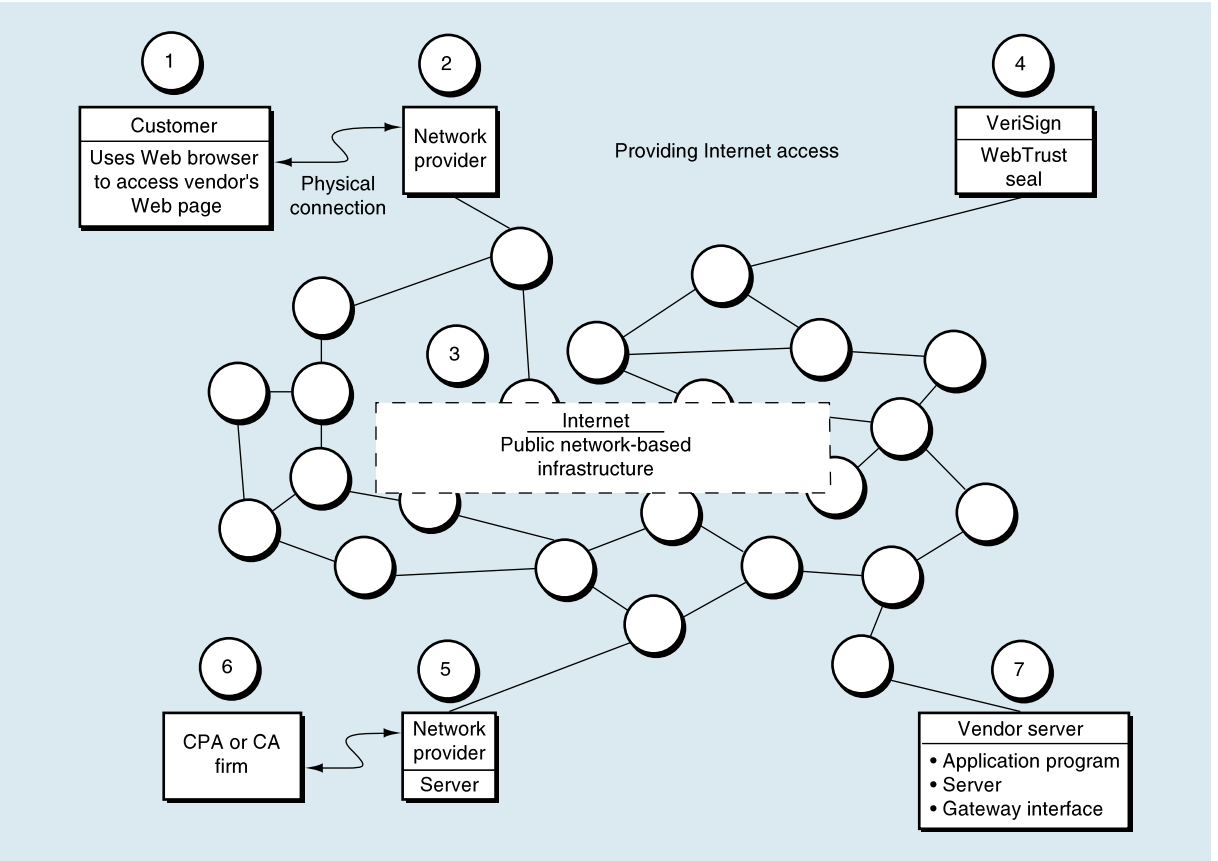
- Organizational change to a completely different way of doing business
- Buying equipment and maintaining connection to the Internet (or leasing through a network provider)
- Establishing connections with a new set of customers
- Staffing and training employees to work in a technology-driven environment
- Reengineering application systems to process data acquired through the Internet
- Maintaining security of the Internet site

Risks of Internet commerce include the following:

- Hackers attempting to access sensitive information such as customer lists or customer credit card information.
- Denial of service attacks (see Chapter 7) are expected to escalate over the next few years as individuals or organizations attempt to knock out Web sites by overloading them with site visits and preventing customers or other users from gaining access. These attacks may occur simply for the challenge or frequently due to a political or other difference with the organization that hosts the site.
- Increasingly, the success of B2B Internet commerce relationships necessitates the identification of business partners that are allowed to gain access to sensitive internal information. Trust must be placed with these business partners, but certainly a breakdown of that trust can have grave consequences to the organization making its information available.

therefore must have the capability to receive the customer's transmission and translate that transmission into processable data for use in the vendor's application programs. This translation is made through *common gateway interface (CGI)* software. The vendor, acting as the server part of the relationship, then provides the necessary correspondence back to the customer (client) in an understandable format (i.e., Internet-based language). To use the Lands' End example again, this means that when you place your order, your computer should be nonaccessible (i.e., secure) over the Internet, and the type of computer and software you are using will be unknown on the system. The Lands' End computer will receive your order and use CGI to translate your message into a form its program can understand and process. Similar to EDI environments, after the vendor collects the business event data, the applications can be completed through any of the

FIGURE 3.9 Typical Electronic Communications Connection for Internet Commerce



modes of business event data processing. For instance, Lands' End uses an immediate mode approach to process sales events upon receipt.[14]

Network Providers (Circles 2 and 5)

Much like the examples discussed with EDI, to participate in Internet commerce both parties to the business event must have the capability to communicate. For Internet commerce, this means being connected to the Internet. For many companies and organizations (as well as some individuals), this access will be obtained through a direct connection between the entity's computer networks (or a single server) and the Internet. For other companies and organizations, as well as the vast majority of individuals, it will be more desirable to gain access through a network provider.

Network providers are companies that provide a link to the Internet by making their directly connected networks available for access by fee-paying customers. From the customer side, this physical connection is made in Figure 3.9 using one of many options, such as a cable (TV), DSL, direct Ethernet, satellite dish, or the traditional telephone line, to connect with the network provider's network. Companies and other organizations are also using high-speed direct lines (referred to as Trunk Level 1 or T1 lines) to maintain continuous access.

Most network providers bring a host of other benefits along with Internet access. Common benefits include e-mail access, e-mail boxes, space allocation for personal

14 Lands' End, "Your Security at landsend.com," http://www.landsend.com, June 2006.

Web pages, and remote connection to other computer sites (e.g., telnet and FTP connection). Many organizations also will use network providers to run their Internet servers for them, thus hosting their Web presence. In Figure 3.9, circle 5 denotes a network provider that is providing server management services for the CPA or CA firm denoted by circle 6. Hence, when the business event is being completed between the customer and the vendor, information from the accounting firm would be acquired from a server operated by the firm's network provider.

Assurance Providers (Circles 4 and 6)

A major concern with participating in Internet commerce for most organizations and individuals has been Internet security. This is the single most critical factor that has hampered the growth of Internet commerce to date. As security technology has increased, so has the public's willingness to participate in Internet commerce, although concerns of privacy and identity theft are significant. A recent survey indicates 79 percent of Internet users are concerned that their personal information will be sold, whereas 74 percent of users are concerned with identity theft.[15] Many stories exist about credit card misuse and identity theft. In the first half of 2004, about 3 percent of U.S. households were exposed to some type of identity theft (including credit card misuse). The total annualized losses for the year were more than $6.4 billion![16] The Internet has spawned a whole array of cottage industries that have no physical store fronts but rather are operated completely from Internet server-supported Web pages. Many Internet users are rightfully concerned about the possibility that a company may be fictitious, with the electronic store front merely being a means by which to gather credit card and debit card information for illicit use. In Chapter 9, you will be introduced to technologies such as encryption and SSL that provide organizations and their customers a protected environment in which to transact business.

Concerns over security have spurred the development of a new line of business—Internet assurance services. **Internet assurance** is a service provided for a fee to vendors to provide limited assurance to users of the vendor's Web site that the site is in fact reliable, and event data security is reasonable. Technology Application 3.2 provides a more detailed discussion of Internet certification programs and assurance services.

In Figure 3.9 (pg. 89) we demonstrate how one common type of assurance provider operates using the WebTrust® program as discussed in Technology Application 3.2. The vendor (circle 7) will display the WebTrust® certification seal and a reference to the assurance provider on its server Web page. When the customer accesses the vendor's Web page, he or she can click on the WebTrust® symbol to determine that it continues to be applicable. Clicking on the WebTrust® symbol executes a link to the VeriSign® server (circle 4) for verification of the authorized use of the symbol. VeriSign®, which simply operates as a verification company, will verify the symbol's appropriate use by sending a message to the customer (circle 1). The customer also can get a report on the level of assurance provided with the certification by clicking on the Web link (contained on the vendor's Web page) for the accounting firm. Clicking on this link will connect the customer with the accounting firm's (circle 6) server—provided by its network provider in this case (circle 5)—and the auditor's Internet assurance report for the vendor will be displayed on the customer's computer (circle 1).

---

15 "Security concerns dog U.S. online shoppers, says survey," http://www.computerworld.com, November 22, 2005.

16 "DOJ: Identity theft hit 3.6M U.S. families in six months of '04," http://www.computerworld.com, March 31, 2006.

TECHNOLOGY APPLICATION 3.2

INTERNET SECURITY CERTIFICATION

CPA WebTrust®

How do you know that an Internet merchant can be trusted? One source of confidence is a brand name—a vendor that has a good reputation for service and quality. Typically large vendors, such as Amazon.com or Walmart.com, have a reputation for dealing honestly with their customers. In an attempt to provide small vendors with a reputation, eBay uses the feedback from each vendor's trading partners. For each vendor, you are allowed to see the feedback before you purchase. You would obviously be cautious if frequent posts indicate that the vendor did not ship items timely or of an advertised quality. Outside of eBay, there are services that provide assurance (in varying degrees) to give you confidence in Web sites. Some of these services are VeriSign®, TRUSTe, and CPA WebTrust®. Our discussion will focus on the CPA WebTrust® Seal of Assurance because it was developed by accountants under a joint venture between the American Institute of Certified Public Accountants (AICPA) and the Canadian Institute of Chartered Accountants (CICA). CPA WebTrust® is designed to provide comfort and assurance that a Web site is reasonably safe for users participating in B2C Internet commerce. Upon receiving an unqualified opinion from an accounting practitioner, a seal is placed on the client's Web page. A user of the Web page can click on the seal to receive verification of the rights for the symbol to be displayed on the given Web page. If a user selects the link provided with the seal, he or she can view the practitioners' actual report on the client's Web site. The WebTrust® seal provides assurances that a CA or CPA has evaluated the business practices and controls of the given client to determine whether its Web page is in accordance with WebTrust® criteria. After a site receives WebTrust® certification, the practitioner should review the site periodically to assure that adequate standards have remained in place and the site remains reasonably secure. Basically, a Web site must meet the following principles:

- **Security:** The system is protected against unauthorized access (both physical and logical).
- **Availability:** The system is available for operation and use as committed or agreed.
- **Processing integrity:** System processing is complete, accurate, timely, and authorized.
- **Online privacy:** Personal information obtained as a result of e-business is collected, used, disclosed, and retained as committed or agreed.
- **Confidentiality:** Information designated as confidential is protected as committed or agreed.

Sources: AICPA/CICA, "CPA/CA WebTrust® Version 2.0," http://www.cica.ca, August 2000; AICPA/CICA, "Suitable Trust Services Criteria and Illustrations for Security, Availability, Processing Integrity, Online Privacy, and Confidentiality (Including WebTrust® and SysTrust®)," http://www.aicpa.org/download/trust_services/final-TrustServices.pdf, accessed June 2006.

In addition to concerns regarding event data, many customers have apprehensions over the protection and use of their personal information. To address this issue, the AICPA/CICA Privacy Framework was developed.[17] The framework includes the AICPA/CICA Trust Services Privacy Principle and Criteria to be used in all assurance engagements.

Internet Connection (Circle 3)

We briefly note here how the Internet connection is provided between two or more entities. The network diagram displayed at circle 3 pictorially presents a representation of how the Internet operates. First, you must have a link to one of the network providers that are connected to the Internet (as discussed earlier). The client machine provides an Internet address indicating the Internet site with which the client wants to connect.

17 Available for download at http://www.aicpa.org.

Technology Summary 3.4

INTERNET AUCTION MARKETS

Internet auction markets provide an Internet base for companies to place products up for bid or for buyers to put proposed purchases up for bid. In the first case, a scenario common to the eBay® exchange, a market participant puts an item up for bid, sets a minimum bid price, and awaits completion of the bidding process. While this market is fairly successful for B2C Internet commerce, it is not so effective for B2B Internet commerce. For B2B Internet commerce, a company may put specifications for a product out on the marketplace as a request for proposals (RFPs). Participating organizations in the market can then bid on the sales by providing a proposal that includes details on product specifications, costs, availability (i.e., timing of delivery), and logistics. The buying organization can then select the proposal that seems most desirable for meeting the organization's needs at a minimal cost and risk.

A connection is then made between the client and the desired site—the server. This connection is made by working a path between the network provider (circle 2) and the server connection (circle 7). The path chosen will differ from one time to the next based on what links in the Internet may not be working at a given time and based on how busy the traffic is on various network connections between the client and the server. The amount of traffic also influences the speed of connection and is the reason why the Internet is slower than at other times.

A couple of other issues related to the organization of the Internet and its impact on such commerce should be noted. First, by the nature of the Internet being a "public network-based infrastructure," it has greatly leveled the field in e-business. With traditional EDI, only fairly large businesses could afford the communications hardware and software to effectively use e-business as a competitive weapon. The creation of a public network and the subsequent creation of relatively inexpensive (or even free) software for using the network have brought the costs of e-business within the threshold of economic feasibility for most small- and medium-sized entities. These changes in cost structure and ease of use are the two forces driving the strong growth in Internet commerce.

The other phenomenon that has arisen from the new economic feasibility of e-business is an explosion in cottage industries and electronic store fronts. These cottage industries that have sprung up to support Internet commerce include companies that provide one or more of the following: Internet access, Web page development, interface software for linking between Web pages and application programs, e-mail, and related goods and services. **Electronic store fronts** represent the creation of Internet-located resources for displaying goods and services for sale and for conducting related sales events. For many emerging small companies, these electronic store fronts are the only store fronts, and no sales staff or physical store fronts need to be maintained. Even better, you can run your operation from that ski chalet in Vermont or the beach condominium in Florida regardless of where your potential customers live. Further, the world is now your marketplace!

Other Internet Uses for E-Business

ENTERPRISE SYSTEMS

Before leaving this chapter on e-business, we should discuss other ways in which the Internet is being used to support commerce. Although we have focused in this chapter on the most common forms of Internet commerce and the direct linkages between customer and vendor, a number of intermediaries are evolving that promise to reduce costs for organizations. The two forms that seem most likely to have long-term success are *auction markets* and *market exchanges*. These are explained in greater detail in Technology Summary 3.4 and Technology Summary 3.5.

Technology Summary 3.5

INTERNET MARKET EXCHANGES

Internet market exchanges bring together a variety of suppliers in a given industry with one or more buyers in the same industry to provide Internet commerce through organized markets. Suppliers can put their products online, generally feeding into electronic catalogs that allow the buyer(s) to sort through alternatives from different suppliers and electronically place an order. Often, only one supplier will carry a certain item, but efficiencies are still gained by avoiding the purchase order process (described in detail in Chapter 12) and executing an order through selection from a Web catalog. In some cases, buyers make their needs known on the marketplace, and suppliers review the needs and determine whether to fill the orders. The key is to make sure the market is efficient enough to assure that the buyer will get the product purchased on a timely basis for when it is needed—often meaning that the purchased goods arrive at an assembly line within an hour of when the goods will be needed for production. This part can be tricky, and the exchange must be set up carefully.

Internet market exchanges can be either private or public. Private exchanges restrict the buyers and suppliers that can participate in the market. Public exchanges bring together suppliers and buyers and allow essentially any organization to participate, subject sometimes to credit approval and background checks. Because of their exclusive nature, private exchanges have drawn the watchful eye of the Federal Trade Commission (FTC), which maintains concerns over fair trade practices and potential anticompetitive practices that evolve from restricting participation in the market exchange.

The Internet is not only a place for completing sales but is also an environment for improving customer support for non-Internet-based commerce. Probably the biggest use for the Internet at this point in time is to support the delivery of goods and services for customers. In its simplest form, a Web page may simply be one more venue in which to advertise and market an organization's goods and services. At the next level, it may be an arena for providing ongoing customer support. For instance, Symantec™ is one of many companies that provide software upgrades over the Internet—in this case, providing monthly updates for its anti-virus software. For many courier companies (such as Federal Express®), the Internet has become a means for allowing customers to instantly access information to track their packages at any given point and to know when they have reached their destination. These latter examples of customer support have become a huge new market for major software vendors. These systems fall under the broader category of *customer relationship management (CRM)* and *customer self-service (CSS)* systems, both introduced in Chapter 2. These systems provide customer self-service capabilities (i.e., let the customer inspect his or her account or get product help through a Web interface rather than through interaction with a support person), electronic catalogues, and shipment update information. They aid the salesperson by storing an analyzable history of the customer and the customer's past business interactions. One of the bigger challenges has been to get the CRM systems to interact with the ERP system to share data between the two systems and enhance the power and capability. In an effort to improve the integration, all the major software firms are involved in initiatives to further empower CRM extensions to their ERP systems.

Summary

The future of e-business will see an increased merging of technologies as the lines between EDI and Internet commerce become less defined. The major impediment to most organizations (and individuals) conducting business over the Internet is the

concern about security. However, advances in Internet security have been significant in the past few years, with the potential major benefactors of Internet commerce pushing the charge. For instance, software companies such as Microsoft® and Netscape® along with financial providers MasterCard and Visa have been on the forefront of development efforts to assure safe use of the Internet in commerce.

The evolution of EDI practices toward the Internet will initially be facilitated by increased use of corporate extranets. Moving EDI applications to an extranet environment can help simplify the processing while maintaining higher levels of control and security. These extranets will be open to business partners using programs that limit access to selected business partners—hence the corporate networks will not be accessible by unintended Internet users. As Internet security increases, extranets will lose their appeal, and the Internet will increasingly become a viable alternative as the communication infrastructure of choice.

These same increases in security will help fuel the growth of Internet commerce. As Internet commerce becomes an increasingly acceptable way of doing business, technologies such as Web Services will continue to move forward and allow companies to experience newfound opportunities for reaching customers; for many companies, a new globalization of their customer base will occur. On the other hand, new competition also will arise from distant companies that now have access to the same customers.

Entering the e-business domain is not simply a matter of switching on the connection. E-business is nothing less than a fundamental change in the way organizations do business and, as such, is a driver of organizational change. To succeed in an e-business environment, an organization must recognize the need to embrace change and must effectively plan and manage change. Management must take a proactive stance and lead the change.

Success will rely heavily on your understanding of how to manage and control change. In Chapters 7 through 9 you will learn about ways in which to implement and maintain effective organizational and information systems control structures.

Key Terms

electronic business (e-business)
journalize
post
summarize
business event data
master data
information processing
data maintenance
standing data
batch processing
periodic mode
offline
online transaction entry (OLTE)
online
online real-time (OLRT) systems
immediate mode
client/server technology
local area networks (LANs)
wide area networks (WANs)
Internet
Web browsers
intranet
extranet
electronic mail (e-mail)
public database
electronic document management (EDM)
electronic data interchange (EDI)
value-added network (VAN)
Web Services
Service-Oriented Architecture (SOA)
Internet commerce
network providers
Internet assurance
electronic store fronts
Internet auction markets
Internet market exchanges

Review Questions

RQ 3-1 Define e-business.

RQ 3-2 Describe how technology has supported Amazon.com's growth.

RQ 3-3 Describe the activities associated with a manual accounting process.

RQ 3-4 Describe the stages of an automated accounting process.

RQ 3-5 Regarding data stores, compare/contrast business event data and master data.

RQ 3-6 Explain the relationship between the periodic mode and batch processing.

RQ 3-7 List and describe the four basic subprocesses completed in processing business event data using batch processing.

RQ 3-8 Explain how the use of online transaction entry (OLTE) can increase efficiency when using batch processing.

RQ 3-9 Explain the relationship between online real-time (OLRT) and immediate mode processing.

RQ 3-10 List and describe the three basic subprocesses completed in processing business event data using OLRT processing.

RQ 3-11 Explain the difference between wide area networks and local area networks.

RQ 3-12 What are the four methods of conducting e-business?

RQ 3-13 How can e-mail be adapted to a more structured form to aid in capturing business event data?

RQ 3-14 Explain the advantages of using electronic document management rather than traditional paper-based document systems.

RQ 3-15 Explain how electronic data interchange is used to link two companies' business processes together.

RQ 3-16 What is the main advantage of using EDI to capture and process business events?

RQ 3-17 Explain how value-added networks (VANs) are used to simplify electronic data interchange between two or more companies.

RQ 3-18 Define *Web Services*.

RQ 3-19 Describe *service-oriented architectures (SOA)*.

RQ 3-20 How does Internet commerce simplify the world of e-business?

RQ 3-21 What role do network providers play in the Internet commerce environment?

RQ 3-22 Explain the concept of Internet assurance services. What types of assurance are provided?

RQ 3-23 Describe CPA WebTrust®.

RQ 3-24 Describe uses of the Internet, other than completing sales, which help improve the success of businesses and other organizations.

Discussion Questions

DQ 3-1 The business environment is increasingly demanding the use of OLRT systems for more up-to-date information. Identify one business process and the environment in which it would be used, as an example of why immediate mode processing is so critical. Be prepared to explain your answer to the class.

DQ 3-2 Consider a business that you patronize. Could it operate without automated information systems? Why or why not?

DQ 3-3 Consider your favorite fast food chain restaurant. How do you think this restaurant might use online transaction entry to improve its business event data processing activities? Explain.

DQ 3-4 How could (and/or does) your university bookstore use technology to improve customer interactions with students, faculty, and staff?

DQ 3-5 What do you perceive to be the advantages and disadvantages of conducting business on the Internet? Be prepared to explain your answer.

DQ 3-6 Why is it important to have standards, such as X12 and EDIFACT, when conducting EDI transactions and other forms of e-business? Is there a down side to using standards?

DQ 3-7 Discuss the benefits of service-oriented architectures (SOA) to the growth of e-business.

DQ 3-8 Why has the Internet caused such an explosion in e-business when electronic data interchange has been available for decades?

DQ 3-9 One of Amazon.com's marketing strengths is the capability to collect and analyze customer purchase data. How does this add value to the company? From the customer's perspective, is value added?

DQ 3-10 Some potential e-business customers have security concerns regarding online purchases. How do Internet security certifications attempt to address these concerns?

DQ 3-11 It is almost a given that an automated accounting systems is better than a manual system. Describe circumstances where you would recommend a manual system rather than automation.

Problems

P 3-1 Find a merchandising business on the Internet (other than the Lands' End or Amazon.com examples used in this chapter). Explore its Web page and how the order processing system works.

a. Is there any information provided on how secure the Web page is? What level of comfort do you feel with its security? Explain.

b. Does the business provide information regarding delivery time/stockouts on purchases?

c. What methods of payment does it accept?

d. Analyze the design of the Web page in terms of usability and completeness of information content. Write a brief critique of your company's page.

P 3-2 Think about a business you might want to start on the Internet using e-mail to communicate with customers and capture business data. Explain why e-mail would be a good approach for your business. Draft a brief business plan evaluating the advantages and disadvantages of e-mail-based commerce in your business, and how you plan to get your business rolling (your professor will tell you how long the report should be).

P 3-3 Identify a business venture that you believe could be successful using only Internet commerce. Explain how you would design your Web page, how you would capture business event data, and the mode of processing you would use. Provide a report detailing support for your design decisions (your professor will tell you how long the report should be).

P 3-4 Develop a research paper on the emerging use of the Internet to support electronic data interchange (EDI) between companies. Your paper should consider how companies set up communications over the Internet to maintain the same security and standardization that are achieved using value-added networks for non-Internet EDI (your professor will tell you how long the paper should be).

P 3-5 Explain how electronic document management (EDM) could be used in your accounting information systems class to eliminate all paper flow between the students and professor. Include in your explanation what technologies would be necessary to facilitate your plan (your professor will tell you how long the paper should be).

P 3-6 Using the Internet, find and describe an Internet market exchange or Internet auction market. Your discussion should include the products and/or services available and the type of buyers and sellers you expect to participate. If you choose a private market, also identify the owner/sponsor of the exchange.

P 3-7 Use the Internet to locate http://www.cia.gov and http://www.Amazon.com. Find the privacy and security policies for each. Compare and contrast the use of privacy statements, encryption, SSL, and cookie policies.

P 3-8 The chapter describes how a batch processing system works with a used book and CD shop as an example. Looking at Figure 3.2 (pg. 69) and its description of how the system works, identify another type of business that might use a similar batch processing system and describe each of the steps in detail.

P 3-9 Using the four methods of conducting e-business (e-mail, EDM, EDI, and Internet commerce), select a business of your choice and describe how each method is currently integrated into their business or how each method could be incorporated into their business in the future.

P 3-10 Although CPA WebTrust® has been in existence for several years, it has met limited acceptance by business. If Internet assurance is truly important, why do you think that WebTrust® has a limited share of the market? (Include in your discussion, criteria that an organization might use when choosing an assurance service.)