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E-Commerce

Unit 3: Electronic Payment System (9 Hrs)

Syllabus:

Unit 3: Electronic Payment System (9 Hrs.)

E-payment System, Online Credit Card Transaction, Online Stored Value Payment System, Digital and Mobile Wallet, Smart Cards, Social/Mobile Peer-to-Peer Payment Systems, Digital Cash/e-cash, E-Checks, Virtual Currency, Electronic Billing Presentment and Payment (EBPP) System, Auctioning in E-commerce (English, Dutch, Vickery, Double), SET Protocol, Features of SET, Participants in SET, Card Holder Registration, Merchant Registration, Purchase Request, Dual Signature, Payment Authorization, Payment Capture, Status of E-Payment Systems in Nepal, Case Studies of Global and Local Payment Systems

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E-payment System

An important function of electronic commerce sites is the handling of payments over the Internet. Most electronic commerce involves the exchange of some form of money for goods or services. As we know many transactions of payments between B2B companies are made using electronic funds transfers (EFTs).

So, E-payment system is the means of making payment or transaction for goods and services on an e-commerce website or electronic environment without any need to use cash or check. E-payment system is also known as online payment system. Normally e-payment is done via debit cards, credit cards, direct bank deposits, and e-checks, other alternative e-payment methods like e-wallets, bitcoin, cryptocurrencies, bank transfers are also gaining popularity.

Electronic payment has revolutionized the business processing by reducing the paperwork, transaction costs, and labour cost. Being user friendly and less time-consuming than manual processing, it helps business organization to expand its market reach/expansion.

The electronic payment systems have grown dramatically after the inception of online shopping and eCommerce websites. The E-payment system made it convenient for the customer to pay for anything at any time.

E-payments can be done in the following ways

Internet banking –

Internet Banking, also known as net-banking or online banking, is an electronic payment system that enables the customer of a bank or a financial institution to make financial or non-financial transactions online via the internet.

In this case, the payment is done by digitally transferring the funds over the internet from one bank account to another.

Card payments –

Card payments are done via cards e.g., credit cards, debit cards, smart cards, stored valued cards, etc. In this mode, an electronic payment accepting device initiates the online payment transfer via card.

BSc CsIt SEM - VI

E-Commerce

Credit Card-

When a customer purchases a product via credit card, credit card issuer bank pays on behalf of the customer and customer has a certain time period after which he/she can pay the credit card bill. It is usually credit card monthly payment cycle.

Debit card –

Debit card, like credit card, it is required to have a bank account before getting a debit card from the bank. The major difference between a debit card and a credit card is that in case of payment through debit card, the amount gets deducted from the card's bank account immediately and there should be sufficient balance in the bank account for the transaction to get completed; whereas in case of a credit card transaction, there is no such compulsion.

Debit cards free the customer to carry cash and cheques. Even merchants accept a debit card readily. Having a restriction on the amount that can be withdrawn in a day using a debit card helps the customer to keep a check on his/her spending.

Smart card –

Smart card is again similar to a credit card or a debit card in appearance. It has the capacity to store a customer's work-related and/or personal information. Smart cards are also used to store money and the amount gets deducted after every transaction.

Smart cards can only be accessed using a PIN that every customer is assigned with. Smart cards are secure, as they store information in encrypted format and are less expensive/provides faster processing. Mondex and Visa Cash cards are examples of smart cards.

Stored value card –

A stored-value card (SVC) is a payment card with a monetary value stored on the card itself, not in an external account maintained by a financial institution. This means no network access is required by the payment collection terminals as funds can be withdrawn and deposited straight from the card.

Like cash, payment cards can be used anonymously as the person holding the card can use the funds. They are an electronic development of token coins and are typically used in low-value payment systems or where network access is difficult or expensive to implement, such as parking machines, public transport systems, closed payment systems in locations such as ships or within companies.

Stored value cards come in two major categories. Closed-loop cards have a one-time limit, as with Visa, Mastercard, and American Express gift cards, merchant gift cards, and prepaid phone cards. Open-loop cards, on the other hand, may reload these with funds and use them again.

BSc CsIt SEM - VI

E-Commerce

Direct debit –

Direct Debit is an instruction from you to your bank. Direct Debit authorises someone to collect payments from your account when they are due. That is Direct debit transfers funds from a customer's account with the help of a third party.

E-cash

It is a form where the money is stored in the customer's device which is used for making transfers. It is a system of purchasing cash credits in relatively small amounts, storing the credits in your computer, and then spending them when making electronic purchases over the Internet.

E-check –

This is a digital version of a paper check used to transfer funds within accounts.

Alternate payment methods –

As technology is evolving, e-payment methods kept evolving with it (are still evolving) These innovative alternate e-payment methods became widely popular.

E-wallet –

E-wallet is a type of electronic card which is used for transactions made online through a computer or a smartphone. Its utility is same as a credit or debit card. An E-wallet needs to be linked with the individual's bank account to make payments.

Mobile wallet –

A mobile wallet is a type of virtual wallet that stores credit card numbers, debit card numbers, and loyalty card numbers. It is accessible through an app installed on a mobile device, such as a smartphone or tablet.

Customers use mobile wallets to make in-store payments, and it is a convenient payment method compared to paying with cash or carrying physical credit cards. Mobile wallets are accepted as a method of payment in stores that are listed with mobile service providers.

The most popular mobile wallets include Google Pay, Apple Pay, and Samsung Pay, PayPal etc. The wallets are integrated into mobile devices, or users can download the application from app stores.

QR payments –

QR code stands for 'Quick Response' code, a code that contains a pixel pattern of barcodes or squares arranged in a square grid.

QR code payment is a contactless payment method where payment is performed by scanning a QR code from a mobile app. This is an alternative to doing electronic funds transfer at point of sale using a payment terminal. This avoids a lot of the infrastructure traditionally associated with electronic payments such as payment cards, payment networks, payment terminal and merchant accounts.

BSc CsIt SEM - VI

E-Commerce

Biometric payments –

Biometric payments are done via using/scanning various parts of the body, e.g., fingerprint scanning, eye scanning, facial recognition, etc. These payments are replacing the need to enter the PIN for making transactions making these payments more accessible and easier to use.

Payments are done via Wearable devices –

Wearable devices are rapidly becoming popular among customers. These devices are connected to the customer's bank account and are used to make online payments. An example of a wearable used for making an online payment is a smartwatch.

AI-based payments –

As machine learning and Artificial Intelligence is creating a revolution all around the world, AI-based solutions are becoming more popular. Payments based on AI such as speakers, chatbots, ML tools, deep learning tools, etc are making it easier for businesses to maintain transparency.

Advantages of electronic payments

1. Reduced Transaction Costs

Paper-based payments are a hassle for both businesses and suppliers. It is the expensive method where the collection and processing paper checks is an extremely costly activity and they are also slow. It can take upwards of two weeks for a check to clear.

Electronic payment methods have made the advantage of being faster, safer, easier to collect, and less expensive to the business.

2. Secure E-Payment Transactions

Electronic payments are much more efficient and safer than their traditional, paper-based counterparts. E-payment methods and systems offer multiple ways of securing your payments, such as payment tokenization, encryption, SSL, and more.

Although digital solutions are not immune to hackers and security breaches, most electronic payment providers also have a host of data experts and engineers working to keep your payment information safe.

3. Saved Time and Resources

By adopting electronic payment methods, your business saves time for its teams, its customers, and its leadership. Processing supplier payments the traditional way takes a lot of time.

4. Speed of E-Payments

Since electronic payments are made digitally, funds are transferred much faster relative to traditional payment methods like checks. E-payments allow users to make payments online at any time, from anywhere in the world, and also remove the need to go to banks.

BSc CsIt SEM - VI

E-Commerce

5. Complete Visibility into Electronic Payment Process

Electronic payments provide complete visibility and transparency throughout the entire payment process for both your business and your suppliers, thus improving the supplier relationship.

Online Credit Card Transaction

Because credit and debit cards are the dominant form of online payment, it is important to understand how they work and to recognize the strengths and weaknesses of this payment system.

Online credit card transactions are processed in much the same way that in-store purchases are, with the major differences being that online merchants never see the actual card being used, no card impression is taken, and no signature is available.

Online credit card transactions most closely resemble to Mail Order-Telephone Order (MOTO) transactions. These types of purchases are also called Cardholder Not Present (CNP) transactions and are the major reason that charges can be disputed later by consumers. Because the merchant never sees the credit card, nor receives a hand-signed agreement to pay from the customer, when disputes arise, the merchant faces the risk that the transaction may be disallowed and reversed, even though he has already shipped the goods or the user has downloaded a digital product.

Figure below illustrates the online credit card purchasing cycle.

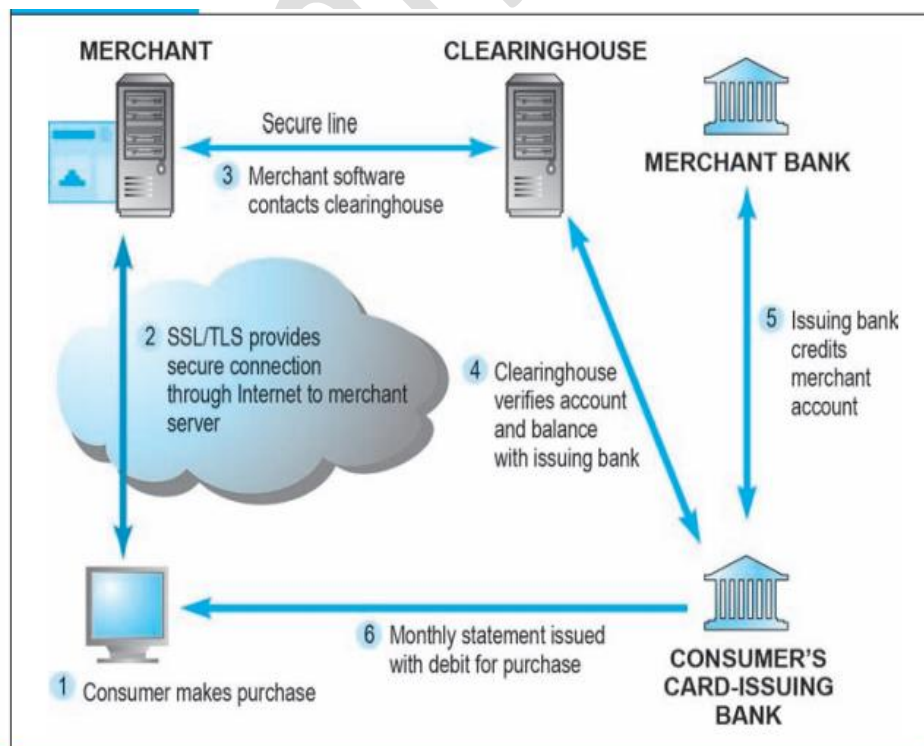


Figure: Online credit card purchasing cycle

BSc CsIt SEM - VI

E-Commerce

There are five parties involved in an online credit card purchase: consumer, merchant, clearinghouse, merchant bank (sometimes called the “acquiring bank”), and the consumer’s card issuing bank.

In order to accept payments by credit card, online merchants must have a merchant account established with a bank or financial institution. A merchant account is simply a bank account that allows companies to process credit card payments and receive funds from those transaction.

As shown in Figure above, an online credit card transaction begins with a purchase (1). When a consumer wants to make a purchase, he or she adds the item to the merchant’s shopping cart. When the consumer wants to pay for the items in the shopping cart, a secure tunnel through the Internet is created using SSL/TLS. Using encryption, SSL/TLS secures the session during which credit card information will be sent to the merchant and protects the information from interlopers on the Internet (2). SSL does not authenticate either the merchant or the consumer. The transacting parties have to trust one another.

Once the consumer credit card information is received by the merchant, the merchant software contacts a clearinghouse (3). A clearinghouse is a financial intermediary that authenticates credit cards and verifies account balances. The clearinghouse contacts the issuing bank to verify the account information (4). Once verified, the issuing bank credits the account of the merchant at the merchant’s bank (5). The debit to the consumer account is transmitted to the consumer in a monthly statement (6).

Online Stored Value Payment System

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BSc CsIt SEM - VI

E-Commerce

Hence, it can be summarised as

- Stored value systems are a form of electronic payment technology.
- They coexist with credit and debit technology and principally target low-value transactions.
- Online stored value systems have very low transaction costs.
- Stored value systems are based on creating a form of electronic value, for example on smart cards or as computer files.
- The value can be bought (withdrawn) anytime.
- Today Stored Value Cards (SVC) are one of the most dynamic and fastest-growing products in the financial industry
- One leading difference between SVC and debit cards is that debit cards are usually issued in the name of the account holders. In contrast, Stored Value Cards are usually anonymous.
- The notion "stored value" means the funds and data which is stored on the card
- Eg: fare cards, telephone prepaid cards, etc.

Digital and Mobile Wallet

Digital Wallet

A digital wallet (or electronic wallet) is a financial transaction application that runs on mobile devices. It securely stores your payment information and passwords. These applications allow you to pay when you're shopping using your device so that you don't need to carry your cards around. You enter and store your credit card, debit card, or bank account information and can then use your device to pay for purchases.

Example of digital wallet are...

- Cash App
- ApplePay
- Google Wallet
- Samsung Pay
- PayPal
- Venmo
- AliPay
- Walmart Pay
- Dwolla
- Vodafone-M-Pesa

BSc CsIt SEM - VI

E-Commerce

Mobile Wallet

A mobile wallet is a type of virtual wallet that stores credit card numbers, debit card numbers, and loyalty card numbers. It is accessible through an app installed on a mobile device, such as a smartphone or tablet.

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Smart Cards

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Social/Mobile Peer-to-Peer Payment Systems

In addition to using a mobile device as a vehicle for e-commerce and as a payment method at physical point-of-sale, another type of mobile payment transaction is becoming increasingly popular: social/mobile peer-to-peer payments.

Peer-to-peer payment services are apps or app features that allow you to send money to other people, Often by searching for their phone number, email address or username, quickly and usually for free.

Services such as Venmo, Square Cash, Snapcash, the newly refocused Google Wallet, and the new Facebook Messenger Payment service all enable users to send another person money through a mobile application or Web site, funded by a checking account, debit card, credit card, or a digital wallet balance.

Here are some of the most common P2P services available...

PayPal

PayPal is a payment service that runs the gamut of helping people with personal money transfers, online purchases and e-commerce. Using PayPal as a peer-to-peer money transfer service, individuals can send money to each other via a linked bank account or a debit or credit card.

How it works: PayPal offers many different functions, perhaps the most popular being payment services for online merchants and buyers. But PayPal also offers P2P money transfers

BSc CsIt SEM - VI

E-Commerce

for registered users. Once you've created a PayPal account, you can send and request money by searching for another user's name, email or phone number and then filling out the amount you want to send or request.

Zelle

Zelle is a service that is offered by most major banks in the U.S. and allows people to send money to other Zelle users either through their bank account or the Zelle app.

After setting up a Zelle account either through their bank or the Zelle app, users can send or request money by entering another Zelle user's registered email address or phone number. If the recipient doesn't have a Zelle account, they will have to set one up in order to send or receive money.

Venmo

Venmo is an app that allows users to send money to each other via linked bank account, Venmo balance or credit card. The service is owned by PayPal, but it has some different functionality compared to PayPal's peer-to-peer money transfer service. One of Venmo's most interesting draws is that the app also offers a free, optional debit card that allows users to spend money from their Venmo account balance.

How it works: Users download the Venmo app and create an account. They can then link a bank account or credit card to fund their Venmo account; then they can send, request or receive money from other Venmo users.

Cash App

Cash App is a money transfer app created by Block Inc. that allows people to send money via their Cash App balance or linked bank account, credit card or debit card. The service offers an optional debit card — called a Cash Card — that allows users to spend the money in their Cash App balance as well as receive “cash boosts,” which are savings that are applied to various vendors.

How it works: Once Cash App is downloaded to a smartphone or tablet, users create an account and link a debit card, credit card or bank account. Once their Cash App account is set up, they can send, request and receive money from other Cash App users as well as invest in stocks and buy and sell bitcoin.

Digital Cash and Virtual Currencies

- Although the terms digital cash and virtual currencies are often used synonymously, they actually refer to two separate types of alternative payment systems.
- Digital Cash acts much like real cash, except that it's not on paper. Money in your bank account is converted to a digital code. This digital code may then be stored on a microchip, a pocket card (like a smart card), or on the hard drive of your computer.

BSc CsIt SEM - VI

E-Commerce

- Digital cash typically is based on an algorithm that generates unique authenticated tokens representing cash value that can be used “in the real world.”.
- Bitcoin is the best-known example of digital cash. Bitcoins are encrypted numbers (sometimes referred to as cryptocurrency) that are generated by a complex algorithm using a peer-to-peer network in a process referred to as “mining” that requires extensive computing power.
- Bitcoin, a form of electronic currency that does not exist in physical form and can be transferred from one person to another via peer-to-peer networks, without the need for a bank or other financial institution as intermediary. This ability to operate outside the banking system has made Bitcoin a favourite of narcotics traffickers and buyers and sellers of illicit goods and services; but more recently, it has made Bitcoin a darling among many in the technological elite who believe that Bitcoin and the technology behind it could be the next big thing in the payments industry.
- Like real currency, Bitcoins have a fluctuating value tied to open-market trading. Like cash, Bitcoins are anonymous—they are exchanged via a 34-character alphanumeric address that the user has, and do not require any other identifying information.
- Bitcoins have recently attracted a lot of attention as a potential money laundering tool for cybercriminals, and have also been plagued by security issues, with some high profile heists.
- Nonetheless, there are companies now using Bitcoins as a legitimate alternative payment system.
- **Virtual currencies**, on the other hand, typically circulate primarily within an internal virtual world community, such as Linden Dollars, created by Linden Lab for use in its virtual world, Second Life. Virtual currencies are typically used for purchasing virtual goods.
- Virtual currencies are a subset of digital currencies and include other types of digital currencies, such as cryptocurrencies and tokens issued by private organizations. The advantages of virtual currencies include faster transaction speeds and ease of use. The disadvantages of virtual currencies are that they can be hacked and do not provide much legal recourse to investors because they are not regulated.

E-cash

It is a form where the money is stored in the customer's device which is used for making transfers. It is a system of purchasing cash credits in relatively small amounts, storing the credits in your computer, and then spending them when making electronic purchases over the Internet.

BSc CsIt SEM - VI

E-Commerce

E-Checks

- E-check is a form of online payment that performs the same function as a paper check. It is processed in fewer steps and is more cost-efficient.
- An electronic check is an electronic version of the conventional paper check. It is a form of online payment where money is withdrawn from one account and deposited into another account using the Automated Clearing House (ACH) network.
- Through an ACH merchant account, a business can collect payments for products or services directly from a customer's bank account electronically. However, the payment must first be authorized by the customer, which is usually done through consent taken in various forms, such as acceptance of a website's terms and conditions or a signed contract.

Electronic Billing Presentment and Payment (EBPP) System

Electronic bill presentment and payment; often abbreviated to EBPP; is a form of electronic billing service that enables businesses to present electronic billing statements and invoices to customers, typically using an online platform. In most cases, customers also have the option to pay their bill electronically using the same platform. EBPP is an integral component of online banking and other electronic billing systems across all industries.

Electronic billing presentment and payment (EBPP) systems are systems that enable the online delivery and payment of monthly bills. EBPP services allow consumers to view bills electronically and pay them through electronic funds transfers from bank or credit card accounts.

More and more companies are choosing to issue statements and bills electronically, rather than mailing out paper versions. But even those businesses that do mail paper bills are increasingly offering online bill payment as an option to customers, allowing them to immediately transfer funds from a bank or credit card account to pay a bill somewhere else.

There are two main types of EBPP systems: biller-direct and consolidated.

Biller-Direct EBPP

In a biller-direct EBPP system, companies and customers interact directly. The company or service provider sends an electronic bill to the customer, typically via email. The customer then can follow the instructions provided with the bill to log into their account on the company's website, review the bill, and pay online.

For example, an insurance company might use the biller-direct method to notify you via email that your monthly premium is due. You can then visit the company's website to make a payment.

BSc CsIt SEM - VI

E-Commerce

Consolidated EBPP

The consolidated form of EBPP uses a third-party service provider to aggregate financial transactions. This third party is usually a bank, and consolidated EBPP is also known as bank-aggregator or bank-consolidator EBPP. The consolidator service collects billing data from one or more companies, delivers it to customers, accepts payments, then distributes the funds to the appropriate companies.

Consolidated EBPP allows customers to use a single portal to view and pay bills for multiple accounts instead of signing into each account separately.

For example, you might be able to use your online bank account to pay your credit card, cellphone, and utility bills.

When a company uses a consolidator to handle presentment, it can share different amounts of information with its customers. “Thick” presentment means customers can view a detailed summary of their transactions. “Thin” presentment only includes basic bill details, so the customers must visit the billing company’s website for more information.

Auctioning in E-commerce (English, Dutch, Vickery, Double)

An online auction is a service in which auction users or participants sell or bid for products or services via the Internet. It is a transaction between sellers (the auctioneers) and bidders (suppliers in the business-to-business scenarios) that takes place on an electronic marketplace. It can occur business to business, business to consumer, or consumer to consumer, and allows suppliers to bid online against each other for contracts against a published specification.

Virtual auctions facilitate online activities between buyers and sellers in different locations or geographical areas. Various auction sites provide users with platforms powered by different types of auction software. An online auction is also known as a virtual auction.

An eBay.com, eBid.net, Webstore.com Bonanza.com are the best online auction site similarly Zip Auctions is the best traditional online auction site.

Types of e-auctions

English Auction

The English Auction is one of the most common types of auctions. It’s a live auction, meaning that bids happen in real-time. It can be conducted as an online or in-person event, with the online auctions lasting much longer than the in-person ones.

English auction is the auction process under which one quantity of a product is listed for sale. Under this method, all the bidders are aware of each other, and the bids are placed openly in front of everyone. The process starts with the declaration of the opening bid or the reserve price, which the seller of the product sets. After this, the interested bidders start placing their respective bids in an ascending order, i.e., the next bid should be higher than the previous

BSc CsIt SEM - VI

E-Commerce

bidder's price. This process continues until there is a bid above which any other buyer is not interested in buying the item. This is the highest bid and the selling price of the product.

Features

1. English auction is an open and transparent auction as the different bidders, and the value of the bid placed by each bidder is known to others.
2. All the bids should be in ascending order, and the next bidder can place the bid with the amount higher than the previous bid amount only.
3. The seller of the product sets the reserve price or the opening bid. So, the bid below such price is allowed.
4. The auction houses set the mechanism of the bid price increment.

Example of English Auction

Mr. A defaulted on the loan taken from the bank. On his inability to repay the loan, the bank decided to sell off the security attached to the loan, i.e., Mr. A's house. So, the bank decided to recover the loan by selling the house through the bidding process. Bank arranged the auction and advertise about the auction so that many bidders can come and bid. The bank's initial price was \$ 250,000, which was the current market value of the house prevailing at the time of auction.

The bidding process started by the host of the bid program declared the initial set price as \$ 250,000 to all the bidders at the time of auction and asked them to bid further. One of the bidders placed the bid at \$ 265,000, and further bid increased to \$ 275,000 and then to \$ 300,000. After which no further bid was received. So, the house was sold to the person who bid for \$ 300,000, and with this, the host announced the completion of the auction. This is an example of an English auction.

Dutch Auction

The Dutch auction is like an English auction, except that prices start high and are successively dropped until a bidder accepts the going price, and the auction ends. The Dutch auction is so-named because it is used to sell cut flowers in Holland, in the enormous flower auctions.

A strategy in a Dutch auction is a price at which the bidder bids. Each bidder watches the price decline, until it reaches such a point that either the bidder bids or a rival bids, and the auction ends. Note that a bidder could revise his bid in the course of the auction, but there isn't any reason to do so. For example, suppose the price starts at \$1,000, and a bidder decides to bid when the price reaches \$400. Once the price gets to \$450, the bidder could decide to revise and wait until \$350. However, no new information has become available and there is no reason to revise. In order for the price to reach the original planned bid of \$400, it had to reach \$450, meaning that no one bid prior to a price of \$450. In order for a bid of \$400 to win, the price had to reach \$450; if the price reaching \$450 means that a bid of \$350 is optimal, then the original bid of \$400 could not have been optimal. Of course, a bidder who thinks losing is likely may wait for a lower price to formulate the bid, a consideration ignored here. In addition, because the Dutch auction unfolds over time, bidders who discount the future will bid slightly higher in a Dutch auction as a way of speeding it along, another small effect that is ignored for simplicity.

BSc CsIt SEM - VI

E-Commerce

What is interesting about the Dutch auction is that it has exactly the same possible strategies and outcomes as the sealed-bid auction. In both cases, a strategy for a bidder is a bid, no bidder sees the others' bids until after her own bid is formulated, and the winning bidder is the one with the highest bid. This is called strategic equivalence. Both games—the Dutch auction and the sealed-bid auction—offer identical strategies to the bidders and, given the strategies chosen by all bidders, produce the same payoff. Such games should produce the same outcomes.

The strategic equivalence of the Dutch auction and the sealed-bid auction is a very general result that doesn't depend on the nature of the values of the bidders (private vs. common) or the distribution of information (independent vs. correlated). Indeed, the prediction that the two games should produce the same outcome doesn't even depend on risk aversion, although that is more challenging to demonstrate.

Example of a Dutch Auction

Let's assume there are 10 shares of stock for sale. A bidder offers \$10 per share of stock for 8 shares. The next highest bidder offers \$9 per share for 10 shares. The auction will end, as there are adequate bids to sell all shares. The price paid for all shares will be the lowest successful bid of \$9. The first bidder will receive 8 shares at a price of \$9 (lower than her original \$10 bid). The second bidder will receive the 2 remaining shares (less than her desired lot of 10 shares) at \$9.

Vickrey Auction

Vickrey auction is a sealed-bid auction in which each participant simultaneously submits his or her bid. This is the same concept like in any other standard sealed-bid auction. Vickrey auction is however a "second price" auction. The price paid for the exchanged good is equal to the second-highest bid placed.

The Vickrey auction is named after Canadian national William Vickrey who first described this concept in his paper in 1961 and pointed out benefits of the Vickrey auction. The Vickrey auction is also often called second-price sealed-bid auction. William Vickrey received a Nobel Prize for his work.

Vickrey auction is a type of auction where all the bidders will bid for their true value or worth and will have the maximum willingness to pay for the highest price to stand as the winner of the bid. The auction is a sealed bid where no bidder is aware of other bids. Thus everyone contributes willingly and wants to go the extra mile to win the bid. Every bidder will put the maximum bid possible. They are kind of motivated or encouraged to quote a high bid because, anyways, they won't be paying the highest amount and will only have to pay for the second-highest bid. This will not cause any disadvantage to the bidder for quoting the maximum bid. Thus, we see Vickrey's auction follows the second price mechanism. By following the second price mechanism, bidders will bid truthfully.

BSc CsIt SEM - VI

E-Commerce

Example of Vickrey Auction

Example :

Let us suppose an auction for an antique gemstone is going on, and four bidders have got involved in the bidding process. Now, bidder A places a bid of \$1500, bidder B places a bid for \$2000, bidder C places a bid for \$1800, and finally, bidder D places a bid for \$1700. It is evident now that bidder B had the highest bid, winning the auction bid. The twist in the Vickrey auction is that although bidder B has won the auction quoting a bid of \$2000, he will only pay the sum of the second-highest bid, which is \$1800. Thus, in this way, he is ending up in surplus money of \$200. Thus, in the Vickrey auction every bidder is willingly motivated to call for the highest bid because of the hope to end up retaining surplus money. Therefore, every bidder tries to win the bid and thus places the bid truthfully based on the value of the item and is motivated about doing so.

Double Auctions

In double auction, Buyer's place bids and sellers place offers throughout the trading day. This can be done electronically, or by open outcry where each party calls out prices they are willing to buy or sell at and make a transaction if the prices match up. In this way a negotiation of sorts occurs where buyer and seller work together to arrive at a fair market price.

Secure Electronic Transaction (SET)

- Secure Electronic Transaction is also called SET, is a credit card based online payment system developed by Visa and Microsoft, supported by MasterCard, IBM, CyberCash and NetScape which provided technology of Secure Socket Layer (SSL).
- The first official version was launched in May 1997. SET aims at enabling a secure electronic payment. It is an expensive system and has low acceptance in the markets.
- It is an open-source encryption and security specification designed to protect credit card transactions on the internet. The Secure electronic transaction is not a payment system; **it is a set of security protocols and format** that ensures that using online payment transaction on the internet is secure.
- SET provides a secure environment for all the parties that are involved in the e-commerce transaction. It also ensures confidentiality. It provides authentication through digital certificates. It uses different encryption and hashing techniques to secure payments over internet done through credit cards.
- SET protocol restricts revealing of credit card details to merchants thus keeping hackers and thieves at bay. SET protocol includes Certification Authorities for making use of standard Digital Certificates like X.509 Certificate.

BSc CsIt SEM - VI

E-Commerce

In order for secure transactions to work, SET must possess the following qualities (**key features**):

- **Confidentiality:** others cannot eavesdrop on an exchange.
- **Integrity:** the messages received are identical to the messages sent.
- **Authenticity:** you are assured of the persons with whom you are making an exchange.
- **Non-Repudiability:** none of the involved parties can deny that the exchange took place.

In addition to these four requirements, SET also assumes that a hierarchy of certificate authorities that can vouch for the bindings between a user and a public key already exists. Therefore, consumers, merchants, and acquirers must exchange certificates before a party can know what public key to employ to encrypt a message for a particular correspondent.

Requirements in SET:

SET protocol has some requirements to meet, some of the important requirements are:

- It has to provide mutual authentication i.e., customer (or cardholder) authentication by confirming if the customer is intended user or not and merchant authentication.
- It has to keep the PI (Payment Information) and OI (Order Information) confidential by appropriate encryptions.
- It has to be resistive against message modifications i.e., no changes should be allowed in the content being transmitted.
- SET also needs to provide interoperability and make use of best security mechanisms.

Process: How it works

Ordering/purchase request:

- Customer sends an initial message (initiate request),
- Request is answered by the supplier through sending a signed answer and also the certificate of the supplier and the certification of the supplier's bank (initiate response),
- Customer checks both certificates and the supplier's signature at the certification office,
- Customer creates the order and the order to pay and creates from both messages a dual signature,
- The order to pay is additionally encrypted with the public key of the supplier's bank so that the supplier is not able to read it,
- Finally, all messages are sent to the supplier together with the certificate of the customer,

Acceptance of the order to pay (payment authorization):

- The supplier sends a request to his bank,
- This request is signed and encrypted by the supplier. Certificates of supplier and customer as well as customer's order to pay are added,
- The bank of the supplier checks all certificates and sends a corresponding request to the customer's bank via the banks network,
- The answer is signed by the supplier's bank and encrypted with the public key of the supplier,

BSc CsIt SEM - VI

E-Commerce

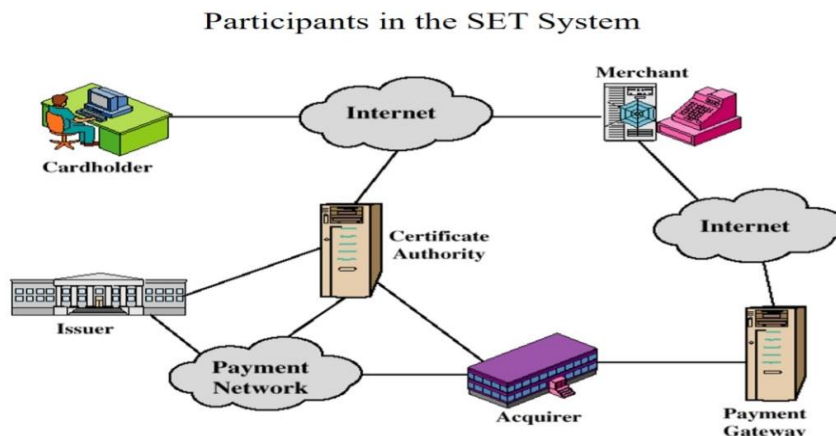
- Furthermore, a so-called “capture token” is created for the subsequent clearance. This is encrypted with the public key of the supplier’s bank and can only be read by this bank later on.
- The encrypted answer and capture token are transferred to the supplier. He checks the certificates and the answer of the customers bank, stores the capture token and delivers the goods or services to the customers

Clearance (payment capture):

- The supplier sends the capture request to his bank complemented with his certificates and the payment amount,
- This request is checked by the supplier’s bank and a corresponding message is sent to the customer's bank (clearing request),
- Subsequently a signed and encrypted acknowledgement is forwarded to the supplier (capture response), who can store it for his purposes.

Secure Electronic Transaction Participants

A number of participants are involved in the SET process:



Cardholder:

A cardholder is an authorized holder of the payment card. The card can be a Master card or a Visa which an issuer has issued.

Merchant:

A merchant is any person or organization who wants to sell its goods and services to cardholders. Note that a merchant must have a relationship with the acquirer to accept the payment through the internet.

Issuer:

An issuer is a financial organization such as a bank that issues payment card – Master card or visa to user or cardholder. The issuer is responsible for the cardholder’s debt payment.

BSc CsIt SEM - VI

E-Commerce

Acquirer:

This is a financial organization with a relationship with the merchant for processing the card payment authorization and all the payments. An acquirer is part of this process because the merchant can accept credit cards of more than one brand. It also provides an electronic fund transfer to the merchant account.

Payment Gateway:

For payment authorization, the payment gateway acts as an interface between secure electronic transactions and existing card payment networks. The merchant exchanges the Secure Electronic Transaction message with the payment gateway through the internet. In response to that, the payment gateway connects to the acquirer's system by using a dedicated network line.

Certification Authority:

It is a trusted authority that provides public-key certificates to cardholders, payment gateways, and merchants.

SET Protocol

Most Internet merchants use the SSL protocol to prevent eavesdroppers from learning customers' account details, such as credit card numbers. This arrangement follows the classical idea that bad persons are necessarily outsiders, and it has two major limitations:

- The customer has to trust the merchant to keep these details secure. Some merchants are dishonest or at best incompetent. A million credit card numbers have recently been stolen from Internet sites whose managers had not applied security patches .
- The merchant has to trust the customer, who does not sign anything. The merchant has little protection from the use of stolen card numbers or from customers who repudiate their purchases.

Visa and Mastercard designed the SET protocol to address this unsatisfactory situation and they are...

1. Provide confidentiality of payment information
2. Ensure integrity of all transmitted data
3. Provide authentication that a cardholder is a legitimate user of a branded payment card account
4. Provide authentication that a merchant can accept branded payment card transactions

To achieve these goals, the SET protocol comprises following sub-protocols:

- **Cardholder Registration** allows a customer to register a credit card with a Certificate Authority. The request includes the Cardholder's public signature key and a secret nonce (called Card Secret). The outcome of registration is a public-key certificate that includes the hash of the primary account number (PAN), i.e. the credit card number, and of a secret nonce (PANSecret).
- **Merchant Registration** is analogous. A Merchant registers both a signature key and an encryption key.

BSc CsIt SEM - VI

E-Commerce

- **Purchase Request** allows a Cardholder to place an order with a Merchant.
- **Dual Signature:** The dual signature is a concept introduced with SET, which aims at connecting two information pieces meant for two different receivers:
 1. Order Information (OI) for merchant and
 2. Payment Information (PI) for bank
- **Payment Authorization** follows or is combined with Purchase Request. It allows a Merchant to verify the Cardholder's details with a so-called Payment Gateway, which authorizes the transactions.
- **Payment Capture** allows a Merchant to request the actual transfer of funds.

The basic idea is that both Cardholders and Merchants must register with Certificate Authorities before they engage in transactions. Unsuitable individuals (known criminals, for example) may not get past this stage. Reliable (or reliable-looking) principals can then engage in business. During the purchase phases, all parties commit themselves to each transaction by using digital signatures. In this way, registered Cardholders can make purchases without sharing account details with the Merchant.

Assignment:

Status of E-Payment Systems in Nepal, Case Studies of Global and Local Payment Systems

Roll no 1 to 7: Status of E-Payment Systems in Nepal

Roll no 8 to 15: Local Payment Systems (Case Studies)

Roll no 16 to last: Global Payment Systems (Case Studies)

===== End of Unit-3 =====

Unit 3: Electronic Payment System (9 Hrs.)

E-payment System, Online Credit Card Transaction, Online Stored Value Payment System, Digital and Mobile Wallet, Smart Cards, Social/Mobile Peer-to-Peer Payment Systems, Digital Cash/e-cash, E-Checks, Virtual Currency, Electronic Billing Presentment and Payment (EBPP) System, Auctioning in E-commerce (English, Dutch, Vickery, Double), SET Protocol, Features of SET, Participants in SET, Card Holder Registration, Merchant Registration, Purchase Request, Dual Signature, Payment Authorization, Payment Capture, Status of E-Payment Systems in Nepal, Case Studies of Global and Local Payment Systems
