



“शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।”

— इन्दिरा गांधी

"Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances."

—Indira Gandhi

Block

2

PRACTICES IN E-COMMERCE

UNIT 5

E-Business	5
-------------------	----------

UNIT 6

E-Security and Legal Issues	17
------------------------------------	-----------

UNIT 7

M-Commerce	29
-------------------	-----------

UNIT 8

Online Shopping Portal: An E-Commerce Case Study	37
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BLOCK INTRODUCTION

This block brings some of the best practices in e-commerce.

Internet is being used increasingly for purchase and sale of goods and services (including after sales support), making payments, sharing of business information, conducting business transactions, electronic banking, etc. With the sales as well as number of users of smartphones, tablets, phablets, etc. increasing at an alarming pace, e-commerce has become a normal feature in our day to day life. Further, with the introduction of various safety measures in the field of technology, number of e-banking users are also increasing and hence internet banking is catching fast with the traditional modes of payment. A developed e-banking environment plays an important role in e-commerce by encouraging people to shift from traditional modes of purchases to electronic purchases. The success or failure of an e-commerce transaction depends on various factors. The security of data transmitted is most important. People using Internet for commercial transactions remain at risk of disclosure of their confidential information such as passwords, credit card details, etc. Hackers use various techniques to extract personal user information.

Mobile commerce is all about doing commerce transactions through mobile devices. Surveys and estimates indicate that nearly half of all commerce transactions will happen from mobile devices within next 2 years. Explosion and popularity of mobile devices provide huge opportunities for business enterprises and consumers to do the selling and purchasing on-the-go using mobility devices such as PDA, smart phones and other hand-held devices. *Commerce anywhere anytime* concept is becoming a reality due to the advent of m-commerce.

This block consists of four units and is organized as follows:

Unit 5 deals with e-business. It covers web based bookshops, grocery suppliers, software suppliers, software support, auctions, and stock trading.

Unit 6 deals with security and legal issues associated with e-commerce. It introduces SSL, digital signatures, fire walls, cyber crimes, cyber laws as well as IT Act.

Unit 7 deals with m-commerce. It also glances at the future trends that may emerge in the area of e-commerce.

Unit 8 is a case study. As part of case study, Online Shopping Portal was discussed.

UNIT 5 E-BUSINESS

Structure

- 5.0 Introduction
- 5.1 Objectives
- 5.2 Internet Bookshops
 - 5.2.1 Shopping Procedure
 - 5.2.2 Advantages
 - 5.2.3 Disadvantages
- 5.3 Grocery Suppliers
 - 5.3.1 Shopping Procedure
 - 5.3.2 Advantages
 - 5.3.3 Disadvantages
- 5.4 Software Supplies and Support
 - 5.4.1 Shopping Procedure
 - 5.4.2 Advantages
 - 5.4.3 Disadvantages
- 5.5 Electronic Newspapers
 - 5.5.1 Advantages
 - 5.5.2 Disadvantages
- 5.6 Online Auctions
 - 5.6.1 Online Auction Procedures
 - 5.6.2 Advantages
 - 5.6.3 Disadvantages
- 5.7 Online Trading System
 - 5.7.1 Online Trading Procedure
 - 5.7.2 Advantages
 - 5.7.3 Disadvantages
- 5.8 Summary
- 5.9 Further Readings

5.0 INTRODUCTION

Internet is being used tremendously these days for purchase and sale of goods, services (including after sales support), making payments, sharing of business information, conducting business transactions, e-banking, etc. With the sales as well of number of users of smart phones, tablets, phablets, etc. increasing at a rapid pace, e-commerce has become a normal feature in our day to day life.

Further, with the introduction of various safety measures in the field of technology, number of e-banking users are also increasing and hence, Internet banking is catching up fast with traditional modes of payment. A developed e-banking environment plays an important role in e-commerce by encouraging people to shift from traditional modes of purchases to online purchases. This unit explains the practices in e-commerce. That is, the issues and prospects of applications of e-commerce in various fields. Hence, this unit discusses about the usage of e-commerce for Internet based bookshops, grocery suppliers, software suppliers and support, electronic newspapers, virtual auctions, and online trading systems, etc. This unit will also throw some light on e-commerce security concerns and issues related thereto.

5.1 OBJECTIVES

After going through this unit, you should be able to

- know the impact of e-commerce on day to day life, and
- find services that can be offered through e-commerce.

5.2 INTERNET BOOKSHOPS

Internet base bookshops are the online bookshops that provide an opportunity to users to scroll through various books so as to pick and choose any book of their liking on a click of a button while sitting in comfort of their homes or lounges. These bookshops also provide for various options for placing an order as well as payment of consideration either through credit cards or Internet banking etc. With the emergence of Internet, many online bookshops have come up and provide an easy way to procure books. At its simplest, these bookshops list the products for sale or the services offered and invite customer to phone, fax or e-mail their order for COD (Cash On Delivery).

5.2.1 Shopping Procedure

Each Internet Bookshop follows a specific shopping procedure. For the convenience of a new customer, these web sites include various tabs such as the following amongst others:

- How to order,
- How to become a member,
- How to check out,
- Shopping cart facility,
- Help desk,
- Discount/special packages,
- Payment procedure and options, and
- Delivery options.

5.2.2 Advantages

Some of the major advantages of Internet based bookshops are given below:

- These bookshops act as databases of a vast amount of information about books currently available in the market. All Internet users can use these databases and have knowledge of the same.
- Online bookshops are open 24×7 . The access is available to anyone, at anytime, from anywhere. At a click, all information can be obtained at the user system.
- User can take time in searching and selecting books.
- These bookshops are extremely useful to people looking for specific books. Any book not available nearby can be obtained from any part of the Country/World by just ordering online thus avoiding long distance travel and saving time.
- The huge list of publications in each subject or topic can be accessed easily. Such Internet based bookshops also provide the user to select the best and latest literature.
- In most of the instances, there will be a discount on the price of the book



5.2.3 Disadvantages

Apart from above advantages, online bookshops also suffer from following disadvantages:

- Any delay in updating of database in detail such as edition, cost, etc will create problems in identifying the correct book and payment thereof.
- Security issues are another concern while making payment online especially through credit cards. Any site with unsecure server or without encryption facilities may not provide a safe environment for online transactions.
- Some users may not have access to credit card facility, hence will not be able to transact and purchase books online.
- Mostly, Internet based bookshops charge extra as packing and shipping charges which burdens the user with additional costs.
- As there is no physical inspection of the product by customer before purchase, there is a risk of receiving book in a damaged condition.
- There may be abnormal delays in shipping.
- A book that is different from what is ordered may be shipped.

In the light of above discussion, shopping for books online looks much simpler and faster than purchasing from the market. However, the joy of browsing physically through the book shelves and glancing through the pages before purchasing a book is not available here. For specific requirements and crosschecking of bibliographic data of books, online bookshops can always be used.

Some of the renowned Internet based bookshops are <http://www.amazon.com> (Figure 5.1), <http://www.barnesandnoble.com>.

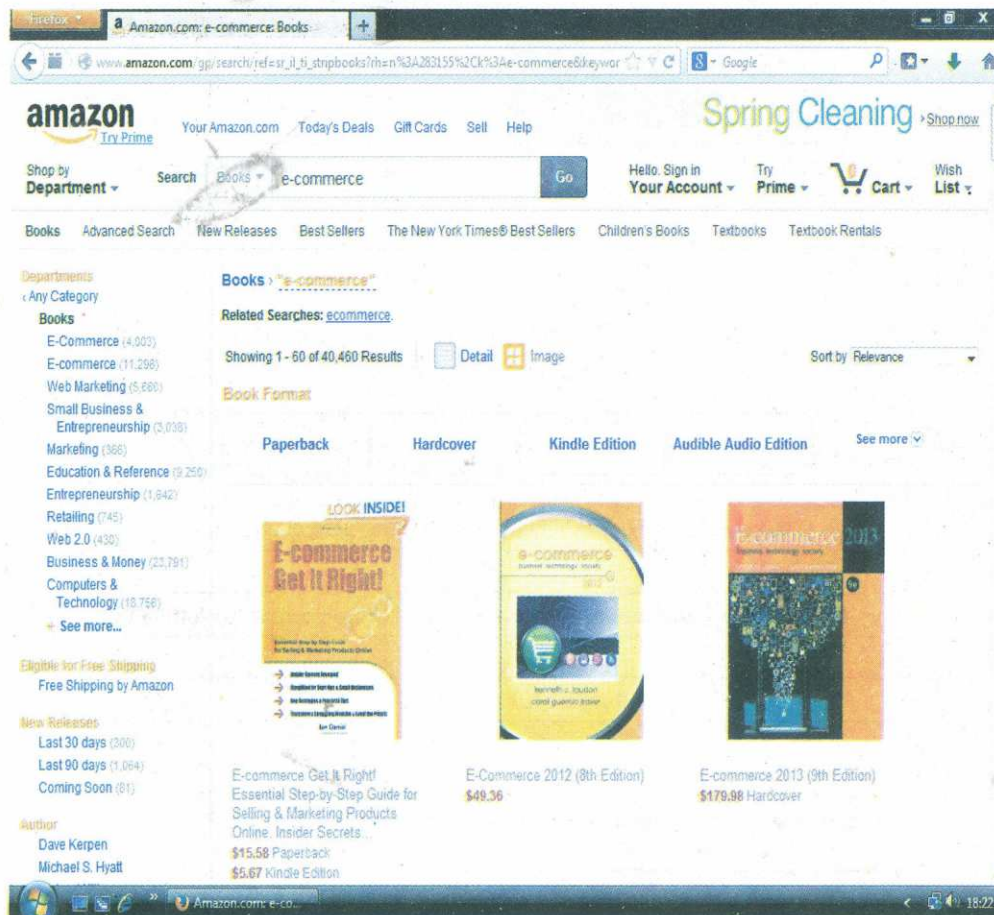


Figure 5.1: Snapshot of <http://www.amazon.com>

5.3 GROCERY SUPPLIERS

Purchasing of groceries is one of the basic shopping requirements. With a large customer base and increase in the usage of Internet, some big entrepreneurs have started the concept of creation of e-stores for groceries. <http://www.eazygrocery.com>, <http://www.bigbasket.com> (Figure 5.2) are some of the online grocery suppliers.

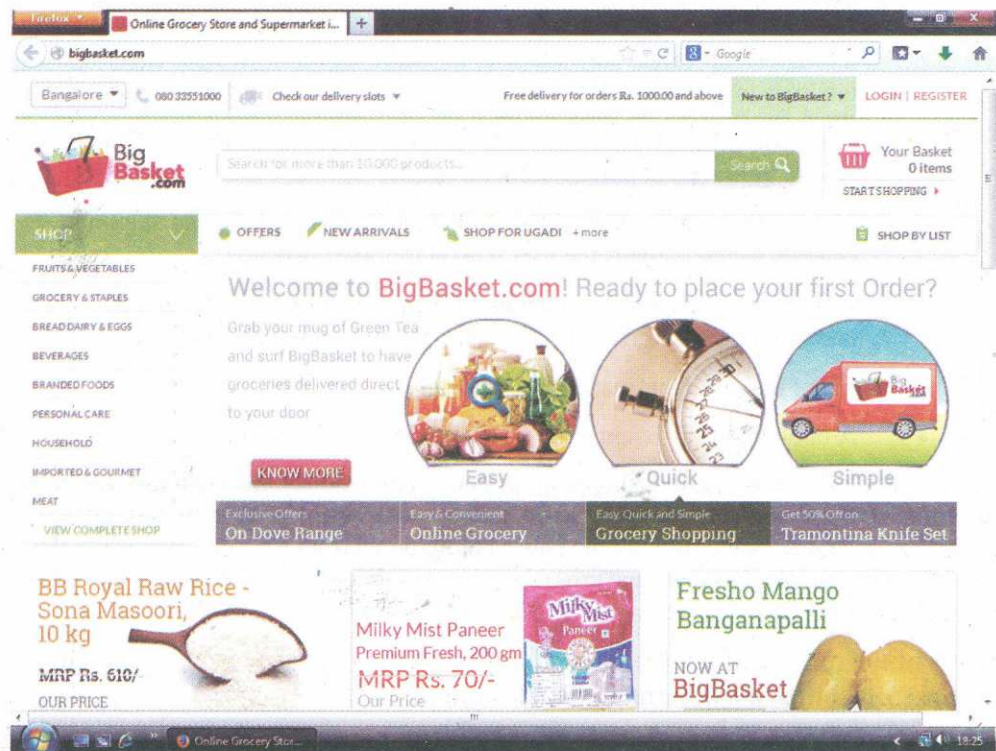


Figure 5.2: Snapshot of <http://www.bigbasket.com>

5.3.1 Shopping Procedure

Figure 5.3 depicts the shopping procedure from online grocery suppliers. Its only illustration and every online grocery supplier may have their own procedure.

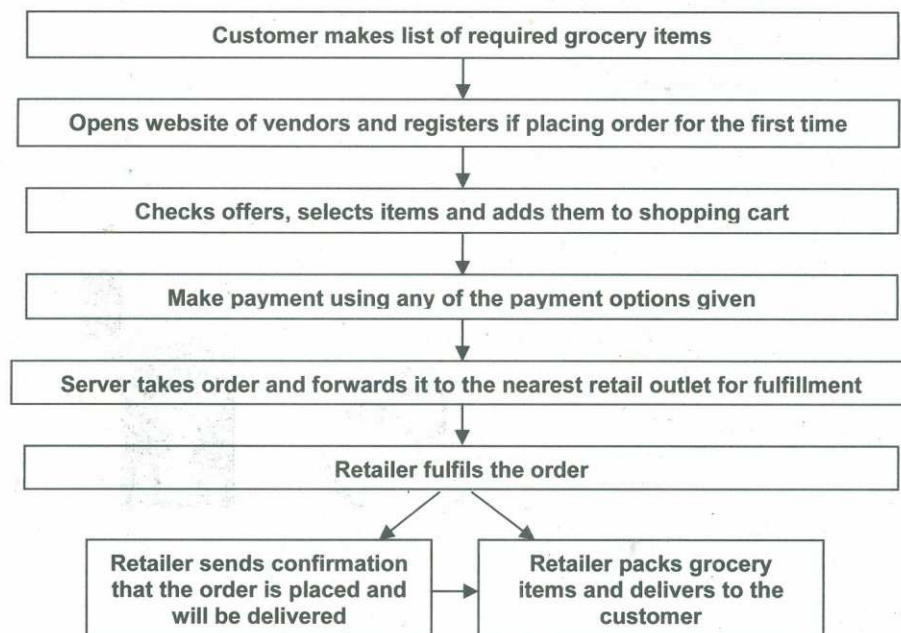


Figure 5.3: Shopping Procedure from Online Grocery Suppliers

5.3.2 Advantages

The following are some of the advantages of Online Grocery Suppliers:

- E-grocery suppliers provide a wide range of products and various payment options.
- It is a big welcome to an easy and relaxed way of browsing and shopping for groceries at customers' comfort.
- The customer can discover new products and get everything right at the doorstep.
- The e-grocer guarantees timely delivery and best quality.
- From the grocer perspective, online selling helps in speedy transactions of grocery items and cash. There is no credit system and payment is at a time and is normally before delivery.
- From the user perspective, free home delivery, time saving and various payment options are the advantages of online grocery shopping.

5.3.3 Disadvantages

However, it is still out of the ambit of online shopping. Online grocers stand in a different line from other e-retailers due to following potential risks:

- Online grocer caters to a specific city or certain areas.
- Online grocer caters Internet savvy customers only.
- Handling perishable products is a big challenge
- Late delivery of goods due to various reasons like traffic etc. can create problems.
- After sales is not convenient like replacement of incorrect product, questions on acceptable quality, etc.
- Buyers still relate groceries with local store and malls.
- Buyers prefer to choose and pick best of fresh products.

5.4 SOFTWARE SUPPLIES AND SUPPORT

With the phenomenal growth of Internet, selling software and providing related support through Internet allows the seller to reach a large computer savvy global market easily, economically and efficiently. Software is being ordered/delivered online and after sales support is also being provided through remote access. Online software supplies and their support contribute significantly to the revenue of the IT companies.

5.4.1 Shopping Procedure

With online software suppliers and support, the entire sale/purchase including delivery of the product is completed with an online transaction. The following is the shopping procedure normally followed:

- Customer logs on to the website.
- Places an order through a secure order form.
- Submits payment information.
- Proceeds to download the purchased software.

5.4.2 Advantages

The following are some of the advantages of purchasing software online:

- It is a great marketing channel for IT companies to market their products.

- By selling through the Internet, software sellers get an easy and cheap distribution channel.
- It eliminates the need to manufacture and store large inventories of shrink-wrapped goods, costly courier/shipping charges. In addition, it also eliminates the need to manage potential back order situations.
- Software buyers get a quick and efficient way of getting software.

5.4.3 Disadvantages

The following are some of the disadvantages of purchasing software online by downloading:

- There may be portability issues as it may not be easy to port it to a machine that is different from the machine to where it is downloaded.
- Chances of online threats such as viruses, malware, etc. increases manifold.
- Not all software products are available for download.
- Bandwidth may become a major constraint as memory size of the software product to be downloaded may be large.

Purchase of software and its online support on a real time basis is a normal way of transaction for IT companies and its users. In the new era of technology, purchase/use of software/applications is a requirement of every individual and with the development in E-commerce, it is accessible to even kids. Hence, its importance in our life cannot be denied. However, one has to be cautious of the disadvantages, risks it has such as viruses, etc. <http://www.microsoftstore.com> (Figure 5.4) is an example of online software supplier.

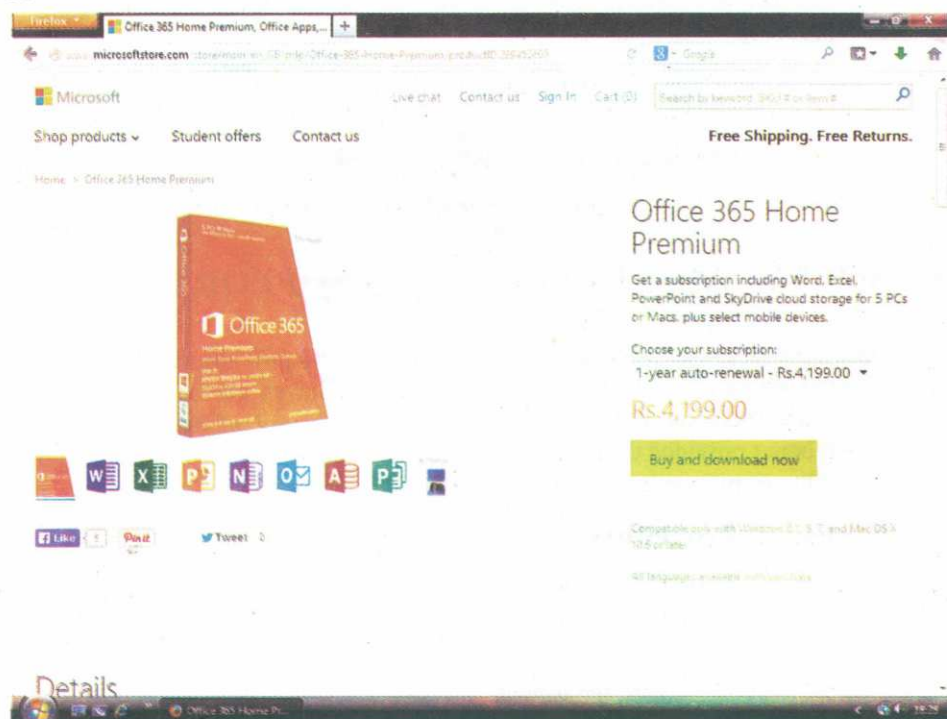


Figure 5.4: Snapshot of <http://www.microsoftstore.com>

5.5 ELECTRONIC NEWSPAPERS

Electronic newspaper is the newspaper which exists on the Internet either separately or as online version of a printed periodical. Online newspapers are becoming more and more popular to news readers who are Internet savvy. Electronic newspaper is normally called e-paper.

5.5.1 Advantages

The following are advantages of electronic newspapers:

- It is accessible 24 × 7. Online newspapers can be read anywhere, anytime.
- Content can be updated any number of times in a day by the online newspaper.
- The reader can select the news of interest and leave the rest.
- Some e-papers are free.
- It is environmental friendly than getting a printed newspaper.
- There is no cluttering in the home.
- It is a reliable source of news information as it is updated at regular intervals.
- It is available to reader before the print version is available due to time consumed in shipping.
- Archives are easily available.

5.5.2 Disadvantages

The following is an important disadvantage of online newspaper:

- A newspaper company should be prepared for reduced revenues if it provides e-paper free of cost.

There are a number of online newspapers available on the Internet which provides up to date news and in depth coverage. With the access of Internet on tablets, smart phones etc. and coupled with the fact that tech savvy people spend significant amounts of time online, popularity of e-papers is increasing rapidly. <http://www.thehindu.com>, <http://www.timesofindia.com> (Figure 5.5) are examples:



Figure 5.5: Snapshot of <http://www.timesofindia.com>

5.6 ONLINE AUCTIONS

In an online auction, the seller sells the product or service to the person who bids the highest price. These auctions facilitate online sale and purchase between the sellers and buyers in different locations or geographical areas.

5.6.1 Online Auction Procedure

Figure 5.6 depicts an online auction procedure:

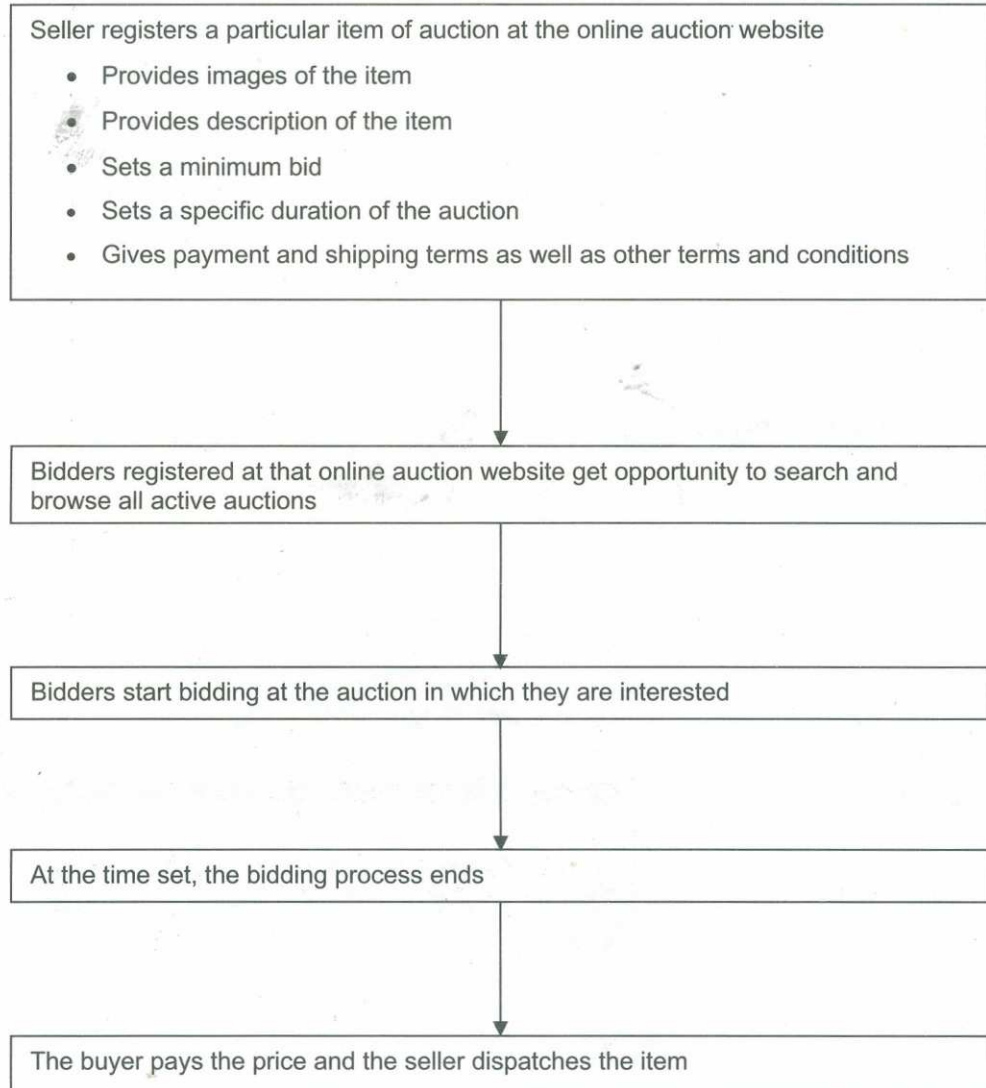


Figure 5.6: Procedure for Online Auction

5.6.2 Advantages

The following are advantages of online auction:

- May get goods cheaply.

Includes a large number of sellers and bidders which encourages a high volume of online business.

5.6.3 Disadvantages

The following are disadvantages of online auctions:

- There are chances of the product being a stolen or pirated one.

- Sellers will not always accept all forms of payment.
- There is always a risk of item not being of the value for which it is bought.

Online auctions are one of the fastest growing segments of online business. Large number of people buy and sell all types of goods on consumer auction sites each year.

<http://www.ebay.com> and <http://www.ubid.com> (Figure 5.7) are examples:

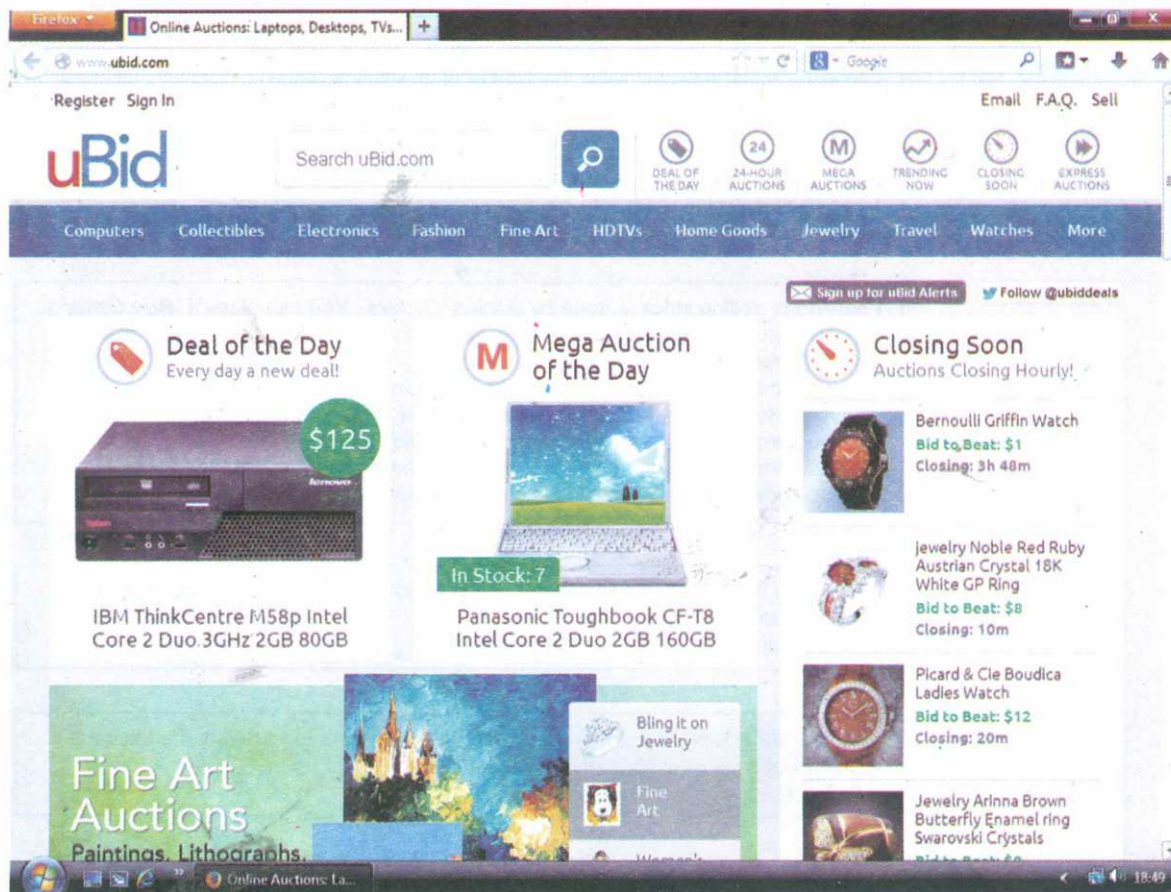


Figure 5.7: Snapshot of <http://www.ubid.com>

5.7 ONLINE TRADING SYSTEM

Online trading in securities refers to the opportunity to an investor to place orders using Internet as trading platform offered by the trading member (broker). The transactions of buying and selling are made through Internet. The investor / trader gets updated information online. It leads to the decrease in the practice of an investor of looking at the share price in the morning newspaper. The transaction is dealt at a price at a moment checked in an online trading platform than issuing instructions for execution to brokers by phone or by person.

Today, practically 99% settlement of shares take place in demat mode only. The physical shares (share certificates) are converted into electronic form and are held in demat account. SEBI (Securities and Exchange Board of India) is the market regulator in India who has made it compulsory to open a demat account if you want to buy/sell shares in Indian stock market.

5.7.1 Online Trading Procedure

Figure 5.8 depicts online trading procedure.

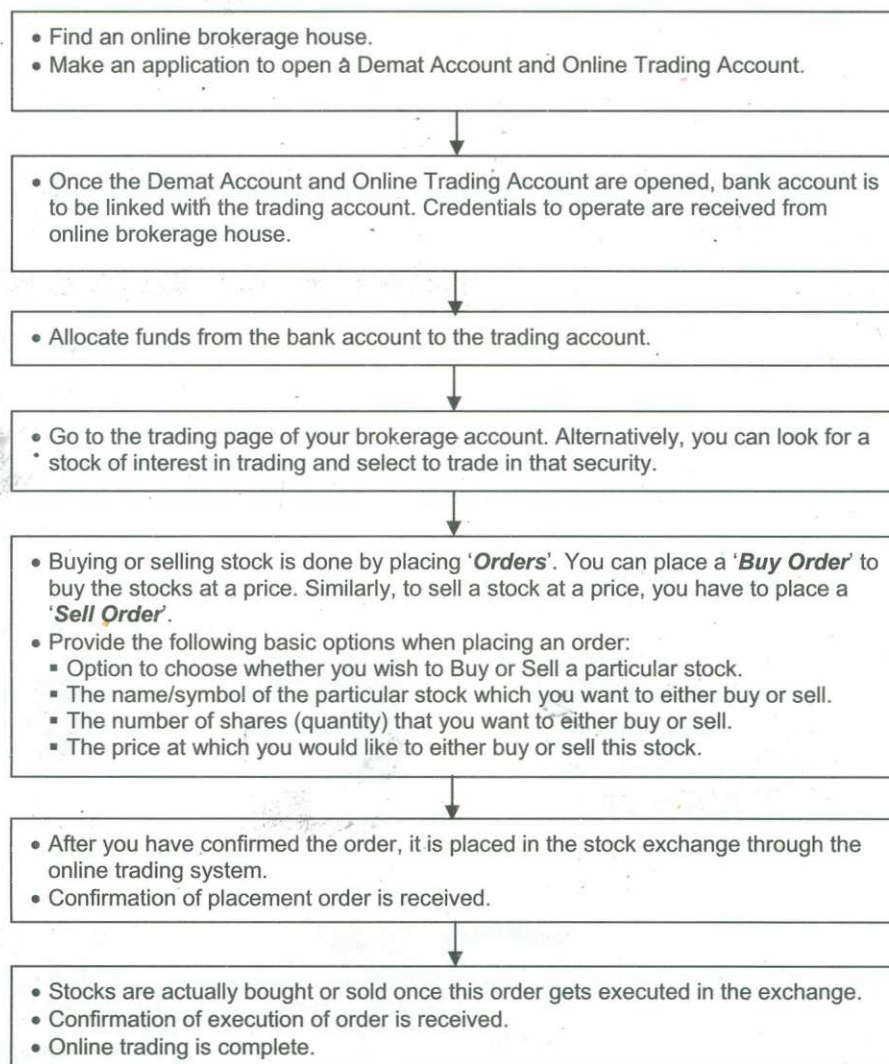


Figure 5.8: Procedure for Online Trading

5.7.2 Advantages

The following are the advantages of online trading:

- It leads to paperless transactions. That is, shares are held in electronic form in the demat account.
- It helps in improving market transparency.
- It helps in smooth market operation while retaining the flexibility of conventional trading practices.
- All the records of transactions are available online.
- The commission costs for trading are policy based rather than person based.
- Investor can manage his own stock portfolios.
- There is free access to high quality research reports generated by financial players.

5.7.3 Disadvantages

The following are the disadvantages of online trading:

- There are chances of losing the trade if online trading system fails.

- The scope of manipulation, speculation and malpractice is more due to the security issues associated with Internet.
- Due to the policy of online brokerage house, some stocks may not be available for trading online for whom the customer needs to contact other brokerage houses.

<http://www.icicidirect.com> and <http://www.sharekhan.com> (Figure 5.9) are examples.

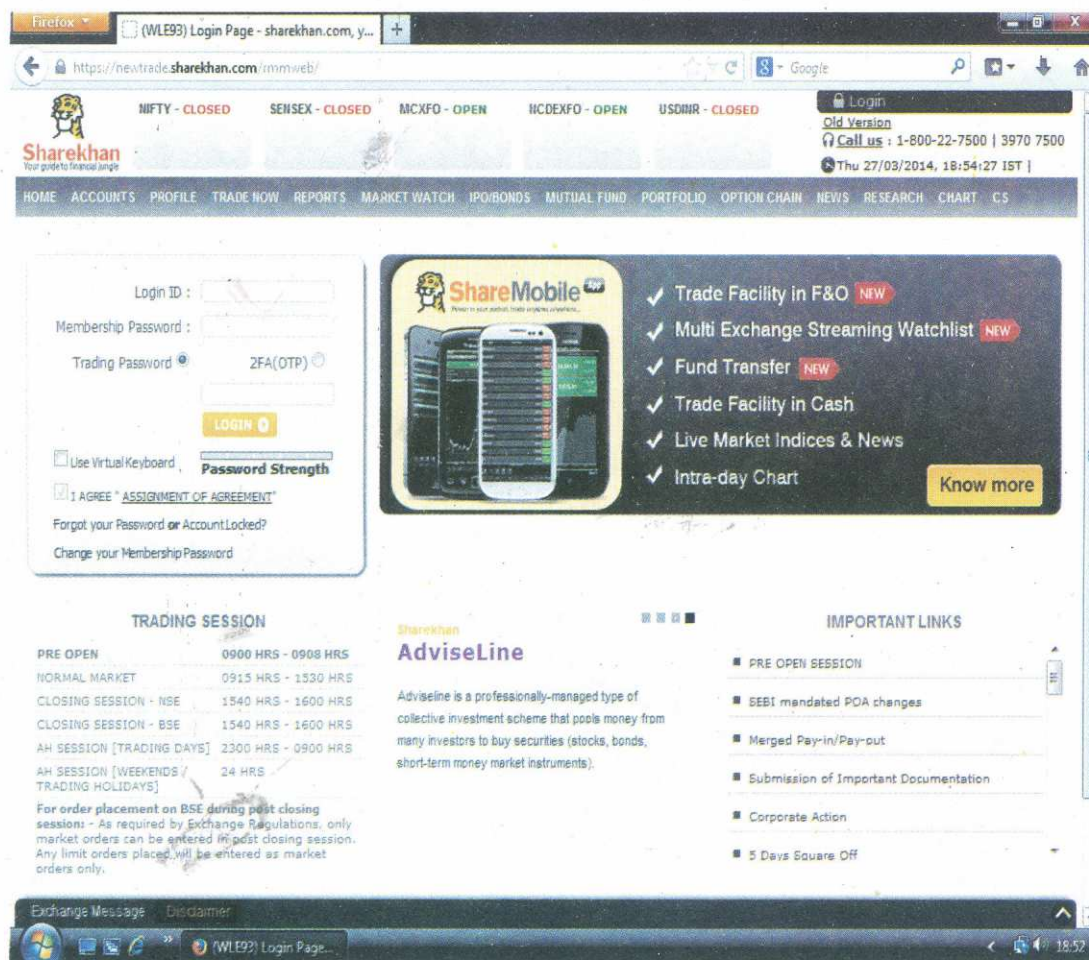


Figure 5.9: Snapshot of <http://www.sharekhan.com>

5.8 SUMMARY

This unit has evaluated the current state of e-commerce by focussing on its diversity in different market areas. The e-commerce market is showing a promising development as there is a tremendous increase in e-commerce turnover. World Internet user population is increasing day by day which further brings immense advantages for e-businesses in different market areas. A well designed portal positively impacts the customer's purchasing intentions and their retentions. With the creativity, market strategies, and the smartness and knowledge of individual customers, e-commerce is expanding to various market areas leading to creation of new standards and diversification.

In this unit, various practices in e-commerce are discussed. Use of e-commerce in different market areas such as Internet based bookshops, online auctions, online software suppliers and support, online grocery suppliers, online trading systems, and electronic newspapers are explained. The procedure for various types of transactions in e-commerce, their advantages and disadvantages are also given.

5.9 FURTHER READINGS

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1. *Electronic Commerce* by Whiteley David;Mc-Graw Hill; 2000.
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3. <http://www.webopedia.com>
4. <http://en.wikipedia.org>

UNIT 6 E-SECURITY AND LEGAL ISSUES

Structure

- 6.0 Introduction
- 6.1 Objectives
- 6.2 Security Concerns in E-commerce
 - 6.2.1 Security Concerns of the Client
 - 6.2.2 Security Concerns of the Communication Channel
 - 6.2.3 Security Concerns of Server
- 6.3 Other Issues in E-commerce Security
- 6.4 Secure Socket Layer (SSL)
- 6.5 Digital Signatures and Firewalls
 - 6.5.1 Digital Signature
 - 6.5.2 Firewalls
- 6.6 Introduction to IT Act, 2000
- 6.7 Cyber Crimes and Cyber Laws
 - 6.7.1 Cyber Crimes
 - 6.7.2 Cyber Laws
- 6.8 Summary
- 6.9 Solutions/Answers
- 6.10 Further Readings

6.0 INTRODUCTION

In today's world, with increasing access to Internet, its use for purchase and sale of goods and services (including after sales support), making payments, sharing of business information, conducting business transactions, electronic banking etc. has grown tremendously. With more and more people becoming computer-savvy, and the Internet growing, e-commerce is fast becoming the default way of doing business. E-commerce has automated the conduct of business between enterprises, suppliers, customers anytime and anywhere.

The success or failure of an e-commerce transaction depends on various factors. But the security of data transmitted is most important. For all the advantages of e-commerce, the major hindrance is threat to security.

People using Internet for commercial transactions always remain at risk of disclosure of their confidential information such as passwords, credit card details etc. Hackers use various techniques to extract personal user information.

6.1 OBJECTIVES

This unit examines the issues related to security of assets and transactions in e-commerce, possible attack scenario in an e-commerce system (cyber crimes), provide preventive strategies including security features (digital signatures, firewalls, SSL) and relevant cyber laws applicable in India.

Hence, after studying this unit, the learner should be able to:

- know the security concerns and issues in e-commerce,
- know about Secure Socket Layer (SSL),
- know about digital signatures and firewalls,
- know about Information Technology Act, 2000, and
- learn about cybercrimes, offences and penalties under the law.

6.2 SECURITY CONCERNS E-COMMERCE

E-commerce security is the protection of e-commerce from unauthorized access, unauthorized usage, unauthorized alteration and unauthorized deletion.

Therefore, the main objectives of security in e-commerce are the following:

- Computer security: Protection of assets from unauthorized access, use, alteration or destruction.
- Physical security: Includes tangible devices for protection.
- Logical security: Protection of assets using non-physical means.
- Threat minimization: Any act or object that poses a danger to computer assets.

An e-commerce system faces large number of threats which create issues and concerns related to its security. Some of these are obvious and others are created and can be understood only by experts. This means that attacks can be directed on a system from many different directions.

Security concerns in e-commerce can be studied from three perspectives as given Table 6.1. E-commerce can be secured if the entire commerce chain is secured. That is, the client computer, the messages travelling on the communication channel and associated servers.

Table 6.1: Security Concerns in E-commerce

Security Concerns of the Client	Security Concerns of the Communication Channel	Security Concerns of the Server
• Active Content • Malicious codes • Masquerading	• Confidentiality • Integrity • Availability	• Web server • Commerce server • Database • Other Credentials

6.2.1 Security Concerns of the Client

Client security means privacy of the client and integrity of his Computer.

Active Content

Amongst various threats, active content is a major area of concern in client security. Active content is the program embedded transparently in web pages which can cause actions to occur. For example, display moving graphics, download and play audio etc. It is used in e-commerce in the form of Java applets, ActiveX controls etc. It creates security risk because malicious programs hidden inside webpage can reveal and destroy the confidential and sensitive information in the form of cookies. These cookies remember user names, passwords, etc. on the client computers.

Another security issue that arises to client and his computer are the viruses, worms and Trojan horses which can create havoc to the systems.

- Virus is a piece of software that is designed to replicate itself by copying itself into other programs stored in a computer which can cause the program to operate incorrectly or corrupt the Computer's memory.
- Worm is software that is capable of reproducing itself. It can also spread from one computer to the next over a network.
- Trojan horse is a program that appears to have a useful function but contains a hidden function which is harmful.
- These viruses can delete stored data or manipulate actual data. Malicious software can damage the system and is a major threat.

Masquerading

Another security concern is masquerading. Masquerading occurs when one person uses the identity of another to gain access to a computer. This may be done in person or remotely. For example, a perpetrator could pretend to be a particular vendor and divert the payment to his own benefit. But, the customer himself could assume a false identity and make an invalid payment which the dealer would not actually receive.

6.2.2 Security Concerns of the Communication Channel

Another major concern in any e-commerce application is the security of the communication channel. That is, the security of the message when it passes through the Internet. This is probably the most obvious issue for e-commerce applications since the amount and severity of cyber-attacks are increasing. The data/message being transferred through the network must be secured from any unauthorized disclosure and alterations. Any theft of sensitive or personal information may become a significant danger. Replaying old messages, tapping of communications, unauthorized changes to messages, misuse of remote maintenance accesses are the dangers to the communication channel.

6.2.3 Security Concerns of Server

Another major concern in any e-commerce application is the security of the web server, commerce server and databases. Database contains valuable and sensitive information. Any loss or manipulation of stored data can create irreparable damages. The server is required to be protected from break-ins, site vandalism, and denial of service attacks. The more complex software becomes, the higher is the probability that errors exist in the codes. Revelation of server's folder names to a web browser leads to breach of confidentiality.

6.3 OTHER ISSUES IN E-COMMERCE SECURITY

E-commerce security has the following main aspects: (i) Privacy, (ii) integrity, (iii) availability, (iv) authenticity and (v) non-repudiation of the parties to the e-commerce transaction. To deploy a fully secured e-commerce environment, it is essential to consider all the above mentioned aspects while implementing the information security policy.

The elements associated with e-commerce security are explained below:

Privacy/Confidentiality

Privacy/confidentiality is the extent to which individuals/businesses make personal/confidential information available to other individuals and businesses. With any business, confidential information must remain secure and only be accessible to the intended recipient and should not reach to unauthorized people.

However, this becomes increasingly difficult when dealing with e-businesses specifically. It is essential to secure data storage and data transmission of such information.

Integrity

Integrity is the assurance that the data is consistent and correct. When the data is transmitted over the Internet, there is a possibility of the tempering of data intentionally or unintentionally. Data integrity may be compromised in a number of ways due to human errors, hardware malfunction, natural disaster, bugs in software, and virus etc. In any e-commerce process, data integrity is of major concern as the information being transmitted over the Internet is not altered in any way by any unauthorized party and the data received is same as the data sent. Integrity involves maintaining the consistency, accuracy, and trustworthiness of data over its entire life cycle. Integrity is violated when data received is not as that has been sent.

Availability

Availability is the assurance that the e-commerce site continues to function as intended. It needs to be ensured that the data associated with e-commerce transactions is easily accessible. Lack of availability of data could be due to network failure, transmission errors, etc.

Authenticity

Authenticity is the ability to verify the identity of a person, entity or website with whom the transaction is to be made. It is an integral component of e-commerce as it ensures the genuineness of parties, electronic documents, transactions and data. It is important to verify that all parties in a transaction are who they claim to be and are duly authorized to perform the same. Identity can be checked by digital signatures, certificates, biometrics, retinal scan etc. Such authenticity helps to reduce instances of fraud.

Non-Repudiation

Non repudiation is the ability to ensure that the parties in ecommerce transactions do not deny their online actions. It is a guarantee that the sender of a message cannot later deny, having sent the message and the recipient cannot deny, having received the message. This assurance makes the online transaction complete and plays a major role in e-commerce. The responsibility of submitting or receiving an electronic message is accepted by the sender and receiver, thereby protecting them against any false assertions made later. E-commerce utilizes technology like encryption and digital signatures to establish non-repudiation in a transaction.

☛ Check Your Progress 1

1. _____ refers to preventing unauthorized data modification.
2. Secrecy is the prevention of unauthorized disclosure of information. (True/False).
3. Process to verify the real identity of an individual, computer or e-commerce website is known as _____.

6.4 SECURE SOCKET LAYER

SSL is a web security protocol developed by Netscape. It operates between the application and transport layers. It is commonly used to manage the security of message transmission on the Internet. It establishes an encrypted link between a web server and a web browser to exchange sensitive information. It secures the data during online transactions or when transmitting confidential information. It is a solution to

authentication, privacy and integrity problems and avoids attacks. SSL has been universally accepted on the World Wide Web (www). SSL authenticates servers and users. It establishes encrypted link to hide the data transmitted thus leading to data integrity.

The following are the characteristics of SSL:

- It operates at TCP/IP transport layer,
- It uses a dedicated TCP/IP socket,
- It encrypts the communications between the server and client when connection is established, and
- It requires a server certificate.

Figure 6.1 depicts a SSL handshake:

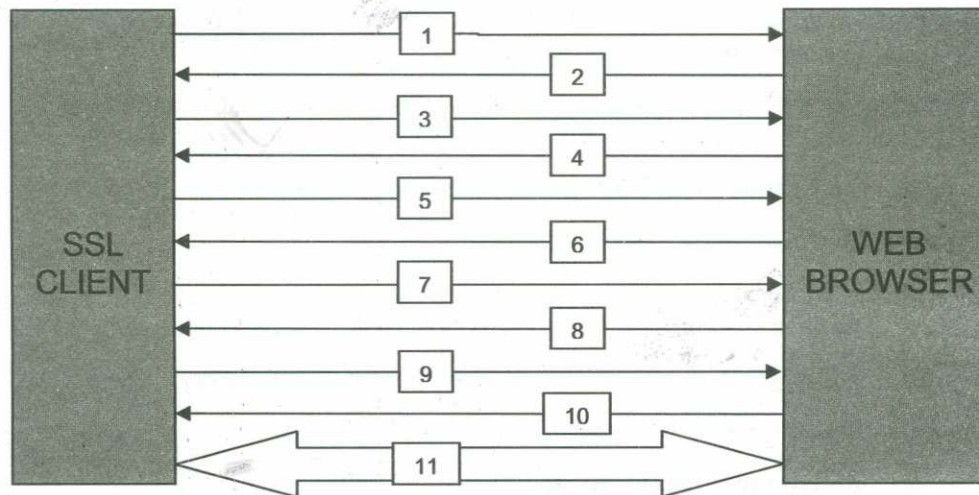


Figure 6.1: SSL Handshake

The following are various steps of SSL handshake:

1. SSL client attempts to connect to a SSL server (website secured with SSL) by sending a *client hello* message.
2. Web server responds with a *server hello*.
3. Client requests web server to prove its identity.
4. Web server sends a copy of its SSL certificate to authenticate its identity to client.
5. Client verifies it. Accordingly, it sends a message to the server.
6. If the server requires client authentication, it asks for "client certificate request".
7. Then the client sends its certificate.
8. SSL server verifies the signature on the client certificate.
9. Client sends a digitally signed acknowledgement to start sharing.
10. Server sends a digitally signed acknowledgement to start sharing.
11. The data in encrypted form is shared between the server and browser and a secured session starts that protects message privacy, integrity and security. A secure session starts between server and client enabling data to be transmitted in encrypted form, thus ensuring privacy, integrity and security.

6.5 DIGITAL SIGNATURES AND FIREWALLS

This section deals with digital signatures and firewalls.

6.5.1 Digital Signature

Digital signature authenticates the identity of the sender of a message or signature holder of the document. It ensures that the contents of the message are intact. The sender cannot repudiate it later on. Digital Signatures are easily transportable. They cannot be imitated. They can be automatically time stamped.

As per Information Technology Act, 2000, Digital Signature may be defined as authentication of any electronic record by a subscriber by means of an electronic method or procedure in accordance with the provision of concerned sections of the Act.

IT Act provides the conditions subject to whom any electronic record(s) may be authenticated by means of affixing digital signature.

TCS, Safescrypt and MTNL are some of the digital signature certifying authorities in India licensed by the Controller of Certifying Authorities, Government of India.

The following are various steps in the working of a digital signature:

- (a) Sender creates the message (electronic record).
- (b) Electronic record is converted into message digest by using a mathematical function known as hash function (which freezes the message).
- (c) The message digest is encrypted with the sender's private key.
- (d) Sender sends the message.
- (e) Receiver receives the message.
- (f) Receiver decrypts the message by the sender's public key.
- (g) Receiver verifies the message.

6.5.2 Firewalls

Firewall is a hardware or software based security system that filters the packets and prevents some packets from entering the network based on a security policy. A firewall allows to establish certain rules to determine what traffic should be allowed in or out of the private network. All data entering or leaving the Intranet pass through the firewall, which examines each packet and blocks those that do not meet the specified security criteria. It acts as a gatekeeper and protects a computer network from unauthorized and malicious access.

A firewall may be hardware or software or both.

- Hardware firewalls can be found in broadband routers and is an important part of network setup. It protects Computer on the local network. Software firewalls are installed on the Computer and can be customized to incorporate protection features.

The following are four mechanisms used by firewalls (refer to Table 6.2):

- Packet filter firewalls
- Stateful inspection firewalls
- Proxy server firewalls, and
- Application level firewalls.

Table 6.2: Mechanisms used by Firewalls

Basis	Packet Filter Firewalls	Stateful Inspection Firewalls	Proxy Server Firewalls	Application Level Firewalls
Evaluation	Evaluates the headers of incoming and outgoing packets.	Evaluates the state of TCP connection.	Acts as intermediary between internal and external IP addresses & blocks direct access to internal network	Include filtering capabilities and additional validation of packet content based on the application.
Usage	Used in small office/home office (SOHO) and operating systems	Inbound network traffic	Domain name servers, mail servers and web servers.	Telnet, FTP, and HTTP
Advantages	Faster performance than application firewalls. Effective and transparent to users.	Faster performance than application firewalls.	Effectively hides true network addresses.	Packets are evaluated completely.
Disadvantages	Does not support advanced user authentication.	More complex than other firewalls, and incompatible with some protocols.	Incompatible with all network protocols, and configuring these proxies is difficult.	Time taken for evaluating each packet slows network traffic, and limited support for new network applications is provided.

In practice, many firewalls use two or more of these techniques in concert. A firewall is considered as first line of defense in protecting private information. For greater security, data can be encrypted.

6.6 INTRODUCTION TO IT ACT, 2000

Information technology generates information by processing data. It gives rise to a variety of legal problems. For dealing with legal problems, some countries have enacted specific legislation. In India, the Information Technology Act (IT Act) was passed on 17th October, 2000.

It Act was amended on 27th October 2009. Amended Act is known as The Information Technology (Amendment) Act, 2008.

The following are some of the objectives of IT Act:

- To provide legal recognition to transactions carried out by means of EDI and other means of electronic communication.
- To facilitate electronic filing of documents with government agencies.
- To amend Indian Penal Code, Indian Evidence Act, 1872, etc. to bring electronic documentation within the purview of the respective enactments.

The following are some of the issues dealt by the IT Act:

- Legal Recognition of Electronic Documents.
- Legal Recognition of Digital Signatures.
- Offenses and Contraventions.

Recognition to Electronic Records

IT Act grants legal recognition to electronic records. It states that "if any information is required in printed or written form under any law, the Information

provided in electronic form, which is accessible so as to be usable for subsequent use, shall be deemed to be lawful.”

Thus, electronic record practically equates with the manual or typed record and e-mail is a valid legal form of communication in our Country that can be duly produced and approved in a court of law.

Legal Recognition of Digital Signatures

As per IT Act, whenever any law requires that information or any other matter shall be authenticated by affixing the signature of any person, then such requirement shall be satisfied if it is authenticated by means of digital signatures affixed in such manner as may be prescribed by the Central Government. Hence, digital signatures have been given legal validity and sanction in the Act.

Use of Electronic Records in Government and Its Agencies

As per IT Act, wherever any law provides for filing of any form, application, issue of any license permit, etc. or receipt or payment of money, then, notwithstanding anything in that law, the information provided in electronic form shall be deemed to be lawful. Government can prescribe the manner and formats in which such records shall be filed and the manner of payment of fees or charges for the same.

Retention of Electronic Records

As per IT Act, records can be retained in electronic form so as that it remains accessible for subsequent use, in the format which it was originally generated and provide for the identification origin, destination, date and time of dispatch or receipt of that record. Hence, companies can carry out commerce using the legal infrastructure provided by the Act. Act now allows Government to issue notification on the web thus emphasizing e-governance.

6.7 CYBER CRIMES AND CYBER LAWS

With the growth of cyber space and the onset of Internet, cyber crimes have also grown. To tackle these cybercrimes, IT Act was passed in 2000.

However, the term cyber crime is neither defined in Information Technology Act 2000 nor in any other legislation in India. In common parlance, one can say that, it is just a combination of crime and computer. To put it in simple terms ‘any offence or crime in which a computer is used is a cyber crime’.

Cyber crimes are referred to any act of causing financial, emotional or psychological distress to any other party with the use of computer or cyber medium. It includes hacking, spams, pornography, etc. Now, let us discuss various facets of cyber crimes in detail.

6.7.1 Cyber Crimes

Cyber crimes can be classified on the following basis:

Against Person

- Harassment via e-mails: Repeatedly sending abusive messages via email.
- Cyber stalking: Use of Internet to stalk someone like online harassment and online abuse.
- Email spoofing: Emailing messages with a forged sender address.
- Unauthorised control/access over computer system.
- Publishing/transmitting of obscene material.
- Cyber defamation: causing injury to the reputation of a person with the help of Internet by floating/publicizing negative messages.

- Cheating and fraud: Any deliberate deception for unfair or unlawful gain online is fraud. Examples are no delivery of paid products purchased online, misrepresentation of a product advertised for sale, and fraudulent promises for investment in securities.

Against Property

- Transmitting virus.
- Computer vandalism: Malicious attack on the software, stealing information, hacking or destroying the Computer.
- Unauthorized control/access of Computer system.
- Intellectual property crimes: Patent violations, copyright infringement, trademark violations, etc.

Against Government/Corporate Entities

- Possession of information in an unauthorized manner.
- Cyber terrorism: Use of Internet for terror activities.
- Distribution of pirated software.

Against Society at Large

- Pornography.
- Polluting the youth through indecent exposure.
- Financial crimes.
- Sale of illegal articles like narcotics, weapons, etc.
- Online gambling.
- Forgery – Manipulations in mark sheets, currency notes etc with the use of information technology.

Table 6.3 lists various cyber offences and contraventions with related penalties under the IT Act.

Table 6.3: Cyber Offences and Penalties

	Cyber Offences and Contraventions	Related Section under the IT Act, 2000 (as Amended till Date)	Related Penalties under the IT Act, 2000 (as Amended till Date)
a.	Tampering with Computer source documents.	Section 65	Imprisonment up to three years or fine up to two lakh rupees, or both.
b.	Hacking the Computer system.	Section 66	Imprisonment up to three years or with fine which may extend up to 5 lakh rupees or both.
c.	Sending offensive or false messages through communication service, etc. It is also known as cyber stalking.	Section 66A	Imprisonment up to three years and with fine.
d.	Dishonestly receiving stolen computer resource or communication device.	Section 66B	Imprisonment up to three years or fine up to rupees one lakh or both.
e.	Identity theft: Fraudulently or dishonestly make use of the electronic signature, password or any other unique identification feature of any other person.	Section 66C	Imprisonment up to three years or fine up to rupees one lakh.
f.	Cheating by impersonation by using computer resource.	Section 66D	Imprisonment up to three years and fine up to one lakh rupees.

g.	Violation of privacy: Intentionally or knowingly captures, publishes or transmits the image of any person without his or her consent, under circumstances of violating the privacy of that person.	Section 66E	Imprisonment up to three years or fine up to two lakh rupees or both.
h.	Cyber terrorism: Whoever uses cyber space with intent to threaten the unity, integrity, security or sovereignty of India or to strike terror in the society or any section of the people.	Section 66F	Imprisonment which may extend to life imprisonment.
i.	Publishing or transmitting obscene material in electronic form	Section 67	First conviction: Imprisonment up to three years and with fine up to five lakh rupees. Subsequent conviction: Imprisonment up to five years and with fine up to ten lakh rupees.
j.	Publishing or transmitting of material containing sexually explicit act, etc. in electronic form	Section 67A	First conviction : Imprisonment up to five years and with fine up to ten lakh rupees. Subsequent conviction: Imprisonment up to seven years and fine up to ten lakh rupees.
k.	Publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form	Section 67B	First conviction: Imprisonment up to five years and fine up to ten lakh rupees. Subsequent conviction: Imprisonment up to seven years and fine up to ten lakh rupees.
l.	Preservation and retention of information by intermediaries: Intermediary shall preserve and retain such information as may be specified for such duration and in such manner and format as the Central Government may prescribe.	Section 67C	Imprisonment up to three years and fine.
m.	Misrepresentation about suppress a material fact from the Controller or Certifying Authority for obtaining digital signatures	Section 71	Imprisonment up to two years or fine up to one lakh rupees or both.
n.	Breach of confidentiality and privacy: Securing access to any Computer, system or network	Section 72	Imprisonment up to two years or fine up to one lakh rupees or both.
o.	Disclosure of information in breach of lawful contract	Section 72A	Imprisonment up to three years or fine up to five lakh rupees or both.
p.	Knowing, creating, publishing etc. of a Digital Signature Certificate for any fraudulent or unlawful purpose	Section 73	Imprisonment up to two years or fine up to one lakh rupees or both.

6.7.2 Cyber Laws

The Indian Penal Code, 1860

Relevant sections dealing with records and documents with strong legislation covering substantive criminal law was amended with the introduction of IT Act, 2000. The word 'electronic' was inserted thereby treating the electronic records at par with physical records.

The Indian Evidence Act, 1872

Another legislation amended by the IT Act was Indian Evidence Act. Prior to IT Act, all evidences in the courts were in physical form only. Now, evidence can be presented in electronic form also.

Hence, electronic records were made admissible as evidence.

With the passing of IT Act, the provisions of Bankers' Books Evidence Act were also amended to include printout from a computer system or disc as a valid document and evidence, provided, it is accompanied by a certificate stating that it is a true extract from the official records of the bank and that such entries or records are from a computerised system with data integration.

The Reserve Bank of India Act, 1934

The Reserve Bank of India Act, 1934 was amended to insert a clause relating to the regulation of funds transfer through electronic means between banks (i.e. transactions like RTGS and NEFT and other fund transfers) to facilitate EFT and ensure legal admissibility of documents and records therein.

☛ Check Your Progress 2

1. Sending offensive or false messages through communication service, etc is known as _____.
2. Electronic record is admissible evidence in the court of law. (True/false).
3. Causing injury to the reputation of a person with the help of Internet by floating/publicizing negative messages is known as _____.

6.8 SUMMARY

In this unit, lines we discussed the issues related to security concerns to the client, communication lines and server in an e-commerce process. The five aspects of a secured e-commerce transaction, namely, confidentiality, integrity, availability, authenticity and non-repudiation are also discussed. Security features such as digital signatures, firewalls and SSL are explained. Finally, some of the cyber crimes and cyber laws applicable in India (as per Information Technology Act, 2000) are given in the form of a table.

6.9 SOLUTIONS/ANSWERS

Check Your Progress 1

1. Integrity
2. True
3. Authentication

Check Your Progress 2

1. Cyber stalking
2. True
3. Cyber defamation

6.10 FURTHER READINGS

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UNIT 7 M-COMMERCE

Structure

- 7.0 Introduction
- 7.1 Objectives
- 7.2 Benefits of M-Commerce
- 7.3 Impediments of M-Commerce
- 7.4 M-Commerce Framework
- 7.5 M-commerce Application Flow
- 7.6 Emerging Trends in M-Commerce
- 7.7 Summary
- 7.8 Solutions/Answers
- 7.9 Further Readings

7.0 INTRODUCTION

M-commerce stands for Mobile Commerce. This section elaborates the concepts of m-commerce. M-commerce is all about doing commerce transactions through mobile devices. Surveys and estimates indicate that nearly half of all commerce transactions will happen from mobile devices in near future. Explosion and popularity of mobile devices provide huge opportunities for business enterprises and consumers to sell and purchase on-the-go using mobile devices such as PDA, smart phones and other hand-held devices. M-commerce is making the *commerce anywhere anytime* concept a reality using a host of technologies which are discussed in later sections.

Figure 7.1 depicts the outlook for m-commerce as per the forecast of research and analysts.



Figure 7.1: Outlook for M-Commerce

M-commerce involves performing financial or commerce transactions over wireless and mobile devices which involve exchange of goods, services and information between end consumers and merchants.

Key Drivers for M-Commerce

The following are the key drivers of m-commerce:

- **Popularity of mobile devices:** Hand held devices are quickly overtaking the traditional desktops and laptops and are becoming the primary channel for access.

- **Wireless bandwidth advancements:** Mobile devices can now leverage enhanced bandwidths offered by 3G (Third generation) and 4G networks in addition to Wi-Fi and Wi-Max technologies.
- **Location based services:** M-commerce also offers unique ability to get the offers and promotions based on the current location of the subscriber.
- **Convenience and affordability** of mobile devices.

Technology Enables

The following are the main technology components which help perform the commerce transactions using mobile devices:

- **GPRS (General Packet Radio Service)** offers band width between 9.6 kbps and 115 kbps via GSM network and enables simultaneous receiving and transmission. It is essentially a packet switching wireless protocol which enables continuous connectivity for mobile devices.
- **WAP (Wireless Application Protocol)** is a protocol that involves Wireless Markup Language (WML). Like HTML, it provides support for text and image presentation, etc. for mobile devices.
- **W-CDMA (Wideband Code Division Multiple Access)** offers 2 Mbps bandwidth approximately.
- **UMTS (Universal Mobile Telecommunications System)** also known as 3G network which offers 2 Mbps approximately for both up-linking and down-linking.
- **Satellite based communication** provides wide coverage over various geo locations.

There may be variations to the bandwidths indicated above.

Attributes of M-Commerce

The following are the attributes of m-commerce:

- **Ubiquity:** Transaction service access from anywhere in real-time. Weather and stock updates are examples.
- **Convenience:** Mobile devices enable access from anywhere and anytime.
- **Interactivity** achieved through responsive user experience.
- **Personalization:** Possible to personalize the experience based on user identification and preference as well as location. Flashing relevant advertisements and recommendations are examples.
- **Context-aware localization:** Using GPS (Global Positioning System) and triangulation techniques it is possible to identify the location of the user and push relevant promotions and offers. Directory services are an example.

7.1 OBJECTIVES

After going through this unit, you should be able to

- understand key concepts of m-commerce,

- know the benefits and challenges of m-commerce,
- know the m-commerce framework, and
- know the emerging trends of m-commerce.

7.2 BENEFITS OF M-COMMERCE

The following are some of the benefits of m-commerce:

- Timely and on-the-go access to information such as stock quotes during travel.
- Enables purchase of products any time anywhere.
- Availability of location based promotions and sales offers.
- Opportunity to use mobile device for instant payments.
- Mobile technology covers wider distance and enhances the reach of potential customers.
- Many vendors are pushing deals to encourage m-commerce which can be leveraged by customers.
- Reduces overall transaction cost through streamlined business processes and offers competitive price to customers.

The four main categories of benefits of m-commerce are shown in Figure 7.2.

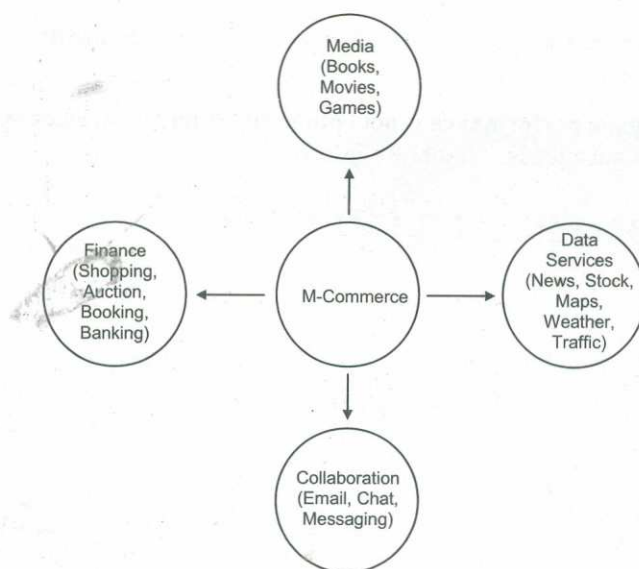


Figure 7.2: Benefits of M-commerce

The following is the list of some of the prominent m-commerce services available:

- Mobile money transfer,
- Mobile ticket delivery,
- Mobile coupons,
- Mobile banking,
- Mobile auctions,
- Mobile shopping, and
- Mobile marketing

Check Your Progress 1

1. _____ attribute of m-commerce helps mobile users to access service anywhere in real time.
2. Pushing personalized and user relevant content is known as _____.
3. Four main categories of m-commerce include _____.

7.3 IMPEDIMENTS OF M-COMMERCE

Though m-commerce is a promising technology, there are few challenges which are preventing it from wider adoption. Some of the prominent impediments are given below.

- **Mobile security:** This is one of the prime concerns which is further increased due to the transactions happening over wireless networks. Similarly, the security issues related to mobile payment systems is another limitation.
- **Mobile network coverage and bandwidth:** Wireless networks offering high bandwidths are not available in all areas posing challenges to commerce transactions.
- **Mobile experience:** Due to the wide variety of mobile devices, operating systems and device form factors, it requires a design that leads to robust user experience that caters to consumers of all these devices. Applications not conforming to standards pose challenges across various mobile platforms.
- **Screen size** is limiting user experience.
- **Interoperability** across multiple networks, protocols and devices also pose challenges.
- **Web page performance** is not optimized for mobile devices resulting in slower page loads on mobile platforms.

7.4 M-COMMERCE FRAMEWORK

A m-commerce framework is given in Figure 7.3.

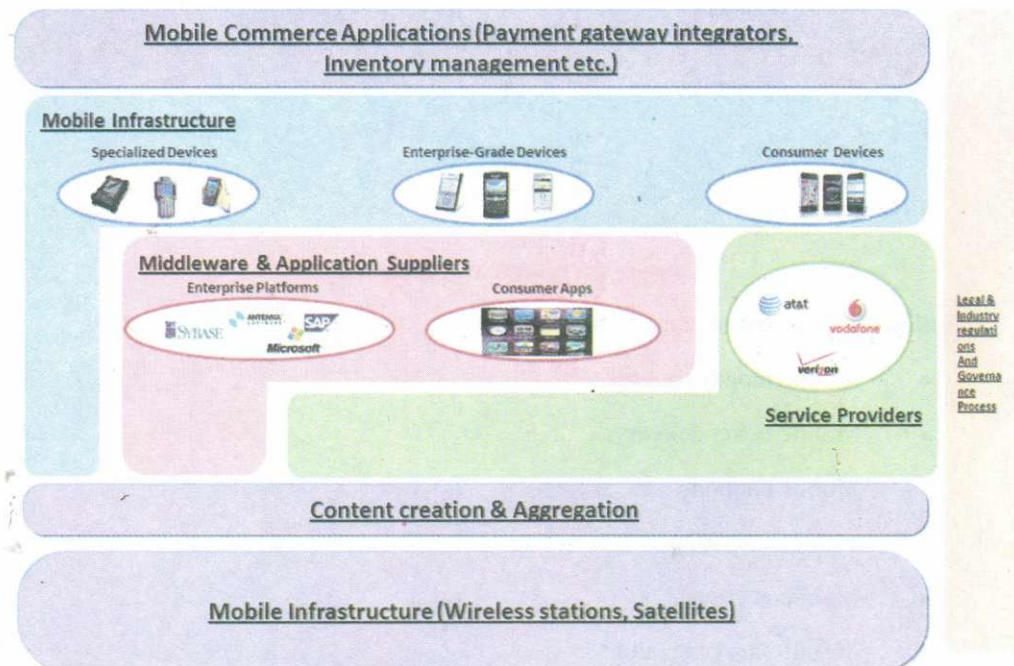


Figure 7.3: M-commerce Framework

- **Mobile infrastructure:** It includes sufficient cell towers to provide wide coverage and sufficient network bandwidth for users to have smooth e-commerce transactions. 3G networks provide bandwidth sufficient for most of the m-commerce transactions. The mobile infrastructure should also provide robustness in providing seamless switch over to heterogeneous networks. It also provides multicast support and user access to multiple networks.
- **Content creation and aggregation:** This layer is responsible for generating the content used for m-commerce transactions. The content could be stored locally such as marketing campaigns, promotion materials, targeted ads and emails or the content could be aggregated from multiple sources.
- **Mobile middleware:** Lot of enterprise vendors such as SAP, Microsoft provide middleware software for m-commerce. This layer consists of various tools and technologies to perform following functions:
 - Maintaining a device repository of all mobile devices.
 - Using device repository for providing most optimal user experience and navigation experience.
 - Enforce device specific policies.
 - Provide network optimization techniques such as compression etc. to improve response times and reliability.
- **Service providers:** These operators are responsible for maintaining the quality of mobile service such as bandwidth, coverage, availability, reliability and scalability. Some of the popular service providers include Airtel, Vodaphone, AT&T and Verizon, etc.
- **M-commerce applications:** These are the applications running on mobile devices. The applications can be of two types: Native applications for targeted mobile platforms or browser based applications. With the emergence of HTML5 and CSS3 standards and in addition to responsive web design (RWD) concepts, more and more commerce applications are becoming browser based. The applications include selling/buying product, mobile inventory management, payment gateway integrations, etc.
- **Legal and industry regulation and governance process:** This layer consists of various processes to comply with regulations at both national and international levels.

7.5 M-COMMERCE APPLICATION FLOW

Figure 7.4 depicts the flow of an m-commerce application.

M-commerce application flow with reference to Figure 7.4 is explained below:

1. End user uses one of the mobile devices to perform a e-commerce transaction such as buying the product.
2. The transaction is supported by the wireless network provider by providing wireless network bandwidth and signal coverage.
3. The mobile request will then be intercepted by mobile middleware. The mobile middleware authenticates the user and the web site through validation of certificate. It also optimizes the rendition using device specific policy as well as experience using its rich device repository

4. The request reaches the e-commerce store which does a variety of tasks:

- Gets the inventory and pricing information from internal ERP systems.
- Gets the product metadata from product database.
- Gets product attributes from product catalogue.
- Uses payment gateway to execute the financial transaction.

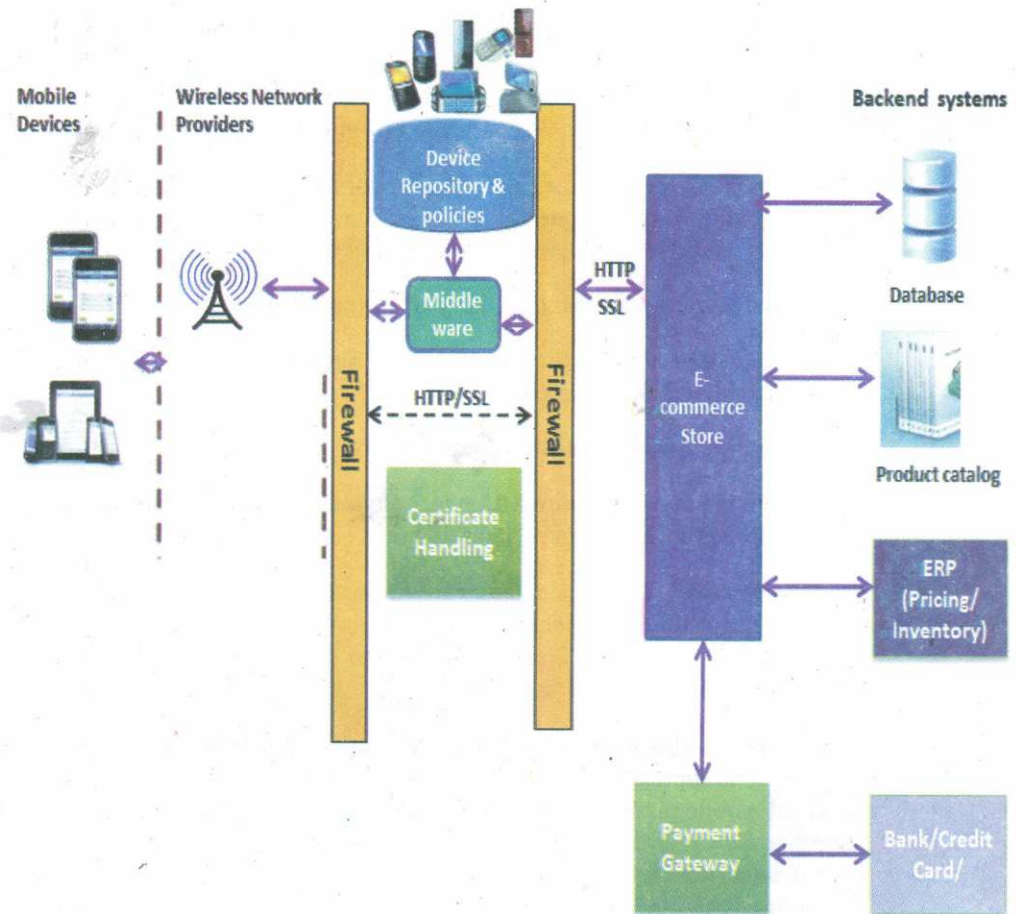


Figure 7.4: M-commerce Application Flow

7.6 EMERGING TRENDS IN M-COMMERCE

The following are some of the emerging trends in the space of m-commerce:

- **M-wallet:** Using mobile devices for various ranges of financial transactions.
- **Near Field Communications (NFC)** enable radio communication between smart phones and other similar devices which are in proximity (normally not more than a few inches) or when they touch each other.
- **Mobile coupons** are expected to become popular at retail stores.
- Majority of **purchase decisions may be done via mobile phones** during shopping. It includes product research, product comparison etc.
- **Mobile shopping** is going to play a major role in the shopping space.
- **In-store personalization** based on mobile app which indicates the available sales and acts as a smart store guide.

- Taking off of **Mobile first strategy** wherein the enterprises design their online strategy predominantly around mobile devices first making the user experience on mobile devices more friendlier.
- **Social commerce** enablement through mobile devices.
- **Mobile inventory management** using RFID on products and track the inventory in real time.

☞ Check Your Progress 2

1. Device recognition feature is provided by _____ in m-commerce framework.
2. Exchange of data between mobile devices located in proximity is known as _____.

7.7 SUMMARY

In this unit, we started discussing the broad trends and outlook of m-commerce. We then discussed the benefits of m-commerce and the current challenges. We also saw various layers in m-commerce framework and the flow of control and data for a e-commerce transaction. With the increasing number of mobile users, more and more services are being offered in the mobile space. People want to perform maximum transactions using their mobile devices.

7.8 SOLUTIONS/ANSWERS

Check Your Progress 1

1. Ubiquity.
2. Context-aware localization.
3. Media, finance, collaboration and data services.

Check Your Progress 2

1. Mobile middleware layer.
2. Near-Field Communications.

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UNIT 8 ONLINE SHOPPING PORTAL: AN E-COMMERCE CASE STUDY

Structure

- 8.0 Introduction
- 8.1 Objectives
- 8.2 Online Shopping Portal: An E-Commerce Case Study
 - 8.2.1 Business Scenario
 - 8.2.2 Main Functionalities
 - 8.2.3 Architecting Online Shopping E-commerce Portal
 - 8.2.4 Designing Online Shopping E-commerce Portal
 - 8.2.5 User Experience of Online Shopping E-commerce Portal
 - 8.2.6 Conformance to QoS Standards
- 8.3 Popular E-Commerce Sites

8.0 INTRODUCTION

This unit discusses a real-world e-commerce case study detailing the requirement of a typical B2C ecommerce system and then explains the design/implementation approach of it. The unit also describes few popular e-commerce web sites along with their salient features. There are abbreviations used in this unit. The expanded forms are not indicated for all the abbreviations.

8.1 OBJECTIVES

After going through this unit, you should be able to know the

- terminology of e-commerce,
- advantages and limitation of e-commerce, and
- terminology of m-commerce.

8.2 ONLINE SHOPPING PORTAL: AN E-COMMERCE CASE STUDY

This case study is about architecting and designing an online shopping application which offers various items such as books, apparels, electronic items etc. for web users. This case study show cases most of the e-commerce features in B2C space.

8.2.1 Business Scenario

A team of entrepreneurs want to develop an online shopping application which provides seamless advantage for web users to provide a “single-stop-shop” e-commerce experience for all its customers. The team is planning to launch the e-commerce application in a developing economy in which the tech-savvy population who are ready to trust and transact in online platform is fast increasing. They want to take the “early-mover” advantage in this demography where there are minimal competitors.

The following are the key business objectives and metrics for the team:

- Enroll at least 1000 customers in first 3 months
- Sell items worth 10 Lakhs INR in first 3 months
- Achieve the conversion ratio (the ratio of visitor to purchaser) to 30%.

8.2.2 Main Functionalities

The team wants to incrementally roll out the functionalities. The main functionalities are listed phase wise below:

Phase-1: Functionality

Category	Functionality
User Experience	- The e-commerce application should be visually appealing, responsive and interactive. - The web application should contain consistent hierarchy and layout structure. - The web application should provide consistent branding and immersive visual elements.
Search Feature	- The application should allow the user to search for the product by its attributes such as name, and brand. - The search should be filtered based on price, brand, and product features.
Cross-sell and up-sell features	- The application should provide product promotion features. - During search results and check out flow, the application should push other "related products" which customer may be interested in. - During search results and check out flow, the application should provide "packaging" option to bundle multiple products for a discount.
Personalization	The application should provide personalized recommendations based on recent purchase history and user profile attributes for registered users.
Marketing	- The application should support marketing campaigns such as BOGO (Buy One Get One). - The application should support running campaigns and promotions.
Product purchase	- The application should allow shopping cart and check out features. - The application should support various electronic payments such as online payment, COD (Cash On Delivery), etc.
Integrations	The application should be integrated with following applications for achieving commerce functionalities: - Internal inventory system through SOA (Service Oriented Architecture) based integration. - Internal Pricing system through SOA based integration. - External payment gateway system. - Internal database for product information.
Security	Application should support authentication and authorization.
Quality of Service (QoS) and Non Functional Requirements (NFR)	- Availability: The application should be available 99.999% of times. - Performance: The application should respond within 5 second page response time. - Scalability: The application should support 1000 users per second in peak load, 100 users per second average load. - Maintainability: There should be less than 15 defects per month. - Extensibility: It should be easy to add future functionality to the application. - Reusability: Platform and library components should be reusable.
Social features	E-Commerce application should support social features to promote and advertise the product(s).

Category	Functionality
Localization	The e-commerce application be available in 10 languages including Hindi, Kannada, Malayalam, Telugu, Tamil, Punjabi, Marathi, Oriya, Gujarati and Assamese.
Mobile enablement	The application should be accessible through mobile devices.

8.2.3 Architecting Online Shopping E-commerce Portal

In order to architect a flexible and extensible e-commerce portal to satisfy the requirements it is necessary to adopt a three-tier architecture model. The following is a sample logical architecture of the online shopping e-commerce portal (refer to Figure 8.1).

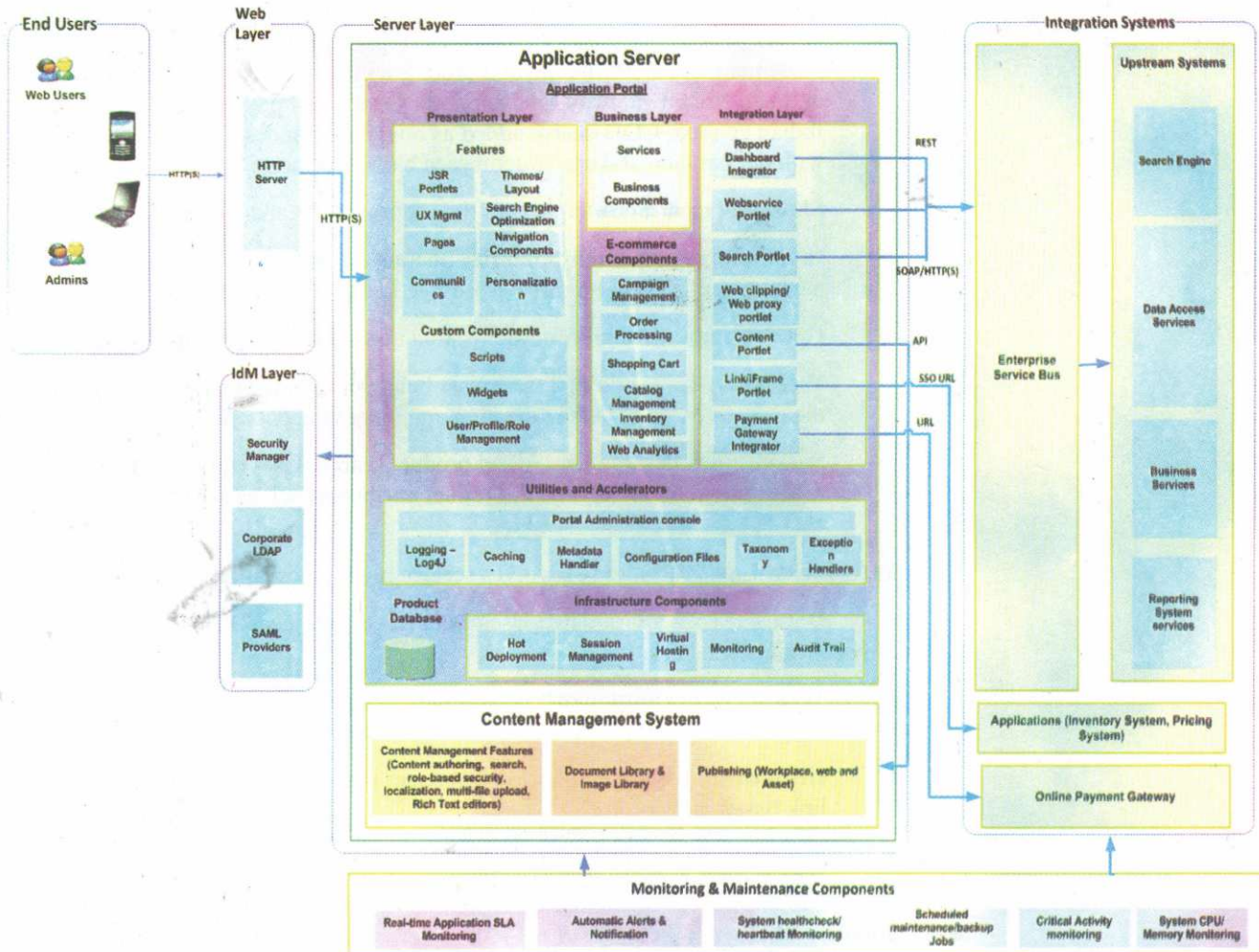


Figure 8.1: Architecture of Online Shopping E-commerce Portal

Various components of Figure 8.1 are explained below. The multi-layered architecture is mainly based on MVC architecture:

- Presentation Layer:** Includes presentation components like web pages and user experience components. The key components are explained below:
 - Web pages:** HTML compliant pages such as home page, search page, products page, shopping cart and check out page.
 - Themes/Layout:** Pages will be designed with consistent themes and layout.
 - Navigation components:** Include navigation aids such as left navigation component, etc.

- **Personalization engine:** The engine tracks the purchase history of user and uses the user profile attributes such as interests, location to provide personalized product recommendations. The engine also tracks customer's web behaviors, click path, downloads to fine tune the product recommendation.
- **Search Engine Optimization (SEO):** Makes the pages search engine friendly so that they get higher ranking in search engine results driving more traffic.
- **E-commerce Components:** Include server side business components and services to satisfy the core e-commerce requirements.
 - **Campaign management module:** Helps the business and marketing team to setup the sales and marketing campaigns, and seasonal offers and promotions. The content is mainly retrieved from content management systems (CMS) to perform dynamic delivery.
 - **Order processing module:** Manages all parts of order flow such as order placement, order fulfilment, and order tracking. This is integrated with online payment gateways and supports varieties of payment modes. For Indian context, COD is also added as one of the modes of payment along with net banking and credit/debit card based payment.
 - **Shopping cart module:** Allows the user to add to and update shopping cart.
 - **Inventory management module:** Interacts with internal inventory management ERP (Enterprise Resource Planning) system.
 - **Catalog management module:** Maintains and categorizes product catalog.
 - **Web analytics module:** Tracks user behavior on the web pages to improve the effectiveness of personalization and recommendation.
 - **Search:** Includes keyword based product search. User can filter the search results based on price, model, product attributes such as color, size, brand etc.
- **Integration Layer:** Primarily involves service based integration components.
 - **Data services component:** Uses Data Access Object (DAO) to access the product database.
 - **Web services component:** Is built into the application using JAX-WS to support any future services based integration.
 - **Iframe/link based integration component** is provided to support any future link based integration.
 - **Search engine component:** Helps in indexing product details to provide query-based search results.
- **Identity Management (IDM) Layer:** It includes security manager, LDAP and SAML providers.
 - LDAP server acts as the user registry. It stores the user profile information.
 - Online shopping applications provide security at coarse-grain level through authentication and at fine-grained level through authorization. Additional security measures include admin access to catalog management and personalized promotion management.
- **Monitoring and Maintenance Component:** Includes real time application SLA monitoring, automatic alerts and notifications, system health check/ heart beat monitoring, scheduled maintenance/backup jobs, critical activity monitoring and system CPU/ memory monitoring.

- **Real-time application SLA** monitoring components would check the live production of web pages.
- **Automatic alerts and notification through email** when the page/system performance falls below a pre-configured threshold value.
- **System health-check/heartbeat** monitoring to ping the availability of portal system and all interfacing systems to ensure that they are responding within expected response time. Automatic notification is triggered if any system is down.
- **Scheduled maintenance and backup jobs** to perform system clean-up and back up activities.
- **Web analytics** will be configured to monitor the business-critical process/activities in real-time. This could include activities such as page load time, search processing time etc. Additionally reports would be designed to display the monitoring data.
- **System CPU / Memory monitoring** is done.

8.2.4 Designing Online Shopping E-commerce Portal

End-to-end design of online shopping portal involves key stages as detailed in Figure 8.2.

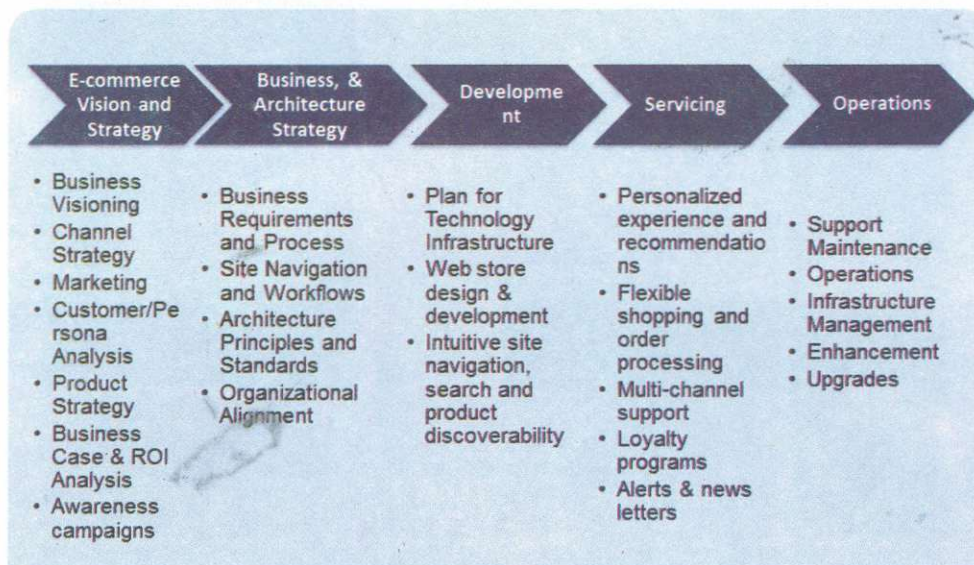


Figure 8.2: Stages of Designing of Online Shopping E-commerce Portal

- **E-commerce vision and strategy:** At this stage, the business team lays out the vision and business objectives of online shopping portal application. They also do the market and competitor surveys and defines the solution strategy. Business teams also do awareness campaigns including the paid ads on search engines to route the traffic, carries out seasonal campaigns and product banners, and creates one-off microsites.
- **Business and Architecture Strategy:** At this stage, the business and technical teams finalize the business flow, architecture principles and standards. It involves defining key business processes, finalizing technology stack, etc.
- **Development:** E-commerce web store will be developed during this stage with all commerce functionality. User experience development involves intuitive and responsive site design along with friendly navigation aids and enhanced product discoverability through search.
- **Servicing:** At this stage, the list of personalized services that are to be provided to the customer such as customized look and feel, personalized content and product recommendations, access to social communities and forums and multi-channel

support through live chat, email and phone are made. Online shopping application also rewards customer loyalty through targeted promotion and discount campaigns.

- **Operations:** Involves regular site maintenance and upgrade activities. This stage also ensures that application is accessible 24×7 and provides good response time across geographies. Operations teams will also install code updates and software patches.

8.2.5 User Experience of Online Shopping E-commerce Portal

In this section let us look at the key user experience elements and features offered in online shopping portal.

Home Page: The home page of the user after login is shown below (refer to Figure 8.3).

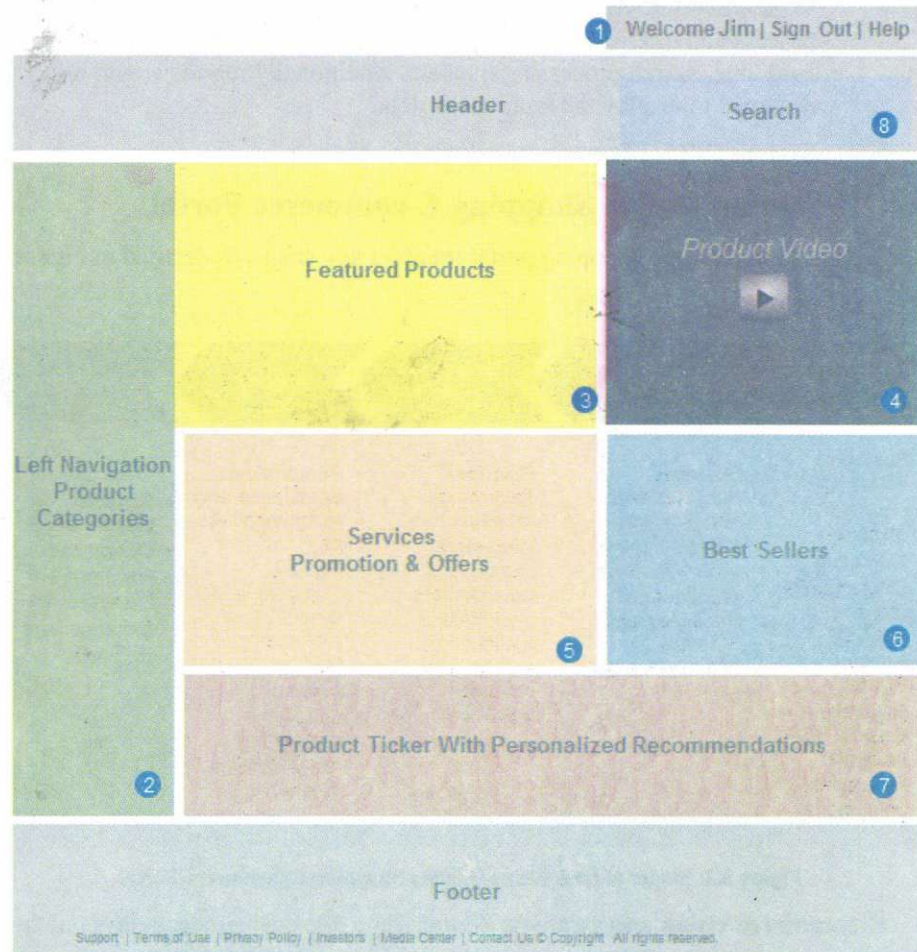


Figure 8.3: Home Page of Online Shopping E-commerce Portal

The elements of Figure 8.3 are explained below:

- **Element 1:** This element provides the registered user name along with option to edit profile and logout.
- **Element 2:** This left navigation element provides various categories of products. Users can expand the *product* to see the products belonging to that category.
- **Element 3:** All features and promotions are provided. It also includes advertisement banners and seasonal sales offers.
- **Element 4:** A featured video is shown in this space.
- **Element 5:** Personalized promotions and offers are shown here.

- **Element 6:** Top best sellers of products are shown here for cross-selling purposes.
- **Element 7:** The ticker/carousel element provides personalized product recommendations. Recommendations are given based on purchase history and product view history
- **Element 8:** In each page, a search feature is provided to help user to quickly find the product by its name or model.

Product Details Page: This page shows details of a selected product. The page mockup is shown in Figure 8.4.

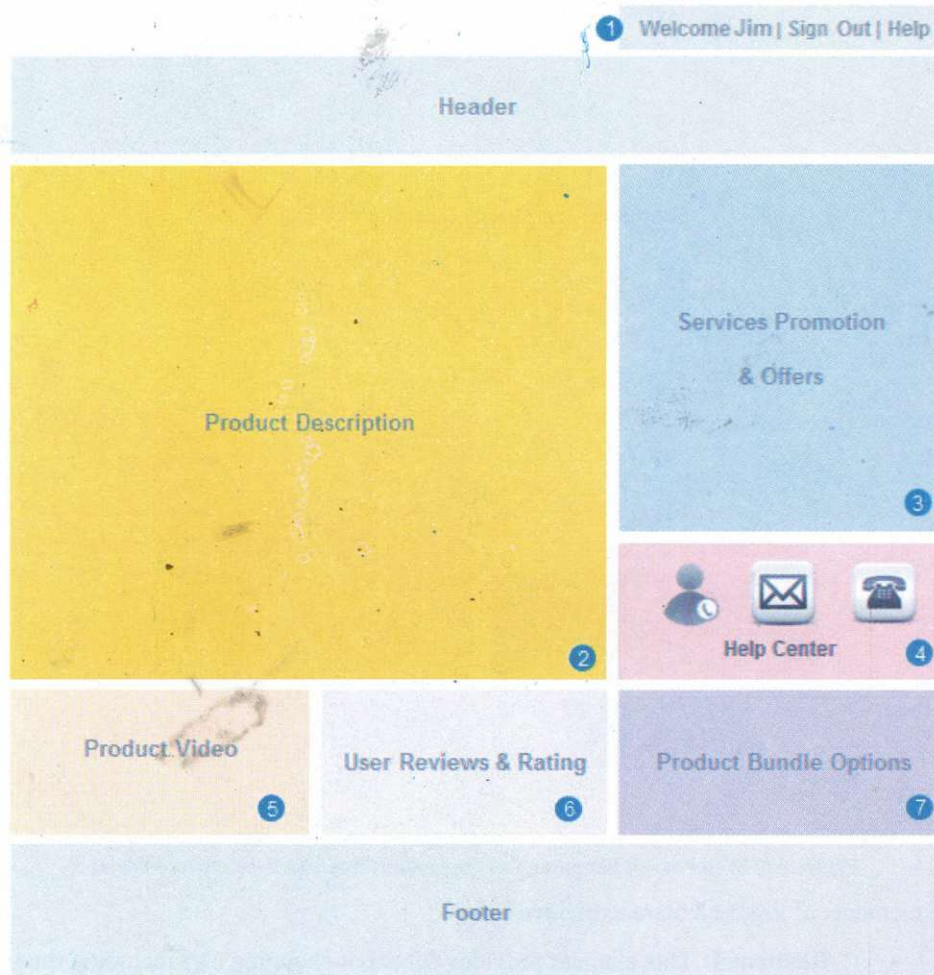


Figure 8.4: Web Page of a Product in Online Shopping E-commerce Portal

The elements of Figure 8.4 are explained below:

- **Element 1:** This element provides the registered user name along with option to edit profile and logout.
- **Element 2:** This section provides the details of the product such as product images, technical specification, product features, availability and pricing information, accessories etc.
- **Element 3:** Any applicable promotions for this product are shown here.
- **Element 4:** Help center provides various ways in which customer can learn more about product and helps in easing his/her purchase experience. It includes real time chat or email or phone based support.
- **Element 5:** It shows the product demo video.

- **Element 6:** This section shows all the review comments given by other users of this product along with overall rating.
- **Element 7:** All product bundling or packaging options are shown here for up-selling. It includes packaging complimentary products, accessories, etc.

Shopping Cart Page: This page show the details of shopping cart. Mockup is shown in Figure 8.5.

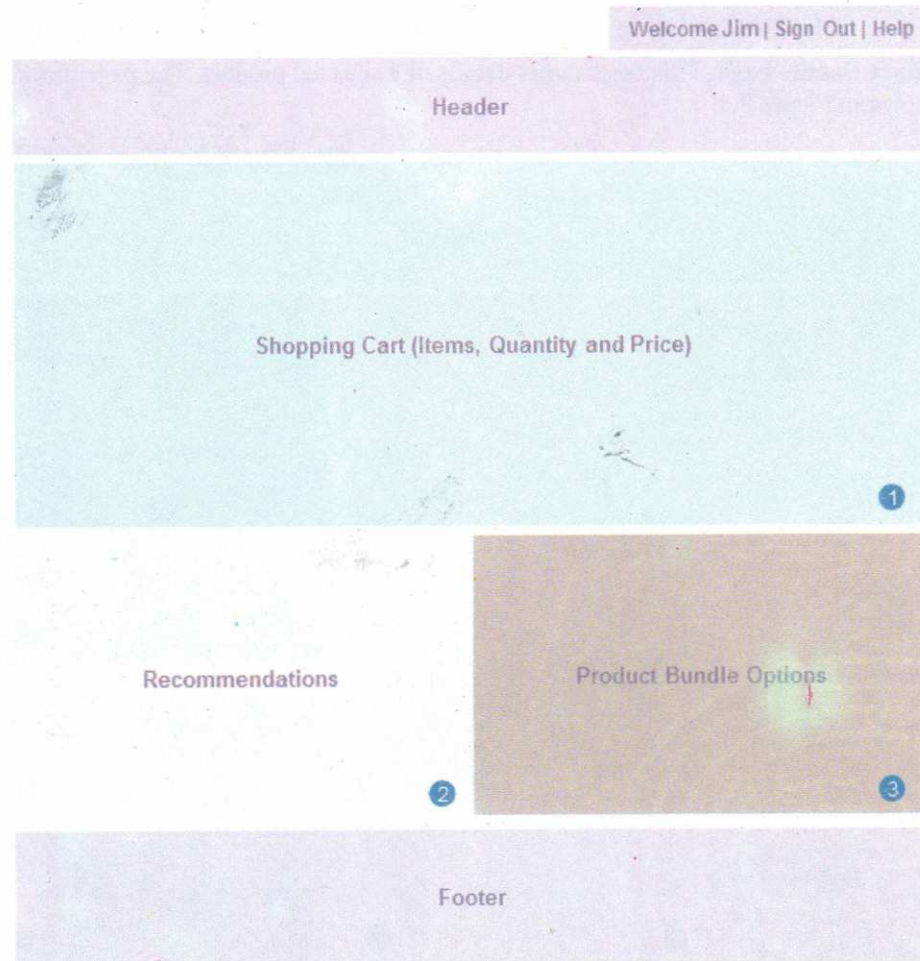


Figure 8.5: Web Page of Shopping Cart in Online Shopping E-commerce Portal

The elements of Figure 8.5 are explained below:

- **Element 1:** This element provides details of shopping cart including the list of all products in the cart along with its quantity and total price.
- **Element 2:** This section provides the recommended products which user can add to shopping cart.
- **Element 3:** All product bundling or packaging options are shown here for up-selling. This includes packaging complimentary products, accessories, etc.

8.2.6 Conformance to QoS Standards

The following are explicitly stated NFR requirements:

- **System Performance:** 99% of pages must be loaded within five seconds or less
- **Scalability:** Maximum 1000 concurrent users
- **Availability:** 99.999 percent of core working hours
- **Security:** Minimum 128-bit encryption

(i) Explicitly Stated NFR

The following are explicitly stated NFR:

- **Performance:** The following techniques are used for ensuring the required performance:
 - **Caching:**
 - Frequently used objects, controlled lists are cached in memory.
 - Caching is employed at every layer:
 - Presentation tier: browser caching, merging and minifying of global assets, http compression, placement of external JS files at the bottom of the page to improve the perceived page load times.
 - Server end: Cache frequently used objects and use connection/thread pool.
 - CDN (Content Delivery Network) to provide edge side caching.
- **Scalability:** The scalability techniques that are followed are given below:
 - Usage of optimal amount of RAM which can handle peak load of 1000 concurrent users. However the clustered deployment also provides additional load distribution and RAM availability if the load exceeds 1000 users. The application server infrastructure has server cluster consisting of two 8 GB RAM nodes which will be used for load balancing.
 - Adopting network load balancers and clustered deployment.
 - **Connection pooling and thread pooling:** Pooling technique is followed to obtain connection or thread from the pool maintained by the application server to ensure optimum resource utilization. The thread pool size settings are as follows:
 - Maximum thread pool size:100
 - Thread time out: 10 minutes (600 seconds)

This configuration is tested to handle a peak load of 500 users per second.

For database connection pooling, following settings are used:

- Maximum thread pool size: 100
- Minimum pool size: 100
- Idle pool time out: 120 seconds
- JVM (Java Virtual Machine) parameters like heap size, GC (Garbage Collection) values are optimally tuned to obtain the optimum scaling. For optimal heap size, following JVM parameters are used:
`java -Xms 1024m -Xmx 1024m -Xgc: parallel`

This allocates 1GB of heap size for Online Shopping Portal which is sufficient to handle a very high level of peak load.

- **Availability:** The following techniques are followed for high availability:
 - **High availability clustered deployment:**
 - Server cluster consists of primary node and fail-over node for handling load and to serve as fallback node.
 - Session fail-over is adopted to ensure the continuity of sessions.

- Load-balancer to ensure that load is optimally distributed across various nodes.
- Session replication and cache replication will be used to avoid session fail over.
- **Stand-by backup cluster with on-demand cluster routing:** The production environment also has an additional back-up cluster which mirrors the production cluster in code base and data. The load balancer is configured to route the requests to the back-up cluster only on-demand when there is a failure of the primary live cluster. This provides additional high availability to the system to handle any fail-over of the primary cluster.
- **Disaster recovery environment:** The application code and environment is mirrored in diversified geographies to handle any unforeseen disaster.
- **Hot deployment:** To avoid the unavailability of the application during deployment, hot deployment is followed.
- **Roll out deployment and maintenance:** All deployment and maintenance activities are followed node-by-node basis to avoid outage during these times.
- **Continuous monitoring:** Set up production monitoring agents to continuously monitor the availability and setup a notification mechanism to alert the administrators when the site performance falls below a pre-defined threshold.
- **Frequent data backups:** The data stored in database and the application data is backed up on daily basis to ensure recoverability.
- **Security tests:** Security and vulnerability tests are conducted frequently to ensure that application does not have any vulnerability.
- **Security**
 - Transport Level Security:
 - All internal and external communications are done using secured transport layer leveraging HTTPS protocol.
 - Firewall software blocks all ports except for the ones that are required.
 - All secured content are encrypted using one-way hash encryption algorithms.
 - **Application Level Security:**
 - The application is thoroughly tested for security related vulnerabilities like SQL injection, buffer overflow, cross-site scripting, etc.
 - Application server specific data sources are used to obtain a connection instead of storing the database user id and password within the application.
 - **Web service security:** Following security measures will be adopted to address the security issue related to web service.
 - Web service is invoked using HTTPS.
 - Vendor provided web service security features will be leveraged to ensure the message integrity and security.

- Transport level security will be implemented using SSL for connection between client and web service server.
- Additionally, other vendor provided security features will be leveraged for the web service invocations.

- **Authentication and authorization:**

- JAAS based login module is used for user authentication with LDAP based user registry.

(ii) **Other NFR**

The following are the other NFR:

- **Extensibility:** The application supports extensibility in following ways:
 - The application follows MVC architecture pattern which allows clear separation of concerns for each layer. This would also provide the flexibility for the application to change the technologies in each layer without impacting other layers.
 - Individual service classes implement abstract service which can also be extended by future services.
 - All integrations are based on standards. This would help plugging in extensions in future.
- **Maintainability**
 - Testing at all layers will be done to ensure good maintainability of the code.
 - All major classes and interfaces will have sufficient documentation including *javadocs*.
 - Proper interface documentation would be provided for all integrations.
- **Portability**
 - Application will be developed based on standards.
 - Vendor specific code/feature usage will be kept to the most minimal possible extent.
- **Reliability**
 - Ensure that all unit test cases are developed for all classes.
 - Ensure that significant amount of code is covered by test cases.
 - Include functional, integration, performance and security testing as gating criteria for release sign-off.
- **Testability**
 - Code would be developed so that it is testable.
 - Out of box dependency injection principle would be followed wherever applicable to make it more testable.
 - Each class addresses only single concern/functionality to ensure proper testability.
- **Accessibility**
 - Presentation components such as JSF are developed to adhere to WCAG 2.0 guidelines.

8.3 POPULAR E-COMMERCE SITES

The following are some of the popular Online Shopping E-commerce portals:

- <http://www.amazon.com>
- <http://www.ebay.com>
- <http://www.flipkart.com>
- <http://www.myntra.com>
- <http://www.olx.in>
- <http://www.snapdeal.com>

