Introduction To Electronic Commerce

Introduction

E-commerce is a modern business methodology that addresses the needs of organizations, suppliers and consumers to cut costs while improving the quality of goods and services and increasing the speed of service delivery. It applies to the use of computer networks to search and retrieve information in support of human and corporate decision making.

Electronic commerce (e-commerce) remains a relatively new, emerging and constantly changing area of business management and information technology. E-commerce is digitally enabled commercial transactions between and among organizations and individuals. *Digitally enabled transactions* include all transactions mediated by digital technology e.g. Internet. For the most part, this means transactions that occur over the Internet and the Web. *Commercial transactions* involve the exchange of value (e.g., money) across organizational or individual boundaries in return for products and services. Exchange of value is important for understanding the limits of e-commerce. Without an exchange of value, no commerce occurs.

Some of the definitions of e-commerce often heard and found in publications and the media are:

- Electronic Commerce (EC) is where business transactions take place via telecommunications networks, especially the Internet.
- Electronic commerce describes the buying and selling of products, services, and information via computer networks including the Internet.
- Electronic commerce is about doing business electronically.
- E-commerce is defined as the conduct of a financial transaction by electronic means.

THE DIFFERENCE BETWEEN E-COMMERCE AND E-BUSINESS

E-business refers primarily to the digital enablement of transactions and processes *within* a firm, involving information systems under the control of the firm as shown in figure below.

FIGURE 1.1 **THE DIFFERENCE BETWEEN E-COMMERCE AND E-BUSINESS**
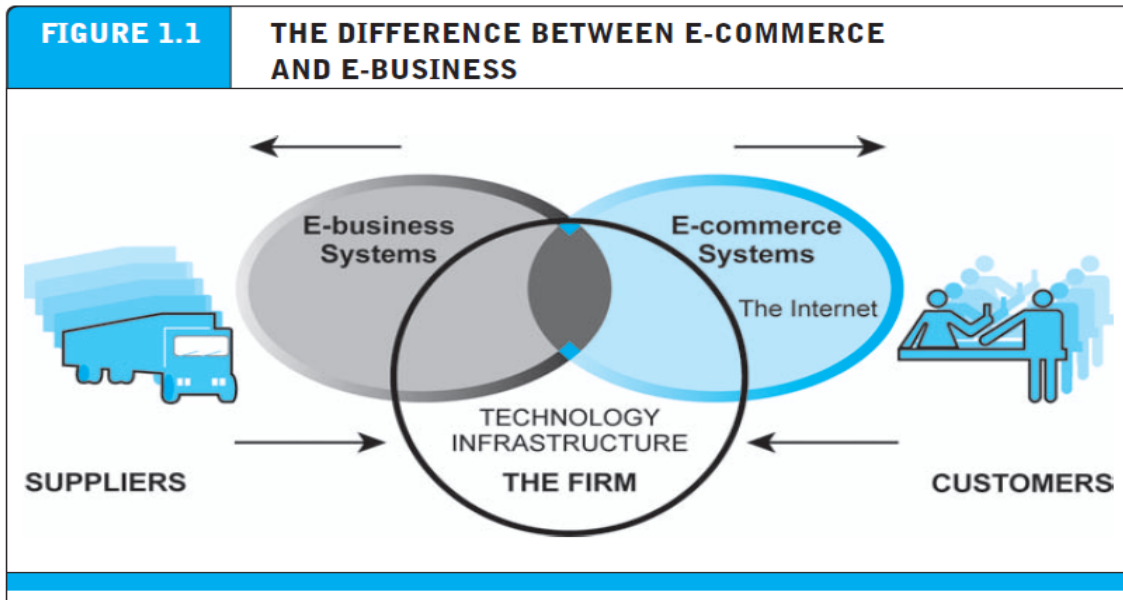
E-commerce primarily involves transactions that cross firm boundaries. E-business primarily involves the application of digital technologies to business processes within the firm.

For the most part, in our view, e-business does not include commercial transactions involving an exchange of value across organizational boundaries. For example, a company's online inventory control mechanisms are a component of e-business, but such internal processes do not directly generate revenue for the firm from outside businesses or consumers, as e-commerce, by definition, does. It is true, however, that a firm's e-business infrastructure provides support for online e-commerce exchanges; the same infrastructure and skill sets are involved in both e-business and e-commerce. E-commerce and e-business systems blur together at the business firm boundary, at the point where internal business systems link up with suppliers or customers, for instance. E-business applications turn into e-commerce precisely when an exchange of value occurs (see Mesenbourg, U.S. Department of Commerce, August 2001 for a similar view).

BENEFITS OF E-COMMERCE

The benefits of e-commerce can be seen to affect three major stakeholders: organisations, consumers and society.

1) **Benefits of e-commerce to organizations**

International marketplace. What used to be a single physical marketplace located in a geographical area has now become a borderless marketplace including national and international markets. By becoming e-commerce enabled, businesses now have access to people all around the world.

Operational cost savings. The cost of creating, processing, distributing, storing and retrieving paper-based information has decreased.

Mass customisation. E-commerce has revolutionised the way consumers buy good and services. In the past when Ford first started making motor cars, customers could have any colour so long as it was black. Now customers can configure a car according to their specifications within minutes on-line via the www.ford.com website.

Enables reduced inventories and overheads by facilitating 'pull'-type supply chain management – this is based on collecting the customer order and then delivering through JIT (just-in-time) manufacturing. This is particularly beneficial for companies in the high technology sector, where stocks of components held could quickly become obsolete within months. For example, companies like Motorola (mobile phones), and Dell (computers) gather customer orders for a product, transmit them electronically to the manufacturing plant where they are manufactured according to the customer's specifications (like colour and features) and then sent to the customer within a few days.

Lower telecommunications cost. The Internet is much cheaper than value added networks (VANs) which were based on leasing telephone lines for the sole use of the organisation and its authorised partners. It is also cheaper to send a fax or e-mail via the Internet than direct dialling.

Digitisation of products and processes. Particularly in the case of software and music/video products, which can be downloaded or e-mailed directly to customers via the Internet in digital or electronic format.

No more 24-hour-time constraints. Businesses can be contacted by or contact customers or suppliers at any time.

2) Benefits of e-commerce to consumers

24/7 access. Enables customers to shop or conduct other transactions 24 hours a day, all year round from almost any location. For example, checking balances, making payments, obtaining travel and other information.

More choices. Customers not only have a whole range of products that they can choose from and customise, but also an international selection of suppliers.

Price comparisons. Customers can 'shop' around the world and conduct comparisons either directly by visiting different sites. (for example www.moneyextra.co.uk for financial products and services).

Improved delivery processes. This can range from the immediate delivery of digitised or electronic goods such as software or audio-visual files by downloading via the Internet, to the on-line tracking of the progress of packages being delivered by mail or courier.

An environment of competition where substantial discounts can be found or value added, as different retailers for customers.

3) Benefits of e-commerce to society

Enables more flexible working practices, which enhances the quality of life for a whole host of people in society, enabling them to work from home. It also potentially reduces environmental pollution as fewer people have to travel to work regularly.

Connects people. Enables people in developing countries and rural areas to enjoy and access products, services, information and other people which otherwise would not be so easily available to them.

Facilitates delivery of public services. For example, health services available over the Internet (on-line consultation with doctors or nurses), filing taxes over the Internet through the Inland Revenue website.

<u>LIMITATIONS OF E-COMMERCE</u>

There was much hype surrounding the Internet and e-commerce over the last few years of the twentieth century. Much of it promoted the Internet and e-commerce as the panacea for all ills, which raises the question, are there any limitations of e-commerce and the Internet?

Isaac Newton's 3rd Law of Motion, 'For every action there is an equal and opposite reaction' suggests that for all the benefits there are limitations to e-commerce. These again will be dealt with according to the three major stakeholders – organisations, consumers and society.

Limitations of e-commerce to organisations

Lack of sufficient system security, reliability, standards and communication protocols.

There are numerous reports of websites and databases being hacked into, and security holes in software. For example, Microsoft has over the years issued many security notices and 'patches' for their software. Several banking and other business websites, including Barclays Bank, Powergen and even the Consumers' Association in the UK, have experienced breaches in security where 'a technical oversight' or 'a fault in its systems' led to confidential client information becoming available to all.

Rapidly evolving and changing technology, so there is always a feeling of trying to 'catch up' and not be left behind.

Under pressure to innovate and develop business models to exploit the new opportunities which sometimes leads to strategies detrimental to the organisation. The ease with which business models can be copied and emulated over the Internet increase that pressure and curtail longer-term competitive advantage.

Facing increased competition from both national and international competitors often leads to price wars and subsequent unsustainable losses for the organisation.

Problems with compatibility of older and 'newer' technology. There are problems where older business systems cannot communicate with webbased and Internet infrastructures, leading to some organisations running almost two independent systems where data cannot be shared. This often leads to having to invest in new systems or an infrastructure, which bridges the different systems. In both cases this is both financially costly as well as disruptive to the efficient running of organisations.

Limitations of e-commerce to consumers

Computing equipment is needed for individuals to participate in the new 'digital' economy, which means an initial capital cost to customers.

A basic technical knowledge is required of both computing equipment and navigation of the Internet and the World Wide Web.

Cost of access to the Internet, whether dial-up or broadband tariffs.

Cost of computing equipment. Not just the initial cost of buying equipment but making sure that the technology is updated regularly to be compatible with the changing requirement of the Internet, websites and applications.

Lack of security and privacy of personal data. There is no real control of data that is collected over the Web or Internet. Data protection laws are not universal and so websites hosted in different countries may or may not have laws which protect privacy of personal data.

Physical contact and relationships are replaced by electronic processes. Customers are unable to touch and feel goods being sold on-line or gauge voices and reactions of human beings.

A lack of trust because they are interacting with faceless computers.

Limitations of e-commerce to society

Breakdown in human interaction. As people become more used to interacting electronically there could be an erosion(divide) of personal and social skills which might eventually be detrimental to the world we live in where people are more comfortable interacting with a screen than face to face.

Social division. There is a potential danger that there will be an increase in the social divide between technical haves and have-nots – so people who do not have technical skills become unable to secure better-paid jobs and could form an underclass with potentially dangerous implications for social stability.

Reliance on telecommunications infrastructure, power and IT skills, which in developing countries nullifies the benefits when power, advanced telecommunications infrastructures and IT skills are unavailable or scarce or underdeveloped.

Wasted resources. As new technology dates quickly how do you dispose of all the old computers, keyboards, monitors, speakers and other hardware or software?

Facilitates Just-In-Time manufacturing. This could potentially cripple an economy in times of crisis as stocks are kept to a minimum and delivery patterns are based on pre-set levels of stock which last for days rather than weeks .

Difficulty in policing the Internet, which means that numerous crimes can be perpetrated and often go undetected. There is also an unpleasant rise in the availability and access of obscene material and ease with which paedophiles and others can entrap children by masquerading in chat rooms.

FEATURES OF E-COMMERCE TECHNOLOGY

Ubiquity: In traditional commerce, a marketplace is restricted i.e. we can be in limited physical area to buy or sell. Whereas E-Commerce is ubiquitous meaning that it is available just about everywhere, at all times. It make possible to shop from your desktop, at home, at work or even from your car, using mobile commerce. The result is called a market space - a marketplace extended beyond traditional boundaries and removed from a temporal and geographic location. From a consumer perspective, ubiquity reduces transaction costs – the costs of participating in a market. To transact, it is no longer necessary that you spend time and money traveling to a market.

Global Reach: Unlike traditional commerce, e-commerce technology permits commercial transaction to cross cultural and national boundaries far more conveniently and cost effectively. As a result, the potential market size for e-commerce merchants is roughly equal to the size of the world's online population.

Universal Standards: One strikingly unusual feature of e-commerce technologies is that the technical standards of the Internet, and therefore the technical standards for conducting e-commerce, are universal standards – they are shared by all nation around the world. In contrast, most traditional commerce technologies differ from one nation to the next. For instance, television and radio standards differ around the world, as doe's cell telephone technology. The universal technical standards of e-commerce greatly lower market entry cost –t he cost merchants must pay just to bring their goods to market.

Richness: With the use of e-commerce technology merchant can present their message in effective way. Information richness refers to the complexity and content of the message.

Interactivity: E-Commerce technologies are interactive, meaning they allow two-way communication between merchant and consumer. Television, for instant, cannot ask the viewer any questions, enter into a conversation with a viewer, or request customer information be entered into a form. In contrast, all of these activities are possible on an e-commerce Web site.

Interactivity allows an online merchant to engage a consumer in a ways similar to a face-to-face experience, but on a much more massive, global scale.

Information density: The Internet and the Web vastly increase information density – the total amount and quality of the information available to all market participants, consumers and merchants alike. E-commerce technologies reduce information collection, storage, processing and communication costs. At the same time, these technologies increase greatly the accuracy and timeliness of information – making information more useful and important than ever. As a result, information becomes more plentiful, cheaper and of higher quality.

Personalization/Customization: E-commerce technologies permit personalization: Merchants can target their marketing message to specific individuals by adjusting the message. The technology also permits customization – changing the delivered product or service based on a user's preference or prior behavior.

E-Commerce Framework

E-Commerce applications will be built on the existing technology infrastructure - a myriad of computers, communication networks, and communication software forming the nascent Information Superhighway. The **technology infrastructure** of the Internet is both an enabler and a driver of change. An infrastructure is defined as "*the foundation of a system.*" In this case, the technological foundation of the Internet, simply put, enables the running of the e-commerce enterprises. The hardware backbone of computers, routers, servers, fiber optics, cables, modems, and other network technologies provides half of the technology equation. The other half includes the soft-ware and communications standards that run on top of the hardware, including the core protocols for the Web. Understanding technology infrastructure— and there-fore understanding what is and is not achievable—is essential to formulating a company's vision and strategy.

The framework for e-Commerce consists of three parts as shown in below figure.

1. The first part consists of a *variety of electronic commerce applications* including both inter- and intra-organizational and electronic market examples such as Supply Chain Management, Video-on-Demand, Procurement and purchasing, On-line marketing and advertising, Home shopping etc.

2. The second part of the building blocks of the infrastructure consists of:

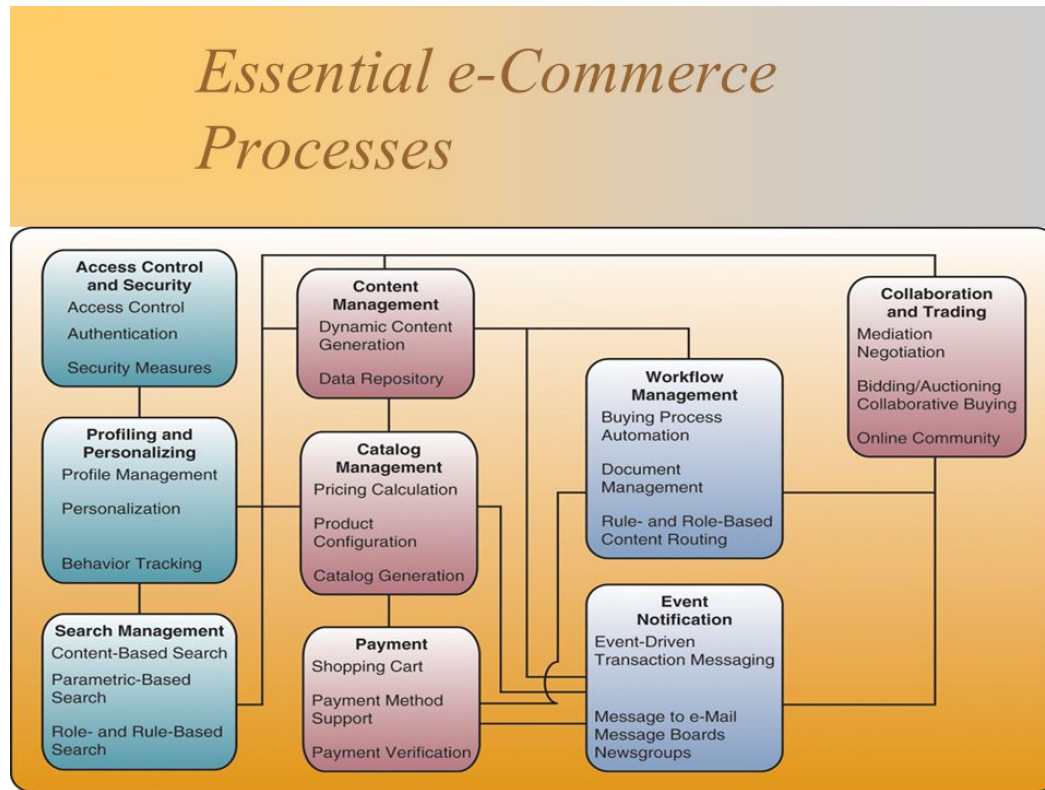   ➢ **Common business services**, for facilitating the buying and selling process.

➢ **Messaging and information distribution**, as a means of sending and retrieving information (ex-EDI, e-mail, P2P file transfer)

➢ **Multi-media content and network publishing**, for creating a product and a means to communicate about it.

➢ **Information Superhighway infrastructure** consisting of telecommunication, cable operator, ISPs , Wireless technologies and Internet.

3. The third part consists of the *public policy* and *technical standards* necessary to support the applications and the infrastructure.

➢ **Public policies** govern issues like universal access, privacy, and information pricing. The public policy infrastructure affects not only the specific business but also direct and indirect competitors. It should take into consideration of:

▪ Cost of accessing information

▪ Regulation to protect consumers from fraud and protect their right to privacy.

▪ Policies of global information traffic to detect information pirating and obscene sites**.**

➢ **Technical Standards** governs issues like technology for communication and as well as for Internet

Fig: Generic Framework of Electronic Commerce

Essential EC process Architectures

Essential e-Commerce Processes

Access Control and Security
- Access Control
- Authentication
- Security Measures

Profiling and Personalizing
- Profile Management
- Personalization
- Behavior Tracking

Search Management
- Content-Based Search
- Parametric-Based Search
- Role- and Rule-Based Search

Content Management
- Dynamic Content Generation
- Data Repository

Catalog Management
- Pricing Calculation
- Product Configuration
- Catalog Generation

Payment
- Shopping Cart
- Payment Method Support
- Payment Verification

Workflow Management
- Buying Process Automation
- Document Management
- Rule- and Role-Based Content Routing

Event Notification
- Event-Driven Transaction Messaging
- Message to e-Mail Message Boards Newsgroups

Collaboration and Trading
- Mediation
- Negotiation
- Bidding/Auctioning Collaborative Buying
- Online Community

Access Control and Security

• E-commerce processes must establish mutual trust and secure access between the parties in an e- commerce transaction. By authenticating users, authorizing access, and enforcing security features

Profiling and Personalizing

• Gather data on you and your website behavior and choices. Build electronic profiles of your characteristics and preferences. Profiles are used to recognize you and provide you with a personalized view of the contents of the site with product recommendations and personalized advertising. It also supports one-to-one marketing strategy.

Search Management

• Search processes that helps customers find the specific product or service they want to evaluate or buy.

**Content and Catalog Management**

• Content Management – software that helps e-commerce companies develop, generate, deliver, update, and archive text data and multimedia information at e-commerce websites

• Catalog Management – software that helps generate and manage catalog content

• May support customer self-service and mass-customization of products, e.g., Dell Computer configuration management

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Workflow Management

• Software that helps employees electronically collaborate to accomplish structured work tasks within knowledge-based business processes

• Ensure proper transactions, decisions, and work activities are performed and the correct data and documents are delivered to the right employee, customer, or supplier.

Catalog/content management and workflow example
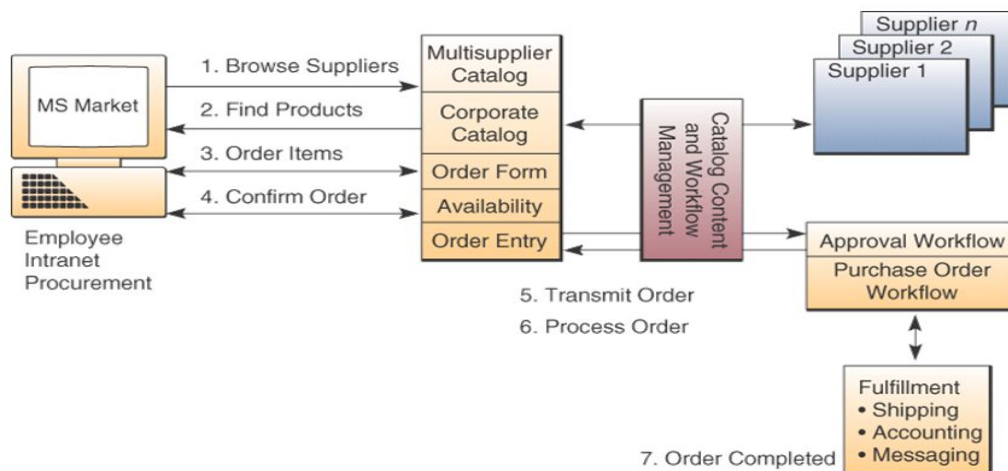
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Event Notification

• Most e-commerce applications are event-driven. They respond to events such as customer's first website access, payment, delivery• Event notification software monitors e-commerce processes and records all relevant events including problem situations. It also notifies all involved stakeholders

Collaboration and Trading

- Processes that support the vital collaboration arrangements and trading services

- Needed by customers, suppliers, and other stakeholders

- Online communities of interest

- E-mail, chat, and discussion groups

- Enhance customer service and build customer loyalty

E-COMMERCE SUCCESS FACTORS

• Selection and Value

✓ Attractive product selections, competitive prices, satisfaction guarantees, and customer support after the sale

• **Performance and Service**

✓ Fast, easy navigation, shopping, and purchasing, and prompt shipping and delivery

• **Look and Feel**

✓ Attractive web storefront, website shipping areas, multimedia product catalog pages, and shopping features

• **Advertising and Incentives**

✓ Targeted web page advertising and e-mail promotions, discounts and special offers, including advertising at affiliate sites

• **Personal Attention**

✓ Personal web pages, personalized product recommendations, Web advertising and e-mail notices, and interactive support for all customers

• **Community Relationships**

✓ Virtual communities of customers, suppliers, company representatives, and others via newsgroups, chat rooms, and links to related sites

• **Security and Reliability**

✓ Security of customer information and website transactions, trustworthy product information, and reliable order fulfillment

Electronic Commerce and Media Convergence

E-commerce has been repeatedly linked with the idea of convergence (junction) of industries centered on information that until today has been isolated – content, storage, network, business applications and consumer devices.

Media convergence applies to the conversion of text, voice, data, image, graphics and motion video into interactive digital content whereas cross media convergence refers to the integration of various industries – entertainment, publication, and communication media base on multimedia content.

Convergence may incorporate the following technological advances:

1. Convergence of content: Translates all types of information content including books, business documents, videos, movies, music into digital information. Once converted into digital format, the processing, searching, sorting, conversion, compression, encryption, transmission of information can be easily matched with today's information processing systems.

2. Convergence of transmission: Compresses and stores digitalized information so it can travel through the existing guided transmission media. Hence the information including voice, data, image and video can be transmitted without rewiring our home.

 3. Convergence of information access devices: Have the sophistication to function as both computers and televisions. Other examples are the ubiquitous telephone, with internal fax machine, modem and video monitor.

The Anatomy of E-Commerce Applications

The anatomy of E-Commerce applications can be described as shown in figure below:
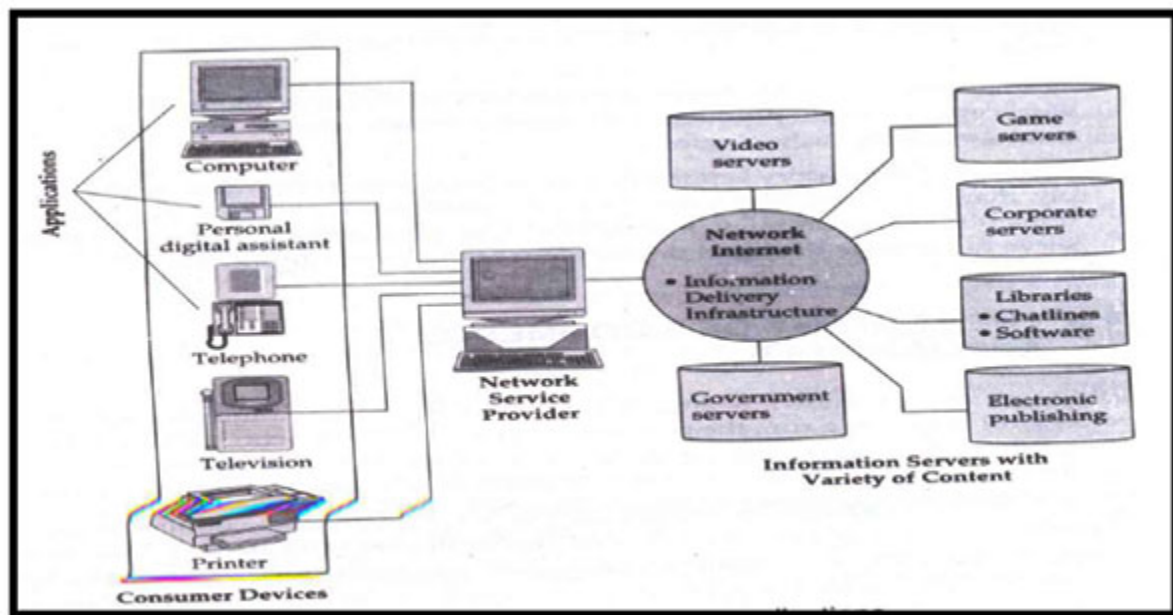
1. Multimedia Content for E-Commerce Applications

2. Multimedia Storage Servers & E-Commerce Applications

      i. Client-Server Architecture in Electronic Commerce

      ii. Internal Processes of Multimedia Servers

      iii. Video Servers & E-Commerce

3. Information Delivery/Transport & E-Commerce Applications

4. Consumer Access Devices

Multimedia Content for E-Commerce Applications

❖ Multimedia content can be considered both fuel and traffic for electronic commerce applications. The technical definition of multimedia is the use of digital data in more than one format, such as the combination of text, audio, video, images, graphics, numerical data, holograms, and animations in a computer file/document. ❖ Most business systems support only a fraction of the information and communication found in the workplace and the goal of multimedia is to increase the utility of all information through the processing and distribution of new forms such as images, audio and video.

Multimedia Storage Servers & E-Commerce Applications

❖ E-Commerce requires robust servers to store and distribute large amounts of digital content to consumers. These Multimedia storage servers are large information warehouses capable of handling various contents, ranging from books, newspapers, advertisement catalogs, movies, games, & X-ray images.

These servers, deriving their name because they serve information upon request, must handle large-scale distribution, guarantee security, & complete reliability

i. Client-Server Architecture in Electronic Commerce

All e-commerce applications follow the client- server model. Clients are devices plus software that request information from servers or interact known as message passing. The client server model, allows client to interact with server through request-reply sequence governed by a paradigm known as message passing. The server manages application tasks, storage, and security & provides scalability-ability to add more clients and client devices like Personal digital assistants to Pc's.

ii. Internal Processes of Multimedia Servers

• The internal processes involved in the storage, retrieval & management of multimedia data objects are integral to e-commerce applications. A multimedia server is a hardware & software

combination that converts raw data into usable information & then disseminates it out as per the user requirement.

• It captures, processes, manages, & delivers text, images, audio & video.

• A multimedia server must be able to

> Handle thousands of simultaneous users.

> manage the transaction of these users (purchase, information request, billing) deliver information streams to consumers at an affordable cost

> Include high-end symmetric multiprocessors, clustered architecture, and massive parallel systems. E.g. requirements of Video On Demand Service..

iii. Video Servers & E-Commerce

The electronic commerce applications related to digital video will include

1. Telecommunicating and video conferencing

2. Geographical information systems that require storage & navigation over maps

 3. Corporate multimedia servers

 4. Postproduction studios

5. Shopping kiosks.

Electronic Market

• Is a place where shoppers and sellers meet electronically? In electronic markets, sellers and buyers negotiate, submit bids, agree on an order, and finish the execution on- or off- line. A market is a network of interactions and relationships where information, products, services, and payments are exchanged.

✓ It handles all the necessary transactions

✓ It is a place where shoppers and sellers meet electronically

✓ Sellers and buyers negotiate, submit bids, agree on an order, and finish the execution on- or off- line

M-Commerce

• 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.

• M-commerce (mobile commerce) is the buying and selling of goods and services through wireless handheld devices such as cellular telephone and personal digital assistants (PDAs). Known as next-generation e-commerce, m-commerce enables users to access the Internet without needing to find a place to plug in.

• "Mobile Business", signifies an "anytime and anywhere access" to business processes managed by computer-mediated networks.

• As content delivery over wireless devices becomes faster, more secure, and scalable, there is wide speculation that m-commerce will surpass wire line e-commerce as the method of choice for digital commerce transactions. The industries affected by m-commerce include:

> Financial services, which includes mobile banking (when customers use their handheld devices to access their accounts and pay their bills) as well as brokerage services, in which stock quotes can be displayed and trading conducted from the same handheld device ✓ Telecommunications, in which service changes, bill payment and account reviews can all be conducted from the same handheld device ✓ Service/retail, as consumers are given the ability to place and pay for orders on-the-fly ✓ Information services, which include the delivery of financial news, sports figures and traffic updates to a single mobile device

> Mobile commerce was born in 1997 when the first two mobile phone enabled Coca Cola vending machines were installed in the Helsinki area in Finland. They used SMS text messages to send the payment to the vending machines.

> In 1997 also the first mobile phone based banking service was launched by Merita bank of Finland also using SMS.

Attributes of M-Commerce and Its Economic Advantages

▪ Mobility: -users carry cell phones or other mobile devices

▪ Broad reach:-people can be reached at any time

▪ Ubiquity:-easier information access in real-time

▪ Convenience:-devices that store data and have Internet, intranet, extranet connections

▪ Instant connectivity:-easy and quick connection to Internet, intranets, other mobile devices,

databases

▪ Personalization:-preparation of information for individual consumers

▪ Localization of products and services:-knowing where the user is located at any given time and match service to them

Limitations of M-Commerce

➢ Usability Problem: Small size of mobile devices (screens, keyboards, etc)

➢ limited storage capacity of devices

➢ insufficient bandwidth

➢ Speed

➢ Cost

➢ Accessibility

U-COMMERCE

• U-commerce extends traditional commerce to a world of ubiquitous networks and universal devices, a world in which users can access networks at any time from any place, using a range of devices to invoke unique and personalized services. Specifically, four constructs are discussed that form the fundamental dimensions of u-commerce: ubiquity, uniqueness, universality, and unison. It is proposed that future developments of information systems will be framed by these constructs.

• Ubiquity = Ultimate form of (Reachability + Accessibility + Portability)

• Uniqueness = Ultimate form of (Localization + Identification + Portability)

• Universality = Ultimate merge of (Mobile Networks + Mobile Devices)

• Unison = Ultimate merge of (Mobile Applications + Data Synchronization) UNIQUE

Chapter 2

Types of E-Commerce

Introduction to Business Model

A business model is the methods of doing business by which a company can sustain itself, that is, generate revenue. The business model spells out how a company makes money by specifying where it is positioned in the value chain.

Some models are quite simple. A company produces goods or services and sells it to customers. If all goes well, the revenues from sales exceed the cost of operation and the company realizes profit. Other models can be more complex. Radio and television broadcasting is a good example. The broadcaster is part of a complex network of distributors, content creators, advertisers, and listeners or viewers. Who makes money and how much, It is not always clear at the outset. The bottom line depends on many competing factors.

The interaction between participants is supported by electronic trade processes that are basically search, valuation, payment and settlement, logistics, and authentication, as shown in Figure 2.1. The Internet and the World Wide Web allow companies to efficiently implement these key trading processes. For instance, many search services and brokers are available to help buyers find information, products, and merchants in electronic markets.
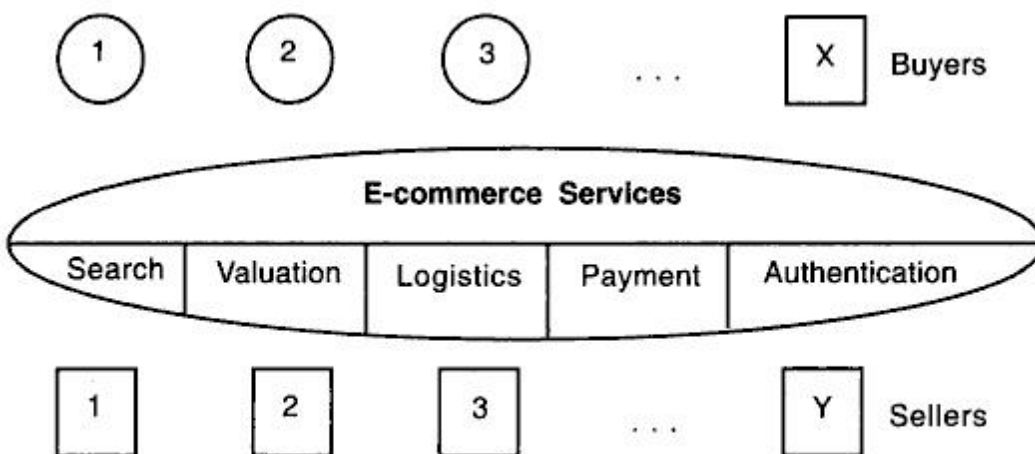
Fig. 2.1 Representation of an electronic market.

E-commerce can be formally defined as technology-mediated exchanges between parties (individuals, organizations, or both) as well as the electronically-based intra- or inter-organizational activities that facilitate such exchanges. It is global. It favours intangible things—ideas, information, and relationships. And it is intensely interlinked. These three attributes produce a new type of marketplace and society.

A company's business model is the way in which it conducts business in order to generate revenue. In the new economy, companies are creating new business models and reinventing old models. Reading the literature, we find business models categorized in different ways. Presently,

there is no single, comprehensive and cogent taxonomy of Web business models that one can point to. Although there are many different ways to categorize e-business models, they can be broadly classified as follows:

1) E-Business models based on the relationship of Transaction Parties
2) E-Business models based on the relationship of Transaction Types

E-Business models based on the relationship of Transaction Parties

Electronic markets are emerging in various fields. Different industries have markets with different characteristics. For example, an information B2C market differs in many respects from the automotive B2B market.

The information B2C market represents companies that sell digital information goods, such as news, articles, music, books, or digital videos. In the information B2C market, the electronic infrastructure not only helps match customers and sellers, but also acts as the distribution channel, delivering products to customers.

In the automotive B2B market, the products traded, such as parts and components of cars, have a high degree of specificity. The market infrastructure used is to be mainly based on Electronic Data Interchange (EDI) over expensive VAN services. EDI involves the exchange of standardized, structured information between organintions, permitting direct communication between computer systems. B2B is also a closed market in the sense that the number of participants involved in trading is limited and known a priori.

Understanding the nature of the market's requirements is critical for creating the underlying e-business infrastructure. The relation between B2B and B2C models is clearly shown in Figure 2.3.
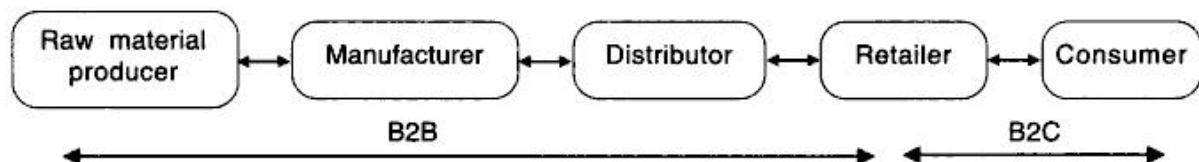

Fig. 2.3 Relation between B2B and B2C models.

B2B covers business transactions along the various interactions existing in the value chain from producers of raw materials to retailers and consumers including manufacturers and distributors. On the contrary. B2C reflects only the interactions between a customer and a retailer. Basically, B2C transactions include the following steps: (i) account acquisition. (ii) product discovery through search and browse, (iii) price negotiation, (iv) payment, and (v) product delivery. In some cases, customer services may also exist.

TABLE 2.1
SUMMARY OF E-BUSINESS TRANSACTION MODELS

Model	Description	Examples
B2C	Sells products or services directly to consumers.	*amazon.com, autobytel.com, eDiets.com, Pets.com*
B2B	Sells products or services to other businesses or brings multiple buyers and sellers together in a central marketplace.	*MetalSite.com, VerticalNet.com, SHOP2gether.com*
B2G	Businesses selling to local, state, and federal agencies.	*iGov.com*
C2C	Consumers sell directly to other consumers.	*ebay.com, InfoRocket.com*
C2B	Consumers fix price on their own, which businesses accept or decline.	*Priceline.com*

E-commerce can be classified according to the transaction partners such as **1) business to-consumer (B2C), 2) business-to-business (B2B), 3) business-to-government (B2G), 4) consumer to-consumer (C2C), and 5) consumer-to-business (C2B)**. Within these broad categories, there are a number of variations in the way the models are implemented. Table 2.1 summarizes souse of the current e-business models. The contents of this table are illustrated in the form of a diagram in Figure 2.4.
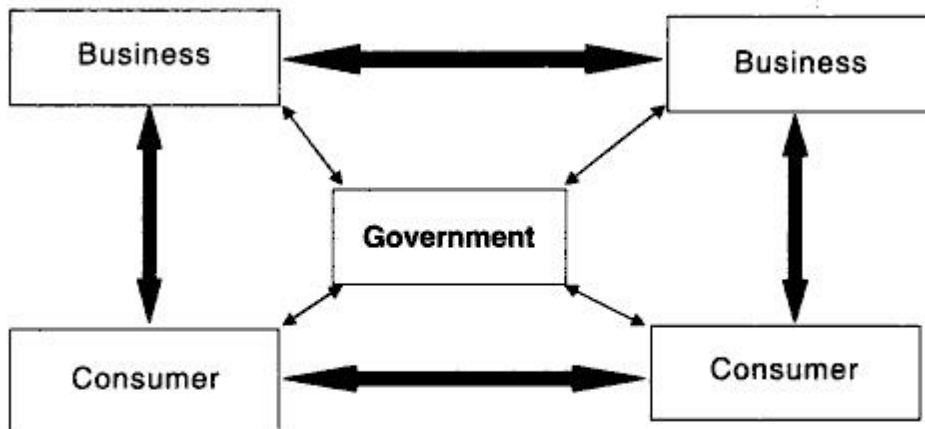

Fig. 2.4 E-business transaction model.

1) Business-to-Consumer (B2C)

The B2C model involves transactions between business organizations and consumers. It applies to any business organization that sells its products or services to consumers over the Internet. These sites display product information in an online catalog and store it in a database. The B2C model also includes services online banking, travel services, and health information and many more as shown in figure below.

Consumers are increasingly going online to shop for and purchase products, arrange financing, arrange shipment or take delivery of digital products such as software, and get service after the sale. B2C e-business includes retail sales, often called e-retail (or e-tail), and other online purchases such as airline tickets, entertainment venue tickets, hotel rooms, and shares of stock.

Some B2C e-businesses provide high-value content to consumers for a subscription fee. Examples of e-business following this subscription model include the Wall Street Journal (financial news and articles), Consumer Reports (product reviews and evaluations), and ediels.com (nutritional counseling).

B2C e-business models include virtual malls, which are websites that host many online merchants. Virtual malls typically charge setup, listing, or transaction fees to online merchants, and may include transaction handling services and marketing options. Examples of virtual malls include excite.com, choicemall, women.com, networkweb.com, amazon.com, Zshops.com, and yahoo.com.

B2C Business Model
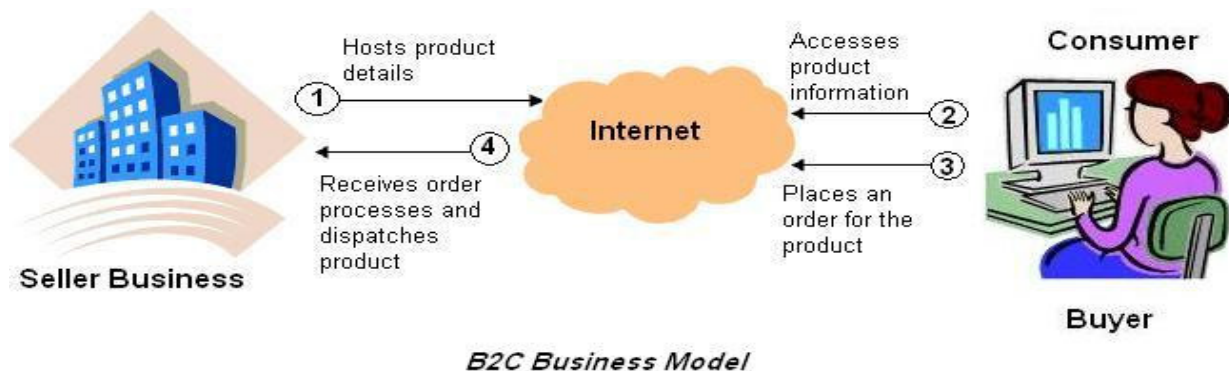
E-tailers that offer traditional or Web-specific products or services only over the Internet are sometimes called virtual merchants, and provide another variation on the B2C model. Examples of virtual merchants include amazon.com (books. electronics, toys, and music), eToys.com (children's books and toys), and ashford.com (personal accessories).

Some businesses supplement a successful traditional mail-order business with an online shopping site, or move completely to Web-based ordering. These businesses are sometimes called catalogue merchants. Examples include avan.com (cosmetics and fragrances), chefs (cookware and kitchen accessories), Omaha Steaks (premium steaks, meats, and other gourmet food), and Harry and David (gourmet food gifts).

Many people were very excited about the use of B2C on the Internet, because this new communication medium allowed businesses and consumers to get connected in entirely new ways. The opportunities and the challenges posed by the B2C e-commerce are enormous. A large amount of investment has gone into this and many sites have either come up or are coming up daily to tap this growing market.

Some of the reasons why one should opt for B2C are:

1) Inexpensive costs, big opportunities. Once on the Internet, opportunities are immense as companies can market their products to the whole world without much additional cost.

2) Globalization. Even being in a small company, the Web can make you appear to be a big player which simply means that the playing field has been levelled by e- business. The Internet is accessed by: millions of people around the world, and definitely, they are all potential customers.

3) Reduced operational costs. Selling through the Web means cutting down on paper costs, customer support costs, advertising costs, and order processing costs.

4) Customer convenience. Searchable content, shopping carts. promotions, and interactive and user-friendly interfaces facilitate customer convenience. Thus, generating more business. Customers can also see order status, delivery status, and get their receipts online.

5) Knowledge management. Through database systems and information management, you can find out who visited your site, and how to create, better value for customers.

Processes in B2C (How Does B2C Work?)

B2C e-commerce is more than just an online store. It really is about managing the entire process, but just using technology as a tool for order processing and customer support. Figure 2.5 depicts the processes in B2C
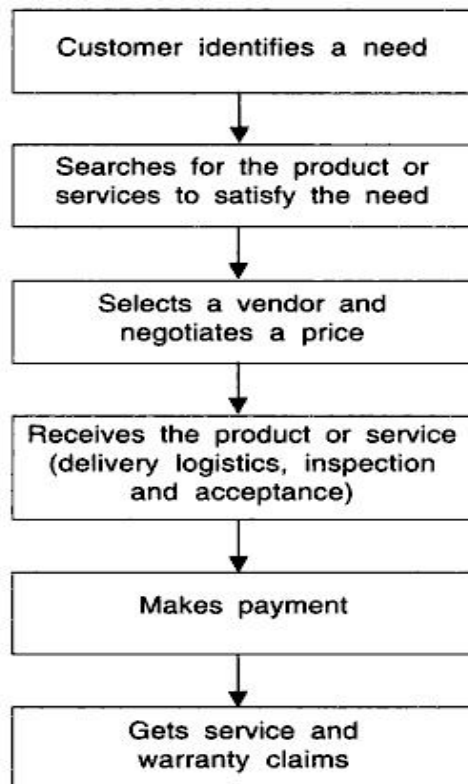
Fig. 2.5 Processes in B2C.

The B2C process is now explained in greater details:

1) **Visiting the virtual mall**. The customer visits the mall by browsing the online catalogue—a very organized manner of displaying products and their related information such as price, description, and availability. Finding the right product becomes easy by using a keyword search engine. Virtual malls may include a basic to an advanced search engine, product rating system, content management, customer support systems, bulletin boards, newsletters and other components which make shopping convenient for shoppers.

2) **Customer registers**. The customer has to register to become part of the site's shopper registry. This allows the customer to avail of the shop's complete services. The customer becomes a part of the company's growing database and can use the same for knowledge management and data mining.

3) **Customer buys products**. Through a shopping cart system, order details, shipping charges, taxes, additional charges and price totals are presented in an organized manner. The customer can even change the quantity of a certain product. Virtual malls have a very comprehensive shopping system, complete with check-out forms.

4) **Merchant processes the order**. The merchant then processes the order that is received from the previous stage and fills up the necessary forms.

5) **Credit card is processed**. The credit card of the customer is authenticated through a payment gateway or a bank. Other payment methods can be used as well, such as debit cards, prepaid cards, or bank-to-bank transfers.

6) **Operations management**. When the order is passed on to the logistics people, the traditional business operations will still be used. Things like inventory management. total quality management, warehousing, optimization and project management should still be incorporated even though it is an e-business. Getting the product to the customer is still the most important aspect of e-commerce.

7) **Shipment and delivery**. The product is then shipped to the customer. The customer can track the order/delivery as virtual malls have a delivery tracking module on the website which allows a customer to check the status of a particular order.

8) **Customer receives**. The product is received by the customer, and is verified. The system should then tell the firm that the order has been fulfilled.

9) **After-sales service**. After the sale has been made, the firm has to make sure that it maintains a good relationship with its customers. This is done through customer relationship management or CRM.

The example of the www.amazon.com site also involves the B2C model in which the consumer searches for a book on their site and places an order, if required. This implies that a complete business solution might be an integration solution of more than one business model. For example, www.amazon.com includes the B2B model in which the publishers transact with

Amazon and the B2C model in which an individual consumer transact with the business organization. The B2C model of e-commerce is more prone to the security threats because individual consumers provide their credit card and personal information n the site of a business organization. In addition, the consumer might doubt that his information is secured and used effectively by the business organization. This is the main reason why the B2C model is not very widely accepted. Therefore, it becomes very essential for the business organizations to provide robust security mechanisms that can guarantee a consumer for securing his/her information.

2) Business to Business (B2B)

The B2B model involves electronic transactions for ordering, purchasing, as well as other administrative tasks between business houses. It includes trading goods, such as business subscriptions, professional services, manufacturing, and wholesale dealings. Sometimes in the B2B model, business may exist between virtual companies, neither of which may have any physical existence. In such cases, business is conducted only through the Internet.

Let us look at the example of www.amazon.com. As you know, www.amazon.com is an online bookstore that sells books from various publishers including Wrox, O'Reilly, Premier Press, and so on. In this case, the publishers have the option of either developing their own site or displaying their books on the Amazon site (www.amazon.com), or both. The publishers mainly choose to display their books on www.amazon.com at it gives them a larger audience. Now, to do this, the publishers need to transact with Amazon, involving business houses on both the ends, is the B2B model as shown in figure below.

B2B Business Model
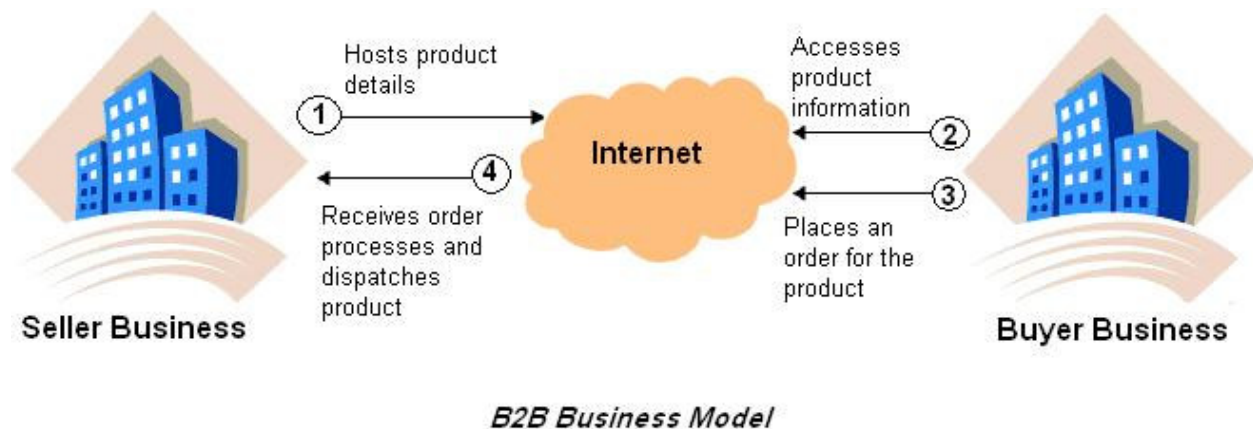
Thus, B2B is that model of e-commerce whereby a company conducts its trading and other commercial activity through the Internet and the customer is another business itself. This essentially means commercial activity between companies through the Internet as a medium.

This is supposed to be a huge opportunity area on the Web. Companies have by and large computerized all the operations worldwide and now they need to go into the next stage by linking their customers and vendors. This is done by supply chain software, which is an integral part of your ERP application. Companies need to set up a backbone of B2B applications, which

will support the customer requirements on the Web. Many B2B sites are company and industry specific, catering to a community of users, or are a combination of forward and backward integration. Companies have achieved huge savings in distribution-related costs due to their B2B applications.

Major Advantages of B2B

1) **Direct interaction with customers**. This is the greatest advantage of e-business.

2) **Focussed sales promotion**. This information gives authentic data about the likes, dislikes and preferences of clients and thus helps the company bring out focussed sales promotion drives which arc aimed at the right audience.

3) **Building customer loyalty**. It has been observed that online customers can be more loyal than other customers if they are made to feel special and their distinct identity is recognized and their concerns about privacy are respected. It has also been found that once the customers develop a binding relationship with a site and its product, they do not like to shift loyalties to another site or product.

4) **Scalability**. This means that the Web is open and offers round-the-clock access. This provides an access never known before, to the customer. This access is across locations and time zones. Thus a company is able to handle many more customers on a much wider geographical spread if it uses an e-business model. The company can set up a generic parent site for all locations and make regional domains to suit such requirements. Microsoft is using this model very successfully.

5) **Savings in distribution costs**. A company can make huge savings in distribution, logistical and after-sales support costs by using e-business models. Typical examples are of computer companies, airlines, and telecom companies.

Processes for Business-to-Business Transactions and Models

B2B interactions involve much more complexity than B2C. For instance, typical B2B transactions include, among others, the following steps:

(i) review catalogues,

(ii)   identify specifications.

(iii)   define requirements,

(iv)   post request for proposals (REP).

(v)   review vendor reputation.

(vi)   select vendor.

(vii)   fill out purchase orders (PO).

(viii) send PO to vendor,

(ix)   prepare invoice,

(x)   make payment,

(xi)   arrange shipment, and

(xii)   organize product inspection and reception.

Due to the large number of transactions involved, business-to-business operations can be too risky if e-business sites cannot guarantee adequate quality of service in terms of performance, availability, and security.

3) Consumer to Consumer (C2C)

The C2C model involves transaction between consumers. Here, a consumer sells directly to another consumer. eBay and www.bazee.com are common examples of online auction Web sites that provide a consumer to advertise and sell their products online to another consumer. However, it is essential that both the seller and the buyer must register with the auction site. While the seller needs to pay a fixed fee to the online auction house to sell their products, the buyer can bid without paying any fee. The site brings the buyer and seller together to conduct deals as shown in figure below.

C2C Business Model
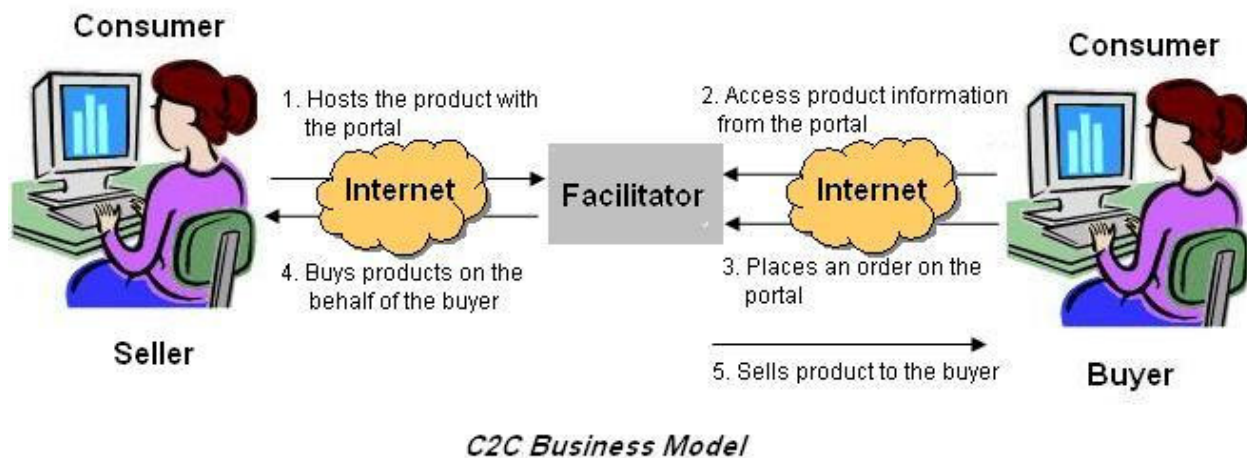
Let us now look at the previous figure with respect to eBay. When a customer plans to sell his products to other customers on the Web site of eBay, he first needs to interact with an eBay site, which in this case acts as a facilitator of the overall transaction. Then, the seller can host his product on www.ebay.com, which in turn charges him for this. Any buyer can now browse the site of eBay to search for the product he interested in. If the buyer comes across such a product, he places an order for the same on the Web site of eBay. eBay now purchase the product from

the seller and then, sells it to the buyer. In this way, though the transaction is between two customers, an organization acts as an interface between the two organizations.

There are also a number of new consumer-to-consumer expert information exchanges that are expected to generate $6 billion in revenue by 2005. Some of these exchanges, such as AskMe.com and abuzz, are free, and some allow their experts to negotiate fees with clients. InfoRocket.com, one of the first question-and-answer marketplaces, is driven by a person-to-person auction format. The InfoRocket.com bidding system allows a person who submits a question to review the profiles of the "experts" who offer to answer the question. When the person asking the question accepts an "expert" offer, infoRocket.com bills the person's credit card, delivers the answer, and takes a 20 percent commission.

4) Consumer to Business (C2B)

The C2B model involves a transaction that is conducted between a consumer and a business organization. It is similar to the B2C model, however, the difference is that in this case the consumer is the seller and the business organization is the buyer. In this kind of a transaction, the consumers decide the price of a particular product rather than the supplier. This category includes individuals who sell products and services to organizations. For example, www.monster.com is a Web site on which a consumer can post his bio-data for the services he can offer. Any business organization that is interested in deploying the services of the consumer can contact him and then employ him, if suitable as shown in figure.
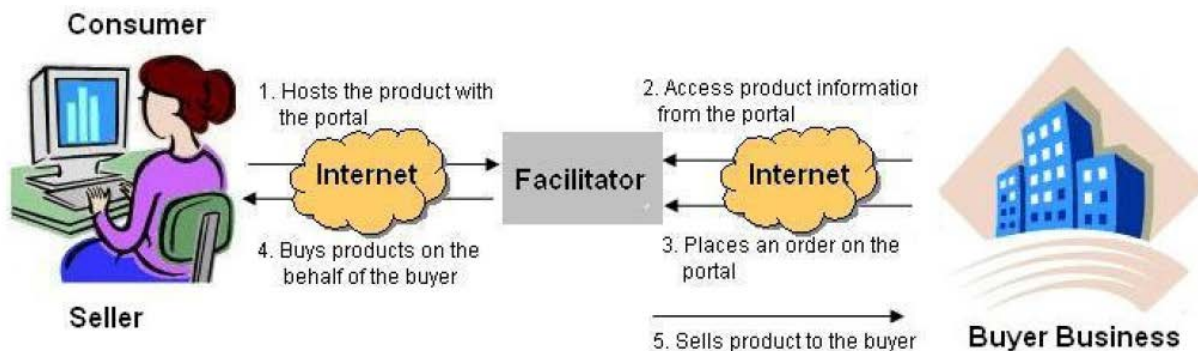
C2B Business Model

Let us look at another example of the C2B model. William Ward needs to buy an airline ticket for his journey from New York to New Jersey. William needs to travel immediately. Therefore, he searches a Web site for a ticket. The Web site offers bidding facility to people who want to buy tickets immediately. On the Web site, William quotes the highest price and gets the ticket.

In addition to the models discussed so far, five new models are being worked on that involves transactions between the government and other entities, such as consumer, business organizations, and other governments. All these transactions that involve government as one entity are called e-governance. The various models in the e-governance scenario are:

• **Government-to-Government (G2G) model**: This model involves transactions between 2 governments. For example, if the American government wants to by oil from the Arabian government, the transaction involved are categorized in the G2G model.

• **Government-to-Consumer (G2C) model**: In this model, the government transacts with an individual consumer. For example, a government can enforce laws pertaining to tax payments on individual consumers over the Internet by using the G2C model.

• **Consumer-to-Government (C2G) model**: In this model, an individual consumer interacts with the government. For example, a consumer can pay his income tax or house tax online. The transactions involved in this case are C2G transactions.

• **Government-to-Business (G2B) model**: This model involves transactions between a government and business organizations. For example, the government plans to build a fly over. For this, the government requests for tenders from various contractors. Government can do this over the Internet by using the G2B model.

• **Business-to-Government (B2G) model**: In this model, the business houses transact with the government over the Internet. For example, similar to an individual consumer, business houses can also pay their taxes on the Internet.

E-Business models based on the relationship of Transaction Types

Based on transaction type, different types of transactions can be identified as listed below:
- Brokerage
- Aggregator
- Info-mediary
- Community
- Value chain
- Advertising

These transaction types take place in a variety of ways. Moreover, any given firm may combine one or two of these as part of its web business strategy.

1) Brokerage Model

Brokers are market-makers: they bring buyers and sellers together and facilitate transactions. Brokers play a frequent role in business-to-business (B2B), business-to-consumer (B2C), or consumer-to-consumer (C2C) markets. Usually a broker charges a fee or commission for each transaction it enables. The formula for fees can vary depending on context. Brokerage models include:

Marketplace Exchange -- offers a full range of services covering the transaction process, from market assessment to negotiation and fulfillment. Some examples are [Orbitz, ChemConnect]

Buy/Sell Fulfillment -- takes customer orders to buy or sell a product or service, including terms like price and delivery. Some examples are [CarsDirect, Respond.com]

Auction Broker -- conducts auctions for sellers (individuals or merchants). Broker charges the seller a listing fee and commission scaled with the value of the transaction. Auctions vary widely in terms of the offering and bidding rules. Some examples are [eBay]

Transaction Broker -- provides a third-party payment mechanism for buyers and sellers to settle a transaction. Some examples are [PayPal, Escrow.com]

Search Agent -- a software agent or "robot" used to search-out the price and availability for a good or service specified by the buyer, or to locate hard to find information.

Virtual Marketplace -- or virtual mall, a hosting service for online merchants that charges setup, monthly listing, and/or transaction fees. It may also provide automated transaction and relationship marketing services. Some examples are [zShops and Merchant Services at Amazon.com]

2) Aggregator Model

Electronic commerce business model where a firm (that does not produce or warehouses any item) collects (aggregates) information on goods and/or services from several competing sources at its website. The firm's strength lies in its ability to create an 'environment' which draws visitors to its website, and in designing a system which allows easy matching of prices and specifications. Aggregator model includes:

Virtual Merchant -- this is a business that operate only from the web and offers either traditional or web specific goods and services. The method of selling may be listing price or auction. Some example includes [Amazon, eToys]

Catalog Merchant – Catalog business is a migration of mail order to web-based order business.

Bit Vendor – This is the merchant that deals strictly in digital products and services in its purest form.

Subscription model – the users have to pay for the access of the site. High value added content should be essential for subscription model. Some examples are [Wall street journal, Consumer Reports]

3) Info-mediary Model

Data about consumers and their consumption habits are valuable, especially when that information is carefully analyzed and used to target marketing campaigns. Independently collected data about producers and their products are useful to consumers when considering a purchase. Some firms function as infomediaries (information intermediaries) assisting buyers and/or sellers understand a given market. Info-mediary model includes:

Advertising Networks -- feed banner ads to a network of member sites, thereby enabling

advertisers to deploy large marketing campaigns. Ad networks collect data about web users that can be used to analyze marketing effectiveness. [DoubleClick]

Audience Measurement Services -- online audience market research agencies. [Nielsen//Netratings]

Incentive Marketing -- customer loyalty program that provides incentives to customers such as redeemable points or coupons for making purchases from associated retailers. Data collected about users is sold for targeted advertising. [Coolsavings]

Metamediary -- facilitates transactions between buyer and sellers by providing comprehensive information and ancillary services, without being involved in the actual exchange of goods or services between the parties. [Edmunds]

4) Community Model

The viability of the community model is based on user loyalty. Users have a high investment in both time and emotion. Revenue can be based on the sale of ancillary products and services or voluntary contributions; or revenue may be tied to contextual advertising and subscriptions for premium services. The Internet is inherently suited to community business models and today this is one of the more fertile areas of development, as seen in rise of social networking.

Open Source -- software developed collaboratively by a global community of programmers who share code openly. Some examples are [Red Hat, Linux]

Open Content -- openly accessible content developed collaboratively by a global community of contributors who work voluntarily. [Wikipedia]

Public Broadcasting -- user-supported model used by not-for-profit radio and television broadcasting extended to the web. A community of users support the site through voluntary donations. [The Classical Station (WCPE.org)]

Social Networking Services -- sites that provide individuals with the ability to connect to other individuals along a defined common interest (professional, hobby, romance). Social networking services can provide opportunities for contextual advertising and subscriptions for premium services. [Facebook, Orkut]

5) Value Chain Model

Value chain selling is supported through two business models: demand chain and a supply chain; E-Commerce supports the transactions through both the demand chain business model and supply chain business model.

Products, goods, services, or information are delivered through the parties of the value chain

from producers to end users. A value chain also has relationship and administrative aspects, that is, you can manage the relationship of the partners or enterprises in your value chain, as well as offer some administrative services to those parties.

As a result, value chain business models must manage the two sides of their businesses: their customers and direct sales, and their channel partners and suppliers. Each requires its own management channels and practices.

To sell directly to customers (direct sales), value chain models usually include a storefront, where customers can purchase their goods or services directly. To manage relationships with partners or suppliers, the demand chain and a supply chain models within the value chain include a hub.

6) Advertising Model

The web advertising model is an extension of the traditional media broadcast model. The broadcaster, in this case, <u>a web site</u>, provides content (usually, but not necessarily, for free) and services (like email, IM, blogs) mixed with advertising messages in the form of banner ads. The banner ads may be the major or sole source of revenue for the broadcaster. The advertising model works best when the volume of viewer traffic is large or highly specialized. Advertising model includes:

Portal -- usually a search engine that may include varied content or services. A high volume of user traffic makes advertising profitable and permits further diversification of site services. Some common examples are [Google, Yahoo!]

Classifieds -- list items for sale or wanted for purchase. Listing fees are common, but there also may be a membership fee. [Monster.com, Craigslist]

User Registration -- content-based sites that are free to access but require users to register and provide demographic data. Registration allows inter-session tracking of user surfing habits and thereby generates data of potential value in targeted advertising campaigns. [NYTimes]

Contextual Advertising / Behavioral Marketing -- For example, a browser extension that automates authentication and form fill-ins, also delivers advertising links or pop-ups as the user surfs the web. Contextual advertisers can sell targeted advertising based on an individual user's surfing activity.

E-Business/revenue Model

In business, revenue typically consists of the total amount of money received by the company for goods sold or services provided during a certain time period. Therefore, revenue models are a part of the business model. Many online companies generate revenues from

multiple income streams such as advertising, subscription, affiliate marketing etc. Online models not only sell goods or services but also contacts (e.g. banner) and information (e.g. user-data).

Five primary revenue models are described below. Since there are possibilities of multiple variations, many companies do not use one single revenue model

1. **Transaction fee model:**

   A company receives commissions based on volume for enabling or executing transactions. The revenue is generated through transaction fees by the customer paying a fee for a transaction to the operator of a platform. The company is a market place operator providing the customer with a platform to place his transactions. Example: eBay

2. **Subscription Fee model:**
   Users are charged a periodic (daily, monthly or annual) fee to subscribe to a service. Many sites combine free content with premium membership, i.e. subscriber- or member-only content. Subscription fees do not depend on transactions. Subscribers use the content as long and often as they want. E.g.: online journal/magazine such as New York times, daily mail etc.

3. Advertisement model:
   Typically, fees are generated from advertisers in exchange for advertisements, which is ultimately the classic principal among the revenue models besides sales. Even if representatives of major media companies complain about earning less money with online advertising than with advertising in print or TV.

4. Sales Revenue model:
   Wholesalers and retailers of goods and services sell their products online. The main benefits for the customer are the convenience, time savings, fast information etc. The prices are often more competitive. In terms of online sales there are different models such as market places as common entry points for various products from multiple vendors.

5. Affiliate model: Commission is taken for referring customer to other site or party.

Chapter 3

Network for E-Commerce

Information superhighway (I-Way): Introduction

I-way, also known as the electronic, interactive, or multimedia superhighway has become the leading buzzword that has no precise definition. I-way can be portrayed as the high bandwidth, interactive pipeline capable of simultaneously supporting a large number of electronic commerce applications. Multinational companies have started mergers and investments in technology to construct the new infrastructure. (AT & T, Sony, Time Warner, Microsoft, Viacom)

Projections indicate that anywhere from $100 to $200 billion will be spent on constructing the I- way infrastructure over the next 10 to 15 years

Market Forces influencing I-Way

1. Demands and Requirements of Market Participants

• The success or failure of any innovation, product or service is a factor of Market forces

• The market participants are

- Users who become information publishers by setting up on line servers
- Consumers, end users or business consuming and paying for information, products/services
- Information service providers who are commercial, government or private providers or publishers of information goods and service.
- Value added information providers, including third party brokers and other intermediaries, as well as originators or services who add value by packaging or building on services provided by others

•From the list above, we may see that users and firms play multiples roles as consumers and producers of information. These roles are not fixed and can be a major reason for why many companies are merging or realigning themselves.

• The companies which once focused on one type of user role (communication, entertainment or information) now seek to broaden their markets and serve as many users as possible.

• The Telecom companies want to see an I-way that can support a variety of applications: on-demand publishing, real time video conferencing, and tele-everything— telemedicine, telemarketing, and telecommuting – where individuals work from home through the extensive used of telephone hookups.

• While the cable industry wants to expand services from TV programming or pay per view services such that the consumer can pay bills, shop, reference encyclopedias, or check stock prices – all staying at home. Most cable companies tend to see the I-way as a 500 channel one way distribution vehicle.

• The online services (Prodigy, CompuServe, America Online) and computer companies want to see an I-way that involves a lot of two-way interaction such as electronic mail, information search and retrieval, and more forums, chat lines and BBS.

• The demand and requirements various participants place on the network infrastructure are bound to be very different. To support as many roles as possible, an increasing number of alliances are developing between telecommunication, cable television and entertainment companies. These partnerships provide synergy to spur consumer demand for advanced information, entertainment services and the equipment and devices necessary to provide them

2. Strategic Alliance and the I-Way Infrastructure

• To ensure construction of a broadly useful I-way, strategic planning should take into account the needs of the communication, entertainment and information sectors

• The resource requirements of building these three segments of the I-way are driving companies to make maximum use of existing facilities through alliances to control costs and create test markets.

• Alliances, particularly among large firms are dominant as they reduce risks, spread costs and allow firms to acquire costly expertise in different areas instantly

• Two aspects of these alliances:

- They cut across industry lines a diversity suggesting that member companies will perform different roles within the alliances. E.g studio provide the content, telephone or cable companies deliver the information and computer hardware and software firms provide the access hardware and application to use the data.

- Many alliances are international, signaling that the I-way will be global from the start.

- A majority of the alliances are between Telcos and cable companies just because today the cable companies posses the bandwidth to the home that the Telcos lack but they don't have the Telcos sophisticated switching equipment and operational support systems to provide interactive point to point communications.

• These mergers are expected to result in significant long term opportunities to achieve economies of scale by providing cable and telephony access to more customers. Moreover, it would give the new alliance increased control, from both cost and timeliness perspective in the purchase of content or programming.

Components of I-Way

Three major components make up the I-way as shown in the figure below.
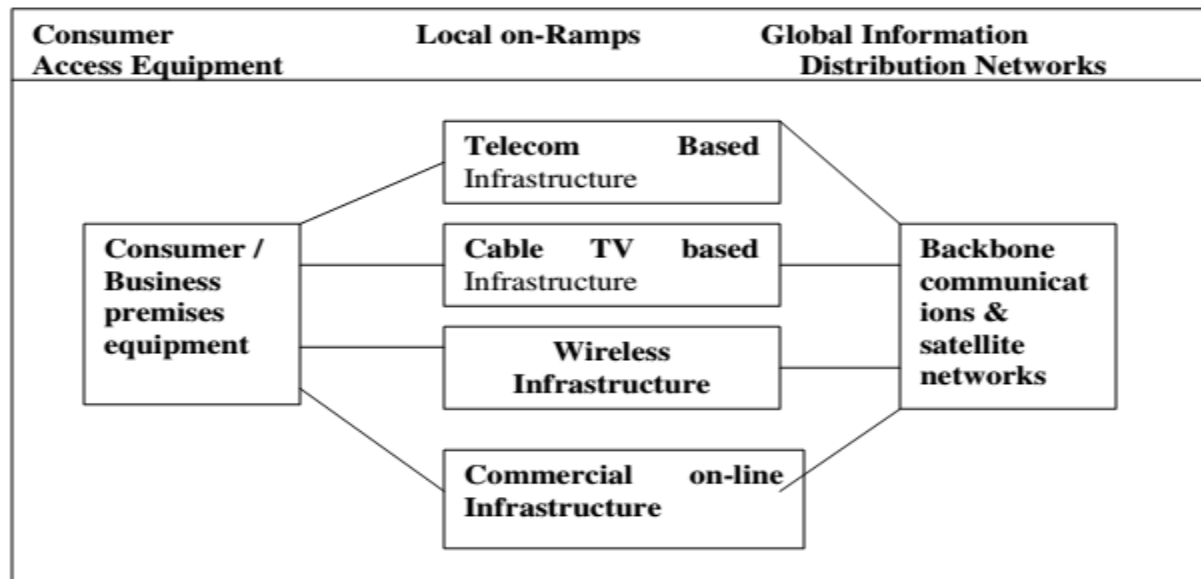
a) Consumer Access Equipments

Consumer access equipment is often ignored in discussions of the I-way but represents a critical category, the absence or slow progress of which is holding up other segment of the I-way. For instance, interactive TV is uncommon, not because of a lack of wiring but because of a lack of affordable equipment on the customer's side for access and on the provider's side for distribution

This segment includes hardware and software vendors who provide physical devices such as routers and switches and access device such as computer, set top box and software platforms such as browsers and Operating systems.

b) Local Or Access Roads or On-RAMPS

• Simplifies linkage between businesses, schools and homes to the communication backbone. These are often called the "last mile" in telecommunication industry. • The providers of access ramps can be divided into 4 categories:

- Telecom based
- Cable TV based
- Wireless based
- Computer based Online Information Services

These providers link users and E-commerce application providers where users research which service best suit their need and decide which service they want to access. A careful consideration should be made to the applications deployed or accessed, objectives and costs, and security as well as privacy.

c) Global Information Distribution

it represents the infrastructure criss-crossing countries and continents• Most of the infrastructure for the I-way already exists in the vast network of fiber optic strands, coaxial cables, radio waves, satellites and

copper wires spanning the globe. • This backbone, put in place over the last three decades by the telephone and cable companies, includes such networks as long distance telephone lines, satellite networks and the internet.

NETWORK ACCESS EQUIPMENT

• The network access equipment of the I-way includes the CPE (Customer Premises Equipment) which are the privately owned communications equipment that is attached to the network.

A) SET-TOP BOXES

- A key hardware for I-way access will be cable converter boxes known as set top boxes (converter boxes or descramblers).

- They will be the gateway for information services, commercial transactions and 500 digitally compressed channels.

- These boxes will have greater intelligence and more intelligence than the existing converter boxes such as enabling users to make phone calls, surf the internet and even plan their viewing, schedule for the week.

- The simplest set-top box would include on screen text menus enabling features like parental controls, favorite channel grazing and time delay programming for unattended VCR recording.

- At the high end, it might have menu system based on icons for navigating through various activities to shop, access a bank account, play video games, watch a pay-per-view movie or examine an on screen TV schedule.

- They may also have slots for add on cards that can be used to change or add application, provide security or expand the memory. They may also have a serial data port for a printer.

SET-TOP VS. PC

The Display – traditional low resolution display vs. high definition text enabled high resolution which can easily display test, video and graphics crisply to a viewer a foot and half way.

The Controls –hand held remote control (possibly a joystick or trackball) vs. the full functional keyboard with a mouse assisting for clicking, selecting and highlighting plus a variety of devices are supported by a PC.

The Pipeline – existing cable systems that can deliver a huge amount of information rapidly one way (must be modified to allow a significant return flow) vs. the dominant system with high capacity modems and networks for video on demand services.

The Brains – the set-top box is really a special purpose computer with powerful graphics and communication features but limited versatility whereas PCs are interactive, versatile and not central server dependent.

The Accessibility – nearly every household has a television and is familiar and comfortable with it. PCs are rapidly gaining acceptance but people who don't tend to take a technology leap resist use of PCs and remain uncomfortable with PCs.

B) Digital Switches, Routers and Hub

• The digital switches industry has a major impact on the I-way.

• All digital bits are essentially alike whether they represent a movie, a phone call, a newspaper or an opera.

• In a network data move from a source to their intended destination with a header.

• Like any other data, the digital data packets pass the switches that route them to their intended destination using the fast packet switching.

• Cable companies are testing different switching techniques, including asynchronous transfer mode which is quickly gaining international acceptance.

GLOBAL INFORMATION DISTRIBUTOIN NETWORKS

Two major technologies underpins the global information network distribution:

A) Long Distance Networks – Fiber Optics

Long distance connectivity is available via cable (coax or fiber) owned by long distance or inter-exchange carriers (IXCs). Experience suggests that fiber optics for international transmission is likely to grow as they provide impressive economic advantage for selected routes where the growth in demand for communications capacity is high.

The current large scale capacity of fiber optic connections between the US and Europe is enhanced to operate at gigabit rate.

The major long distance carriers have focused their attention on wireless technologies and made plans to work with or acquire companies in the wireless market. This would enable them to provide long-distance services to cellular users and possibly to develop a more economical local access network to reach their own subscribers

B) Satellite Networks

• The role of satellites in the communications industry has changes substantially during the past two decades.

• Initially satellites were used to transport long distance telecommunications and one way video broadcasts.

• The advent of fiber optics in the early 80s changed the role of satellites in the global communication industry.

• Fiber optics has emerged as the technology of choice, not only because it is capable of providing higher bandwidth than satellites but also because it is immune to EMI. Hence, it is being deployed for long distance communication and even underseas to carry international traffic.

• Satellite networks do have accessibility from any spot on the globe, can provide digital broadband service including voice, data and video without the cost of acquiring wire installation.

• Today about 150 communication satellites in geosynchronous orbit (GEO) are providing a wide range of services, including broadcast video and overseas telephone links.

• In 1980s, a new class of satellites using a narrow beam to focus the transmitted energy on a small geographical area known as VSAT.

Compiled by Tej Shahi@CDCSIT

Seven major issues of I-Way

- Cost: ▪ the primary concern is cost; who will pay for constructing the I-way?

- Subsidies: Developers might hope for subsidies, tax breaks, government business, or other form of encouragement

- Allocation of scarce resource: Investments in all aspects of the I-way may be wasted because there is no strong evidence that markets exist for the services it would offer or it my create markets due to developing technologies.

- Regulation: Regulation to provide public access, privacy. What are the rules? Who writes them? Who enforces them?

- Universal Access: Who gets access to the I-way. Networks are inherently collectivist: a broader reach benefits everyone. '

- Information Privacy Issues

- Social and Religious Barriers

- Public policy and global connectivity

Chapter 3
Network Security and Firewalls

Introduction to Network Security

A network security is defined as a circumstance, condition with the potential to cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, denial of service, and/or fraud, waste, and abuse.

The discussion of security concerns in electronic commerce can be divided into two broad types: **Client/server security** uses various authorization methods to make sure that only valid user and programs have access to information resources such as databases. Access control mechanisms must be set up to ensure that properly authenticated users are allowed access only to those resources that they are entitled to use. Such mechanisms include password protection, encrypted smart cards, biometrics, and firewalls.

Data and transaction security ensures the privacy and confidentiality in electronic messages and data packets, including the authentication of remote users in network transactions for activities such as on-line payments. The goal is to defeat any attempt to assume another identity while involved with electronic mail or other forms of data communication. Preventive measures include data encryption using various cryptographic methods.

Client/Server Network Security

Client/server network security is one of the biggest headaches system administrators face as they balance the opposing goals of user maneuverability andeasy access and site security and confidentiality of local information. According to the National Center for Computer Crime Data, computer security violations cost U.S. businesses half a billion dollars each year.

Network security on the Internet is a major concern for commercial organizations, especially top management. Recently, the Internet has raised many new security concerns. By connecting to the Internet, a local network organization may be exposing itself to the entire population on the Internet. As figure below illustrates, an Internet connection opens itself to access from other
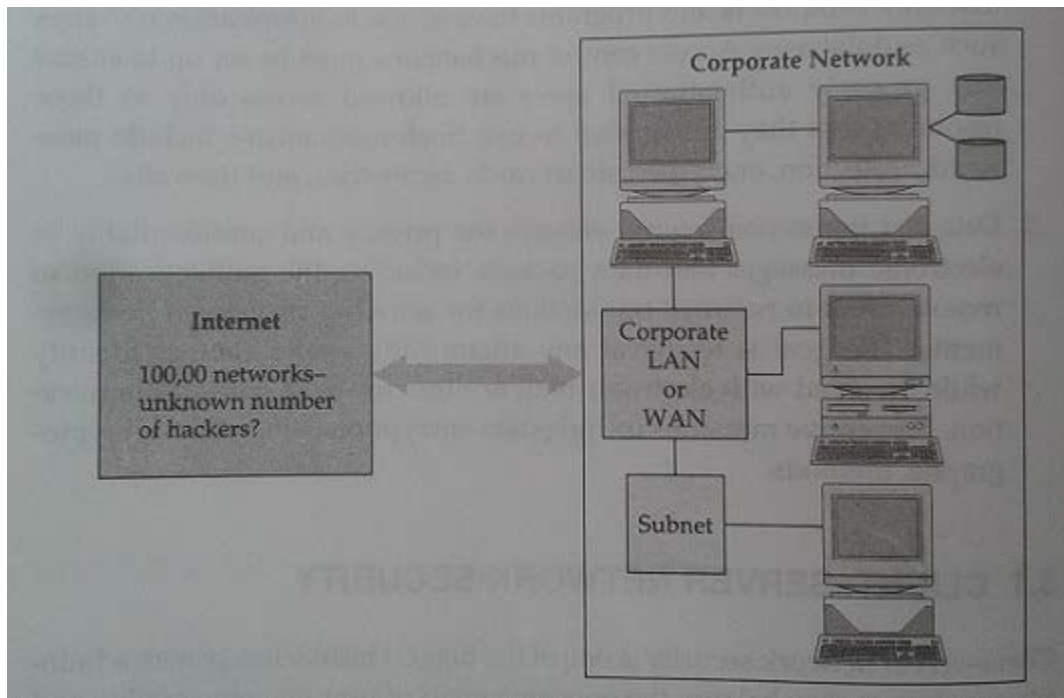
networks comprising the public Internet.

Fig: Unprotected Internet Connection

Client–server network security problems manifest themselves in three ways:

1) **Physical security holes** result when individuals gain unauthorized physical access to a computer. A good example would be a public workstation room, where it would be easy for a wandering hacker to reboot a machine into single-user mode and tamper with the files, if precautions are not taken. On the network, this is also a common problem, as hackers gain access to network systems by guessing passwords of various users.

2) **Software security holes** result when badly written programs or "privileged" software are "compromised" into doing things they shouldn't. The most famous example of this category is the "sendmail" hole, which brought the Internet to its knees in 1988. A more recent problem was the "rlogin" hole in the IBM RS-6000 workstations, which enabled a cracker (a malicious hacker) to create a "root" shell or superuser access mode. This is the highest level of access possible and could be used to delete the entire file system, or create a new account or password file.

3) **Inconsistent usage holes** result when a system administrator assembles acombination of hardware and software such that the system is seriouslyflawed from a security point of view. The incompatibility of attemptingtwo unconnected but useful things creates the security hole. Problemslike this are difficult to isolate once a system is set up and running, so itis better to carefully build the system with them in mind. This type ofproblem is becoming common as software becomes more complex.

To reduce these security threats, various protection methods are used. Over the years, several protection methods have been developed, including trust-based security, security through obscurity, password schemes, and biometric systems.

Trust-Based Security: Quite simply, trust-based security means to trust everyone and do nothing extra for protection. It is possible not to provide access restrictions of any kind and to assume that all users are trustworthy and competent in their use of the shared network. This approach assumes that no one ever makes an expensive breach such as getting root access and deleting all files (a common hacker trick). This approach worked in the past, when the system administrator had to worry about a limited threat. Today, this is no longer the case.

Security through Obscurity: Most organizations in the mainframe era practiced a philosophy known as security through obscurity (STO)—the notion that any network can be secure as long as nobody outside its management group is allowed to find out anything about its operational details and users are provided information on a need-to-know basis. Hiding account passwords in binary files or scripts with the presumption that "nobody will ever find them" is a prime case of STO (somewhat like hiding the housekey under the doormat and telling only family and friends). In short, STO provides a false sense of security in computing systems by hiding information.

Password Schemes: One straightforward security solution, a password scheme, erects a first-level barrier to accidental intrusion. In actuality, however, password schemes do little about deliberate attack, especially when common words or proper names are selected as passwords. For instance, network administrators at a Texas air force base discovered that they could crack about 70 percent of the passwords on their UNIX network with tools resembling those used by hackers. The simplest method used by most hackers is dictionary comparison— comparing a list of encrypted user passwords against a dictionary of encrypted common words EGCN941. This

scheme often works because users tend to choose relatively simple or familiar words as passwords. To beat the dictionary comparison method, experts often recommend using a minimum of eight-character length mixed-case passwords containing at least one non-alphanumeric character and changing passwords every 60 to 90 days.

Biometric Systems: Biometric systems, the most secure level of authorization, involve some unique aspect of a person's body. Past biometric authentication was based on comparisons of fingerprints, palm prints, retinal patterns, or on signature verification or voice recognition. Biometric systems are very expensive to implement: At a cost of several thousand dollars per reader station, they may be better suited for controlling physical access—where one biometric unit can serve for many workers—than for network or workstation access. Many biometric devices also carry a high price in terms of inconvenience; for example, some systems take 10 to 30 seconds to verify an access request.

Security Threats in Client –Server Systems

Mobile Codes Emerging threat in the e-commerce world is mobile code which in many ways resembles a more traditional virus threat. It is an executable program that has the ability to move from machine to machine and also to invoke itself without external influence. it can be divided into two major categories.

- Threats to local computing environment from mobile software

- Access control and threats to servers that include impersonation, eavesdropping, denialof service, packet relay and packet modification.

Threats to Client

Internet tends to be the major security threat for running client software as client program interprets data downloaded from arbitrary servers on the internet.• In absence of checks on imported data, the potential exists for this data to disrupt programs running on the systems.Most of the client threats arise from malicious data or code (viruses, worms, Trojan Horse, logic bombs).These codes mistakenly intrude into standalone PCs and have the ability to attack systems on network where the maintenance cost tends to be significant.

Threats to Servers

Threats to servers consist of unauthorized modification of server data, eavesdropping, modification of data packets and compromise of a server system by exploiting bugs in the server software. They are much more susceptible to attacks where legitimate users are impersonated. Hackers have potential access to a large number of systems. As a result, computers that are not properly configured and running programs with security holes are particularly vulnerable.Hackers can use popular UNIX programs like Finger, rsh or ruser to discover account names and then try to guess simple passwords using a dictionary

Hackers can spoof or configure a system to masquerade as another system this gaining unauthorized access to resources or information on systems that trust the system being mimicked.

Hackers can eavesdrop using software that monitors packet sent over the network. Information sent over Telnet or FTP is often sent unencrypted which allows a hacker to make a complete transcript of network activity and obtain sensitive information.The two most common forms of Denial of Service (DOS) attacks are:

Service overloading: This may happen to servers for instance, if anyone writes a small loop that send continuous request for a particular file. The server tries to respond in good faith. It may also happen due to accidental infinite loops.

Message flooding: This occurs when someone send a very large file to a message box every few minutes. This message box rapidly grows in size and beings to occupy all the space on the disk and increases the number of receiving processes on the recipient's machine, trying it up even more and often causing a disk crash. The best way to avoid message overloading is to provide separate areas for different programs and to make provisions for graceful failure.

Firewalls and Its Types

The most commonly accepted network protection is a barrier—a firewallbetween the corporate network and the outside world (untrusted network). The term firewall can mean many things to many people, but basically it is a method of placing a device—a computer or a router—between the network and the Internet to control and monitor all traffic between the outside world and the

local network. Typically, the device allows insiders to have full access to services on the outside while granting access from the outside only selectively, based on log-on name, password, IP address or other identifiers as shown in figure below.
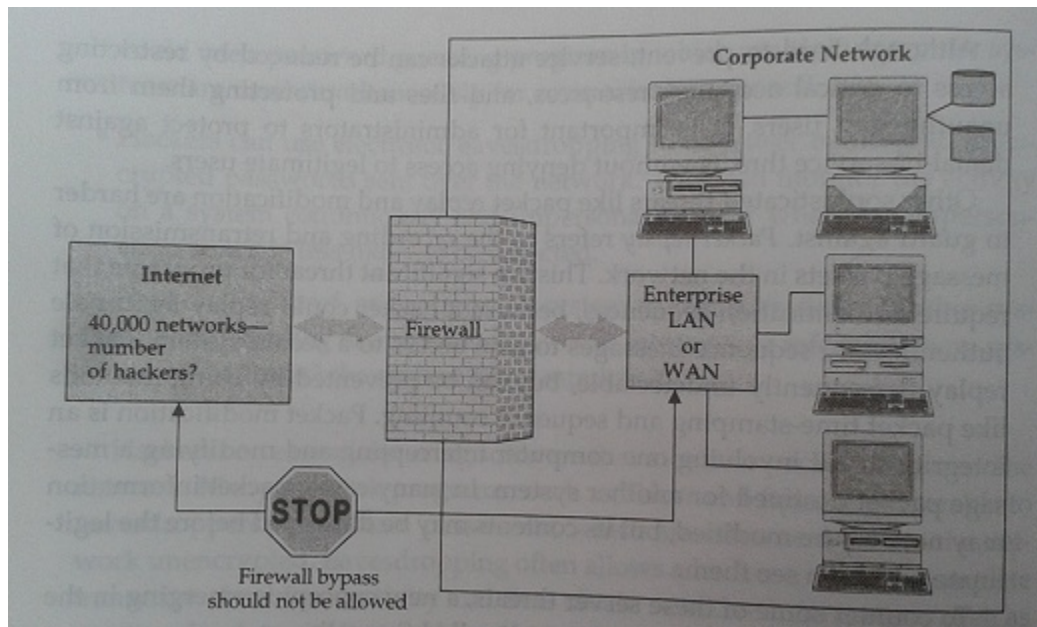

Fig: Firewall-secured Internet Connection

Generally speaking, a firewall is a protection device to shield vulnerable areas from some form of danger. In the context of the Internet, a firewall is a system—a router, a personal computer, a host, or a collection of hosts—set up specifically to shield a site or subnet from protocols and services that can be abused from hosts on the outside of the subnet. A firewall system is usually located at a gateway point, such as a site's connection to the Internet, but can be located at internal gateways to provide protection for smaller collection of hosts or subnets.

Firewalls come in several types and offer various levels of security. Generally, firewalls operate by screening packets and/or the applications that pass through them, provide controllable filtering of network traffic, allow restricted access to certain applications, and block access to everythingelse. The actual mechanism that accomplishes filtering varies widely, but in principle, the firewall can be thought of as a pair of mechanisms: one to block incoming traffic and the other to permit outgoing traffic. Some firewalls place a greater emphasis on blocking traffic, and others emphasize permitting traffic.

In short, the general reasoning behind firewall usage is that, without a firewall, network security is a function of each host on the network and all hosts must cooperate to achieve a uniformly high level of security. The larger the subnet, the less manageable it is to maintain all hosts at the same level of security. As mistakes and lapses in security become more common, break-ins can occur not as the result of complex attacks, but because of simple errors in configuration and inadequate passwords.

Types of Firewall (Firewalls in Practice)

Firewalls range from simple traffic logging systems that record all network traffic flowing through the firewall in a file or database for auditing purposes to more complex methods such as IP packet screening routers, hardened fire-wall hosts, and proxy application gateways. The simplest firewall is a packet- filtering gateway or screening router. Configured with filters to restrict packet traffic to designated addresses, screening routers also limit the types of services that can pass through them.

More complex and secure are application gateways. They are essentially PCs or UNIX boxes that sit between the Internet and a company's internal network to provide proxy services to users on either side. For example, a user who wants to FTP in or out through the gateway would connect to FTP software running on the firewall, which then connects to machines on the other side of the gateway. Screening routers and application gateway firewalls are frequently used in combination when security concerns are very high.

IP Packet Screening Routers: This is a static traffic routing service placed between the network service provider's router and the internal network. The traffic routing service may be implemented at an IP level via screening rules in a router or at an application level via proxy gateways and services. Figure below shows a secure firewall with an IP packet screening router.
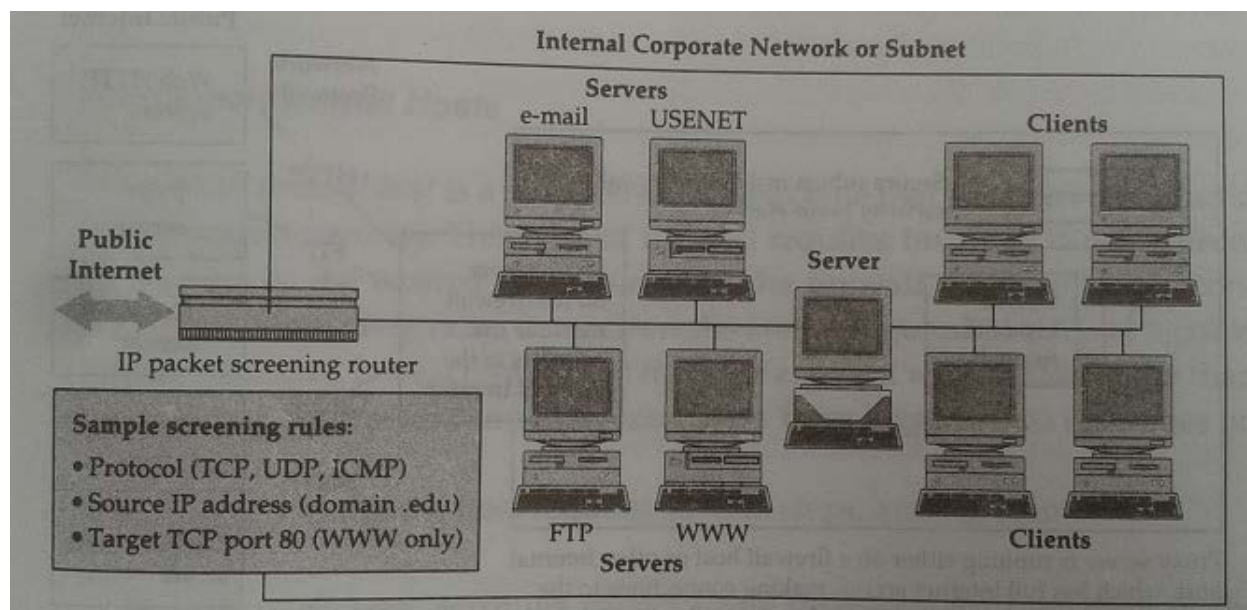
Fig: Secure firewall with IP packet screening router

The firewall router filters incoming packets to permit or deny IP packets based on several screening rules. These screening rules, implemented into the router are automatically performed. Rules include target interface to which the packet is routed, known source IP address, and incoming packet protocol (TCP, UDP, ICMP). ICMP stands for Internet Control Message Protocol, a network management tool of the TCP/IP protocol suite.

  Although properly configured routers can plug many security holes, they do have several disadvantages. First, screening rules are difficult to specify, given the vastly diverse needs of users. Second, screening routers are fairly inflexible and do not easily extend to deal with functionality different from that preprogrammed by the vendor. Lastly, if the screening router is circumvented by a hacker, the rest of the network is open to attack.

Proxy Application Gateways: A proxy application gateway is a special server that typically runs on a firewall machine. Their primary use is access to applications such as the World Wide Web from within a secure perimeter as shown in figure below. Instead of talking directly to external WWW servers, each request from the client would be routed to a proxy on the firewall that is defined by the user. The proxy knows how to get through the firewall. An application-Level proxy makes a firewall safely permeable for users in an organization, without creating a potential security hole through which hackers can get into corporate networks. The proxy waits

for a request from inside the firewall, forwards the request to the remote server outside the firewall, reads the response, and then returns it to the client. In the usual case, all clients within a given subnet use the same proxy. This makes it possible for the proxy to execute efficient caching of documents that are requested by a number of clients.The proxy must be in a position to filter dangerous URLs and malformed commands.
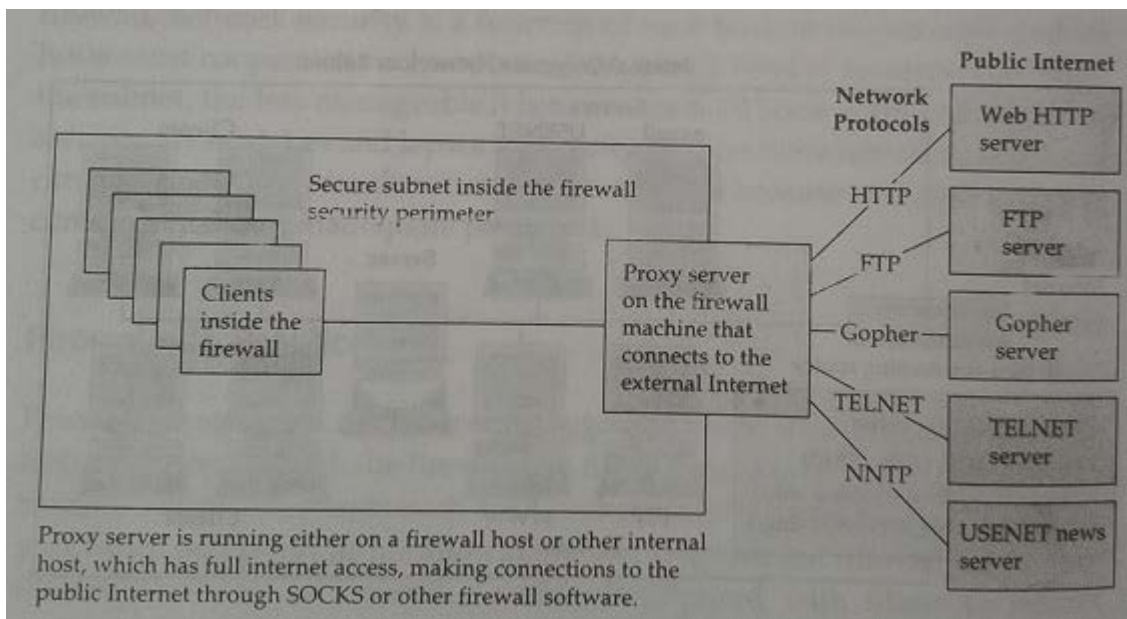
Fig: Proxy servers on the World Wide Web

Hardened Firewall Hosts: A hardened firewall host is a stripped-down machine that has been configured for increased security. This type of firewall requires inside or outside users to connect to the trusted applications on the firewall machine before connecting further. Generally, these firewalls are configured to protect against unauthenticated interactive log-ins from the external world. This, more than anything, helps prevent unauthorized users from logging into machines onthe network.

The hardened firewall host method can provide a greater level of audit and security, in return for increased configuration cost and decreased 'level of service (because a proxy needs to be developed for each desired service).

Security Policy and Firewall Management

The First Issue: Security policy of the organization

- Is the firewall in place explicitly to deny all services except those integral to the mission of connecting to the Internet or is the firewall in place to provide a metered and audited method of regulating access in a non-threatening manner?

- Many corporations and data centers have computing security policies and practices thatdictate how data must be protected and a firewall is embodiment of this security policy

The Second Issue: The level of monitoring, redundancy and control

- Having established the acceptable risk level by resolving the first issue, a checklist is made ofwhat should be monitored, permitted and denied.

- E.g. the firewall system can control access based on time of day, organizations might allowemployee to run email only from 1 pm to 2 pm.

The Third Issue: Technical design dictated by financial concerns

- How much will it cost either to buy or to implement?

- It's important to evaluate firewalls not only in terms of what they cost now but in terms ofcontinuing maintenance costs such as support and upgrades

The Final Issue: Realistic firewall policies

- The firewall policies must be a realistic reflection of the level of security in the entire network.

- In general, firewall cannot protect against data-driven attacks – attacks in which something ismailed or copied to an internal host and then executed.

Data and Message Security (Private or Secret and Public Key Cryptography)

The lack of data and message security on the Internet has become a high- profile problem due to the increasing number of merchants trying to spur commerce on the global network. For

instance, credit card numbers in their plain text form create a risk when transmitted across the Internet where the possibility of the number falling into the wrong hands is relatively high. Would you be willing to type in your credit card number knowing the risk? Even worse, would you expose your customers to that risk? In short, the lack of business transaction security is widely acknowledged as a major impediment to widespread e- commerce.

Historically, computer security was provided by the use of account passwords and limited physical access to a facility to bona fide users. As users began to dial in from their PCs and terminals at home, these measures were deemed sufficient. With the advent of remote users on internetworks, commercial transactions, mobile computers, and wireless technologies, simple password schemes are not sufficient to prevent attacks from sophisticated hackers.

Transaction security issues can be divided into two types: **data** and **message** security. These are discussed below.

Data Security: Electronic data security is of paramount importance at a time when people are considering banking and other financial transactions by PCs. Also, computer industry trends toward distributed computing, and mobile computers, users face security challenges. One major threat to data security is unauthorized network monitoring, also called packet sniffing.

The fact that someone can extract meaningfulInformation from network traffic is nothing new. Network monitoring can rapidly expand the number of systems intruders are able to access, all with only minimal impact on the systems on which the sniffers are installed and with no visible impact on the systems being monitored. Users whose accounts and passwords are collected will not be aware that their sessions are being monitored, and subsequent intrusions will happen via legitimate accounts on themachines involved.

Message Security: Threats to message security fall into three categories:

1. confidentiality,

2. integrity, and

3. Authentication.

1. **Message Confidentiality**- Confidentiality is important for uses involving sensitive data such as credit card numbers. This requirement will be amplified when other kinds of data, such as employee records, government files, and social security numbers, begin traversing the network. Confidentiality precludes access to, or release of, such information to unauthorized users.

   The environment must protect all message traffic. After successful delivery to their destination gateways, messages must be removed (expunged) from the public environment. All that remains is the accounting record of entry and delivery, including message length, authentication data, but no more. All message archiving must be performed in well-protected systems.

   The vulnerability of data communications and message data to interception is exacerbated with the use of distributed networks and wireless links. The need for securing the communications link between computers via encryption is expected to rise.

2. **Message and System Integrity**- Business transactions require that their contents remain unmodified during transport. In other words, information received must have the same content and organization as information sent. It must be clear that no one has added, deleted, or modified any part of the message.

   While confidentiality protects against the passive monitoring of data, mechanisms for integrity must prevent active attacks involving the modification of data. Error detection codes or checksums, sequence numbers, and encryption techniques are methods to enhance information integrity. Encryption techniques such as digital signatures can detect modifications of a message.   .

3. **Message Sender Authentication/Identification**- For e-commerce, it is important that clients authenticate themselves to servers, that servers authenticate to clients, that both authenticate to each other. Authentication is a mechanism whereby the receiver of a transaction or message can be confident of the identity of the sender and/or the integrity ofthe message. In other words, authentication verifies the identity of an entity (a user or a service) using certain encrypted information transferred from the sender to the receiver.

Authentication in e-commerce basically requires the user to prove his or her identity for each requested service. The race among various vendors in the e-commerce today is to provide an authentication method that is easy to use, secure, reliable, and scalable. Third-party authentication services must exist within a distributed network environment where a sender cannot be trusted to identify itself correctly to a receiver. In short, authentication plays an important role in the implementation of business transaction security.

Encryption Techniques for Data and Message Security (Private and Public Key Cryptography)

The success or failure of an e-commerce operation depends on different key factors, including but not limited to the business model, the team, the customers, the investors, the product, and the security of data transmissions and storage. Data security has taken on heightened importance since a series of high-profile "cracker" attacks have humbled popular Web sites, resulted in the impersonation of Microsoft employees for the purposes of digital certification, and the misuse of credit card numbers of customers at business-to-consumer e-commerce destinations. Security is on the mind of every e-commerce entrepreneur who solicits, stores, or communicates any information that may be sensitive if lost. Technologists are building new security measures while others are working to crack the security systems. One of the most effective means of ensuring data security and integrity is **encryption**.

Encryption is a generic term that refers to the act of encoding data, in this context so that those data can be securely transmitted via the Internet. Encryption can protect the data at the simplest level by preventing other people from reading the data. In the event that someone intercepts a data transmission and manages to deceive any user identification scheme, the data that they see appears to be gibberish without a way to decode it. Encryption technologies can help in other ways as well, by establishing the identity of users (or abusers); control the unauthorized transmission or forwarding of data; verify the integrity of the data (i.e., that it has not been altered in any way); and ensure that users take responsibility for data that they have transmitted.

Encryption can therefore be used either to keep communications secret (defensively) or to identify people involved in communications (offensively). Encryption Provide Following Security:

- **Message Integrity**: provides assurance that the message has not been altered.
- **No repudiation**: prevents the users from denying he/she sent the message
- **Authentication**: provides verification of the identity of the person (or machine) sending the message.
- **Confidentiality**: give assurance that the message was not read by others.

There are two types of encryption: **symmetric key** encryption and **asymmetric key** encryption. Symmetric key and asymmetric key encryption are used, often in conjunction, to provide a variety of security functions for data and message security in e-commerce.

Symmetric Key Encryption (Private or Secret Key Encryption):

Encryption algorithms that use the same key for encrypting and for decrypting information are called symmetric-key algorithms. The symmetric key is also called a secret key because it is kept as a shared secret between the sender and receiver of information. Otherwise, the confidentiality of the encrypted information is compromised. Figure below shows basic symmetric key encryption and decryption.
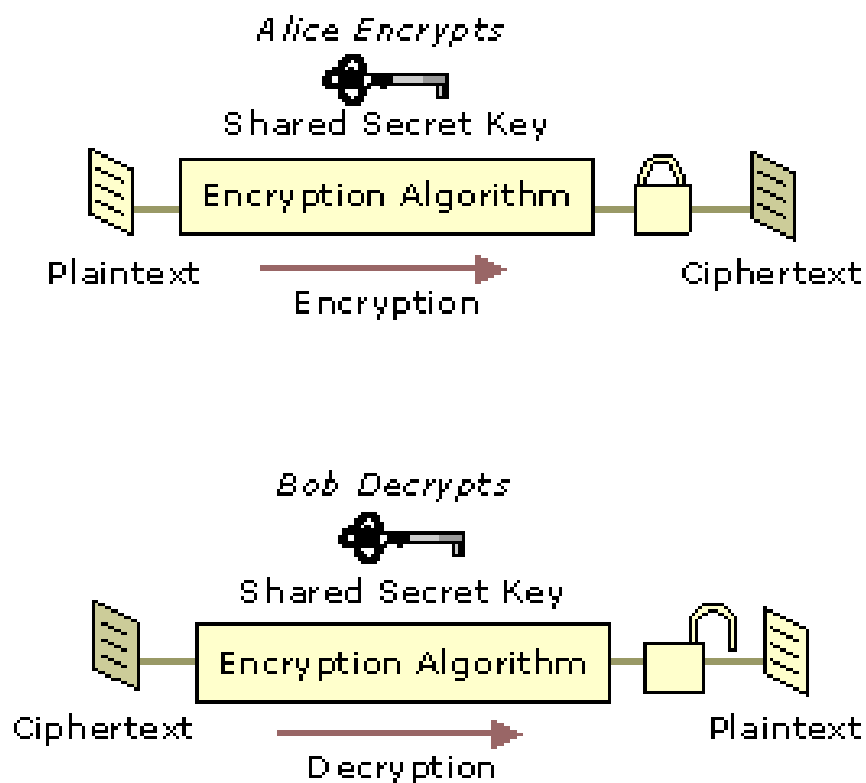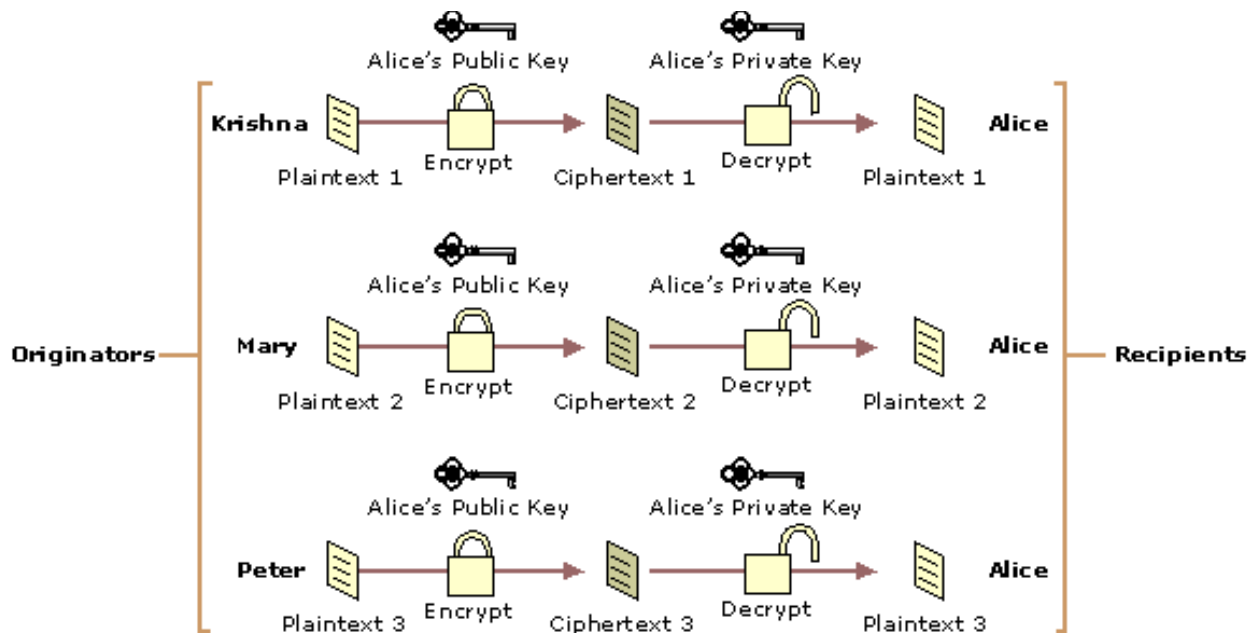

Fig: Encryption and Decryption with a Symmetric Key

Symmetric key encryption is much faster than public key encryption, often by 100 to 1,000 times. Symmetric key technology is generally used to provide secrecy for the bulk encryption and decryption of information.

Cryptography-based security technologies use a variety of symmetric key encryption algorithms to provide confidentiality. Symmetric algorithms have the advantage of not consuming too much computing power. People can use this encryption method as either a "**stream**" cipher or a "**block**" cipher, depending on the amount of data being encrypted or decrypted at a time. A stream cipherencrypts data one character at a time as it is sent or received, while a block cipher processes fixed block (chunks) of data. Common symmetric encryption algorithms include Data EncryptionStandard (**DES**), Advanced Encryption Standard (**AES**), and International Data Encryption Algorithm (**IDEA**).

Asymmetric Key Encryption(Public Key Encryption):

Encryption algorithms that use different keys for encrypting and decrypting information are most often called public-key algorithms but are sometimes also called ***asymmetric key algorit***. Public key encryption requires the use of both a private key (a key that is known only to its owner) and a public key (a key that is available to and known to other entities on the network). A user's public key, for example, can be published in the directory so that it is accessible to other people in the organization. The two keys are different but complementary in function. Information that is encrypted with the public key can be decrypted only with the corresponding private key of the set. Figure below shows basic encryption and decryption with asymmetric keys.

Fig: Encryption and Decryption with Asymmetric Keys

Today, public key encryption plays an increasingly important role in providing strong, scalable security on intranets and the Internet. Public key encryption is commonly used to perform the following functions:

- Encrypt symmetric secret keys to protect the symmetric keys during exchange over the network.
- Create digital signatures to provide authentication and non-repudiation for online entities.
- Create digital signatures to provide data integrity for electronic files and documents.

Algorithms that use public key encryption methods include RSA and Diffie-Hellman.

Common Cryptosystems

a) **RSA Algorithm**: RSA is the most commonly used public key algorithm, although it is vulnerable to attack. Named after its inventors, Ron Rivest, Adi Shamir and Len Adleman, of the MIT, RSA was first published in 1978. It is used for encryption as well as for electronic signatures (discussed later). RSA lets you choose the size of your public key. The 512-bit keys are considered insecure or weak. The 768-bit keys are secure from everything but 1024-bit keys are secure from virtually anything.

b) **Data Encryption Standards (DES)**: DES was developed by IBM in1974 in response to a public solicitation from the US Department of Commerce. It was adopted as a US federal standard in1977 and as a financial industry standard in1981. DES uses a 56-bit key to encrypt.

c) **3DES**: A stronger version of DES, called 3DES or Triple DES, uses three 56-bit keys to encrypt each block. The first key encrypts the data block, the second key decrypts the data block, and the third key encrypts the same data block again. The 3DES version requires a 168-bit key that makes the process quite secure and much safer than plain DES.

d) **RC4**: RC4 was designed by Ron Rivest RSA Data Security Inc. this variable-length cipher is widely used on the Internet as the bulk encryption cipher in the SSL protocol, with key length ranging from 40 to 128 bits. RC4 has a repudiation of being very fast.

e) **IDEA**: IDEA (International Data Encryption Algorithm) was created in Switzerland in1991. it offers very strong encryption using 1 128-bit key to encrypt 64-bit blocks. This system is widely used as the bulk encryption cipher in older version of Pretty Good Privacy(PGP)

Digital Signature

Just as handwritten signatures or physical thumbprints are commonly used to uniquely identify people for legal proceedings or transactions, so digital signaturesare commonly used to identify electronic entities for online transactions. A digital signature uniquely identifies the originator of digitally signed data and also ensures the integrity of the signed data against tampering or corruption.

One possible method for creating a digital signature is for the originator of data to create the signature by encrypting all of the data with the originator's private key and enclosing the signature with the original data. Anyone with the originator's public key can decrypt the signature and compare the decrypted message to the original message. Because only someone with the private key can create the signature, the integrity of the message is verified when the decrypted message matches the original. If an intruder alters the original message during transit, the intruder cannot also create a new valid signature. If an intruder alters the signature during transit, the signature does not verify properly and is invalid.

However, encrypting all data to provide a digital signature is impractical for following two reasons:

- The ciphertext signature is the same size as the corresponding plaintext, so message sizes are doubled, consuming large amounts of bandwidth and storage space.
- Public key encryption is slow and places heavy computational loads on computer processors.

Digital signature algorithms use more efficient methods to create digital signatures. The most common types of digital signatures today are created by signing **message digests** with the originator's private key to create a digital thumbprint of the data. Because only the message digest is signed, the signature is usually much shorter than the data that was signed. Therefore, digital signatures place a relatively low load on computer processors during the signing process, consume insignificant amounts of bandwidth. Two of the most widely used digital signature algorithms today are the **RSA digital signature** process and the **Digital Signature Algorithm** (DSA).

RSA Data Security Digital Signature Process: In the RSA digital signature process, the private key is used to encrypt only the message digest. The encrypted message digest becomes the digital signature and is attached to the original data. Figure below illustrates the basic RSA Data Security digital signature process.
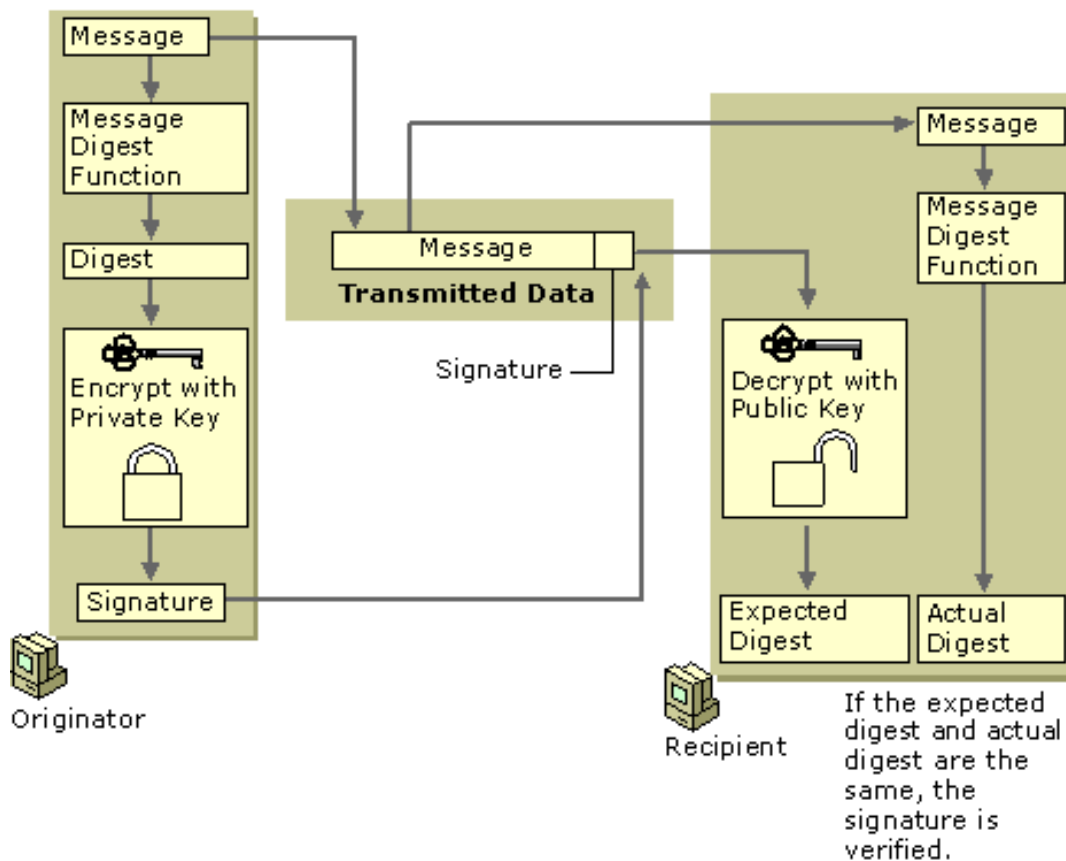
Fig: Basic RSA Data Security Digital Signature Process

To verify the contents of digitally signed data, the recipient generates a new message digest from the data that was received, decrypts the original message digest with the originator's public key, and compares the decrypted digest with the newly generated digest. If the two digests match, the integrity of the message is verified. Theidentification of the originator also is confirmed because the public key can decrypt only data that has been encrypted with the corresponding private key.

Digital Certificate and Certification Authority

Digital certificates are electronic credentials that are used to assert the online identities of individuals, computers, and other entities on a network. **Digital certificates** function similarly to identification cards such as passports and drivers licenses. Most commonly they contain a public key and the identity of the owner. They are issued by certification authorities (CAs) that must validate the identity of the certificate-holder both before the certificate is issued and when the certificate is used. Common uses include business scenarios requiring authentication, encryption, and digital signing.

Most certificates in common use today are based on the X.509v3 certificate standard. X.509v3 stands for version 3 of the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) recommendation X.509 for certificate syntax and format. Typically, certificates contain the following information:

- The subject's public key value
- The subject's identifier information, such as the name and email address
- The validity period (the length of time that the certificate is considered valid)
- Issuer identifier information
- The digital signature of the issuer, which attests to the validity of the binding between the subject's public key and the subject's identifier information

Process to obtain a Certificate From CA: One can obtain a certificate for your business from commercial CAs. The Issuing entities of commercial CAs provide certificate with a cost.User can generate a Key pair of its own and generate a Certificate Signing Request (CSR) and then send the CSR to Issuing CA for a certificate. CSR contains the public key of the user and user identity information in a format that issuing CAs would normally expect as shown in figure below.
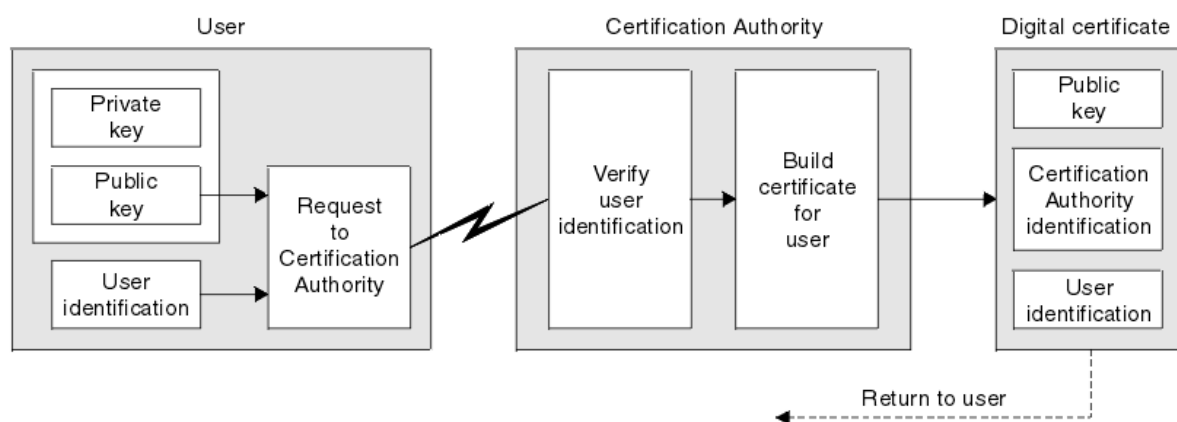
A **Certificate Authority (CA)** issues digital certificates that contain a public key and the identity of the owner. The matching private key is not made available publicly, but kept secret by the end user who generated the key pair. The certificate is also a confirmation or validation by the CA

that the public key contained in the certificate belongs to the person, organization, server or other entity noted in the certificate. A CA's obligation in such schemes is to verify an applicant's credentials, so that users and relying parties can trust the information in the CA's certificates. CAs use a variety of standards and tests to do so. In essence, the Certificate Authority is responsible for saying "yes, this person is who they say they are, and we, the CA, verify that".

If the user trusts the CA and can verify the CA's signature, then he can also verify that a certain public key does indeed belong to whoever is identified in the certificate. Browsers maintain list of well known CAs root certificates. Aside from commercial CAs, some providers issue digital certificates to the public at no cost. Large institutions or government entities may have their own CAs.

Using Certificates for Secure Web Communications (SSL)

Secure Sockets Layer (SSL) and **Transport Layer Security** (TLS) are protocols that are used to provide secure Web communications on the Internet or intranets. TLS is the standardized (on the Internet Engineering Task Force—IETF—level) version of SSL. TLS is also referred to as SSL version 3.1, whereas the most commonly used SSL version is 3.0. Both protocols can provide the following basic security services:

- **Mutual authentication.** Verifies the identities of both the server and client through exchange and validation of their digital certificates.
- **Communication privacy.** Encrypts information exchanged between secure servers and secure clients using a secure channel.
- **Communication integrity.** Verifies the integrity of the contents of messages exchanged between client and server, which ensures that messages haven't been altered en route.

Sample Scenario Example: Here's an example of an environment using SSL/TLS. When you use the Internet for online banking, it's important to know that your Web browser is communicating directly and securely with your bank's Web server. Your Web browser must be able to achieve Web server authentication before a safe transaction can occur. That is, the Web server must be able to prove its identity to your Web browser before the transaction can proceed. Microsoft IE uses SSL to encrypt messages and transmit them securely across the Internet, as do most other modern Web browsers and Web servers.

Secure Electronic Transmission (SET)

The **Secure Electronic Transmission** protocol imitates the current structureof the credit card processing system. SET makes banks bydefault one of the major distributors of certificates.When a user might change organizations orlose his or her key pair, or an e-commerce site using SSL may discontinue itsoperations; a certificate must be revoked before it expires. In all thesecases, the certificate needs to be revoked before it expires so that it cannotbe used intentionally or unintentionally.

The most important property of SET is that the credit card number is notopen to the seller. On the other hand, the SET protocol, despite strongsupport from Visa and MasterCard, has not appeared as a leading standard.

The two major reasons for lack of widespread acceptance are followings:
(1) The complexity of SET
(2) The need for the added security that SET provides.

Though, this might change in the future as encryption technology becomesmore commonly utilized in the e-business world.

Advantages of SET: Some of the advantages of SET contain the following:
1. Information security: Neither anyone listening in nor a merchant canuse the information passed during a transaction for fraud.
2. Credit card security: There is no chance for anybody to steal a creditcard.
3. Flexibility in shopping: If a person has a phone he/she can shop.

Disadvantages of SET: Some of the disadvantages of SET include itscomplexity and high cost for implementation.

Email Security

Email security refers to the collective measures used to secure the access and content of an email account or service. It allows an individual or organization to protect the overall access to one or more email addresses/accounts.

An email service provider implements email security to secure subscriber email accounts and data from hackers - at rest and in transit.

PEM: Privacy Enhanced Mails

Privacy-Enhanced Mail (PEM) is an Internet standard that provides for secure exchange of electronic mail. PEM employs a range of cryptographic techniques to allow for confidentiality, sender authentication, and message integrity.

The message integrity aspects allow the user to ensure that a message hasn't been modified during transport from the sender.

The sender authentication allows a user to verify that the PEM message that they have received is truly from the person who claims to have sent it.

The confidentiality feature allows a message to be kept secret from people to whom the message was not addressed.

PGP: Pretty Good Privacy

PGP is an implementation of public key cryptography based on RSA.

• It is a free software package developed by Philip Zimmerman that encrypts e-mail. It is freely available for DOS, Mac, UNIX, Atari and OS/2

• The latest version is available from MIT via FTP://net-dist.mit.edu in the pub/PGP directory.

• Provides secure encryption of documents and data files which tend to be a tough task even for the supercomputers to crack.

• For authentication, PGP employs the RSA public key encryption scheme and the MD5 (a one-way hash function to form a digital signature that assures the receiver that an incoming message is authentic.

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Unit 2: Chapter 2

World Wide Web and E-Commerce

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Introduction

The need for E-commerce stems from the demand within business and government must make better use of computing i.e. to better apply computer technology to improve business process and information exchange both within an organization and across the organization. E-commerce is used to devote proper exchange of business information using EDI, E-mail, Electronic bulletin boards, EFT(electronic fund transfer) and other similar technologies.

E-Commerce is used to describe a new online approach to perform traditional function such as payment and fund transfer, order entry and processing inventory management involving cargo tracking, electronic catalogue etc. Advertising, marketing and customer support functions are also a part of E-commerce application. No single technology can provide the full potential of E-commerce. Therefore we require an integrated architecture which is revolving in the form of WWW as E-commerce is becoming more matured. Thus we need to develop sophisticated applications on WWW.

Architectural Framework For E-Commerce

The E-commerce application architecture consists of six layers of functions and services. They are:

Applications Services	Customer-to-Business Business-to-Business Intra-organisational
Brokerage and data management	Order processing-mail order houses Payment scheme-electronic cash Clearinghouse or virtual mall
Interface layer	Interactive catalogue Directory support function Software agents
Secure messaging	Secure Hypertext Transfer Protocol Encrypted e-mail, EDI Remote programming (RPC)
Middleware services	Structure documents (SGML, HTML) Compound document (OLE, OpenDoc)
Network infrastructure	Wireless-cellular, radio, PCS Wire line-POTS, Coaxial, Fibre Optics

Application Services

It will be composed of existing and future applications based on innate architecture. The three distinct classes of E-commerce applications can be distinguished as

> (a) Consumer to Business
>
> (b) Business to Business
>
> (c) Intra organization

a) Consumer to Business

We call this enterprise market place transaction. In market place transaction customer learn about product differently through Electronic publishing by them differently using Electronic cash and secure payment and have them developed differently.

b) Business to Business

This is called as market link transaction. Here business, government and other organizations depend on computer to computer communication as a fast, economical dependable way to conduct business transactions. They include the use of EDI and E-mail for Purchasing goods and services, buying information and consulting services, submitting requests for proposals and receiving proposals.

c) Intra-organizational Transactions

This is called as market driven transaction. A company becomes market driven by dispersing throughout the firm information about his customers and competitors by spreading strategic and tactical decision making so that all units can participate and by continuously monitoring their customer commitment. To maintain relationships that are critical and to deliver superior customer value management, they must pay close attention to both before and after sales.

A market driven business develops a comprehensive understanding of its customer business and how customers in the immediate and downstream markets perceive value. Three major components of market driven transactions are

(i) Customer orientation through product and service customization

(ii) Cross functional coordination through enterprise integration, marketing and advertising.

(iii) Customer service.

Information Brokerage and management:

This layer provides service integration through the notion of information brokerages. Information brokerage is used to represent an intermediary which provides service integration between customer and information providers, given some constraints such as low price, fast service, profit

maximization for a client. Information brokerage addresses the issue of adding value to the information that is retrieved. Brokerage function can support data management and traditional transaction services. Brokerage may provide tools to accomplish more sophisticated tasks such as time delay updates or feature comparative transaction.

Interface Layer

The third layer interface and support services will provide interface for e-commerce applications such as interactive catalogues and will support directory services etc., functions necessary for information search and access. Interactive catalogues are customized interface to consumer applications such as home shopping. An interactive catalogue is an extension of paper based catalogues and incorporates additional features such as sophisticated graphics and video to make advertising more attractive.

Secure messaging and structure document interchange service

The importance of fourth layer is secured messaging. Messaging is software that sits between the network infrastructure and the clients or e-commerce applications.

Messaging services offer solutions for communicating non formatted data such as letters, memo, reports etc as well as formatted data such as purchase order, shipping notices and invoice etc. messaging support both for synchronous (immediate) and asynchronous (delay) messaging. When a message is sent work continuous (software does not wait for response). This allows the transfer of messages through store and forward methods. With messaging tools people can communicate and work together more effectively, no matter where they are located. The main disadvantages of messaging are the new types of applications it enables which appear to be more complex especially to traditional programmers.

Middleware services:

Middleware is a relatively new concept that emerged only recently. Middleware is a mediator between diverse software programs that enable them to talk with one another. It solves all the interface, translation, transformation and interpretation problems that were driving application programmers crazy.

Another reason for Middleware is the computing shift from application centric to data centric. i.e., remote data controls all of the applications in the network instead of applications controlling data. To achieve data centric computing middleware services focus on three elements.

(1) Transparency

(2) Translation security management

(3) Distributed object management and services

Network Infrastructures

It consists of:

(i) Information superhighway (I-way)

(ii) Components of I-way

(iii) Internet as network infrastructure

(iv) Wireless (cell phones, radio)

(v) Wireline (POTS, optical Fibers, Coax)

WWW as Architectures

The World Wide Web (abbreviated WWW or the Web) is an information space where documents and other web resources are identified by Uniform Resource Locators (URLs), interlinked by hypertext links, and can be accessed via the Internet

We can realize www as human analogy; think of network as the skeleton and the web as the flesh, veins, and skin that shape the human body. And the functions carried by the human body would be the ecommerce applications. In short, the web provides the functionality necessary for ecommerce.

• The web architecture is made up of three primary entities: client browser, web server, and third party services. The client browser usually interacts with the WWW server, which acts as an intermediary in the interaction with third-party services

• The client browser resides on the user's PC or workstation and provides an interface to the various types of content.

• Web server functions can be categorized into information retrieval, data and transaction management, and security.

• Third party services could be other web servers that make up the digital library, information processing tools, and electronic payment systems

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┌─────────────┐          ┌─────────────┐          ┌─────────────┐
│   Client    │  <────>  │    WWW      │  <────>  │ Third Party │
│   Browser   │          │   Server    │          │  Services   │
└─────────────┘          └─────────────┘          └─────────────┘
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Components of Web

The web has become an umbrella for a wide range of concepts and technologies that differ markedly in purpose and scope. These include:

- The global hypertext publishing concept,
- The universal reader concept, and
- The client-server concept

The Hypertext Publishing Concepts

Web provides functionality necessary for e-commerce. The web has become an umbrella for wide range of concepts and technology that differ markedly in purpose and scope which include hypertext publishing concept, the universal reader concept and the client server concept.

Hypertext publishing promotes the idea of seamless information world in which all online information can be accessed and retrieved. In a constant and simple way hypertext publishing is a primary application of web interest in hypermedia. On the internet (called distributed or global hypermedia). As accelerated shortly following the success of web media and browser. This success has been aided by more powerful work station high resolution graphic display faster network communication and decreased cost for large online service.

The universal readership concept

It promotes the idea that, unlike the segmented applications of the past we can use one application- a universal/common user interface- to read a variety of documents. This concept implies that once information is published it is accessible from any type of computer, in any country, and that any (authorized) person just needs to use one single program to access it. This is accomplished in web by using a core browser or application that is augmented by supporting applications.

The client-server concept

It allows the web to grow easily without any centralized control. Anyone can publish information; anyone (authorized) can read and download it. Publishing information requires a server program, and reading data requires a client browser. All clients and all the servers are connected to one another by the internet. The various standard protocols allow all the clients to communicate with all servers.

Technology Behind Web

a) Uniform Resource Locators

• URLs are the strings as a addresses of objects (documents, images) on the web. URL marks the unique location on the internet where a file or service can be found.

• The URLs follow a fairly consistent pattern. The first part describes the type of resource; the second part gives the name of the server housing the resource; and the third part gives the full file name of the resource.

– Eg: FTP://server.address/complete.file.name

telnet://server.address:port http://server.address:port/index.html

• The different protocols use different syntaxes, but they do have a small amount in common. For eg., the common URL syntax reserves the solidus (/) as a way of representing hierarchical space, the pound label (#) as a way of pointing inside the document.

b) Hyper Text Transfer Protocol (HTTP)

• is a simple request/response protocol that is currently run over TCP and is the basis of the world Wide Web. In short, HTTP is a protocol for transferring information efficiently between the requesting client and server. The data transferred may be plain text, hypertext, images, or anything else. HTTP is used for retrieving documents in an unbounded and extensible set of formats. To achieve this, the client sends a list of the formats it can handle, and he server replies with data in any of those formats that it can produce.

Security in the Web

Security and confidentiality are essential before business conduct, financial transactions over the internet has become a big problem due to the increasing number of application oriented towards commerce. Therefore commercial application requires that the client and server be able to authenticate each other and exchange data confidentiality. This exchange has three basic properties.

1) Clients are confident about servers they are communicating with server authentication.
2) Client conversation with server is private using encryption.
3) Client conversation cannot be tampered or inter separated with data integrity.

Categories of Internet data & Transaction: Several categories of data must be encrypted making internet data security an interesting challenge.

Public Data :

Public data have no security distinctions and can be read by anyone. Such data should be protected from unauthorized tampering or modification because a reader may perform damaging actions on its contents.

Copyright Data:

Copyright data have content that is copyrighted but not secret. The Owner of the data is willing to provide it but wishes to ensure that the user has paid for it. The objective is to maximize the revenue and security.

Confidential Data:

Confidential data contains material that is secret but whose existence is not secret such data include bank account systems, personal files etc. such material may be referenced by public or copyright data.

Secret Data:

Secret data existence is a secret such data might include algorithms which is necessary to monitor, log all access to secret data.

WWW based security schemes: Several methods can provide security in the web framework. This

includes the following.

1. SHTTP:- (Secured Hypertext Transfer Protocol)

• Assumes that the Web and the HTTP protocol are central to electronic commerce due to their installed base and ease of use.

• Supports a variety of security mechanisms necessary for commerce, HTTP clients and servers, providing the security service options appropriate to the wide range of potential end uses possible on the Web.

• To ensure a secure conversation between a Web client and server, S-HTTP works by negotiating the type of encryption scheme used between client and server.

• S-HTTP supports end to end secure transactions which minimized multiple encryption/decryption at every intermediate point.

SHTTP will enable the incorporation of various cryptographic messages, formats such as digital signature Algrithms (DSA) & RSA standards into the both their client & servers.

2. SSl :- (Security Socket Layer)

• Proposed by Netscape communications for providing data security layered between high level application protocols and TCP/IP.

• Provides data encryption, server authentication, message integrity and optional client authentication for a TCP/IP connection.

• Is layered beneath application protocols such as HTTP, SMTP, TELNET, FTP and NNTP and above the Internet connection protocol TCP/IP.

• Provides a security "handshake" to initiate the TCP/IP connection which results in the client and server agreeing on the level of security they will use and fulfill any authentication requirements for the connection.

• Only role is to encrypt and decrypt the message stream.

SHEN :

It is the security scheme for the web sponsored by www. It is not non-commercial or more research oriented security & is similar to SHTTP.

SHEN Security scheme for the web:

SHEN provides for three separate securities – related mechanisms.

1. Weak authentication with low maintenance overhead and without patent or export restrictions. A user identity must be established as genuine. Unauthorized access must be improbable but need not be secure from all possible forms of attack.

2. Strong authentication via public key exchange. A user identity must be established as genuine. Unauthorized access must be impossible except by random chance or by access to unknown technology.

3. Strong encryption of message content. The data must not be transmitted in a form comprehensible to a third party, an identified party acts as guarantor in this respect

Unit 2 Chapter 6

Consumer Oriented E-commerce and E- Payments

Introduction

The convergence of money, commerce, computing and networks is laying the foundation for a global consumer market place. Some fundamental business issues must be addressed before consumer oriented e-commerce can become widespread, including:

1. Establishment of standard business processes for buying and selling products and services in electronic markets

2. Development of widespread and easy to use implementations of mercantile protocols for order taking, online payment, and service delivery similar to those found in retail/ credit card based transaction.

3. Development of transport and privacy methods that will allow parties that have no reason to trust one another to carry on secure commercial exchanges.

In other words, to make consumer oriented e-commerce more effective, we need a better understanding of the components of the business process from the initial search and discovery of the product/services via on-line catalogs to the management of the order to delivery cycle, including the all- important payment/settlement component.

Consumer Oriented E-Commerce Applications

1. Personal Finance and Home Banking Management: The technology for paying bills, whether by computer or telephone is infinitely more sophisticated than any on the market a few years ago. The range of options has expanded to include PCs, interactive TV and even personal digital assistance (PDAs) and Smartphone. Customer's interest in home banking has resumed, fueled by growing comfort – or at least familiarity – with electronics, by greater demands on consumer time and by the expanding needs for information to manage the increasing complexity of house hold.

a) Basic Services: It is related to personal finance i.e. checking savings account statement around the clock, banking with ATM's (Automated Teller Machines). Bill payment, balancing cheque book status of payment or stock payment requested etc.

b) Intermediate services: It includes a broader array of financial management services which include non-banking activities as well as banking activities such as household banking, tax return preparations etc.

c) Advanced services: It includes stock and mutual funds brokerage or trading services such as currency trading and credit card or debit card management.

2. Home shopping:

One of the examples often sighted about e-commerce is home shopping which is widely used and had generated substantial revenue for many companies racing to develop on-line malls. The malls will enable a customer to enter an online store look at products, try on computerized clothes, and see a reflection in a digital mirror and purchase with overnight delivery against credit card billing. The exact operating method of these services has yet to be determined, but the retailers are well aware of the potential opened up by the ability to transmit huge amounts of digital information into home and to provide interactive control to the shopper.

a) **Television based shopping:** TV shopping has evolved over years to provide a wide variety of goods ranging from clothing, small electronic house ware, and jewelry and computing devices.

b) **Catalog based shopping:** The online catalog business consists of brochures, CD ROM catalogs and online interactive catalogs. Most online catalogs are some form of electronic brochure. Electronic brochures are multimedia replacement for direct mail, paper & brochures used in the business to business marketing. Basically electronic catalog contains highly interactive programs using still images, graphics, animation, sound, text & data. One of the disadvantages of this catalog is its prohibitive cost.

3. Home Entertainment: It is another application area of E-commerce, the most important services provided under these are movies on demand, interactive games etc. The online gaming industry in turn parallels the TV industry where the customer is primarily interested in good quality programming & is not faithful to any one network.

In the entire home entertainment area, the key element is the notion of customer control under programming entertainment on demand as expected to give each viewer total control over what, when and where to watch.

In addition to game technology, we also witness the emerging services of entertainment support function such as on screen catalogues, TV guide that inform users what is on TV.

3.Micro Transaction of Information: To serve the information needs of the consumer, services providers whose product is information delivered over the I-way are creating an entirely new industry. Most sell any form of digital information and can be sent down the network of one sort or another such as data, picture, images, sounds, computer programs and services. A few sell products such as music books, clothing etc through on-line catalogues.

One significant change in the traditional business forced by is online information. Business is the creation of new transaction catalogues called small fee transactions for micro services.

Mercantile Processes Model

Mercantile processes define interaction model between consumers and merchants for online commerce. This is necessary because to buy and sell goods, a buyer, seller, and other parties most interact in ways that represents some standard business processes. A well-established standard process for processing credit card purchasers has contributed to the wide spread dissemination of credit cards. The establishment of common mercantile process model is expected to increase the convenience for consumers in e-commerce.

Mercantile models from the Consumer's Perspective:

The online consumer expects quality and convenience, value, low price etc. To meet their expectations and understand the behavior of online shopper, there is a need for the business process models that provides the standard product / service purchasing process. The business process model for a consumer point of view consists of seven activities that can be grouped into three phases. They are:

        1. Pre Purchase phase

        2. Purchase consumption phase

        3. Post purchase interaction phase.

Steps taken by customer in purchasing:

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┌────────────────────────────────────────────────┐
│ Product or Service search and discovery in the │
│               information space                │
└────────────────────────────────────────────────┘
                      │
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┌────────────────────────────────────────────────┐        ┌──────────────────┐
│ Comparison shopping and product selection based │ ─────▶ │    Purchase      │
│             on various attributes              │        │  Determination   │
└────────────────────────────────────────────────┘        └──────────────────┘
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│ Negotiation of terms such as price, delivery   │
│                  times etc                      │
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│              Placement of orders                │
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│           Authorization of payments             │ ─────▶ │    Purchase      │
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│              Receipt of Product                 │
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│         Customer service and supports           │ ─────▶ │  Post Purchase   │
└────────────────────────────────────────────────┘        │     Service      │
                                                           └──────────────────┘
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Pre Purchase Preparation: From the consumer point of view any major purchase can be assumed to involve some amount of pre purchase deliberation. Pre purchase deliberation is defined as elapsed time between the consumer's first thinking about buying and actual purchase itself. Consumers can be categorized into three types:

        1. Impulsive buyers

        2. Patient buyers

3. Analytical buyers

1. Impulsive buyers: these buyers purchase the product quickly.

2. Patient buyers: who purchase products after making some analysis or comparison.

3. Analytical buyers: who do substantial research before making the decision to purchase product or services.

Purchase Consumption:

After identifying the product to be purchased by the buyer and the seller must interact in some way (e-mail, on-line) to carry out the mercantile transactions. The mercantile transaction is defined as the exchange of information between the buyer and seller followed by necessary payment depending upon the payment model mutually agreed on, they may interact by exchanging currently i.e. backed by the third party such as the central bank, master card, visa card etc.

A single mercantile model will not be sufficient to meet the needs of everyone. In very general terms a simple mercantile protocol would require the following transaction where the basic flow remains the same .

1. Through e-mail, online the buyer contacts the vendors to purchase a product or service.

This might be done online through e-mail (or) through e-catalogue etc.

2. Vendor states the price.

3. Buyer and vendor may or may not engage in a transaction.

4. If satisfied buyer authorizes payment to the vendor with an encrypted transaction containing the digital signature.

5. Vendor contacts the billing service of the buyer to verify the encrypted authorization for authentication.

6. Billing service decrypts the authorization and checks the buyer account balance and puts a hole on the amount transfer.

7. Billing service gives the vendor green signal to deliver the product.

8. On notification of adequate funds to cover financial transaction, vendor delivers the goods to buyer or in the case of information purchase provides a crypto key to unlock the file.

9. On receiving the goods the buyer signs and delivers receipt. Vendors then tell billing service to complete the transaction.

10. At the end of the billing cycle buyer receives a list of transactions.

The following are the two types of mercantile protocols where the payment is in the form of electronic cash and credit cards.

1. Mercantile process using digital cash: A bank mints (prints) electronic currency or e-cash. Such a currency is simply a series of bits that the issuing bank can be verified to be valid. This currency is kept secured by the use of cryptographic techniques. After being issued some e-cash, a buyer can transfer it to a seller in exchange for goods. Upon receiving an e-cash, the sellers can verify authenticity by sending it to the issuing bank for verification. E-cash issuing banks make money by charging either buyer or seller or both.

E-cash is similar to paper currency and has the benefits of being anonymous (hidden)and easily transmitted electronically. It still entails the risk of theft or loss. However, and so requires significant security by the buyer when storing e-cash.

2. Mercantile Transaction Using Credit Cards: two major components of credit card transaction in the mercantile process are

• Electronic Authorization

• Settlement

In the authorization process in the retail transaction, the 3_{rd} party processor (tpp) captures the information at the point of sale and transmits the information to the credit card issue for authorization, communicated a response to the merchant and electronically stores the information for the settlement and reporting. Once the information leaves the merchants premises the entire process takes few seconds. The benefits of electronic processing include a reduction of credit card losses, lower merchant transaction costs, faster consumer checkout.

Credit card authorization is processed at the point of sale terminal using dial-up phone access into the TPP networks. The credit card number is checked against the database and the transaction is either approved typically in a few seconds. A similar procedure is used for debit cards and check verification once the electronic authorization function is completed. The information is processed within the system for client reporting. The data are then transmitted for settlement to the appropriate institution processor. After the transaction is completed a set of activities related to account settlement are initiated. In a credit card or debit card transaction the merchant account number is credited and or either credit card issuer is notified to enter the

transaction or the card holder's checking account is debited automatically. A settlement institution then enters the transaction data into the settlement process. In addition to the data computer also takes care of the settlement function through electronic transaction processing. This electronic transaction processing also provides other services such as 24 hr network, helpdesk which response to enquire from merchant location etc.

Post Purchase Interaction:

As long as there is payment for services there will be references, disputes, other customer service issues that need to be considered. Returns and claims are an important part of purchasing process that impacts the administrative costs, scrap and transportation expenses and customers relations. To overcome these problems many companies design their mercantile process for one way i.e., returns and claims must flow upstream. The following are the complex customer service challenges that arise in the customized retaining which have not fully understood or resolved.

1. Inventory Issues: to serve a customer properly a company should inform a customer right from when an item is ordered to it is sold out; otherwise the company will have a disappointed customer.

2. Database Access and Compatibility Issues: unless the customer can instantly access all the computers of all the direct response vendors likely to advertise on the information super highway on a real time basis, with compatible software to have an instant access to themerchants inventory and database.

3. Customer service issues: Customers often have questions about the product such as colour, size, shipment etc. and other things in mind can resolved only by talking to an order entry operator.

Mercantile process model from merchant's perspective:

E-commerce order management cycle:

To order to deliver cycle from the merchant perspective has been managed with an eye towards standardization and cost. This is based on assumption that an organization must create a set of operating standard for service and production. They perform to those standards while minimizing the cost. To fully realize and maintain a competitive advantage in the online environment it is necessary to examine the order management cycle (OMC) that also includes the traditional order to delivery cycle. However the OMC has the following generic steps.

1. Pre Sale Interaction:

a) Order planning and order generation:

The business process begins long before an actual order placed by the customer. The production planners develop the final forecast used to high workers and built inventory. Order planning leads into order generation. Orders are generated into number of wages into e-commerce environment such as sales force broadcast. Since personalized e-mail to customer or creates WWW web page.

b) Cost Estimation and Pricing:

Pricing is the bridge between the customer needs and company capabilities pricing atthe individual order level depends on understanding value to the customer i.e, generated by each order etc. through order based pricing it is difficult to generate greater profits that are indicated by pricing.

2. Product service purchase and delivery:

a) **Order Receipt and entry:** After the acceptable price code, the customer enters the order receipts and entries paid in OMC.

b) **Order selection and prioritization:** customer service representatives are responsible for choosing which to accept and order to decline. Not all customer order created equal, some or better business and some are fit into the companies' capabilities and offers healthy profits. Companies also make gains by the way they handle over priority i.e, to check which orders to execute faster.

c) **Order Scheduling:** during this phase prioritized orders get slotted into an actual production or operational sequence. Production people seek to minimize equipment change over communication between various function units is most essential in this phase of OMC.

d) **Order fulfillment and delivery**: during order fulfillment and delivery the actual provision of product or service is made. While the details vary from industry to industry in almost in every company this step has become increasingly complex.

Often order fulfillment involves multiple functions and location. Different parts of any order may be created in different manufacturing facilities and merged yet another site or order may be manufactured in one location warehoused in a second and installed in the third. In some businesses fulfillment includes third party vendor. In service operations it can mean sending

individuals with different talent to the customer's site. The more complicated task the more coordination required across the organization.

e) **Order billing and payment:** after the order has been fulfilled and delivered billing is typically handled by the finance staff who view their job as getting the bill out effectively and collecting quickly i.e, the billing function is designed to serve the needs of the company not the customer service.

Post Sale Interaction:

a) **Customer service and support:** this phase plays an interestingly important role in all Elements of a company's profit equation, customer value, price and cost. Depending on the specifications of business it can include elements such as physical installation of a product, repair and maintenance, customer training, equipment upgrading and disposal. Thus post sale service can affect customer satisfaction and company profitability of the year. But in most companies the post-sale service people are not linked to any marketing operation, internal product development effort or quality assurance team.

Unit 2 Chapter 4
Electronic Payment System

Introduction

Electronic payment systems are becoming central to on-line business process innovation as companies look for ways to serve customers faster and at lower cost. Emerging innovations in the payment for goods and services in electronic commerce promise to offer a wide range of new business opportunities.

Electronic payment systems and e-commerce are intricately linked given that on-line consumers must pay for products and services. Clearly, payment is an integral part of the mercantile process and prompt payment (or account settlement) is crucial. If the claims and debits of the various participants—individuals, companies, banks, and nonbanks—are not balanced because of payment delay or, even worse default, then the entire business chain is disrupted. Hence an important aspect of e-commerce is prompt and secure payment, clearing, and settlement of credit or debit claims.

We will examine these demands by looking at the following issues:

- What form and characteristics of payment instruments—for example, electronic cash, electronic checks, credit/debit cards—will consumers use?

- In on-line markets, how can we manage the financial risk associated with various payment instruments—privacy, fraud, mistakes, as well as other risks like bank failures? What security features (authentication, privacy, anonymity) need to be designed to reduce these risks?

To answer these questions, we will draw on examples of various electronic payment systems that have been proposed, prototyped, or actually deployed (implemented).

Types of Electronic Payment Systems: Electronic payment systems grow rapidly in banking, retail, health care, on-line markets, and even government—in fact, anywhere money needs to change hands. Organizations are motivated by the need to deliver products and services more cost effectively and to provide a higher quality of service to customers. Let's briefly describe the pertinent developments in various industries to provide an overall picture of electronic payment

systems of the present.

Work on EFT can be segmented into three broad categories:

1. **Banking and financial payments**
   - Large-scale or wholesale payments (e.g., bank-to-bank transfer)
   - Small-scale or retail payments (e.g., automated teller machines and cash dispensers)
   - Home banking (e.g., bill payment)

2. **Retailing payments**
   - Credit cards (e.g., VISA or MasterCard)
   - Private label credit/debit cards (e.g., J.C. Penney Card)
   - Charge cards (e.g., American Express)

3. **On-line electronic commerce payments**
   - Token-based payment systems

      Electronic cash (e.g., DigiCash)

      Electronic checks (e.g.; NetCheque)

      Smart cards or debit cards (e.g., Mondex Electronic Currency Card)
   - Credit card-based payment systems
      Encrypted credit cards (e.g., World Wide Web form-based encryption) Third-party authorization numbers (e.g., First Virtual)

Retail payments and large-scale payments between banks and business are widely recognized as the pioneering efforts in electronic commerce that involve the extensive use of EDI for transferring payment information.

Risks Associated with Electronic Payment System: Electronic payment is a popular method of making payments globally. It involves sending money from bank to bank instantly -- regardless of the distance involved. Such payment systems use Internet technology, where information is relayed through networked computers from one bank to another. Electronic payment systems are popular because of their convenience. However, they also may pose serious risks to consumers

and financial institutions.

Tax Evasion

Businesses are required by law to provide records of their financial transactions to the government so that their tax compliance can be verified. Electronic payment however can frustrate the efforts of tax collection. Unless a business discloses the various electronic payments it has made or received over the tax period, the government may not know the truth, which could cause tax evasion.

Fraud

Electronic payment systems are prone to fraud. The payment is done usually after keying in a password and sometimes answering security questions. There is no way of verifying the true identity of the maker of the transaction. As long as the password and security questions are correct, the system assumes you are the right person. If this information falls into the possession of fraudsters, then they can defraud you of your money.

Impulse Buying

Electronic payment systems encourage impulse buying, especially online. You are likely to make a decision to purchase an item you find on sale online, even though you had not planned to buy it, just because it will cost you just a click to buy it through your credit card. Impulse buying leads to disorganized budgets and is one of the disadvantages of electronic payment systems.

Payment Conflict

Payment conflicts often arise because the payments are not done manually but by an automated system that can cause errors. This is especially common when payment is done on a regular basis to many recipients. If you do not check your pay slip at the end of every pay period, for instance, then you might end up with a conflict due to these technical glitches, or anomalies.

Let us describe about on-line electronic commerce payment category first:

Digital Token based Electronic Payment Systems

None of the banking or retailing payment methods is completely adequate in their present form for the consumer-oriented e-commerce environment. Their deficiency is their assumption that the parties will at some timebe in each other's physical presence or that there will be a sufficient delay in the payment process for frauds, overdrafts, and other undesirables to be identified and corrected. These assumptions may not hold for e-commerce and so many of these payment mechanisms are being modified and adapted for the conduct of business over networks.

Entirely new forms of financial instruments are also being developed. One such new financial instrument is "**electronic tokens**" in the form of electronic cash/money or checks. Electronic tokens are designed as electronic analogs of various forms of payment backed by a bank or financial institution. Simply stated, electronic tokens are equivalent to cash that is backed by a bank.

Electronic tokens are of three types:

1. **Cash or real-time**: Transactions are settled with the exchange of electronic currency. An example of on-line currency exchange is *electronic cash*(*e-cash*).
2. **Debit or prepaid**: Users pay in advance for the privilege of getting information. Examples of prepaid payment mechanisms are stored in smart cards and electronic purses that store electronic money.
3. **Credit or postpaid**: The server authenticates the customers and verifies with the bank that funds are adequate before purchase. Examples of postpaid mechanisms are *credit/debit* cards and *electronic checks*.

Electronic Cash (e-cash)

What is electronic cash?: Electronic cash is one of the instruments that can be used to conduct paperless transactions. Paperless transaction is a term used to describe financial exchanges that do not involve the physical exchange of currency. Instead, monetary value is electronically credited and debited. Often called e-cash or digital money, this financial instrument is commonly used to conduct distant transactions, such as those between parties on the Internet and those between parties in different countries.

There are a number of advantages of electronic cash. One of them is that it eliminates the apprehension that many people feel about carrying and exchanging paper currency. Another advantage of electronic cash is that it is usually easily converted to another currency, making traveling and international business substantially easier.
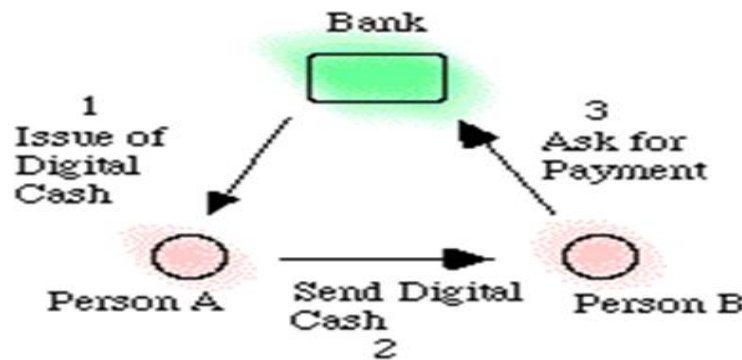

Fig: Transaction of Electronic Cash.

The figure shows the basic operation. User A obtains digital cash "coins" from her bank (and the bank deducts a corresponding amount from her account). The user is now entitled to use the coins by giving them to another user B, which might be a merchant. B receives e-cash during a transaction and see that it has been authorized by a bank. They can then pay the cash into their account at the bank.

Ideal properties of a Digital Cash system should be:

1. **Secure**. Alice should be able to pass digital cash to Bob without either of them, or others, able to alter or reproduce the electronic token.
2. **Anonymous**. Alice should be able to pay Bob without revealing her identity, and without Bob revealing his identity. Moreover, the Bank should not know who Alice paid or who Bob was paid by. Even stronger, they should have the option to remain anonymous concerning the mere existence of a payment on their behalf.
3. **Portable**. The security and use of the digital cash is not dependent on any physical location. The cash should be able to be stored on disk or USB memory stick, sent by email, SMS, internet chat, or uploaded on web forms. Digital cash should not be restricted to a single, proprietary computer network.

4. **Off-line capable**. The protocol between the two exchanging parties is executed off-line, meaning that neither is required to be host-connected in order to proceed.

5. **Wide acceptability**. The digital cash is well-known and accepted in a large commercial zone. With several digital cash providers displaying wide acceptability, Alice should be able to use her preferred unit in more than just a restricted local setting.

6. **User-friendly**. The digital cash should be simple to use from both the spending perspective and the receiving perspective. Simplicity leads to mass use and mass use leads to wide acceptability. Alice and Bob should not require a degree in cryptography as the protocol machinations should be transparent to the immediate user.

Electronic Checks:

When you write a check, you may assume that the piece of paper you write on will be deposited at a bank and processed manually. Electronic check conversion makes that process less and less likely. Instead of processing the piece of paper, some businesses prefer to turn your paper check into an electronic check.

How Electronic Checks Work? How does a piece of paper become an electronic check? The business you write the check to slips the check into a machine that reads information from your check. That information is all the business needs to collect money from your bank account.

With E-Checks, a check imager is connected to a small printer through a credit card terminal directly at the point of sale. When a customer presents a check, the check is scanned by the imager, the magnetic data (MICR) indicating the bank routing number and account number are read, and the dollar amount of the check is entered. The E-Check process verifies the check by comparing the check's bank account and the customer's driver's license with a national negative database to determine if the account has a fraud history, is closed, or has had insufficient funds (NSF) problems. If the check is approved, a

receipt is printed for customer signature. The check and a copy of the signed receipt are returned to the customer. The captured data is used in the electronic transfer of money through the Automated Clearing House (ACH) system.

Fig: Electronic Check Format.

Merchant benefits of converting checks to an electronic form:

- Saves you time with your deposits - no more bank runs or long teller lines.
- Lowers traditional bank fees, like per item deposit and returned item fees.
- Funds you quickly, usually within 2 business days of the original transaction.
- Secures your customer's personal and bank account information by returning the original item to the check writer.
- Provides your customers complete transaction information for easy bank reconciliation, as well as providing sales information, like store name and location.
- Expandable equipment is simple and user friendly.

Smart Cards

A smart card is a device that includes an embedded integrated circuit chip (ICC) that can be either a secure microcontroller or equivalent intelligence with internal memory or a memory

chip alone. The card connects to a reader with direct physical contact or with a remote contactless radio frequency interface. With an embedded microcontroller, smart cards have the unique ability to store large amounts of data, carry out their own on-card functions (e.g., encryption and mutual authentication) and interact intelligently with a smart card reader. Smart card technology is available in a variety of form factors, including plastic cards, fobs, subscriber identity modules (SIMs) used in GSM mobile phones and etc.

Smart Card Technology: There are two general categories of smart cards: **contact** and **contactless**as shown in figure below**.**
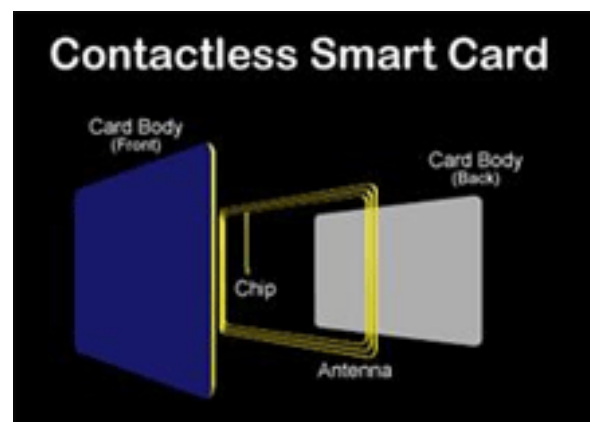
A contact smart card must be inserted into a smart card reader with a direct connection to a conductive contact plate on the surface of the card (typically gold plated). Transmission of commands, data, and card status takes place over these physical contact points.

A contactless card requires only close proximity to a reader. Both the reader and the card have antennae, and the two communicate using radio frequencies (RF) over this contactless link. Most contactless cards also derive power for the internal chip from thiselectromagnetic signal. The range is typically one-half to three inches for non-battery-powered cards, ideal for applications such as building entry and payment that require a very fast card interface.

The chips used in all of these cards fall into two categories as well: microcontroller chips and memory chips. A memory chip is like a small floppy disk with optional security. Memory chips are less expensive than microcontrollers but with a corresponding decrease in

data management security. Cards that use memory chips depend on the security of the card reader for processing and are ideal for situations that require low or medium security.

A microcontroller chip can add, delete, and otherwise manipulate information in its memory. A microcontroller is like a miniature computer, with an input/output port, operating system, and hard disk. Smart cards with an embedded microcontroller have the unique ability to store large amounts of data, carry out their own on-card functions (e.g., encryption and digital signatures) and interact intelligently with a smart card reader.

The selection of a particular card technology is driven by a variety of issues, including:

- Application dynamics
- Prevailing market infrastructure
- Economics of the business model
- Strategy for shared application cards

Smart cards are used in many applications worldwide, including:

- **Secure identity applications** - employee ID badges, citizen ID documents, electronic passports, driver's licenses, online authentication devices
- **Healthcare applications** - citizen health ID cards, physician ID cards, portable medical records cards
- **Payment applications** - contact and contactless **credit/debit cards**, transit payment cards
- **Telecommunications applications** - GSM Subscriber Identity Modules, pay telephone payment cards

Debit and Credit Cards

Debit Cards: Debit cards are linked to your bank account so the money you spend is automatically deducted from your account. They provide a convenient alternative to cash, especially if you do a lot of shopping online. Debit cards can also help you budget. Use your card to pay your bills and day-to-day expenses and your monthly statement will provide a

good snapshot of how much you spend per month and where it's going. There's another benefit as well: Unlike credit cards, your bank balance goes down with each debit card transaction, so you're less likely to overspend. (Many banks offer "overdraft protection" that allows you to exceed your balance. But you'll end up paying interest, and maybe extra fees, on the money you borrow from your overdraft account.)

Credit Cards: Credit cards basically allow you to use someone else's money (the card issuer's) to make a purchase while you pay the money back later. If you do so within the billing period — generally, 15 to 45 days — you can avoid paying any interest on it. The problem arises, of course, when you don't pay the balance in full and are charged interest as well. That can quickly add up. If it takes you two years to pay off a $500 balance, for example, and you're being charged 18 percent interest, you'll end up paying nearly $100 more in interest.

Working Techniques of Credit Cards: Credit card payment processing for the e-commerce electronic payment system takes place in two phases: authorization (getting approval for the transaction that is stored with the order) and settlement (processing the sale which transfers the funds from the issuing bank to the merchant's account). The flow charts below represent the key steps in the process starting from what a customer sees when placing an order through completing the sale and finishing with the merchant processing the sale to collect funds.
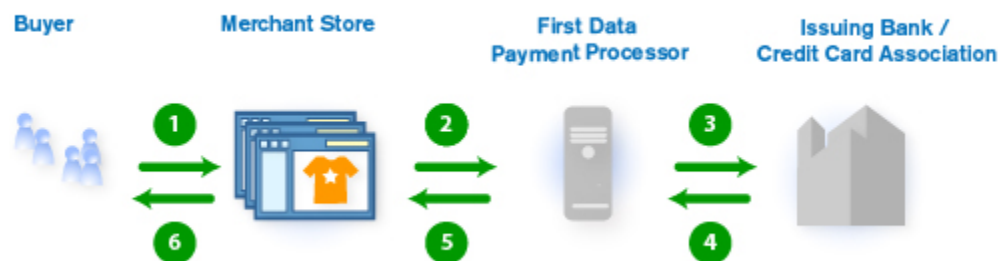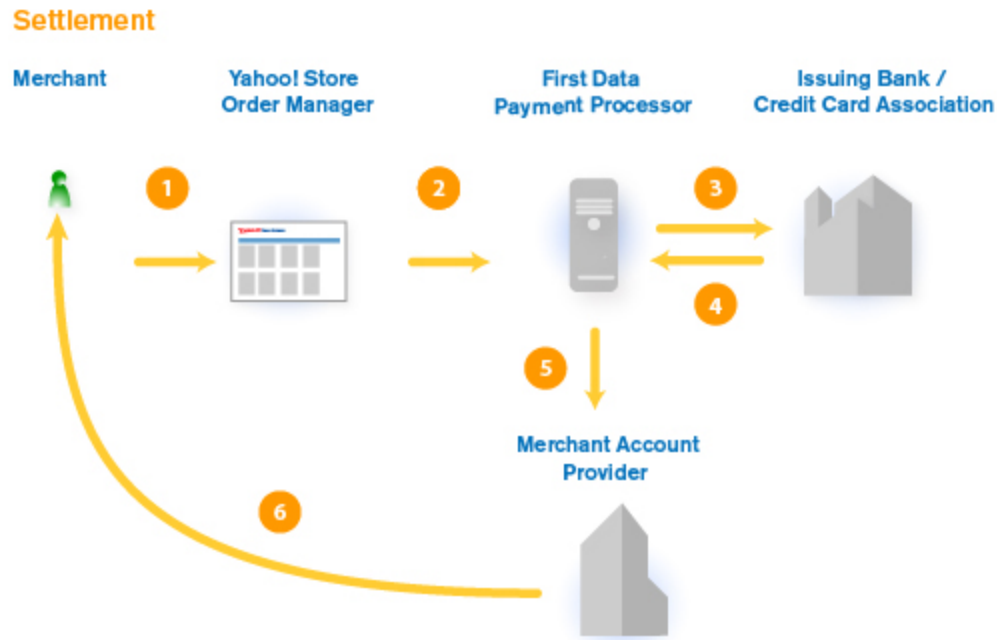

Fig: Authorization Process of Credit Cards.

Fig: Settlement Process of Credit Cards.

Benefits and Limitations of Credit Cards: Advantages and Disadvantages of Credit Cards are:

Advantages	Disadvantages
Convenience--Credit cards can save your time and trouble--no searching for an ATM or keeping cash on-hand.	**Overuse**--Revolving credit makes it easy to spend beyond your means.
Record keeping--Credit card statements can help you track your expenses. Some cards even provide year-end summaries that really help out at tax time.	**Paperwork**--You'll need to save your receipts and check them against your statement each month. This is a good way to ensure that you haven't been overcharged.
Low-cost loans--You can use revolving credit to save today (e.g., at a one-day sale), when available cash is a week away.	**High-cost fees**--Your purchase will suddenly become much more expensive if you carry a balance or miss a payment.
Instant cash--Cash advances are quick and	**Unexpected fees**--Typically, you'll pay

convenient, putting cash in your hand when you need it.

Build positive credit--Controlled use of a credit card can help you establish credit for the first time or rebuild credit if you've had problems in the past--as long as you stay within your means and pay your bills on time.

Purchase protection--Most credit card companies will handle disputes for you. If a merchant won't take back a defective product, check with your credit card company.

between 2 and 4 percent just to get the cash advance; also cash advances usually carry high interest rates.

Deepening your debt--Consumers are using credit more than ever before. If you charge freely, you may quickly find yourself in over your head--as your balance increases, so do your monthly minimum payments.

Homework--It's up to you to make sure you receive proper credit for incorrect or fraudulent charges.

Unit 3: Chapter 1
Electronic Data Interchange (EDI)

Introduction

Electronic data interchange (EDI) is defined as the inter-process communication (computer application to computer application) of business information in a standardized electronic form. In short, EDI communicates information for business transactions between the computer systems of companies, government organizations, small businesses, and banks.

Using EDI, trading partners establish computer-to-computer links that enable them to exchange information electronically. This allows businesses to better cope with a growing avalanche (too many) of paperwork: purchase orders, invoices, confirmation notices, shipping receipts, and other documents. With the aid of EDI, all these documents are in electronic form, which aliases more work automation to occur and even alters the way business is done.

The primary benefit of EDI to business is a considerable reduction in transaction costs, by improving the speed and efficiency of filling orders. Studies show that it takes up to five times as long to process a purchase order manually as it does electronically.

Ironically, despite these advantages, EDI is not (yet) widely used. It is estimated that out of millions of businesses in the United States, only 44,000 companies exchange business data electronically. Only about 10 percent of these companies use EDI for financial transactions. Moreover, no more than fifty banks have the capability of providing complete financial EDI services to their corporate customers. The joke in industry is that most companies are so unfamiliar with EDI they don't even know how to spell it.

EDI Layered Architecture

EDI architecture specifies four layers: the **semantic** (or application) layer, the standards **translation** layer, the packing (or **transport**) layer, and the **physical** network infrastructure layer as shown in figure below.

EDI semantic layer	Application level services	
EDI standard layer	EDIFACT business form standards	
	ANSI X12 business form standards	
EDI transport layer	Electronic mail	X.435, MIME
	Point to point	FTP, TELNET
	World Wide Web	HTTP
Physical layer	Dial-up lines, Internet, I-way	

Fig: Layered Architecture of EDI

The EDI semantic layer

It describes the business application that is driving EDI. For a procurement application, this translates into requests for quotes, price quotes, purchase orders, acknowledgments, and invoices. This layer is specific to a company and the software it uses. In other words, the user interface is customized to local environments.

EDI Standard Layer

The information seen at the EDI semantic layer must be translated from a company-specific form to a more generic or universal form so that it can be sent to various trading partners, who could be using a variety of software applications at their end. To achieve this, companies must adopt universal EDI standards that lay out the acceptable fields of business forms. What complicates matters is the presence of two competing standards that define the content and structure of EDI forms: the **X12 standard**, developed by the American National Standards Institute (ANSI), and **EDIFACT**, developed by United Nations Economic Commission for Europe (UN /ECE).

EDI Transport Layer

When the trading partner sends a document, the EDI translation software converts the proprietary format into a standard mutually agreed on by the processing systems. When a company receives the document, their EDI translation software automatically changes the

standard format into the proprietary format of their document processing software so that the company can manipulate the information in whatever way it chooses to.

Electronic Data Interchange versus E-mails

EDI document transport is far more complex than simply sending e-mail messages or sharing files through a network. These EDI documents are more structured than e-mail. What really differentiates EDI from messaging is its emphasis on the automation of business transactions conducted between organizations. In addition, EDI messages have certain legal status. For instance, if a buyer sends a supplier EDI purchase orders that specify the requirements, time of delivery, and quantity and the supplier does not uphold its end of the contract, it can be taken to court with the EDI trading agreements serving as evidence. Table below indicates some EDI properties which distinguish it from e-mail.

Electronic Data Interchange (EDI)	Electronic Mail
There is typically no human involvement in the processing of the information, as the interface has software-to-software orientation. The data are structured in a software-understandable way.	The data are not necessarily structured to be software-understandable. A human-to-software interface is involved at a minimum of one end of the interchange.
The interchange is composed by one software for interpretation by another software. If a reply is involved, it is composed by a software to be interpreted by another software.	The message is composed by a human and/or interpreted by a human and/or a reply is composed by a human and/or interpreted by a human.

Table: EDI versus E-mails

How EDI works?

The idea behind EDI is very simple. EDI seeks to take a form from a business application, translates that data into a standard electronic format, and transmit it. At the receiving end, the standard format is "untranslated" into a format that can be read by the recipient's application. Hence output from one application becomes input to another through the computer-to-computer exchange of information. The result is an elimination of the delays and the errors inherent in

paper-based transactions.

Benefits of EDI can be seen by comparing the flow of information between organizations before and after its implementation. For this purpose the purchasing application provides an ideal scenario. In general, EDI has been used extensively in the procurement function to streamline the interaction between the buyer and seller. Other uses for EDI are also available. For example, Universities use EDI to exchange transcripts quickly. Auto manufacturers use EDI to transmit large, complex engineering designs created on specialized computers.

Figure below shows the information flow when paper documents are shuffled between organizations via the mailroom. When the buyer sends a purchase order to a seller, the relevant data must be extracted from the internal database and recorded on hard copy. This hard copy is then forwarded to the seller after passing through several intermediate steps. Sellers receive information in the form of letters and in some cases a vast number of facsimiles. This information is manually entered into the internal information systems of the recipient by data entry operators. This process generates a considerable amount of overhead in labor costs and time delays. The reproduction of information also increases the risk of errors caused by incorrect data entries.
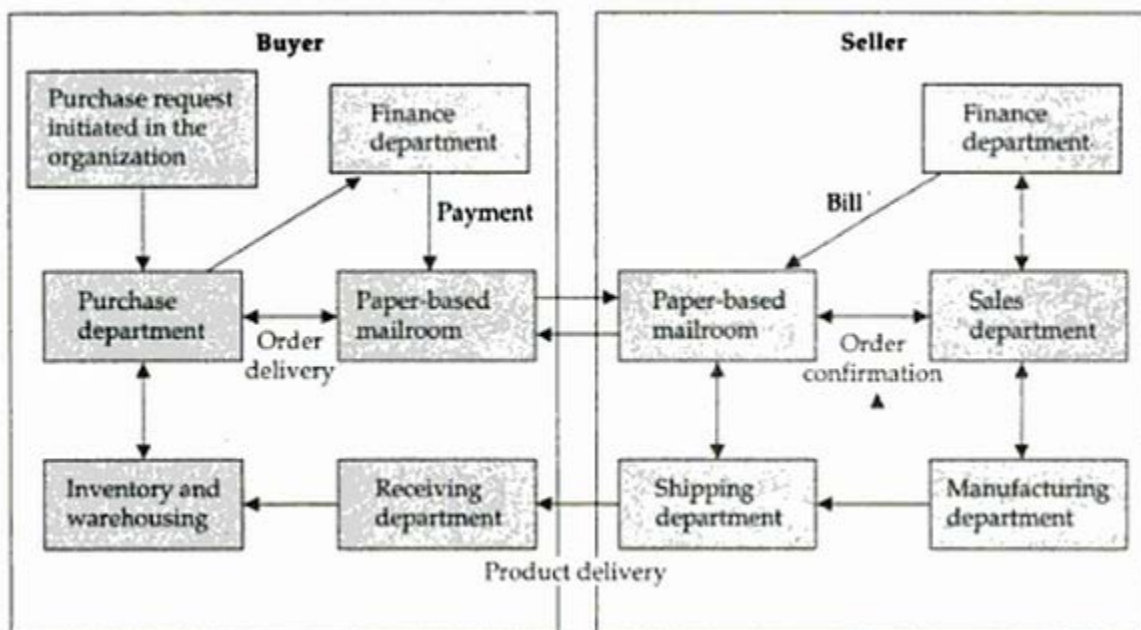
Fig: Information flow without EDI

This pervasive practice of converting digital data into hard copy data that is reconverted into electronic information again on the receiving end generates unnecessary costs. It is quite possible to exchange the information in its electronic format by means of EDI. EDI can substantially automate the information flow and facilitate management of the business process, as illustrated in Figure below.
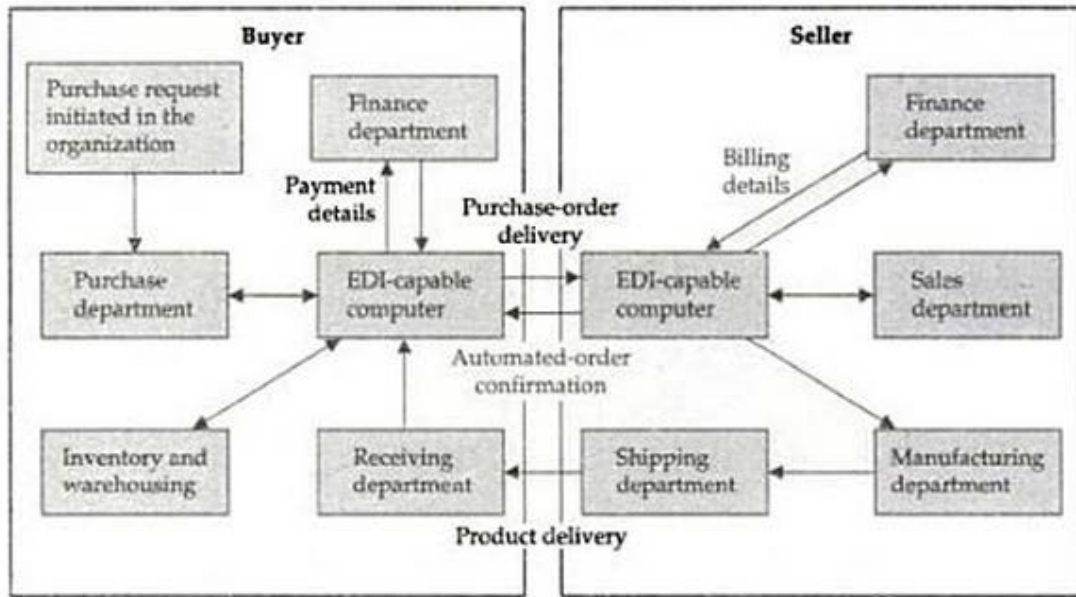

Fig: Information flow with EDI

The EDI transactions for a purchase, shipment, and corresponding payment are as follows:

Step 1: Buyer's computer sends **Purchase Order** to seller's computer.

Step 2: Seller's computer sends **Purchase Order Confirmation** to buyer's computer.

Step 3: Seller's computer sends **Booking Request** to transport company's computer.

Step 4: Transport company's computer sends **Booking Confirmation** to seller's computer.

Step 5: Seller's computer sends **Advance Ship Notice** to buyer's computer.

Step 6: Transport company's computer sends **Status** to seller's computer.

Step 7: Buyer's computer sends **Receipt Advice** to seller's computer.

Step 8: Seller's computer sends **Invoice** to buyer's computer.

Step 9: Buyer's computer sends **Payment** to seller's computer

In sum, firms are adopting EDI as a fast, inexpensive, and safe method of sending invoices, purchase orders, customs documents, shipping notices, and other frequently used business documents. The improved ability to exchange huge amounts of data in a fast and effective manner tends to speed up business processes.

Benefits of EDI

EDI can be a cost- and time-saving system, for many reasons. The automatic transfer at information from computer to computer reduces the need to rekey information and as such reduces costly errors to near zero. EDI transactions produce acknowledgments of receipt of data. Many firms are now finding that this acknowledgment can make the invoice obsolete and save many efforts now devoted to acquiring, receiving, and paying for goods.

For companies dealing with thousands of suppliers and tens of thousands of purchase orders a year, the savings from EDI are significant. For example, RJR Nabisco figures that purchase orders that previously cost between $75 and $125 to process now cost 93 cents. Companies can also pay each other through "automated receipts settlement" or financial EDI, whereby electronic purchase order acknowledgments and shipping notices provide the data necessary for payment, further reducing paper.

Savings also accrue from the following improvements:

1. **Reduced paper-based systems.** EDI can impact the effort and expense a company devotes to maintaining records, paper-related supplies, and to the personnel required to maintain all of these systems. Electronic transactions takeover most of the functions of paper forms and through automation drastically reduce the time spent to process them. EDI can also reduce postage bills because of the amounts of paper that no longer need be sent.

2. **Improved problem resolution and customer service.** EDI can minimize the time companies spend to identify and resolve inter business problems. Many such problems come from data-entry errors somewhere along the way, and EDI can eliminate many of them. EDI can improve customer service by enabling the quick transfer of business

documents and a marked decrease in errors land so can fill orders faster/ and by providing an automatic audit trail that frees accounting staff for more productive activities.

An example of problem resolution and customer service facilitated by EDI is the Vendor Stock Replenishment (VSR) initiated by retailers such as Wal Mart. This program requires that vendors maintain appropriate inventory levels in all stores. With VSR, stores do not run out of a product while suppliers or distributors wait for a purchase order from the headquarters. Suppliers and distributors send stock as soon as the store EDI system reports it is necessary and automatically bill the client. It cuts days, even weeks, from the order fulfillment cycle and ensures that the product is always on the shelf. The time savings come from not having to copy and fax/mail copies of invoices or purchase orders.

3. **Expanded customer/supplier base.** Many large manufacturers and retailers with the necessary clout are ordering their suppliers to institute an EDI program. Today, when evaluating a new product to carry or a new supplier to use, the ability to implement EDI is a big plus in their eyes. These same companies tend to stop doing business with suppliers who do not comply with EDI.

EDI Applications in Business

Although EDI was developed to improve transportation and trade, it has spread everywhere. In short, EDI has grown from its original (and somewhat limited) use as expediter of the transfer of trade goods to facilitator of standard format data between any two computer systems.

An examination of EDI usage in various industries provides insight into the business problems that EDI is attempting to solve. We will present four very different scenarios in industries that use EDI extensively:

1. International or cross-border trade,
2. Financial EDI or electronic funds transfer (EFT),
3. Health care EDI for insurance claims processing, and

4. Manufacturing and retail procurement.

Let us describe the EDI business applications briefly:

1. **International or cross-border trade**

   EDI has always been very closely linked with international trade. Over the last few years, significant progress has been made toward the establishment of more open and dynamic trade relations. Recent years have brought the General Agreement on Tariffs and Trade (GATT); the Free Trade Agreement (NAFTA) among the United States, Canada, and Mexico; and the creation of the European Union. These developments have meant the lifting of long-standing trade restrictions. Many countries, and in particular developing countries, have made significant efforts to liberalize and adjust their trade policies. In this context, trade efficiency, which allows faster, simpler, broader and less costly transactions, is a necessity. It is a widely held view that trade efficiency can be accomplished only by using EDI as a primary global transactions medium.

2. **Financial EDI or electronic funds transfer (EFT)**

   Financial EDI comprises the electronic transmission of payments and remittance information between a payer, payee, and their respective banks. This section examines the ways business-to-business payments are made today and describes the various methods for making financial EDI payments.

   Financial EDI allows businesses to replace the labor-intensive activities associated with issuing, mailing, and collecting checks through the banking system with automated initiation, transmission, and processing of payment instructions. Thus it eliminates the delays inherent in processing checks.

   Types of Financial EDI: Traditionally, wholesale or business-to-business payment is accomplished using checks, EFT, and automated clearinghouses (ACH) for domestic and international funds transfer. ACH provides two basic services to industrial and financial corporate customers (including other banks): (1) fast transmission of information about their financial balances throughout the world, and (2) the movement of money

internationally at rapid speed for settlement of debit/credit balances. Banks have developed sophisticated cash management systems on the back of these services that essentially reduce the amount of money companies leave idly floating in low-earning accounts.

Thus, three principal types of noncash payment instruments currently used for business-to-business payments: **checks, electronic funds transfers, and automated clearinghouse (ACH)** transfers.

3. **Health care EDI for insurance claims processing, and**

    Providing good and affordable health care is a universal problem. In 1994, the American public spent $1 trillion on health care, nearly 15 percent of the gross domestic product (GDP). National health care expenditures have risen by 10.5 percent each year for the past eight years—more than double the rate of increase in the consumer price index. It is estimated that $3.2 billion in administrative savings are expected to be achieved by switching from being paper-based to an EDI implementation. Employers could save $70 million to $110 million by using EDI for enrollment and to certify that a prescribed procedure is covered under the subscriber's health insurance contract.

4. **Manufacturing and retail procurement.**

    Both manufacturing and retail procurement are already heavy users of EDI. In manufacturing, EDI is used to support just-in-time. In retailing, EDI is used to support quick response.

    Just-in-Time and EDI: Companies using JIT and EDI no longer stock thousands of large parts in advance of their use. Instead, they calculate how many parts are needed each day based on the production schedule and electronically transmit orders and schedules to suppliers every day or its some cases every 30 minutes. Parts are delivered to the plant "just in time" for production activity.

    Quick Response and EDI: Taking their cue from the efficiencies manufacturers have gained from just-in-time manufacturing techniques, retailers are redefining practices

through the entire supply chain using quick response (QR) systems. For the customer, QR means better service and availability of a wider range of products. For the retailer and suppliers, QR may mean survival in a competitive marketplace.

Much of the focus of QR is in reduction of lead times using event-driven EDI. Occurrences such as inventories falling below a specified level immediately trigger a chain of events including automatic ordering from one company's application directly into the other's application. In QR, EDI documents include purchase orders, shipping notices, invoices, inventory position, catalogs, and order status.

Security and privacy issues of EDI

Since in the case of EDI, we are dealing with trade between countries and corporations, issues of legal admissibility and computer security are important. Companies that deal with EDI often retain the services of a lawyer during the design of an EDI application so that the appropriate evidentiary/admissibility safeguards are implemented.

Legal Status of EDI Messages: There has been considerable debate concerning the legal status of EDI messages and electronic messages in general. Although a lot of work is being done on legal framework, nothing concrete has come out these efforts. No rules exist that indicate how electronic messages may be considered binding in business or other related transactions.

The establishment of such a framework is essential if EDI is to become widespread. To understand the legal status better, let's take a quick look at contract law. It distinguishes three modes of communication types: instantaneous communication, delayed communication via the U.S. Postal Service (USPS), and delayed communication via non-USPS couriers:

1. Instantaneous, if the parties are face to face or use an instantaneous communication medium such as the telephone, an offer or acceptance is held operable when spoken.

2. Delayed (USPS and non-USPS). The "mailbox rule" provides that an acceptance communicated via USPS mail or via telegram, mailgram, and probably electronic messaging systems, is effectively communicated when dispatched, or physically deposited in a

USPS and non USPS mailbox.

Messaging systems combine features of both instantaneous and delayed communications. A message's delay is a function of the specific application, message routing, network(s) traversed, system configuration, and other technical factors typically unknown to the user. So, who assumes liability? If the U.S. mail or an overnight express service does not deliver a contract to the right addressee, it can be held responsible for any business losses caused by the error. Of course, liability also depends on the situation. In the case of EDI, however, the courts haven't decided who is liable if an EDI network fails to transmit a document or transmits a document to the wrong party. There is no legal precedence in this area (yet!).

Digital Signatures and EDI

The cryptographic community is exploring various technical uses of digital signatures by which messages might be time-stamped or digitally notarized to establish dates and times at which a recipient might claim to have had access or even read a particular message.

If digital signatures are to replace handwritten signatures, they must have the same legal status as handwritten signatures (documents signed with digital signatures must be legally binding). For example, an on-line "notarized time-stamping" service has been suggested that would accept a message and return one showing the date, time, and a digital signature binding the notarized message content and received date and time to the digital public notary. The digital signature provides a means for a third party to verify that the notarized object is authentic.

Digital signatures should have greater legal authority than handwritten signatures. For instance, if a ten-page contract is signed by hand on the tenth page, one cannot be sure that the first nine pages have not been altered. If the contract was signed by digital signatures, however, a third party can verify that not one byte of the contract has been altered.

EDI for e-commerce

The economic advantages of EDI are widely recognized. But until recently, companies have

been able to improve only discrete processes such as automating the accounts payable function or the funds transfer process. Companies are realizing that to truly improve their productivity they need to automate their external processes as well as their internal processes. This is the thrust of new directions in EDI.

New EDI services for electronic commerce are seen as the future bridge that automates external and internal business processes, enabling companies to improve their productivity on a scale never before possible. They present information management solutions that allow companies to link their trading community electronically—order entry, purchasing, accounts payable, funds transfer, and other systems interact with each other throughout the community to link the company with its suppliers, distributors, customers, banks, and transportation and logistics operations.

Another goal of new EDI services is to reduce the cost of setting up an EDI relationship. These costs are still very high because of the need for a detailed bilateral agreement between the involved business partners and for the necessary technical agreements. Therefore most successful EDI implementations are either in long-term partnerships or among a limited number of partners. With the advent of inter-organizational commerce, several new type of EDI are emerging that can be broadly categorized as **traditional EDI** and **open EDI**.

Traditional EDI: Traditional EDI replaces the paper forms with almost strict one-to-one mappings between parts of a paper form to fields of electronic forms called transaction sets. Traditional EDI covers two basic business areas:
   i)   Trade data interchange (TDI) encompasses transactions such as purchase orders, invoices, and acknowledgments.
   ii)   Electronic funds transfer (EFT) is the automatic transfer of funds among banks and other organizations.

Today, traditional EDI is divided into two camps: old EDI and new EDI. Old EDI is a term created by those working on the next generation of EDI standards in order to differentiate between the present and the future.
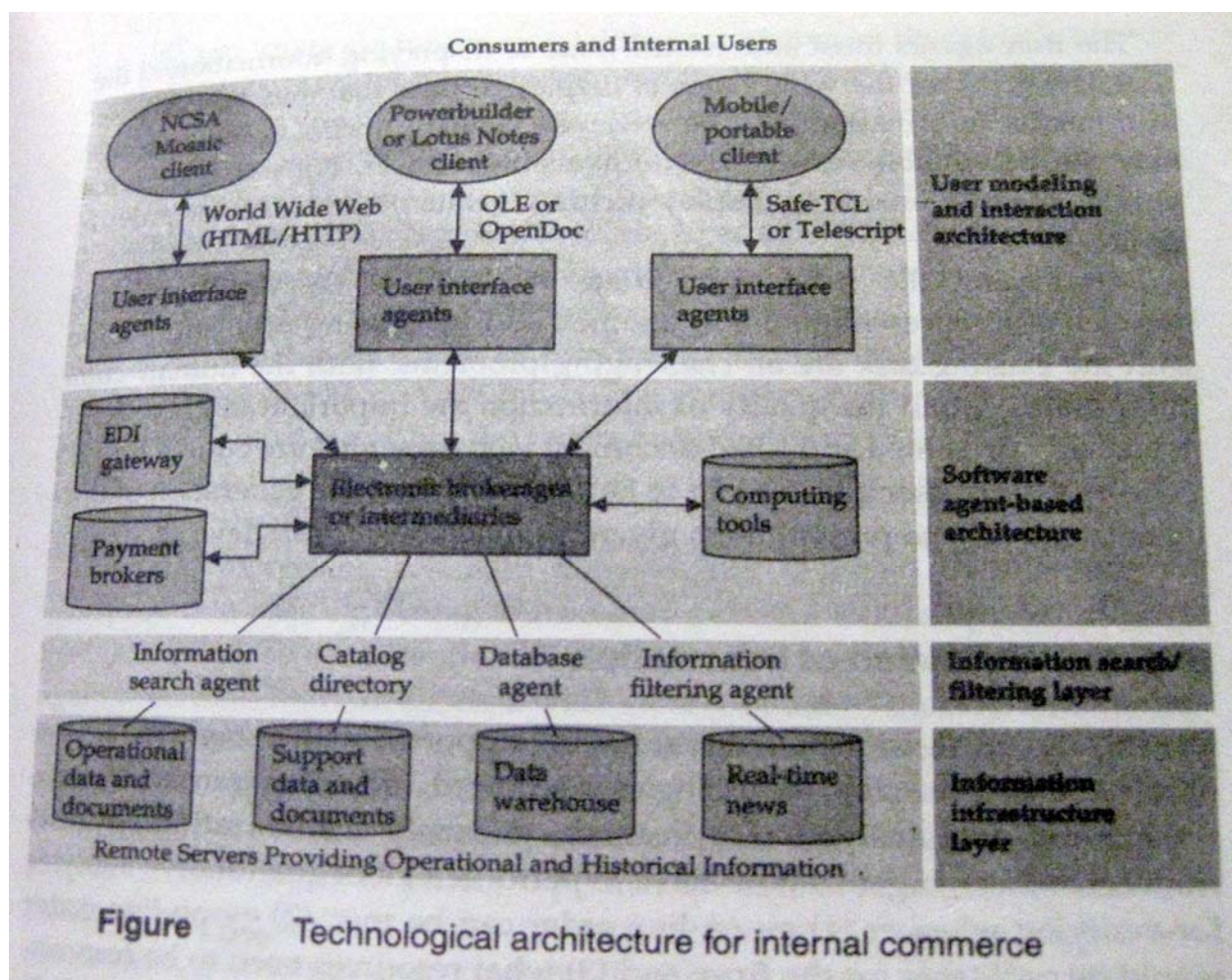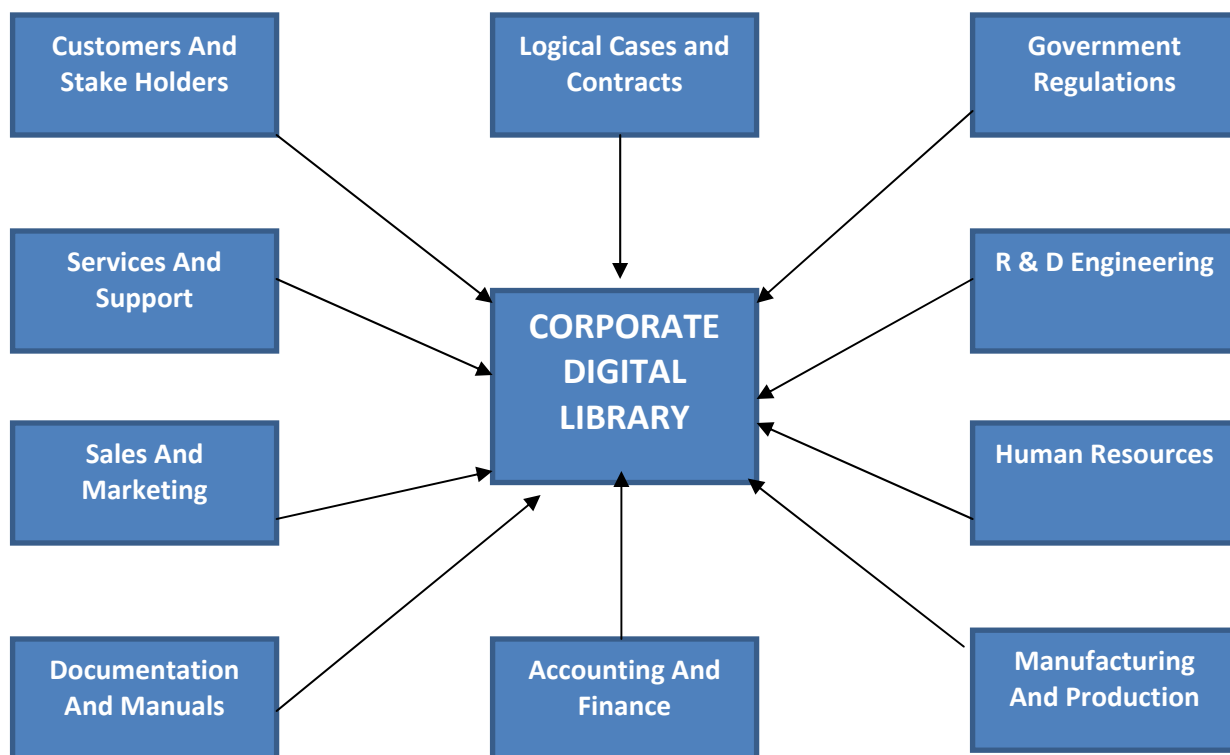
Old EDI refers to the current practice of automating the exchange of information pertinent to the business activity. Information that is generated by the business process of one computer is transferred electronically and effects a corresponding business process in another computer.Old EDI is also used to refer to the current EDI-standardization process (e.g., X12, EDIFACT) where tens of thousands of people in groups (or working committees) all around the world are attempting to define generic document interchanges (e.g., purchase orders) that allow every company to choose its own, unique, proprietary version (that is a subset of the original transaction set).

New EDI is really a refocus of the standardization process. With old EDI, the standardization is focused on the interchange structure, on the transaction set in X12 or the message in EDIFACT. With new EDI the structure of the interchanges is determined by the programmer who writes the business application program, not by the lengthy standards process.

Open EDI provides a framework where two potential trading partners can whip out an EDI structure for their potential partnership in the short time frame that it takes them to draw up and negotiate the legal contracts. The increased interest in open EDT is a result of dissatisfaction with traditional EDI. Open EDI is a business procedure that enables electronic commerce to occur between organizations where the interaction is of short duration. In essence, open EDI is the process of doing EDI without the upfront trading partner agreement that is currently signed by the trading partners before they commence trying to do business by EDI.

PRELUDE

Customers And Stake Holders	Logical Cases and Contracts	Government Regulations
Services And Support		R & D Engineering
Sales And Marketing	CORPORATE DIGITAL LIBRARY	Human Resources
Documentation And Manuals	Accounting And Finance	Manufacturing And Production

Figure Technological architecture for internal commerce

TYPES OF DIGITAL DOCUMENTS

Structuring applications around a document interface

Active or compound (OLE, OpenDoc)

Structuring interlinked textual and multimedia information for distributed network access

Distributed hypertext (HTML)

Structuring and encoding information using document encoding standards

Structured documents (SGML)

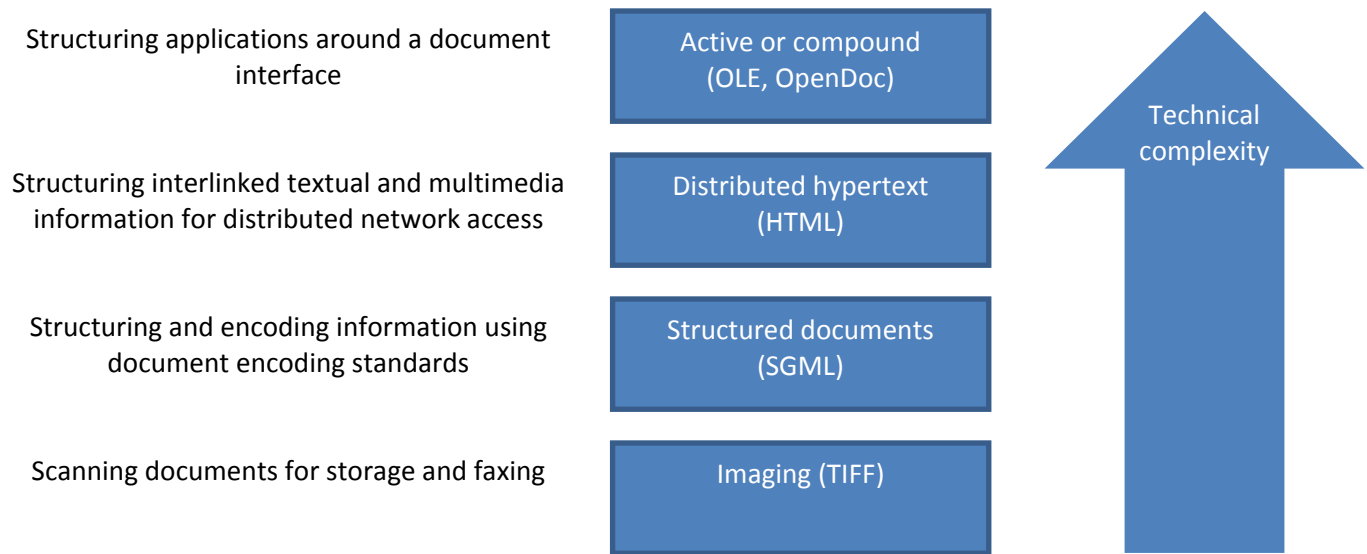Scanning documents for storage and faxing

Imaging (TIFF)

Technical complexity

Fig. Four Types of Digital Documents

1. Document Imaging
* Document imaging emulates microfiche and microfilm.
* An imaging system passes appear document through a scanner that renders it digital and then stores the digital data as a bit-mapped image of document.
* The problem with the imaging approach is that the output contains only images not text.

The following imaging standards are prominently used:
* TIFF(tag image file format): format for interchange of bit-mapped images.
* ITU-TSS(international telecommunication union-telecommunication standardization sector) Group IV T.6 facsimile: this standard is used for compression and exchange of bit-mapped files.

2. Structured Documents
* Structured documents provide clear description of document content.
* Structured documents apply data-base structuring capabilities to individual documents and document collections.

Capabilities of Structured Documents
* Document formatting, rendering and presentation (interactive CDs of customer catalog, manuals)
* Dynamic documents, user interaction and manipulation such as the ability to create bookmarks, highlight text and write notes.
* Easier search and query

Standard for structured documents are:
SGML (Standard Generalization Markup Language):
* It is an ISO standard for interchange & multi-formatting description of text document in terms of logical structure.

ODA (Office Document Architecture):
* It is an ANSI & ISO standard for interchange of compound office documents. ODA specifies both content & format.

CDA (Compound Document Architecture):
- It defines set of rules for content and format .It defines services for compound documents.

RTF (Rich –Text Format):
- It is developed by Microsoft for interchanging of desk top documents.

3. Hyper Text Documents
- Hyper text is a way of making document-based information more mobile.

Reasons for mobility of information are:
- Information in enterprises is seldom located on server but is distributed throughout the organization.
- Accessing & retrieving large monolithic document is time consuming.
- Reuse of document for composing new documents is difficult task.
- In this relation ships between documents can be represented through hypermedia links i.e. hyperlinks.

Standards of Hypertext Documents
- HyTime: It adds time based relationships like synchronization, t is extension of SGML.
- HTML: Developed by WWW to support distributed hypermedia.
- MHEG: (Multimedia /Hypermedia Encoding/Experts Group):standard for presenting objects in multimedia

4. Active Documents
- Active document represents what is known as document oriented computing.
- Active document provide an interactive interface between documents.
- Active documents are especially powerful because they combine composition of information with the distributed nature of information.
- Ex: spreadsheet, word-processing

ISSUES BEHIND DOCUMENT INFRASTRUCTURE
- Creating a digital library poses many hurdles and challenges. What stats out as a conceptually simple exercise can quickly turn in to a cluster of incompatible platforms, software applications, databases and document formats.
- Special challenges include: variance in end users' needs and sophistication, diversity in hardware performance, information resources that are physically distributed, heterogeneous types of information resources and multimedia data types created by a variety of departments.

Document infrastructure must address the following questions:
- What is the proper architecture for the corporate digital library?
- What are appropriate model?
- What protocols required?
- What are the best human interfaces?
- How dose one represent and manipulate the information processing activities occurred in the digital library?

Document Constituencies
- The emerging document processing & management strategies must address three constituencies.
  - ✓ End Users
    - ▪ End users want to do more with the information in their documents than merely sore them to disk or occasionally print them.
    - ▪ They need systems to access distributed repositories and to manipulate them in a number of ways.

- ✓ Developers
  - ▪ Developers need a framework to prevent ad hoc system design and assure the longevity and flexibility of documents and the information they include in the face of new technological advancements.
  - ▪ Methodologies are required that can guide to develop and deploy documents in organization.
- ✓ Document librarians
  - ▪ Librarians manage the dissemination and maintenance of information in document.
  - ▪ This new role alters the process by which workers create, find and use information they need in the networked environment.

Document-oriented processes

Components:
- ✓ Document creation
  - ▪ End Users want to be able to create mission critical documents cooperatively on disparate systems and applications. So links between these systems needs to be seamless.
- ✓ Document media conversion
  - ▪ End users are looking for systems that accept multiple forms of input – hard copy, image, text, numeric data, video and sound – from either paper originals, networks or magnetic media.
- ✓ Document production and distribution
  - ▪ End users need interfaces between document creation, document production and document distribution systems.
  - ▪ They want to
    - ❖ Direct document output via networks to print on demand systems
    - ❖ Exploit Justin time document production using page description languages, image retrieval and network storage technologies
    - ❖ Simplify document production by integrating finishing into high speed production processes
- ✓ Document storage and retrieval
  - ▪ End Users seek integrated archival storage and retrieval support with easy access to whole documents as well as documents elements such as text passages and illustrations.
  - ▪ They need document inventory techniques that can generate substantial savings in document storage costs and near elimination of document obsolescence while assuring easy document access.

Document-Based Work Flows:

- • Is the process how documents move in and out of the digital library.
- • four activities make up the document-based framework flow

  - ✓ Document modeling
    - ▪ Defines the structure and processes of operation systems, both internal and external to the enterprise
  - ✓ Transformation
    - ▪ Creates modules for capturing, validating, transforming, and applying key operational concepts.
  - ✓ Synthesizing
    - ▪ Create value-added informational objects from the combination of two or more documents.
  - ✓ Business modeling
    - ▪ Defines the structure and processes of the business environment, both internal and external to the enterprise.

CORPORATE DATA WAREHOUSES
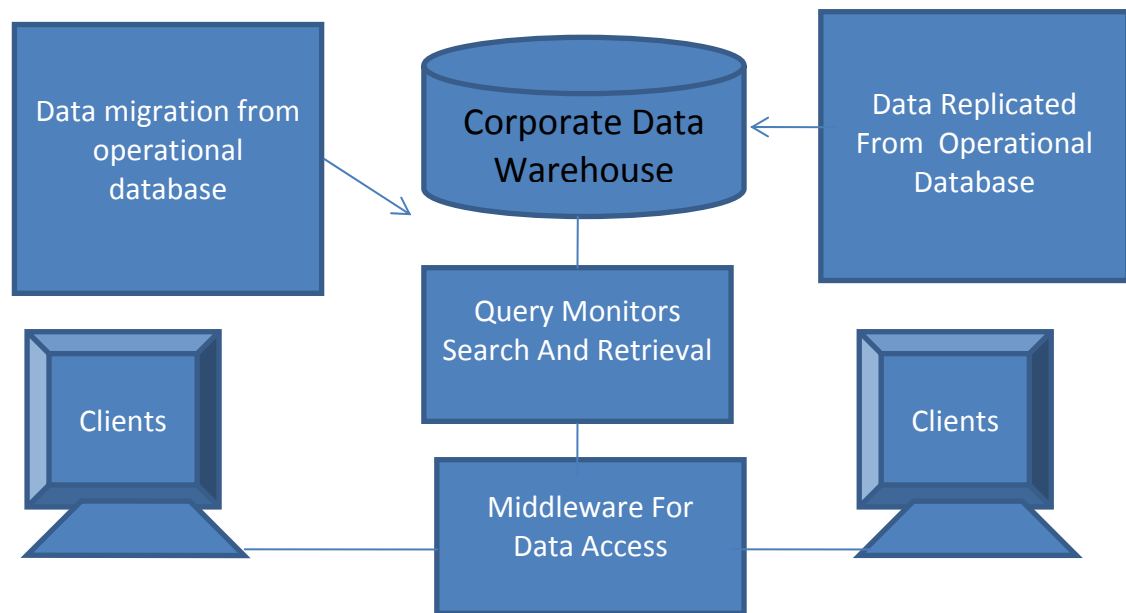
- Data warehouse is used store information of the organization, leverage existing business and generate new growth opportunities.
- Data warehouse is needed to handle increasing data in volume and complexity.
- Data warehouse is a repository of an organization's electronically stored data and are designed to facilitate reporting, analysis, extraction and transformation to manage a data dictionary.
- In contrast to data, warehouses are operational systems that perform day-to-day transaction processing.
- It provides a tool to satisfy the information needs of the employee's at all organizational levels-not just for complex data queries but as a general facility for getting quick, accurate and often insightful information.
- One of the principal reasons for developing a Data Warehouse is to integrate operational data from various sources into a single and consistent architecture that supports analysis and decision making with the enterprise.

Organizational Needs of data warehouse (Why data warehouse?)
- An information-based approach to decision making.
- Involvement in highly competitive & rapidly changing markets with a large, diverse customer base for a variety of products.
- Data stored in many systems and represented differently.
- Data stored in complex, technical, difficult to decipher formats, making conversion for analysis difficult

Functions of Data warehouse
- Allow existing transactions and legacy systems to continue in operation.
- Consolidates data from various transaction systems into a coherent set.
- Allows analysis of virtual information about current operations of decision support.

Types of data warehouse
- Physical data warehouse
  - It is the actual physical database into which all the corporate data for the data warehouse are gathered along with the schemas and the processing logics.

- Logical data warehouse:
  - It contains all the metadata, business rules and processing logics required to scrub, organize, package and preprocess the data.
  - It also contains information required to find and access the actual data, wherever it actually resides

- Data library:
  - This is sub set of the enterprise wide data warehouse and performs the role of a departmental, regional or functional data warehouse.
  - As part of the data warehouse process, the organization builds a series of data libraries over time and eventually links them via an enterprise wide logical data warehouse.

- Decision Support System (DSS):
  - These systems are not data warehouses but are the applications but make use of data warehouse.
  - Also called Executive Information Systems (EIS)

Advantages of data warehouse:
- **More cost effective decision making:** A data warehouse allows reduction of staff and computer resources required to support queries and reports against operational and production database. This typically offers significant savings.
- **Better enterprise intelligence:** Increased quality and flexibility of enterprise analysis arises from the multi-level data structure which guarantees data accuracy and reliability ensuring that a Data Warehouse contains only "trusted" data.
- **Enhanced customer service:** An enterprise can maintain better customer relationships by correlating all customer data via a single Data Warehouse Architecture.
- **Business reengineering:** Allowing unlimited analysis of enterprise information often provides insights to enterprise processes that may yield breakthrough ideas for engineering those processes. Knowing what information is important to an enterprise will provide direction and priority for reengineering efforts.
- A data warehouse provides a common data model for all data of interest regardless of the data's source. This makes it easier to report and analyze information than it would be if multiple data models were used to retrieve information such as sales invoices, order receipts, general ledger charges, etc.
- Prior to loading data into the data warehouse, inconsistencies are identified and resolved. This greatly simplifies reporting and analysis.
- Information in the data warehouse is under the control of data warehouse users so that, even if the source system data is purged (washed out) over time, the information in the warehouse can be stored safely for extended periods of time.
- Because they are separate from operational systems, data warehouses provide retrieval of data without slowing down operational systems.
- Data warehouses can work in conjunction with and, hence, enhance the value of operational business applications, notably customer relationship management (CRM) systems.
- Data warehouses facilitate decision support system applications such as trend reports (e.g., the items with the most sales in a particular area within the last two years), exception reports, and reports that show actual performance versus goals.