CHAPTER 9

ELECTRONIC COMMERCE SOFTWARE

LEARNING OBJECTIVES

In this chapter, you will learn about:

- Finding and evaluating Web hosting services
- Basic functions of electronic commerce software
- Advanced functions of electronic commerce software
- Electronic commerce software for small and midsize businesses
- Electronic commerce software for midsize to large businesses
- Electronic commerce software for large businesses that have an existing information technology infrastructure

INTRODUCTION

In 1996, Australian Phillip Merrick started **webMethods** in Fairfax, Virginia. Merrick wanted to create a company that could exploit a new technology called XML (about which you learned in Chapter 2) in helping get B2B electronic commerce off the ground. Since then, the company has installed software in more than 1200 of the world's largest organizations that helps those organizations conduct electronic commerce with their suppliers. **Covisint**, the auto industry procurement portal you learned about in Chapter 6, uses webMethods software to integrate its Oracle database system with its Commerce One procurement and auction software, its Supply Solution supply chain execution software, and a variety of other vendors' software products.

Businesses on the Internet can face challenges when trying to exchange information with each other—information such as invoices and inventory tracking information—using XML. With XML and webMethods software, a manufacturing company's order can be translated into a Web page that both the manufacturer's software and the Web server can understand. One of webMethods' largest customers, Dun & Bradstreet, compiles financial and credit information. It uses webMethods software to translate data from proprietary systems into a common format that any Dun & Bradstreet customer's computer can understand. Dun & Bradstreet's customers save money when they use webMethods software instead of writing their own customized programs to interpret Dun & Bradstreet data. Dun & Bradstreet benefits because it no longer has to worry about supporting many different financial data and credit information formats in its regional data centers; webMethods software takes care of translating the different formats into a single form. As you will learn in this chapter, companies that engage in online business activities often combine software and tools from different vendors to accomplish their goals. Although small companies can sometimes use a single vendor to supply all their electronic commerce software, most larger companies need to integrate a number of software products, each of which performs a particular task or process particularly well.

WEB HOSTING ALTERNATIVES

When companies need to incorporate electronic commerce components, they may opt to run servers in-house; this is called **self-hosting**. This is the option used most often by large companies. Other companies, especially midsize and smaller companies, often decide that a third-party Web hosting service provider is a better choice than self-hosting. Many small Web stores use a third-party host provider for both Web services and electronic commerce functions, particularly when the Web site is small or the company sells a limited number of products.

As you learned in Chapter 2, a number of companies, called Internet service providers (ISPs), are in the business of providing Internet access to companies and individuals. Many of these companies offer Web hosting services as well. To distinguish themselves from companies that provide only Internet access services, these hosting service firms sometimes call themselves something other than ISPs. Because the hosting services they offer are designed to help companies conduct electronic commerce, these hosting service

firms sometimes call themselves **commerce service providers (CSPs)**. These firms often offer Web server management and rent application software (such as databases, shopping carts, and content management programs) to businesses; thus, these companies also sometimes call themselves **managed service providers (MSPs)** or **application service providers (ASPs)**. Despite the increasing variety of acronyms, many companies that provide some or all of these additional services still call themselves ISPs.

Service providers offer clients hosting arrangements that include shared hosting, dedicated hosting, and co-location. **Shared hosting** means that the client's Web site is on a server that hosts other Web sites simultaneously and is operated by the service provider at its location. With **dedicated hosting**, the service provider makes a Web server available to the client, but the client does not share the server with other clients of the service provider. In both shared hosting and dedicated hosting, the service provider owns the server hardware and leases it to the client. The service provider is responsible for maintaining the Web server hardware and software, and provides the connection to the Internet through its routers and other network hardware. In a **co-location** (also spelled **collocation** and **colocation**) service, the service provider rents a physical space to the client to install its own server hardware. The client installs its own software and maintains the server. The service provider is responsible only for providing a reliable power supply and a connection to the Internet through its routers and other networking hardware. You can find service providers by looking in your local telephone directory or by using a Web directory such as **The List**, which appears in Figure 9-1.

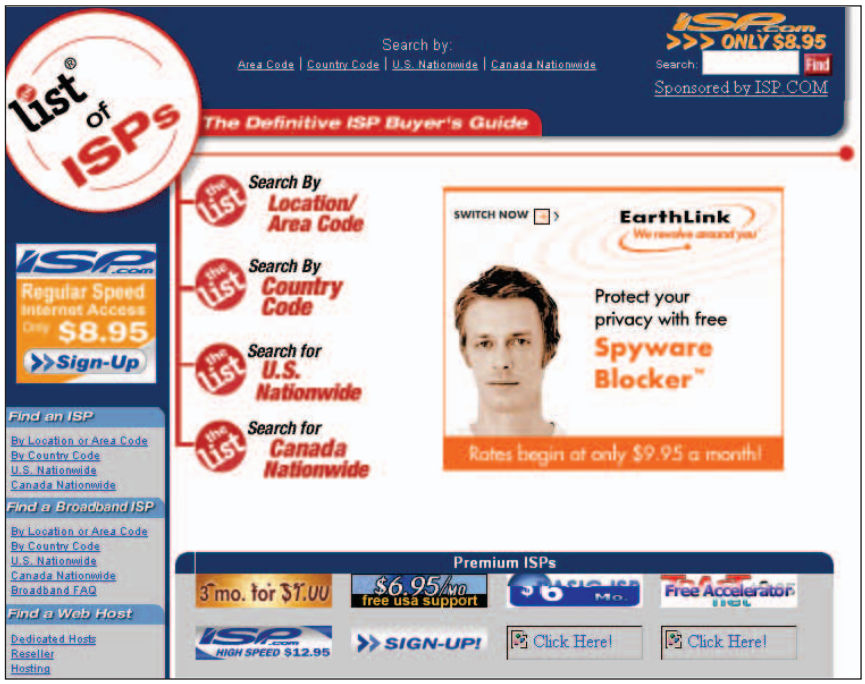


FIGURE 9-1 The List Web host directory

The **HostIndex** site provides a convenient collection of Web pages that compare Web hosts. **TopHosts.com** and **HostSearch** also provide comprehensive link collections to companies researching Web hosting alternatives and services. Major Web directories can be helpful sources; the **Google Directory of Web Host Directories** is especially comprehensive.

When making Web server hosting decisions, a company should ask whether the hardware platform and software combination can be upgraded when the traffic on its Web site increases. A company's Web server requirements are directly related to its electronic commerce transaction volume and Web site traffic. The best hosting services provide Web server hardware and software combinations that are **scalable**, which means they can be adapted to meet changing requirements when their clients grow.

BASIC FUNCTIONS OF ELECTRONIC COMMERCE SOFTWARE

The size and objectives of electronic commerce sites vary greatly; thus, a variety of software and hardware products are used to build those sites. At the inexpensive end of the spectrum of electronic commerce solutions are choices such as externally hosted stores that provide software tools to build an online store on a host's site. At the other end of the range are sophisticated electronic commerce software suites that can handle high transaction volumes and include a broad assortment of features and tools.

The type of electronic commerce software an organization needs depends on several factors. One of the most important factors is the expected size of the enterprise and its projected traffic and sales. A high-traffic electronic commerce site with thousands of catalog inquiries each minute requires different software than a small online shop selling a dozen items. Another determining factor is budget. Creating an online store can be much less expensive than building a chain of retail stores. The start-up cost of an electronic commerce operation can be much lower than the cost of creating a brick-and-mortar sales and distribution channel that includes warehouses and multiple retail outlets. A traditional store requires a physical location with leases, employees, utility payments, and maintenance. The cost of creating the infrastructure for an online business can be much lower.

Another early decision is whether the company should use an external host or host the electronic commerce site in-house. Companies that have an existing information technology (IT) staff of programmers, Web designers, and network engineers are more likely to choose an in-house hosting approach. If a company does not have or cannot easily hire people with the skills required to set up and maintain an electronic commerce site, it can outsource all or part of the job to a service provider. Companies that are located outside of major metropolitan areas and want to host sites themselves must also consider whether their Internet connections are sufficient. In many cases, these companies find that they are not close enough to a major Internet access point or that their connections do not have sufficient bandwidth to handle large volumes of traffic efficiently. Even if these companies have employees with sufficient skills, they might decide to use a service provider to host their electronic commerce sites.

The specific duties that electronic commerce software performs range from a few fundamental operations to a complete solution—from catalog display to fulfillment notification. All electronic commerce solutions must at least provide:

- A catalog display
- Shopping cart capabilities
- Transaction processing

Larger and more complex electronic commerce sites also use software that adds other features and capabilities to the basic set of commerce tools. These additional software components can include:

- Middleware that integrates the electronic commerce system with existing company information systems that handle inventory control, order processing, and accounting
- Enterprise application integration
- Web services
- Integration with enterprise resource planning (ERP) software
- Supply chain management (SCM) software
- Customer relationship management (CRM) software
- Content management software
- Knowledge management software

Tools required by all electronic commerce sites are described in the following sections. The more advanced functions used by larger sites are covered later in this chapter.

Catalog Display

A catalog organizes the goods and services being sold. To further organize its offerings, a retailer may break them down into departments. As in a physical store, merchandise in an online store can be grouped within logical departments to make locating an item, such as a camping stove, simpler. Web stores often use the same department names as their physical counterparts. In most physical stores, each product is kept in only one place. A Web store has the advantage of being able to include a single product in multiple categories. For example, running shoes can be listed as both footwear and athletic gear.

A small commerce site can have a very simple static catalog. A **catalog** is a listing of goods and services. A **static catalog** is a simple list written in HTML that appears on a Web page or a series of Web pages. To add an item, delete an item, or change an item's listing, the company must edit the HTML of one or more pages. Larger commerce sites are more likely to use a dynamic catalog. A **dynamic catalog** stores the information about items in a database, usually on a separate computer that is accessible to the server that is running the Web site itself. A dynamic catalog can feature multiple photos of each item, detailed descriptions, and a search tool that allows customers to search for an item and determine its availability. The software that implements a dynamic catalog is often included in larger electronic commerce software packages; however, some companies write their own software to link their existing databases of product information to their Web sites.

Most of the Web stores you read about in earlier chapters are large, well-known sites. These sites include many features and have a professional look. Figure 9-2 shows the Web page of a small electronic commerce site that sells guitars and other musical instruments.

This site uses simple, inexpensive electronic commerce software and has a clean look with few features beyond those necessary to make sales.

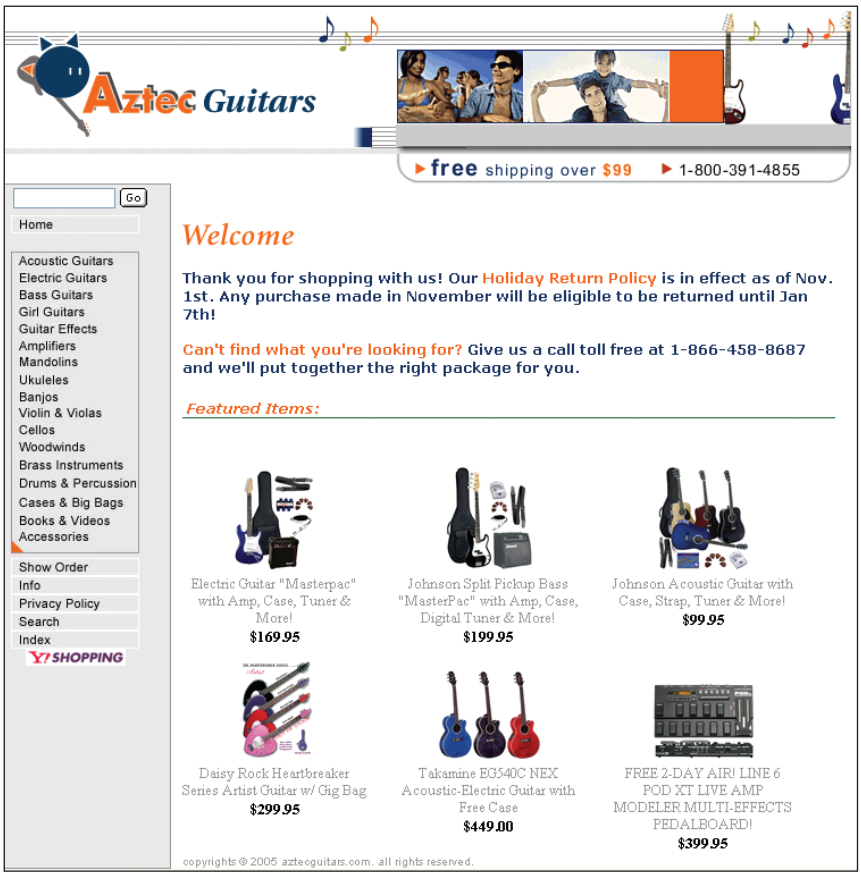


FIGURE 9-2 Small electronic commerce site

Small Web stores that sell fewer than 30 or 40 items, such as the store shown in Figure 9-2, need only a simple list of products or categories. Organization of the items is not particularly important. Companies that offer only a small number of items can provide a photo of each item on the Web page that is a link to more information about the product. A static catalog is sufficient for their needs. Larger electronic commerce sites require the more sophisticated navigation aids and better product organization tools that are a part of dynamic catalogs.

Good sites give buyers alternative ways to find products. Besides offering a well-organized catalog, large sites with many products can provide a search engine that allows customers to enter descriptive search terms, such as "men's shirts," so they can quickly find the Web page containing what they want to purchase. Remember, the most important rule of all commerce is: Never stand in the way of a customer who wants to buy something.

Shopping Cart

In the early days of electronic commerce, shoppers selected items they wanted to purchase by filling out online forms. Using text box and list box form controls to indicate their choices, users entered the quantity of an item in the quantity text box, the SKU (stock-keeping unit) or product number in another text box, and the unit price in yet another text box. This system was awkward for ordering more than one or two items at a time.

One problem with forms-based shopping was that shoppers had to write down product codes, unit prices, and other information about the product before going to the order form, which was inevitably on another page. Another problem was that customers sometimes forgot whether they had clicked the submit button to send in their orders. As a result, they either sent the same order twice (pressing the submit button when they had already done so) or thought they had submitted the order when they really had not (consequently failing to submit the order). The forms-based method of shopping was confusing and error prone.

Figure 9-3 illustrates the problems that shoppers faced with forms-based ordering systems. First, many customers found it difficult to remember the exact descriptions of the products. Second, customers had to enter the item numbers, which were located on a different Web page, in the text boxes. Thus, the customers needed to either write down or memorize the numbers.

FIGURE 9-3 Using a form to enter an order

The forms-based method of ordering has given way to electronic shopping carts. Today, shopping carts are a standard of electronic commerce. As you learned in Chapter 4, a shopping cart, also sometimes called a shopping bag or shopping basket, keeps track of the items the customer has selected and allows customers to view the contents of their carts, add new items, or remove items. To order an item, the customer simply clicks that item. All of the details about the item, including its price, product number, and other identifying information, are stored automatically in the cart. If a customer later changes his or her mind about an item, he or she can view the cart's contents and remove the unwanted items. When the customer is ready to conclude the shopping session, the click of a button executes the purchase transaction. Figure 9-4 shows a typical shopping basket page at a site that sells computer equipment.

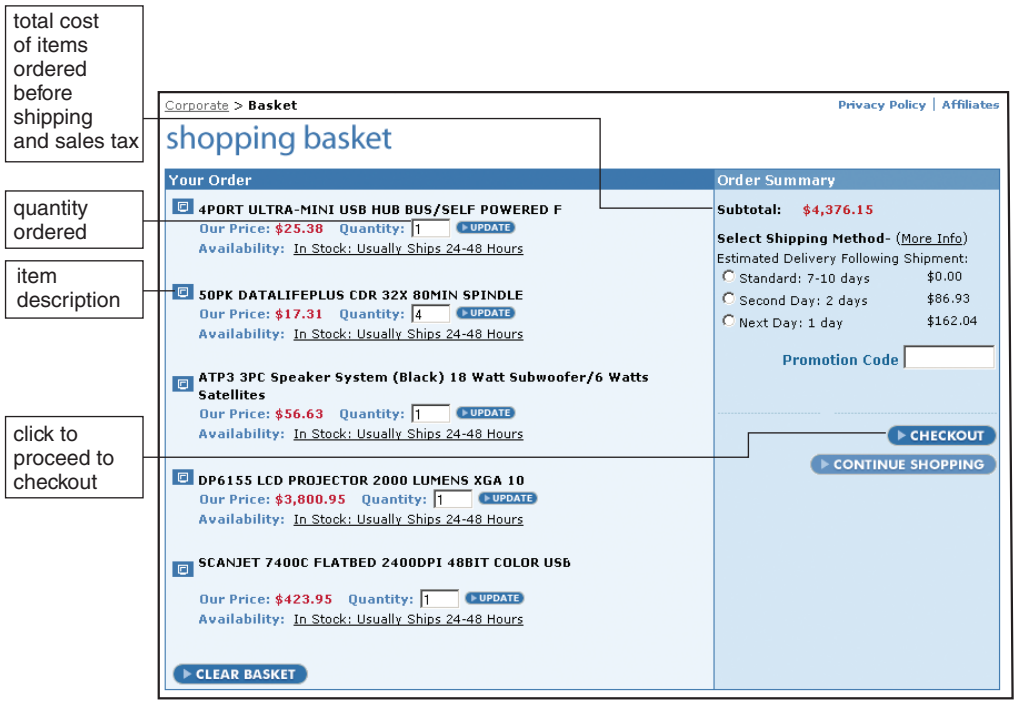
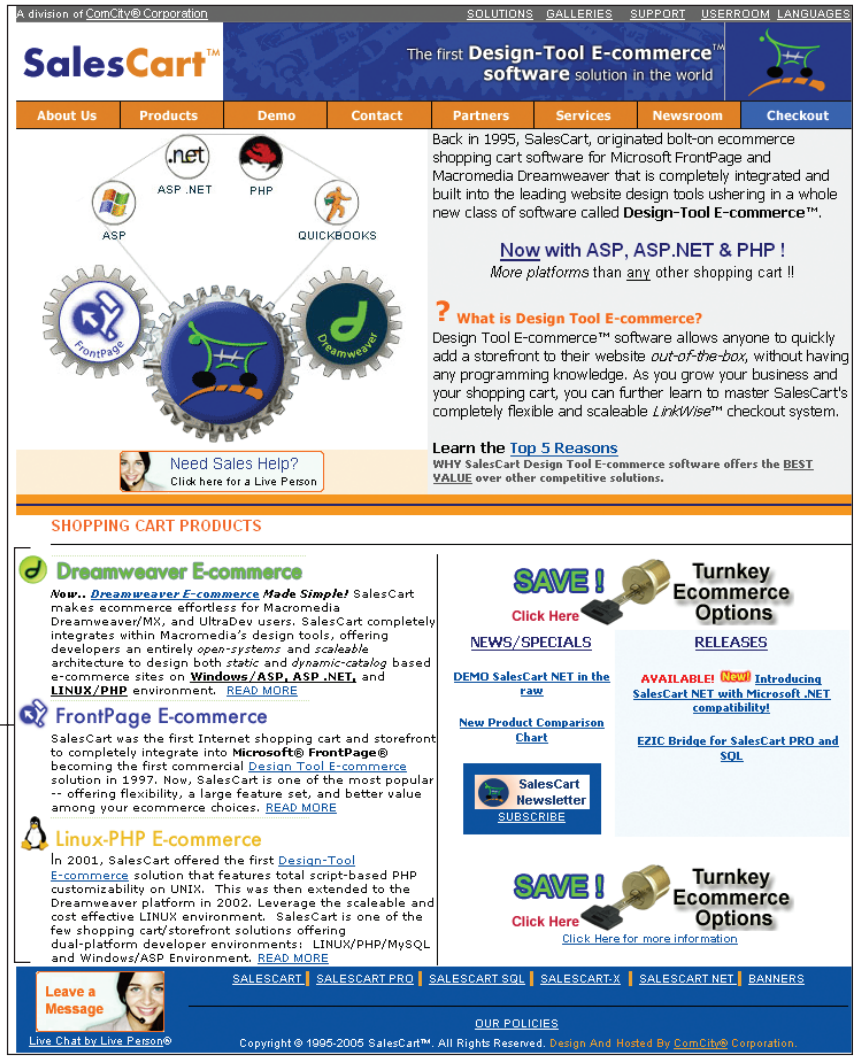


FIGURE 9-4 Typical shopping basket page

Clicking the Checkout button usually displays a screen that asks for billing and shipping information and that confirms the order. As you can see from the figure, the shopping cart software keeps a running total of each type of item. The shopping cart calculates a total as well as sales tax and shipping costs.

Some shopping cart software allows the customer to fill a shopping cart with purchases, put the cart in virtual storage, and come back days later to confirm and pay for the purchases. A number of companies, including **BIZNET Internet Services**, **CartIt!**, **SalesCart**, and **WebGenie Software**, sell shopping cart software that sellers can add to their Web sites.

These software packages range in price from a few hundred dollars to several thousand dollars, plus an ongoing monthly fee. The shopping cart software sold by SalesCart works with several different Web site design tools, as shown in Figure 9-5 on page 408.



shopping cart software for several different Web design tools

FIGURE 9-5 SalesCart shopping cart software

Because the Web is a stateless system—unable to remember anything from one transmission or session to another—shopping cart information must be stored explicitly for the shopper to retrieve later. Furthermore, it must distinguish one shopper from another so that the purchases are not mixed up. One way to uniquely identify users and store information about their choices is to create and store cookies, which, as you learned in earlier chapters, are bits of information stored on a client computer. When a customer returns to a site

that issued a particular cookie, the shopping software reads either the cookie from the customer's computer or the database record from the merchant's server.

If a shopper's browser does not allow storage of cookies, sites can use another way to preserve shopping cart information from one browser session to another. Some electronic commerce software packages, such as **ShopSite**, do this by automatically assigning a shopper a temporary number. The number is added to the end of the shopper's URL and persists as he or she navigates from one Web site to another. When the customer returns, the URL still contains the bits of information about his or her shopping cart. When the customer closes the browser, the temporary number is discarded and thus cannot be reused, even if the customer later reopens the browser and returns to the same Web site.

LEARNING FROM FAILURES

PDG Software

PDG Software is a company based in Tucker, Georgia, that sells electronic commerce software to companies that operate small and midsize electronic commerce Web sites. PDG sells shopping cart software, auction software, shopping mall software, and a number of other packages. Although it sells some of its software directly to the companies that use it, most of its sales are through resellers—firms that use PDG software as part of Web sites that they design, build, and deliver to customers as complete units.

In April 2001, an attacker discovered a vulnerability in the PDG software that allowed an intruder to enter the shopping cart and open the file that contained customer names, contact information, and credit card numbers. PDG developed a patch that would repair the software the same day it found out about the intrusions. PDG posted the patch on its Web site so that companies using the software could download and install the patch. Both PDG and the FBI issued press releases immediately to warn users of the problem with the shopping cart software and encourage them to obtain the patch. Unfortunately, the users of the software that had purchased it as part of a complete electronic commerce Web site were, in many cases, unaware that their sites included the PDG shopping cart software.

Because it took so long—several months, in some cases—to find and contact the companies using the software, online offenders had an excellent opportunity to exploit this vulnerability and collect thousands of credit card numbers. In most cases such as this, the difficulty of finding the sites that are running the vulnerable software helps slow down the attackers. Unfortunately, in this case, the intruder who discovered the opening also found that entering a specific word in a search engine's search expression would instantly return a list of the thousands of sites running the PDG software.

Most of the Web sites found out about the problem when their customers called them, suspicious because their credit card information had been compromised. The lesson from this failure is that companies that operate electronic commerce Web sites must know the source of the software used in creating and maintaining their sites and must monitor news about the security of that software.

Transaction Processing

Transaction processing occurs when the shopper proceeds to the virtual checkout counter by clicking a checkout button. Then the electronic commerce software performs any necessary calculations, such as volume discounts, sales tax, and shipping costs. At checkout, the customer's Web browser software and the seller's Web server software both switch into a secure state of communication. You will learn more about how Web clients and servers establish these secure communication states in the next two chapters.

Transaction processing can be the most complex part of the online sale. Computing taxes and shipping costs are important parts of this process, and site administrators must continually check tax rates and shipping tables to make sure they are current. Some software enables the Web server to obtain updated shipping rates by connecting directly to shipping companies to retrieve information.

Other calculation complications include provisions for coupons, special promotions, and time-sensitive offers; for example, "purchase a round-trip ticket before the end of the month and receive a 50 percent discount." Some shopping cart software designed for small and midsize companies provides connections to accounting software so that Web sales can be entered simultaneously in the company's accounting system. In larger companies, the integration of the Web site's transaction processing into the accounting and operation-control systems of the company can be very complex. The next section discusses some of the advanced functions that larger companies look for in electronic commerce software.

ADVANCED FUNCTIONS OF ELECTRONIC COMMERCE SOFTWARE

In this section, you will learn about the features that larger companies need in their electronic commerce software. Although there are exceptions, such as Amazon.com and Buy.com, most large companies that have electronic commerce operations also have substantial business activity that is not related to electronic commerce. Thus, integrating electronic commerce activities into the company's other operations is very important.

Middleware

Larger companies usually establish the connections between their electronic commerce software and their existing accounting system by using a type of software called middleware. Some large companies that have sufficient IT staff write their own **middleware**; however, most companies purchase middleware that is customized for their businesses by the middleware vendor or a consulting firm. Thus, most of the cost of middleware is not the software itself, but the consulting fees needed to make the software work in a given company. Making a company's information systems work together is called **interoperability** and is an important goal of companies when they install middleware.

The total cost of a middleware implementation can range from $50,000 to several million dollars, depending on the complexity of the company's underlying operations and its existing information systems. Major middleware vendors include **BEA Systems**, **Broadvision**, **Digital River**, and **IBM Tivoli Systems**. As the market for this type of software has matured, the companies that provide this software have worked to build products that can integrate software throughout the enterprise with company Web sites. The BEA Integration Projects Web page appears in Figure 9-6.

links to information about BEA electronic commerce, middleware, and integration products

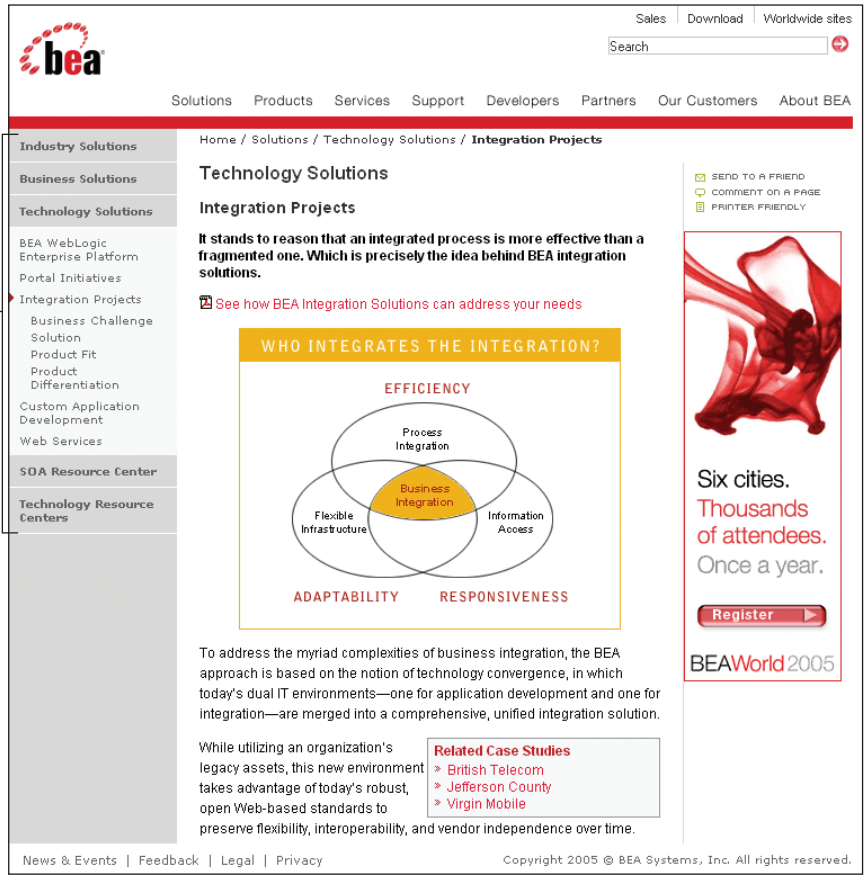


FIGURE 9-6 BEA Technology Solutions page

Enterprise Application Integration and Databases

A program that performs a specific function, such as creating invoices, calculating payroll, or processing payments received from customers, is called an **application program**, **application software** or, more simply, an **application**. An **application server** is a computer that takes the request messages received by the Web server and runs application programs that perform some kind of action based on the contents of the request messages. The actions that the application server software performs are determined by the rules used in the business. These rules are called **business logic**. An example of a business rule is: When a customer logs in, check the password entered against the password file in the database.

In many organizations, the business logic is distributed among many different applications that are used in different parts of the organization. In recent years, many IT departments have devoted significant resources to the creation of links among these scattered applications so that the organization's business logic can be interconnected. This activity is called **application integration** or **enterprise application integration**. The integration is

accomplished by programs that transfer information from one application to another. For example, a program might transfer information from order entry systems in several different divisions to a single accounts receivable and sales system that integrates all enterprise-wide sales activity. In many cases, the data formats in the various programs are different and the transfer programs must edit and reformat the data before transferring it. Increasingly, programmers are using XML data feeds to move data from one application to another in enterprise integration implementations.

Application servers are usually grouped into two types: page-based and component-based systems. **Page-based application systems** return pages generated by scripts that include the rules for presenting data on the Web page with the business logic. Common page-based server systems include Macromedia ColdFusion, JavaServer Pages (JSP), Microsoft Active Server Pages (ASP), and PHP: Hypertext Preprocessor (PHP). These page-based systems work quite well for small and midsize Web sites. Because they combine the page presentation logic with the business logic, however, they can be difficult to revise and update. Larger businesses often prefer to use a **component-based application system** that separates the presentation logic from the business logic. Each component of logic is created in its own module. This makes updating and changing elements of the system much easier—especially on large electronic commerce sites that are built and maintained by teams of programmers. The most common component-based systems in use today are **Enterprise JavaBeans (EJBs)**, **Microsoft Component Object Model (COM)**, and the Object Management Group **Common Object Request Broker Architecture (CORBA)**.

Application servers usually obtain the business logic information they use to build Web pages from databases. A **database manager** is software that stores information in a highly structured way. The structure of the database makes it easy for the database manager software to retrieve the information stored in the database. Smaller electronic commerce sites can use low-cost databases such as Microsoft Access. Larger sites need the power of more expensive database management software such as IBM DB2, Microsoft SQL Server, or Oracle. These database management software packages can be quite expensive. Typical installations cost between $5000 and $200,000. Companies with very large databases that have operations in many locations must make their data available to users in those locations. Large information systems that store the same data in many different physical locations are called **distributed information systems**, and the databases within those systems are called **distributed database systems**. The complexity of these systems leads to their high cost.

Most companies that can afford it do use commercial database products; however, an increasing number of companies and other organizations are beginning to use MySQL, which was developed and is maintained by a community of programmers on the Web. Similar to the Linux operating system you learned about in earlier chapters, **MySQL** is open-source software that can be downloaded and used at no cost. The term **open source** is used to describe such software because the source code of the software is freely available, or "open." The MySQL home page appears in Figure 9-7.

Except for small sites offering only a few products, companies should consider database support as they evaluate electronic commerce software. Most Web stores selling many products use a database that stores product information, including size, color, type, and price details. Usually, the database that serves an online store is the same one that is used by the existing corporate clients. It is better to have one database serving two separate entities because it eliminates parallel but distinct databases—something companies should

FIGURE 9-7 MySQL page

avoid if possible. If a company has existing inventory and product databases, then it should evaluate only electronic commerce software that supports these systems.

Web Services

Companies are beginning to extend the idea of application server systems so that these programs can communicate across organizational boundaries. Although a generally accepted definition has not yet evolved, many IT professionals define **Web services** as a combination of software tools that let application software in one organization communicate with other applications over a network by using a specific set of standard protocols known by their acronyms: SOAP, UDDI, and WSDL (these protocols are described below). Another definition of Web services that IT professionals use is: a self-contained, modular unit of application logic that provides some business functionality to other applications through an Internet connection.

What Web Services Can Do

Companies are using Web services to offer improved customer service and reduce costs. In some companies, Web services are used to provide the XML data feeds that flow from one application to another in enterprise application integration efforts. In other applications,

Web services provide data feeds between two different companies. J.P. Morgan Chase & Co., a major investment bank, uses Web services in its investment information portal. The Web services pull information, such as general economic forecasts, financial analyses of specific companies, industry forecasts, and financial markets results into continually updated online reports that customers can obtain on the J.P. Morgan Chase portal site. The bank's customers could obtain all of this information themselves, but the aggregation is a service that the bank provides. The information flow in this case is from the bank to its customers.

Nationwide Building Society, a mortgage company in Swindon, England, uses a Web services tool to automate its communications with mortgage application service companies. These service companies obtain information from consumers who want mortgages and then forward the information in a prescribed XML format to Nationwide. The Nationwide Web services software reformats the submission and submits it to Nationwide's enterprise computer system. When a lending decision has been reached, the Web services tool conveys the decision back to the mortgage application service company. This Web services approach has reduced costs and decreased turnaround time for loan decisions at Nationwide.

CUNA Mutual Group sells services to credit unions throughout the United States from its headquarters in Madison, Wisconsin. These services include everything from check clearing to construction management. CUNA provides many of its services by running programs on old computer systems that have been in operation for years. Instead of reprogramming everything so it could be accessible on the Web, CUNA created a Web services layer that takes information from the old computer systems and generates Web pages that its customers can use to obtain those services.

How Web Services Work

A key element of the Web services approach is that programmers can write software that accesses these units of business application logic without knowing the details of how each unit is implemented. Web services can be mixed and matched with other Web services to execute a complex business transaction. Thus, Web services allow programs written in different languages on different platforms to communicate with each other and accomplish transaction processing and other business tasks.

The common format of this machine-to-machine communication was originally HTML; however, most newer Web services implementations use XML. As you learned in Chapter 2, organizations can use XML to mark up content with agreed upon sets of descriptive tags. As Web services become more fully implemented, businesses will be able to connect their operations quickly and cheaply. Thus businesses will be able to reduce transaction costs and improve customer service at the same time. Customers and employees will find it easier to access companies' Web resources from a variety of devices such as PDAs and mobile phones.

The first Web services were information sources. The Web services model allowed programmers to incorporate these information sources into software applications. For example, a company that wanted to collect all of its financial management information into one spreadsheet could use Web services to obtain bank account and loan balances, stock portfolio holdings, and current interest rates on financial instruments. If this information is available through Web services, the spreadsheet program can use those services to update itself automatically. Some of the information might be available as a Web service at no

cost; other information access might require a subscription. But Web services can make automated access of the information much easier.

A more advanced example would be a company that uses purchasing software to help manage that activity. That software can use Web services to obtain price information from a variety of vendors. After the purchasing agent reviews the price and delivery information and authorizes the purchase, the software can submit the order and track it until the shipment is received. On the other side of this transaction, the vendor's software can use Web services (in addition to providing price and delivery information) to check the buyer's credit and contract with a freight company to handle the shipment.

SOAP, WSDL, and UDDI Specifications

Three rule sets (usually called protocols or specifications) let programs work with the formatted (using XML or HTML) data flows to accomplish the communication that makes Web services work. The **Simple Object Access Protocol (SOAP)** is a message-passing protocol that defines how to send marked up data from one software application to another across a network. You can see the full SOAP specification and learn more about SOAP at the **W3C SOAP Page**.

The characteristics of the logic units that make up specific Web services are described using the **Web Services Description Language (WSDL)**. Today, programmers can use the information in a WSDL description to modify an application program so it can connect to a Web service. When Web services become more complex, WSDL descriptions allow programs to configure themselves to connect to multiple Web services. You can learn more about WSDL and related topics at the **W3C Web Services Activity** pages.

Programmers (and, eventually, the programs themselves) need to find the location of Web services before they can interpret their characteristics (described in WSDL) or communicate with them (using SOAP). The set of protocols that identify locations of Web services and their associated WSDL descriptions is called the **Universal Description, Discovery, and Integration (UDDI) specification**. The **UDDI.org** Web site is a good source of information about this specification and includes the current UDDI Business Registry, which provides a catalog of currently available Web services.

A number of major software vendors have embraced the idea of Web services in new technology initiatives such as **Microsoft .NET** and the **Sun Java 2 Platform, Enterprise Edition**. Many companies that have used Web services to accomplish application integration have found it to be less expensive to implement than older approaches that required programmers to write or adapt multiple middleware software programs. Merrill Lynch was able to use Web services to implement an integration project for $30,000 that would have cost $800,000 using its older application integration approach.

The Future of Web Services

The idea behind Web services is a major change in the way business does computing. The IT industry has historically resisted standards and has frequently used programming languages that cannot communicate with each other. For years, large businesses and other organizations have hired armies of programmers to write middleware software to integrate their hodgepodge of programs for financial management, inventory control, marketing, and other functions. The idea of connecting software within an organization is still

revolutionary—connecting software across organizational boundaries is even more revolutionary. Some industry analysts report companies are using Web services in 25 percent of all current data integration projects.

Despite the promise of Web services, there are some potential pitfalls. Much of the data in Web services applications is stored and transmitted in XML format. Because there are so many variations of XML in use today, it is critical that data-providing and data-using partners agree on which XML implementation to use. As Web services become more commonplace, individual companies' software applications will become more dependent on them. This means that Web services must include quality of service and service level specifications on which applications developers at each company can rely. At present, there are no Web services management standards or history of best practices. This lack of standards means that each Web services subscriber needs a detailed agreement (specifying service levels, quality of service standards, and so on) with each Web services provider. Security can be a problem with Web services. By its very nature, a Web services data feed connects directly into a company's internal applications, bypassing any security features installed at the company's perimeter (you will learn more about perimeter security defenses in Chapter 10). These are not insurmountable issues, but they do prevent Web services from being a simple matter.

Despite the hurdles that must be overcome, some companies have begun to implement Web services successfully. For example, the **MSN Money** site buys stock quotes from the Interactive Data Corporation through its ComStock Web service. An MSN Money stock quote page with the **ComStock** Web services acknowledgment appears in Figure 9-8.

Integration with ERP Systems

Larger firms have extranets and intranets requiring tools and capabilities different from those needed to implement simpler electronic commerce Web sites. In the case of large B2B interactions, both the buyer and seller have complex systems. In general, B2B sites require security tools not standard in B2C systems, such as encryption and authentication, as well as signed receipt notices.

FIGURE 9-8 ComStock Web services on MSN Money stock quote page

Many B2B Web sites must be able to connect to existing information systems such as enterprise resource planning software. **Enterprise resource planning (ERP)** software packages are business systems that integrate all facets of a business, including accounting, logistics, manufacturing, marketing, planning, project management, and treasury functions. The major ERP vendors include **Baan**, **Oracle**, **PeopleSoft** (now a part of Oracle), and **SAP**. A typical installation of ERP software costs between $2 million and $25 million; thus, companies that are already running these systems have made a significant

investment in them and expect their electronic commerce sites to integrate with them. Figure 9-9 shows a typical architecture for a B2B Web site that connects to several existing information systems, including the ERP system within the company and its trading partners' systems through EDI connections.

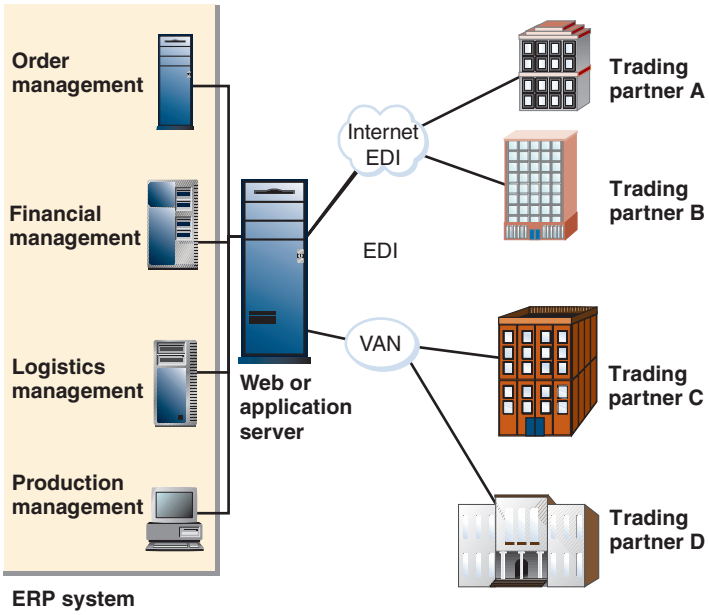


FIGURE 9-9 ERP system integration with EDI

ELECTRONIC COMMERCE SOFTWARE FOR SMALL AND MIDSIZE COMPANIES

In this section you will learn about software that small and medium-sized businesses can use to implement online business Web sites. In most cases, these companies can create a Web site that stands alone in its business activities and does not need to be coordinated completely with the business' other activities.

Basic Commerce Service Providers

Using a service provider's shared or dedicated hosting services instead of building an in-house server or using a co-location service means that the staffing burden shifts from the company to the Web host. CSPs have the same advantages as ISP hosting services, including spreading the cost of a large Web site over several "renters" hosted by the service. The biggest single advantage—low cost—occurs because the host provider has already purchased the server and configured it. The host provider has to worry about keeping it working through lightning storms and power outages.

CSPs offer free or low-cost electronic commerce software for building electronic commerce sites that are then kept on the CSP's server. Services in this category usually cost

less than $20 per month, and the software is built into the CSP's site, allowing companies to immediately begin building and storing a storefront using the Web interface of the software. These services are designed for small online businesses selling only a few items (usually no more than 50) and having relatively low transaction volumes (fewer than 20 transactions per day). **ValueWeb**, operating since 1996, is an example of a CSP. ValueWeb offers businesses comprehensive electronic commerce hosting services including shared hosting, dedicated hosting, and co-location services. **ProHosting.com** and **Interland** are other examples of Web hosting companies serving the small and midsize company market. Because these companies offer a variety of services, they might be called ISPs, CSPs, MSPs, or ASPs by different users, depending on the service they are seeking. Figure 9-10 shows the home page of Interland, which outlines its CSP offerings.

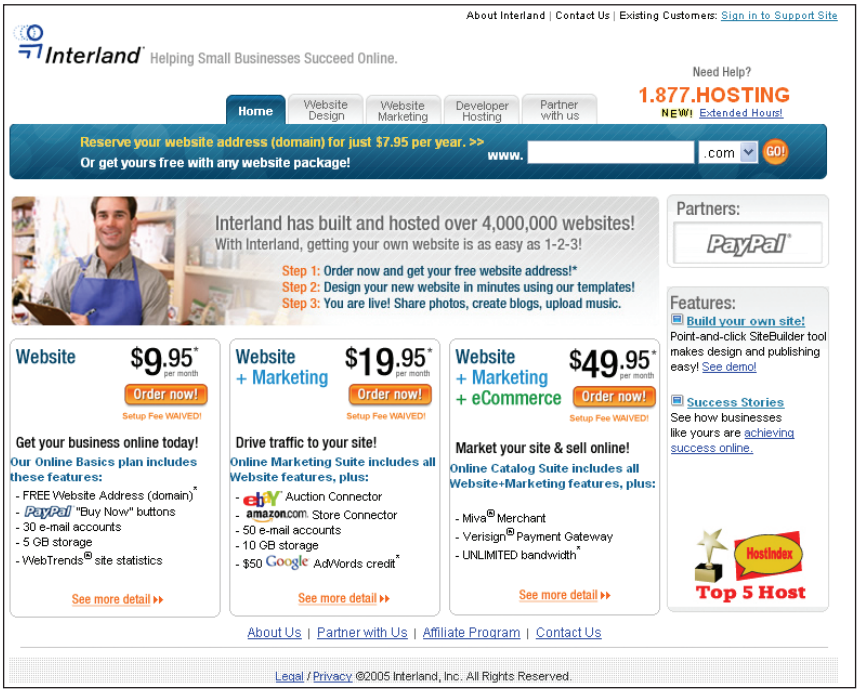


FIGURE 9-10 Interland Web hosting services home page

TopHosts.com (see Figure 9-11) features a comprehensive presentation about CSPs and hosting issues. This site contains hundreds of links and much good information. Yahoo! offers a wide range of Web hosting and electronic commerce services for companies of all sizes. Its commerce services are offered on its **Yahoo! Small Business Merchant Solutions** Web page, shown in Figure 9-12.

FIGURE 9-11 TopHosts.com home page

FIGURE 9-12 Yahoo! Small Business Merchant Services page

Mall-Style Commerce Service Providers

Mall-style CSPs provide small businesses with an Internet connection, Web site creation tools, and little or no banner advertising clutter. Web hosts in this group charge a monthly fee that is often higher than that of lower-end providers, and may also charge one-time setup fees. Some of these providers also charge a percentage of or fixed amount for each customer transaction. These Web hosts also provide high-quality tools, storefront templates, an easy-to-use interface, and quick Web page-generation capabilities and page maintenance.

Mall-style CSPs provide shopping cart software or the ability to use another vendor's shopping cart software. They also furnish customer payment processing so that customers can choose to purchase their goods and services with a credit card or other form of payment. The CSP processes the acceptance and authorization of credit cards on behalf of the merchant. Another benefit is that because they are paying a monthly fee to the CSP, sites do not have to display any Web banners, which can be unattractive and distracting. The fourth benefit of the mall-style CSPs is that they provide higher-quality Web store building and maintenance tools than do the basic CSPs.

One CSP that offers mall-style commerce services is **eBay Stores**. One CSP that offers a mall-style service is **Bigstep**, but it no longer uses the mall structure. Mall-style CSPs offer Web site construction tools that can be used by small and midsize businesses to take their businesses online.

You can learn how capable these Web hosting services are by trying them. Some of these services have a 30-day trial period. The eBay Stores service does not offer a free trial, but the charges are minimal and are based on the number of products listed and graphic images used. Creating an eBay test store with only a few items costs less than $20.

Bigstep has received many industry awards for its CSP offering. Bigstep provides two different storefront packages that can meet the electronic commerce software needs of a range of small and midsize businesses. The Bigstep home page, which shows the two levels of service offered, appears in Figure 9-13.

FIGURE 9-13 Bigstep home page

To create a store, merchants must register with Bigstep. The registration process identifies the user with an e-mail address and password. As with Yahoo!, the store's URL is a subdomain of Bigstep unless the merchant pays an additional fee. After logging on with a store owner e-mail address and password, the merchant can create and manage the electronic store.

Bigstep's reports provide data-mining capabilities that search through site data collected in log files. **Data mining**—looking for hidden patterns in data—can help businesses find customers with common interests and discover previously unknown relationships among the data. Reports can indicate problematic pages in a store's design where, for example, a large number of customers get stuck and then leave the Web site. Other facts that Bigstep reports can reveal include the number of pages an average customer must load and display before locating the merchandise he or she wants. If customers have to load too many pages, they might become impatient and leave without making a purchase.

If a merchant has a brick-and-mortar store, Bigstep's built-in map locator can display the location of the store. Additional Bigstep store features include automatic calculation of taxes and shipping, collection of customer data, merchant e-mail notification of sales, and customer e-mail confirmation when products ship.

Estimated Operating Expenses for a Small Web Business

The following table shows an estimate of the first-year expenses that a small business owner might incur to put a store on the Web. The estimate assumes that the Web site will offer fewer than 50 different items for sale. The total omits payment processing charges, which might average 50 cents per transaction and 2 percent of each sale's total. The costs shown are averages. Depending on which hosting service and electronic commerce software options are chosen, the actual costs could be somewhat lower or considerably higher.

Operating Costs	Cost Estimate
Initial site setup fee	$ 200
Annual maintenance fee (12 x $100)	1200
Domain name registration	70
Scanner for photo conversion or digital camera	300
Photo editing software	100
Occasional HTML and site design help	400
Merchant credit card setup fee	200
Total first-year cost	**$2470**

The preceding costs are typical, but they can vary because different Web hosting sites charge a range of fees for various services. Additional payment processing fees can run into hundreds and thousands of dollars, but those fees occur only when a site makes sales. A reasonable guideline for payment processing fees that would be charged to a new merchant opening a business on the Web is about 3 percent of gross sales. Thus, if a site's annual gross sales are $50,000, then the payment processing fees should be approximately $1500. That estimate would include both the per-transaction fixed costs and the percentage of total sales costs charged by most merchant credit card processing agencies.

Contrast the preceding costs with comparable estimated costs for self-hosting a Web site. Setup and Web site maintenance costs include equipment, communications, physical location, and staff. Equipment—a server and networking gear—has a one-time cost ranging from $3000 to $20,000. A T1 connection or fraction thereof (see Chapter 2) costs from $1200 to $12,000 per year. A server must be housed in a room that is both secure and convenient to communications access. The cost to secure a room, properly air-condition it, and install a chemical fire extinguishing system would run about $5000 a year. A self-hosted system requires a staff of experts well versed in a variety of Web programming and scripting languages, electronic commerce packages, and database management systems. Technicians will likely be required to monitor and maintain equipment. Minimum staff costs range from $50,000 to $100,000 annually. In total, annual operating costs for self-hosting approach $60,000 to $100,000 or more the first year. Costs for subsequent years will be about the same. Companies should carefully compare self-host cost estimates with the fees charged by various hosting services.

The costs previously discussed are for a small electronic commerce site. Costs for larger sites are much more difficult to estimate. The cost of integrating the Web site with the existing systems of the company is often the largest element of the total cost. Midsize businesses typically incur start-up costs ranging from $100,000 to $500,000 and recurring annual costs of about half that amount. Large businesses typically spend between $1 million and $50 million to launch an electronic commerce site and then spend another 50 percent of the launch cost every year to operate, maintain, and improve the site. You will

learn more about managing the costs of Web site implementation and operation for large organizations in Chapter 12.

Next, you will learn about midrange electronic commerce packages. Midrange packages are suitable for running larger businesses. These software packages have more features, are capable of handling more inventory items and types of transactions, and thus are more expensive than the template-driven CSP offerings described above.

ELECTRONIC COMMERCE SOFTWARE FOR MIDSIZE TO LARGE BUSINESSES

This section includes a discussion of software that midsize and large companies can use to implement electronic commerce features on their Web sites. It also includes an outline of Web site development tools that can be used for that purpose and an overview of three specific midrange electronic commerce software products that are representative of the types of products available.

These midrange packages allow the merchant to have explicit control over merchandising choices, site layout, internal architecture, and remote and local management options. In addition, the midrange and basic electronic commerce packages differ on price, capability, database connectivity, software portability, software customization tools, and computer expertise required of the merchant.

Web Site Development Tools

Although they are more often used for creating small business sites, it is possible to construct the elements of a midrange electronic commerce Web site using the Web page creation and site management tools you learned about in Chapter 2. For example, recent versions of **Macromedia Dreamweaver** include integrated development environments. Experienced Web designers using this tool can create the elements of dynamic Web pages as easily as static Web pages.

Other Web page design tools, such as **Microsoft FrontPage**, can also be used to build the framework of a functional midrange electronic commerce site. The remaining elements of the dynamic pages needed to create catalog, customer service, and transaction-processing pages can be added with development tools such as Microsoft's **Visual Studio .NET** product.

After creating the Web site with these development tools, the designer can add purchased software elements, such as shopping carts and content management software, to the site. The final step is to create the middleware that connects the site to the company's existing product and transaction-processing databases.

Buying and using midrange electronic commerce software is significantly more expensive than using one of the CSPs described in the previous section, with annual costs ranging from $2000 to $50,000. Midrange software traditionally offers connectivity to database systems that store catalog information. Having the catalog stored in a database simplifies updates and changes. Several of the midrange systems provide connections into existing inventory and ERP systems. This can yield savings because there is no need to run duplicate inventory systems, and the cost of the existing systems is spread across several software systems.

Three midrange electronic commerce systems are described in this section. They are representative of the whole group, yet are different from one another in important ways. The systems are Intershop Enfinity MultiSite, WebSphere Commerce Suite by IBM, and Commerce Server 2002 by Microsoft.

Intershop Enfinity

Intershop Enfinity MultiSite provides search and catalog capabilities, electronic shopping carts, online credit card transaction processing, and the ability to connect to existing back-end business systems and databases. Intershop Enfinity MultiSite has setup wizards and good catalog and data management tools. It provides many built-in storefront templates. Management and editing of a storefront are done through a Web browser—either locally at the server or remotely through any Internet connection. The products inventory management module tracks inventory levels and allows merchants to view the quantity of items available, create a list of inventory transactions, and enter new products into the inventory. Discount rules are also easy to enter. Merchants define the business rules for a discount and dates during which special discounts apply. Bundled with the software is a database management system. Alternatively, Enfinity can work with DB2 (IBM's relational database) or Oracle databases. The software includes an automated e-mail facility that can send order confirmations to customers. Enfinity includes support for secure transactions. A wide variety of site and customer reports are available to track Web page visits and customer activities.

IBM WebSphere Commerce Professional Edition

IBM produces the **WebSphere Commerce Professional Edition**, which is a family of electronic commerce packages. IBM WebSphere is a set of software components that provides software suitable for midsize to large businesses to sell goods and services on the Internet. It includes catalog templates, setup wizards, and advanced catalog tools to help companies create attractive and efficient electronic commerce sites. WebSphere Commerce Professional Edition can be used both for business-to-business and business-to-consumer applications and provides a smooth connection to existing corporate systems, such as inventory databases and procurement systems.

WebSphere Commerce products run on many different operating systems. Merchants can begin with a small store and then move up to a bigger, more capable store as necessary. A wizard leads the merchant through the process of creating a starter store. Once that is up and working, more functionality can be added by executing commands and writing code. With the basic pages built, the merchant can populate the catalog with products, prices, and product pictures. The WebSphere Commerce Professional Edition also accommodates electronic download products, such as audio tracks or software.

WebSphere offers a large collection of functions, utility programs, and commands that allow a merchant to create a customized online store experience. However, JavaScript, Java, or C++ expertise is required. Typical of commerce programs in this class, WebSphere can connect to existing databases and other legacy systems through DB2 or Oracle databases. A single store or several different stores can be administered from the same browser-based interface. A large number of midrange electronic commerce sites use

WebSphere software. Enough IT professionals are involved in installing, maintaining, and customizing WebSphere that a magazine, *WebSphere Advisor*, is devoted to it.

The system has all the standard electronic commerce features, including tools for a shopping cart, e-mail notifications upon sale completion, secure transaction support, promotions and discounting, shipment tracking, links to legacy accounting systems, and browser-based local and remote administration. WebSphere Commerce Professional Edition costs $155,000 per processor. The less powerful Professional Edition of the software costs $99,000 per processor.

Microsoft Commerce Server 2002

Microsoft **Commerce Server 2002** allows businesses to sell products or services on the Web using tools such as user profiling and management, transaction processing, product and service management, and target audience marketing. Commerce Server 2002 is not an out-of-the-box solution. Wizards help users build a site in several steps, but program code must be written to make the software meet specific user needs. The Microsoft Visual Studio .NET tools, bundled with Commerce Server 2002, allow companies to customize the sites they build.

Like other midrange electronic commerce software, Commerce Server 2002 has tools that help companies engage the customer (through marketing and advertising), complete an order, and analyze the sales information after the sale. Commerce Server 2002 also includes tools for advertising, promotions, cross-selling, and customer targeting and personalization.

Commerce Server 2002 provides many predefined reports for analyzing site activities and product sales data. Commerce Server 2002 can grow with increasing business demands. The system provides several storefront templates, wizards for setting up and initializing a store, and database connections. In addition, Commerce Server 2002 provides a shopping cart, confirms completed sales transactions by e-mail, and supports secure transactions. It can connect to existing accounting systems, and the administrator can oversee the site through a Web browser. Commerce Server 2002 licenses are available in a Standard Edition for up to two servers at a cost of $7000 per processor and in an Enterprise Edition for an unlimited number of servers at a cost of $20,000 per processor.

ELECTRONIC COMMERCE SOFTWARE FOR LARGE BUSINESSES

Larger businesses require many of the same advanced capabilities as midsize firms, but the larger firms need to handle higher transaction loads. In addition, they need dedicated software applications to handle specific elements of their online business. In this section, you will learn about electronic commerce software that has higher transaction-load capability, and you will learn about software that accomplishes specific tasks in large businesses, such as customer relationship management, supply chain management, content management, and knowledge management.

The distinction between midrange and large-scale electronic commerce software is much clearer than the one between basic systems and midrange systems. The telltale sign is price. Other elements, such as extensive support for business-to-business commerce, also indicate that the software is in this category. Commerce software in this class is sometimes called **enterprise-class software**. The term "enterprise" is used in information systems to describe a system that serves multiple locations or divisions of one company and encompasses all areas of the business or enterprise. Enterprise-class electronic commerce software provides tools for both B2B and B2C commerce. In addition, this software interacts with a wide variety of existing systems, including database, accounting, and ERP systems. As electronic commerce has become more sophisticated, large companies have demanded that their Web sites and supporting information infrastructure do more things. The cost of these enterprise systems for large companies ranges from $200,000 for basic systems to $10 million and more for comprehensive solutions.

Enterprise-Class Electronic Commerce Software

Enterprise-class electronic commerce software running large online organizations usually requires several dedicated computers—in addition to the Web server system and any necessary firewalls. Examples of enterprise-class products that can be used to run a large online business with high transaction rates include **IBM WebSphere Commerce Business Edition, Oracle E-Business Suite**, and **Broadvision One-To-One Commerce**.

Enterprise-class software typically provides good tools for linking to and supporting supply and purchasing activities. A large part of B2B commerce is ordering supplies from trading or business partners and issuing the appropriate documents, such as purchase orders. For a selling business, e-business software provides standard electronic commerce activities, such as secure transaction processing and fulfillment, but it can also do more. For instance, it can interact with the firm's inventory system and make the proper adjustments to stock, issue purchase orders for needed supplies when they reach a critically low point, and generate other accounting entries in ERP, legacy accounting, or file systems. In contrast, both basic and midrange electronic commerce packages usually require an administrator to check inventory manually and place orders explicitly for items that need to be replenished.

In B2C situations, customers use their Web browsers to locate and browse a company's catalog. For electronic goods (software, research papers, music tracks, and so on), customers can download the items directly from the site, or they can complete order forms and have the hard-copy versions of the products shipped to them. The Web server is linked to back-end systems, including a database management system, a merchant server, and an application server. The database usually contains millions of rows of information about products, prices, inventory, user profiles, and user purchasing history. The history provides a way to recommend to a user on a return visit related items that he or she might wish to purchase. A merchant server houses the e-business system and key back-end software. It processes payments, computes shipping and taxes, and sends a message to the fulfillment department when it must ship goods to a purchaser. Figure 9-14 shows a typical enterprise-class electronic commerce architecture.

As you learned in Chapter 4, companies are storing data about site visitors in large databases and analyzing it to improve their relationships with those customers. These clickstreams track the path a visitor takes through a Web site, including which pages were

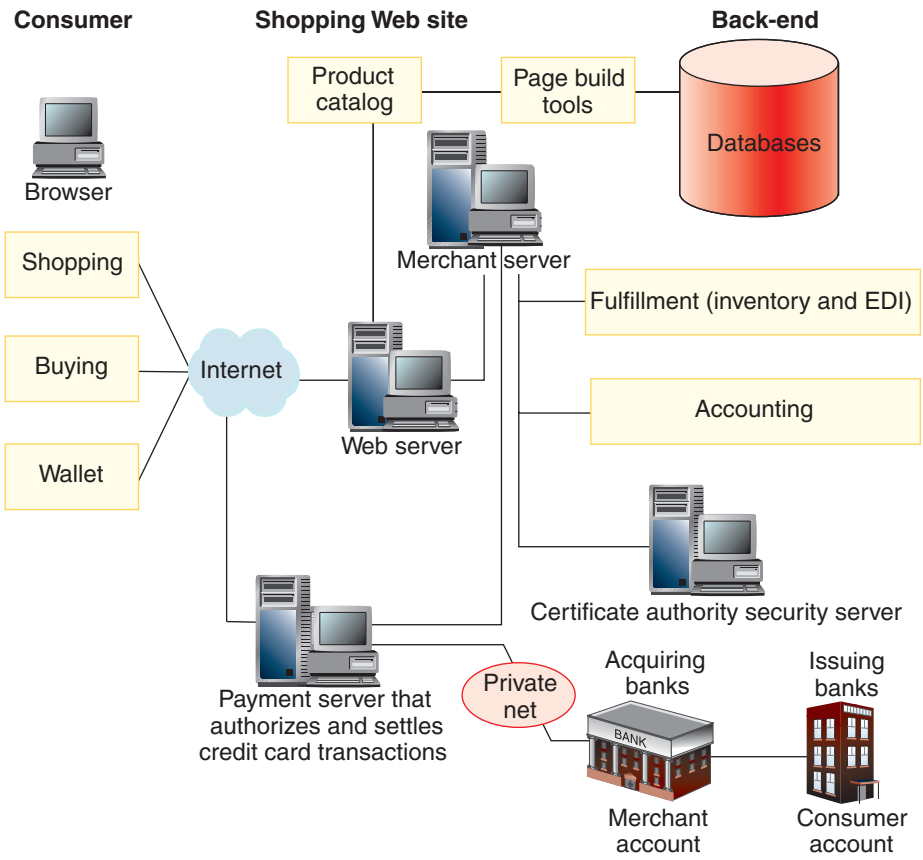


FIGURE 9-14 Typical enterprise-class electronic commerce architecture

viewed, the amount of time spent on each page, and the sequence in which pages were viewed. Thus, large electronic commerce sites must include customer relationship management software. In Chapter 5, you learned how companies are using the Web to integrate their supply chains. As a result, enterprise-class commerce Web sites must include or work with supply chain management software.

In Chapter 6, you learned about companies that were building business portal sites to engage their customers and suppliers. A significant part of that strategy is providing useful, fresh content to attract site visitors to the portal. This need has given rise to software that automatically manages and rotates content on Web sites. Some companies have even developed software that helps them manage the knowledge that exists in their businesses. An enterprise-class Web site often includes several of these types of software packages in its design. The next four sections discuss software that works with electronic commerce software in large companies to help those companies achieve all of their electronic commerce objectives.

Customer Relationship Management Software

You learned about the philosophy and techniques of customer relationship management (CRM) in Chapter 4. The goal of CRM is to understand each customer's specific needs and then customize a product or service to meet those needs. The idea is that a customer whose needs are being met exactly is willing to pay more for the goods or services that are meeting those needs. Although companies of all sizes can practice CRM techniques, large companies can afford to buy and implement expensive software products that automate many of CRM's principles.

Customer relationship management (CRM) software must obtain data from operations software that conducts activities such as sales automation, customer service center operations, and marketing campaigns. The software must also gather data about customer activities on the company's Web site and any other points of contact the company has with its existing and potential customers. CRM software uses this data to help managers conduct analytical activities, such as gathering business intelligence, planning marketing strategies, customer behavior modeling, and customizing the products and services to meet the needs of specific customers or categories of customers. In its most basic form, CRM uses information about customers to sell them more (or more profitable) goods or services. More advanced CRM is about delivering extremely attractive and positive experiences regularly to customers. CRM can be very important in maintaining customer loyalty in businesses where the purchase process is long and complex. Companies that design and install custom machinery, software products, or office workflow systems often find themselves involved in these types of long and complex processes. CRM software can help maintain positive and consistent contacts with multiple employees at the purchasing company.

Some companies create their own CRM software using outside consultants and their own IT staffs. In recent years, software vendors have increased the quality and variety of their offerings and today, most large companies are likely to buy a CRM software package. **Siebel Systems** was the first company to specialize in CRM software and it has a large share of the market. In 2005, Oracle announced that it had agreed to buy Siebel and merge its operations with its **Oracle CRM** business. Other major software firms have created products in this market, including **MySAP CRM**. Prices for these systems start around $30,000 (on average, about $1500 per user); large implementations can cost millions of dollars. One of the most interesting new developments in the CRM software market has come from companies that offer the software for use on their Web site. That is, the buyer does not have to install the CRM software on its own servers. The buyer's employees simply log in to the CRM vendor's Web site and use the software. The cost of this software is much lower; in fact, it can be under $1000 per user per year. **Salesforce.com** is one of the leading vendors of this type of online CRM software. The Salesforce.com home page is shown in Figure 9-15.

In the early days of CRM software implementation (approximately 1996 through 2000), companies spent many millions of dollars to buy CRM systems that promised to monitor and improve relationships with existing customers. Most of these systems were focused on giving companies the information they needed to identify changing customer preferences and respond very quickly to those changes. By responding quickly, companies hoped that they would be able to gain sales that might otherwise be lost to competitors that could respond better to the new customer preferences. In addition to gaining sales, the use of

FIGURE 9-15 Salesforce.com home page

CRM software would help retain customers and reduce the need to spend money on marketing to find new customers. The goal was to instantly make available perfect information about all customer behaviors from all customer-interaction points throughout the company.

Most companies did not realize these benefits and CRM software sales dropped from 2000 through 2003. Many industry analysts pronounced that CRM was just another business fad that was dying as quickly as it had become fashionable. Starting in 2003, however, CRM software sales began growing again. Companies had learned from the bad experiences in which they invested large amounts of money to revamp their customer interaction strategies completely. Those companies became less likely to view CRM software as a tool for changing their overall customer strategy, and instead began using CRM software to solve smaller and more specific problems. For example, a cable company might use CRM to track service outages and repair team responses in real time, but would not expect the CRM system to calculate the profitability of on-demand video services on a continual basis.

One of the most popular targets for these new focused CRM applications has been call center operations. By examining problems that arise in their call centers, many companies have identified specific applications where CRM software can improve response times, accuracy, and effectiveness.

Supply Chain Management Software

Supply chain management (SCM) software helps companies to coordinate planning and operations with their partners in the industry supply chains of which they are members. SCM software performs two general types of functions: planning and execution. Most companies that sell SCM software offer products that include both components, but the functions are quite different. SCM planning software helps companies develop coordinated demand forecasts using information from each participant in the supply chain. SCM execution software helps with tasks such as warehouse and transportation management. The two major firms offering SCM software are **i2 Technologies** and **Manugistics**.

The i2 Technologies product, RHYTHM, includes components that manage demand planning, supply planning, and demand fulfillment. The demand planning module includes proprietary algorithms customized for specific industry markets that examine customers' buying patterns and generate continually updated forecasts. The supply planning module coordinates distribution logistics, inventory-level forecasting, collaborative procurement, and supply allocations. The demand fulfillment module handles the execution elements, including order management, customer verification, backlog control, and order fulfillment.

The Manugistics SCM product includes a constraint-based master planning module that controls the other elements of the system. These other elements include modules for transportation management, replenishment management, manufacturing planning, scheduling, purchase planning, and materials control.

The cost of SCM software implementations varies tremendously depending on how many locations (retail stores, wholesale warehouses, distribution centers, and manufacturing plants) are in the supply chain. For example, a retailer with 500 stores might pay between $4 million and $10 million for an SCM package that includes both planning and execution functions, but a wholesaler with only three or four distribution centers might be able to install a good SCM product for $1 million.

Content Management Software

Most electronic commerce software comes with wizards and other automated helpers that create template-driven pages, such as home pages, about pages, and contact pages. But most businesses want to customize Web pages with company and product pictures and text. Content management software should be tested before committing to it. The testing should ensure that company employees find the software's procedures for performing regular maintenance (for example, adding new categories of products and new items to existing product pages) to be straightforward. The software should also facilitate typical content creation tasks, such as adding sale-item specials.

Large companies are finding new ways to use the Web to share information among their employees, customers, suppliers, and partners. **Content management software** helps companies control the large amounts of text, graphics, and media files that have become a

key part of doing business. With the rise of wireless devices, such as mobile phones, handheld computers, and personal digital assistants (PDAs), content management has become even more important.

Companies that need many different ways to access corporate information—for example, product specifications, drawings, photographs, or lab test results—often choose to manage the information and access to that information using content management software. The three leading companies that provide these tools are **Documentum**, **Vignette**, and **webMethods**. Content management software generally costs between $200,000 and $500,000, but it can cost three or four times that much to customize, configure, and implement.

Knowledge Management Software

An increasing number of large companies have achieved cost savings by using content management software. Most content management software is designed to help companies manage information that, until recently, was stored in paper reports, schedules, analyses, and memos. Although the cost reductions that can be obtained by moving mountains of paper into an electronic format are significant, some companies have begun to understand that the true value of those documents is in the information contained in them. Thus, they began the search for systems that would help them manage the knowledge itself, rather than the documentary representations of that knowledge. The software that has been developed to meet that goal is called **knowledge management (KM) software**.

KM software helps companies do four main things: collect and organize information, share the information among users, enhance the ability of users to collaborate, and preserve the knowledge gained through the use of information so that future users can benefit from the learning of current users. KM software includes tools that read electronic documents (in formats such as Microsoft Word or Adobe PDF), scanned paper documents, e-mail messages, and Web pages. KM software often includes powerful search tools that use proprietary semantic and statistical algorithms to help users find the content, human experts, and other resources that can aid them in their research and decision-making tasks.

Most early KM software required companies to build a centralized knowledge repository before the software could provide users any real benefits. The building of these repositories required major investments of time and money, and often disrupted the regular flow of work. More recently developed KM systems are less obtrusive and allow the collection of knowledge elements to flow as a natural by-product of the normal interactions users have with information.

The major software vendors have KM software offerings, including **IBM Lotus Discovery Server** and **Microsoft SharePoint Technologies**. Smaller companies have also entered the market with innovative KM software and technologies. Two of the more interesting products are Entopia **Quantum** and Mirror Worlds Technologies **Scopeware**. Total costs for a KM software implementation, including hardware, software licenses, and consultant fees, typically range from $50,000 to $1 million or more.

Summary

In this chapter, you learned about electronic commerce software for small, midsize, and large businesses and the functions provided by each software type. The electronic commerce software a company chooses depends on its size, objectives, and budget, and requires making major decisions. A company must first choose between paying a service provider to host the site and self-hosting. External hosting options include shared hosting, dedicated hosting, and co-location. Many hosting companies offer comprehensive services to merchants, such as databases, shopping carts, and content management, in addition to basic Web hosting services.

Key elements of all electronic commerce software include catalogs, shopping carts, and transaction-processing capabilities. An important new way for companies to get their information systems to work across organizational boundaries is the implementation of Web services.

Small enterprises that are just starting an electronic commerce initiative might use a commerce service provider (CSP). Basic CSP and mall-style hosting services for small businesses provide a range of standard features, including tools for quickly creating storefronts, catalogs, and transaction processing. These packages are usually wizard- and template-driven.

If a company already has computing equipment and staff in place, purchasing a midrange electronic commerce software package provides more control over the site and allows for expansion. Midrange software can interact with database software to create dynamic catalogs and shopping carts and handle order processing.

Large enterprises that have high transaction rates, B2B partnerships, or a large investment in ERP and other existing information systems, need to invest in larger, more customizable systems that can provide needed features and flexibility. These packages can include customer relationship management, supply chain management, content management, and knowledge management capabilities, or they can work with dedicated software that performs these functions.

Key Terms

Application integration
Application program (application)
Application server
Application service providers (ASPs)
Application software (application)
Business logic
Catalog
Co-location (collocation, colocation)
Commerce service providers (CSPs)
Component-based application system
Content management software
Customer relationship management (CRM) software
Data mining
Database manager
Dedicated hosting
Distributed database systems
Distributed information systems
Dynamic catalog
Enterprise application integration
Enterprise-class software
Enterprise resource planning (ERP)
Interoperability
Knowledge management (KM) software
Managed service providers (MSPs)
Middleware
Open source
Page-based application system
Scalable
Self-hosting

Shared hosting
Simple Object Access Protocol (SOAP)
Static catalog
Supply chain management (SCM) software
Transaction processing
Universal Description, Discovery and Integration (UDDI) specification
Web services
Web Services Description Language (WSDL)

Review Questions

RQ1. Provide a brief definition of the term "middleware." In one or two paragraphs, explain why middleware can be difficult to write and test.

RQ2. Using your library or the Web, find an article that describes a successful application of Web services. In about 200 words, discuss how the company that implemented the Web services application overcame the lack of standards for such applications.

RQ3. List two disadvantages of hosting an electronic commerce site on a host that is free or available at a very low cost. What is missing from such a host's services that would make an online entrepreneur's job more difficult?

RQ4. In about 200 words, describe the differences between basic electronic commerce software and midrange electronic commerce software. Discuss at least four differences and give examples of each type of software.

RQ5. What are the characteristics of large firms conducting both B2B and B2C transactions that require more robust and capable electronic commerce systems? Consider the volume and types of transactions and store maintenance activities that differ between a small storefront operation and, for example, an Amazon.com-caliber store.

RQ6. Visit the product Web sites to learn more about two of the knowledge management software products discussed in the chapter. In a report of about 300 words addressed to the president of a local university, explain how that university could benefit from an implementation of knowledge management software.

Exercises

E1. Your friend Faye Borthick wants to set up a small Web site devoted to gardening. She believes her many years of experience in gardening give her an understanding of the kinds of gardening tools, fertilizers, soil amendment products, herbicides, pesticides, and plants that appeal to the serious gardener. Right now Faye doesn't want to sell anything, although she might change her mind in the future. She merely wants to display pages of plant photography, write and store short how-to papers for novice gardeners, and provide links to other gardening tips on the Web. She wants your advice on whether to self-host the Web site or use an ISP (or CSP) to start her endeavor. Use **The List** or the **TopHosts** sites to locate information on the cost of using a service provider to host a Web site. Then, estimate what a small Web site might cost in terms of the minimal configuration of hardware and software. Estimate the design and development costs and the annual maintenance costs. Then, select one of the Web server programs. Estimate the cost of a Web connection. Write a 200-word summary of everything you think Faye needs to know to use either of the two options (she builds it or she uses a service provider) for creating

her site.

E2. Annette Jackson owns a small crafts store in central Missouri. She wants to expand her store's reach outside the region to increase her profits and simultaneously reduce her inventory. Annette has been watching her teenage daughter, Kelly, use the Internet to order music CDs and books. After learning from Kelly how simple it is to order from online stores, Annette decided that she needs to create an online store. She asked you to do a little research on how much it might cost in the first year to create a simple store with a catalog of about 100 items. Annette wants you to investigate two CSP offerings and report back to her what you find. Because her store is small, limit your research to basic commerce and mall-style services. You might want to begin your research with sites such as **Freemerchant.com** or **Bigstep**. Annette would like to consider the following information for the two CSP offerings you examine:

- Costs: initial setup fee, monthly fee, and transaction fees
- Amount of disk space the CSP would provide for Annette's 100-item store
- Existence of a search engine within each store
- Promotion and marketing opportunities
- Customer communications capabilities, such as automated e-mail confirmation of orders
- Shopping cart or other order entry mechanism
- Storefront-building wizards for creating a new store
- Security provisions for transactions
- Nature of the domain names available (subdomain of the site or not)
- Upload capabilities for product names, descriptions, images, and costs (can they be uploaded from files or databases, or must the merchant enter each item individually?)
- Existence of an online user manual for the merchant

Produce a report of about 500 words summarizing your findings.

E3. Write a 400-word report summarizing the costs and features of any enterprise-class commerce package for large businesses. You can review a product mentioned in the chapter or one of your own choosing. Pick seven characteristics of the software package and describe them in detail in your report. The Online Companion includes links to several vendors of these products under the Exercise 3 heading.

E4. Review the material in Chapter 4 on customer relationship management (CRM). Then visit the Web sites of Salesforce.com and two or more of the providers of CRM software discussed in this chapter. In about 300 words, critically evaluate Salesforce.com and one of the other CRM software packages by comparing what it accomplishes to the goals of CRM.

Cases

C1. Ingersoll-Rand Club Car Division

Ingersoll-Rand is a $9 billion diversified manufacturing company that sells its products worldwide. Its well-known brands include Ingersoll-Rand tools and portable power generators, Bobcat construction equipment, Thermo King refrigerated transport systems, Dexter and Schlage locks, and ARO industrial fluids equipment. The company's Club Car division manufactures and sells a variety of small electric cart vehicles to golf courses and industrial users. The division also sells a rough-terrain version designed for farmers, ranchers, construction workers, and recreational users.

In 2001, the Club Car division was experiencing a sales decline. The downturn in the general economy was affecting golf courses, which, in turn, were reducing the size and frequency of their golf cart orders. Club Car had a general sense that this major market segment was causing their revenues to decline, but their information systems were not providing enough data about exactly which sales were being most affected by the economic downturn.

Club Car sales managers relied on their sales representatives for information about likely future sales. Sales forecasting was a matter of judgment, guesswork, and a few spreadsheet software models scattered throughout the regional sales offices. The sales representatives had little influence on how the carts were customized for particular customer segments or for individual customers.

The company decided it needed better information about all of its sales and marketing activities, so it spent more than $2 million to install a comprehensive CRM system. This system was designed to automate the entire customer sales cycle: prospect evaluation, proposal writing, product configuration, and order entry. However, the users at Club Car division found the new system difficult to use and therefore were reluctant to spend much time learning how to use it. Thus, the promised benefits of improved productivity and more detailed reports were not forthcoming. Sales managers did not see the ultimate benefits that the system might provide. Salespeople found that the new system was requiring them to spend time entering data into the system rather than seeing customers. The order entry staff found the system to be cumbersome and unfamiliar.

When Club Car's president realized that the CRM system was not delivering on its promise, he had the management team go back and re-examine the key elements in the division's customer relationships and asked them to choose one or two issues that needed attention. The management team identified two major issues. First, the order entry process required the time of salespeople and order entry staff, but it did not include any interaction with customers. Second, the division was not producing accurate and timely sales forecasts.

In 2002, Club Car division re-launched its CRM efforts and focused on these two problem areas. The new effort included the sales representatives in redesigning the order entry process. The division was able to reduce the data entry time and effort required, especially the time of salespeople. Salespeople do have remote access to the system, so they can work on-site with customers to configure the carts to the customers' exact specifications. Salespeople can obtain pricing information and explore various alternatives with customers while they are at the customer's site. They can also examine manufacturing schedules and provide more accurate delivery date estimates. All of this remote, real-time information access helps salespeople close deals and increase sales volume and profitability.

Sales forecasts are more accurate now because the information about sales orders is automatically collected when the sales representatives close sales at the customers' sites. The CRM system combines this real-time sales order information with general industry information on cart demand, cart replacement cycles, and economic trends in their customers' industries. The increased accuracy of sales forecasts allows the company to create more stable production schedules, which means that more customers receive their carts on the delivery date they were promised.

Required:

1. List the types of information that Club Car division's new CRM system makes available to sales representatives in the field. For each type of information, briefly explain how salespeople's remote access to that type of information can help them close sales on their customers' sites.
2. In the CRM re-launch, Club Car division focused on two CRM elements. In about 200 words, explain why this approach would work better, in general, than implementing a comprehensive CRM system that could track all of the division's sales activities and related information in real time.
3. In about 200 words, explain how Club Car division might use Web services in its CRM system.

Note: Your instructor might assign you to a group to complete this case, and might ask you to prepare a formal presentation of your results to your class.

C2. Web Services for State Government

You are a member of the Web site management team of a state government. You have worked on all of the state's Web sites from time to time and have managed the launch of four major sites and the redesign and relaunch of two others. Some of the Web sites on which you have worked include electronic commerce features such as order acceptance, payment processing, and purchasing.

You report to Anne Nelson, the state's CIO. Anne asked you to lead a project to explore the potential uses of Web services in carrying out state government activities. She scheduled a formal briefing at which you will present an overview of Web services technology. You will also outline specific applications of Web services technologies to specific tasks that the state either currently performs or that it might perform in the future.

Anne knows that the state has many current and potential applications that could use Web services technologies, so she asked you to focus on four specific areas of state government in your briefing. At the briefing, you will address the directors of four state departments: the Attorney General's Department of Corporation Records, the Tax Administration and Collection Department, the Department of Motor Vehicles, and the Department of Fish and Wildlife Management.

The Attorney General's Department of Corporation Records maintains the official records of corporations chartered by the state or holding licenses to do business in the state. In addition to the original charter or license, companies must file annual reports that include the names and addresses of corporate directors and officers, the amount of company stock issued or redeemed during the year, and the current address of the company.

The Tax Administration and Collection Department is responsible for accepting income tax, personal property tax, and sales tax return filings of companies and individuals. The department also processes payments of these taxes and authorizes the State Treasurer to issue refunds that are due to taxpayers who have overpaid their taxes. This department currently provides tax forms and instructions in Adobe PDF format on its Web site. It also maintains an extensive frequently asked questions (FAQ) list on the site.

The Department of Motor Vehicles issues driver's license renewals and vehicle registration renewals (for cars, trucks, and boats) and accepts auto dealerships' monthly reports of vehicles purchased or sold on its Web site. The site also includes extensive collections of information about motor vehicle laws and administrative rulings that visitors can review to ensure they are in compliance.

The Department of Fish and Wildlife Management provides downloadable applications for hunting and fishing licenses on its site. Current hunting and fishing license holders can renew their licenses and pay their annual fees on the Web site. Companies that have state-issued permits to undertake logging or mining operations can file their monthly activity reports on the department's Web site, too.

Anne suggests that you review current IT trade publications (both in print and on the Web) to learn more about Web services applications that have been implemented in government agencies. She also recommends that you examine a number of other state Web sites to see how they are performing these tasks.

Required:

1. Prepare a briefing report of about four double-spaced pages in which you describe Web services technology in a way that will be understandable to the four department directors. These directors are experienced administrators, but they are not technology experts.
2. Prepare a briefing report that outlines opportunities for the use of Web services in each department. Include about three double-spaced pages for each department.
3. Prepare an analysis of costs and benefits for each major application of Web services that you identify. In this setting, a benefit can arise from an increase in revenue, a reduction in expense, an improvement in the quality of service provided, or an increase in the speed with which a service is provided. This report should be directed to Anne and should include an implementation recommendation (whether the state should implement or should not implement) for each Web service application you identified.

Note: Your instructor might assign you to a group to complete this case, and might ask you to prepare a formal presentation of your results to your class.

For Further Study and Research

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