When speaking about innovative electronic business (e-business) organizations, we normally think of web pioneers such as Amazon.com, E*TRADE, and eBay. Yet, e-business is radically changing the way many so-called brick-and-mortar companies (i.e., traditional organizations with extensive sales staffs and internally controlled business processes) conduct operations in the current business environment. Caterpillar Incorporated is typical of such evolving organizations. The 75-year-old manufacturer of construction and farming equipment is radically changing its supply-chain operations through a Web-based makeover. This initiative will allow Caterpillar’s customers to order and configure heavy machinery and related products through an Internet connection. In order to facilitate timely fulfillment of the many combinations of equipment that may be ordered, Caterpillar is also opening up access to key sales and business data for use by its suppliers. These suppliers work closely with Caterpillar to ensure parts and materials are available on an as-needed basis without interruptions on assembly lines.

Why would Caterpillar make such a radical change? Well, for starters, there is the anticipated savings of $100 million in costs during the first year the system is fully in place. Second, there is the newly created ability to allow customers actually to customize products and to provide them with build-to-order models not previously available.

**Synopsis**

This chapter introduces the concept of e-business and explores how communications technology is revolutionizing the way individuals and organizations conduct business. As organizations venture down this path, driving their business processes with electronic communications, the trail of paper including invoices, check payments, and so forth quickly disappears. E-business captures business event data at the connection with a customer or supplier. Enterprise systems store data and make it readily accessible to all who need it. The evolution to e-business had been a rather slow process before the advent of the Internet, which has switched the evolution into high gear. As

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1 A primary source for this vignette was Marc L. Songini, “Caterpillar Moves to Revamp Supply-Chain Operations via the Web,” *Computerworld Online* (October 11, 2000).
you 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 usage and Information Systems design in order to link two companies’ computer systems together, and finally the actions that must be taken to ensure that e-business conducted over the Internet is secure. All of these technologies, along with the flexible processes they allow to exist, are fundamental to providing companies like Caterpillar with the capability to implement new streamlined processes and to create build-to-order service for its customers.

**Learning Objectives**

- To describe and analyze the major approaches used to transfer electronic data during business event data processing
- To explain the complexities that are introduced as electronic document management moves us steadily toward the paperless office
- To evaluate the complexities surrounding electronic data interchange that are introduced when linking two different organizations’ computer systems for joint business event data processing
- To explain the challenges faced by organizations when they pursue direct business links with customers via the Internet
- To be able to use business advantages gained through effective facilitation of e-business

**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 today’s society that is increasingly dependent on e-mail and instant messages. In essence, the richness of older 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, and e-mail took away the ability to detect emotions through voice inflection.

The Internet expanded the impact on society since it can substitute for such a wide range of personal and commercial interaction. The power of the Internet to support the sales and marketing of products efficiently has led to incredible levels of Web activity to support electronic commerce (e-commerce). E-commerce is a commonly used term that describes the business events associated with the Order-to-Cash and Purchase-to-Pay business processes, which encompass electronically ordering goods and services, and often the associated electronic payments. Although frequently used interchangeably with e-business, e-commerce is really only one part of what e-business encompasses. As noted in Chapter 1, e-business is the involvement of two (or more) individuals and/or organizations in the completion of electronically based business events (i.e., the partial or complete elimination of paper documentation and human intervention during business processes in favor of more efficient electronically based communication). These electronically based business events entail the interconnection
of the underlying back-office processes of both organizations. Pricewaterhouse-Coopers was one of the first firms to use the term e-business to broaden the narrower view of e-commerce as support of the sales process. In 1999, the firm’s Web site included a statement in its discussion of e-business that recommended looking beyond the marketing aspects of a firm to see that e-business involves “optimizing business processes, enhancing human capital, harnessing technology, and managing risk and compliance.” We use the term “e-business” to refer to any interorganizational business activities conducted by electronic means, including e-commerce. We will sometimes use the term e-commerce when specifically discussing Internet-enabled sales support.

A by-product of e-business is often the elimination of the staff that would normally serve as the intermediary between the two parties to the business event. In e-commerce, 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 own Information System (which for many organizations participating in e-business today would be their enterprise system), and facilitating the electronic transfer of funds for immediate payment. The business event is completed more quickly. Additionally, the purchaser may electronically solicit pricing and quickly determine the best price—increasing price efficiency as well. Often, the computer, eliminating any waste of a purchaser’s time on such activities, does the price checking automatically.

It is not just big organizations that are using such technologies to speed up a process. For instance, your favorite pizza joint or sandwich shop may very well accept e-mail or fax ordering—basically allowing you to avoid being put on hold when you place your order and avoid the risk of the phone answerer getting the wrong ingredients on your pizza or sandwich. The Domino’s Pizza chain allows Internet ordering in some markets. You simply enter the order yourself—reducing the business’s need for people to answer the phones and take orders.

With the Internet, many more organizations now have the opportunity to reach customers directly through electronic communication. The potential of this distribution channel has led to the explosion of e-business over the Internet. In this chapter, we will explore a variety of technologies that enable e-business. We will also learn about the various forms of e-business that are used by organizations in today’s business environment.

One final note before we proceed. Throughout this text we highlight the discussion of e-business as it relates to various business processes, controls, and systems development issues. Since 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.

The Changing World of Business Processing

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 business practice has been exponential. We have seen cottage industries springing up on the Internet where there
are no personal contacts and face-to-face negotiations. We also see online catalogs that can be viewed through an Internet browser and where orders can immediately be placed and paid for over the Internet. Of course, the bookkeeping functions may be done much the same as the ancient merchant did them, but more likely 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 enterprise system vendors to build Web sites that from day one are linked into the enterprise system’s processing and database.

While it may sometimes appear that we 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 channels supporting 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 understand fully 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. Once 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.

In this chapter, we first examine the evolution of business event data processing. Doing so will help you to understand how we got where we are and to appreciate different stages of the e-business evolution—including many organizations that still operate using essentially the same processes used three or four decades ago! We might well view this latter method as a pre–e-business stage.

**Automating Manual Systems**

Ever since the earliest days of business, when fairly primitive manual approaches were the only available information systems, 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 of the event data at once. The periodic mode is the processing mode in which there is a delay 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. 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.

Almost all manual systems use the periodic mode. In a computerized environment, the easiest approach to automating some business processes has been to simply mirror analogous manual batch processing systems.

Batch processing systems typically require four basic subprocesses to be completed before event data is converted into informational reports that can be used by decision makers. Follow along with Figure 4.1 (page 110) as we explain how each of these four subprocesses are typically completed.

- **Business event occurs:** At the point of occurrence for the business event, the information for the event is recorded on a source document (the activities of the sales department in Figure 4.1). For example, if you think of one of the small businesses you might frequent, such as a used books and CDs shop, they may
often have you bring the books and CDs you wish to purchase to a clerk at the front of the store. The clerk then writes down a description of the items purchased on a sales slip (prepared in duplicate) and totals the sale. He or she returns one copy to you (often a white copy) and stuffs the other copy (generally a yellow or pink copy) into a drawer of sales receipts.

◊ Record business event data: A batch of source documents is transferred to a data entry clerk (in the data processing department in Figure 4.1) 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 that is not directly connected to the processing computer). The resulting computerized format becomes the event data store. In our 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 of the sales slips into a personal computer for storage on a disk. The personal computer 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 for possible future reference.

◊ Update master data: After all of the data have been entered into the system, the data are then processed, and any calculations and summarizations completed (represented by the sales processing update symbol in Figure 4.1). 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 as the newly updated master data. The sales event data would also be stored in a more permanent data store. It would not be uncommon for the owner-manager of our used books and CDs store to either take the data stores home and process it on a computer at home, or perhaps take the information to a public accountant for processing.

◊ Generate outputs: After all of the calculations have been completed and the data have been updated, the system periodically generates the applicable reports (the report generator program in Figure 4.1). For our used books and CDs store, this might include such documents as a sales report and an inventory update report. For our small store, both reports would probably go to the owner-manager.

Note that between each step there 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 our used books and CDs store, the sales documents are collected for the day 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 may still 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, there is little reason to provide a query capability (as discussed in Chapter 3) 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.
Online Transaction Entry (OLTE)

Information technology improvements have provided a low-cost means for improving the efficiency of these traditional automated equivalents to manual systems. The most prevalent change has been the increasing use of online transaction entry to reduce redundancies in pure periodic mode processing (see Figure 4.2). 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 occurs (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 is used to enter the event data into the data entry system rather than onto a source document. Generally, the system automatically generates prices as the computer retrieves data from the system data stores. Such a system is considered online because the data entry device is connected to the processing computer. The input system usually also services a printer that then prints document copies to fill the still-needed role of source documents. As business events occur, the related data are usually accumulated on disk.

Figure 4.2 Online Transaction Entry (Batch Processing Environment)
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 4.2, what is occurring at this point is that the sales items are being entered into a computer that is recording a log of the sales event, 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 4.1 and 4.2. The manual recording process (in Figure 4.1) by the sales clerk becomes a computer entry process (in Figure 4.2), and the record input process in Figure 4.1 becomes part of process sales in Figure 4.2. Other than these changes, the two flowcharts 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 systems, this data entry will be completed using bar code readers or scanners. The use of such technologies eliminates the human error that can result from entering data manually. Thus, in many OLTE systems the only human impact on the accuracy of the input data is the necessity to scan items properly into the system. Various control procedures that assure data accuracy are discussed in detail in Chapter 9.

It should be noted that the processing of the data in Figure 4.2 is still completed on a batch of event data at a later point in time. In the case of many systems in use by businesses today, sales event data is aggregated by cash register terminals for the entire day; and then, after the store has closed, the data is electronically transferred to the computer system where the business event data is processed. This process is reflected in Figure 4.2 by the communications line connecting the sales log in the sales department with the program procedures in data processing. The processing is completed overnight (note the reference to third shift in the column heading for data processing) 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 here that the use of electronic communication technology does not change the traditional periodic approach, but rather makes the approach much more efficient. Thus, we encounter one of the first steps in the evolution toward e-business systems. Periodic mode systems had long been the most common method for completing business event data processing, but in the last decade, they have become much less common for most activities. However, for some applications, periodic mode processing is almost always the preferred approach. For instance, payroll systems are a natural match with the batching of business event data, since all employees are generally paid on a periodic basis and all at the same time. It is almost 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 one hears in today’s harried business environment is the phrase “time is money.” While a cliché by its nature is worn out, this one is quite 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 led to a rapid migration towards online real-time systems. **Online real-time (OLRT)** systems gather business event data at the time of occurrence, update the master data almost instantaneously, and provide the results arising from the business event within a very short time—i.e., 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 there is little or no delay between any two data processing steps (as opposed to periodic mode, in which there is a significant delay 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. Figure 4.3 illustrates each of these subprocesses.

- **Business event occurrence and recording of event data**: At the time of the business event, related data are entered directly into the system. Source documents are almost never used, as 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 4.2 (other than the absence of an audit file). This process is consistent with the use of **online transaction entry (OLTE)** for OLRT systems.

- **Update master data**: Each business event entered into the system is processed individually and any calculations and summarizations completed. This informa-
tion is then used to update the master data. Note in Figure 4.3 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 time will be within seconds of being up to date. When your books and CDs store is entering your information into the computer, it may 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 time—perhaps to answer a customer’s question.

- **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 are generated by the system on a periodic basis. At the same time, however, these reports are usually instantaneously available through access to the system on an as-needed basis, as demonstrated in Figure 4.3 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 given time. In the books and CDs store, it would allow the sales staff to check quickly whether a given book or CD is in stock. In many cases, rather than using pre-specified reports that may not necessarily provide information that decision makers need, these Information Systems users use a query language (as discussed in Chapter 3) to create unique reports dynamically 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 top-ten selling CDs and books.

It was noted previously that OLTE systems are also increasingly used with systems that primarily use the *periodic mode*. While the data entry performed in all OLTE systems is essentially the same, the mode of processing may vary. While 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 data to the data processing center, an OLRT system generally requires a continuous electronic communication connection, usually necessitating the use of some form of *network*. This arrangement will be addressed later in this chapter.

It should be noted here that 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 there is a delay between every step of the processing. On the other hand, OLRT systems represent pure *immediate mode* systems in that there is little or no delay between any steps in the processing. We note these as the extremes because many systems lie somewhere between these two extremes, exhibiting a mix of *periodic* and *immediate mode* processes at various stages. For example, OLTE used with batch processing results in an imme-

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2 This is one method of accomplishing OLRT that uses expensive, continuous direct communications to a remotely located central computer. Many organizations use a distributed processing mode that places the computer locally to avoid the costs associated with the continuous communications line; however, as in the case shown here, the need to process information centrally for multiple locations may warrant the communications line costs of continuous direct communication.
diately mode approach for combining the business event occurrence and record event data steps, while periodic mode processing might be used for the remainder of the steps.

**Online Transaction Processing (OLTP)**

In an effort to reduce both the expense and delay of communicating business event data over what are sometimes great distances to complete business event data processing in real time, many entities are turning to online transaction processing (OLTP) systems. An OLTP system is a real-time system that performs all or part of the processing activities at the user’s location. These systems use business event data processing machines that have the capability to manage data, run applications, and control communications with the central computer and data stores. By performing most of the processing at the user’s location, delays caused from electronic communications between the user and the central computer are reduced or eliminated (see Figure 4.4), as is the cost associated with communicating to the central location during the processing of the business event. Only the results need be communicated. Two common applications for these systems have been automatic teller machines (ATMs) and computerized reservation systems. Note in Figure 4.4 that the electronic communication network in an OLTP system becomes even more complex as processing occurs at the user’s end, but then data must be updated at all computers. For instance, in the case of an ATM, once an individual

![Figure 4.4 Alternative Approaches to Real-Time Processing](image-url)
has withdrawn money from his or her account, the system needs to update the balance at all ATMs before additional withdrawals may be made.

Many banks have only recently converted to OLTP technology. Note that in an OLTP system, the immediate updating of balances at the central location and the user locations is done with shadow data (e.g., copies of the master data used for real-time processing) which are duplicated at each site, but for control purposes, the actual master data are usually updated once a day using batch processing.

While immediate mode-dominated systems are becoming the most prevalent method for new business event data processing applications, they are not necessarily the end-all solution for all applications. Both periodic mode and immediate mode approaches have distinctive characteristics that make each a preferable option for certain types of applications. If periodic processing were used for ATM processing, for example, a person might withdraw the entire balance from his or her account multiple times before the system processed the event data and updated the accounts—a significant losing proposition for a bank. Clearly, any given application should be matched with the best or most applicable processing method.

**Review Question**

How does the use of online transaction processing (OLTP) improve the timeliness of online real-time processing?

**Advances in Electronic Processing and Communication**

The key enabler of the transition from primarily periodic mode systems to primarily immediate mode systems has been communications technology. Similarly, communications technology has enhanced many of the remaining periodic mode systems through enabled approaches such as online transaction entry (OLTE). Many important recent advances have relied on image-based technologies. These technologies are discussed in this section as a precursor to exploring their application in early stage e-business systems.

Communications-based systems that facilitate the processing, storage, and management of image-based data require the use of several related technologies. First are technologies that facilitate the effective capturing of data to support business information processing through the use of imaging technology. Second are communications-based systems that facilitate the storage and distribution of image-based data used in business processing and managerial decision making. Third, data communications networks are necessary for effective transmission and routing of data from the point of recording and storage to the processes or users needing the data. In this part of the chapter we take a brief look at these key communications technologies.

**Automated Data Entry**

While there are a variety of methods for electronic data capturing, the interest here is in image-based technologies. Increasingly, optical-based technologies eliminate the need to key in data (a major source of data entry error) as well as voluminous files of paper documents by maintaining electronic copies.

One commonly used technology is bar coding. **Bar code readers** are devices that use light reflection to read differences in bar code patterns in order to identify a labeled item. While the most common place consumers see bar code readers is in grocery and department stores, bar coding systems are also used extensively by warehouses for inventory tracking. Similarly, delivery and courier companies frequently use such coding systems to track inventory items and packages during shipping transfers. The
next time you receive a delivery from Federal Express or United Parcel Services, notice the bar codes on the package that were used to track its delivery to you.

Utility and credit card companies frequently ask customers to handwrite the amount of the payment on the remittance slip. In such cases, optical character recognition (OCR) is used—similar to the way bar code readers work—for pattern recognition of handwritten or printed characters. Both bar code readers and OCR are technologies designed to eliminate the need to key in data and reduce the accompanying risk of error.

A third optical input technology is the scanner. Scanners are input devices that capture printed images or documents and convert them into electronic digital signals (i.e., into binary representations of the printed image or document) that can be stored and manipulated on computer media. Scanners are key to the increased use of electronic digital imaging to drive business processes and facilitate management decision making.

Digital Image Processing

Digital image processing systems are computer-based systems for storage, retrieval, and presentation of images of real or simulated objects. In the typical business application, the images are usually documents.

After a document has been input, additional processing may take place. The user may enter additional data related to the document or that acts on data contained in, or associated with, the document. Recall that in Chapter 3 we discussed the move toward object-oriented databases that are capable of handling object data—such as images—and that we noted the move toward enabling object storage within relational databases. A major part of the demand for object-capable databases is the management of a vast array of document images. Linkages of these images into the enterprise system can make accessibility much easier as information can readily be distributed throughout the organization. In many advanced digital imaging systems, the content of the digital image may subsequently be manipulated as if it were directly entered into an application or retrieved from a database. For example, a scanned word processing document could be edited directly, or a purchase order changed to reflect the receipt of a backordered item. This is not always a desirable feature, as some business documents (e.g., contracts) should not be manipulable once they are digitally recorded.

Communication Networks

The key component for electronic communication systems is the network that provides the pathways for transfer of electronic data. Communication networks come in several different levels: from those designed to link a few computers together to the Internet, which links all publicly networked 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 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 together 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 system technology, but recent advances in communications technology are rapidly changing the underlying infrastructure models to rely more on the Internet.

Network technologies are driving the evolution of e-business. These technologies allow for more simplified user interactions, and empower users to access broad arrays of data for supplementing management decision making as well as opening new avenues for direct commerce. The leading technology in this arena is the Internet, the massive interconnection of computer networks worldwide that enables communication between dissimilar technology platforms. The Internet is the network that connects all of the WANs to which organizations choose to have access.

To simplify access to the vast arrays of data that have suddenly become available via the Internet, Web browsers were developed by several vendors. Web browsers are software programs designed specifically to allow users to search through the various sites and data sources available on the Internet. The advent of this easy-to-use software has rippled back through organizations and caused a rethinking of how companies can set up their own networks. The result has been the development of intranets, which are essentially mini internal equivalents of 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. For instance, the use of an intranet by PricewaterhouseCoopers’ TeamMate system to support teams of auditors will be discussed in Technology Application 5.1 (page 147).

Extranets serve the same purpose as a WAN, in that they link together a set of users (usually from the supply chain of a single company, or a professional organization), but use the Internet instead of a private communication network. Access to the extranet is restricted, so that private activities using internal data can be securely supported as part of the organization’s business processes.

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

**Stages of E-Business**

To this point the discussion has focused on the modes of business event data processing and related communication technologies that underlie the ability of organizations to enter into e-business. Now the discussion moves to specific methods for conducting e-business and how these methods use alternative modes of business event data processing and available communication technologies.

The three stages of e-business discussed here are fairly diverse. First is electronic document management (EDM). Some might not consider EDM part of e-business because the majority of such applications support non-e-business events, but it has an integral role in supporting the last two stages. Electronic data interchange (EDI) is the second area discussed. It currently represents the predominant form of e-business in transactions between two businesses. The third stage is e-commerce, which comprises the fastest-growing segments of e-business, and where EDI is slowly being replaced by XML.
Electronic Document Management

Electronic document management (EDM) is the capture, storage, management, and control of electronic document images for the purposes of supporting management decision making and facilitating business event data processing. Capturing and storing document images typically relies on the digital image processing approaches discussed earlier in the chapter. 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 4.1 discusses some general uses of EDM.

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

1. *Document storage and retrieval.* For example, mortgages, deeds, and liens are archived and made available to the public for such uses as title searches.

2. *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.

**Technology Application 4.1**

**General Uses of Electronic Document Management Systems**

**Case 1**

The push to improve crime investigation time and accuracy, in an effort to let fewer criminals escape from the vicinity of the crime, has led to one of the biggest EDM networks to date. In August 1999, the FBI unveiled a $640 million fingerprint system that allows fingerprint scans to be compared from the cars of police officers through connection to the central EDM repository. Prior to the implementation of the new system, law enforcement agencies, security firms, child-care organizations, and other entities requiring background checks would mail more than 50,000 fingerprints to the FBI each day. Specialists would then spend months trying to match the submitted fingerprints to some 34 million cards with an average of 10 fingerprint images each. The new system digitizes the fingerprint images to make them available for electronic comparison. The rapid access to fingerprint images coupled with the ability to do electronic comparisons should vastly reduce the number of arrested individuals who are released before their fingerprints have been reviewed and tied to past criminal activities.

**Case 2**

European companies use EDM to cut the cost of filing regulatory documents, a practice expected to grow 42% per year over a five-year period. Certainly driving this growth has been the integration of Internet capabilities for distribution of electronic images along with recent developments that enable integrated storage of voice and video clips as well. The European trend also includes increased use of laser disk storage for faster retrieval of document images coupled with high levels of storage capacity. Finally, EDM is being perceived as a key enabler for evolving knowledge management endeavors (see Chapter 5), as much of the knowledge captured in such systems is document based.

EDM systems provide a relatively inexpensive alternative to paper documentation. 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 can translate into faster and better customer service and result in increased customer loyalty—themes we explore in some depth in Chapter 10. The typical benefits include:

- Reduced cost of handling and storing paper.
- Improved staff productivity.
- Wider use of geographically distributed virtual teams.
- Superior customer service.
- Enhanced management of operational workflow.
- Faster processing.

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 had been slowed by a lack of transmission and presentation standards. What this often meant was that an organization used 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 had to be printed and mailed or faxed to the vendor. Then, at the vendor, the PO had to be sorted from other mail in the mailroom, routed to the appropriate clerk, and entered into the vendor’s computer. The efficiency, timeliness, and accuracy gained by the automated purchasing process at the originating organization were lost through the mailing and reentry of the data at the vendor.

One technology that permits 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 standardized formats that allow direct processing of those electronic documents by the receiving computer system. Technology Application 4.2 describes some general uses of EDI, and Figure 4.5 (page 123) depicts typical EDI 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 in the destination organization’s Order-to-Cash 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. Figure 4.6 (page 124) depicts the translation process. The figure shows a specimen PO as it might appear as a conventional paper document and then illustrates how the PO is transformed into an EDI transaction standard,
referred to as transaction set 850. Translation sets are the generally accepted representation standard for EDI and are described in Appendix A.

Communications Network (circles 3 and 5) One method for communicating electronic messages between business partners would be to establish a direct computer-to-computer link between the origination computer and one or more destination computers. This kind of interface could be accomplished through a leased or dedicated communication line with each trading partner, or through a communications network in which one of the partners—let’s say a large manufacturer—serves as the “hub” of the network, and its suppliers and other trading partners are the network “spokes.” However, communications system incompatibilities may require that one partner or the other purchase communications hardware or software, making 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.

An alternative is to use an EDI service bureau—an organization that acts as an intermediary between a large hub company and its suppliers. The EDI service bureau generally works with smaller suppliers reluctant to acquire in-house translation and
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 suppliers. In the other direction, the bureau translates suppliers’ paper documents—such as shipping notices or invoices—into EDI format and sends the electronic documents to the hub. Service bureaus are declining in use due to easily accessed and relatively inexpensive Internet-based options.
Figure 4.6  Electronic Data Interchange Transaction Set

<table>
<thead>
<tr>
<th>Heading Area</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST<em>850</em>73561 N/L</td>
<td>Start transaction set (ST), identify purchase order (850), and provide sender-assigned control number (73561)</td>
</tr>
<tr>
<td>BEG<em>00</em>SA*BL2-1563 **950901 N/L</td>
<td>Begin (BEG) transaction set for a new (00) stand-alone (SA) PO, number (BL2-1563) of September 1, 1995 (950901)</td>
</tr>
<tr>
<td>N1<em>SE</em>Compu Supply**82645 N/L</td>
<td>Identify (N1) the seller (SE), Compu Supply, vendor number (82645)</td>
</tr>
<tr>
<td>N1<em>BY</em>Delta Fabricating**29327 N/L</td>
<td>Identify (N1) the buyer (BY), Delta Fabricating, whose customer number to Compu Supply is (29327)</td>
</tr>
<tr>
<td>ITD<em>01</em>03<em>2**10</em>N30 N/L</td>
<td>Specify terms of sale (STD): basic sale (01), 2% (2) discount if paid within 10 days (10) of invoice date (03), net invoice due in 30 days (N30)</td>
</tr>
<tr>
<td>SHH<em>SD</em>010*950904 N/L</td>
<td>Specify (SHH) ship date (SD) requested (010) of September 4, 1995 (950904)</td>
</tr>
<tr>
<td>SHH<em>DD</em>002*950907 N/L</td>
<td>Specify (SHH) delivery date (DD) requested (002) of September 7, 1995 (950907)</td>
</tr>
<tr>
<td>FOB*PP N/L</td>
<td>FOB information (FOB): freight prepaid (PP)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detail Area</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1<em>01</em>140<em>CA</em>29.6<em>QT</em>IN<em>A235</em> VN*96240 N/L</td>
<td>Order line item data (PO1): line no. (01), 140 (140) cases (CA) ordered, quoted (QT) unit selling price of $29.60 (29.6), with buyer’s ID (IN) number of (A235) and seller’s ID (VN) of (96240)</td>
</tr>
<tr>
<td>PO1<em>02</em>25<em>EA</em>269.95<em>QT</em>IN<em>1936</em> VN*19965 N/L</td>
<td>Order line item data (PO1): line no. (02), 25 (25) units (EA) ordered, quoted (QT) unit price of $269.95 (269.95), with buyer’s ID (IN) number (1936) and seller’s ID (VN) of (19965)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary Area</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CTT<em>2</em>165 N/L</td>
<td>Control totals (CTT): number of PO lines (2) and total of the number of units ordered (140 + 25) = (165)</td>
</tr>
<tr>
<td>SE<em>12</em>73561 N/L</td>
<td>End the transaction set (SE), give the number of segments included (12) and the control number from the header (73561)</td>
</tr>
</tbody>
</table>

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 “postman.” 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 is a network service that provides communications capabilities for organizations not wishing to obtain their own communications links. VANs are also dropping in popularity due to Internet-based options for EDI.

As shown in Figure 4.5, one of the several functions that the VAN will perform is to translate the message from one communications protocol to another, if necessary.

EDI and Business Event Data Processing If we consider the implications of EDI for 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 online transaction entry (OLTE). With EDI, both source document capture of business event data and subsequent keying in of the source document 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. Keep in mind that EDI may be completed through traditional modes using dedicated communications lines, but are increasingly moving to the Internet.

You should be careful, however, not to make assumptions as to the mode of business event data processing. You will recall from our earlier discussion that OLTE can be used with both periodic and immediate modes of processing. The same holds true for the core business processing activities in an EDI environment. The business event data are frequently processed using an online real-time system, but many organizations also choose to do the bulk of the processing steps using periodic mode as well—particularly with batching of business event data for more efficient processing. It is worth noting also that particularly when batch processing is being used, there may be the need for online transaction processing (OLTP) approaches to handle order and payment confirmation activities during acceptance of the externally generated OLTE transmission—in other words, the customer may need an immediate confirmation that the order has been accepted and the business event will be completed by the vendor.

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—has been the catalyst for change in a firm’s basic business processes.

Technical Insight 4.1 (page 126) presents some management, operational, and control issues associated with EDI.

Internet Commerce

A mere decade or so ago, e-business basically meant EDI. The Internet has radically changed the nature of e-business so that it has 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 continues to grow at a rate of about 15% per year. Still, the Internet shows far more potential growth—primarily
From the potential seen in the emerging replacement language for EDI on the web, XML (eXtensible Markup Language).3 XML is described in Technology Insight 4.2 (page 128).

Today, e-business enables the computer-to-computer exchange of business event data in structured (e.g., EDI or XML) or partially structured formats, usually via the Internet, 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 the case with software). The Internet radically simplifies business processes by allowing the organization

3 Carol Sliwa, “Firms Wait on XML, Increase Use of EDI,” Computerworld Online (May 1, 2000).
that is receiving and processing business event data to project template formats 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—particularly warm stuff!) you see an “intelligent order form.” You are provided an entry box to type in 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 appears in menu form for you to select from the options available (e.g., for color, the menu might show red, navy, black, white, and green). As you enter responses on your computer, the data are automatically captured and recorded on the Lands’ End computer. Technology Insight 4.3 (page 129) provides some management, operational, and control issues associated with the use of the Internet for e-business, while Technology Application 4.3 (page 130) provides some examples of ventures into Internet commerce.

Review Question
How does the Internet simplify the world of e-business?
Extensible Markup Language (XML) is a Web-based data format that enables information to be shared over the Web. XML provides a framework within which data from any type of source can be communicated and understood by any business partner’s system, independent of technology platform.

XML supports a tree structure in which labeled data items are hierarchically related. A simple example is an XML item in which a phrase labeled as a greeting might hail the world with the following XML code:

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE greeting [
<!ELEMENT greeting (#PCDATA)>
]>
<greeting>Hello, world!</greeting>
```

Most XML standards are being established to permit common transaction processing among like-minded industries or corporate functions (e.g., buying or selling computer hardware components, or exchanging human resources data). XML-enabled transaction processing will simplify Web transaction exchanges, and may completely replace EDI as the standard of choice as soon as reliability and security problems have been adequately addressed. XML parsers (programs that can read XML) have been integrated into many Web browsers, Web-enabled enterprise systems (e.g., Oracle Applications and Great Plains), and other business applications.

In a recent Zona Research Market Report, almost half of surveyed companies reported that they plan to convert some or all of their EDI applications to XML within the near future. Of the rest, half don’t use EDI presently, and the other half will stay with EDI or convert EDI dynamically to XML. XML’s usage is expected to rise from 0.5% of e-commerce transactions in early 2000 to 40% by the end of 2003. The key reasons these companies see for using XML are that XML

- Makes it easier to search for business partners or products
- Lets the company use event data for other purposes once it’s in XML form
- Shortens application development time
- Enables business processes to take less time from start to finish
- Makes it easier to convert business data to a more usable form
- Ties together multiple internal applications within the company
- Allows links with customers’ systems
- Supports links with suppliers’ and trading partners’ systems
- Allows the company to join an electronic marketplace that uses XML

Although many vendors are working diligently to release XML-based products, there remain many issues and questions to be answered before the language reaches its potential. These include security, agreement on standard formats, and senior management’s lack of understanding about its challenges and potential. XML encryption standards are in development and a draft was released in 2001.

E-Business Management and Operations Considerations

Benefits of Internet commerce include the following:

• Survival. Many organizations have been “forced” to implement e-business to compete in the changing nature of their industries. If they wish to remain competitive with other companies taking advantage of the Internet for commerce, they will need to venture to the Web.

• Improved responsiveness to customers’ needs. Customers expect immediate feedback and easy availability of information and help. The Internet is a useful tool for servicing customer and client needs—forming the communications medium for distributing information and support services.

• Global penetration. The Internet is generally the easiest and least expensive way to reach customers worldwide that an organization may never have been able to reach previously.

• Reduced processing costs and improved accuracy result when data are not reentered at the receiving organization. Customers now provide most of the data entry themselves, removing the need for the selling organization to key in 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.

• The opportunity to rethink and redesign existing business processes and controls in the course of implementing e-business.

Costs of using the Internet include:

• 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:

• Hackers attempting to access sensitive information such as customer lists or customer credit card information.

• Denial of service attacks. Denial of service attacks 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. See Technology Insight 8.3, on page 267, for a fuller description.

• Trust. Increasingly, the success of B2B relationships necessitates the identification of business partners who are allowed access to sensitive internal information. A breakdown of that trust can have grave consequences to the organization making its information available.
There are two primary categories of e-business over the Web: (1) business-to-consumer, or B2C (e.g., Lands’ End), and (2) business-to-business, or B2B. Figure 4.7 depicts a typical type of secure B2B arrangement. 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 a Web-enabled 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 inaccessible via the network. The vendor (circle 7) is the server node and 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., an Internet-based language such as Java or XML). To use the Lands’ End example again, when you place your order, your computer should be inaccessible (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 receives your order and uses CGI to translate your message into a form their program can understand and process. Similar to EDI environments, once the business event data have been collected by the vendor, applications can be completed through any of the modes of business event data processing. For instance, Lands’ End used a periodic mode approach to process batches of sales several times an hour.4

Network Providers (circles 2 and 5) As with EDI, to participate in the business event, both parties must have the capability to communicate over the Internet. For many companies and organizations (as well as some individuals), this access comes 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 into the Internet by making their directly connected networks available to fee-paying customers. Most network providers bring a host of other benefits along with Internet access. Common benefits include e-mail access, electronic mail boxes, space allocation for personal Web pages, and remote connection to other computer sites (e.g., telnet and FTP connection). Many organizations will also use network providers to run their servers when assuming that role in the client-server relationship. In Figure 4.7, circle 5 denotes a network provider who would be 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 for most organizations and individuals participating in e-commerce has been Internet security. Security is the most critical factor that has hampered the growth of e-commerce. One early survey showed that 90% of Internet users felt increased security was necessary before they would transmit personal information (e.g., credit card information) across the Internet. Many stories have circulated about the risk of credit or debit card information being pirated off the network, with large sums of money being expended by unauthorized users. Additionally, the Internet has spawned a whole array of cottage industries that have no physical storefronts, 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 storefront merely being a means by which to gather credit card and debit card information for illicit use.

These 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 in order to provide limited assurance to users of the vendor’s Web site that a site is in fact reliable and data security is reasonable. Technology Application 4.4 provides a more detailed discussion of Internet certification programs and assurance services.

Figure 4.7 demonstrates how one common type of assurance provider operates using the WebTrust program as discussed in Technology Application 4.4. The vendor (circle 7) displays 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 assure 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 verifies the symbol’s appropriate use by sending a message to the customer (circle 1). The customer can also 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 this link connects to the accounting firm’s (circle 6) server—provided by its network provider.

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Review Question

What role do network providers play in the e-commerce environment?

Review Question

What types of assurances are provided by Internet assurance services?

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provider in this case (circle 5)—and the auditor’s Internet assurance report for the vendor displays on the customer’s computer (circle 1).

**Internet Connection (circle 3)** To obtain an Internet connection you must have a link to one of the networks that connect to the Internet and indicate the Internet site with which the client wants to connect. A connection is then made between the client and the desired site—the server.

A couple of other issues related to the organization of the Internet and its impact on e-commerce should be noted. First, the nature of the Internet as a public network-based infrastructure has greatly leveled the field in e-business. Only fairly large businesses could afford EDI’s communications hardware and software. The creation of a public network and the subsequent creation of XML and relatively inexpensive (or even free) software for using the network have brought the costs of e-business within the ranges of economic feasibility for most small- and medium-sized entities. This change in cost structure and ease of use are the two forces driving the strong growth in e-commerce.

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**Technology Application 4.4**

**Internet Security Certification**

**Case 1: Webtrust Certification**

Like many vendors of high technology products, Westek Presentation Systems made a decision to pursue opportunities for e-commerce by taking its product lines to the Web. However, a major problem was many customers’ reluctance to purchase products over the Internet because of security issues. These security issues included concerns over whether the company really existed (or was simply a front to collect credit card numbers for fraudulent use) and over the safety of transmitting credit card information over the Internet. Westek’s CPA proposed a solution recommending that Westek have the CPA provide assurance services that would attest to the validation of the company and the safety of its Web site for potential customers. In late 1997, Westek became the first certification client for this new type of security service.

The WebTrust Seal of Assurance is the product of a joint venture between the American Institute of Certified Public Accountants (AICPA) and the Canadian Institute of Chartered Accountants (CICA). It is designed to provide comfort and assurance that a Web site is reasonably safe for users participating in B2C e-commerce. Once a site receives WebTrust certification, it should be reviewed at least every 90 days by the CPA/CA to assure adequate standards have remained in place and the site remains reasonably secure. Basically, the Web site must meet three standards:

- **Business practices disclosure:** The client company must disclose its business practices for conducting e-commerce to users accessing its Web page.

- **Transaction integrity:** The client company must have proper control procedures in place to assure that customers’ business events data are completed and billed correctly.

- **Information protection:** The client company must have proper controls in place to ensure customer information is protected from unauthorized use.

Recently, WebTrust certification was made available in separate components rather than requiring certification on all three of the above areas. For instance, one of the available seals now covers only business practices and transaction integrity.

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**Review Question**

Why is EDI moving to the Internet?
Technology Application 4.4 (continued)

Case 2: ICSA Certification

An alternative to WebTrust is provided by the International Computer Security Association (ICSA) Labs—a subsidiary of TruSecure. ICSA Labs provides reduced risk to both the customer and the vendor by providing, verifying, and improving the use of appropriate security standards across a range of critical dimensions. The Anti-Virus certification helps product developers address threats from malicious programs. The Firewalls certification is based on testing of commercially available firewall packages. Cryptography certification helps users identify products that effectively use cryptography to provide security services. Intrusion Detection tests the functionality and compliance of intrusion detection products. Additionally, a new product related to Public Key Infrastructure (PKI) product certification is due out around the beginning of 2003.

Case 3: TRUSTe

Another product, TRUSTe, focuses solely on privacy issues. The TRUSTe certificate is awarded only to sites that adhere to established privacy principles of disclosure, choice, access, and security. Websites carrying the seal also agree to TRUSTe’s prescribed dispute resolution processes for customers. The focus on privacy creates a nice market niche for TRUSTe as privacy concerns have been in the forefront of Internet legislation for many countries. TRUSTe has recently added services for compliance with the guidelines of the Children’s Online Privacy Protection Act (COPPA). The Children’s Privacy Seal Program assures Web sites are safe harbors for children to visit.

Case 4: BBB Online

The most popular certification program is the Better Business Bureau’s BBB OnLine program with 10,482 active Web sites. The program confirms a company is a member of the Better Business Bureau and that there has been a review for truth in advertisement guidelines and good customer service practices. The program is likely so popular because of the broad recognition of the Better Business Bureau and the low cost of attaining certification.


Other Internet Uses for E-Business

While we have focused in this chapter on the most common forms of e-commerce and the direct linkages between customer and vendor, a number of intermediaries are evolving that promise to bring costs down even further for organizations. 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 Insights 4.4 and 4.5.

The Internet is not only a place for completing sales, but is also an environment for improving customer support for non-Internet-based commerce. A Web page may simply be one more channel 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 provides free software upgrades over the Internet—in this case, providing monthly updates for its Anti-Virus software. In another example, many courier companies (such as Federal
Internet Auction Markets

Internet auction markets provide an Internet base for companies to either place products up for bid or for buyers to put proposed purchases up for bid. In the first case, a market participant puts an item up for bid, sets a minimum bid price, and awaits completion of the bidding process, as happens on eBay. While this market works fairly well for B2C e-commerce, it is not as effective for business-to-business commerce. For B2B e-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.

Internet Market Exchanges

Internet market exchanges bring together a variety of suppliers in a given industry and one or more buyers in the same industry. 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. Even if only one supplier carries a certain item, 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, the buyer will make its needs known on the marketplace and suppliers will 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, for example getting purchased goods to an assembly line within an hour of when needed for production. This part can get tricky and the exchange must be set up carefully.

Internet market exchanges can be either private or public. Private exchanges limit the buyers and suppliers who 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. Private exchanges that have been planned or are currently operating outnumber such public exchanges 30,000 to 600. However, private exchanges have drawn the watchful eye of the Federal Trade Commission (FTC), which oversees fair trade practices and potential anti-competitive practices that may result from restricting participation in the market exchange.

Express) use the Internet to allow customers to access information to track their packages at any given point and to know when they have reached their destination. Such 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) systems. CRM systems provide customer self-service capabilities (i.e., let the customer inspect an account or get product help through a Web interface rather than through interaction with a support person), electronic catalogues, shipment update information, and 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 enterprise systems to share data. In an effort to improve integration, all of the major software firms are involved in initiatives to further empower CRM extensions to their enterprise systems.

Conclusions

The future of e-business will see an increasing merge 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. Yet the advances in Internet security have been significant in the past few years, with the potential major beneficiaries of e-commerce leading the charge. For instance, software companies like Microsoft and Netscape, along with financial providers Mastercard and Visa, have been in the forefront of development efforts to assure safe use of the Internet in commerce.

The evolution of EDI practices toward the Internet and XML will initially involve increased use of corporate intranets. Moving EDI applications to an intranet environment can help simplify processing while maintaining high levels of control and security. These intranets will be opened to business partners using programs, referred to as tunneling software (or VPNs, virtual private networks) that limit intranet access to selected business partners. As security increases, the Internet will increasingly become a viable alternative as the communications infrastructure of choice.

These increases in security will help to fuel the growth of Internet commerce. As the Internet becomes an increasingly acceptable channel for doing business, companies will experience newfound opportunities for reaching customers; and for many companies, will bring globalization of their customer bases. On the other hand, there will also be new competition from distant companies who have access to the same customers.

Entering the e-business domain is not simply a matter of switching on the connection, however. 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.

It is thought to be an ancient curse to wish upon someone “may you live in interesting times.” We are certainly not wishing a curse upon you, but the reality is that we are all living in interesting times. E-business success will rely heavily on understanding how to manage and control change at a fast pace. While these are interesting times, they are also exciting times.
**EDI Standards**

Presently, there are two major, nonproprietary, public, translation standards:

1. In the United States and Canada, the American National Standards Institute (ANSI) X12 standard has been used.
2. EDIFACT (EDI for Administration, Commerce, and Transport) is the predominant standard for international EDI transactions.

In addition, there are several standards that 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, interindustry standards (e.g., ANSI X12), while some are not compatible.

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 purchase order (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.

Besides purchase orders, other typical EDI transaction sets include (the ANSI X12 transaction set number appears in parentheses):

- Purchase order acknowledgment (855).
- Advance shipping notice (ASN) (856). From supplier to customer, advising that the goods are on the way.
- Receiving advice (861). From customer to supplier to report late, incomplete, or incorrect shipments.
- Invoice (810).
- Payment order/remittance advice (820). From customer to supplier for payment.
- Functional acknowledgment (FA) (997). A message is sent from receiver to sender to acknowledge receipt of *each and every one* of the above transaction sets. For instance, when the seller receives a purchase order (850) from the buyer, the seller sends back an FA (997) to indicate the message was received. Then, when the buyer receives a purchase order acknowledgment (855), the buyer acknowledges that the message was received by sending the seller an FA (997).

Translation software translates outgoing messages so that they are in the standard message format (e.g., ANSI X12) and translates the incoming messages from the standard message format into the form understood by the application system. This intermediate translation to/from the EDI format precludes the need for an organization to reprogram its application so that it can communicate with *each* trading partner’s application.
The translation software also performs administrative, audit, and control functions. For example, the software inserts identification and control information in front of (header) and after (trailer):

- Each transaction set, such as one purchase order.
- Each functional group (e.g., a group of purchase orders, a group of receiving advices, and so forth) so that several groups may be sent in one transmission.
- All components comprising one transmission.

In EDI lingo, the data sets and the headers/trailers are called “envelopes.” In addition to assembling and disassembling the EDI envelopes, the translation software may log incoming and outgoing messages and route the messages from and to the proper application.

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**REVIEW QUESTIONS**

**RQ4-1** Briefly define e-business and e-commerce. How are they related?

**RQ4-2** Explain the relationship between the periodic mode and batch processing.

**RQ4-3** List and describe the four basic subprocesses completed in processing business event data using batch processing.

**RQ4-4** Explain how the use of online transaction entry (OLTE) can increase efficiency when using batch processing.

**RQ4-5** Explain the relationship between online real-time (OLRT) and immediate mode processing.

**RQ4-6** List and describe the three basic subprocesses completed in processing business event data using online real-time processing.

**RQ4-7** How does the use of online transaction processing (OLTP) improve the timeliness of online real-time processing?

**RQ4-8**

a. Explain how bar code readers work.

b. Explain how optical character recognition works and how it differs from bar code technology.

c. Explain how scanners are used to capture data.

**RQ4-9** How is digital image processing used to support the keying in of data?

**RQ4-10** Explain the difference between wide area networks and local area networks.

**RQ4-11** Explain the advantages of using electronic document management rather than traditional paper-based document systems.

**RQ4-12** Explain how electronic data interchange is used to link two companies’ business processes together.
Explain how value-added networks (VANs) are used to simplify electronic data interchange between two or more companies.

Compare EDI and XML technologies.

How does the Internet simplify the world of e-business?

What role do network providers play in the e-commerce environment?

What types of assurances are provided by Internet assurance services?

Why is EDI moving to the Internet?

The business environment is increasingly demanding the use of online real-time systems for more up-to-date information. Identify one business application, 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.

Take as an example 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.

We noted during the chapter discussion that banks were one of the earliest adopters of online transaction processing systems. Discuss why OLTP would be so desirable for use in ATM systems.

How does your university use the Internet to improve communication between students, faculty, and staff?

What would you perceive to be the advantages and disadvantages of conducting business on the Internet? Be prepared to explain your answer.

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

Consider again the example of Lands’ End and its use of Internet commerce as discussed in the text. In a business where customers want to know fairly definitive delivery dates, what are the risks of using periodic processing on orders? Does the processing of orders several times each hour negate the disadvantages of periodic processing?

How can e-mail be adapted to a more structured form to aid in capturing business event data?
P4-1 Find a merchandising business on the Internet (other than the Lands’ End example 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/stock-outs 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.

P4-2 Identify a business venture that you believe could be successful solely using the Internet. 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.)

P4-3 Develop a research paper on the growing 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.)

P4-4 Explain how electronic document management is or could be used in your 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.)

P4-5 Write a research paper on the issues involved in developing an XML-based alternative to EDI for use in a specific industry of your choosing. Consult the Internet to see if a standard has been proposed for that industry, and if so, evaluate its use.