E-Commerce

UNIT 1

Introduction

Sharing business information, maintaining business relationships and conducting business transactions using computers connected to telecommunication network is called E-Commerce. It draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.

- It is a general concept covering any form of business transaction or information exchange executed using information and communication technologies (ICT's)
- It includes electronic trading of goods, services and electronic material.
- It takes place between companies, between companies and their customers, or between companies and public administrations.

Categories of E-Commerce

B2B (Business-to-Business)

B2B definitely deals with companies who are doing business with each other.

Ex: Manufacturers who are selling their product to distributors and the wholesalers are selling it to retailers. Thus, the pricing can be based on the number of orders and is frequently up for grabs.

B2C (Business-to-Consumer)

Business-to-consumer typically involves selling products and services to the general public or consumers through the use of catalogs utilizing shopping cart software. B2B can easily earn a lot of money; on the other hand, B2C is what really in mind in an average customer when it comes to the ecommerce as whole. With the help of ecommerce, you can easily purchase many things at time without having human interaction.

Ex: If you are having hard time finding a book, when you need to purchase a customized, high-end computer system, or finding a first class, all-inclusive trip to a tropical paradise island. Thus, ecommerce can help you purchase the products all at the same time.

C2B (Consumer-to-Business)

An example of C2B is when a consumer posts his projects or assignments in the Internet and web site. The consumer sets a budget online where within hours many companies reviews the requirements needed by the consumer and then bid on the project. It empowers the customers around the globe by providing the meeting ground and platform for that certain transaction.

C2C (Consumer-to-Consumer)

A very good example for C2C is the eBay. It is where consumers sell their products to other consumers through bidding. Thus, the one who bids the highest can buy the product. Another example is the sites offering free classified ads, auctions, and forums where consumers can buy and sell products to other consumers. They use PayPal as a tool for online payment system where they can send and receive money with ease through online.

B2E (Business-to-Employee)

Here, companies are using internal networks to offer their employees products and services online. It may not be necessarily online on the Web.

The other forms of ecommerce are the

- G2G (Government-to-Government)
- G2E (Government-to-Employee)
- G2B (Government-to-Business)
- B2G (Business-to Government)
- G2C (Government-to-Citizen)
- C2G (Citizen-to-Government)

These transactions involves mainly with the government, from procurement to filing taxes to business registration to renewing license. There are still plenty of other categories that exist but then they tend to be superfluous.

Classification Based on Application type

<u>Electronic Markets</u>

Present a range of offerings available in a market segment so that the purchaser can compare the prices of the offerings and make a purchase decision.

Example: Airline Booking System

<u>Electronic Data Interchange (EDI)</u>

- It is used by organizations that a make a large no. of regular transactions. It provides a standardized system.
- Communicated from one computer to another without the need for printed orders and invoices & delays & errors in paper handling.

Example: EDI is used in the large market chains for transactions with their suppliers

<u>Internet Commerce</u>

It is use to advertise & make sales of wide range of goods & services. This application is for both business to business & business to consumer transactions.

Example: The purchase of goods that are then delivered by post or the booking of tickets that can be picked up by the clients when they arrive at the event

Framework of E-Commerce

The term e-commerce framework is related to software frameworks for e-commerce applications. They offer an environment for building e-commerce applications quickly. E-Commerce frameworks are flexible enough to adapt them to your specific requirements. As result, they are suitable for building virtually all kinds of online shops and e-commerce related (web) applications.
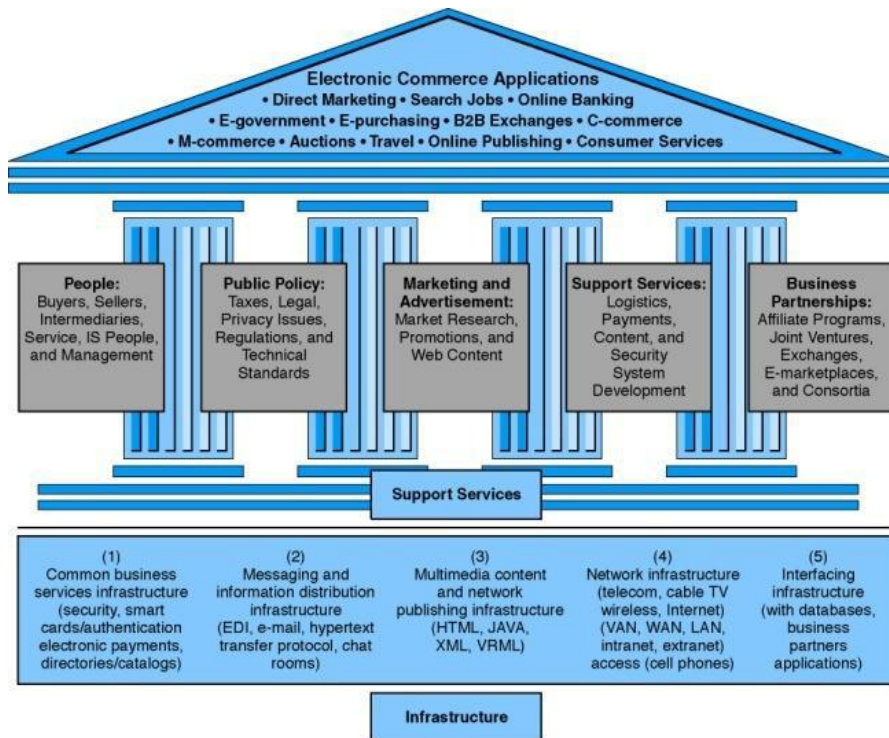
An e-commerce framework must

- ➢ allow replacing all parts of the framework code
- ➢ forbid changes in the framework code itself
- ➢ contain bootstrap code to start the application
- ➢ be extensible by user-written code

E-Commerce frameworks should

> ➢ define the general program flow
> ➢ consist of reusable components
> ➢ be organized in functional domains

They provide an overall structure for e-commerce related applications.

Furthermore, they implement the general program flow e.g. how the checkout process works. Contrary to monolithic shop systems, existing program flow can not only be extended but completely changed according to your needs.

E-commerce frameworks must be based on a strong architectural model. Usually, they make heavy use of interfaces and design patterns like

> ➢ Dependency Injection (make components independent of used object implementation)
> ➢ Factories (create objects at a central place that instantiates the actual implementation)
> ➢ Decorators (dynamically add functionality to existing objects)
> ➢ Publish/Subscribe model (notify listening objects about changes instead of polling for updates)

E-Commerce application will be built on the existing technology infrastructure

> ➢ A myriad of computers
> ➢ Communication networks
> ➢ Communication software

- Common business services for facilitating the buying and selling process
- Messaging & information distribution as a means of sending and retrieving information
- Multimedia content & network publishing, for creating a product & a means to communicate about it
- The information superhighway- the very foundation-for providing the high way system along which all e-commerce must travel

Any successful e-commerce will require the I-way infrastructure in the same way that regular commerce needs. I-way will be a mesh of interconnected data highways of many forms like Telephone, wires, cable TV wire, Radio-based wireless-cellular & satellite

In the electronic 'highway system' multimedia content is stores in the form of electronic documents. These are often digitized.

On the I-way messaging software fulfills the role, in any no. of forms: e-mail, EDI, or point-to-point file transfers. Encryption & authentication methods are used to ensure security. Electronic payment schemes developed to handle complex transactions. These logistics issues are difficult in long-established transportation.

Anatomy of E-Commerce Applications

- Multimedia Content for E-Commerce Applications
- Multimedia Storage Servers & E-Commerce Applications
  - Client-Server Architecture in Electronic Commerce
  - Internal Processes of Multimedia Servers
  - Video Servers & E-Commerce
- Information Delivery/Transport & E-Commerce Applications
- 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.

Multimedia is associated with Hardware components in different networks. The Accessing of multimedia content depends on the hardware capabilities of the customer.
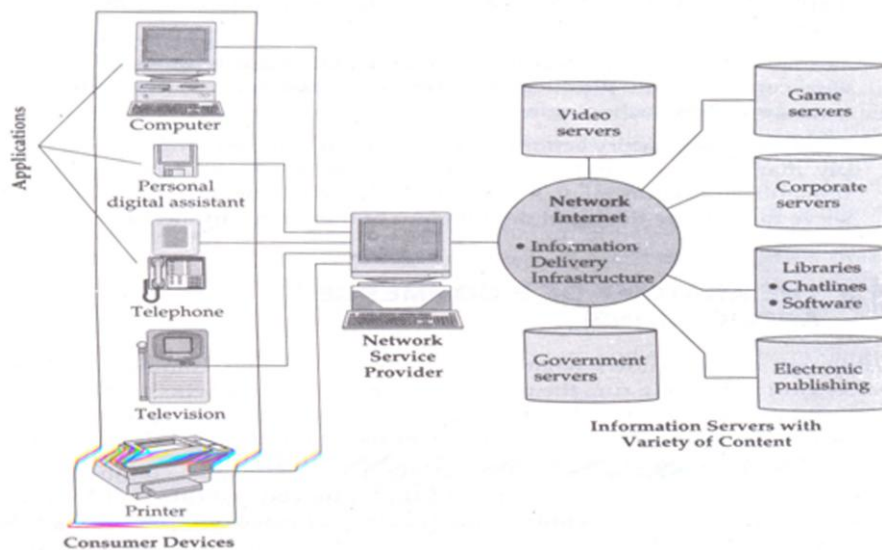
Figure 1.2 Elements of electronic commerce applications

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 variety of content, 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

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
➤ Mainframe computing, which meant for "dump".
➤ 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 & security & provides scalability-ability to add more clients and client devices.

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 dishes out. It captures, processes, manages, & delivers text, images, audio & video. It must do to handle thousands of simultaneous users.

Include high-end symmetric multiprocessors, clustered architecture, and massive parallel systems.

<u>Video Servers & E-Commerce</u>

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.

Consumer applications will include video-on-demand.

Information Delivery/Transport & E-Commerce Applications

Transport providers are principally telecommunications, cable, & wireless industries.

<u>Information Transport Providers</u>	<u>Information Delivery Methods</u>
•Telecommunication companies	long-distance telephone lines; local telephone lines
•Cable television companies	Cable TV coaxial, fiber optic & satellite lines
•Computer-based on-line servers	Internet; commercial on-line service providers
•Wireless communications	Cellular & radio networks; paging systems

<u>Consumer Access Devices</u>

<u>Information Consumers</u>	<u>Access Devices</u>
•Computers with audio & video capabilities	Personal/desktop computing Mobile computing
•Telephonic devices	Videophone

- Consumer electronics   Television + set-top box Game systems
- Personal digital assistants (PDAs)   Pen-based computing, voice-driven computing

ONLINE PAYMENT SYSTEMS

A wide variety of payment mechanisms as well as related services is currently available. This section provides a summary of the uptake of online payments, and is followed by a brief account of common payment systems.[4]

The uptake of online payments

The use of online payments varies widely across countries. The Nordic countries (*e.g.* Sweden[5], Finland[6]) are notable users of online payments; and in Australia and New Zealand there has been an important trend towards adopting online payments (BIS, 2004). In contrast, there are markets where online payments have struggled to capture market share; for example in Japan online payments are still low despite important e-commerce growth.[7] Also in Germany offline payment methods such as cash on delivery have been frequently used for online purchase.

In the absence of official statistics on the use of different kinds of Internet payment instruments, data provided by payment service providers such as the European group Pago, provide useful estimates. In 2003, 94% of the total number of worldwide e-commerce transactions carried out via Pago used credit cards (Pago, 2003). Evidence from other sources confirms this dominance: For instance, Visa European online sales for 2003 were EUR 12.6 billion doubling 2002 results (Visa, 2004b). VisaNet shows increasing use of credit cards particularly for airlines, catalogue ordering and travel (Visa, 2004c). However, for 2004 Pago data found credit card dominance decreased somewhat to 81%. Much of this drop in share was due to a significant increase in the use of electronic direct debit especially by German consumers who have been increasing online purchases and payments, and their direct debit payments rose from 6.5% to 17% in 2004 (Pago, 2005). The emergence of credit cards as the major payment system has been relatively rapid considering that in 1999 the market was still dominated by traditional financial intermediaries which offered conventional electronic payment services. However, national habits and specific industry characteristics matter for the use of online payment systems and there are significant differences in payment markets by country and payment types. For example, in Germany and some Northern European countries the share of credit cards in online payments is significantly lower, and in markets such as online auctions credit cards have a smaller market share.

Mobile payment methods are increasing in number, and in 2002 a third of the new payment schemes recorded by the Electronic Payment Systems Observatory (ePSO), used the mobile platform (Carat, 2002). In some countries, as for example Japan, mobile phones are used more frequently for payment than PCs and they are also used in some other countries including Finland and Korea although other payment methods are preferred (OECD, 2004e). But not all mobile payment systems have been successful and there have been challenges to establish independent mobile phone payment systems.[8]

Uptake in selected countries and regions

European Union. Across the European Union, the most commonly accepted online payment instruments are credit cards, direct debit cards and e-banking. A 2003 study of European Web sites found that 78% of Web sites in the sample studied accept classic credit cards, 51% direct debit and 9% e-banking (Figure 6, PwC, 2003).[9] Some evidence suggests that in Europe as a whole the share of credit cards in online payments is lower compared to non-European countries and direct debit and online banking higher

(Pago, 2005). However, there were significant differences across countries. Credit cards and direct debit payments were the primary options in all countries but e-banking was a fairly common option in some countries (Finland, the Netherlands and Portugal) and is being increasingly offered, notably in Northern Europe and higher income countries where banks have co-ordinated their online payment systems. Mobile payments or electronic cheques were less frequently provided. Instruments such as debit cards have grown, with a surge in offerings from 2001 (BIS, 2004).

Figure 6. Payment methods most frequently proposed by e-commerce Web sites
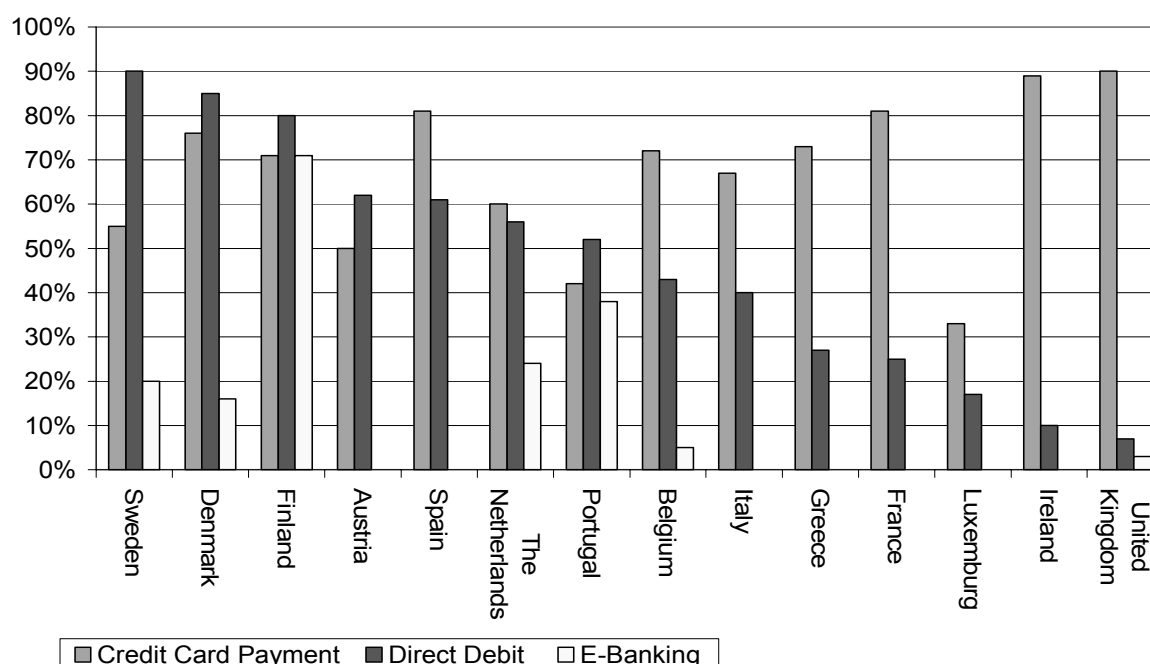
Source: PwC, 2003.

Finland. In Finland credit and debit cards and online banking payments are important for financial transactions on the Internet. Online payments have a favourable environment and approximately 91% of payment transactions are electronic (Finnish Bankers Association). However more innovative payment means are not frequently used for online payments. The results of a 2003 survey suggested that less than 7% of mobile phone users have used their phone for ordering or purchasing online (Statistics Finland, 2003).

Germany. Online debit and online transfer were most frequently used for Internet purchases by respondents of a recent online survey (Table 2).[10] Credit cards were also important but less frequently used (Krueger, 2004). According to data from payment provider Pago, in 2005 only 29% of German online transactions were made using credit cards. The statistics also confirm the importance of direct debit; nearly 64% of all payments used this method (Pago, 2005). For purchases of digital content only, the results are similar; and mobile phones were not used frequently for any type of purchase - including for digital content.

Table 2. Survey Result: Payment methods used when shopping on line, Germany

Payment method	% of respondents (multiple answers possible)
Mobile phone	3.3
Prepaid systems	22.6
Billing systems	54.9
Credit card	62.4
E-mail	14.4
Online-debit	70.3
Online-(giro)-transfer	79.0
Paper-based debt	40.6
Paper-based (giro)-transfer	53.3
Cash on delivery	63.9

Source: Krueger, 2004.

Australia. According to the Australian Bureau of Statistics in 2002, 23% of all adults used the Internet to pay bills or transfer funds. There has been a continuing positive trend in online payments usage, with a tenfold increase from 1999 to 2002 in Australian users of the Internet for payments, and this trend has continued. Although these are not necessarily payments for e-commerce transactions, the high levels of use suggest familiarity with online payment systems for e-commerce.

Figure 7. Australian households paying bills or transferring funds via the Internet
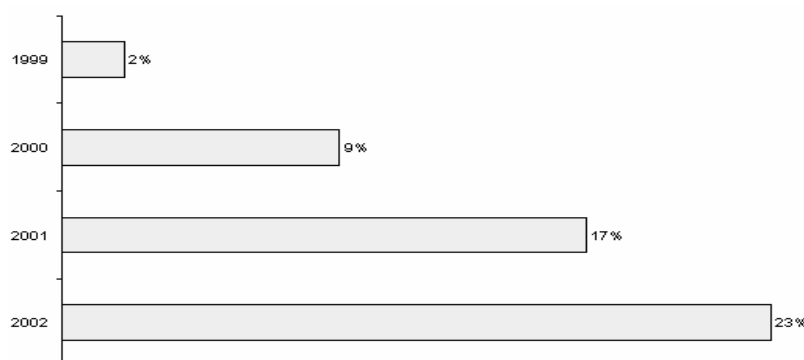
Source: OECD, based on Household Use of Information Technology, ABS, 2003.

Korea. Online banking is commonly used in Korea and has grown very rapidly (Table 3). If familiarity with online banking is used as a proxy for possible uses of online payments for e-commerce, then this suggests that online payments are likely to grow. Household surveys show that 25% claimed to use e-commerce transactions in 2002 - an increase from 15% in 2001, with credit cards taking an increasing share of transactions (67% in 2002 compared with 54% in 2001) and wire transfers decreasing proportionately (Korean Statistical Office).

Table 3. Online banking users in Korea
thousands

	1999	2000	2001	2002	2003
Online banking user	1 230	4 090	11 310	17 710	22 754

Source: The Bank of Korea.

United States. Credit card payments are the most common payment option for online purchases in the United States. Among new payment systems, the mediating service PayPal has been very successful for person-to-person payments and moderately successful for some other payments. According to PayPal, one in three online buyers has an account with them, and by the fourth quarter of 2004, PayPal had 45.6 million accounts, an increase of 67% over 2003, with revenues and profits growing rapidly.

Characteristics of online payment systems[*]

A wide range of systems has been developed for online payments. The analysis of online payment systems in this report follows the scheme in Figure 8. It is divided into account-based and electronic currency systems. Account-based systems allow payment via an existing personalised account (usually a bank account), whereas electronic currency systems allow payment simply if the payer has an appropriate amount of electronic currency. Five different forms of account-based systems are described: *i)* credit cards, *ii)* debit cards, *iii)* mediating systems, *iv)* mobile payment and telephony account systems, and *v)* payments via online banking. Electronic currency systems can be divided into *i)* smart card and *ii)* online cash systems. As the focus of this work is upon recent trends in online payments, the scope of this overview does not cover offline payment mechanisms such as cash on delivery. Also, certain aspects including aggregation are not covered in detail.

This section gives an overview of the characteristics of different online payment systems, briefly describing their features and initial comparisons among the systems. The discussion covers selected characteristics summarised in Box 1 focusing on applicability, ease to obtain, ease of use, and cost. Table 5 provides a summary of these characteristics for different payment systems.

Box 1. Selected characteristics of online payment systems

Applicability. Availability (point of sale coverage), payment size (*e.g.* micropayments, large sums) and destination (*e.g.* merchants, private persons).

Ease to obtain. Ease / complexity of registration.

Reliability/ease of use. Simplicity, ease and transparency of use by customers and merchants.

Cost. Distribution of costs between merchants and users; cost structure (*e.g.* fixed transaction charge or proportion of sales value).

Security. Customer confidence and economic sustainability, information transmission mechanisms from buyer to seller, security of information stored on client and seller equipment.

Liability. Legislative protection and provisions, coverage of potential losses.

Anonymity. Protection of personal information; tradeoffs between anonymity and traceability for payment support.

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[*]   There has been a great deal of innovation and turbulence in the provision of online payment systems and many of the early examples mentioned in the following text are no longer operational or have changed their operating strategies.

Figure 8. Classification of online payment systems
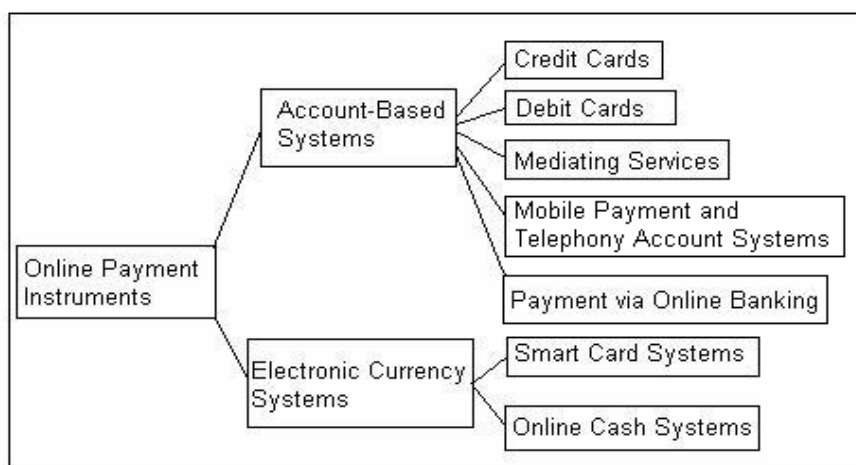
Source: OECD.

Account-based systems

Credit cards

Credit cards are widely used to pay on line. Initially there was relatively little adaptation of credit cards to online payments apart from additional security codes. But new, more secure features have been added to protect transactions. A major difference between online and offline payments is that in online purchases a physical copy of the card is not provided and the merchant does not obtain a signed, or similar, confirmation from the customer. Also, whereas all offline transactions are authorised this is not the case for all online purchases (especially with small businesses,) although authentication and verification technologies have increased the ability of accurately authorising transactions.

Characteristics

Applicability. The credit card system has a long-established network of users and merchants ensuring widespread applicability and a large user base for transactions of most kinds. However, fees for credit card operations for small payments are relatively high; a fact that makes credit cards a less-suitable payment system for micropayments. A potential way of adapting credit cards to micropayments is by using cumulative or aggregation payment solutions (see discussion on micropayments). Another limitation arises for person-to-person payments as a seller needs a merchant account with the credit card company to accept payment and this option may not be feasible for occasional transactions or small businesses.

Ease to obtain. One of the main advantages of using credit cards for online payment is that the customer does not need to obtain any additional hardware or software and there is no need for further registration with third parties. However, some segments of potential buyers may not be eligible for this payment method. For example, in the rapidly growing online games market, one third of game players are less than 18 years old. They may not have a credit card because minimum financial conditions have to be fulfilled (OECD, 2004d).[11] More importantly, in some emerging economies where credit cards are not widespread, the system may not be most suitable for online payments.

Reliability/ease of use. Payment systems are relatively easy to use provided users have experience with online transactions. The frequency of uncompleted transactions may serve as an indicator of ease of use. Some illustrative evidence comes from the Pago Platform that processed around 90 million

transactions in 2004. In their 2003 analysis of a large sample of their 2002 transactions one in three credit card transactions (32.5%) did not end in payment, and a main cause was the rejection of credit card information by the authorisation system (56% of failures). Possible reasons for a large share of these non-completions include mistakes in entering information, credit card number not existing, verification number incorrect, an un-issued number, unfamiliarity with verification numbers, and insufficient account funds, as well as a relatively small share of rejections due to possible fraud (9%). German online purchasers had a much lower rate of unsuccessful transactions (12.6%), but the distribution of reasons for non-completion is similar to the overall sample. These results are based on analysis of 3.67 million transactions that include representative online sellers from 29 different countries and buyers from 198 countries (Pago, 2003).[12] There were no major changes in 2003; analysis of 16.5 million transactions showed that 34.5% of worldwide credit card transactions did not end in payment (Pago, 2004).

Cost. The fee charged by the credit card company to the merchant ranges from 2-6% depending on geographical location, issuing bank, merchant category and sales characteristics (including size, the importance of national and international sales) (Pago, 2003), and there is usually a certain fixed fee for opening and maintaining a credit card account. Further, as non-completion of credit card payments appears to be relatively high, there may be additional costs (perhaps up to one third higher) for online stores. Even when the credit card transaction is authorised and concluded, the merchant may have to cover costs for payment reversals. Merchants generally bear the cost of "chargeback" if they do not have a customer transaction signature and these costs could prove onerous for smaller merchants.

Security and related issues

Since credit cards were not specifically designed as online payment systems, there are inherent risks associated with their use as such. Cardholder authentication has usually been handled through the provision of name, credit card number and expiration dates without further authentication.[13] In giving this information the online customer provides the merchant with information that could be used by others for online purchase if intercepted. Hence this information needs to be secured during transmission and on the receiving server. Moreover, an important share of online sellers store credit card information (Figure 9 gives a picture of the minimum share that store information for some time). To the extent that they keep financial data on their servers, additional requirements for secure Web site information storage arise to prevent misuse of financial information.

To prevent information interception during the transmission of credit card information, secure socket layer (SSL) service, which is widely used for a variety of security applications, is commonly used. SSL also allows verification of merchant identity via the SSL server certificate (see description of SSL below). Despite the availability of tools to verify and secure online transactions, a significant share of e-commerce sites (10%) may still lack protection mechanisms for the transmission of information (PwC, 2003), and some industries have significantly lower levels of implementation. Although these are general problems that apply also to other payments, they will largely affect credit card payments because of their very high use for online transactions.

Enhancing security. Credit card companies have taken numerous steps to address security concerns, and a number of complementary systems have been developed. Some such as SET[14] have not had a wide take-up, and currently the most important systems are one-off credit card numbers, MasterCard SecureCode and "Verified by Visa". The latter two protect an existing credit card with a password created by the user, assuring the user that only they can use their credit card when shopping online. The idea is to progressively have these more secure payments substitute simple credit card payments. An important step in this direction has been taken with the industry adoption of this payment technology as a standard. One-off numbers provide increased security, as any interception of information is rendered useless by once-only use. Although there may be extra costs, there are no significant network limitations as the credit card

network is used. An application is the ABN-AMRO e-wallet, which generates one-time credit card numbers. This is a special and not a general characteristic for e-wallets, which are encrypted storage mediums holding financial information; they make payment easier as data do not have to be re-entered (see PwC, 2003).

Figure 9. E-commerce Web sites storing customer credit card numbers in Europe
percent
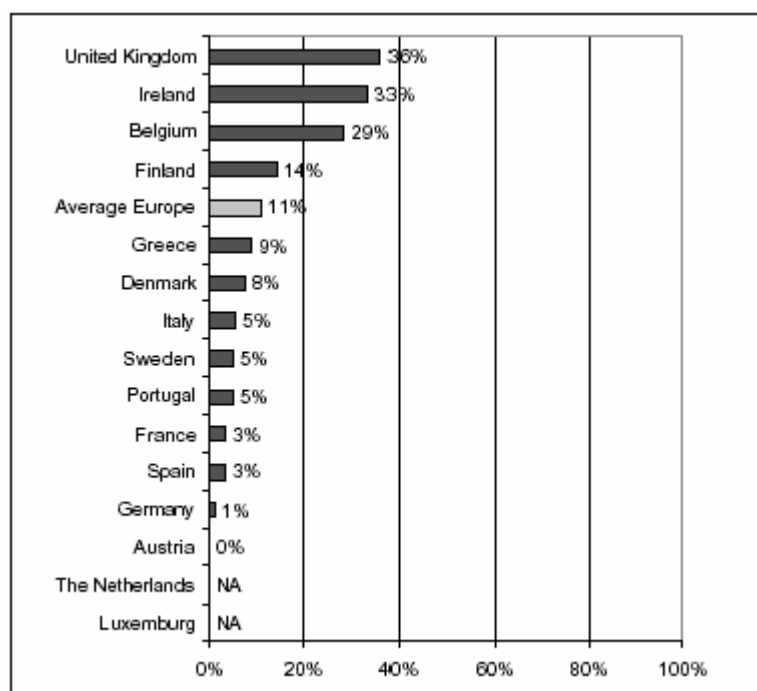
Source: PwC, 2003.

Verified by Visa is a system that connects the card owner for each transaction directly with the bank by using a personal password and a personal message verifies the bank connection. This double authentication increases payment security. Inscription for customers at their bank is relatively easy. Another important characteristic of the system is its payment guarantee: The higher frequency of payment cancellation in online payments often represents a significant cost to merchants.[15] With Verified by Visa the entire cost is borne by the credit card company, addressing merchant concerns over accepting credit cards. But at the same time, limitations for charge-backs mean that consumers face less favourable conditions under this system in comparison to simple credit card payments and lower costs for merchants is balanced against less flexibility for customers.

The programme has experienced a successful initial merchant uptake across all regions, although uptake on the consumer side has been weaker. In Canada all banks support Verified by Visa, and in Korea the programme has received official supported by the government, which selected it as a secure payment option. By 2004, more than 10 000 Internet sellers in Europe had subscribed to the system. Well-known businesses using the Verified by Visa system include flight operator British Airways, the major German mail-order house Otto, British food supplier Tesco, Spanish newspapers *El Pais* and *La Vanguardia*, and the European flight operator RyanAir. In Australia, South-East Asia and North America some important online sellers have subscribed to the service, and in the United States these included Walmart, Sony's Playstation and flight operator Northwest Airlines, although major online sellers such as Amazon had not.

Other developed mechanisms are 3D Secure/Verified by Visa and MasterCard SecureCode/UCAF. MasterCard's SecureCode provides a similar service to add protection against unauthorised online use of credit cards. Once the user has registered and created a private SecureCode, they are automatically prompted by the financial institution to provide the personal SecureCode in order to purchase online. The merchant will not receive information concerning the code. So far a significant number of banks and other merchants offer the service in the United States, United Kingdom and other countries, including British Airways, Continental Airlines and Reebok.

Liability. The range of payment systems falling under legislative protection differs widely across countries. In Denmark, for example, legislation covers all payment cards; in comparison, in the United States the most important protection is for credit cards, as risk is carried by card providers (OECD, 2002a). Hence, in some countries consumers wishing to use alternative payment means to avoid transferring credit card information over the Internet may give up considerable credit card-related consumer protection guarantees by using these means. According to various industry specialists, the chargeback option is one of the key advantages of credit cards over other payment systems, and alternative payments often do not provide it. On the other hand, many of the alternative payments are offered by third parties, who may provide strong protection of consumer information, and are becoming more competitive in their chargeback strategies for both consumers and merchants.

Anonymity. Generally, using a credit card means paying via an identifiable account and thus losing anonymity. However, credit card payment schemes exist where the client receives "virtual" credit card account numbers, which are specific to individual transactions. In this payment process, the identity of the buyer is hidden from the seller and only the buyer's bank retains a record of the buyer. As the buyer's customary credit card number is not given to the merchant this provides an additional level of security. Citibank US offers this service free to its customers and additionally offers USD 0 liabilities on unauthorised charges for consumers if they pay via this service.[16]

Debit cards

Debit card payments are directly withdrawn from the bank account and not from an intermediary account in contrast to credit cards. This can make it difficult for consumers to handle a dispute/charge-back, since there is typically no extra protection of the funds in a debit account. Once the funds have been withdrawn, they are harder to refund than with a credit card. Also, for debit payments a physical card and/or providing a card number is often not necessary; an account number may be enough. Apart from these differences, the payment mechanism is comparable with credit card transactions.

Characteristics

Debit cards have a significant user spread, which in most countries is higher than the number of credit card users depending on financial regulation and conditions attached to credit card issuance. However, debit card payment is generally not as widespread on merchant Web sites as credit card payment, their application is mostly limited to national payments, due to the national structures, operations and regulation of banking systems, and they do not address the demand for international payments. Furthermore their cost structure (as for credit cards) is not most suitable for realising one-off micropayments. It is again essential to provide SSL for the transaction as well as for merchants and consumers to take the necessary security precautions (see details above). Banks frequently impose stronger identification requirements for debit payments and their overall security has been found to be higher than for ordinary credit card payments (see *e.g.* PwC, 2003).

Debit card holders are less well protected in terms of legislation than credit card holders (OECD, 2002a). For example, there is a lack of specific protection in case of un-delivered goods or services,

notably in the United States, Austria, Canada, Greece and the United Kingdom. Furthermore, as this is an account-based payment card, it does not usually allow for anonymous payments.

Mediating services

These mechanisms employ traditional payment means and add a further layer to it. To be able to use the service, it is necessary to register providing credit card or bank account details as the source of payments. A very successful mediating service for online transactions, beginning in the United States, is the PayPal payment option. To pay, buyers only need to know the seller's e-mail address, which is verified and linked to a PayPal account. The payment will be debited from the buyer's personal PayPal account. No further financial information is transmitted to the seller. Another mediating service is the German FIRSTGATE Click&Buy. By 2005, more than 3 500 industry content providers of media, publishing, research, music, and online games with more than 5 million customers used the payment system. Further, the payment system has become increasingly internationalised, notably with the development of the Click & Buy Alliance that connects major telecommunications providers, ISPs and financial institutions.[17] Click&Buy has been licensed by British Telecom in the United Kingdom and Ireland, and by SWISSCOM in Switzerland and TelMex in Mexico. In March 2003 FIRSTGATE Click&Buy was introduced to the US market. Other important mediating payments options are offered by mobile service providers (see below).

There are differences in pricing structure, in whether or not both parties have to sign up for the service and other such characteristics across providers. Some systems allow paying from the personal bank account and are bank-related offerings (*e.g.* Italian Bankpass Web[18] or Japanese Inter Debit and Net Debit[19]), whereas others may require pre-funding an account with the service provider. For example, the United Kingdom has several online account-based e-payment services, used for person-to-person payments and sometimes by businesses to offer customers a means to pay online. Examples are Moneybookers, NatWest FastPay, NOCHEX, PayHound and Yahoo! PayPal launched UK service in early 2004.

Characteristics

Applicability. Mediating services provide satisfactory payment methods for purposes such as online auctions; they allow person-to-person transfers without the seller having to register as a merchant (as required for accepting credit card payments). As mediating services rely on established payment networks, they benefit from an already existing network. The payment function can also increasingly be used in other areas, *e.g.* for some dotcoms, to pay taxes in certain countries, to provide gift vouchers, online music sales, etc.[20] In the example of PayPal both seller and buyer require an account with the service, and the size of the user network is important. Only a few mediating services seem to have overcome this obstacle, for many providers it persists; even PayPal faces a restricted network outside auction-related (*i.e.* eBay) payments and outside of the United States.

Ease to obtain. Consumers have to sign up for the service, but charging the account does not involve major efforts as existing credit cards can be used. However, it means establishing an extra relation with an additional provider and can be used only after registration for online purchase. But a key advantage for sellers is that they can obtain an account easily and do not need to create a merchant account. This is the essential feature of the PayPal payment option that explains much of its success. It renders the service particularly attractive to small and medium sellers; the payment system is thus capturing a niche market rather than providing a general payment option.

Cost. The PayPal system is free of charge for buyers and earns revenue from charging merchants. It charges a rate of 2.2-2.9% and a flat fee of USD 0.30 per transaction. To make its cost structure more attractive for micropayments in the digital music sector, the company charges a rate of 2.5% plus

USD 0.09 per transaction (Navraine, 2003). However, the fixed component in the payment structure is a major cost disadvantage for competition in the micropayments sector.

Security. Centralised account systems can, in principle, support only limited technical security above that of the established payment networks on which they are based, because their advantage over other payment instruments (easy registration procedures) may be lost if stronger security measures (strong authentication) were implemented on top of the established payment networks. In order to enhance security and be able to deal with "phishing", identity theft and other criminal activity, providers have planned two-factor authentication at the domain level, *i.e.* authentication methods that include a hardware token. It depends on the exact features whether this will render the payment process more complicated.

The main security features of the system are the following: In contrast to debit and credit card payment, financial information stays with the service provider and is not transmitted to every seller. Because both buyers and sellers have frequent transactions with PayPal rather than with individual merchants or buyers there are incentives on both sides not to defraud, to ensure future benefits of making/accepting payments through the service. This, however, supposes in particular that sellers cannot create multiple identities.[21]

Anonymity. As the buyer has to register with the service there is no inherent anonymity in the service. The provider may be storing and using the information provided, for example if there are close relations between the mediating service and a merchant site.

Mobile payment and telephony account systems

Mobile payments are payments conducted through wireless devices. They may be used to conduct payments for example via a bank account or via the telephone bill.

Mobile banking. GSM/SMS systems are used for contacting and effecting payments with the bank (m-banking) as alternatives to PC-based systems. A further method is to make use of WAP for e-banking applications. In the Postbank-O2 mobile banking payment Postbank customers are provided with WAP telephones based on pre-paid subscription to access an m-banking application.

Bank-based mobile mediation services. An example of a mass-market mobile phone payment method is Paybox using GSM phones.[22] Internet transactions and payments to other GSM phones are possible. The client enters the mobile number together with the amount to be paid and confirmation takes place with a personal Paybox PIN. An automatic reply from Paybox acknowledges the payment. The amount is debited from the customer's bank account.

Telephony for payment. There are two different ways in which telephony accounts are used for payment: *i)* "premium rate" models and *ii)* "direct transfer" models. In the "premium rate" model the customer pays a higher rate for the service, which is then passed on to the merchant by the telephony operator. Payment occurs by phoning a special number the merchant has installed with an operator, by sending a particular code by SMS, by voice contact, or by dialup to access content on a site and the user is charged by the minute for using the site. The direct transfer models consist in charging the telephony account directly for payment. This is often done by installation of specific software by the operator that offers the payment option. It can be used to debit the consumer's account to pay another account (see PwC, 2003).

Characteristics

Applicability: *mobile payments*. These systems may be widely applicable due to the very impressive growth and high penetration of wireless access compared to other telecommunication infrastructure

(OECD, 2004a). Mobile device systems are being developed for small offline payments (transport tickets, parking fees) as well as for online e-commerce purchases. Mobile payments are potentially attractive for e-commerce merchants because of the large mobile phone user base and installed billing and payment systems. An example of a mobile payment means is Paybox in Austria, which provides a variety of services ranging from secure Internet shopping, to paying for hotels, to purchasing parking tickets. Mobile payments are also becoming increasingly common for buying mobile content. Additionally, young people, who are important purchasers of digital content (*e.g.* ringtones and games), may not have a credit card. So paying via the mobile phone bill or prepaid cards may be their only available payment option (OECD, 2004e). However, mobile payment systems have encountered difficulties gaining a sufficient user mass for a variety of reasons. Paybox, for example, now only operates in Austria, and has discontinued attempts to operate in other countries.

International mobile payments remain a challenge, and it is currently uncertain whether such payment options will be available in the near future. Simpay, a payment service association set up by Orange, Telefónica Moviles, T-Mobile and Vodafone in 2003, was an attempt to create a unified European m-payment system for micropayments and international payments (OECD, 2004e). However, the venture failed as intense competitive rivalry among founding companies resulted in disagreements on the scope and applicability of a common system and members started to develop individual systems. As a result, a possible future outcome may be separate, more complicated and costly m-payment options. Alternatively, other payment options may substitute this option altogether (EurActiv, 2005).

Applicability: telephony systems: To take one example, the T-Pay system of Deutsche Telekom provides different payment possibilities for consumers: Internet payments can be undertaken by charging the phone bill or by phoning a special number; additionally it is possible to pay by credit card or debit card and with MicroMoney, an electronic money card that allows anonymous payments. With this business approach the telephony account system widens potential applicability provided that it receives wide merchant adoption.

Ease to obtain. The ease of obtaining mobile payment systems differs. Ringtones or online games can often be downloaded and paid for via premium SMS or premium call. However consumers may not know how to use mobile phones for online payments, and easy processes and detailed explanations may be important for widespread adoption. For specialised payment services that are separate from the mobile operator (*e.g.* Paybox), prior registration is necessary.

Cost. Costs differ across telecommunication service providers and systems. Mobile payment options are still emerging so current cost structures are not good indicators of actual prices especially as scale economies are likely with further developments.

Security. Security characteristics differ across services. As a general aspect for mobile phones, they offer additional possibilities for customer authentication, specifically SIM and PIN. For specialised payment services, security is assured via multiple measures; a personal PIN, the phone number and the mobile phone (*i.e.* the SIM card) itself – are all necessary for payment. Furthermore, the connection between the handset and the base transceiver station (BTS) is encrypted.

Anonymity. Payment takes place either via the telephony or another account. Storing and tracing consumer information and spending is thus possible. Mobile phones with pre-paid accounts may offer greater anonymity. However, in many countries users are required to register to use pre-paid accounts.

Payment via online banking

Use of e-banking for online payments is not widespread across OECD countries. However, for three EU countries (Finland, Portugal and the Netherlands) online banking payment appears to be important according to their Web site availability (see Figure 6) and it appears to be growing in availability and use in Northern Europe particularly. A number of Electronic Bill Presentment and Payment (EBPP) systems are available; examples are Nordea Solo (Finland) and Telecast (France). However, apart from adoption in Nordic countries, in most countries they are only marginally used. E-banking enjoys widespread use in the United States, in particular among early adopters of the Internet and online services.

A number of online payment systems have been developed in Europe, especially where offline bank transfers are already well established. The most common and easy to use include: online banking transfers where the account holder is redirected to the bank's Web site by the merchant site to effect payment. Other options are: *i)* electronic and mobile banking which have more advanced features, for example, schedule payments and *ii)* EBPP, where instead of having to enter all transaction details manually, these are automatically entered from the electronic bill and the payer only authorises. The EBPP provider (either bank or third party) establishes contracts with the organisations whose bills it can present electronically (*e.g.* utility companies) and will send in the bills the buyer has authorised.

Characteristics

Applicability. Online banking has grown rapidly in some countries as payment systems are in place and familiarity is very high so that there is potential for further applications and merchant use. However not all countries have frequently provided online banking options (see Figure 6). This suggests that other factors such as industry co-operation, privacy and security concerns, and cost-benefit analysis as well as payment habits have to be favourable for widespread use. An important issue is whether merchant and customer banks need to be the same, a fact that would require merchants to have accounts with a range of banks. Cross-border payments and micropayment are challenges to established banking payment systems, an important reason being the large overhead and transaction costs that are charged.

Ease to obtain. Obtaining the online payment option via online banking is straightforward as the possession of a customer account and subscription to online banking automatically allows use for on-line payments provided that merchants accept them.

Cost. For merchants setup costs are relatively low as the payment is effected via the bank's payment facilities and they do not need to install particular payment services and security devices. Also, the system allows existing networks to be used and does not require the creation of a new one. Important merchant costs may be entailed if merchants need to set up arrangements with a wide range of banks, but costs can be contained if banks co-operate or provide similar systems to allow scale economies.

Security. Banks have frequently implemented supplementary security provisions beyond the standard use of a password and PIN. One development is the use of one-off passwords for authentication, which cannot be re-used. E-banking also often applies multiple authentications to improve payment security – the consumer has to provide several confidential pass codes to access a personal account. Compared with alternative hardware systems, these are relatively low cost solutions.

The online payment option may be integrated into the shopping process, but it may also be used to pay after the purchased item has been received. This provides additional security to buyers and its availability may encourage consumers who distrust online shopping to purchase on the Internet.

Electronic currency systems

Smart card systems

In the early stages of the online payment market new products such as Cybercash or DigiCash, were proposed (OECD, 2000). However, they had little success and most of these instruments have disappeared. Currently, smart card-based systems are most commonly used to pay small amounts within organisations (*e.g.* vending or copying machines). They usually rely on specialised hardware and dedicated smartcard readers for authentication.

Online cash systems

A number of online cash systems designed for online purchases such as Virtual BBVA clic-e[23] (Spain) have been implemented, and there are similar payment mechanisms in Italy,[24] Austria[25] and Australia (*e.g.* PAY offered by SNAP). Online cash systems are software-only electronic money instruments based on "signed" money. They usually work via prepaid cards, and arrangements differ although most require merchant subscriptions. Electronic tokens representing a certain value are exchanged in a similar way to cash.

Characteristics

Applicability. The user base for new electronic currency systems is initially necessarily small. Often only a few merchants accept the new payment means so that it is not perceived by consumers to be a payment option. However, these systems can be built on widely available networks. For example, the prepaid cash system of the Italian Moneta Online offers a temporary Visa card that permits buyers to pay on merchant Web sites where there is Visa card acceptance. The question is, however, whether this is a feasible business model for new payment system providers. Consumers have to perceive an advantage in this system over available alternative options.

Cost. There are different costs for prepaid card and smart card systems. Prepaid accounts such as scratch-cards have physical card and distribution costs as well retailer commissions. For smart cards there are additional installation costs for consumers, as specific software and hardware are generally necessary for online use. Both electronic currency systems may also require large databases to prevent abuse such as double spending, adding a further overhead cost. Overall, these systems potentially have large transaction costs that may limit their use in some applications.

Anonymity. Electronic currency systems potentially allow anonymity in the same way as paper currency in offline transfers. However, providers may require consumer registration and undermine the potential for anonymous payment of these systems.

Box 2. Consumers and online payments – a German survey

Online payments are not currently surveyed in detail in internationally comparable official consumer surveys. For non-official surveys there are many differences including questionnaire phrasing, sample selection and other methodological issues, and questionnaires with simple "yes" and "no" options often do not provide adequate insights into consumer behaviour. Furthermore because payment system availability and use are very diverse across countries, national results cannot be generalised to all OECD countries. For a recent overview see also OECD, 2005b.

However, a series of German surveys based on a large number of online respondents provide a detailed overview of online payment behaviour and consumer attitudes in Germany (Krueger, 2004).[26] Survey results include:

Mobile payments: In the experience of respondents, mobile payments were not generally available at merchant sites. Not all respondents were fully convinced of the security of this payment method. However, the possibility to use the payment from anywhere was considered important, and many respondents saw the payment process as simple and fast and found it useful.

Online banking: Many respondents found this a widely applicable payment option, and emphasised that online banking enables more control of transactions. For non-users, some respondents mentioned perceived lack of security as a factor.

Credit cards: A large majority of consumers found this method to have wide applicability providing an easy payment option. Various respondents who had not used credit cards said that the timing of account debiting and security concerns were major reasons for non-use.

Billing system: Consumers did not find this payment option on many websites. Many who said they did not use these systems mentioned that they would need to invest time to consider the advantages among other reasons.

Prepaid systems: Limited availability of this payment option was an issue. There was also uncertainty with respect to the security of this payment option and many found they were not financially secured with the payment method.

Horizontal issues surveyed:

Consumers preferred using the payment option they had already adopted to trying other payment options. Reasons may be that they were unwilling to invest time to consider other payment systems or that they simply did not find any inconvenience with the payment system they were using.

The timing of payment compared with receipt of goods seems to be an important factor, explaining the success of offline systems such as cash on delivery.

Consumers did not find the possibility to pay large/small amounts was a major problem for any payment system.

When asked what should be done to make Internet payments more attractive, respondents most frequently mentioned legal safeguards and more information on liability in case of product damage, suggesting that consumer protection issues are important. Other aspects mentioned were standardisation and simplification of Internet payment methods.

Source: Section for Money and Currency, Institute for Economic Policy Research, University of Karlsruhe.

Micropayments

Micropayments for transactions under EUR 5 are of growing importance for purchase of low price items, and small payments of less than EUR 1 for instance for newspaper articles, are currently increasing.[27] Other examples include digital content such as single music tracks, single games play, press articles and academic papers. There is evidence of a rise in supply of low-priced online content, and according to Gartner, 44% of retailers affirm they have goods and services to sell if micropayment systems existed, and users are increasingly willing to pay for low-cost Internet content.[28] However, this is still a developing market.

A central issue in developing micropayments is that traditional systems were originally designed for relatively large payments. For example, credit cards have a fixed transaction fee combined with a percentage of the transaction cost and are expensive for micropayments. Typically, the costs of micropayments are in the range of 30-40% of the purchase value. New mediating services are beginning to recognise the potential importance of micropayments, and specific tariffs are offered for digital content (*e.g.* PayPal tariffs for individual music downloads). PayPal is one of the leading micropayment firms together with Bitpass, Peppercoin, Opass and Payment One.

Different micropayment systems

There are a large number of competing micropayment systems including: *i)* direct-to-bill, *ii)* aggregation (to form a single larger transaction), *iii)* pre-paid accounts and *iv)* direct transfers.

Direct-to-bill. A proposed payment solution is direct-to-bill payment via telephony. An example is the Vodafone/T-Mobile m-Pay Bill, which is intended for small transfers. It allows either to charge the telephony bill or to debit from pre-paid credit. Another system is the Coinlet system by Portalify (Finland), which provides for premium-rate SMS and voice. Such payment systems are not widely offered as yet and frequently do not permit international payments.

Aggregation. Cumulative collection/aggregation services are a frequently used development (Paunov and Vickery, 2004). Individual transaction expenditures are summed once a month for payment. This service may be offered by a micropayment organisation connecting to a range of merchants. Examples are Cartio Micropayments and Clickshare, similar payment systems have been introduced in Germany (FIRSTGATE Click & Buy and Micromoney) and Denmark.[29] An alternative option is to add the cost of transaction to existing monthly bills (usually telephone bills). A further mechanism consists in merchants themselves aggregating consumer expenditures.

Prepayment. Prepaid systems also have potential for micropayments (*e.g.* Paysafecard[30] and Micromoney in Germany). The card is for one time use only and contains no other information than a 16-digit PIN concealed under scratch foil. New Zealand with Payex has also developed these kinds of instruments. However none of these payment mechanisms have been widely taken up.

Prospects

There are challenges for the future development of micropayment systems. So far, the two major online payment system providers, credit card companies and banks, have not identified this market as a priority and profit margins are generally low. For payment provider Visa, existing aggregation models provide a micropayment solution and so far no alternative business model to support investments in micropayments systems has been developed. According to the company, aggregation models present an optimal solution to consumer demands.[31]

Other established providers, including telecommunication service companies, may become more involved. They have long-standing experience in micropayments, as phone calls in essence are micropayments. Some (*e.g.* Deutsche Telekom) have decided to become providers of online payment systems (see T-Pay discussion above). However, other mobile telecommunications providers are still exploring the role they want to play in this market. For European companies, this may partly be related to the direction of the E-Money Directive (see below). Another challenge is that it has been difficult for payment system providers to gain a wide user spread and a number of systems have failed.[32] Finally, there are no common micropayment platforms that allow interoperability of different systems across national borders; the failure of Simpay (see above) suggests that for m-payment solutions this will persist.

Further, there is an advantage for merchants to have consumer subscriptions rather than one-off payments. These provide more stable income flows to merchants and increase knowledge of customers and their purchasing habits. Consumers could benefit potentially if the result is more customised offers. At the same time, privacy issues arise. The advantages of aggregation services for payment providers (*e.g.* credit card systems) and merchants mean that there is less market pressure to develop alternative micropayment options.

It is projected that the "direct-to-bill" option via mobile phones will grow rapidly. For Internet-based solutions it is expected that aggregation-based systems will grow in importance along with prepaid payment options (see Figure 10 for the United States). However, given the current weakness of prepaid solutions (apart from mobile prepaid payments), it remains to be seen whether these will develop. Aggregation/cumulative account systems and mobile solutions[33] may become dominant systems.

Figure 10. Evolution of Internet and mobile micropayment revenues in the United States
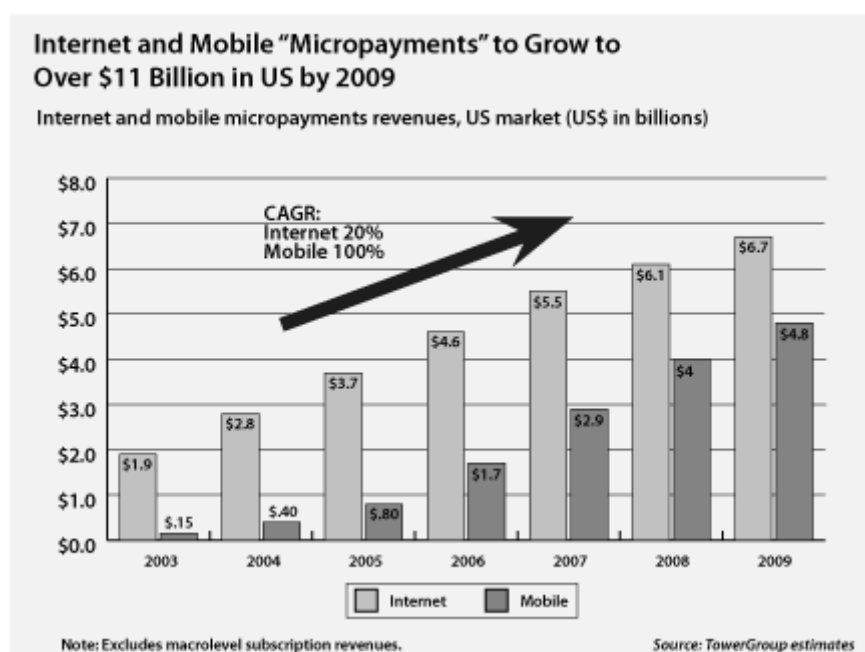
Source: Tower Group (2004).

International electronic payments

Credit cards are the almost exclusive payment mechanism for international payments. Many alternative payment systems are not usable across borders. A recent US study found that end users and financial service providers consider cross-border payments to be costly and cumbersome and that there are few incentives to develop faster and lower cost systems. Moreover, the small volume (1-2%) of US cross-border payments relative to domestic payments is a significant challenge to establishing a critical mass that will lead to decreasing marginal costs for such services (Federal Reserve Bank of Chicago, 2004). However B2C (and particularly B2B) cross-border payments are relatively more important in smaller national markets and recent evidence suggests that international e-commerce is growing.

Additional services offered by payment providers

Intermediaries increasingly provide partial or complete services to merchants to deal with e-commerce payment and related issues.[34] These include technical solutions for online payments and

ensuring transaction security, and also providing services so that smaller merchants can accept a variety of payment systems.

Some payment systems also offer consumer protection. Mediating service provider PayPal offers a Money Back Guarantee that allows buyers to return merchandise and be reimbursed. Online payment services may give buyers an option to have additional protection in the event of dispute, reimburse dissatisfied buyers or provide insurance against fraud, and it has been suggested that mediating services may have a relative advantage to resolve disputes between buyer and seller (Sorkin, 2001).

Security for online payments

There are two main systems for transaction security, secure socket layer and secure electronic transaction (OECD, 2000).

Secure Socket Layer (SSL)

SSL is the widely used secure service system and is an important measure to establish trust between online seller and buyer (OECD, 2005b). Encryption and decryption allow secure transfer of information between an Internet browser and server (*i.e.* between buyer and seller). Data cannot be intercepted or changed during transmission. SSL also permits merchant identification through SSL server certificates. The SSL standard has been widely adopted because it is relatively simple and easy to use and does not place excessive demands on the average consumer's home PC, while at the same time reducing major concerns about the public nature of the communication infrastructure.

SSL has an over 90% share of security measures, about the same as credit cards among online payment systems. According to Netcraft's SSL survey, in July 2004 there were 305 000 secure servers in the OECD area (Table 4), an increase of about 47% since 2002. The data have been weighted by population in order to facilitate cross-country comparisons. However, there are limitations to comparability as there is a higher degree of centralised use of secure servers in some countries than in others (OECD, 2005b). Until recently, SSL provided services exclusively for fixed networks. But as mobile networks are increasingly important e-commerce markets, SSL services for wireless devices have been developed. For example, since July 2004, GeoTrust offers SSL certification to ensure secure access to Web-based applications from mobile wireless devices (OECD, 2005b).

Table 4. Secure servers in the OECD area

	Secure servers July 2002	Secure servers July 2003	Secure servers July 2004	Per 100 000 inhabitants July 2002	Per 100 000 inhabitants July 2003	Per 100 000 inhabitants July 2004
Australia	4 693	4 830	8 079	23.8	24.5	40.9
Austria	949	1 073	1 590	11.8	13.3	19.7
Belgium	439	512	912	4.2	5.0	8.8
Canada	7 768	9 378	15 166	24.7	29.9	48.3
Czech Republic	185	213	315	1.8	2.1	3.1
Denmark	660	890	1 681	12.3	16.5	31.2
Finland	744	870	1 255	14.3	16.7	24.1
France	2 511	2 646	3 799	4.1	4.3	6.2
Germany	7 987	7 912	13 163	9.7	9.6	16.0
Greece	170	181	270	1.6	1.7	2.5
Hungary	86	122	199	0.8	1.2	2.0
Iceland	136	170	249	47.3	59.1	86.6
Ireland	579	701	1 201	14.8	17.9	30.7
Italy	1 167	1 327	1 977	2.0	2.3	3.4
Japan	7 179	10 513	19 610	5.6	8.2	15.4
Korea	562	623	878	1.2	1.3	1.8
Luxembourg	97	104	184	21.7	23.3	41.2
Mexico	324	379	605	0.3	0.4	0.6
Netherlands	1 332	1 723	3 595	8.2	10.7	22.3
New Zealand	983	1 124	1 668	24.7	28.3	42.0
Norway	528	666	1 122	11.6	14.7	24.7
Poland	373	382	557	1.0	1.0	1.5
Portugal	214	286	443	2.1	2.8	4.3
Slovak Republic	38	47	61	0.7	0.9	1.1
Spain	1 315	1 764	2 745	3.2	4.4	6.8
Sweden	1 246	1 437	2 826	14.0	16.1	31.7
Switzerland	1 555	1 769	2 826	21.2	24.1	38.5
Turkey	400	432	855	0.6	0.6	1.2
United Kingdom	10 288	11 714	20 339	17.4	19.8	34.4
United States	106 884	120 661	197 769	37.2	42.0	68.8
OECD	161 392	184 449	305 939	14.1	16.1	26.7

Source: OECD, 2005b based on Netcraft surveys (www.netcraft.com).

Secure Electronic Transaction (SET)

SET is an alternative, more complex security system based on digital certificates and signatures.[35] SET needs specific software and is more difficult for cardholders to obtain and use, and despite the high level of security offered it has not gained widespread use.

Provision of security information

In contrast to offline transactions, online commerce does not involve personal contact during the payment transaction, and the quality and level of information provided to consumers matter to a greater extent. However a recent survey of European Web sites found significant information shortcomings for e-commerce Web sites, and a significant number of them did not provide comprehensive information on transaction security measures adopted, nor measures to educate consumers (PwC, 2003).

Network security

More generally regarding network security, because of the ubiquitous nature of the Internet and potential threats to and vulnerabilities of the networked world, governments and businesses have become increasingly aware of the need for a culture of security among all participants to protect national and international systems and networks. The 2002 OECD *Guidelines for the Security of Information Systems and Networks* is one example of these concerns and the response suggests nine principles for participants: *i)* awareness, *ii)* responsibility, *iii)* response, *iv)* ethics, *v)* democracy, *vi)* risk assessment, *vii)* security design and *viii)* implementation, *ix)* security management and reassessment. The role of private industry is critical to promote this culture of security, as they build, maintain and use the networks upon which information is shared and used, such as payment systems (OECD, 2002b).

Summary

Although there is a large range of online payment systems, credit cards for payment and SSL for security are dominant. However, there are significant differences across OECD countries, and other payment methods are of importance in some countries. Innovative new payment options have not often succeeded in replacing established ones. Particular niche markets are also the exceptions, most notably the auction market where mediating service provider PayPal established itself. The area of micropayments has seen a range of developments but none has achieved sufficient reach and practicality to substitute the more prevalent subscription systems as the payment option.

A central challenge for payment methods is to provide authentication mechanisms that allow both secure payments and convenience of the transaction process. A number of new solutions, such as Verified by Visa have been proposed or are being developed (*e.g.* by PayPal). As mobile phones provide additional authentication possibilities without the need for additional hardware, this gives them some advantage in developing secure and convenient payment systems.

Credit cards for online payments have a large user-base and benefit from familiarity and simplicity of use and also allow international payments. Security is being addressed via new modified credit card payment solutions. Micropayments have not been extensively addressed, in part due to potentially high transaction volumes compared with low cash value. Debit cards are an alternative payment system, especially where they previously enjoyed popularity for offline payments and where they enjoy a broader user-base on the consumer side. However, they cannot be used in international payments in the majority of cases. Further, debit cards are not currently suitable for micropayments. Mediating services can be used for person-to-person payments, and cost savings in clearing processes may allow them to become a cost-efficient payment means.

Using mobile devices for payments has major potential due to the very large user base and familiarity with mobile phones and billing systems. Costs are potentially low (payments added onto an established payment system), security can be established with extra personal pin-numbers, and micropayments can simply be aggregated into overall payments. Challenges exist in relation to international payments and there is the question to what extent new intermediaries (mobile operators) can act as financial intermediaries. Electronic banking systems have a large user base and established network, and banks have well-established procedures and security systems for online banking. International payments and micropayments remain challenges and the relatively low offer of e-banking for online purchase in several countries suggests that these systems still need further development to become widespread payment options. Electronic currency systems have not had high levels of uptake despite their potential for small and varied payments and anonymity; however, overcoming network and cost constraints pose significant challenges.

Early business Information Interchange efforts

- After a decade of fragmented attempts at setting broader EDI standards, industry groups decided to make a major effort to create a set of cross industry standards for electronic components, mechanical equipment's etc

- 1979 – (American National Standards Institute) ANSI chartered a new committee to develop uniform EDI standards called Accredited Standards Committee X12   - (ASC X12)

- 1987- United Nations published its first standards under the title EDI for Administration, Commerce and Transport / Trade (EDIFACT or UN/EDIFACT)

EDI

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 pertinent 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 business to better cope with a growing use of paper work: purchase orders ,invoices, confirmation notices ,shipping receipts, and other documents.

Many industries see EDI as essential for reducing cycle times ,order fulfillment times.

Definition: EDI is the electronic transfer, from one computer to another computer processable data using an agreed standard to structure the data.

EDI layered Architecture

EDI architecture specifies four layers:

the semantic (or application)layer,

the standards translation layer,

the packing (or transport) layer,

the physical network infrastructure layer.

EDI semantic layer: Describes the business application that is driving EDI.

For a procurement application, this translates into requests for quotes, price quotes, purchase orders, acknowledgements, and invoices. This layer is specific to a company and the software it uses.

EDI standards layer: This layer is responsible for changing the data format to a standard which both the end firms interchanging the data can understand.

It specifies "business form" structure and to some extent influence content seen at the application layer.

For instance purchase order name field in an X12 standard might be to hold 50 characters. An application using 75-character field length will produce name truncation during the translation from application layer to document standard layer.

EDI Layered Architecture Contd…

EDI transport layer: Corresponds closely with the non electronic activity of sending a business form from one company A to company B. Ex. Sent via post, registered mail, certified mail, private carrier (UPS) or simply fax. More and more, the EDI transport carrier of choice is becoming e-mail.

EDI physical layer: The layer actually supporting for the transmission of information through Dial-up lines, Internet and I-way.

EDI Semantic layer	Application level services
EDI Standard layer	EDIFACT business form standards ANSI X12 business form standards
EDI transport layer	Email and X.435 ,MIME POINT TO POINT, FTP ,TELNET,WWW,HTTP
Physical layer	Dial –up lines, internet ,I-way

EDI in Action: The Idea behind EDI is very simple.

EDI seeks to take a manually prepared form or 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 recipients 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.

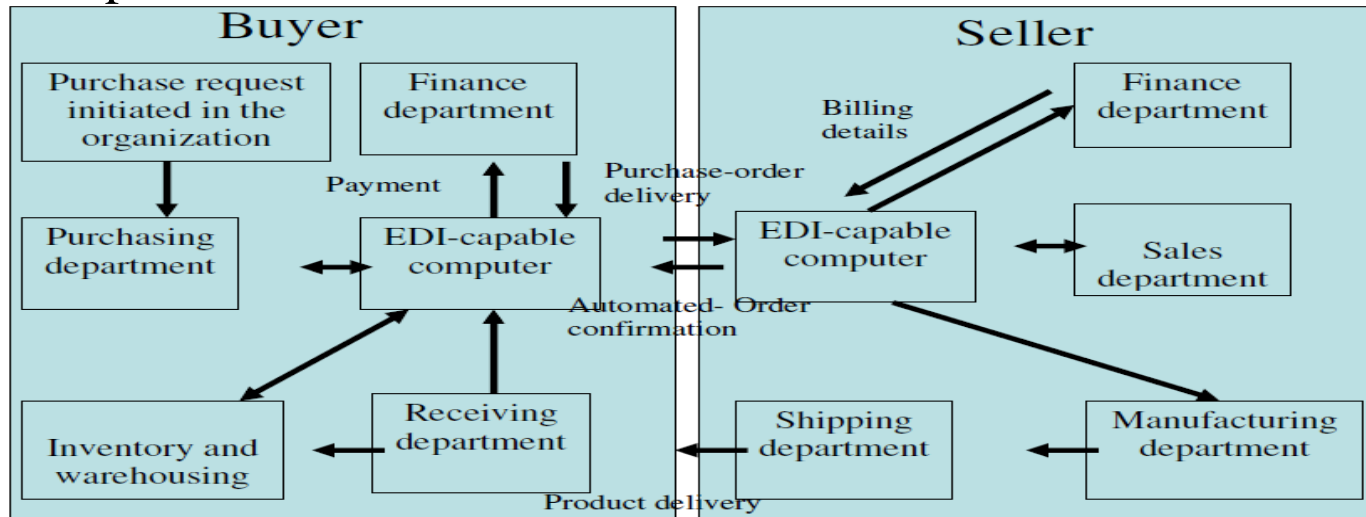Eg: Universities use EDI to exchange transcripts quickly.

EDI

The following figure shows the information flow when papers are shuffled between organizations via the mailroom.

Information flow without EDI
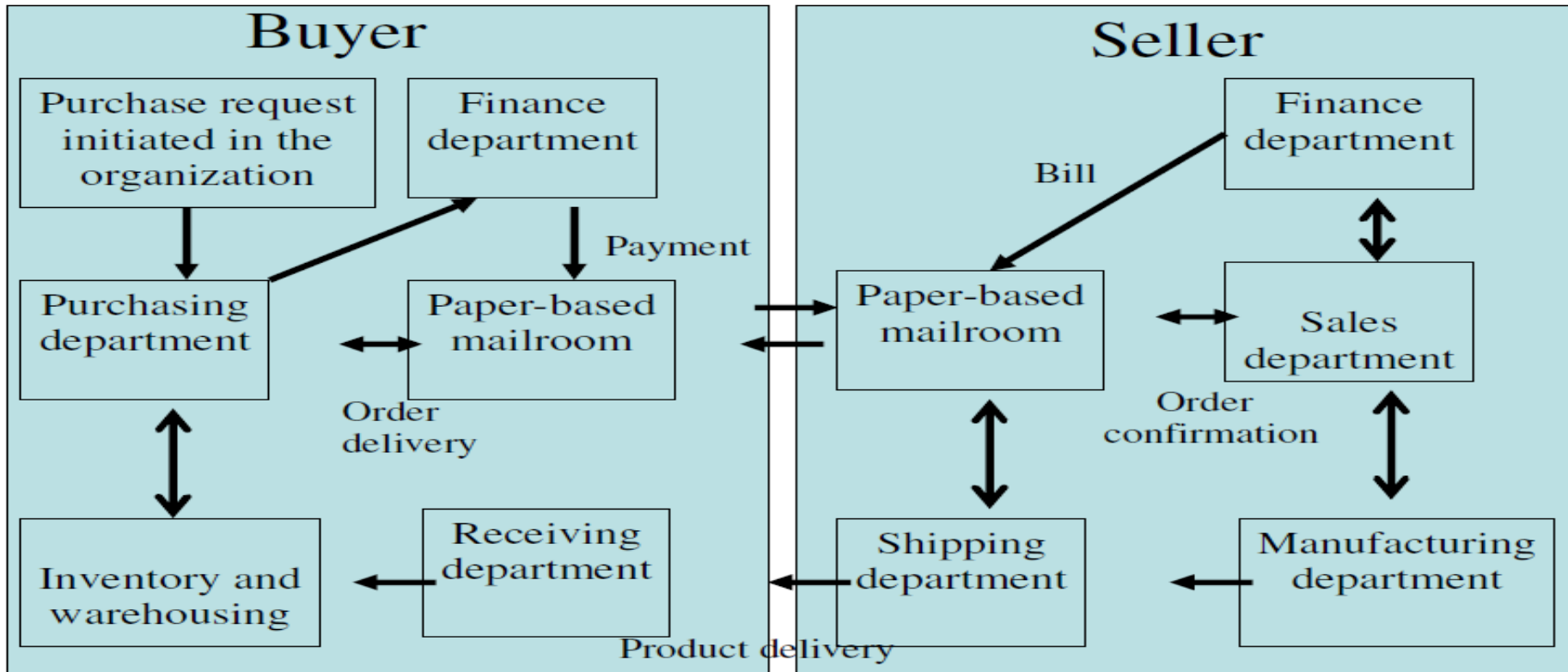
EDI can substantially automate the information flow and facilitate management of the business process.

Information Flow with EDI

The EDI Transaction for a purchase, shipment and payments are as follows :

1. Buyers computer sends purchase order to sellers computer

2. Sellers computer sends purchase order confirmation to buyers computer

3. Sellers computer sends booking request to transport company's computer.

4. Transport companies computer sends booking confirmation to sellers computer

5. Sellers computer sends advance ship notice to buyers computer.

6. Transport company' s computer sends status to sellers computer.

7. Buyers computer sends receipt advice to sellers computer.

8. Sellers computer sends invoice to buyers computers.

9. Buyers computer sends payment to sellers computer

EDI is used as a strategic tool that enhances completeness of companies involved. It speed ups business processes.

Tangible benefits of EDI are:

1.Reduced paper based system: EDI can reduce the effort and expense, a company devotes for maintaining records and others even it can reduce time spent for processing and reduce postage bills too.

2.Improved problem resolution and customer services: EDI can minimize the time companies spend to identify and resolve inter business problems. Ex: such problems come from data entry errors. EDI can improve customer service by quick transfer of business documents and a marked decrease in errors.

3.Expanded customer / supplier base: Many large manufactures and retailers are ordering their suppliers to institute an EDI program. EDI can make the suppliers to have an easy and permanent communication to customers

EDI APPLICATION IN BUSINESS :

It involves various of applications in business

i. International Trade, The components of international trade, The customs and international trade and The logics of transport.

ii. Financial EDI which includes Types of financial EDI, Bank Checks, Interbank Electronic Funds Transfer (EFT): Electronic Transmission of payments and remittance information between a payer, payee and their respective banks

Benefits of EFT:

– reduced cost,

– more timely,

– improves accuracy,

– reduces paper.

Financial EDI Standards, Health Care and Insurance EDI.

EDI Implementation:

EDI Implementation starts with an agreement between a company and its trading partner. The two parties decide which standard to use, the nature of information to be exchanged, the network carrier, the mode of information transmission.

The basic kit necessary for EDI implementation includes:

Common EDI standards: EDI standards dictate the syntax and standardize on the business language. EDI standards basically specify transaction sets –complete sets of business documents.

Translation Software: it sends messages between trading partners, integrates data into and from existing computer applications, and translates among EDI message standards.

Trading partners are a firm's customers and suppliers with whom business is conducted.

Banks facilitate payment and remittance.

EDI value added network services (VANs): is a third party service provider that manages data communications networks for businesses that exchange electronic data with other businesses.

EDI Standardizations:

Standardization is expected to promote Interoperability.

1) Both are working towards compatibility.

2) Both are comprised of strings of data elements called segments

3) A transaction set is a set of segments Ordered as specified by the standard.

4) ANSI standards require each element to have a very specific name such as order date or invoice date. EDIFACT allows for generic or multiuse elements such as date.

EDI Implementation Cost:

Cost depends on several factors.

i) The expected volume of electronic documents.

ii) Economics of the EDI Translator s/w.

iii) Implementation times : Some applications are easier to learn and use them, the time spent in training.