tools that capture customer information from all customer **touch points** (methods of interacting with customers) like e-mail, telephone, fax, retail stores, company's Website, etc. This consolidated information is stored in a common customer database and made available across the organization via the Internet, intranet or other network links. Figure 10.8 shows a typical CRM information system.

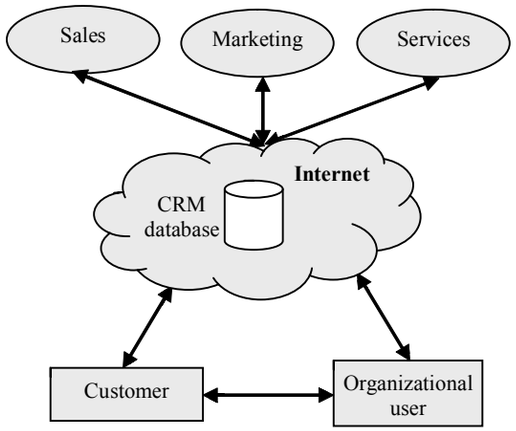

Fig. 10.8 *A Typical CRM System*

Types of CRM Systems: Nowadays, three major types of CRM systems, namely *Operational CRM*, *Analytical CRM* and *Collaborative CRM* are being used in many organizations.

- ***Operational CRM:*** It provides support to front-office business processes that involve direct interaction with customers through any communication channel, such as phone, fax, e-mail, etc. The details of every interaction with customers, including their requirements, preferences, topics of discussion, etc., are stored in the customers' contact history and can be retrieved by the organization's staff whenever required. Thus, it presents a unified view of customers across the organization and across all communication channels. Examples of operational CRM applications are Sales Force Automation (SFA), Customer Service and Support (CSS), Enterprise Marketing Automation (EMA), etc.
- ***Analytical CRM:*** It enables to analyse customer data generated by operational CRM applications, understand the customers' behaviour and derive their true value to the organization. This helps to approach the customers with pertinent information and proposals that satisfy their needs. The analytical CRM applications use analytical marketing tools like data mining to extract meaningful information like the buying patterns of the customers, target market, profitable and unprofitable customers, etc., that help to improve performance of the business.
- ***Collaborative CRM:*** It allows easier collaboration with customers, suppliers and business partners and, thus, enhances sales and customer services across all the marketing channels. The major goal of collaborative

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CRM applications is to improve the quality of services provided to the customers, thereby increasing the customers' loyalty. Examples of collaborative CRM applications are Partner Relationship Management (PRM), customer self service and feedback, etc.

Benefits of CRM: Effective CRM systems can realize the following benefits to an organization.

- Help organizations to determine their most profitable customers and establish a long term relationship with them. This can increase the firm's sales revenue.
- Result in reduced churn rate (the number of customers who stop buying or using products of a company) by enabling the firms to customize and personalize the products according to user needs, preferences, buying habits, etc.
- Enables provision of better customer service and support across all the touch points, whichever the customer uses.

Supply Chain Management

The concept of supply chain management is not new but it has become increasingly important for the last few years. With the shifting of business focus from manufacturing to customer value, companies are not much concerned about manufacturing costs or producing high-quality products; rather the major challenge is to deliver the correct product, at the correct location, at the time the customers need, in the appropriate quantity and at the lowest possible cost. Meeting this challenge entails the need of Supply Chain Management (SCM).

SCM is a business and technology discipline that refers to the ways of coordinating the activities involved in purchasing, designing, building and selling a product. It uses information technology to create a cross-functional inter-enterprise (involving more than one organization) system called **SCM information systems**. These systems integrate the business processes of suppliers, purchasing firms, distributors and custom logistics in order to improve the efficiency and effectiveness of manufacturing and distribution. They automate the flow of information between a company and its supply chain partners to optimize the sourcing and procurement, manufacturing and delivery of products or services.

The Supply Chain: In simplest terms, SCM is all about managing the supply chain—a network of organizations and the business processes for acquiring the raw materials, transforming them into finished goods and distributing the products to the customers. The supply chain links many business entities, such as supplier, manufacturer, transporter, distributor, retailer and the customers themselves. Note that the supply chains of different organizations may differ in the number of entities and it is not always required for a supply chain to have all the entities. Each entity in the supply chain contributes to the goal of reaching the customers. The supply chain is driven by three main inputs, namely *information*, *materials* and *funds* which flow among the supply chain members.

Figure 10.9 shows a simplified example of a supply chain in a typical organization. The raw material sources from suppliers are transformed to

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intermediate products and finished goods through manufacturing facilities. The finished products are shipped to distribution centres and from there to retailers and ultimately to customers. Note that in this figure, only the primary supplier of the company has been shown. However, the supply chains, especially of large manufacturers can have primary, secondary and tertiary suppliers also.

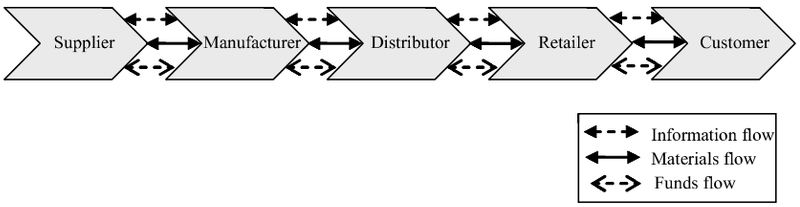

Fig. 10.9 *An Example of a Supply Chain*

The ultimate goal of SCM systems is to efficiently manage the flow of information, materials and funds across the entire supply chain, thereby reducing the cost of supply chain while bringing a firm's products from concept to market.

Types of SCM Systems: Depending on the functions the SCM systems perform, they are classified into two categories, namely *Supply Chain Planning Systems* and *Supply Chain Execution Systems*.

- ***Supply Chain Planning Systems:*** These systems provide information that help businesses in the planning of their supply chain. Some of the important supply chain planning functions are as follows:
  - o Forecasting demand for specific products, and preparing sourcing and manufacturing plan for those products.
  - o Estimating the quantity of the product to be manufactured in a given time period.
  - o Deciding the location where the finished goods are to be stored.
  - o Identifying the transportation mode to be used for delivering the products.
  - o Setting the inventory levels for raw materials, intermediate products and finished goods.
  - o Determining the product quantity a business should make in order to meet all its customers' demands.
- ***Supply Chain Execution Systems:*** These systems provide information that help businesses in the execution of their supply chain steps. Some of the major supply chain execution functions are as follows:
  - o Managing the flow of products from the manufacturers to distributors to retailers and finally to customers in order to ensure the accurate delivery of products.
  - o Providing information about the status of orders being processed so that the vendors could provide the exact delivery dates to customers.

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- Tracking the shipment and accounting for the products that have been returned or are to be repaired and serviced.

Benefits of SCM: Effective SCM systems provide the following benefits to optimize the organization's performance.

- Improve the customer service by delivering them the right product at the right time and at the right location, which in turn increases the organization's sales.
- Enable the companies to bring the products to the market at a quicker rate. Thus, the companies get their payment sooner than those who lack an efficient supply chain.
- Lower the total supply chain cost, including procuring materials cost, transportation cost, inventory carrying cost, etc. The reduction in supply chain cost helps to increase the firm's profitability.

10.8 VALUE-ADDED NETWORKS AND NETWORKINGS

A Value-Added Network (VAN) is a private, third-party-managed network that offers data transmission and network services to subscribing firms. Let us say, a business firm wants to communicate purchase orders to its vendor. One possibility is that both parties join hands and set up a communication system. Another possibility is to subscribe to a VAN service provider who will set up the system and the buyer and the vendor will be connected to each other through the VAN service provider. The VAN service provider will facilitate communications between both parties. The parties pay only for the amount of data they transmit along with a subscription fee. VANs are cost effective because of economies of scale.

The term VANs stands for Value Added Network Services. Traditionally it transmits data formatted as Electronic Data Interchange (EDI) but now they also transmit data formatted as XML or in more specific binary formats. Value-added network services provide data transformation between specific formats, such as EDI-to-XML, EDI-to-EDI, etc. At one extreme, a VAN hosts only horizontal Business-to-Business application integration services, hosting general-purpose integration services for any process or industry. At the other extreme a VAN also hosts process specific or industry specific integration, for example supply chain ordering or data synchronization services. A VAN not only transports (receives, stores and forwards) messages but also adds audit information to them and modifies the data in the process of automatic error detection and correction or conversion between communications protocols.

Check Your Progress

7. What are enterprise applications?
8. What is value-added network?

10.9 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

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1. A client-server network is also known as a server-based network. The client-server network model is centralized and computers are configured with specific functionality. Also, computers can be configured with high priority or low priority.
2. The data management layer in client-server model is most critical to any business and deals with database management of the system. Data is available across multiple sessions of the application. Data represents the knowledge repository, which is reusable.
3. A file server is used to store files in a centralized location in the network. It is also responsible for management of data. Users in the network can centrally access files from a file server. For each user in the network, some storage space is allocated by the administrator to store files on a file server.
4. ISDN is a network architecture in which digital technology is used to convey information from multiple networks to end user. This information is digital from end to end.
5. Electronic Data Interchange (EDI) software has four layers, namely business application, internal format conversion, EDI translator and EDI envelope for document messaging. At the sender's side, these four layers make a package of the information and then this package is sent over the value added network to the target side where the four layers follow the reverse process to obtain the original information.
6. Enterprise Resource Planning (ERP) system is an information system that integrates departments and functions across a company using one database system. It runs off a single database, enabling various departments to share information and communicate with each other. It is a business management system that integrates all facets of the business, including planning, manufacturing, sales and marketing. It automates the finance and human resources departments and helps manufacturers in handling jobs such as order processing and production scheduling.
7. Enterprise applications are the cross-functional enterprise information systems that support the organization-wide coordination and integration of business processes. It improves the efficiency and effectiveness of critical business processes all across the organization and coordinate the firm's activities with those of suppliers and customers using customer relationship management, supply chain management and enterprise systems.
8. A value added network is a private, third-party managed network that offers data transmission and network services to subscribing firms.

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10.10 SUMMARY

- A computer network can be either of the following two major types: peer-to-peer network or client-server network.
- In a peer-to-peer network, all computers in a network are equal. It means no computer in the network has any higher or lower priority. There is no specific computer configured as client or server.
- A client-server network is also known as a server-based network. A client-server network is centralized and computers are configured with specific functionality. Also, computers can be configured with high priority or low priority.
- The Butler Group of Client-Server Forum, London, has designed a new framework to advance the client-server approach which is a five-layer model, also called the VAL (Value Added Layers) model. The basic structure of this model resembles a pyramid having the infrastructure layer at the bottom, followed by middleware, applications, repository and business model layers.
- A file server is used to store files in a centralized location in the network. It is also responsible for management of data. Users in the network can centrally access files from a file server. For each user in the network, some storage space is allocated by the administrator to store files on a file server.
- Groupware server provides environment to all users to share documents, communicate and coordinate in groups to complete tasks more effectively. Users can prepare schedules; they can view schedule of other users in the group and share their knowledge and plan accordingly.
- The flow of work in an organization is called workflow. Workflow can be a group of interdependent tasks that are carried out in business. It has a start and an end point. In workflow, any task or information or document is passed from one level to another level in hierarchical way.
- Mail servers are workgroup servers. It provides e-mail-related services on a network and stores the incoming messages and waits for the user to read it. Mail server is also used by corporate to send auto response to incoming mail.
- Database servers are special servers used in an organization to store data centrally. Data stored in a database can be accessed by any user from any location in the network. It allows multiple users to share the same data at the same time.
- A Private Branch Exchange (PBX) is a special-purpose computer designed for handling and switching office telephone calls at a company site. It can belong to a company or to a provider.
- Integrated Services Digital Network (ISDN) is an international standard for dial-up network access that integrates voice, data, image and video services in a single link.

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- Electronic Data Interchange (EDI) is defined as 'the computer-to-computer transfer of information in a structured and predetermined format'. EDI software has four layers, namely business application, internal format conversion, EDI translator and EDI envelope for document messaging.
- Enterprise Resource Planning (ERP) is an information system that integrates departments and functions across a company using one database system. It runs off a single database, enabling various departments to share information and communicate with each other. It is a business management system that integrates all facets of the business, including planning, manufacturing, sales and marketing.
- Enterprise applications are the cross-functional enterprise information systems that support the organization-wide coordination and integration of business processes.
- The main objectives of enterprise applications are to improve the efficiency and effectiveness of critical business processes all across the organization and coordinate the firm's activities with those of suppliers and customers. To achieve these objectives, a number of enterprise applications are used, which include customer relationship management, supply chain management and enterprise systems.
- A Value Added Network (VAN) is a private, third-party-managed network that offers data transmission and network services to subscribing firms.

10.11 KEY WORDS

- **Repository:** It refers to a place where or receptacle in which things are or may be stored.
- **Questionnaire:** It refers to a set of printed or written questions with a choice of answers, devised for the purposes of a survey or statistical study.
- **Groupware:** It refers to programs that help people work together collectively while located remotely from each other.
- **Domino server:** It refers to the name of the applications and messaging server program for the Lotus Corporation's Lotus Notes product.
- **Digital Conduits:** It refers to the tubes or troughs for protecting electric wiring.
- **Cross-functional Business Processes:** It refers to the different functional areas of an organisation working to complete the same piece of work, goal or aim.
- **Churn Rate:** It refers to the annual percentage rate at which customers stop subscribing to a service or employees leave a job.

10.12 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short Answer Questions

1. Differentiate between peer-to-peer and client-server networks.
2. What are the various layers in client-server model?
3. What does file server handles?
4. What is the significance of integrated services digital network?
5. Define the term electronic data interchange.
6. Why is enterprise resource planning system used?
7. What is CRM?

Long Answer Questions

1. Discuss peer-to-peer and client-server network models with the help of examples and illustrations.
2. Describe Butler pyramid model of client-server computing with the help of an example.
3. Explain the golden rules of client-server implementation.
4. Discuss the significance of communication servers. Explain its various types.
5. Discuss the role of integrated services digital networks in an organization and explain its various types.
6. Analyse the significance of electronic data interchange and its applications.
7. Discuss the significance of enterprise resource planning system in an organization and also management of resources.
8. Discuss the various roles and standards of inter-organizational information systems in business processes.
9. Explain the significance of value added network services in business processes.

10.13 FURTHER READINGS

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UNIT 11 ELECTRONIC COMMERCE AND INTERNET

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Structure

11.0 INTRODUCTION

In this unit, you will learn about Electronic commerce, commonly known as e-commerce. E-commerce refers to the buying and selling of products or services over electronic systems, such as the Internet and other computer networks. Electronic commerce describes such technologies as electronic funds transfer, supply chain management, Internet marketing, online transaction processing, Electronic Data Interchange (EDI), inventory management systems and automated data collection systems. Modern electronic commerce typically uses the World Wide Web in the transaction's life cycle. E-commerce is the application of communication and information sharing technologies among trading partners to the pursuit of business objectives. E-commerce is generally considered to be the sales aspect of e-business. It also consists of the exchange of data to facilitate the financing and payment aspects of business transactions. You will also learn about Mobile Commerce or M-Commerce, which is any transaction involving the transfer of ownership or rights to use goods and service using mobile access to computer mediated networks with the help of an electronic device. The Internet applications can be categorized into online media, online information search, online

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communications, online communities, online entertainment, e-business, online finance and other applications. E-business is an application that is closely related to our lives. Search engines are used as basic applications that allow users to acquire the information they demand online.

11.1 OBJECTIVES

After going through this unit, you will be able to:

- Analyze the scope of e-commerce bases
- Discuss the significance of e-commerce and the Internet
- Define the concept of M-commerce
- Explain the process of electronic data interchange
- Describe the various applications of the Internet and Website management
- State the type of social media and their usage in business

11.2 E-COMMERCE BASES

E-commerce is the application of communication and information sharing technologies among trading partners to the pursuit of business objectives. E-commerce can be defined as a modern business methodology that addresses the needs of organizations, merchants and consumers to cut costs while improving the quality of goods and services and increasing the speed of service delivery. E-commerce is associated with the buying and selling of information, products and services via computer networks. Key element of e-commerce is information processing. It facilitates new types of information based business processes for reaching and interacting with customers – online advertising and marketing, online order taking and online customer service, etc. Virtual enterprises are business arrangements in which trading partners separated by geography and expertise are able to engage in complex joint business activities, as if they were a single enterprise. E-commerce allow the customer to do 'one stop shopping' with the assurance that a single phone call will bring the right materials to the right location at the right time.

Hence, e-commerce has become a very popular form of transaction in today's world. Now buyers purchase goods and services online rather than visiting the shops and making selections. The prime benefit of e-commerce is its 24 × 7 connectivity which is not present in normal transactional selling. The following are best Indian Website which deal with e-commerce:

khoj.com

khoj.com is a very popular Indian Web directory as the e-commerce section of this site provides important information regarding the e-commerce rules defined by the Ministry of Commerce of India. This Website also provides a list of other

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e-commerce portals, such as walletwatch.com, paygateindia.com, seekandsource.com. dotlinedesigns.com and many more.

Sifycorp.com

Sify is referred as one of the most renowned end to end e-solutions providing company in India. They endeavor persistently to provide you with a network connectivity solution that connects your critical business systems and offers a smooth data network directly with customers, vendors and staff.

eBay. in

Formerly known as bazee.com, today ebay.in is one of the largest e-commerce Website of India. This Website has a vast list of products and services on offer to all its prospective customers. Its product line can be divided into several categories like apparels, accessories, electronic gizmos, cars and bikes, fitness and sports, home appliances and many more. Another advantage of using this site is that you can sell your products online.

shopping.rediff.com

It is the e-commerce portal of rediff.com which is known for its unique offerings and cheapest of prices. This e-commerce portal also has a separate section called "best discounts" where only those items are displayed upon which more than normal discount have been allotted.

futurebazaar.com

futurebazaar.com is one of the largest Indian e-commerce Website partnered by Big Bazaar, a leading departmental stores of India. It offers a wide variety of shopping items like apparel, books, cameras, consumer durables, kitchen appliances, laptops, mobile phones, and many more. On some selected products, this e-commerce portal provides up to 50% discount.

Synapse.com

Synapse is a renowned Website. It compiles communications, data management and security to offer clients e-commerce solutions to businesses worldwide. Synapse also provides its customer's competitive, effective B2B and B2C e-solutions involving reduced transaction fees, real time tracking of transactions; e-tailing of products; secure electronic transactions and the remote management of logistics, including the tracking of users, processes and information.

Check Your Progress

1. What is e-commerce associated with?
2. What is the key element of e-commerce? What does it facilitate?
3. What is futurebazaar.com?

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11.3 E-COMMERCE AND THE INTERNET

E-commerce is a form of commerce or business through which consumers are able to buy or sell products or merchandise electronically over the Internet. E-commerce takes place between organizations and between organizations and their customers. It includes transaction of goods and other materials, and includes accessing information, trading goods and electronic materials.

E-Commerce Definitions (From Various Perspectives)

1. **From an Interface Perspective:** E-commerce includes various information and business exchanges between a consumer and an organization.
2. **From Communications Perspective:** E-commerce is a way by which a user can supply items, information or transactions via networks.
3. **From an Online Perspective:** E-commerce provides an electronic environment that makes it possible for the purchasing and selling of items on the Internet, such as furniture, books and electronic items.
4. **As a Market:** E-commerce is a global set of connections.

In a nutshell, e-commerce is a form of commerce or business through which users are able to buy or sell items electronically over the Internet.

11.3.1 E-Commerce Practices

E-commerce practices depend on the following factors:

Role of E-Commerce

These days, e-commerce uses electronic technology for its high growth; thus there is a high demand for the latter. It is well-known that computer increases our capacity to store, search and retrieve information. With the tremendous growth in computer usage for communication and other purposes, people from various fields are forming virtual society on the Internet. The concept is quite simple; if one has access to a Personal Computer (PC) and can connect it to the Internet with a browser he/she can do an online business. You have to just get on the Web, open an online store and watch your business grow. This wired world of business, where technology, human talent and a new method of doing business, make up today's growing worldwide economy. The backbone of this electronic commerce is the Internet. E-commerce is not only about technology; it is also about information, decision-making and communication. Use of e-commerce refers to purchase or sale, advertising and servicing of goods or services over the Internet. Currently though not big enough as compared to traditional peer markets, E-commerce is expected to grow in the near future.

According to a survey, the e-commerce industry in India is expected to grow very quickly. The total number of Internet users are rising very rapidly. Worldwide, the growth of e-commerce has gained popularity due to online shopping

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but this has not happened in the case of the Indian market. Here, it is mainly concentrated on online travel and the banking sector.

However, growth of the industry is expected to go up very high in the near future that will include both the Internet and mobile banking users.

E-Commerce, E-Business and E-Transaction

E-Commerce: E-commerce can be:

- Business-to-business selling and purchasing.
- The security of business transactions.
- E-retailing with online catalogues.
- The assembly and use of demographic data through the Web.
- Business-to-business exchange of data through Electronic Data Interchange (EDI).
- E-mail and fax (e.g., with the help of newsletters).

E-Business: E-business refers to business with customers, vendors and suppliers via the Internet. E-business provides an environment to enhance businesses and also provides an interface between businesses and customers. E-business conducts business on the Internet, not only by selling and purchasing, but also by providing services to customers and collaborating with business partners.

E-Transaction: E-transaction means commercial transactions with anyone, anywhere and anytime. It provides new business opportunities that result in greater efficiency and effective transactions between customers and business partners.

Scale of E-Commerce

In E-commerce, the scale of work consists of communication and information exchange as follows:

- Exchange of secure documents, contents and values.
- Platforms for e-commerce communications.
- Navigation, advertising and exchange of catalogue.
- Negotiation and contract making protocols in interactions among consumers, businesses and public administration.
- Mobile technology based applications.
- Devices and protocols which support mobility.

Drivers of E-Commerce

The drivers of e-commerce are as follows:

1. **Anytime, Anywhere, Anyone**

   Today, any user can access information anytime. E-commerce binds organization, business and other sectors with the help of video, multimedia, text and other technologies.

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2. **Digital Revolution**

   With the help of digital revolution it is possible for digital devices to communicate with each another.

3. **Increase in Access**

   Due to tremendous increase in the number of computers worldwide it has greatly increased the demand for information and communication for business as well as pleasure.

4. **Organizational Changes**

   E-commerce makes it possible to change the approach of any organization. There is a tendency of owners and managers within the departments to develop a chain of relationships within the organization.

Basics of E-Commerce

The basics features of e-commerce are as follows:

- Business process that helps buying and selling items on the Internet.
  - Supplier, inventory, distribution, payment management.
  - Financial management, purchasing products and information.
- Customer purchasing on the Internet.
- Transactions conducted between businesses on the Internet.

Myths about E-Commerce

The following are some of the commonly noticed myths about e-commerce:

1. **E-Commerce is Innovative**

   Unfortunately, many Internet retailers spend a disproportionate amount on the innovative tasks of Website construction and marketing and concentrate little on customer support and fulfilment of their requirements.

2. **Creation of Website is Easy**

   This is true to some extent; however, ensuring availability and performance of the site is not an easy task. There is technology and networking infrastructure to consider for effective use of a Website.

4. **Customers can be Lured**

   All companies know that customers can be lured with price promotions and giveaways. There are rarely loyal customers. The moment a competitor lowers the price, they click over to the site. The best customer can be lured only with quality service once an item has been purchased.

5. **Everyone is Doing It**

   It is true, but a Web presence is not commerce.

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Features of E-Commerce

The following are features of e-commerce:

- The facility to retrieve orders from the Internet.
- The capacity to permit users to accesses accounting data securely over the Internet.
- The Web page catalogue in several cases is actually associated directly to the software data based on accounting. The main advantage is that the buyer observes real time information related to cost, quality and measure.
- The ability to send computerized information and data to users/groups of users.
- To get printouts of all reports in Web page (HTML) formats.
- Web-enabled accounting software's help menu is connected directly to pages on the Internet through the WWW.

E-Commerce Framework

An **e-commerce framework** presumes that e-commerce applications will be built on the existing technology infrastructure—group of computers, communication networks and communication software to develop the information superhighway.

E-Commerce Architectural Framework

(*i*) *Main Platforms*

The risk to the Internet is through digital disorder, closed markets that cannot use each other's services, incompatible applications and frameworks that interoperate or build upon each other, and an array of security and payment options that confuse the consumers.

One solution to these problems is an object oriented architectural framework for the Internet commerce. Several vendors of e-commerce solutions have declared descriptions of such a framework. The most important platforms are:

- IBM commerce point.
- Microsoft Internet commerce framework.
- Netscape ONE (Open Network Environment).
- Oracle NCA (Network Computing Architecture).
- Sun/Javasoft JECF (Java E-Commerce Framework).

(*ii*) *General Model*

Recently, four of these companies have settled to hold a common distributed object model based on Common Object Request Broker Architecture Internet Inter-ORB Protocol (CORBA IIOP). For the commerce on the Internet to be successful, such systems must also interoperate at a business application level. A consumer or business using one framework is supposed

to be able to shop for, buy and make payments for products and services offered on dissimilar frameworks. This is not possible at present.

(*iii*) *CommerceNet*

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CommerceNet is a non-profit society that has been formed to help businesses and customers to utilize the Internet for buying and selling. It is a cross-industry effort to build a framework of frameworks, involving both e-commerce merchants and clients.

The victory of this development certainly depends on market leaders in each area who participate vigorously in their respective task forces**.** All users should use similar software because no single company can control what platform its customers will use.

Mechanics of E-Commerce

1. The Business Aspect of E-Commerce

The following are two bases and interactive business dimensions to e-commerce:

(*i*) ***The Customer Aspect*:** This refers to placing refined goods with the final clients.

(*ii*) ***The Enterprise Aspect*:** This is primarily an intercorporate or inter-organizational supply chain management, etc.

2. The Technological Aspect of E-Commerce

It can be classified according to the three basic functions of any market environment.

(*i*) ***Access Environment:*** It makes use of private and public network technologies, such as the Internet, LAN and WAN.

(*ii*) ***Transaction Aspects:*** These are EDI, point of scale device, credit, debit and smart card, automated Teller Machine (ATM) and Electronic Fund Transfer (EFT).

(*iii*) ***Support Aspects:*** These are support services, such as card validation technologies, bar coding device, among others.

3. The Configuration of E-Commerce

E-commerce to become operational requires three things to happen.

(*i*) ***The Organizational Configuration:*** Integrating business process electronically.

(*ii*) ***The Network Configuration:*** Providing a backbone for e-commerce.

(*iii*) ***The Media Configuration:*** Getting access to the electronic marketplace.

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E-Commerce Applications

By using online business one can place goods or products online. A well-made application in e-commerce provides all the information to satisfy the customers' needs. This provides a sensible amount of product with the purchase ability to the customers. It is important to note that a Website must be product specific and it must also supports the transaction process when business is being done. Some of these consist of:

A. 1. **Search Capability for the Product:** It provides a way through which a consumer can search products of their interest and switch directly to the interested product over the Internet.

2. **Data Sheets can be Downloaded:** Consumers can download products and other supporting information and make their purchase decision.

3. **Support for Customers Online:** It allows staff to focus more on customer services issued online.

4. **FAQ Based on Products:** Once the customer buys the product then they expect that their problems be sorted out directly without having to communicate through the use of quality sites.

5. **Message Board to Support Customers:** Message board provides customers access to information anytime they need. New customers can benefit from the questions and solutions provided by the message board.

6. **Product Newsletters:** These allow customers to be up-to-date with product information. Users can easily subscribe mailing lists for product information in which they are interested.

7. **Support Sales Process:** E-commerce sites support the sales process through purchase and also provides the necessary information to the customer.

B. E-Commerce Communication Mechanism

Nowadays, the Internet is the finest means of communication between businessmen and clients. Due to various advance technology oriented concepts, purchasing and selling of goods through Website has become popular. Online business is growing speedily through a variety of software that helps consumers to learn the tricks of buying and selling. Online business works by the following methods:

- Shopping cart software.
- Online e-telephony.

Shopping cart software is the means of online presentation of goods for sale. It provides the idea of goods to choose from, online payment facility, joint selection of goods in the form of list, etc. By puting all the chosen goods in the cart and paying for all the selected items, shopping cart software has become the simplest way of shopping online. There are many features provided by this software, such as:

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- Credit card adequacy.
- Simple navigation system for the consumers.
- Consumer account ability.
- Order management ability.
- Web-based administration ability.
- Flexible shipping and tax options.
- Built-in site optimization tools.
- Inventory management ability.

One of the finest ways to communicate regarding business is online telephony. It is the technology used to convert voice signals into data packets which are then transported to a data network runs on the Internet Protocol (IP). It allows the consumer to call through the same phone line which he uses for the Internet connection. It is cheaper than making calls on the basic telephone line. This online communication technology is known in the Web world as Voice Over IP (VOIP).

C. Online E-Telephony Benefits

- A user is able to distinguish calls as business calls, personal calls or consumer service calls even as they are on same line.
- A user can direct the calls to a particular department and take automated orders.
- A user can screen the callers without any information to caller.
- A user can get forwarded calls from all over the world.
- There will be no busy line problems.
- Voice mails can be received on the computer.

In addition to these, there are many other facilities which can be availed by using e-telephony. Thus, communication on the Internet provides numerous facilities to ease business complexities and raise profits.

11.3.2 Administration, Business and Consumer Models of E-Commerce

The e-business life cycle starts from the moment a customer buys a product on a Website to the moment the product is actually delivered to the customer. The following are the three major e-commerce applications used in the e-business life cycle:

(i) Business-to-Consumer (B2C), through the Internet.

(ii) Business-to-Business (B2B), through the Internet.

(iii) Business-within-Business, through intranet.

(i) Business-to-Consumer (B2C), through the Internet

The use of the seller's Website by customers is the central focus of attention of e-commerce applications. Consumers can order online from any place

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and at anytime. This approach is the representation of the conventional shopping experience in stores. A shopping cart, for example, is used to hold items or goods until the customer is ready to sign out. Checkout is order and payment processing. B2C is similar to conventional mail order or telephone based ordering system. Table 11.1 shows the main elements of the Internet, extranet and intranet

Table 11.1 *Main Elements of the Internet, Extranet and Intranet*

Element	Internet	Extranet	Intranet
E-commerce	Business-to-consumer(e.g., mail order via the Web)	Business-to-business(procurement and fulfilment)	Internal procurement and processing
Access	Unrestricted (anyone can access a URL address)	Restricted to company employees, staff and business partners	Restricted to company customers, employees and staff
Security	Generally minimum, expect for verifying credit cards and financial transaction integrity	Firewalls and restricted access to data and applications	Firewalls to eliminate non-company employees
Payment Method	Credit card or electronic cash	Predefined credit agreement between business	Within business charges

11.3.3 Applications in B2C

The followings are the applications in business to consumers:

E-Banking

E-banking is a way through which users can do their transactions electronically or online over the Internet. In spite of traditional banking, e-commerce plays an important role nowadays. The following services can be availed through e-banking:

Payment of Bills

Through e-banking various types of bills, such as mobile phone bills, credit card bills, electricity bill, insurance premium, and so on can be paid. The bills can be of different utility organizations, service providers, etc., all over the country. If a user wants to pay a bill, all has to do is to complete an easy one time registration for each bill provider. A customer can also give a standing online instruction to pay his/her recurring bill automatically. The bank may nominally charge customers for online payments.

Fund Transfer

Customers can transfer their funds from one bank to another. They can send money from one place to another. To do this, the customer has to log on to his account, which mentions his bank account number. The amount is transferred within a day however, in the traditional system it could take three working days.

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Credit Cards

Customers can not only pay their bills online with the help of the Internet banking, but also obtain a loan facility. If the credit card is lost, it can be reported online so that it is blocked, and no one misuses it.

Railway Pass

For the common passengers, Indian Railways have tied up with different banks; so customers can buy passes online for local trains. The banks deliver the passes at their homes.

Investment through Internet Banking

An FD (Fixed Deposit) account can be opened online through funds transfer. This is done by investors opening a dematerialized (demat) account in a bank and trade in the stock market. The amount is automatically deducted from his/her account in the bank and shares are allocated to his demat account. At the same time, banks also give the facility to purchase mutual funds online.

These days, major banks have the facility of online banking and also provide demat facility. If a customer has his/her demat accounts with independent share brokers, then he needs to fill a form which helps to combine different accounts.

Recharging Prepaid Phone

Now, customers can recharge their mobile phones through the Internet. The steps include select the name of the operator and enter the recharge amount. Within a few seconds the prepaid phone gets recharged.

Shopping

A customer can shop for any product online including buying air or railway tickets through the Internet. The amount is deducted from his account.

Advantages of the Internet Banking

As per the Internet and Mobile Association of India's report on online banking 2006. 'There are several advantages of online banking. It is suitable, it isn't bound by operational timings, there are no environmental barriers and can offer services at a miniscule cost.'

Through the Internet banking, users can check their transactions at any time and number of times they want. Whereas in the traditional banking, banks provided only quarterly statements to their customers. They could charge outstation fee for transferring amount to outstation or where it may not have a branch. However, this is absolutely free in online banking.

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E-Trading

Electronically trading in stocks, securities and funds is called **e-trading**. It needs an extensive communication network and infrastructure to clear transactions. However, the saving over the conventional stock brokers is substantial. It has been calculated that 40 per cent of trading transacted by individual stock brokers are done electronically, i.e., through an online broker. Online buying and selling of stock, securities, etc., has grown tremendously because of the secure nature of the online trade.

Stock brokers were earlier known for their 'full service' account management. This included personalization services, individual risk management, liberal financial advice, etc. All these came with a hefty commission. Discount brokers charged a flat rate for each transaction completed. However, these simple discount brokers have grown into 'electronic brokerages', by permitting a person to place online orders from anywhere in the world.

E-Auction

In trading valuable goods, such as a painting or other such merchandise, where the price of the goods cannot be easily determined, the process of auction is adopted. Its objective is to select a fair price for the goods by choosing buyers who need them the most. These auctions are also called forward auctions. In this type of auctions, the purchasers complete with each other by bidding for the goods to be sold.

11.3.4 Business-to-Business (B2B) Models

Different models have been developed for B2B e-commerce, which is based on the control of market, buyer, supplier, etc.

E-Distributor: E-distributors are organizations that supply products and services directly to individual business firms. Generally, e-distributors are owned by one company that tries to serve many customers, e.g., grainger.com.

B2B Service Provider: B2B Service Provider is concerned with industrial marketing; among the processes it handles are fulfilment and procurement. When you make an online purchase and payment is allowed through a credit card clearance, a message is generally displayed saying. 'Thank you for your order'. The amount is transferred from your account. The moment the message is displayed on the customer's monitor, an electronic order is sent to the vendor to fill the order and ship or transport it directly to the customer. Performing this electronically means reduced inventory and quick service. Intranet plays an important function as a corporate and product information centre and is strictly a 'within company' type of information exchange. This interlinked environment is restricted to internal employees and customers, with firewalls to keep out non-employees. E-mail replaces paper for communication of messages, order acknowledge and approvals and other forms of correspondence within the organization.

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In intranet, there is no true payment process. Transfers of funds or charges against budget accounts are purely an accounting transaction as part of the intra-company billing procedure. Thus, intranet becomes a facilitator for the exchange of information and services among the departments or divisions of a large company.

Benefits of B2B

Some of the benefits of B2B are: you can outsource the unprofitable parts of your business; quicken your product development activities; or reduce time to the market; improve business and market intelligence; understand your market better than your competitors; clone your business in future markets; improve the speed of communication; facilitate communication between your customers and suppliers; reduce wastage through additional sales channels; improved ability to experiment and learn; higher customer retention rates; lower customer acquisition costs; and reduced costs can be passed on in favourable pricing. Besides these, B2B also provides exclusive benefits, such as fewer human interventions, less overhead expenses, fewer inadvertent errors, more efficiency, more advertising exposure, new markets and new physical territories equated to an intelligent method of mutual business. It is a win-win situation for both the buyer and the seller.

These are just few of the advantages of B2B e-commerce. It has been proved beyond doubt that doing business on the Internet is profitable. The actual return on the initial investment is very good. There is bound to be more profits for the business.

Thus, while transacting business-to-business e-commerce, it is necessary to remember the following two points:

(i) **Supply Chain Management (SCM):** In the late 1980s, different management concepts, such as just-in-time, design for manufacturing, stockless production, lean manufacturing, and so on were developed. These helped to properly manage the operating costs of manufacturing. There were noticeable reductions in the operating cost in all areas of operation, such as transportation, inventory costs, overhead and finally direct labour costs. All these have the potential to save cost to the tune of crores of rupees. This can only happen when business organizations engage in the efforts of supply chain management.

(ii) **Electronic Procurement System:** In this system, the two basic processes to handle are distribution of goods from distributors to buyers and to remove the complex manifold paper and process labour intensive process. Thus, the business run more efficiently and purchase managers get sufficient time to focus on supplier negotiation and complex acquisitions. At the same time, it should reduce cost

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and hassle. The electronic procurement system, should also give extensive management control, besides integrating with the existing systems.

Just-in-Time Delivery: Just-in-time delivery is very important from customers' viewpoint. This phase of B2B is critical because customers want delivery of good, items and products are delivered just when they are required. It means savings in terms of time and money.

11.3.5 Consumer-to-Consumer Model

Consumer-to-Consumer (C2C) involves the electronically-facilitated transactions between consumers with the help of a third-party. Online auction is a common example, in which a consumer posts an item for sale and other consumers propose to buy it; the third-party generally charges a commission or flat fee. The sites are only intermediaries, just there to match consumers. They do not have to check the quality of the products being offered, for example eBay, Craigslist, Amazon.com, etc.

This type of e-commerce is expected to increase in the future, because it cuts out the costs of using another company. It could change in the sense that some one can send an advertisement regarding a sale to your Global Positioning System (GPS).

Universities

Consumer to consumer models are becoming popular among students in universities, because these are large organizations in the same environmental area which are low on cost. So they look for deals very often and these kinds of Website offer them. Universities themselves identify spaces for the students to sell books and other items to various students; users can also advertise that they are subletting their apartment. An example of this is Tiger Books and Dalhousie University classifieds, both of which are put together by the Dalhousie Student Union (DSU) for the students.

11.3.6 Peer-to-Peer Model

Many attempts have been made by different companies to utilize the P2P (Peer-to-Peer) architecture for making money. However, to date, the only successful business model is based on benevolent users, donating their CPU resources for scientific work, although some content sharing software client developers do provide functionality enhancements based on a fee as well as display third-party advertisements in the client console in order to finance the client programming projects. A P2P model for mega-scale business is yet to be developed. The main obstacles in P2P model are of security and rating.

There is a lack of responsibility inherent in the privacy and anonymity of P2P environment. A lack of a central authority makes it difficult to enforce contracts.

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In addition, there is no true P2P payment mechanism so far which facilitates exchanges without depending on some sort of intermediate authority and without affecting the privacy.

An individual rating system can help to solve the trust and contract enforcement problem, while an electronic payment mechanism (incorporating a card reader and e-cash) is designed to resolve the issue of payment. In addition, some variant of escrow may be applied to P2P architecture in order to ensure smoothness of transactions.

Table 11.2 *Benefits and Drawbacks of Peer-to-Peer Network*

Benefits	Drawbacks
Users have the authority to control their own shared resources.	Network security is applied to one computer at a time.
It is easy to install and configure.	Every time a computer in the network is accessed, performance suffers.
Inexpensive to purchase and operate.	Back up is performed on each machine separately to protect shared resources.
No dependence on a dedicated server.	Users have to use a separate password on each computer in the network.
Ideal for small businesses of ten users or fewer.	No centralized set-up to locate, manage, or control access to data.
All you need to set up this network is an operating system and a few cables.	
No need for a full-time network administrator.	

Check Your Progress

4. What is e-commerce?
5. What does does e-transaction mean?
6. What does an e-commerce framework presume?
7. What is e-banking?

11.4 M-COMMERCE

Mobile Commerce, also known as M-Commerce or mCommerce, is the ability to conduct commerce using a mobile device, such as a mobile phone, a Personal Digital Assistant (PDA) or a smartphone. Mobile Commerce has been defined as, 'Mobile Commerce is any transaction involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobile access to computer mediated networks with the help of an electronic device'.

Mobile commerce was originated in 1997 when the first two mobile phone enabled Coca Cola vending machines were installed in the Helsinki area in Finland. The machines accepted payment via SMS (Short Message Service) text

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messages. The first mobile phone based banking service was launched in 1997 by Merita Bank of Finland, also using SMS. In 1998, the first sales of digital content as downloads to mobile phones were made possible when the first commercial downloadable ringtones were launched in Finland. Two major national commercial platforms for mobile commerce were launched in 1999: Smart Money (http://smart.com.ph/money/) in the Philippines and NTT DoCoMo's i-Mode Internet service in Japan. Mobile-commerce-related services spread rapidly in early 2000. In April 2002, building on the work of the Global Mobile Commerce Forum (GMCF), the European Telecommunications Standards Institute (ETSI) appointed Joachim Hoffmann of Motorola to develop official standards for mobile commerce.

PDAs and cellular phones have become so popular that many businesses are beginning to use mobile commerce as a more efficient way to communicate with their customers. In order to exploit the potential mobile commerce market, mobile phone manufacturers, such as Nokia, Ericsson, Motorola and Qualcomm are working with carriers such as AT&T Wireless and Sprint to develop WAP-enabled smartphones. Smartphones offer fax, e-mail and phone capabilities.

Since the launch of the iPhone, mobile commerce has moved away from SMS systems and into actual applications. SMS has significant security vulnerabilities and congestion problems, even though it is widely available and accessible. In addition, improvements in the capabilities of modern mobile devices make it prudent to place more of the resource burden on the mobile device.

More recently, brick and mortar business owners, and big-box retailers in particular, have made an effort to take advantage of mobile commerce by utilizing a number of mobile capabilities, such as location based services, barcode scanning and push notifications to improve the customer experience of shopping in physical stores. By creating a 'bricks & clicks' environment, physical retailers can allow customers to access the common benefits of shopping online, such as product reviews, information and coupons. This is referred as a bridge between the gap created by e-commerce and in-store shopping, and is being utilized by physical retailers as a way to compete with the lower prices typically seen through online retailers.

M-Commerce Applications

Mobile Ticketing: Tickets can be sent to mobile phones using a variety of technologies. Users then use their tickets immediately, by presenting their phones at the venue. Tickets can be booked and cancelled on the mobile device with the help of simple application downloads or by accessing the WAP portals of various travel agents or direct service providers.

Mobile Vouchers, Coupons and Loyalty Cards: Mobile ticketing technology can also be used for the distribution of vouchers, coupons and loyalty cards. These items are represented by a virtual token that is sent to the mobile phone. A

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customer presenting a mobile phone with one of these tokens at the point of sale receives the same benefits as if they had the traditional token. Stores may send coupons to customers using location based services to determine when the customer is nearby.

Content Purchase and Delivery: Currently, mobile content purchase and delivery mainly consists of the sale of ringtones, wallpapers and games for mobile phones. The convergence of mobile phones, portable audio players and video players into a single device is increasing the purchase and delivery of full length music tracks and video. The download speeds available with 4G networks make it possible to buy a movie on a mobile device in a couple of seconds.

Location-Based Services: The location of the mobile phone user is an important piece of information used during mobile commerce or m-commerce transactions. Knowing the location of the user allows for location based services, such as:

- Local discount offers.
- Local weather.
- Tracking and monitoring of people.

Information Services: A wide variety of information services can be delivered to mobile phone users in the same way as it is delivered to PCs. These services include:

- News
- Stock quotes
- Sports scores
- Financial records
- Traffic reporting

Customized traffic information, based on a user's actual travel patterns, can be sent to a mobile device. This customized data is more useful than a generic traffic report broadcast, but was impractical before the invention of modern mobile devices due to the bandwidth requirements.

Mobile Banking: Banks and other financial institutions use mobile commerce to allow their customers to access account information and make transactions, such as purchasing stocks, remitting money. This service is often referred to as Mobile Banking or M-Banking.

Mobile Brokerage: Stock market services offered via mobile devices are becoming more popular and are known as Mobile Brokerage. They allow the subscriber to react to market developments in a timely mode irrespective of their physical location.

Auctions: Over the past three years, mobile reverse auction have developed in popularity. Unlike traditional auctions, the reverse auction (or low-bid auction) bills the consumer's phone each time they place a bid. Many mobile SMS

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commerce solutions rely on a one time purchase or one time subscription; however, reverse auctions offer a high return for the mobile vendor as they require the consumer to make multiple transactions over a long period of time.

Mobile Browsing: Using a mobile browser—a World Wide Web browser on a mobile device—customers can shop online without having to be at their personal computer.

Mobile Purchase: Catalogue traders can accept orders from customers electronically via the customer's mobile device. In some cases, the trader may even deliver the catalogue electronically, rather than mailing a paper catalogue to the customer. Some traders provide mobile Website that are specifically customized for the smaller screen and limited user interface of a mobile device.

Mobile Marketing and Advertising: In the context of mobile commerce, mobile marketing refers to marketing sent to mobile devices. Mobile campaigns must be based on the global Content Generation also called Generation C and four other C's: Creativity, Casual Collapse, Control and Celebrity. A successful mobile commerce requires the development of marketing campaigns targeted to particular market segment.

Payment Methods

Consumers can use many forms of payment in mobile commerce, including:

- Premium rate telephone numbers', which apply charges to the consumer's long distance bill.
- Charges added to the consumer's mobile telephone bill, including deductions to prepaid calling plans.
- Credit cards support. Some providers allow credit cards to be linked to a phone's SIM card.
- Micropayment services.
- Stored value cards, often used with mobile device application stores or music stores.

11.5 ELECTRONIC DATA INTERCHANGE

Electronic Data Interchange (EDI) Exchange integrates business processes across companies by exchanging business documents, such as purchase orders, invoices, shipment notices, etc., in electronic form using a standard format over a communication network. The benefits of EDI include reduction in data entry errors, cycle time, cost and paperwork. Once the data is in electronic form, it stays that way; it does not get converted to paper form that will require re-entry at the receiver's site. If the parties communicating are customer and supplier, both can benefit by following the same standards and plan in a better manner, which results in reduced inventory and competitive advantage.

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There are many protocols for EDI, such as ANSI X.12 and EDIFACT. Applications, such as ATMs, airlines reservations systems and stock exchange transactions use this technology. EDI differs from e-mail in that it transmits an actual structured transaction (with distinct fields such as the transaction date, transaction amount, sender's name and recipient's name) as opposed to an unstructured text message such as a letter.

11.6 APPLICATIONS OF INTERNET AND WEBSITE MANAGEMENT

The **Internet** is a global system of interconnected computer networks that use the standard Internet protocol suite (often called TCP/IP, although not all protocols use TCP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business and government networks of local to global scope that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the interlinked hypertext documents of the World Wide Web (WWW) and the infrastructure to support e-mail.

The Internet applications can be categorized into online media, online information search, online communications, online communities, online entertainment, e-business, online finance and other applications. Search engines are basic applications that allow users to acquire the information they demand online. Online communications include e-mail and instant messaging. Due to the rising popularity of the Internet in offices, more and more employees are using e-mail. Instant messaging is referred as a linking point for the socialized Internet. Additionally, instant messaging platforms are gradually becoming an important entry point for e-mail, blogs, online gaming, search and other types of the Internet applications.

Interactivity is one of the most important characteristics of online news. Online news has allowed traditional one-way broadcasting to give way to two-way or multi-way communication. Online news has resulted in the combination of several types of media. This means it is even more expressive and infective.

The online communities include friend-finding Website and blogs. E-business is an application that is closely related to our lives. Over the past year, the number of online marketplaces has evidently grown. Except for online shopping, online sales and travel bookings have already established a beginning user base. Online payment systems, which are closely related to online shopping, have also been developing extremely fast. Online trading is directly related to the changes in the stock market.

The Internet allows greater flexibility in working hours and location, especially with the spread of high speed connections. The Internet can be accessed almost

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anywhere by numerous means, including mobile Internet devices. Mobile phones, data cards, handheld game consoles and cellular routers allow users to connect to the Internet wirelessly. Educational material at all levels from pre-school to post-doctoral is available from specific Website. Examples range from virtual universities to access to top-end scholarly literature through the likes of Google Scholar. Hence, the Internet in general and the World Wide Web in particular are important enablers of both formal and informal education.

The low cost and almost on the spot sharing of ideas, knowledge and skills has made collaborative work dramatically easier, with the help of collaborative software. Internet chat, whether in the form of an IRC chat room or channel, via an instant messaging system or a social networking Website, allows colleagues to be in touch in an extremely convenient method while working at their computers. Messages can be exchanged even more quickly and conveniently than via e-mail. These systems may allow files to be exchanged, drawings and images to be shared or voice and video contact between team members. Content management systems allow collaborating teams to work on shared sets of documents simultaneously without accidentally destroying each other's work. Business and project teams can share calendars as well as documents and other information.

Website Maintenance

Technically, the Website maintenance process comprises of following:

- Content addition and modifications as per the client needs.
- Website designing and redesigning.
- Search engine submissions and other promotional activities.
- Website restructuring according to the changing client needs.
- New technology deployment.

Creating a Website is easy compared to maintaining it because maintaining a site can require more money that developing it. The following are the four areas of Website maintenance and management:

- **Content:** The content needs to be alive, current and accurate. With fresh information people will return to the Website time and again. Also old articles, comments and other information should be archived.
- **Technology:** Technology changes so fast that a 'Web year' is sometimes referred as one month. A site looks and acts old without updating. In addition, components of the site can malfunction, requiring maintenance.
- **Community Development and Marketing:** The number of visitors depends on the increased activities of the Website. This building of the community requires promotion and regular creative improvement.

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- **Response and Customer Service:** Site visitors, customers and members often need a response. They may have questions, comments, complaints and suggestions. The customer support, forum moderating and any kind of database management must be carefully handled.

11.7 TYPES OF SOCIAL MEDIA

Some of the most popular current forms of social media are social networking Websites, such as Facebook, which surpassed over one billion active monthly users. There are several types of online platforms classified under the vast umbrella of social media. These categories include:

- **Social Networks:** Social networking websites allow users to build web pages featuring personal portfolios and interests. These pages are used to connect with friends, colleagues and other users in order to share media, content and communications. Examples of social networks include Facebook, LinkedIn, MySpace and Bebo.
- **Web Blogs:** Some of the oldest and most popular forms of social media are blogs. Blogs are often viewed as online journals that order content chronologically, or by date, month, year and category. Blogging Websites include Word Press, Blogger and Tumblr.
- **Microblogs:** Microblogging is particularly common for posting quick updates and distributing content via mobile devices. Notable microblogging sites include Twitter and Tumblr. However, social networks, such as Facebook, Google+, LinkedIn and Myspace also have their own microblogging features.
- **Content Communities:** Users on content communities organize, share and comment on different types of content, including images and videos. YouTube, Flickr and Scribd are examples of content communities.
- **Wikis:** Wiki Websites allow a community of people to add and edit content in a community-based database. One of the best-known wikis is Wikipedia.
- **Podcasts:** Podcasts are audio and video files available through subscription services, such as Apple iTunes. The term 'podcast' is a neologism derived from 'broadcast' and 'pod' (as in 'iPod'), since Podcasts are often listened to on portable media players.

Other types of social media include the following:

- Rating and review sites (e.g. Yelp).
- Social bookmarking or social tagging features (e.g. Digg; StumbleUpon).
- Forums and discussion boards (e.g. Yahoo!; Answers).

- Virtual social worlds (e.g. Second Life; World of Warcraft).
- Music and audio sharing (e.g. Spotify; Pandora Radio).

11.7.1 Uses of Social Media in Business Organization

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Social media is not only a whole new way for users to communicate and express themselves; it is also a whole new way for organizations to conduct business. Every day new applications can be seen for social media in market research, marketing communications, brand management, innovation and even supply chain management.

For Brand Managers

Social media gives you a quick and accurate way to find out a specific image for your brand among consumers. You can perform a brand audit by analysing posts (also referred to as 'sound bites' or 'verbatim') from consumers about a brand.

Brand managers and customer service managers can track a metric, such as sentiment (positive or negative), which can be thought of as a measure of brand equity. Brand equity metrics obtained through social media analysis are available without waiting for survey data.

For Customer Service

This is really the same technique as brand equity tracking (i.e., tracking sentiment), but it is used for customer service evaluation instead. Net Promoter Score (NPS), which is survey based, is sometimes used; sentiment is simply another way to measure the same parameter with social media.

For Market Researchers

You can compare brands in a category on various attributes, including share of buzz, overall sentiment, and key positive and negative themes using social media. An innovation technique that social media supports is incremental innovation, where you improve your existing product by fixing the complaints or by finding out what people like about your competitor and adding those benefits to your product. You can search social media for 'lead users,' who are users of a product or service that currently experience needs still unknown to the public and who would benefit greatly if they could find a solution to these needs. If they do, their solution can be commercialized, and the Lead User Method suggests it will be more successful than other methods.

In addition to the above mentioned uses, one can use social media to fulfil other business purposes such as for public relations, for business intelligence, for research and development (R&D), for lead generations, mergers and acquisitions, community participation, brand rationalization, marketing, customer satisfaction measurement and to name a few.

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Check Your Progress

8. What is mobile commerce?
9. What does electronic data exchange integrate?
10. List the categories of Internet applications.
11. Name the several types of online platforms.

11.8 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. E-commerce is associated with the buying and selling of information, products and services via computer networks.
2. Key element of e-commerce is information processing. It facilitates new types of information based business processes for reaching and interacting with customers – online advertising and marketing, online order taking and online customer service, etc.
3. futurebazaar.com is one of the largest Indian e-commerce Website partnered by Big Bazaar, a leading departmental stores of India. It offers a wide variety of shopping items like apparel, books, cameras, consumer durables, kitchen appliances, laptops, mobile phones, and many more.
4. E-commerce is a form of commerce or business through which consumers are able to buy or sell products or merchandise electronically over the Internet. E-commerce takes place between organizations and between organizations and their customers. It includes transaction of goods and other materials, and includes accessing information, trading goods and electronic materials.
5. E-transaction means commercial transactions with anyone, anywhere and anytime. It provides new business opportunities that result in greater efficiency and effective transactions between customers and business partners.
6. An e-commerce framework presumes that e-commerce applications will be built on the existing technology infrastructure—group of computers, communication networks and communication software to develop the information superhighway.
7. E-banking is a way through which users can do their transactions electronically or online over the Internet. Through Internet banking, users can check their transactions at anytime and number of times they want.
8. Mobile Commerce, also known as M-Commerce or mCommerce, is the ability to conduct commerce using a mobile device, such as a mobile phone, a Personal Digital Assistant (PDA) or a smartphone.

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9. Electronic Data Exchange (EDI) integrates business processes across companies by exchanging business documents, such as purchase orders, invoices, shipment notices, etc., in electronic form using a standard format over a communication network.
10. The Internet application can be categorized into online media, online information search, online communications, online entertainment, e-business, online finance and other applications.
11. The several types of online platforms are social networks, web blogs, microblogs, content communities, wikis, podcasts, rating and review sites, forums and discussion boards, virtual social worlds, music and audio sharing.

11.9 SUMMARY

- E-commerce is the application of communication and information sharing technologies among trading partners to the pursuit of business objectives.
- E-commerce can be defined as a modern business methodology that addresses the needs of organizations, merchants and consumers to cut costs while improving the quality of goods and services and increasing the speed of service delivery.
- E-commerce is a form of commerce or business through which consumers are able to buy or sell products or merchandise electronically over the Internet. E-commerce takes place between organizations and between organizations and their customers. It includes transaction of goods and other materials, and includes accessing information, trading goods and electronic materials.
- E-commerce is not only about technology; it is also about information, decision-making and communication. Use of e-commerce refers to purchase or sale, advertising and servicing of goods or services over the Internet.
- E-commerce can be Business-to-Business (B2B) selling and purchasing, the security of business transactions and e-retailing with online catalogues, etc.
- E-business refers to business with customers, vendors and suppliers via the Internet. E-business provides an environment to enhance businesses and also provides an interface between businesses and customers.
- E-transaction means commercial transactions with anyone, anywhere and anytime. It provides new business opportunities that result in greater efficiency and effective transactions between customers and business partners.
- An e-commerce framework assumes that e-commerce applications will be built on the existing technology infrastructure—group of computers, communication networks and communication software to develop the information superhighway.

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- By using online business one can place goods or products online. A well-made application in e-commerce provides all the information to satisfy the customers' needs.
- The e-business life cycle starts from the moment a customer buys a product on a Website to the moment the product is actually delivered to the customer.
- E-banking is a way through which users can do their transactions electronically or online over the Internet. In spite of traditional banking, e-commerce plays an important role nowadays.
- Electronically trading in stocks, securities and funds is called e-trading. It needs an extensive communication network and infrastructure to clear transactions.
- Mobile Commerce, also known as M-Commerce or mCommerce, is the ability to conduct commerce using a mobile device, such as a mobile phone, a Personal Digital Assistant (PDA) or a smartphone.
- Electronic Data Interchange/Exchange (EDI) integrates business processes across companies by exchanging business documents, such as purchase orders, invoices, shipment notices, etc., in electronic form using a standard format over a communication network.
- The Internet applications can be categorized into online media, online information search, online communications, online communities, online entertainment, e-business, online finance, and other applications.
- Technically, the Website maintenance process comprises of Content addition and modifications as per the client needs, Website designing and redesigning, Search engine submissions and other promotional activities, Website restructuring according to the changing client needs and New technology deployment.

11.10 KEY WORDS

- **Web directory:** It refers to a database of selected websites, ordered in such a way as to facilitate browsing.
- **Demographic data:** It refers to the statistical data about the characteristics of a population, such as the age, gender and income of the people within the population.
- **Extranet:** It refers a system of computers that makes it possible for particular organizations to communicate with each other and share information.
- **Intranet:** It refers to a local or restricted communications network, especially a private network created using World Wide Web software.

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- **Loyalty Card:** It refers to a card issued by a supermarket or chain store to a customer and used to record credit points awarded for money spent in the store.
- **Mobile Brokerage:** It refers to a brokerage house that allows you to buy and sell stocks and obtain investment information from its website.
- **Global Positioning System (GPS):** It refers to a satellite navigation system used to determine the ground position of an object.

11.11 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short Answer Questions

1. List the famous Indian Websites which deal with e-commerce.
2. Differentiate between e-commerce, e-business and e-transaction.
3. What is an e-commerce communication mechanism?
4. What are the advantages of e-tailing?
5. What are credit cards?
6. What are the payment methods in m-commerce?
7. What are the protocols and applications of electronic data interchange?

Long Answer Questions

1. Explain the significance and functioning of the e-commerce bases.
2. Discuss the significant features of the e-commerce.
3. 'E-commerce facilitates commercial transactions electronically using the Internet technology.' Discuss.
4. Discuss the administration, business and consumer models of the e-commerce.
5. Explain the applications of B2C, B2B and C2C models of the e-commerce.
6. Explain m-commerce technology with the help of examples.
7. Critically evaluate the uses of social media in business organization.

11.12 FURTHER READINGS

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BLOCK IV
COMPUTER SYSTEMS AND ETHICAL CHALLENGES OF MIS

UNIT 12 COMPUTER SYSTEMS AND RESOURCES

Structure

12.0 INTRODUCTION

When it comes to define a computer system. You can simply define it as a set of integrated devices that input, output, process and store data and information. It is basically a basic, complete and functional system which incorporates all the hardware and software required to make it functional for a user. A complete computer system allows users to input, manipulate and store data.

The unit is all about types of computer systems and the types of computer system processing. It also discusses about the different methods of data processing, primary and secondary storage. In addition to this, you will also learn about hardware and software standards and other acquisition issues.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the types of computer systems
- Assess different methods of data processing

- Describe primary and secondary storage devices
- Understand input and output devices
- Explain hardware standards and other acquisition issues

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12.2 TYPES OF COMPUTER SYSTEM PROCESSING

Computers are used for processing data, analysing it and getting the necessary information for facilitating decision-making. It is, therefore, imperative that the data be processed in keeping with the specific needs, demands and requirements of the organization. Broadly, there are four different methods used for data processing and updating as illustrated in the figure 12.1.

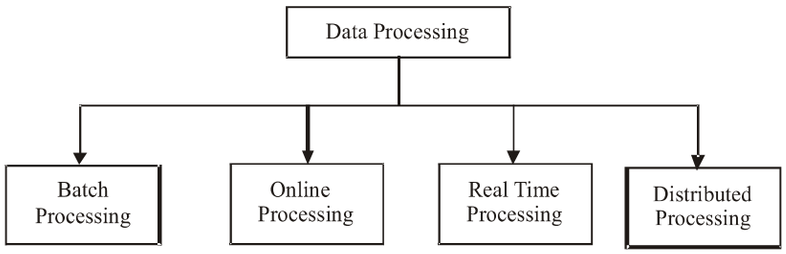

Fig. 12.1 *Different Methods of Data Processing*

Data processing transforms raw data into information. Such processing is automatic and runs on a computer. Just a collection of data alone does not mean anything unless it is presented systematically to convey some meaningful information. An information system has data-processing structures to highlight their practicality. Information systems accept raw data as input and generate information as output. Information is either a meaningful response to a question or may lead to further questions to get a meaningful response.

The computer does not think, and has no power of reasoning. So it can produce output of the quality that matches that of the input. If input is inconsistent, so will be the output.

While the computer keyboard is a common method of data input, there are various other ways for data capture. They are as given below:

- OCR (Optical Character Reader) that reads characters by optical scanning.
- Voice recognition software that takes input in form of speech
- OMR (Optical Mark Reader) that reads marks
- Hand-held devices that extract input from a document
- Bar Code Readers that are used to capture information in the form of bar codes.

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The advantages and disadvantages of these systems are:

Method	Advantage	Disadvantage
OCR	Can scan old documents	May not recognize every character
Voice recognition software	Takes speech input and produces output.	Not fit for regional dialects
OMR	High speed recognition	Recognizes markings only
Hand-held devices	Portable devices for capturing data	Has to be connected to a working station
Barcode	Highly reliable	Difficult to interpret

Data processing is done both offline and online. When high volumes of data is to be handled, and results are not required immediately, then offline or batch processing is most suitable. Advantages of such processing are:

- Done at a quiet time without disturbing other important jobs.
- Verification and validation can be done.

A bank uses offline processing for daily transactions on its customers' accounts. Here, the results are not needed immediately but on the next working day.

In online data processing, an immediate response is needed, as in an air traffic control system, where data is to be updated all the time and there is continuous change in input and subsequent output.

12.2.1 Batch Processing System

Till the early 1960s, batch processing was the only method of data processing, as technical limitations required that periodic data preparation and periodic batch processing be utilized. This system, however, continues to be used till date in older systems or in those systems where massive volumes of periodic transactions are involved.

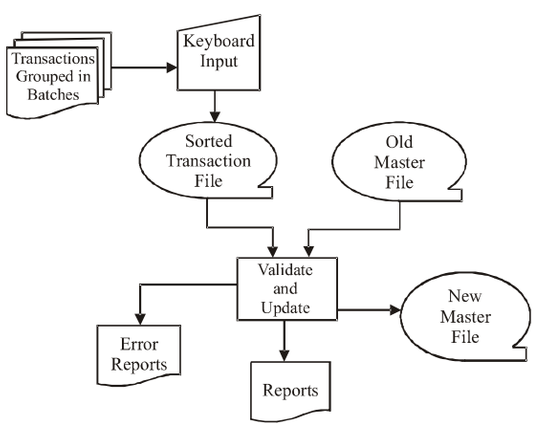

Fig. 12.2 *Batch Processing*

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Batch processing involves the accumulation/storage of information in a group or **batch** until it becomes efficient or necessary for processing them. Batch processing of transactions can be very efficient in terms of data preparation and processing of transactions, especially when they are processed against a sequential file.

In batch systems, transactions are collected in a transaction file, which holds all the transactions for a particular period. This file is periodically used for updating the master file, which holds permanent information on entries. Adding the transaction data to the existing/current master file, generates a new master file, as illustrated in figure 12.2.

While batch processing may be useful in enhancing the control of transaction processing, it must be remembered that one major disadvantage of periodic batch processing is the delay in detecting and correcting errors.

12.2.2 Online Processing System

The online processing system of transactions has now become a way of life. In this system, the user has access to a terminal for input of transactions and output of results. Transactions are entered by the user into a device which is directly connected to the computer system. The transaction is taken for processing directly and validated immediately before being taken up for further processing. After validation, the data is accepted but processing itself may be performed either immediately or later, as illustrated in figure 12.3.

For online processing, the files must be available on direct access storage devices for immediate access to the data, so that records could be added to or deleted from the file. Thus, in online processing, the processing of data—from input to computation and updation of status on various files—is carried out immediately.

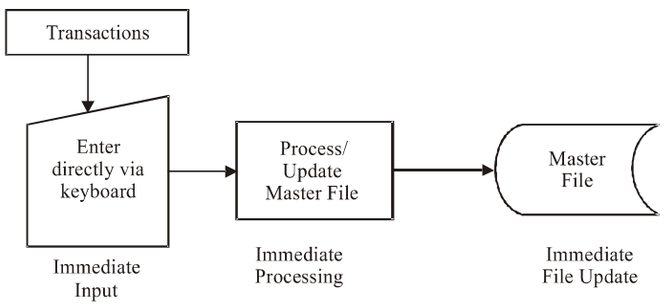

Fig 12.3 *Online Processing*

However, a user responsible for processing data in an online system must ensure proper security protocol—he must sign on properly, enter transactions in the proper, laid down format, respond to error messages with corrected input, review control information and sign off after the transaction processing is completed to prevent unauthorized use/access.

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12.2.3 Online Real-time Processing System

The online real-time processing system is similar to the online processing system as in both the systems, a transaction is entered directly into the computer and validated immediately. However, while under the online processing system, the transaction may be processed later, under the online real-time processing system, once a transaction is found to be valid, it is processed immediately and the results are also made available immediately, as the master data is always kept up to date.

Needless to add, the online real-time processing system is used where stored data needs to be updated simultaneously as the transaction takes place.

The points to be considered are the higher costs of online processing, requiring greater computing power and often data communication, as also the extra procedures required to produce adequate control information and safeguard files against accidental or deliberate destruction during online updating.
A schematic representation of two alternatives for an online direct entry is illustrated in figure 12.4.

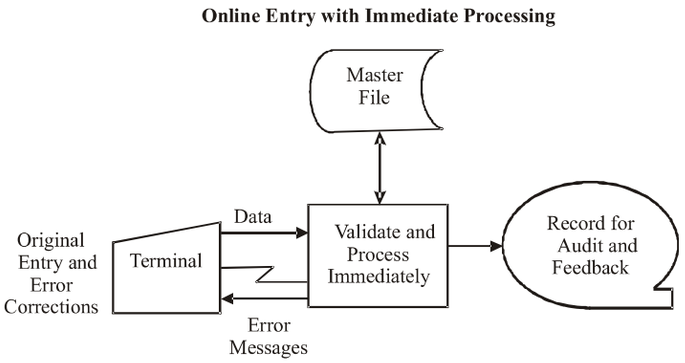

Fig. 12.4 *Online Entry with Immediate Processing*

12.2.4 Distributed Data Processing Mode

The distributed data processing mode became popular during the 1970s as this period witnessed the growth of powerful telecommunications networks and developments in computer technologies, leading to significant decline in computer hardware prices/costs.

The distributed data processing method refers to the distribution of computer processing among geographically and functionally multiple locations linked by the communications network. The distributed data processing mode enables the serving of multiple real-time applications as well as multiple classes of users. Instead of relying on a single centralized/mainframe computer system to provide service to remote sites, the distributed processors directly serve regional/local units/ establishments. These processors, in turn, are linked to each other by networks.

The distributed data processing system provides the advantages of increased system availability and quicker system response time. System availability is increased

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because when the CPU malfunctions or undergoes preventive maintenance, its work may be transferred to another CPU in the system. The response time is improved because the workload can be distributed evenly among the CPUs to ensure optimum utilization.

12.2.5 Other Data Processing Modes

In addition to the batch processing, online processing, real-time processing and distributed data processing modes, there are some other modes which can be used for data processing. These modes are based on the capability of the operating system. Such data processing modes are as follows:

- Time-sharing
- Multi-programming
- Multiprocessing

Let us briefly discuss these three data processing modes.

Time-sharing

The time-sharing mode of data processing allows several users to simultaneously share the processing capability of the computer system. Under this mode, each user is allotted a certain time slot or time slice during which that particular user has access to the processor. The processor spends this allotted time on one program before moving over to another. This activity is repeated until the user's task is finally completed. The users of the system generally avail the facility of time-sharing of a computer system through remote terminals.

Multiprocessing

Multiprocessing is a capability of the operating system. It allows combining two or more CPUs to operate in parallel in one computer system. The tasks envisaged to be carried out are divided between the CPUs, leading to simultaneous execution of two or more processing units, which are part of the same system. This is possible as each processor shares access to its main memory with the other processors.

Multi-programming

Multi-programming is one of the most important capability of an operating system used for sharing computer resources and facilitating data processing. Multi-programming allows numerous programs to use a computer system's resources at any particular time through concurrent use of CPU, thereby enabling higher CPU utilization. Multi-programming enables a group of programs to take turns in using the CPU. For example, in the multi-programming mode, a number of programs are present in the memory and a number of jobs will be in queue waiting to be processed. When one of the jobs in the memory is finished, another job is taken from the queue and put into the main memory for execution.

It has, however, to be remembered that multi-programming and multiprocessing are different in as much as while multi-programming uses concurrent

processing with the single CPU, multiprocessing uses simultaneous processing with multiple CPUs.

Check Your Progress

1. Name the four different methods used for data processing and updating.
2. What are the different ways for data capture?
3. What things a user should ensure while processing data in an online system?

NOTES

12.3 COMPUTERS SYSTEMS: TYPES

According to the Information Technology Act, 2002, 'Computer means any electronic, magnetic, optical or other high-speed data processing device or system, which performs logical, arithmetical and memory functions by manipulating electronic, magnetic or optical impulses, and includes all inputs, output, processing, storage, computer software or communication facilities, which are connected or related to the computer in a computer system or computer network.'

However, a computer is basically an electromagnetic device and when we refer to a computer we normally have in mind the basic hardware equipment in a computer system. Computer hardware is the physical equipment used for input, processing and output activities in an information system, which supports the following functions:

- Entry or input to the computer
- Output from the computer
- Secondary storage
- Central processing unit (CPU), consisting of Arithmetical and Logical Unit (ALU) for computation, control and primary storage. Sometimes, the following two additional functions may also be present:
- Data communication
- Data preparation

The basic functions in a computer system can be illustrated in figure 12.5.

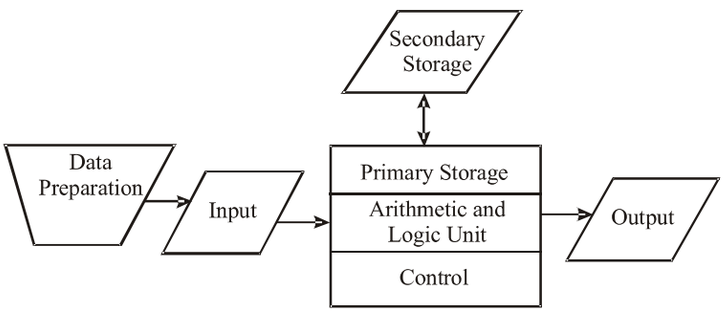

***Fig. 12.5** Central Processing Unit*

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The computer hardware consists of the following:

- Central processing unit (CPU)
- Input devices
- Output devices
- Storage devices—primary and secondary
- Physical media to link the aforesaid devices (communication devices).

The various components can be illustrated in figure 12.6.

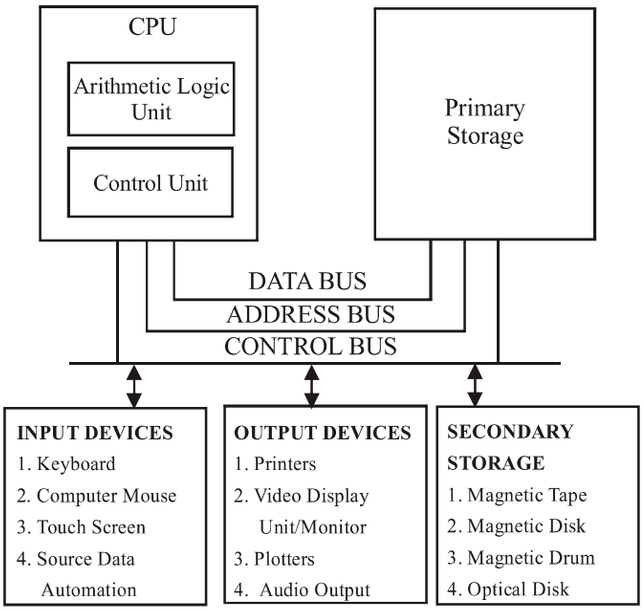

Fig. 12.6 *Various Components of Computer Hardware*

Before proceeding further, let us briefly define and describe the various components:

Central processing unit (CPU)

The CPU consists of the arithmetic and logic unit and the control unit. It is at the CPU that the manipulation of symbols, numbers and letters takes place. The CPU also controls the other parts of the computer system. It functions similar to the human brain.

Arithmetic and logic unit (ALU)*:* The ALU in the CPU performs both arithmetic and logical operations. The arithmetic operations include addition, subtraction, multiplication and division and also determine whether a given number is positive or negative. On the logical side, it distinguishes between letters as well as numbers logically, and also determines whether a given quantity is greater than or lesser than or equal to another quantity.

Control unit*:* It controls and coordinates the other components of a computer system.

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Primary storage

Also referred to as the main/core memory, primary storage is the component where data and storage instructions are stored for a temporary period till the processing is completed. There are three different types of primary storage, namely the register (in ALU or CU), the cache and the RAM. The linkage between CPU, primary storage and the other devices is provided by three buses, viz. data bus, address bus and control bus. The data bus moves data to and from primary storage. The address bus transmits signals for locating a given address in primary storage. The control bus transmits signals specifying whether to read or write data to/from a given primary storage address, input device or output device.

12.3.1 Input Devices

Input devices are used for entering data into the computer system. Using a keyboard has been the traditional method of inputting data. A keyboard consists of the usual keys as well as special keys. The computer mouse is now a more popular input device particularly in the aftermath of the Graphical User Interface. A computer mouse is a hand-held device that is usually attached to the computer by a cable. It is known as a 'point and click' device, though it can also be used to draw images on the screen.

Touch screens permit entering or selecting commands and data by touching the surface of a sensitized video display unit/monitor with a finger or a pointer.

Source data automation is an input device—rather a technology—that captures data in computer readable form at the time and place the data is created. Magnetic ink character recognition (MICR), optical character recognition (OCR), bar code, pen-based inputs, digital scanners, voice input devices and sensors are examples of this technology.

12.3.2 Output devices

Some common output devices are cathode ray tube (CRT), terminals (video display units), printers, plotters, etc.

Cathode ray tube is generally the most popular form of output device in contemporary computer systems.

Printers produce a printed copy—known as hard copy—of information output. Printers can be 'impact printers' (e.g., dot matrix) or 'non-impact printers' (e.g., ink jet, laser, etc.). The output can be in the form of text, graphics or otherwise, as the case may be.

Plotters are used for obtaining high-quality graphic documents and are useful for computing large size charts, maps or drawings. An audio output device is one which converts digital output data into spoken word/intelligible speech.

12.3.3 Secondary storage

Secondary storage is the relatively long-term, non-volatile storage of data outside the CPU and primary storage. Hard disk, high density diskette, magnetic tape, optical disk, etc., are some of the secondary storage devices used.

NOTES

Check Your Progress

4. Define 'computer' as per the Information Technology Act, 2002.
5. What component is called the brain of the computer and why?
6. Name some secondary storage devices.

12.4 HARDWARE STANDARDS AND OTHER ACQUISITION ISSUES

A system consists of both, hardware as well as software. Hardware is the physical part whereas software is an abstract part of the system. Software needs a machine on which it can run and hardware needs instructions in form of program(s), contained in the software, for its working. Thus, to acquire a system, one has to acquire both, hardware as well as software.

The IT strategy should identify the basic type of hardware that the business requires, and prepare a systematic schedule for its acquisition. The pricing and ongoing costs are affected by the upgrade costs, warranties, level of support required, and the maintenance contract with the supplier.

An individual can acquire hardware in a several ways, such as by buying, leasing or renting it. Many small businesses buy their desktop and server hardware from the original manufacturer directly and completely via their website or over the telephone, or through a retail channel. The direct route is much more cost-effective for a small number of PCs at a time.

To gain the best from this route, it is essential that the specifications are clearly defined. One has to choose a standard offering that is not only meets the minimum requirements, but also compatible to changes in the future. For instance, memory can be upgraded later, if need be.

Another option is to hire a consultant to refine the requirements, prepare the list, anlayse the various deals that are offered by different suppliers then finally buy the hardware.

You can also buy printers directly from the manufacturer. Ink-jet printers are priced cheaply. However, their ink cartridges are expensive and need frequent replacement. Therefore, it is better to purchase a more expensive laser-based printer and share it between the staff by using the network. The lower running costs will quickly cover the additional capital cost in case a great deal of colour is used. The running costs must be considered before choosing a particular type.

Network infrastructure components such as, network switches, wiring required to connect servers, printers as well as PCs. This type of hardware is available at most of the major catalogue based IT vendors who have a wide range of network equipments.

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It is essential to strike a balance on the expenditure done on the infrastructure and PCs. The IT strategy and planning must include the expenses so that in case any network upgrades are required, they are implemented at the right time, not in a piecemeal fashion.

Software Acquisition - Types of Software

There are many types of software available in the market today. This requires lot of analysis before acquiring one that suits your requirement.

System software does not deliver business functionality directly. **System software** supports functionality by providing the framework application in which one can use a computer. Operating systems such as Windows or Linux are used to handle large amounts of data and these are not made for specific use. These are made for system oriented use.

Application software supports a particular application handled by user and interacts with hardware component of computer. Application software is designed by keeping in mind the requirement of users of different types. Normally, it is designed to a particular type of business requirements that covers a greater segment of customers. Developers try to create more useful add-ons to attract customers. An application package that has large user base may be marketed at a lower price because development cost is distributed over the entire customer base. On the other hand application packages, built to suit a smaller group, will be very expensive.

Application software fall under three categories:

- **Off-the-shelf package:** Such packages are built to suit a very large number of customers. These are sold through retail outlets. Developer has no contact with customers. Such packages are made with added features that attract different types of users.
- **Bespoke software applications:** Such application packages are created to meet the needs of a single customer as per specification provided by user. Such a package will be very costly since entire cost of development is booked on the single customer. Such applications are normally not used much. There are certain software that are to be kept secret such those used in forensic science. Such packages are not used in normal business operations.
- **Tailored application software:** These packages are developed on some standard. Some changes to suit the requirement of users can be made. Such changes are usually made by original software developer. Alternatively such changes can be done by employing a third party.

Understanding requirements

While deciding to acquire a software application package, the requirements such as the maintenance of VAT facilitates the selection the best of the lot. The time spent on assembling these requirements depends on the software and individual plans to acquire:

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- **Off-the-shelf 'office' package:** A detailed set of requirements is probably not useful in this case. The selection may be restricted to choosing a package that is compatible with the company's partners, suppliers etc.
- **Complex business-oriented package such as a payroll or accounts system:** A collection of requirements is helpful in this case as it to assists selecting between different suppliers' packages.
- **A bespoke application:** An entirely structured set of requirements is vital in this case and will probably require professional help to construct them.

It is useful to concentrate initially on **what** is required in the application, not how this will be accomplished. This is particularly important in case of a customized application. This type of **functional requirement** describes things that the application has to do, in business terms.

Non-functional requirements describe things that are important but are not directly related to the business functions that the package performs. Take for instance, the speed and performance of a package that carries out some functions and the operating systems that the package works with.

The staff using the application is the best source of ideas about the functionality of any equipment/application. Their involvement facilitates the implementation. Their input in the form of a request for proposal can be used that contains the entire list of all the things you propose to buy. This list is sent to several suppliers to obtain a like-for-like price comparison.

Other Routes to Software Acquisition

Most software packages are provided under a license that restricts the utilization of the entire package as it does not provide the source code from which the package is generated.

The source code refers to the original program written by the software developer. This code can be modified to update the product or to suit a new activity. As the source code is not provided with the package, only the original developer can make changes in the code.

The popularity of Open-source software is an alternative has swiftly grown. It is also made available under a license similar to proprietary software; however, this license is less restrictive as it provides the source code of the package.

Open-source software is usually available at minimal or zero cost. What is more, the software can be installed on as many computers as required at no extra cost. Therefore, it serves as a major cost saving approach over proprietary package.

Nevertheless, there are a few drawbacks of this approach:

- Limited number of business-oriented open-source applications
- Obtaining support and training for the application is tough

Another approach is the utilization of an application service provider. In this approach, the software is installed at the service provider's end and used over the internet.

The service provider maintains the data stored on their computers. The service provider also takes care and upgrades the software, which is done quite efficiently as it is situated at a single location.

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Check Your Progress

7. What factors affect the pricing and ongoing costs of hardware?
8. What are the three categories of application software?

12.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The four different methods used for data processing and updating are as follows:
   (a) Batch Processing
   (b) Online Processing
   (c) Online Real-Time Processing
   (d) Distributed Data Processing
2. Different ways for data capture include: Optical Character Reader (OCR), Voice recognition software, Optical Mark Reader (OMR), Hand-held devices, Barcode readers.
3. A user responsible for processing data in an online system must ensure proper security protocol-he must sign on properly, enter transactions in the proper, laid down format, respond to error messages with corrected input, review control information and sign off after the transaction processing is completed to prevent unauthorized use/access.
4. According to the Information Technology Act, 2002, 'Computer means any electronic, magnetic, optical or other high-speed data processing device or system, which performs logical, arithmetical and memory functions by manipulating electronic, magnetic or optical impulses, and includes all inputs, output, processing, storage, computer software or communication facilities, which are connected or related to the computer in a computer system or computer network.'
5. The central processing unit (CPU) is referred as the brain of computer because it is responsible to make decisions and perform calculations. The CPU consists of the arithmetic and logic unit and the control unit. It is at the CPU that the manipulation of symbols, numbers and letters takes place. The CPU also controls the other parts of the computer system.
6. Some of the secondary storage are hard disk, high density diskette, magnetic tape, optical disk, etc.
7. The pricing and ongoing costs of the hardware are affected by the upgrade costs, warranties, level of support required, and the maintenance contract with the supplier.

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8. The three categories of application software are as follows:
   - Off-the-shelf application software
   - Bespoke application software
   - Tailored application software

12.6 SUMMARY

- Computers are used for processing data, analysing it and getting the necessary information for facilitating decision-making.
- There are four different methods used for data processing and updating, namely Batch Processing, Online Processing, Real Time Processing, and Distributed Processing.
- Batch processing involves the accumulation/storage of information in a group or batch until it becomes efficient or necessary for processing them. Batch processing of transactions can be very efficient in terms of data preparation and processing of transactions, especially when they are processed against a sequential file.
- In Online processing system, the user has access to a terminal for input of transactions and output of results. Transactions are entered by the user into a device which is directly connected to the computer system. The transaction is taken for processing directly and validated immediately before being taken up for further processing.
- For online processing, the files must be available on direct access storage devices for immediate access to the data, so that records could be added to or deleted from the file.
- The online real-time processing system is similar to the online processing system in as much as in both the systems, a transaction is entered directly into the computer and validated immediately.
- The distributed data processing method refers to the distribution of computer processing among geographically and functionally multiple locations linked by the communications network. The distributed data processing mode enables the serving of multiple real-time applications as well as multiple classes of users.
- In addition to above-mentioned processing modes, there are some other modes which can be used for data processing. These modes are based on the capability of the operating system. Such data processing modes are time-sharing, multiprocessing and multi-programming.
- A computer is basically an electromagnetic device and when we refer to a computer we normally have in mind the basic hardware equipment in a computer system.

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- Computer hardware is the physical equipment used for input, processing and output activities in an information system, which supports the functions like input, output, secondary storage, data communication, data preparation, and central processing unit.
- The CPU consists of the arithmetic and logic unit and the control unit. It is at the CPU that the manipulation of symbols, numbers and letters takes place. The CPU also controls the other parts of the computer system. It functions similar to the human brain.
- Primary storage is the component where data and storage instructions are stored for a temporary period till the processing is completed. There are three different types of primary storage, namely the register (in ALU or CU), the cache and the RAM.
- Input devices are used for entering data into the computer system. Using a keyboard has been the traditional method of inputting data. A keyboard consists of the usual keys as well as special keys.
- Some common output devices are cathode ray tube (CRT), terminals (video display units), printers, plotters, etc.
- Secondary storage is the relatively long-term, non-volatile storage of data outside the CPU and primary storage. Hard disk, high density diskette, magnetic tape, optical disk, etc., are some of the secondary storage devices used.
- Hardware is the physical part whereas software is an abstract part of the system. Software needs a machine on which it can run and hardware needs instructions in form of program(s), contained in the software, for its working. Thus, to acquire a system, one has to acquire both, hardware as well as software.
- System software supports functionality by providing the framework application in which one can use a computer. Operating systems such as Windows or Linux are used to handle large amounts of data and these are not made for specific use. These are made for system oriented use.
- Application software supports a particular application handled by user and interacts with hardware component of computer. Application software is designed keeping mind requirement of users of different types. Normally, it is designed to a particular type of business requirements that covers a greater segment of customers.

12.7 KEY WORDS

- **Non-volatile Storage:** It refers to the type of computer memory that has the capability to hold saved data even if the power is turned off.

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- **Off-the-shelf Package:** It refers to the designated commercial products that are ready for use without modification.
- **Bespoke software:** It refers to a software that is especially developed for some specific organization or other user.
- **Request for proposal:** It refers to a document issued by a business or an organization to request vendor bids for products, solutions and services.

12.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. Compare the pros and cons of different data capture systems.
2. How transactions are collected in batch processing system?
3. Write a short note on distributed data processing mode.
4. What are the two main classifications of software?

Long-Answer Questions

1. Discuss the difference between online processing and online real-time processing.
2. Explain three data processing modes.
3. Evaluate the difference between primary and secondary storage.
4. Explore the difference between system software and application software.

12.9 FURTHER READINGS

Ahituv, N. and S.Neumann. 1990. *Principles of Information Systems for Management*. Dubuque: Wm. C. Brown Publishers.

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UNIT 13 MANAGING INFORMATION TECHNOLOGY

NOTES

Structure

13.0 INTRODUCTION

Managing information refers to manage the records, information or data efficiently and professionally. Effective management of information involves identifying it as an asset, cataloguing it and providing various types of active management. In his unit, you will study about the methods of managing information resources and technologies, the architecture and management of information systems. The unit also discusses about technologies used in logistics applications like electronic data interchange (EDI). In addition to this, the process of supply chain management and global information technology management has also been discussed in the unit.

13.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the management of information resources and technologies
- Assess the IS architecture and management
- Describe the process of supply chain management
- Analyse the significance of electronic data interchange (EDI)
- Examine the role of MIS in global businesses

13.2 MANAGING INFORMATION RESOURCES AND TECHNOLOGIES

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Initially, in opening our discussion on MIS, we had said that an MIS is a system that provides information to the management. We had also said that we are living in an information age. Information is of critical importance for the setting up, running, survival and prosperity of a business organization as it enables an organization to gain and retain a competitive edge and emerge a winner.

We will now discuss the concepts of information in more detail as MIS is centred around information.

Information is derived from data. Data is nothing but a random, unorganized collection of indications or measurements of certain qualities or attributes relating to an entity, recorded either in alphabetical, numerical, alphanumerical, voice, image, text or any other form.

Data can also be described as unstructured raw facts, observations or unevaluated messages in isolation. Data, per se, does not convey much or is not of much use. It is like a material that is simply available in an unfinished form. Data consists of facts and figures that are not currently being used in the decision process and usually kept as historical records without any immediate intent to retrieve them for decision-making.

Information, on the other hand, is like a finished product. Information, therefore, is defined as data that is collected, collated, processed, logically organized and analysed so as to be used by the decision-maker.

Information, according to Davis and Olson, is 'data that has been processed into a form that is meaningful to the recipient and is of real or perceived value in current or prospective actions or decisions.' Thus, data, in order to be converted into information, has to undergo processing as illustrated hereunder:

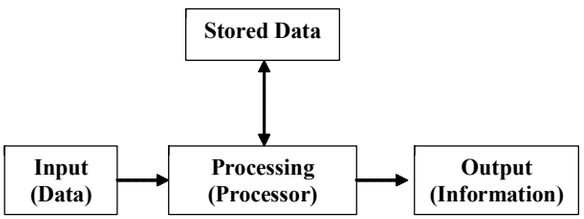

Fig 13.1 *Information Processing*

13.2.1 Information Process

As stated, data has to be processed before information is made available. Hence, various operations have to be carried out for converting data into meaningful information as follows:

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• Capturing	Data from an event/transaction has to be recorded.
• Verifying	Data has to be checked/validated for correctness.
• Classifying	Data has to be placed in specific categories.
• Arranging/sorting	Data has to be placed in a particular order/ sequence.
• Summarizing	Data elements have to be combined/aggregated.
• Calculating	Arithmetical/logical calculations/computations have to be carried out.
• Storing	Data has to be placed in some storage media.
• Retrieving	Specific data elements have to be searched for and accessed.
• Reproducing	Data has to be duplicated from one medium to another.
• Dissemination/ communication	Data has to be transmitted from one place (device) to another (user).

Information and Decision-Maker

Information is not only relevant but also critical for the decision-maker as the quality of the decision depends on the quality of the information. More specifically, information is useful for the decision-maker as:

- It helps in minimizing, if not eliminating altogether, the elements of risk and uncertainty in decision-making.
- It minimizes the element of 'surprise' and uncertainty in decision-making.
- It improves the quality of decision-making.
- It helps achieve the optimum results within given constraints.
- It affects the decision-making behaviour and makes a difference.

Sources of Information

Data is the foundation of them all information. A few aspects of data, sources of data and methods of collecting data for the purposes of converting into information are described as follows:

Primary and secondary data: Data is the raw material used for obtaining information. It is derived from a number of sources, both internal as well as external. If the data is collected for the first time by the researcher, it is known as *primary data.* If, however, is borrowed by the researcher from other sources, it is referred to as *secondary data.*

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Primary data could be gathered directly from the respondent. Different techniques such as observations, questionnaires and interviews can be used for obtaining primary data, which can then be converted into information.

Secondary sources of data/information include internal records as well as external records. Sources such as newspapers, magazines, trade journals, government publications, government policy documents, research reports and Web sites are considered secondary sources of data.

13.2.2 Types of Information

Information is to be used for decision-making. There are three types of information, which are required for the decision-making process:

- Strategic-level information
- Tactical-level information
- Operational-level information

For strategic decision-making, one needs strategic information, which is holistic, unstructured and draws heavily from the external environment. It also requires futuristic inputs like the emerging technologies, competition, consumer preferences, social-economic-political changes, as these inputs would be used for long-term planning.

Tactical information would be used for medium/short-term planning by the middle management, budgets, forecasts, analysis, cash/funds flow projections, etc., are part of tactical information. Such information is mostly from the internal environment and partly from the external environment such as customer perceptions, competitors strategy, pricing, and so on. It has medium-term impact.

Operational information is mainly concerned with current happenings within the organization and is mainly drawn from internal sources. It also covers a specific product, specific activity and a smaller group/number of people.

Apart from the three types stated above, we can also divide information into *Planning Information* and *Control Information.* The planning and control information could be differentiated as follows:

Table 13.1 *Difference between Planning Information and Control Information*

Planning Information	Control Information
• It covers the whole organization.	• It is concerned with a small, specific part of an organization.
• It has a longer time span.	• It has a shorter time span.
• It looks for and analyses trends/patterns.	• It looks for specific details for functional activity.
• It is used for working futuristic trends/forecast.	• It is used for assessing actual performance vis-à-vis budgeted.

13.2.3 Attributes of Information

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Information, in order to be used by decision makers, must have certain attributes. The various attributes required depends upon the decision process and where it is to be used. In general, information must possess some essential attributes. These are:

Timeliness: The information should be available when it is required. For example, if you are planning a journey, you must get all the information about booking your tickets before you move out of the house.

- **Currency:** It must conform to the current situation and should have relevance to present conditions.
- **Periodicity/Frequency**: Much information is required at a regular interval of time in a continuous business process. This is mostly found in day-to-day processes where rate of information is very important. A computer processes millions of instructions per seconds and input too, pertaining to the system, is required for its fast processing.
- **Pertinent/Relevant:** The information collected should be relevant to the purpose for which it is required.
- **Completeness**: The information must be complete. Incomplete information is more dangerous than no information.
- **Consistency**: Information must be consistent with its requirement. If information is consistent, results based on this will also be consistent. Information may contain a set of facts. All these facts should not have any inner contradiction.
- **Accuracy**: The information should be such that it can be used. It must be collected without errors. Inaccurate information will lead to a wrong action.
- **Reliability**: Reliability is essential in a business environment. Information may be accurate, but if it is not reliable, then there is no surety that in future too information extracted from the source will be accurate.
- **Clarity**: Every piece of information should be clear and convey a clear fact.
- **Comprehensibility**: Information should be such that it can be comprehended. Every piece of information may be individually correct but the complete information may not be comprehensible, making it unworthy of use.
- **Verifiability**: Users of information would like to verify whether information is correct and relevant. If the user has no basis to check it, it may be misleading.
- **Brevity**: Too much information may not be good. Information that is complete and accurate should be brief and precise.
- **Cost-effectiveness**: Information should be made available in a cost effective manner. If information costs are high then it will add to business overheads.

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There are many attributes of information that are dependent on factors such as type of business or establishment. Even in the same organization, different departments or sections need different types of attributes for decision making.

An efficient information system brings great potential to the business process and overall business as well as social environment. Some of these are being given below:

Globalization: Information technology has brought the world closer and has contributed to the world economy. Countries separated by thousands of kilometres are able to exchange information and conduct business, making selection of talent and global trading possible. This has over-ridden geographical boundaries, turning the world into a global village. This has brought remarkable socio-economic changes.

Communication: With the development of information system and technology, communication has also become cheaper and faster. Global communication is no longer a dream. Instant messaging, on-line business transaction, on-line video conferencing, remote surgery, and so on are some of distinct advantages that we are witnessing now.

Bridging the cultural gap: Information technology has helped bring people together and know each other better, leading to a better society of understanding, consideration and freedom from prejudice.

Needless to add, the more attributes the 'information' possesses, the better the quality, leading to higher value of such information for the organization and decision-maker.

13.2.4 IS Architecture and Management: Centralized, Decentralized and Distributed

Centralized computing is a type of computing architecture where all or most of the processing/computing is performed on a central server. **Centralized IS architecture** enables the deployment of all of a central server's computing resources, administration and management. All server components are installed on the same host.

In **decentralized IS architecture**, all system information are constantly replicated to all sites in the network. It means that the system does not have any single point of failure. This way, local call and data traffic will continue without interruption. All features will remain intact, even if one or more local sites lose connection to the rest of the network. The flat decentralized IP architecture and intuitive software also enable effortless, self-configuring site expansion.

In **distributed IS architecture**, any or all of the server components are installed on dedicated hosts. In distributed architecture, components are presented on different platforms and several components can cooperate with one another over a communication network in order to achieve a specific objective or goal. The

basis of a distributed architecture is its transparency, reliability, and availability. Distributed architecture is the most recommended method as all IS components function at their most optimized capacity.

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Check Your Progress

1. What is data?
2. What do you mean by information?
3. What are the primary and secondary sources of information?
4. Name the three types of information required for the decision-making process?

13.3 ELECTRONIC DATA INTERCHANGE (EDI)

IT is increasing in both speed and capacity, while there is a decline in the cost of transactions. Some specific technologies have demonstrated wide-spread logistics applications. Some of these technologies are:

- Electronic Data Interchange (EDI)
- Bar Codes and Scanning
- RFID
- Satellite Communication
- Expert Systems

As we have already discussed about technologies like Barcodes and Scanning, RFID, Satellite Communication, and Expert Systems in previous units. Let us now read about Electronic Data Interchange (EDI) in detail.

Electronic Data Interchange (EDI)

Electronic Data Interchange (EDl) describes both the capability and practice of communicating information between two organizations via computer systems, instead of through traditional forms of communication for managing distribution and procurement systems. It allows two organizations to effectively utilize the information exchanged using business documents in standard formats.

EDI has a highly structured message communication system, with tight, pre-decided formats of documents, which allows effective, speedy and reliable communication between different locations (see Figure 13.2). It uses a service provider, which transfers data and provides translators between different formats. The service provider also handles the EDI traffic between various sources and destinations.

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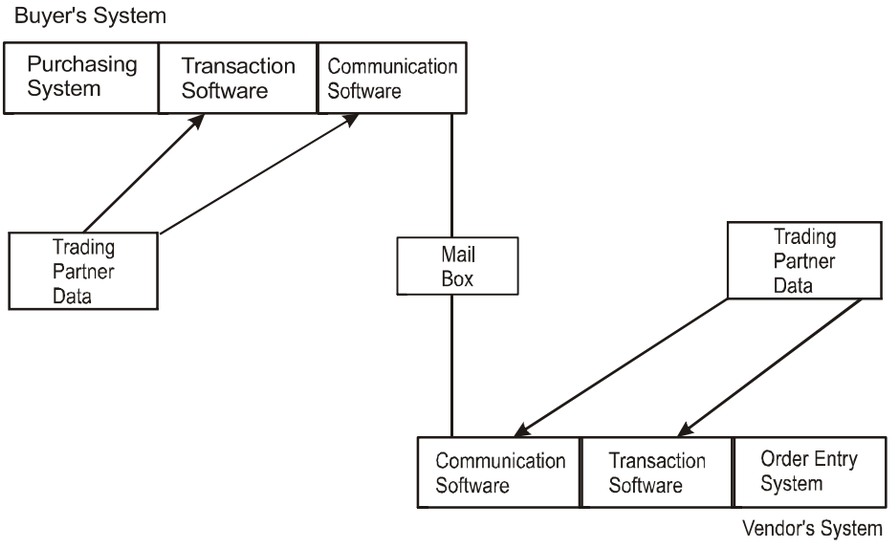

Fig. 13.2 *A Typical EDI System*

Industry organizations have developed and refined two general standards as well as numerous industry-specific standards in an effort to standardize both communication and information interchange. ASC ×12 is promoted as the United States standard, while UN/EDIFACT is used by the United Nations as a global standard for communications. Information exchange is based on transaction sets that are generally application specific on an industry basis. The use of EDI requires adherence to certain document standards. Standards are emerging in various industries worldwide. In India, the automobile industry, along with some major auto component manufacturers and other players like banks have agreed on common formats of EDI documents.

EDI formats typically have a layered structure, which contain identification of the firm and make the transaction, functional specification of documents, the document structure and the data elements, all in a certain format that has to be strictly followed.

The major advantage of EDI is that it provides fast, error-free and reliable exchange of data between different entities in a supply chain. Documents (especially standard and repetitive format ones), such as purchase orders and despatch advices, are ideally suited for EDI. Other common applications are invoices, payment advices, requests for quotations, advance shipping notices (despatch advices), and order status inquiries and response. Real-time data on company operations – inbound material flows, production status, product inventories, customer shipments and incoming orders, among others – are also suited for EDI.

Benefits: Direct EDI benefits include: (1) increased internal and external productivity through faster information transmission as well as reduced information entry redundancy. Accuracy is improved by reducing the number of times and individuals involved in data entry; (2) reduced labour and material costs associated

with printing, mailing and handling paper-based transactions; (3) reduced telephone, fax and telex communication; (4) reduced clerical costs; (5) decreased operating costs; (6) enhanced supply chain relations; and (7) improved customer responsiveness.

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In addition, EDI improves channel relationships and the quality of decision-making, along with the ability to compete internationally.

13.4 SUPPLY CHAIN MANAGEMENT

An organization procures raw materials, processes them to add value and then sells them to customers. The objective is to meet market demand but at the same time avoid excess inventory of raw material or finished products. An organization needs to anticipate market demand and forecast long, intermediate and short term customer demands. Based on these forecasts, the supplies have to be ordered appropriately and production has to be carried out. These activities together are referred to as supply chain management. There are software available in the market to manage information related to supply chains. These software take into account past sales data and the lead time to acquire supplies to forecast demand and calculate optimum or economic re-order quantity and the time to place the order. SCM systems may also be web enabled to give real-time access to orders and suppliers, and this reduces communication time considerably. SCM also supports e-payments to suppliers. One can track the status of orders and shipments using SCM. At any point, one can know the inventory, the shipments due to arrive and the orders pending. An organization can also plan the distribution of its products in an economical way by using SCM. Take for example the problem of a travelling salesman who has to find out the optimum route (travel minimum distance) to visit a particular client or customer. One cannot solve this problem even by trying all possible combinations and choosing the best one as it is computationally impossible. Heuristics are used to find a near-optimal solution for working out a distribution network. Thus, SCM helps an organization in planning the procurement and distribution of goods.

13.5 GLOBAL INFORMATION TECHNOLOGY MANAGEMENT

MIS plays a crucial role in almost all kinds of organizations irrespective of their size and nature of business. MIS has evolved from traditional electronic data processing (EDP) systems to highly integrated information systems (enterprise information systems like ERP, CRM, SCM). Many advances in IS/IT have led to a fundamental shift in the role of information systems. As already been mentioned, information systems play three vital roles for a business organization today. They support the business processes of an organization, decision-making by managers and the strategies of an organization for gaining competitive advantage.

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MIS has changed the way organizations do business and has increased their efficiencies and responsiveness. Today, Internet-based and web-enabled systems and global e-business and e-commerce systems are becoming quite common in the operation and management of a business organization. The information systems have played a major role in automating business transactions, streamlining routine operations and have also helped organizations to take quick and well informed decisions and thus enable the organizations to have better intimacy of customers and suppliers. Today, organizations are implementing integrated MIS systems and replacing their old or legacy systems.

Let us try to understand the role of MIS in impacting the business globally.

(i) Integration of functional areas

Integrated information systems play a very important role in integrating the various functional areas of a business organization. Because a highly integrated information systems like ERP are designed on the premise of a common database and a common interface for all the functional areas and thus have the ability to automatically update data among related functions or activities. For example, when a customer places an order and the order is entered into the system (either online or offline), it triggers many actions across various departments or functional areas like inventory management; production planning; finance; marketing and so on. The invoices are generated, production schedule is planned, the inventory status is verified; the items, if not available in the stock, are ordered; and the customer is informed about the likely date of the delivery of the ordered item. All these actions are taken automatically and data updation happens instantaneously. This role of ERP in integrating various functional areas leads to improved responsiveness across the organization, and thus enables better decision-making and problem solving in organizations. This, in turn, leads to reduced lead time (the elapsed time between placing an order and receiving it); reduced cycle time (the time between placing an order and delivery of the product); efficient use of resources; on time delivery of products; transparency; and overall customer satisfaction.

(ii) Reengineering of business processes

Highly integrated information systems like ERP Systems are process-oriented and one of the pre-requisites for the implementation of ERP systems is business process re-engineering (BPR). Thus ERP Systems force the organizations to re-engineer or redesign their obsolete function-oriented business processes. To implement ERP System, organizations have to either adopt ERP-based processes or modify ERP System so as to match its existing business processes. Since ERP Systems are designed and developed on the basis of the best practices of industry, it is generally recommended to adopt ERP processes.

(iii) Standardization of systems and procedures

Highly integrated information systems, which are based on an integration approach, enables an organization to follow standardized systems and procedures across

the organizational units. This brings about consistency in the entire organization. This becomes all the more important for the organizations, which have either acquired other company or got merged with some other company. ERP ensures that the new company after the acquisition or merger uses the same information systems throughout and follows the similar procedures.

(iv) Networked Business

The integration of highly integrated information systems nowadays are extended beyond the boundaries of an organization leading to network with the business partners of the organization like Supply Chain Management (SCM) System; Customer Relationship Management (CRM) System, etc. This network with the partners of the organization enables it to exchange electronically various business documents like purchase orders, sales order, invoices, billing, etc.

Check Your Progress

5. What is the meaning of EDI and how is it used?
6. Briefly discuss the significance of supply chain management.

13.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Data is a random, unorganized collection of indications or measurements of certain qualities or attributes relating to an entity, recorded either in alphabetical, numerical, alphanumerical, voice, image, text or any other form.
2. Information is like a finished product. Information, therefore, is defined as data that is collected, collated, processed, logically organized and analysed so as to be used by the decision-maker.
3. Data is the raw material used for obtaining information. It is derived from a number of sources, both internal as well as external. If the data is collected for the first time by the researcher, it is known as *primary data,* which could be gathered directly from the respondent. If, however, it is borrowed by the researcher from other sources, it is referred to as *secondary data.*
4. The three types of information, which are required for the decision-making process include strategic-level information, tactical-level information, and operational-level information.
5. Electronic Data Interchange (EDI) is the practice of communicating information between two organizations via computer systems. It allows two organizations to effectively utilize the information exchanged using business documents in standard formats.
6. Supply chain management is the broad range of activities which involve plan, control and execute a product's flow, from acquiring raw materials

and production through distribution to the final customer. There are software available in the market to manage information related to supply chain.

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13.7 SUMMARY

- MIS is a system that provides information to the management. Information is of critical importance for the setting up, running, survival and prosperity of a business organization as it enables an organization to gain and retain a competitive edge and emerge a winner.
- Data is nothing but a random, unorganized collection of indications or measurements of certain qualities or attributes relating to an entity, recorded either in alphabetical, numerical, alphanumerical, voice, image, text or any other form.
- Information, on the other hand, is like a finished product. Information, therefore, is defined as data that is collected, collated, processed, logically organized and analysed so as to be used by the decision-maker.
- Information is not only relevant but also critical for the decision-maker as the quality of the decision depends on the quality of the information.
- Data is the raw material used for obtaining information. It is derived from a number of sources, both internal as well as external. If the data is collected for the first time by the researcher, it is known as *primary data.* If, however, is borrowed by the researcher from other sources, it is referred to as *secondary data.*
- There are three types of information required for the decision-making process, namely strategic-level information, tactical-level information, and operational-level information.
- Strategic information requires futuristic inputs like the emerging technologies, competition, consumer preferences, social-economic-political changes, as these inputs would be used for long-term planning.
- Tactical information would be used for medium/short-term planning by the middle management, budgets, forecasts, analysis, cash/funds flow projections, etc., are part of tactical information.
- Operational information is mainly concerned with current happenings within the organization and is mainly drawn from internal sources.
- Information must possess some essential attributes, such as timeliness, currency, periodicity or frequency, relevant, completeness, comprehensibility, verifiability, brevity and cost-effectiveness.
- Centralized IS architecture enables the deployment of all of a central server's computing resources, administration and management. All server components are installed on the same host.

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- In decentralized IS architecture, all system information are constantly replicated to all sites in the network. It means that the system does not have any single point of failure. In distributed IS architecture, any or all of the server components are installed on dedicated hosts.
- Electronic Data Interchange (EDl) describes both the capability and practice of communicating information between two organizations via computer systems, instead of through traditional forms of communication for managing distribution and procurement systems.
- EDI has a highly structured message communication system, with tight, pre-decided formats of documents, which allows effective, speedy and reliable communication between different locations.
- The major advantage of EDI is that it provides fast, error-free and reliable exchange of data between different entities in a supply chain.
- An organization needs to anticipate market demand and forecast long, intermediate and short term customer demands. Based on these forecasts, the supplies have to be ordered appropriately and production has to be carried out. These activities together are referred to as supply chain management.
- The Information systems have played a major role in automating business transactions, streamlining routine operations and have also helped organizations to take quick and well informed decisions and thus enable the organizations to have better intimacy of customers and suppliers. In view of the role, integrated MIS can play; organizations are implementing these systems replacing their old or legacy systems.
- Integrated information systems play a very important role in integrating the various functional areas of a business organization.
- Highly integrated information systems like ERP Systems are process-oriented and one of the pre-requisites for the implementation of ERP systems is business process re-engineering (BPR).
- Highly integrated information systems, which are based on an integration approach, enables an organization to follow standardized systems and procedures across the organizational units.

13.8 KEY WORDS

- **Heuristics:** It refers to an approach to problem solving or self-discovery that employs a practical method, not guaranteed to be optimal, perfect, logical, or rational, but instead sufficient for reaching an immediate goal.
- **Electronic Data Interchange:** It refers to the transfer of data from one computer system to another by standardized message formatting, without the need for human intervention.

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- **Supply Chain Management:** It refers to the management of the flow of goods and services and includes all processes that transform raw materials into final products.
- **Brevity:** It refers to the exact and concise use of words in writing or speech.

13.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. How is data processed into information?
2. Why is information useful for decision makers?
3. What is strategic-level information in decision making process?
4. What is the difference between planning information and control information?
5. Briefly explain centralized IS architecture.

Long-Answer Questions

1. Why are decision making processes important?
2. Describe the different attributes that influence the quality of information.
3. Discuss the benefits of Electronic Data Interchange (EDI).
4. Discuss the significance of MIS in businesses globally.

13.10 FURTHER READINGS

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UNIT 14 SECURITY AND ETHICAL CHALLENGES

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Structure

14.0 INTRODUCTION

Managing complex information and communication technologies in an organization is not an easy task. It requires the implementation of robust IT security policies and procedures. Organizations face many challenges in managing and protecting information from unauthorized access. The unit is all about the security and ethical challenges of IT faced by business organizations. Such challenges refer to the difficulties that organizations face in the management of complex information and communication technologies from malicious external threats.

The unit discusses the security measures need to be taken in order to prevent security incidents. You will also learn about the types of information security attacks from outsiders and the risk to online operations, Denial of Service (DoS) and spoofing has also been discussed in the unit. Additionally, the topics like information security controls, facility controls and procedural control and ethics to IS professionals have also been taken into consideration in this unit.

14.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the security measures to prevent security incidents
- State the types of information security attacks from outsiders
- Examine the risk prone to online operations, DoS and spoofing

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- Describe Information Security controls- facility control and procedural control
- Analyse the management of social and ethical issues in information society
- Understand the ethics for information security (IS) professionals

14.2 RISK TO ONLINE OPERATIONS: DENIAL OF SERVICE AND SPOOFING

In this section, we are going to discuss about the threats and vulnerabilities of information systems from both insiders and outsiders and the ways of managing such threats and vulnerabilities.

Information Security Attacks from Insiders

It is now an acknowledged fact within the information security community that insiders (people with access to information systems of organizations) within the organization represents one of the biggest (estimates vary from half- to three-fourths of all security incidents) information security threats (Dhillon 1999, Whitman 2003). Considering that a large number of such incidents go undetected (Hoffer and Straub 1989) it is most likely that these numbers are actually much higher. Specialists therefore prescribe a cocktail of measures to prevent security incidents. These measures fall under two broad categories:

1. Procedural or business control measures—those that define access and other security policies, usage guidelines, security education, training and awareness (SETA) programs.
2. Technical measures—includes authentication measures, monitoring techniques, tools and filtering mechanisms.

14.2.1 Types of Information Security Attacks from Outsiders

Information security attacks can be of various types. Modern attacks and techniques are difficult to detect and stop as it requires continuous monitoring of the system. Perimeter security is therefore of vital importance as the objective of a security system is to halt an attacker from gaining access into the system. The following are the major forms of attack:

(a) Hacking

It is the activity of getting into a computer system without authorization to have an access for a look around and see what is possible to do in the system. Hackers are mainly of three different types.

- **Ethical hackers:** Ethical hacking and hacking etiquette demands that the hacker after having penetrated the system notifies the system administrator of his entry to let him know about the vulnerability of the system. This kind

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of hacking actually helps the organization to improve its security apparatus.

- **Crackers:** These are malicious hackers. Once they get inside a system, they destroy valuable assets. Their objective is to cause as much damage to the system as possible. These attacks are to be feared as they have the potential to cause large-scale damage to the organization's information assets.
- **Phreaks:** These are people who hack into the phone systems of organizations so that they can then make calls at the expense of the organization.

Each hacking incident however, may be different from the other as each hacker in each incident tries a different trick to exploit the vulnerability of a system. Since nowadays most systems are connected to the Internet, most hacking incidents occur from net-based hackers who gain access into the organizations computer systems and then cause damage to the system. Most hacking incidents follow a typical pattern or method, which are:

Reconnaissance—The hacker before embarking on a full-scale attack tries to find out the counter measures that are protecting a system. He tests the waters before jumping into the action. In this stage, he typically tries to gather information about the system (and/or network), its vulnerabilities, critical information stored in the system, key employee information, public information about the system and the organization, information about customers of the organization. This is passive reconnaissance. After this stage, the hacker moves on to active reconnaissance in which he acquires DNS information, IP addresses, performs ping sweeps, SNMP network scans and other attacks like banner grabbing, etc.

Vulnerability scanning—After the reconnaissance stage, the hacker moves to the scanning stage in which he looks for vulnerabilities in the perimeter security of the system. He also scans the routers and firewalls of the organization to check for vulnerabilities.

Securing/getting access—After the scanning stage, he moves to the stage of gaining access, here he accesses the organization's system after capitalizing on any vulnerability in the organization's security system. This can happen through the operating system of the organization's server or networked computer, an application (either planted within the system or suitable file corrupted/modified by the hacker to work on his commands), or through any network devices in the organization's network.

Maintaining access—After getting access to the organization's system, the hacker would normally like to continue to maintain access. This he manages by planting a custom-built application on the already compromised server of the organization. This strategy helps the hacker to enter and exit the system at will. Thus, the hacker can have complete control over the organization's system. He can upload applications, modify applications, modify data without anyone's knowledge, steal data and cause widespread

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damage to the system. At this stage, the hacker evaluates the information assets of the organization and based on his intentions goes ahead with a plan to profit from his efforts. He can wish to just maintain access without causing any damage, steal information and sell it outside, profit from altering the data of the organization or simply blackmail the organization.

Covering tracks—Once the hacker has enabled his access into the organization's system, he would like to remove any trace of his entry and exit from the system. This he manages by suitably deleting the evidence of his access from the audit files and log files. Thus, the system administrators remain oblivious to the access of the hacker.

(b) Denial of service (DoS)

This is another form-security attack in which the attacker overwhelms the organization's server (or other hardware resources) or the telecommunication lines from the ISP. Normally, DoS attacks are one-to-one meaning that the attackers launches an attack from his machine and attacks one organization with the objective of overwhelming its resources (hardware or telecom) thereby denying the system's services to legitimate users. Since February 2000, the trend for such attacks has changed. Now attackers use a many-to-one mode of attack for DoS. This is known as distributed denial of service (DDoS). The attacker creates zombies (these are compromised machines on the Internet that run application codes which are controlled by the attacker). At his instructions DoS attacks are launched simultaneously on a single target from all the zombies (sometimes as many as tens of thousands). The only way to control DDoS attacks is to control the number of zombies on the network. It is one of the most difficult forms of attack against which an organization is to be secured.

(c) Malicious code

This is another form of security threat, being pieces of code that reach vital areas of a system and renders great damage to it. The easiest form of distributing malicious codes is through e-mails. It is therefore a good idea to check the attachment files in e-mails before opening them. There are many different types of malicious code:

- **Virus:** This is the most common type of malicious code. Viruses are also of various types. File viruses are viruses that infect files of a system and then keep on multiplying themselves whenever a user opens a file or access a file and therefore spread to all parts of a system and damage all files in a system. Such file viruses are the most common form of virus applications. Most file viruses are executable files. Other types of viruses attack the master boot record of the operating system thereby rendering the OS useless. Some viruses are application specific like macro viruses that affect office applications.
- **Worm:** It is a form of malicious code that affects networks. They have the capability to replicate themselves over a network and spreads very quickly

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from one machine to another in a network. Several highly publicized attacks have been reported.

- **Trojan:** It is a stealth version of a malicious code. It seems like a good and trustworthy code on the surface but is actually a malicious code in reality. The easiest way to stop Trojans is to stop opening untrustworthy attachments and stop downloading and running freeware.
- **Logic bomb:** This type of malicious code waits in a system for a trigger, like a particular date and time, to unleash damage. The code waits patiently and does not act malevolently until a particular data and time and after that due date and time, it would work in a malevolent manner by damaging the system and data.

(d) Social engineering

This is another way of attacking a system. Social engineering is a set of techniques used to trick gullible users into parting with their critical information like username and password. The social engineering attacker uses the following human attributes to get access to critical data:

- Most people trust others unless they are found untrustworthy. The attacker exploits this trait of human nature. For example, simple calls made ostensibly on behalf of a trustworthy organization like a bank would make us divulge a lot of critical information about our bank accounts.
- The fear of getting into trouble is also another human trait that the attacker exploits. For example, a simple mail requesting you to give your password for better maintenance of your bank account may actually cause fear in your mind that if you do not divulge your password, maintenance will not be proper and hence some individuals indeed do give away their password.
- Preference for shortcuts is another human trait that attackers exploit. Most people give passwords as nicknames or birth dates or name of their pets which can be easily cracked.

Thus, we can see that a skilled social engineer may be able to get critical data that will enable him to access the system without much trouble. Thus, this type of attack is a very serious threat that all must be careful about.

> Sometimes a cruder version of social engineering called **phishing** is used to trick the user by sending him emails about opportunities or threats to near and dear ones. This kind of emails normally trick users to part with money instead of system critical data and is the handiwork of petty criminals and not sophisticated cyber attackers, whose sole aim is to get critical information about systems so that they may gain access into it and not to fool or fleece people for small sums of money.

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Some Top Hacking Incidents of All Time

1990s

Kevin Mitnick, a well known hacker, hacked into computer networks and systems of top telecom companies like Nokia, Fujitsu, Motorola, and Sun Microsystems. The incident caused a huge stir in the security establishment and Mitnick was arrested by the FBI in 1995, but later released on parole in 2000.

1995

A Russian hacker Vladimir Levin was the first hacker to hack into a bank to rob money. In early 1995, he hacked into a top US bank which had a very secure VAX VMS based system and robbed an estimated $10 million USD. He was later arrested.

1990

In 1990 a radio station in Los Angeles started a contest that awarded a Porsche for the 102nd caller. Kevin Paulson, a hacker took control of the entire city's telephone network, and ensured that he is the 102nd caller, so that he get the prize. He was later arrested.

1996

Timothy Lloyd wrote a small piece of malicious software code that allowed a "logic bomb" to explode which deleted software worth $10 million USD.

1988

Robert Morris a Cornell University graduate launched a worm on the Internet that infected machines world wide and crashed thousands of machines.

1999

David Smith wrote and launched one of the most dreaded virus, Melissa that damaged machines worldwide.

2000

MafiaBoy hacked into the most popular sites on the Internet world, like eBay, Amazon and Yahoo and managed to engineer a Denial of Service attack.

14.2.2 Incident Response

Let us discuss incident response in detail for better understanding of the concept.

What is an Incident?

An incident, in the parlance of information security, is a security breach or even an attempt to breach security. An unsuccessful attempt to crack the security system is also an incident and needs to be investigated thoroughly.

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Incident Response Process

Whenever an incident takes place, a series of steps need to be taken to find out the causes of the incident to ensure that such incidents do not occur in future. The incident response process involves the following steps:

- **Incident identification**– it is the first step of incident response in which the incident is identified. Some common incidents may be DoS, port scanning, IP sniffing, social engineering, banner capture, unauthorized access or virus infection.
- **Incident classification**– it is the next step in which the incident is classified based on its severity. Every organization must maintain an incident classification chart to rate an incident when it occurs based on its criticality.
- **Incident notification**– it is the notification given to specific functionaries about the incident.
- **Incident response and containment**– it is the action taken to thwart the incident.
- **Incident recovery**– it is the recovery activity to restore system to the previous status.
- **Post mortem**– this is the post incident investigation to find out the vulnerabilities in the system that allowed the incident to happen.

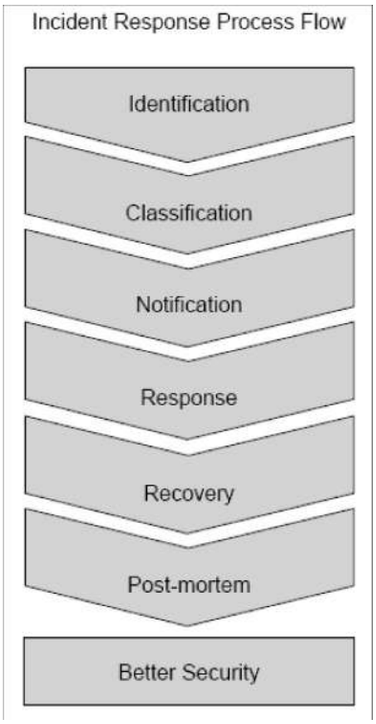

Fig. 14.1 *Incidence Response Flow Chart*

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14.2.3 Some Attack Techniques and Technologies

Some of the attack tools and techniques are:

1. IP spoofing is a the techniques of using forged 12 digit IP address (source) in the IP packets that are used in TCP/IP protocol for data communication (primarily on the Internet or on any other TCP/IP network) for concealing the identity of the sender or impersonating another computing system.
2. Packet sniffing is a technique or a program to troubleshoot network traffic. However, often it is used by hackers to get information about the source and destination of IP packets on a TCP/IP network. When on a TCP/IP network like Internet, data is broken down into small packets that are transmitted over the network and gather together at the destination, reassembled and displayed/stored etc. These packets have stamps of destination and source on them so that they are not lost. Packet sniffing is the technique that can capture these floating packets on the TCP/IP network like a wiretap and find out what is being sent to or from a source or destination.

Check Your Progress

1. What are the two categories of data security measures?
2. Why is perimeter security of a network important?
3. Name the three different types of hackers.
4. What is reconnaissance in network security?
5. Which is the most difficult forms of attack against which an organization is to be secured?
6. What do you mean by IP spoofing?

14.3 IS CONTROLS - FACILITY CONTROL AND PROCEDURAL CONTROL

Information security has been based on the principle of exclusion. Since the early days of computer applications from 1970's onwards, where the primary goal of security has always been to prevent unauthorized users from accessing IT assets. Thus, the systems were made sufficiently secure if:

- Access was restricted with username and password authentication.
- Gateways were monitored and controlled strictly so that communication with the outside world was limited and controlled.
- Electronic communication was limited with stakeholders through only approved applications.

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However, IT systems have today become more networked and integrated with its stakeholders than the systems of the 1970's. Spread of Internet and new business processes has enabled easier access and greater reach but at the same time have increased vulnerability of information systems to attacks and other threats from the outside world. Hence, the principle of exclusion has been refined in the modern context to mean the following:

- Ensuring that the right resource is available to the right person.
- Ensuring that appropriate access controls and authentication is required to access the information resources.
- Ensuring perimeter (virtual) based protection system to allow authorized users but to disallow outsiders.
- Ensuring reliable and on demand integrated information flow.

Today the challenge is to enable inclusion (that too most of the time by having a web enabled system) for insiders including customers, suppliers, employees, partners and other stakeholders and at the same time enforce exclusion of hackers, intruders, competitors and other outsiders in information systems. Figure 14.2 describes the challenge aptly. The virtual perimeter has to protect the information assets from outsiders and at the same time has to grant restricted access to external users, like customers and at the same time base that access on the basis of well defined rules. Therefore, a balance needs to be maintained between security exclusion and inclusion for optimum efficiency. The balance between security exclusion and inclusion is maintained by a proper Security Controls and Identity Management or SCIM solution.

SCIM Components

SCIM Components are given below:

(a) Business process control

(b) Identity management

SCIM solutions are a mix of technological and managerial/process driven interventions that help the organization to maintain the security balance. SCIM has following components:

(a) Business Process Control

It is a set of administrative and managerial interventions mostly in the nature of policies, guidelines and procedures that helps in improving the security of the organization's information assets. The interventions are designed to manage the risks associated with the security balance that the organization would like to maintain.

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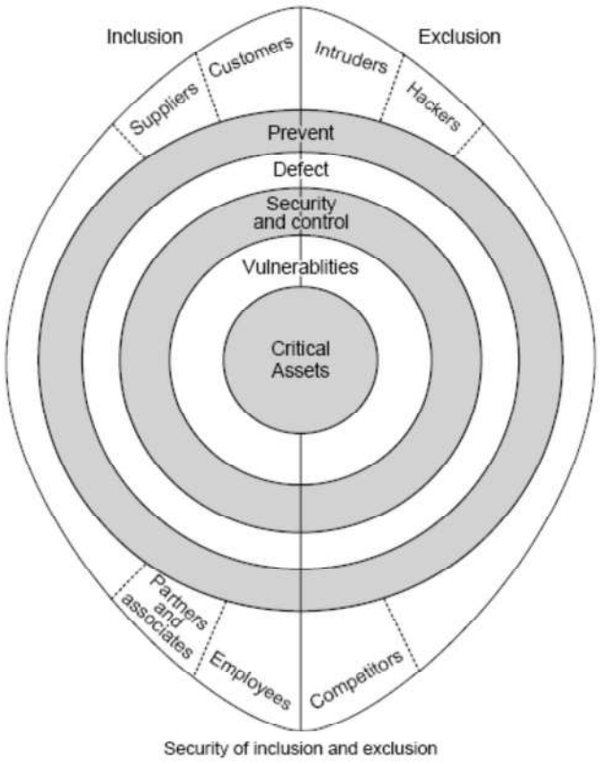

Fig. 14.2 *SCIM Issues*

(b) Identity Management

They are a set of management processes and technological interventions that enables perimeter based protection of systems so that authorized users get the necessary and sufficient access as per their authorization and others are denied access. It may be conceived as the process of managing user information about the interaction with an information system. It involves insertion, updating, deletion of users (user information), assigning rights and privileges, permissions and trailing of users (user information) so that the user is able to access the necessary and sufficient information from the organizations information asset base. There are benefits of identity management.

Identity management may itself be subdivided into five different components:

1. **Authentication** is the process by which the identity of a user is verified by a security system/security apparatus before granting access to the system/ area that contains information assets. If the user is unable to provide the correct information then access is denied.
2. **Username and password** is the most widely used form of authentication mechanism in which the user is identified by an ordered pair of (username, password), through which he access the system resources. This username and password acts as an alias for the user and all his rights, privileges,

permissions and role is granted based on the username and password through which he access the system.

3. **Digital certificates** are electronic equivalents of handwritten signatures. They serve that same purpose as handwritten signatures namely, to verify and act as a seal for the authenticity of a document to have originated from a particular person. A trusted authority to present the users identity and establish his trustworthiness issues them. However, they are not like handwritten signatures which are a set of ordered letters. Instead, they are more complex to avoid any forgery. They are normally based on PKI.
4. **Biometric control** acts as by means of username-password. There is always a risk of someone stealing the username and password and using it inappropriately. In order to avoid this risk, biometric controls are used. These unique identification characteristics of each human being that works as an authentication mechanism for the person. For example, fingerprints are unique to each individual and therefore a biometric control mechanism that scans for fingerprints and on finding the exact match allows access to the system which is much better and secure way of authentication. In such a case, there is the neither problem of losing/forgetting password nor of passwords being stolen.
5. **Smart cards** are hardware devices that have some kind of unique identifying technology within it or holds (stores) some unique code that can be scanned and verified. Some such cards are embedded with RFID chips so that RFID scanners may detect them from a distance and therefore authenticate them. In such cases, the user does not have to explicitly type in the authentication code, like in the case of username and password scheme of authentication but the system interacts directly with the hardware device (smart card) which holds a unique code that verifies the identity of the user.

The term defines the process of controlling the access of users, limiting it to only those applications for which the user have permission and limits the extent to which he can interact with applications and systems. Some users may have read access, some may have read and write access, still other may have read, write and delete/modify access. Similarly, a user with read access in one application may have read and write access in another application and so on. This is done to ensure that after authentication users are given access to only those resources for which they have the need. If a user works in the sales department entering invoice data, then he may have full access to the invoice system but may not even have read access for the taxation system. This is done to ensure that information is available on a need to know basis. Access control approaches are mainly of three types as given below:

- User based—in this approach the access policy of the user is determined for every user. Thus, a user level and group level access policy is required for such systems. This policy is implemented by using access control lists.

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This approach requires more administrative time to manage and control access as lot of duplication of effort takes place.

- Role based—is a more organized approach towards access control in which access is granted to users based on their role in the organization. Since the role of a user in an organization is fairly well defined and the access policy will easily flow from his role.
- Policy based—is the approach in which policies are based and users are made to fall in some part of the policy. Thus, the access is dynamically determined based on rules set in the policy.

User Management

This is the process of managing users so that the users may remain within the perimeters of their access and may get seamless access to data for which they have permission.

- Automated workflow
- Delegated administration
- Automated removal
- Self-service capability
- Provisioning

The physical security of the information systems and the information that it holds is also very important. Some of the measures that are required for ensuring physical security of the IS are:

- Ensuring that only authorized personnel get entry into the area from where access to information system is available. This can be ensured by having entry restrictions on visitors which can be enforced using RFID embedded employee access cards or by having biometric sensors in key access areas. Since the visitors will not have authorization to enter the restricted zone, access to information system will be denied to unauthorized personnel automatically.
- Installation of CCTV on corridors, etc., to monitor the people who access the IS.
- Structurally keeping the servers and other key infrastructure deep inside the office space to ensure that they are suitably hidden.
- Ensuring the servers and other key infrastructure are locked behind closed doors accessible to only a few authorized personnel, like system administrators.
- Ensuring that the Server Park or data centre has proper fire safety equipment.

14.4 MANAGING SOCIAL AND ETHICAL ISSUES IN INFORMATION SOCIETY

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Information systems have today transcended the boundaries of organizations and have entered our personal space. Systems have become more networked, bringing in more people together. The rise in Internet penetration has increased this phenomenon of social integration on cyberspace. Social networking and social media sites available today help aid in this social interaction. However, this social communitization is fraught with challenges. People are more comfortable interacting with one another in cyberspace than in real world. Ethical issues have also cropped up due to this surge in information system usage. Some of the social issues related to systems are given in the Table 14.1.

Table 14.1 *Social Issues Related to IS*

Issue
Increased interaction in cyberspace but not so in real world – the increased interaction on digital space has reduced face to face social interaction leading to reduced emotional attachments and bonding.
Increased use of assumed identity-less face-to-face social contact has resulted in more and more people resorting to assumed identities on cyberspace sometimes resulting in crimes.
The invasive use of technology has resulted in lesser privacy for individuals resulting in social problems.
Information systems help to transfer information very fast and this has resulted in some cases of rumour mongering.
The emergence of social networking has resulted in less trust on official media and more trust on social networks for information.
The easy access to cyber world for a section of society is leading to digital divide in the general society where some have easy access to the cyber space while other are left out. The ones left out are also left out of the several opportunities that information systems can provide.
Disclosing another individual's personal details to others – this is a serious ethical issue. Sometimes when the disclosure in of a very private nature this can even become a legal issue.
Cyberstalking – is when an individual is always stalked in cyberspace resulting in violation of an individual's privacy and creating fear in the mind of the stalked. This on a small scale is an ethical issue but may become a legal issue if the stalking becomes serious.
Disclosure of trusted content is also another ethical issue. If an individual is in the possession of some trusted content and he shares it with others, then that becomes an ethical issue.

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Distribution of pornographic material with open access is another ethical issue and needs to be controlled.

Plagiarism is becoming very rampant as content is soft form can just be copied and pasted from other files and claimed as one's own. This in a small scale is an ethical issue but when the plagiarism is intentional and large scale then this becomes a violation of copyright, which is a legal issue.

Sending SPAM is also another ethical issue, which creates a lot of problems for ordinary users of information systems

Apart from these ethical issues, other legal issues that may arise from the world of information systems are:

- Child pornography
- Stealing of password
- Hacking
- Phishing

Thus, we can see that society is changing due to information systems and new value systems and ethical parameters are emerging for this digital space.

Ethics in an Information Society

Ethics is a branch of philosophy that deals with what is considered right and wrong in society. It deals with issues which are not in the realm of legal or statutory domains but which may be considered conventionally right or wrong as per perception of the society of that time. Slavery was at a certain point in time, legal in United States and then with the passing of legislation later during Abraham Lincoln's Presidency was deemed illegal. The issue is that even when slavery was legal, it was considered as unethical by some as society considered it as something wrong even when it was legal. Therefore, we can say that ethics is a far greater concept than legality. It has something to do with the basic idea of right and wrong that becomes ingrained in us from childhood. Therefore, if you do a good job and your boss steals all the credit for your work then it becomes unethical behaviour on his part but it may not be illegal. An issue becomes ethical in nature when it transgresses any basic norm of human existence.

The issue of ethics in the information age has acquired a different dimension altogether. With more access to information, greater connectivity and anonymity new ethical issues are coming to the fore every day. Some major ethical issues hover around the following questions:

1. How much information about an individual is private and how much that is private which cannot be captured or disclosed?
2. What information can be kept by organizations dealing with individuals?
3. How much right does an individual have over his/her own information.
4. Who can access and who cannot access information?

Most cases of ethical violation in the information society occur due to disclosure of private information. This brings us to the interesting topic of privacy. Let us delve into the issue a little deeper. Is information about a suspected terrorist private or the act that he commits private? Probably not on the other hand if we are asked if information about a dowry victim is private, we will all probably agree that it is. Thus, we see that privacy assumes different degree of severity. In the first case, one can argue that if information about a suspected terrorist is not made public, then the terrorist will not get caught, and will cause more destruction. Thus, the well-being of a majority is at stake if the privacy of information of the terrorist is to be considered. Hence, it may be argued by some that disclosure of such private information as how he looks and what his height is may be considered fine but the same cannot be said for the latter case about the dowry victim. Thus, we see that ethics, privacy and other such related issues have to be considered carefully.

However, the following may be considered ethical issues in information society:

- Disclosing another individual's personal details to others. This is a serious ethical issue. Sometimes when the disclosure is of a very private nature this can even become a legal issue.
- Cyber stalking is when an individual is always stalked in cyberspace resulting in violation of an individual's privacy and creating a fear in the mind of the stalked. This on a small scale is an ethical issue but may become a legal issue if the stalking becomes serious.
- Disclosure of trusted content is also another ethical issue. If an individual is in the possession of some trusted content and he shares it with others then that becomes an ethical issue.
- Distribution of pornographic material with open access is another ethical issue and needs to be controlled.
- Plagiarism is becoming very rampant as content in soft form can just be copied and pasted from other files and claimed as one's own. On a small scale this is an ethical issue but when the plagiarism is intentional and on a large scale then this becomes a violation of copyright which is a legal issue.
- Sending SPAM is also another ethical issue which creates a lot of problems for ordinary users of information systems

Ethics in information society is a very delicate issue and changes with time. At one point of time, stealing of password was an ethical issue. Today it is a crime and has become a legal issue. Such changes in legal and ethical points of view occur with change in legislation and with changes in the norms of society.

14.4.1 Ethics for IS Professionals

Information systems are developed and managed by the IS professionals with technical knowledge and the users, generally, do not have this technical knowledge.

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As a result IS professionals, many a times use the power of technical knowledge over the other users in the organization. A person would be known to have power over other person if he/she is able to influence the behaviour or thinking of the other person. It has been observed that IT professionals many a times influence the thinking or behaviour of the other users and make them to listen to and agree to what they say. Since the user, many a times is dependent on the IT technology, the IT professionals, even go to the extent of dictating terms to the users and thus control their behaviour of using information systems. This is known as exercising the Power of IS Professionals over users. For example, the consultants who are appointed to implement ERP system in an organization, may not listen to the users for their genuine requirements for the customization of the system on the pretext of technical grounds. Even though the users may not be convinced but they have to agree to the IT professionals because of the technical exercise of power. This exercise of power of IS professionals over other users may be unintentional where both the parties are unaware of this exercise of power. In the case when both the user and the IT professionals are aware of the power exercise situation, both the parties would negotiate to arrive at a solution. In still another situation, where the user is not aware of the power exercise, this would result into manipulation by the IT professional. However, if the user is aware and the IS professional is not aware of such a situation, then it may lead to the resistance of the user. The ethical issues arise in situations where either party is unaware of the power exercise.

Organizations should sensitize all the users as well as the IT professionals in the organization so that no one feels that they are being dominated by the other party. Similarly, IT organizations and training programmes organized for such people need to sensitize the IT professional on this issue. Instead of giving technical reasons, they need to provide the logic that why a particular process cannot be changed or has to be accepted by the users.

Check Your Progress

7. What are SCIM solutions?
8. How do smart cards work?
9. What is cyberstalking?

14.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The two categories of data security measures include: procedural or business control measures like security policies, usage guidelines, training and awareness programs, and technical measures such as monitoring techniques, tools and filtering mechanisms, authentication measures.
2. Perimeter security of a network is of vital importance as it aims to halt an attacker from gaining access into the system.

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3. The three different types of hackers include ethical hackers, crackers, and phreaks.
4. Reconnaissance is the first stage of computer attack where an intruder, before embarking on a full-scale attack, tries to gather information about the system or network, its vulnerabilities, critical information stored in the system, key employee information, public information about the system and the organization, information about customers of the organization.
5. Distributed Denial of Service or DDoS is one of the most difficult forms of attack against which an organization is to be secured.
6. IP spoofing is a the techniques of using forged 12 digit IP address (source) in the IP packets that are used in TCP/IP protocol for data communication (primarily on the Internet or on any other TCP/IP network) for concealing the identity of the sender or impersonating another computing system.
7. Security Controls and Identity Management (SCIM) solutions are a mix of technological and managerial/process driven interventions that help the organization to maintain the security balance.
8. Smart cards are hardware devices that have some kind of unique identifying technology within it or holds (stores) some unique code that can be scanned and verified. Some such cards are embedded with RFID chips so that RFID scanners may detect them from a distance and therefore authenticate them. In this type of identity management, the system interacts directly with the hardware device (smart card) which holds a unique code that verifies the identity of the user.
9. Cyber stalking is a crime in which an individual is always stalked by the attacker in cyberspace resulting in violation of an individual's privacy and creating fear in the mind of the stalked individual. This on a small scale is an ethical issue but may become a legal issue if the stalking becomes serious.

14.6 SUMMARY

- Information security attacks can be of various types. Modern attacks and techniques are difficult to detect and stop as it requires continuous monitoring of the system.
- Perimeter security is therefore of vital importance as the objective of a security system is to halt an attacker from gaining access into the system.
- Hacking is the activity of getting into a computer system without authorization to have an access for a look around and see what is possible to do in the system. Hackers are mainly of three different types: ethical hackers, crackers and phreaks.

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- Most hacking incidents follow a typical pattern or method which comprise of five stages, namely reconnaissance, vulnerability scanning, securing/getting access, maintaining access and covering tracks.
- Denial of service (DoS) is a security attack in which the attacker overwhelms the organization's server (or other hardware resources) or the telecommunication lines from the ISP. Now attackers use a many-to-one mode of attack for DoS. This is known as distributed denial of service (DDoS).
- Malicious code is another form of security threat, being pieces of code that reach vital areas of a system and renders great damage to it. The easiest form of distributing malicious codes is through e-mails5. It is therefore a good idea to check the attachment files in e-mails before opening them.
- Social engineering is another way of attacking a system. Social engineering is a set of techniques used to trick gullible users into parting with their critical information like username and password.
- Sometimes a cruder version of social engineering called phishing is used to trick the user by sending him emails about opportunities or threats to near and dear ones.
- Whenever an incident takes place, a series of steps needs to be taken to find out the causes of the incident to ensure that such incidents do not occur in future.
- IP spoofing is a the techniques of using forged 12 digit IP address (source) in the IP packets that are used in TCP/IP protocol for data communication (primarily on the Internet or on any other TCP/IP network) for concealing the identity of the sender or impersonating another computing system.
- Packet sniffing is a technique or a program to troubleshoot network traffic. Packet sniffing is the technique of that can capture these floating packets on the TCP/IP network like a wiretap and find out what is being sent to or from a source or destination.
- Business Process Control is a set of administrative and managerial interventions mostly in the nature of policies, guidelines and procedures that helps in improving the security of the organization's information assets.
- Identity management a set of management processes and technological interventions that enables perimeter based protection of systems so that authorized users get the necessary and sufficient access as per their authorization and others are denied access.
- Five components of identity management are authentication, username and password, digital certificates, biometric control, and smart cards.
- User management is the process of managing users so that the users may remain within the perimeters of their access and may get seamless access to data for which they have permission.

- Ethics is a branch of philosophy that deals with what is considered right and wrong in society. It deals with issues which are not in the realm of legal or statutory domains but which may be considered conventionally right or wrong as per perception of the society of that time.
- This exercise of power of IS professionals over other users may be unintentional where both the parties are unaware of this exercise of power. In the case when both the user and the IT professionals are aware of the power exercise situation, both the parties would negotiate to arrive at a solution.

14.7 KEY WORDS

- **Perimeter Security:** It refers to routers, firewalls, and intrusion detection systems implemented to tightly control access to networks from outside sources.
- **Ping Sweeps:** It refers to a basic network scanning technique which is used to determine a range of IP addresses which map to live hosts (computers).
- **Banner Grabbing:** It refers to a technique used to gain information about a computer system on a network and the services running on its open ports.
- **Gullible Users:** It refers to the internet users who can be easily deceived, tricked, duped or cheated.
- **Phishing:** It refers to the fraudulent practice of sending emails purporting to be from reputable companies in order to induce individuals to reveal personal information, such as passwords and credit card numbers.
- **Incident Response:** It refers to an organised approach to addressing and managing the aftermath of a security breach or cyberattack.

14.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is hacking?
2. What is vulnerability scanning used for?
3. What is the objective of a denial of service (DoS) attack?
4. What does DDoS attack mean?
5. How do social engineering attacking system work?
6. Write a short note on incident response process.

7. List the measures required to ensure physical security of the IS.
8. What ethical and legal issues may arise from the world of IS?

Long-Answer Questions

NOTES

1. Explain the three different types of hackers.
2. Discuss the five phases involved in hacking a network.
3. Describe malicious codes and its types.
4. Critically evaluate the human attributes used by social engineering attackers.
5. Assess the five different components of identity management.

14.9 FURTHER READINGS

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