

# 1

## Introduction

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Commerce is a basic economic activity involving trading or the buying and selling of goods (according to standard dictionaries). For example, a customer enters a bookshop, examines the books, selects a book, and pays for it. To fulfill the customer requirement, the bookshop needs to carry out other commercial transactions and business functions such as managing the supply chain, providing logistic support, handling payments, etc. As we enter the electronic age, an obvious question is whether these commercial transactions and business functions can be carried out electronically. In general, this means that no paperwork is involved, nor is any

physical contact necessary. This is often referred to as electronic commerce (e-commerce). The earliest example of e-commerce is electronic funds transfer [Kalakota and Whinston, 1997]. This allows financial institutions to transfer funds between one another in a secure and efficient manner. Later, electronic data interchange (EDI) was introduced to facilitate interbusiness transactions. However, early EDI systems were typically operated over special networks that are complex to set up and costly to administer. For these reasons, EDI has not been as widely deployed as expected. With the advent of internet technologies and advanced cryptographic techniques, it is now feasible to implement e-commerce over a public network – the Internet. The development of the World Wide Web (www) greatly accelerates the development of e-commerce and expands its scope to cover different types of applications. In this chapter, we will give an introduction to e-commerce by discussing some primary concepts, advantages, and frameworks.

## 1.1 ELECTRONIC COMMERCE AND PHYSICAL COMMERCE

Generally speaking, e-commerce is about the sale and purchase of goods or services by electronic means, particularly over the internet. Figure 1.1 shows that in broad terms one can distinguish two types of commerce: physical commerce and e-commerce. In a physical or traditional commerce system, transactions take place via contact between humans usually in a physical outlet such as a store. For example, if you want to buy a book, you will go to a physical bookstore and buy the physical book from a salesman. In a pure e-commerce system, transactions take place via electronic means.

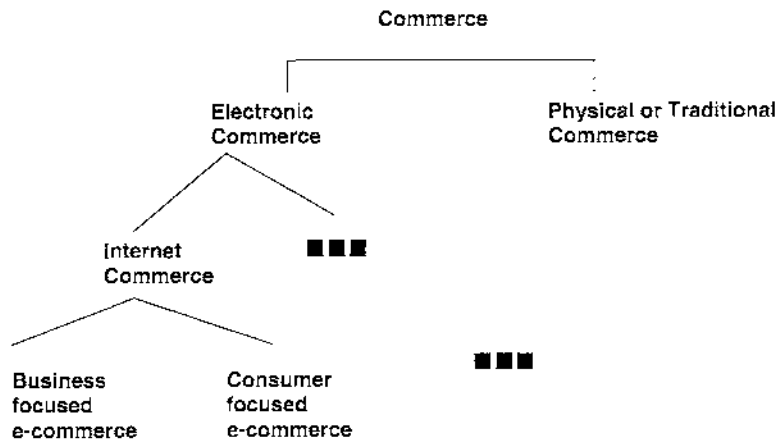


Figure 1.1 Types of commerce

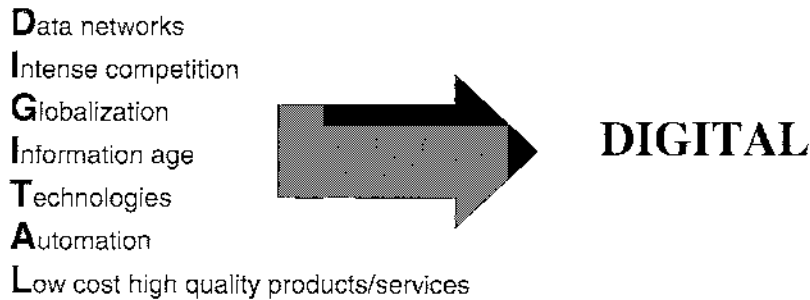
In this case, you will access a cyber bookstore and download a digital book from a server computer. These two cases represent the extremes: the traditional commerce system on one side and the pure e-commerce system on the other. There are many variants and in many cases, e-commerce and physical commerce can complement each other. For example, a physical book is ordered by electronic means and it is sent to you via physical means [Turban *et al.*, 2000]. According to Schneider and Perry [2000], e-commerce is more suitable for standard goods, low-value goods, digital goods, and simple services (i.e. intangible goods), whereas traditional commerce is more suitable for nonstandard goods, perishable goods, expensive goods, and extremely low-value goods. Complex products such as cars and nonstandard services are better served by integrating e-commerce and physical commerce.

Strictly speaking, e-commerce has a very wide scope and can be further divided into different categories. The most popular type is, of course, Internet Commerce. It refers to business transactions over the internet and, in most cases, the transactions are carried out over a web system, so we may call it Web-based Electronic Business. Another broad categorization of e-commerce is to separate it into business-focused or customer-focused e-commerce. We discuss these in greater detail in Section 1.4.

In recent years, another term called e-business has emerged. In general, e-business has a wider perspective than e-commerce. It involves using information technologies in all aspects of the business. Hence, e-commerce can be viewed as a subset of e-business. However, like many other e-commerce books, we will use the following terms e-commerce, internet commerce, Web-based electronic business and e-business in an interchangeable manner.

## 1.2 THE DIGITAL PHENOMENON

Various statistics and forecasts have all indicated that e-commerce has an extremely promising future. A few years ago, Forrester Research forecasted that e-commerce sales would account for 1% of the global economy by 2002 [Korper and Ellis, 2001]. However, recent forecasts have all suggested that this may be too conservative. It is predicted that the number of e-commerce customers worldwide will reach 500 million by 2003, and the associated revenue will increase to \$1.3 trillion as compared with \$120 billion in 1999 [Durra and Srivastava, 2001]. According to the Gartner Group, business-to-consumer e-commerce will account for 5–7% of the retail sales in the United States by 2004 [Derfler, 2001]. This represents at least a 500% growth from the year 2000. Based on research by Jupiter Communications, the revenue for business-to-business e-commerce in the United States will reach \$6.3 trillion by 2005, representing a 2000% increase as compared with the same figure in 2000 [Derfler, 2001].



**Figure 1.2** The DIGITAL phenomenon.

These figures indicate that there must be some “drivers” behind e-commerce. As e-commerce is about going “DIGITAL,” we call this the DIGITAL phenomenon. Here we attempt to examine the possible drivers behind e-commerce (or the DIGITAL phenomenon) by the following “DIGITAL” acronym (see Figure 1.2). Hopefully, this can provide the basis for further discussion.

Let us explain the key words given in the figure in more detail in the following table (Table 1.1).

While each of the topics in this table can be explored in greater depth, they are introduced here to give one a feeling for the drivers behind e-commerce. For those who wish to follow up any of these in greater detail we include many references at the end of this chapter.

### **1.3 LOOKING AT E-COMMERCE FROM DIFFERENT PERSPECTIVES**

E-commerce is changing our economy and affecting all aspects of business. Today, no company can afford to ignore e-commerce. It is even predicted that e-commerce will become part of core business functions just like accounting, marketing, etc. In recent years, many models, frameworks, and thoughts towards building a comprehensive picture of e-commerce are evolving. In this section, we go through some of them in order to look at e-commerce from different perspectives.

A three-layer model is commonly used to describe e-commerce such as the one proposed by Zwass [2000]. Zwass’s model consists of an infrastructure layer, a services layer, and a products/structures layer. The three layers can be further divided into seven functional layers for carrying out different functions. The major functions are to provide the:

- technical infrastructure (e.g. the Internet and www)
- secure messaging services (e.g. EDI)
- supporting services (e.g. electronic payment)

**Table 1.1** Summary of key drivers of e-commerce

Key drivers	Explanations
Data networks	With the advent of data networks such as the local area networks and the internet, dispersed computing systems can now be connected together. This not only allows seamless flow of information but also opens many new opportunities including e-commerce.
Intense competition	In nearly all businesses, competition is becoming increasingly intense. In order to survive, companies are constantly looking for more effective ways to provide better customer services. E-commerce is one of the effective ways.
Globalization	To maintain growth of profit, many companies are moving to the international market. However, one of the major obstacles is the geographical barrier. E-commerce provides an effective "vehicle" for companies to move to the international market because there is almost no geographical barrier in cyberspace. In other words, it is easier for a foreign company to compete with a local company under the cyber environment. Globalization is a complex issue and the reader is referred to the references for a more detailed discussion.
Information age	As we enter the information age, information becomes a valuable asset. Therefore, companies are looking for more effective ways to collect, update, and manipulate various types of information particularly for marketing purposes. E-commerce facilitates this.
Technologies	With the advent of technologies, many business ideas can now be realized. Technologies are the enabler for e-commerce.
Automation	As the cost of labor increases, there is a strong need for companies to look for alternative ways to do routine work. This is particularly true in handling the myriad paper transactions once an order is taken. With electronic messages one can reduce this considerably. E-commerce thus provides an attractive solution.
Low cost high quality products/services	"Low cost high quality products/services" has become one of the major business philosophies in the 21st century because of competitions and high customer expectations. Companies are looking for ways to satisfy these requirements.

- commercial products, services, and systems (e.g. e-retailing)
- electronic marketplace (e.g. on-line auctions)

For details, please refer to the insightful article by Zwass [2000].

Greenstein and Feinman [2000] discusses another three-layer model consisting of the existing market space, the three pillars of e-commerce (electronic information, electronic relationships, and electronic transactions), and the open market processes. Kalakota and Robinson [1999] view e-commerce from a wider perspective, using

the term e-business. It is about integrating the frontend and backend applications with the business process. With the aim of maximizing customer value, it involves redefining the business model in conjunction with various information technologies. Eight business rules are proposed for achieving this goal. Schneider and Perry [2000] view e-commerce as an effective means to improve a value chain, which is used to link various functional activities (i.e. production, marketing, finance, etc.) of a company. This value chain concept can also be extended to link different companies to form an industry value chain. In general, e-commerce helps to facilitate information flow across the value chains and to reduce the associated transaction costs. It is also of interest to look at e-commerce from the point of view of relationship. At its root, every business needs to maintain three types of relationship: the relationship with its customer, the relationship with its business partners (e.g. suppliers), and the relationship with its employees [Derfler, 2001]. E-commerce provides an effective tool for building, managing, and enhancing these relationships. In the context of e-commerce, the first type of relationship is not just selling through the web but managing customer relationships in general. Special electronic customer relationship management software is available for this purpose. The second type of relationship is about procurement and supply chain management by electronic means. Virtual Private Networks and XML are the main facilitators in these areas. They will be described later in this book. While the first two types of relationship are external, the last one is internal. It involves building an effective Intranet for integrating different information systems and sharing information through which communication and productivity can be enhanced (see Derfler [2001] for details).

Furthermore, in both the popular press and in the general community, a number of ideas and commentaries are also gaining credence. It is worth looking at some of the more interesting of these in order to gain an appreciation of some aspects of e-commerce (see Figure 1.3).

## 1.4 DIFFERENT TYPES OF E-COMMERCE

The matrix in Figure 1.4 shows the different types of e-commerce from the perspective of the buyer and seller relationship. This is often used to categorize e-commerce applications. According to this relationship, e-commerce applications can be divided into the following four categories [Turban *et al.*, 2000; Korper and Ellis, 2001]:

- a. *Business-to-consumer (B2C)* In this case, the seller is a business organization whereas the buyer is a consumer. This emulates the situation of physical retailing and so it is commonly called electronic retailing. Typically, electronic stores are set up on the internet to sell goods to the consumers. For example, our VBS sells books to the consumers through the internet. Note here that the business drives

### Some interesting comments on e-commerce: what do you think?

- E-commerce is the smartest way of doing business. You ask your customers to do the work for you such as filling in the order forms, checking the order status and downloading the product themselves so that you can save huge costs and manpower. Furthermore, they do not make any complaints and even think that you have done excellent work for them. Can you think of anything smarter than this?
- E-commerce is changing the traditional way of measuring business performance. People no longer look at the profit and loss account any more. Instead, the future value of a company becomes the major concern. As long as an e-commerce business "makes sense" (it does not need to "make cents"), it may still be backed by numerous investors.
- Many e-commerce companies are "burning money". There has even been the invention of a new term called "burn rate" to measure how "well" a company manages its e-commerce business. In order to survive, the business focus is not "how to make money quickly" but "how to burn money slowly".
- In both traditional commerce and e-commerce, companies and investors care about earning per share (EPS), but in a totally different way. In traditional commerce, investors care whether the EPS of a company is positive. In e-commerce, they care whether the EPS is negative. If the EPS is too positive, it may indicate that the company is too conservative (i.e., not aggressive enough).
- E-commerce is about focus. Many dotcoms (e-commerce companies are usually called dotcoms) sell only one product and in fact the company name may also be the product name.
- E-commerce relies heavily on IP: Innovation and People or Investment and Partnership.

Figure 1.3 Some interesting comments on e-commerce

	Business (organization)	Consumer (individual)
Business (organization)	B2B (e.g. TPN)	B2C (e.g. Amazon)
Consumer (individual)	C2B (e.g. Priceline)	C2C (e.g. eBay)

Figure 1.4 Different types of e-commerce

the specification of the product and the customer chooses whether or not to buy a prefabricated product. An example of this in traditional commerce is purchasing suits “off the rack.”

- b. *Business-to-business (B2B)* In this case, both the buyer and the seller are business organizations. As described in Chapter 12, there are three types of systems, namely, buyer-oriented system, seller-oriented system, and virtual marketplace. In many situations, it is related to supply chain management. For example, the Virtual Bookstore (VBS) needs to order books from various publishers. The ordering process can be accomplished by using electronic data interchange.
- c. *Consumer-to-consumer (C2C)* This refers to situations where both the seller and the buyer are consumers. With the advent of e-commerce, on-line auctions provide an effective means for supporting C2C e-commerce. For example, our VBS can provide on-line auction services for customers to sell used books to other customers through the VBS web site. In addition, a virtual community can be formed.
- d. *Consumer-to-business (C2B)* As explained later, this is a new form of commerce in which a consumer specifies the requirements to a business, which provides a product that meets these requirements. These requirements could be as simple as an acceptable price, or could involve considerable customization of an existing standard product, or creation of a new product. An example of this in the traditional commerce setting is a “made to measure” tailor. The key distinction is related to who is driving the specification of the product being purchased. Unlike B2C, there is a strong element of customization.

## 1.5 EXAMPLES OF THE TYPES OF E-COMMERCE

The aforementioned categories of e-commerce can best be explained by four real life examples.

### 1.5.1 Amazon.com: B2C e-commerce

Established in 1995 by Jeff Bezos, Amazon.com ([www.amazon.com](http://www.amazon.com)) is one of the most well-known e-commerce site in general and internet bookseller in particular (see Figure 1.5). It is a typical example of B2C e-commerce in which a business sells already manufactured products to the consumers directly on the internet. Books are listed under different sections for ease of searching. This resembles organizing books in different bookshelves in a physical bookstore. Furthermore, a search facility is available for searching books according to user input. Our VBS also provides a similar function. Having selected a book, a consumer can put it into his shopping

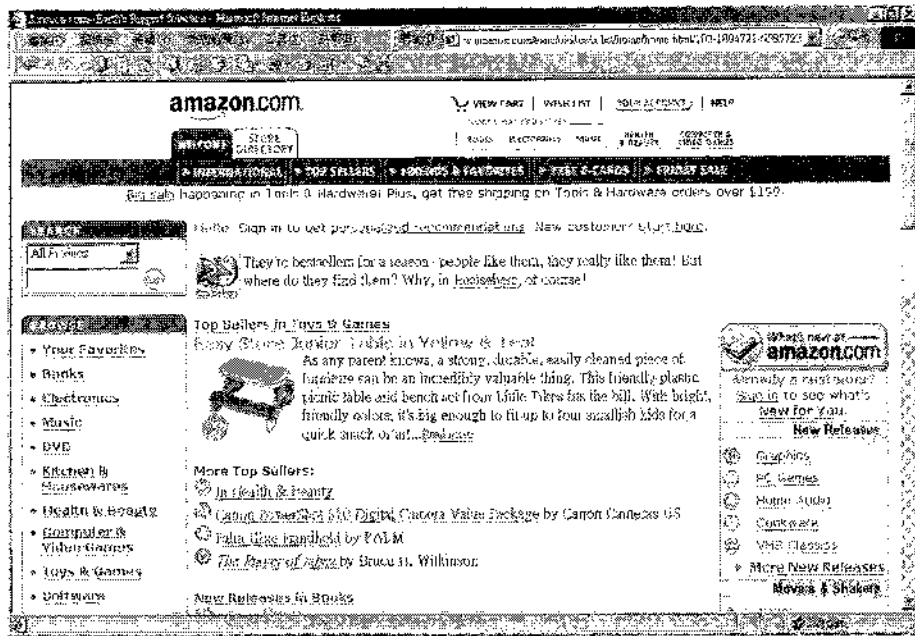


Figure 1.5 Homepage of Amazon.com (©2001 Amazon.com, Inc. All Rights Reserved. Reproduced with permission of Amazon.com)

cart. Amazon.com makes use of data mining techniques to promote the selling of books. This is done by suggesting books to the customer based on the books in the shopping cart and the buying pattern of other customers with a similar profile. After shopping, consumers check out the books and pay by credit cards in most cases. Books are sent by mail or courier, whichever the customer prefers. Besides books, Amazon.com has now become a superstore (or a horizontal portal) by selling a variety of other things such as toys, wireless phones, cameras, and video games.

### 1.5.2 eBay™: C2C e-commerce

Established in 1995, eBay (www.eBay.com) provides the world's largest online trading service by means of online auctions. Basically, a user places an item on the eBay Web site for bidding. Other interested members then bid for it before the deadline. Where the English auction system is used, the highest bid wins. This is a typical C2C

\* This subsection is based on information at eBay web site.

e-commerce example in which a consumer can sell to other consumers. Currently, eBay has more than 29 million members. By means of online auctions, they participate in the buying and selling of a wide range of items, including books, stamps, coins, music, etc. In addition to auctions, eBay creates a virtual community for its users to “talk” at the eBay Café (a chat room) and to communicate with other users via the bulletin boards.

### 1.5.3 Trading Process Network: B2B e-commerce

General Electric's Trading Process Network (TPN) ([www.tpn.geis.com](http://www.tpn.geis.com)) is an internet-based trading network for buyers and sellers to carry out B2B e-commerce on the Internet. Unlike B2C e-commerce, it is buyer-driven rather than seller-driven. That means, a buyer submits a request to the system and then respective sellers respond to the request. In TPN, a typical purchase cycle (from the buyer's perspective) is described as follows based on the information at [www.tpn.geis.com](http://www.tpn.geis.com):

- *Step 1:* A buyer determines the requirements, prepares the Request For Quotation (RFQ), and searches for potential suppliers (sellers).
- *Step 2:* The buyer submits the RFQ and invites potential suppliers to respond.
- *Step 3:* Suppliers obtain the RFQ for processing.
- *Step 4:* Interested suppliers bid for the request accordingly.
- *Step 5:* The buyer and suppliers can negotiate the bids online.
- *Step 6:* Finally, the buyer selects the best bid and completes the purchase.

### 1.5.4 Priceline\*: C2B e-commerce

Priceline ([www.priceline.com](http://www.priceline.com)) introduces a novel e-commerce application called the “demand collection system” (see Figure 1.6). It allows consumers to “name the price” and hence it is consumer driven: not seller driven. According to the above definition, this is a C2B e-commerce application. Suppose that you want to buy an air-ticket. You can provide Priceline with your travel requirements (e.g. how many tickets you want to buy, departure/return date, departure/arrival city etc), the desirable price, and your credit card number. Then Priceline will try to find an airline that can meet your requirements. After finding a match, Priceline will buy the ticket(s) for you with your credit card. As you can “name the price”, the deal is final

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\* This subsection is based on information at Priceline web site.

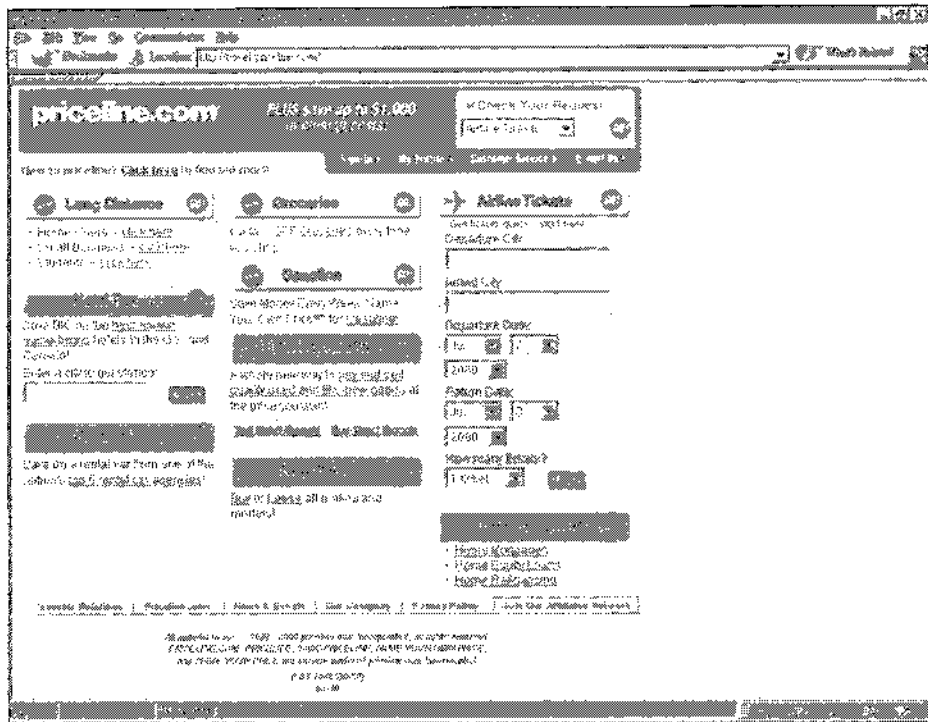


Figure 1.6 Homepage of Priceline (Reproduced with permission of Priceline.com)

(i.e. no alteration is allowed). Besides air-tickets, Priceline also handles the purchase of many other products/services such as cars, hotel rooms, long-distance calls and even mortgage.

## 1.6 SOME E-COMMERCE SCENARIOS

Let us examine some scenarios to see how e-commerce is changing our daily lives.

### 1.6.1 Retailing

In the main form of traditional retailing, when we want to buy something, we need to visit physical shops. Very often, we may not be able to buy the best product in the market because we can visit only a few shops near our home or our office. This

is to some small extent modified in other forms of traditional retailing such as mail order or phone purchasing. With e-commerce, shopping can be done at any time by using our “fingertips” instead of our “feet”. Furthermore, the geographical barrier becomes a blur. A shop located in another country and a shop next to your home are both “one finger-click” away. By using search engines, we can quickly select and compare different brands of products around the world. For some products such as software and music, we can even download the goods instantly. In the future, we may even send out intelligent software programs called “mobile agents” to shop around the internet for us.

### **1.6.2 Servicing**

The classified advertisement has always been the most popular channel for selling used items (e.g. used car). If you have ever sold secondhand items through classified advertisements, you may have experienced the following headache. Tens or even hundreds of interested buyers contact you by telephone. As you can communicate with them only one at a time, it is difficult for you to negotiate the best price. Even after all the items have been sold, you may still receive calls from potential buyers. With e-commerce, a more effective channel is emerging: the on-line auction for facilitating this kind of C2C commerce transaction. By means of an on-line auction, not only can the seller reach a large number of potential buyers, but he can also find the best price in the market.

### **1.6.3 Publishing**

The traditional publishing industry is based on a mass production model. Thus, there are only a few newspapers available and the format, layout, and news selection of these are done by the editorial staff. The degree of detail and slant on a particular news item is also fixed by the reporter or editorial staff. This is necessary for a mass production newspaper. By and large, the only choice the reader has is to select a particular newspaper. Once that is done he has to put up with the editorial layout and reporters’ choices, even though these might not coincide with his own interests. E-commerce makes personalization possible at very little extra cost. Let us imagine that we have a web-based newspaper system available. Each reader can specify his/her favorite newspaper template. Information can then be filled into the personalized template accordingly from the databases. With personalization, electronic newspapers will be published according to customers’ preferences (e.g. someone may want to see the headline news on the first page, while others may prefer to see the sports news or entertainment news on the first page). Obviously, this does not make economical

sense in the traditional newspaper business. However, in the electronic newspaper scenario, the extra cost of printing a personalized newspaper is very small.

#### **1.6.4 Supply chain management**

In its most common forms, traditional supply chain management is supply driven. In other words, goods are “pushed” through the supply chain. One disadvantage of this model is that distributors may keep an unnecessary inventory. In order to overcome this, many manufacturers have introduced *Just-in-Time* (JIT) supply systems. These systems have some element of “pull” in them in the sense that the manufacturer’s estimates of his needs for supplies in a short time horizon are used to determine purchases from suppliers, and suppliers must meet these orders within a specified time frame. Even here the manufacturer could easily see a buildup of the inventory of his manufactured products. What is necessary from the manufacturer’s point of view is not simply JIT supply but also JIT production. Moreover, there may be a lot of paper-based information involved. With e-commerce, this whole process becomes demand-driven as controlled by the end consumer. That means, goods are now “pulled” down the chain by the customers. Thus, “supply chain management” becomes more “demand chain management.” This makes JIT production management and mass customization possible.

### **1.7 CHANGES BROUGHT BY E-COMMERCE**

No doubt, e-commerce is changing our daily lives. These changes occur along four different directions as illustrated by the aforementioned scenarios. In the first scenario, e-commerce provides an alternative solution. Even if we do not have cybershops, we can still make the purchase from physical shops. That means, cybershops are alternatives to physical shops. While cybershopping can be more convenient, some people may still want to shop at physical stores because of the physical shopping experience. In the second scenario, e-commerce provides a better solution. For instance, as explained in Section 1.6.2, the benefits brought by on-line auctions cannot be realized by the traditional classified advertisement and the on-line auction is therefore a better way to solve the same problem. In the third scenario, e-commerce is bringing in a new form of an already-existing service. In the traditional newspaper business, obviously it is not cost effective to print a different newspaper for everyone, so mass production is inevitable. However, with e-commerce, mass customization becomes possible at almost no extra cost. The final scenario illustrates that e-commerce is changing our business logic from a supply-driven model to a demand-driven model.

Turban *et al.* [2000] and Hartman, Sifonis, and Kador [2000] have summarized in a useful tabular form some of the changes e-commerce has made. Utilizing some of the information in these tables and drawing on other detailed sources and our own experience, we have developed an extended summary of the key changes brought about by e-commerce as shown in Table 1.2.

## 1.8 ADVANTAGES OF E-COMMERCE

E-commerce is bringing about advantages to both consumers and business organizations [Turban *et al.*, 2000; Schneider *et al.*, 2000]. For consumers, it is of interest to study the advantages in terms of the buying process, namely search, evaluate, and execute. With e-commerce, consumers can search the global market anytime and anywhere. By using search engines or search agents, consumers can easily compare products in the global market. This allows consumers to evaluate the best possible product efficiently. With certain digital goods such as software, consumers can execute the order conveniently and receive the goods instantly.

For business organizations, the prime objective is to manage this fundamental formula [Kalakota and Whinston, 1997]:

$$\text{Profit} = \text{Revenue} - \text{Cost}$$

According to Kalakota *et al.* [1997], e-commerce is attractive because it can be used to raise profit by increasing revenue while decreasing cost. With e-commerce, a company can increase revenue by exploring new opportunities and expanding into the global market. In fact, a local shop and a foreign shop are both “one click” away in the cyberspace. In other words, the geographical limitation is totally gone and international companies can now compete with local companies more easily. In terms of cost reduction, e-commerce can reduce manpower and operating expenses. The use of electronic documents not only speeds up processing time, but also greatly facilitates data updating (e.g. for updating an inventory). Consequently, business organizations can make use of e-commerce to enhance productivity.

## 1.9 MYTHS ABOUT E-COMMERCE DEVELOPMENT AND IMPLEMENTATION

While many companies realize the importance of e-commerce to their future growth, the true meaning of e-commerce may sometimes be overlooked. Here are three common myths about the development of an e-commerce system.

**Table 1.2** Summary of changes brought about by e-commerce (extension of the work of Turban *et al.* [2000] and Hartman *et al.* [2000])

Traditional commerce	E-commerce	Remarks
Marketplace	Marketspace	Marketplace has many physical constraints whereas marketspace enables almost unlimited movement.
Mostly fixed pricing	Dynamic, customized, and group pricing	Many different pricing models such as dynamic pricing (e.g. by means of on-line auction), buyer-oriented pricing (e.g. Priceline), and group-oriented pricing (e.g. Mercata) become possible in e-commerce.
Standard product	Customized product	In traditional commerce, standard products are manufactured through mass production to achieve economies of scale. In e-commerce, mass customization is possible (or even becoming a norm) such that products can be tailor-made according to customers' requirements.
Physical catalogue (fixed and inflexible)	Digital catalogue (dynamic and flexible)	With digital catalogues, updating can be done easily and they can be linked directly to the ordering process.
Primarily mass marketing (one-to-many selling)	Multifunctional marketing, in particular one-to-one selling (direct selling) and many-to-many selling (community)	In traditional commerce, mass media is often used to convey a generic marketing message. With e-commerce, customers can receive a personalized message according to their profiles and buying behavior.
Supply (seller) driven	Demand (buyer) driven	In many e-commerce applications, buyers pull the goods down the demand chain. Companies now manage a "demand chain" instead of a "supply chain."
Physical goods	Digital goods	In e-commerce, some goods can be made completely digital. They can be bought and downloaded instantly.
Hierarchical organization	Networked organization	The internet together with other information technologies create "networked organizations" (e.g. Cisco), which are more effective and productive.
Tend to expand horizontally	Tend to expand vertically	In general, many dot.coms tend to be extremely specialized (go vertical) rather than generalized (go horizontal). This is because many business rules have changed. For example, no matter how big a company is, it is still limited by say the 15-in. computer screen. Also, no matter how far the competitors are, they are still "one-click" away in cyberspace.

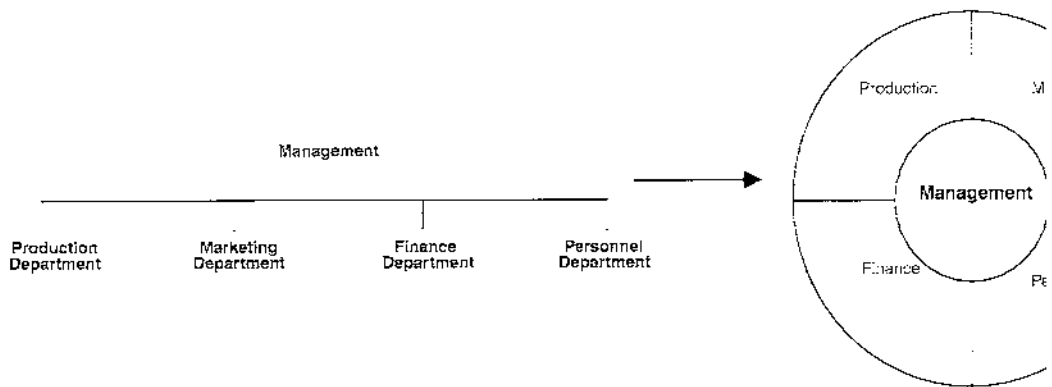
### 1.9.1 Myth 1: E-commerce is about developing web pages

E-commerce is actually about building an integrated system not developing web pages. Very often, the web pages are just the tip of the iceberg in terms of cost and functions. The invisible parts or the backend systems are the real “heart” of the system. They are often many times more expensive than the web pages. In many e-commerce projects the most difficult task is not how to build an attractive web page, but how to integrate existing and new systems together in a cost-effective manner.

### 1.9.2 Myth 2: The successful implementation of an e-commerce system relies on web programmers

While web programmers play an important role in the implementation of an e-commerce system, everyone in the company should participate because e-commerce involves the integration of hardware, software, “peopleware,” and business process. The following examples illustrate how different parties should typically participate in an e-commerce project [Turban *et al.*, 2000; Hartman, Sifonis, and Kador, 2000].

- Senior management should take the lead to define the strategic vision of an e-commerce project. Without top management support and a clear strategic direction, an e-commerce project is unlikely to be successful.
- Procurement department should use new procurement channels such as virtual marketplace to save cost and to improve efficiency.
- Production department should redefine the existing production process to support a buyer-driven supply chain. In particular, it should take into account the need for customization and JIT production.
- Marketing department should make use of new marketing channels and techniques such as banner exchanges, affiliation program, personalization software, and data mining for more effective promotion purposes. Another important opportunity is that the marketing process can now be linked directly to the ordering process.
- Finance/accounting department should investigate new alternatives for funding e-commerce projects. It should also participate in building a secure electronic payment system to complement the conventional payment methods.
- Personnel department should design more effective forms of compensation schemes such as options and to provide up-to-date training to the employees. This is an extremely important issue because of the worldwide shortage of people with technical expertise in specifying, architecting, designing, and implementing e-commerce systems.



**Figure 1.7** Transformation of a compartmentalized organization into an integrated organization

- Customer support department should make use of electronic customer relationship management software to provide better customer support.

To cope with the e-commerce environment, Figure 1.7 illustrates how a company may change its organization structure. In a traditional business organization, a compartmentalized organization structure is often used. In the new e-commerce environment, an integrated organization structure should be used. It looks like a “dynamic wheel” for driving a company to success.

### 1.9.3 Myth 3: E-commerce project is about translating the traditional business model into an electronic business model

The above statement often oversimplifies the whole picture. To implement e-commerce effectively, many business organizations need to reengineer themselves. The process is a “transformation” rather than a “translation.” This may involve adopting a different business strategy. For example, with e-commerce, a manufacturer may sell goods directly to consumers. However, this may create conflicts with existing retailers. This example illustrates that e-commerce may introduce new opportunities as well as new threats. Another real life example is egghead.com, which moved its software retail outlet completely to the internet in 1997 [Zwass, 2000]. In general, an existing business can implement e-commerce using four different strategies\*:

\*This is based on the notes of Prof. Benret P. Lientz's (UCLA) seminar on successful e-business implementation.

- *Separate* – implement by setting up a separate company
- *Overlay* – implement by adding a new department/branch to the existing company
- *Integrate* – implement by combining the traditional business and new business
- *Replace* – implement by replacing the traditional business with the new business

The first two approaches are less risky and so they are likely to be used by most companies. The third approach requires more work in general and the last approach, which has been adopted by egghead.com, is the most aggressive.

It is worth mentioning that many successful e-commerce applications go through the following development process:

1. *Tradition:* Study how the traditional model functions (e.g., customers visit a physical bookstore, choose some books from the bookshelves, and pay for them at the cash counter).
2. *Translation:* Translate the traditional model into the e-commerce model (e.g., customers visit the VBS, choose some books by browsing through the web pages, and pay for them at the check out page).
3. *Transformation:* Transform to a new and perhaps an even more effective model (e.g., in the case of the VBS, various new functions that are not available in the traditional model can be incorporated, such as search engine, shopping cart, promotion through data mining, etc.).

## 1.10 SYSTEM MODEL AND ROAD MAP OF THIS BOOK

The focus of this book is about building an e-commerce system. As a starting point, it is useful to define a generic system model. In general, nearly all e-commerce systems can be represented by the three-tier model as shown in Figure 1.8. This three-tier model has three main components, namely the client side, the service system, and the backend system. The service system and the backend system are often called the server side. This three-tier model is a client/server-based computing system. The client side connects users to the system, the service system serves the users' requests, and the backend system supports the service system in fulfilling the users' requests (e.g., by providing the required data). From the business perspective, the client side provides the customer interface, the service system handles the business logic, and the backend system provides the necessary information to complete a transaction.

To explain the basic concept of e-commerce, we will use an ongoing case-study [a Virtual Bookstore (VBS)] throughout the book. Figure 1.9 shows the typical

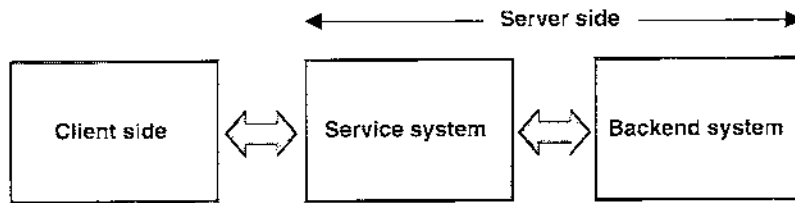


Figure 1.8 The three-tier technical model for an e-commerce system

architecture of a web-based e-commerce system in general and the VBS in particular. Referring to the three-tier model, the web server and the application server forms the service system, the web client or the web browser is the client side, and the database is the backend system.

The web server is responsible for interacting with the web client as well as the application server and the backend system. The internet provides the communication platform for transferring information between the web client and the web server. The information transfer is governed by an application protocol called the Hypertext Transfer Protocol (HTTP). This is a simple request/response protocol for the web client and the web server to “talk” to each other. Generally speaking, the web client issues a request to the web server and the web server returns a response to the web client. In Chapter 2, we will give an overview of the internet and the web system. It is important to learn them because they form the infrastructure of nearly all e-commerce systems.

To build the client side, we need a standard way to present text, images, graphics, and other multimedia information to users. For example, through the user interface, users can view product information and submit information to the web server.

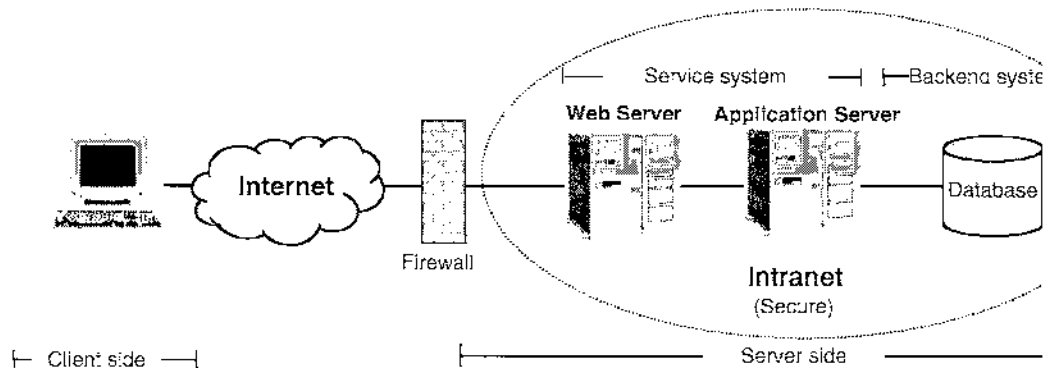


Figure 1.9 Typical architecture of a web-based e-commerce system

Currently, the most popular web publishing technique is to use the Hypertext Markup Language (HTML). In Chapter 3, we will give an overview of HTML and other techniques for building the client side.

In many cases, the web server's response is dynamic or is dependent on the user's input. For example, if a customer wants to search for some books, the web server's response will depend on the search criteria. To create a dynamic web page, the client's request invokes a program in the web server. In conjunction with the application server, the web server processes the client's request according to the program logic. In some cases, this may involve data retrieval from the database(s). After processing the client's request, the output will be returned to the client in the HTTP response message. The programs on the server side can be written in many languages. In this book, we will use Java Servlet as an example. As explained later, Java Servlet has many advantages over many other server-side programming techniques. In Chapter 4, we will discuss the fundamentals of Java Servlet programming and in Chapter 5, we will deal with the important issue of database connectivity.

HTTP is a simple request/response protocol, so it is stateless. In other words, a web server will not keep track of user state or user information. For example, a web server cannot know whether the current request is from a previous client or from a new client. In many e-commerce systems, knowing the user state is an important requirement. In technical terms, this is called session tracking. For example, in a shopping cart application, the web server needs to know the contents of each client's shopping cart so as to display the contents in the web page. Java servlets have an application programming interface (API) for performing session tracking. In Chapter 6, we will discuss the Java Servlet session tracking API. In particular, we will present ways to use the session tracking API for supporting user authentication and for building a shopping cart application.

In consumer-oriented systems, the client side is typically a user on a personal computer with a web browser to interact with the e-commerce system. In business-oriented systems, the client side could be:

1. a user on a personal computer with a web browser to interact with the e-commerce system.
2. an organizational system that is capable of carrying out purchasing and updating its own electronic documents and databases. Here there may be a direct connection between the client's organizational system and the seller's server-side system. Such communication is facilitated by electronic data interchange using business connectors. This issue is discussed in more detail in Chapter 12.

The internet, itself, is a nonsecure public network. Therefore, we need to protect the user against possible attacks from other users of the internet. Security is an important requirement in e-commerce. To build a secure e-commerce system, we need

to employ various cryptographic techniques. These basically encode and decode the user information, putting it in a secure coded form during transmission over the insecure internet. In Chapter 7, we will present the basic cryptographic techniques for addressing these security requirements. As shown in Figure 1.9, the web server, the application server, and the database(s) of an organization are installed in a secure private network called an Intranet. This secure private intranet is protected from possible attacks from the insecure public internet by means of various security techniques such as firewalls. These are discussed in Chapter 8.

Besides these underlying technologies for e-commerce, we will also discuss some of the advanced technologies in Chapter 9. These include Mobile Agents, Wireless Application Protocol, eXtensible Markup Language, and Web Mining. They can be used to complement and enhance the existing e-commerce system.

Besides the above technologies, another important component of an e-commerce system is the payment system. In the traditional commerce system, we have four main types of payment methods, namely cash, check, credit card, and direct funds transfer. To build a complete e-commerce system, it is of great interest to implement these four types of payment methods in the cyberspace. In Chapter 10, we will give an overview of the internet payment systems.

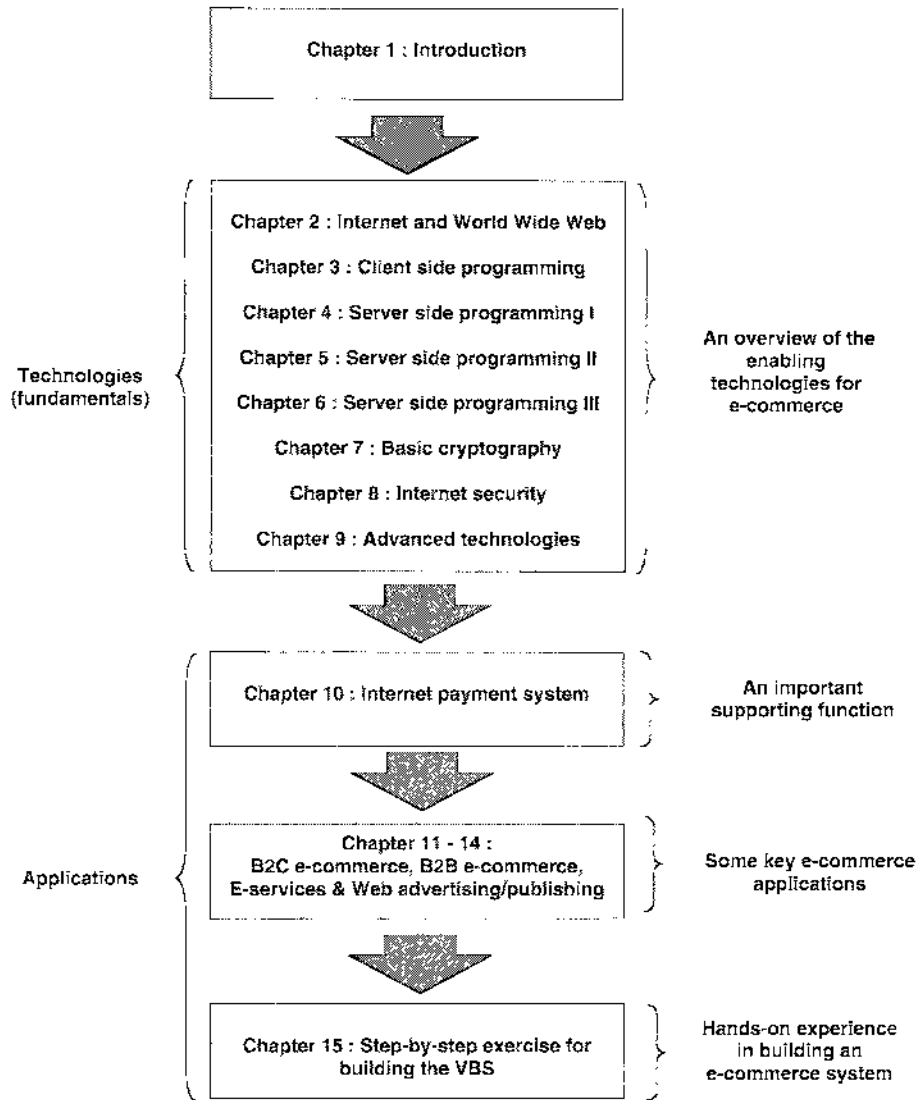
By using the above technologies, many e-commerce applications can be built. In Chapters 11–14, we will give an overview of some of these e-commerce applications.

The road map of the book is shown in Figure 1.10.

Finally, it is important to mention that besides the technical issues, we also need to resolve many nontechnical ones before we can deploy e-commerce widely. Although these issues are beyond the scope of this book, we would like to mention them briefly here. Two important ones are related to law and taxation. As we break the geographical barrier, these two issues are becoming more critical. Imagine that someone starts a cyber shop in country A and sells goods to consumers in country B. Should the cyber shop be bound by the law in country B? If so, how can it be enforced? In terms of taxation, different countries have different taxation requirements. For example, some countries impose sales taxes while others do not. How can we fulfill different taxation requirements in such a complex environment? To explore these nontechnical issues further, please refer to the references and recommended readings at the end of this chapter.

## 1.11 SUMMARY

In this chapter, we have given an introduction to e-commerce. In general, e-commerce refers to business transactions by electronic means, especially by the internet. Various forecasts indicate that e-commerce has a very bright future. As a basis for further discussion, we attempt to capture the drivers behind e-commerce (or the DIGITAL



**Figure 1.10** Roadmap and chapters of this book

phenomenon) by the acronym DIGITAL. We also look at e-commerce from many different perspectives. E-commerce applications are commonly classified in four categories, namely B2C, B2B, C2C, and C2B. Examples for each category are Amazon.com, TPN, eBay, and Priceline, respectively. E-commerce can bring about a number of advantages to both business organizations and consumers. At the same time, it is also bringing about many changes in our traditional commerce system.

In this book, our focus is on the technologies for building an e-commerce system. It is usually based on a three-tier system model involving the user interface, service system, and backend system. In a web-based e-commerce system, the user interface is the web client and the web server is the main part of the service system. We will discuss how to build this web-based e-commerce system in later chapters.

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## RECOMMENDED READING

There are many good books on e-commerce, most of which focus on the business aspect.

This book is devoted to the technical aspects.

Kosiar, D. R., *Understanding Electronic Commerce*, Microsoft Press, 1997.

This is an introductory book that gives a good overview of e-commerce.

Kalakota, R. and Whinston, A. B., *Electronic Commerce – A Manager's Guide*, Addison-Wesley, Reading, MA, 1997.

This is a book on e-commerce specially written for managers.

Kalakota, R. and Whinston, A. B., *Frontiers of Electronic Commerce*, Addison-Wesley, Reading, MA, 1996.

This book describes the technical aspects of e-commerce in greater details.

Kalakota, R. and Robinson, M., *E-business: Roadmap of Success*, Addison-Wesley, Reading MA, 1999.

This is a recent book focusing on e-business.

Turban, E., Lee, J., King, D., and Chang, H. M., *Electronic Commerce – A Managerial Perspective*, Prentice-Hall, Upper Saddle River, NJ, 2000.

This is a textbook on e-commerce written from a managerial perspective. It gives a very good introduction to e-commerce and contains a lot of interesting case studies.

Schneider, G. P. and Perry, J. T., *Electronic Commerce*, Course Technology, 2000.

This is another textbook on e-commerce covering its major aspects, particularly the business aspects.

Greenstein, M. and Feinman, T. M., *Electronic Commerce: Security, Risk Management and Control*, Irwin McGraw-Hill, 2000.

This is an e-commerce textbook written from an accounting perspective.

*WEE Communication Magazine*, 37, Sept. 1999 (Articles on E-commerce)

Zwass, V. "Structure and macro-level impacts of electronic commerce: From technological infrastructure to electronic marketplaces," at <http://www.gvsu.edu/ssb/ijec/>. (An early version of the paper "Electronic commerce: Structures and issues" can be found in *International Journal of Electronic Commerce* 1 (1), 1996.)

These provide many insightful articles on e-commerce.

Hartman, A. Sifonis, J. G., and Kador, J., *Net Ready: Strategies for Success in the E-economy*, McGraw-Hill, New York, 2000.

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Norris, G., Harley, J. R., Hartley, K. M., Dunleavy, J. R., and Bails, J. D., *E-business and ERP*, John Wiley & Sons, New York, 2000.

These provide many interesting and valuable insights concerning e-commerce strategies and business issues.

To find the general information and latest news on e-commerce, please visit

[www.ecommercetimes.com](http://www.ecommercetimes.com)

[www.zdnet.com](http://www.zdnet.com)

In particular, [www.zdnet.com/pccomp/webmap/](http://www.zdnet.com/pccomp/webmap/) gives some of the best web sites in different categories.

For research purposes, the following are two journals on e-commerce

*International Journal of E-commerce* (<http://www.gvsu.edu/ssb/ijec/>)

*Journal of Electronic Commerce Research* (<http://www.balizer.net/jecr/jecr.asp>)

Also, the Harvard Business School web site (<http://www.hbsp.harvard.edu/products/cases/>) contains many case studies on e-commerce.

Last but not least, governments should also play an important role in developing e-commerce. For example, some useful information can be found from the following web sites:

<http://www.e-commerce.gov/framework.htm>

<http://www.info.gov.hk/digital21>