Electronic Commerce

1. What is E-Commerce?

V Rajaraman

V Rajaraman is with the Jawaharlal Nehru Centre for Advanced Scientific Research and the Indian Institute of Science, Bangalore. Several generations of scientists and engineers in India have learnt computer science using his lucidly written textbooks on programming and computer fundamentals.

In this part of the series, we define different types of e-commerce and list their advantages and disadvantages.

Introduction

During the past three years a revolution has taken place in the way business is done. This revolution is primarily due to the convergence of computers and telecommunication technologies and the emergence of a number of Internet Service Providers (ISPs) who facilitate connection of computers to the internet – the worldwide network of computers (see [1]). The internet connects the computers of many companies and also connects individuals and is very much like the worldwide telephone network but is much cheaper and allows exchange of not only documents but also multimedia information – namely audio, graphics and video information. The internet has spawned a number of innovations in business between commercial organizations, between individuals and commercial organizations and between individuals and individuals. These transactions are commonly known as Business to Business (B2B), Business to Customer (B2C) and Customer to Customer (C2C) (see *Box* 1). Electronic commerce is abbreviated as e-commerce. These transactions include orders sent to vendors to supply items,

Box 1. 2MCA

(Too Many Confusing Acronyms!)

Acronyms B2B, C2B, C2C, C2G (Customer to Government), G2G, B2G, etc., crop up every day even in newspapers and one wonders where it all started! The year 2000 bug was originally billed as the year 2000 problem, then it became Y2000 and then Y2K! If you do not understand an acronymn do not worry. You are not alone! It is usually quite trivial.

In e-commerce all transactions are carried out electronically using the network connection.

invoices sent by vendors, payment usually made by debiting an organization's account with a bank and crediting the vendor's account and cash payments made using what is known as electronic cash (e-cash). The important point is that all transactions are carried out electronically using the network connection. There are a variety of e-commerce applications. Some of these are:

- Retail stores such as book stores, music stores, toy stores, etc.
- Auction sites using which an individual buyer and seller can buy and sell goods.
- Cooperating businesses connected using their own private telecommunication network carrying out transactions in a semi-automated way.
- Banks connected to their customers providing services such as deposits, payments, and giving information on status of an account.
- Railways/airlines/cinema theatres permitting booking tickets on-line and paying for them on-line using credit cards or electronic-cash.
- Filing tax returns with government agencies on-line and obtaining an immediate acknowledgement.
- Electronic publishing to promote marketing, advertising, sales and customer support.
- Web-based educational material which allows students to learn anytime and anywhere.

Business to Customer E-Commerce

We will now take an example of e-commerce involving an individual and a shop selling goods. This is called Business to Customer (B2C) e-commerce. One of the earliest such e-shops was a bookstore known as amazon.com set up in USA, which primarily sells books. There are many such companies in India now. One of them is called fabmart.com which first sold music cassettes/CDs and now books and several other items. We will now explain how these internet based shops popularly known by several names such as virtual-shops, cyber-shops, dot-com shops, e-stores, etc. function. All these have the following common characteristics.

Shops have a web address ending with .com (hence called Dot Com Shops) and are connected to the world wide web.

1. Customers have access to the internet from their homes or work places and wish to purchase items sold by these shops. The major reason is convenience, as one can shop at any time from home and items will be delivered. Customer normally knows the web address of the shop. These shops have a web address ending with .com (hence called Dot Com Shops) and are connected to the world wide web. For example the address of a music and books shop in India is www.fabmart.com

2. The customer typically uses a web browser such as Netscape or Internet Explorer and enters the web address of the shop. If he wants a specific item he states that by keying it in a specified place in a form displayed on his terminal. If the item is a book and he wants to look at books on the same subject he gives the subject and the shop searches its data base and gives a list of available books on that subject. The shop may also give the contents page of each of the books, reviews of the books and cost of the books.

3. If the customer wants to buy one or more books he points to the book details shown on his screen using his mouse and clicks. The vendor's computer enters the prices, adds them, provides discount if any and shows the net amount payable. The customer is then asked to enter his credit card number and address to which the items are to be shipped. Usually an option is also given to the customer to pay cash on delivery.

4. If the payment is by credit card, the vendor electronically (i.e. via a telephone line) sends credit card details of the customer and the amount of bill to the credit card company's computer.

5. If the customer's credit is OK, the credit card company authorises the sale. The e-shop can now proceed to fulfill the order.

6. The e-shop's computer sends an order acknowledgement accepting the order and asks the customer for shipping instruc-

tions. Based on the shipping instructions the e-shop specifies the mode of transport and delivery period.

7. The e-shop normally does not have the items in its store and orders them from a distributor (normally electronically). After they are received at vendor's warehouse, the items are packed and despatched to the customer's address.

8. The credit card company sends a bill to the customer and credits the vendor's bank account by the amount of the bill. The various steps involved in this transaction are shown in *Figure* 1.

Customer to Customer E-Commerce

Customer to Customer e-commerce is one in which two individuals want to sell/buy items. The items are usually used items, collector's items such as stamps/coins or antiques. The seller

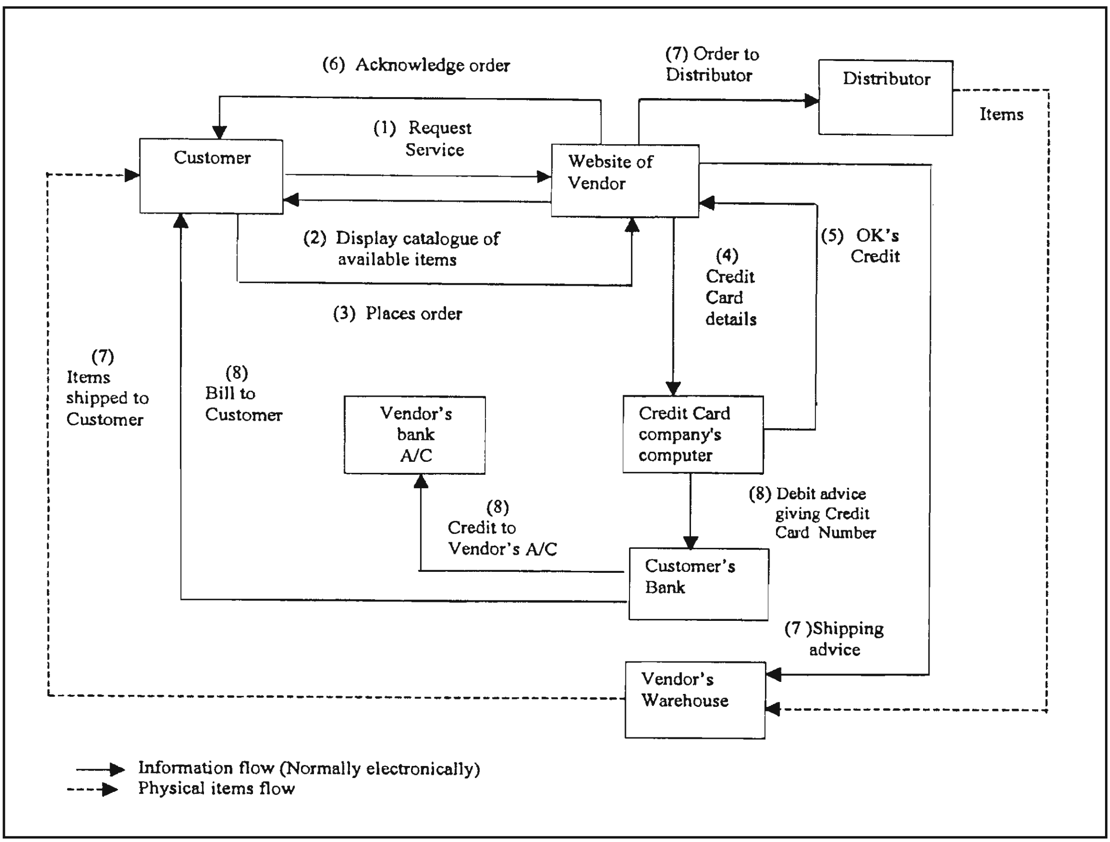

Figure 1. Business to Customer e-commerce.

posts the description of the item and the expected price of the item on a website maintained by a company, which acts as a broker. An individual who logs on to this site looking for items may be interested in the item advertised for sale. He then offers to buy the item and he may quote a price. The price is mutually settled by exchanging messages by email. The broker then arranges to collect the item from the seller and despatches it to the buyer and collects a fee from the buyer and the seller for his services. The primary advantage of this transaction is that the internet enables two individuals located at distant places to come together to buy and sell using an intermediary's web address.

The primary advantage of electronic transactions in customer to customer e-commerce is that the internet enables two individuals located at distant places to come together to buy and sell using an intermediary's web address.

There are a large number of sites or portals on the world wide web in India for various goods and services. We list some of them in *Table* 1.

Business to Business E-Commerce

Business to Business transaction between a vendor and a purchaser of goods will proceeds as follows:

1. A purchase order document is entered via the keyboard of a PC by the customer's purchase office and sent by electronic mail (e-mail) to the vendor. (There is a standard format for the purchase order sent by e-mail which is called electronic data interchange (EDI) standard which we will discuss later in this series).

2. The purchase order is stored in a database by the vendor and is acknowledged electronically. Observe that the vendor's clerk does not have to manually enter the purchase order in his computer. This is to be contrasted with current computerised systems in which the purchase order is a document received by the vendor and the vendor's clerk has to enter it in his computer to process the order. This manual entry is expensive as a clerk's time has to be allocated and there is also a possibility of errors in data entry by the clerk which is avoided if the purchase order is received as an electronic 'soft copy'. However it is essential to

Table 1. Some of the portals accessible for transactions in India.

Product	Web address	Service provided
Automobiles	indiacar.com	New and used car sales
	automartindia.com	Used cars
Finance	indiainfoline.com	Investment advice
	walletwatch.com	Personal finance
	moneycontrol.com	Personal finance
	equitytrade.com	Investment advice
General shopping	rediff.com	Over 15 categories of goods
	indiashop.com	Toys, miscellaneous items
	beautyarcade.com	Cosmetics
	jaldi.com	General goods
	indiabazaar.com	General goods
Music / books	fabmart.com	Music and books
	dhadkan.com	Music
	phindia.com	Books by Prentice-Hall of India
Art	artstall.com	Virtual art gallery for paintings
Matrimonial	snehaquest.com	Find your partner
Construction industry	buzzsaw.com	Items for building construction
Business to Business	indiamarkets.com	Listing of businesses, suppliers, auctions or second-hand machinery
	trade2gain.com	Business to business auctions
	seekandsource.com	Industrial good/sell
IT products	ITchain.com	Hardware/software sale
	fandu.com	
Free services	chequemail.com	Free email site. Profit sharing if you visit the site often
	cheecoo.com	Free access to internet
	formsindia.com	All types of forms for tax returns, etc.
Customer to Customer	kabadibazaar.com	Auction site
Educational	egurucool.com	Educational service

use a standard format (such as EDI standard) which will be 'understood' by the vendor's computer.

It is essential to use a standard format (such as EDI standard) which will be 'understood' by the vendor's computer.

3. The vendor despatches the items physically (may be by rail or truck) and simultaneously a delivery note is sent by e-mail to the customer. Observe that as the delivery note comes electronically there is no need to reenter it manually at the customer site. The receiving office at the customer site will have the purchase order copy in its database and it can be automatically compared by the computer with the delivery note (provided there is clear understanding of the format). If they do not match, a discrepancy note is sent electronically to the purchase office.

4. The items which arrive will have a printed delivery note accompanying them and it is sent to the inspection office which physically inspects items received and compares them with the delivery note. The accepted items note is electronically sent via the company's LAN to the stores office by the inspection office. The rejected items note is sent electronically to the purchase office. The accepted items are sent to the stores and rejected items to the purchase office.

5. The stores office computer automatically updates the inventory using the note sent by inspection office. The items taken into stock report is sent via the LAN to the accounts office thereby authorizing payment to the vendor.

6. The accounts office electronically pays for items accepted. Electronic payment is made by the accounts office by informing its banker (electronically) to debit its account by the specified amount and credit it to the vendor's bank account (which may be with a different bank). This is known as electronic funds transfer (EFT), which is also an important aspect of e-commerce. Observe that it is not necessary to print a cheque and mail it as is presently done. The procedure is given as a block diagram in *Figure* 2.

Electronic funds transfer is an important aspect of e-commerce.

From the above example we see that the following hardware and

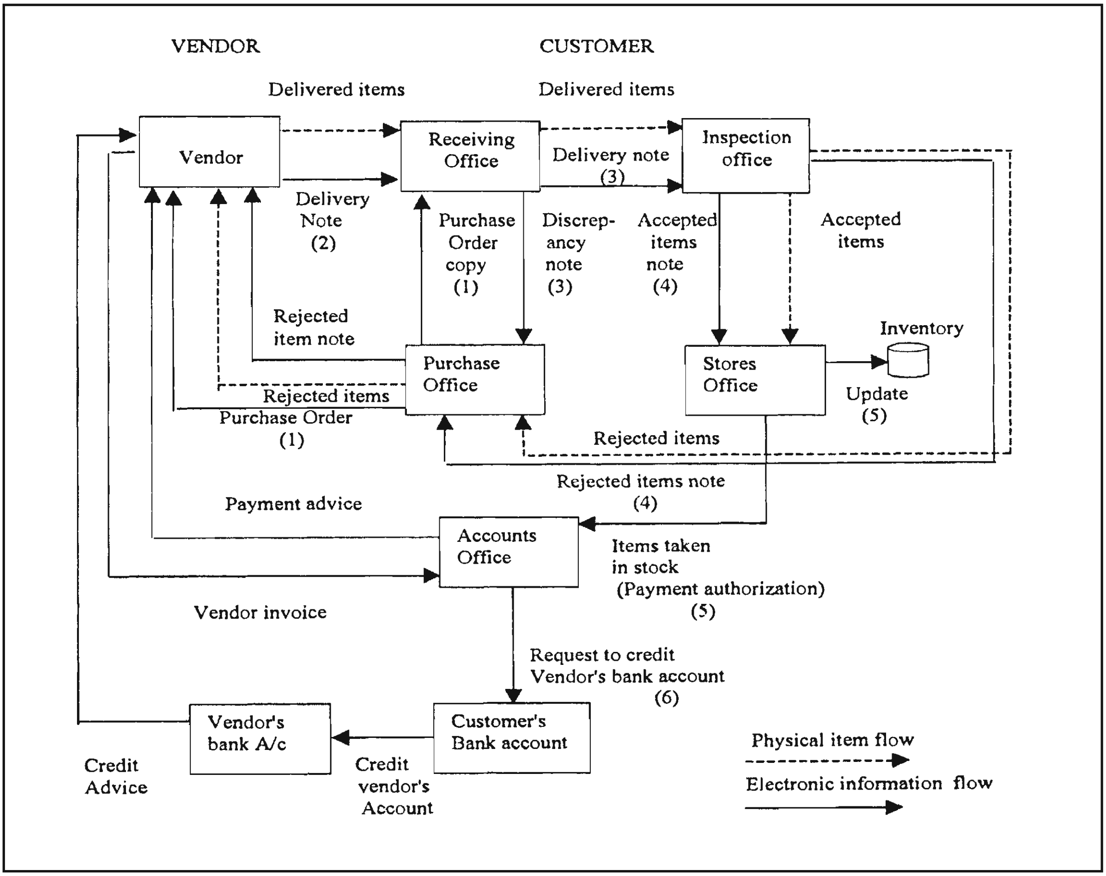

Figure 2. Block diagram of document, item flow and funds transfer in B2B e-commerce.

software would be needed for establishing e-commerce between businesses.

1. Each of the businesses must have a LAN interconnecting their respective offices and the offices themselves should have computers for data entry/receipt, comparison, etc. The system may be a distributed client/server type system with each office being a client and the databases being stored in appropriate servers. The internal system architecture is not a major issue. However, the protocol used by the LAN is usually the same as that used by internet, namely, TCP/IP. The organizational computer network using this protocol is called an *intranet*. Besides using TCP/IP protocol intranets also have one or more world wide web servers.

2. The two intranets must be interconnected. There are two alternative methods available to do this. One is to connect each of the intranets to the internet, which is an inexpensive solution but may be insecure unless special precautions are taken. The other solution is to connect the intranets to constitute what is known as an *extranet*. Extranet is a private interconnection of the intranets of business associates. Each intranet supports web pages which can be accessed by the members of the extranet.

Extranet is a private interconnection of the intranets of business associates.

3. A method of paying for goods or services received electronically must be agreed on which implies that the business partners must know one another's bank account details. Further funds transfer must be secure and each transaction should be authorized electronically.

4. We have assumed that documents are interchanged by e-mail. This is acceptable between close business associates but is not secure and there is no authentication of documents sent and received. For more secure transactions e-commerce has introduced data encryption and a method of digitally signing documents which we will discuss later in this series.

Advantages and Disadvantages of E-Commerce

We saw in the last section that a large number of goods and services are now being sold/bought using the world wide web. The major advantage to a customer using this mode of shopping are:

1. One can buy/sell items from anywhere using one's computer provided an internet connection is available.

2. The shopping can be done 24 hours a day, 365 days in a year – an internet based shop never closes!

3. One can avail of services such as financial services, legal services, medical advice, etc. from appropriate portals.

4. Wider variety of goods (particularly items like books and music) are accessible easily without spending time and money in physically visiting and searching in many shops.

For secure transactions e-commerce has introduced data encryption and a method of digitally signing documents.

Large number of potential business partners can be quickly found and contacted using appropriate search engines and e-mail correspondence.

5. Anonymous friendly advice may be available on items one may like to buy/rent.

The advantages which accrue to a business are:

1. With a web-site a business can reach out to a worldwide customer base at a very low cost.

2. Order processing cost is reduced as manual data entry is reduced. Business is also carried out faster as all documents are exchanged electronically.

3. Inventory size is reduced as transaction time is reduced.

4. Funds transfer is faster.

5. A large number of potential business partners can be quickly found and contacted using appropriate search engines and email correspondence.

6. In some cases middlemen such as retailers can be eliminated as a manufacturer can reach out directly to a customer (Dell Computers in USA sells PCs directly to customers). This reduces cost and delays. This is an example of change in what is known as a supply-chain.

The major disadvantages of e-commerce are:

1. Currently internet access is not widely available in India.

2. Communication infrastructure is expensive and not very reliable particularly to individuals in India.

Electronic data interchange standards have to be in place before Business to Business e-commerce can increase. Small businesses may find it difficult to conform.

3. Payment by credit card requires faith in the system security. As of now there is no mutual trust between seller and buyer on this system of payment using credit cards for goods and services ordered via internet in India. Customers are wary of giving their credit card numbers to vendors who have only a 'web presence'.

4. Electronic data interchange standards have to be in place before Business to Business e-commerce can increase. Small businesses may find it difficult to conform.

5. Many persons go shopping for social contacts, touch and feel before buying items. E-commerce will de-personalize transactions.

Box 2. What are E-Commerce Technologies?

E-commerce has become feasible due to the convergence and integration of many technologies. In *Resonance*, we have already had articles on internet and the world wide web, digital library, search engines, video-on-demand, JAVA programming and data warehousing which have all contributed to e-commerce. In future articles in this series we will discuss e-commerce system architecture, secure messaging, payment schemes, middlemen services and some legal and social issues relevant to e-commerce.

6. A major concern is security of transactions on the internet. Spies or hackers can steal and misuse credit card numbers if appropriate care is not taken.

7. Shopping portals will be vulnerable to attacks by hackers unless special precautions are taken. One type of nuisance is called denial of service in which a large number of frivolous enquiries are posted to a portal making it inaccessible to legitimate customers.

8. Portals have to be protected from virus attacks and other electronic vandalism and espionage by special security systems.

9. Customer's privacy may be lost if regular log is kept of his/her buying habits.

In spite of these disadvantages, e-commerce is bound to rapidly increase due to its convenience. Some of the security and privacy issues are not severe in Business to Business e-commerce using private networks connecting them.

In order to set up e-commerce sites a number of technologies are required (see *Box* 2), which we will discuss in succeeding parts of this series.

Suggested Reading

[1] Neelima Shrikhande, Internet and the World Wide Web, *Resonance*, Vol. 2, No.2, p.64, 1997.
[2] V Rajaraman, *Analysis and Design of Information Systems*, 2nd edition (Chapter 16 on Electronic Commerce), Prentice Hall of India, 2000.
[3] Ravi Kalakota and Andrew B Whinston, *Frontiers of Electronic Commerce*, Addison Wesley Longman, 1999.
[4] Rob Smith, Mark Speaker and Mark Thompson, *The complete Idiot's guide to e-commerce*, Prentice Hall of India, 2000.

Address for Correspondence
V Rajaraman
IBM Professor of Information Technology
JNCASR
Bangalore 560 064, India.
Email:rajaram@serc.iisc.ernet.in