

UNIT-3Electronic Payment System⊗ E-payment System:

Electronic payment system (EPS) is a way of paying for goods and services electronically instead of using direct cash or physical cheque. EPS simply means online transaction of values. Online Credit Card Transaction, Online Stored Value Payment System, Digital and Mobile Wallet, E-Checks, Virtual Currency etc. are some of the E-payment systems. New types of purchasing relationships, such as between individuals online and new technologies such as the development of the mobile platform, have created both a need and an opportunity for the development of new payment systems.

⊗ Types of E-payment System:

1) Debit Card: These are prepaid cards issued by banks to its customers. We can use them for electronic transaction. They are linked to our bank account and deduct balance directly from our bank account. It is a dual-purpose card. It can be used to perform electronic payment as well as it can be used in ATM machine to withdraw cash from our account. It has a daily purchase limit set by the bank. It is used by a PIN to complete transaction.

2) Credit Card: A credit card is similar to debit card issued by a financial institution like a bank that lets us borrow funds to pay for our purchases. The main difference with debit card is that it is postpaid card. User can pay for purchases in advance and later they have to fulfill the amount with the card provider. User has to pay interests for the amount they used.

3) Smart Card: It is a tiny rectangular piece of card that can be fitted in a pocket and has smart features. It can be used for electronic transactions by an individual. It is highly secure and convenient. It is issued by bank. It has integrated circuit chip that stores individual account details. Smart cards are not only used for electronic transaction. They can also be used for authentication, authorization and access control.

4) E-banking: It is a method of banking in which customer can perform transaction electronically using internet. It is banking services moved online in short. User can perform banking activities like taking loan, installment payment, online payment, load e-wallets etc. online. Most of the customers are using smart phones for e-banking, hence it is also called as mobile banking.

5) E-cash: It is an EPS in which, a user gets a card issued by a bank that can be used for electronic transaction. It is a physical card that can be used in supported machine. The transaction has to be verified by bank during payment. It is a prepaid card. User must deposit some amount against which bank will issue the card. User can even take cash by submitting card to the bank.

6) E-cheque: It is an electronic document which is used instead of physical cheques for online transactions. E-cheques use digital signatures for authentication. Unlike physical cheques, it has no chance of rejection for any authenticity issue. It is highly secure as it uses PKI technique. There is almost zero chances of fraud with e-cheques.

7) E-wallet: It is a type of electronic payment system which provides user account that can be accessed through websites or mobile applications. People can use it to pay for things, topup mobile balance, pay bills etc. It is highly secure encrypted system.

④ Online Credit Card Transaction:

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. These types of purchases are also called Cardholder Not Present (CNP) transactions.

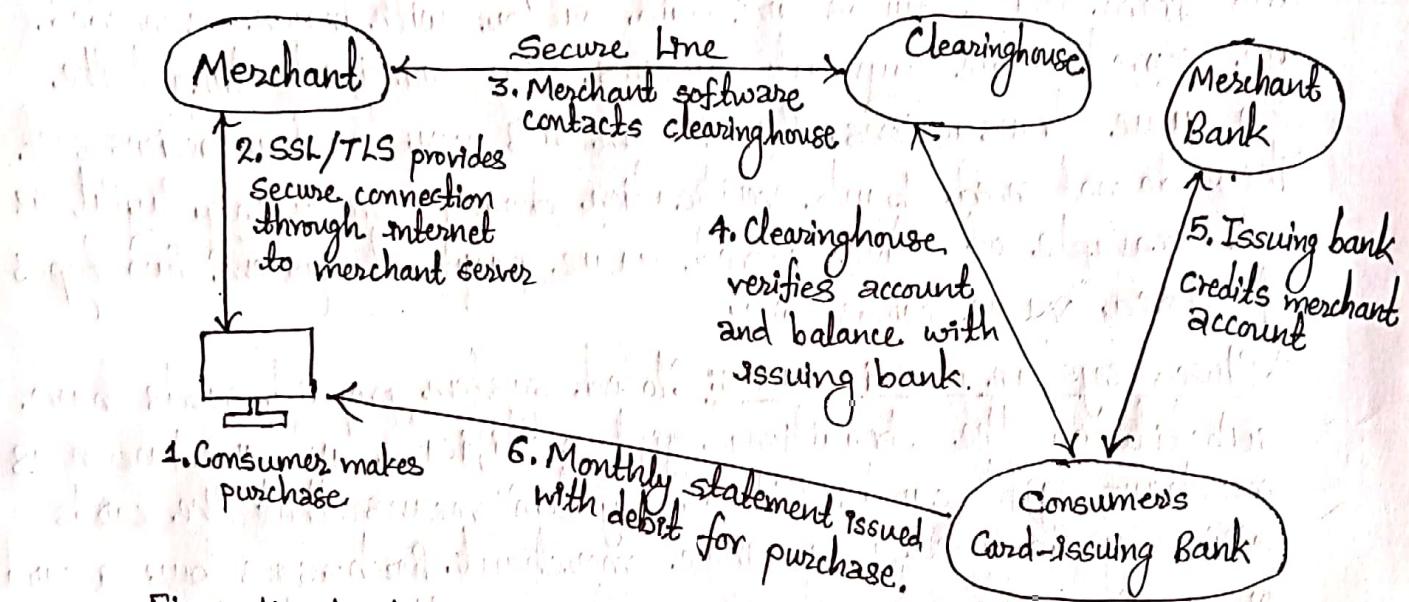


Fig: Illustration of the online credit card purchasing cycle.

There are five parties involved in an online credit card purchase: Consumer, Merchant, Clearinghouse, Merchant bank, and Consumer's card-issuing bank. An online credit card transaction begins with a purchase:

- When a consumer wants to make a purchase he or she adds the item to the merchant's shopping cart.
- A secure tunnel through the internet is created using SSL/TLS.
- Once the consumer credit card information is received by the merchant, the software contacts a clearinghouse.
- The clearinghouse contacts the issuing bank to verify the account information.
- Once verified, the issuing bank credits the merchant account.
- The debit to the consumer account is transmitted to the consumer in a monthly statement.

Limitations: There are a number of limitations to the existing credit card payment system. The most important limitations involve security, merchant risk, administrative and transaction costs, and social equity.

② Online Stored value payment system:

Accounts created by depositing funds into an account and from which funds are paid out or withdrawn as needed are stored value payment systems. They principally target the low value transactions. This system has very low transaction costs. They do not need bank verification during processing. PayPal is an example of online stored value payment system. Two types of stored value cards are:

① Closed system prepaid cards: Closed system prepaid cards have substituted the traditional gift certificate and are known as merchant gift cards. "Closed system" means that the cards are only accepted at a single merchant. Purchasers buy a card for a fixed amount and can only use the card at the merchant that issues the card. The cards have often an expiration date or a service fee. For example, card issued by "Bhatbhateri".

② Open system prepaid cards: Open system prepaid cards have nothing in common with credit cards. The issuer doesn't allow a credit to the cardholder. Stored Value Cards ~~use~~ use magnetic stripe technology to store information about funds that have been prepaid to the card. These cards are similar to closed system prepaid cards but they are connected with a retail electronic payments network such as Visa, MasterCard.

④ Social/Mobile Peer-to-peer Payment System:

P2P payment, short for peer-to-peer or person-to-person payment, means a transaction that enables society to transfer their money to people in online mode with the help of personal bank and credit unions accounts or mobile apps. It lets us to use a bank account or a credit or debit card to pay friends or family from our phone. This way, we should not have to worry about our physical cash or forget wallet at home. We can pay easily using our phone. Paypal, Google Pay, E-sewa, Khalti etc are some most popular P2P payment services around us.

⑤ Electronic Billing Presentment and Payment (EBPP) Systems:

These are the 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. Example: In Nepal, we can pay electricity bill online. We can view bill, pay online and even get an electronic receipt (via e-sewa mobile wallet).

There are four EBPP business models: Online banking, Biller-direct, Mobile, Consolidator. The online banking model is widely used today.

⑥ Auctioning in E-commerce:

Auction means to increase. Auctioning is the process of conducting an auction to sell assets, natural resources or other goods through online competitive bidding. Auction or E-auction takes place in online marketplace. It can occur business to business, business to consumer, or consumer to consumer, and allows suppliers to bid online against each other.

Using e-auctions, the auctioneers can have competitive value for their assets where bidders can participate virtually from any part of the world. Auction is used in the situations in which the seller doesn't know the actual price of an asset. Auction is used as a price discovery mechanism.

Types of Auctioning:

i) English Auction: It is the most general form of auction. Opening price of an asset is low and the price goes on increasing in bidding process. With this type of auction, the seller gets highest possible price for the asset. The major points about this type of auction are:

- Public ascending price.
- Single unit is sold with auction.
- Highest bidder wins the auction.
- It is used when seller is unaware about price of the asset.

ii) Dutch Auction: It is opposite in nature, to the English Auction. In this type of auction seller starts with an opening higher price and keeps on lowering price until a buyer bid on it. The first person to bid wins the auction. Major points about this auction are:

- Seller/Auctioneer descending price.
- Single or multiple units may be sold with an auction.
- First bidder wins the auction.
- It is used when seller has expected price for asset.

iii) Double Auction: The double auction system is what we see in the stock market. Buyers place bids and sellers place offers throughout the trading day. The major points are:

- Seller starts with higher price and bidder starts with lower price.
- Single or multiple units may be sold with auction.
- A bidder with first match wins the auction.
- It is used when there are multiple sellers and multiple bidders, such as share market.

iv) Vickery Auction: A Vickery auction is a type of sealed-bid auction. Bidders submit written bids without knowing the bid of the other people in the auction. The highest bidder wins but the price paid is the second-highest bid.

④ SET Protocol:

SET stands for Secure Electronic Transaction. This is a communication protocol designed for secure electronic payment transaction such as credit card transaction. It is an open source and cryptography-based protocol that make payment transaction secure in a network. It is not a payment system open network secure. It implements encryption and hashing technique due to which hackers can't get credit card details.

⑤ Features of SET Protocol:

i) Merchant Authentication: To prevent theft, SET allows customers to check previous relationships between merchants and financial institutions. Standard X.509V3 certificates are used for this verification.

ii) Cardholder Authentication: SET checks if the use of a credit card is done by an authorized user or not using X.509V3 certificates.

iii) Provide Message Confidentiality: Confidentiality refers to preventing unintended people from reading the message being transferred. SET implements confidentiality by using encryption techniques. Traditionally DES is used for encryption purposes.

iv) Provide Message Integrity: SET doesn't allow message modification with the help of signatures. Messages are protected against unauthorized modification using RSA digital signatures with SHA-1 and some using HMAC with SHA-1.

④ SET Participants:

- i) Cardholder: This is an authorized holder of a payment card such as credit card (eg. MasterCard, Visa) that has been issued by an issuer.
- ii) Merchant: This is the seller organization that provides credit card purchase facility to the cardholders. A merchant that accepts credit card payment, must have a relationship with an acquirer.
- iii) Issuer: This is a financial institution such as a bank that provides cardholder with a payment card.
- iv) Acquirer: This is a financial institution such as a bank that keeps account for the merchant to process credit card authorization and payments.
- v) Certificate authority: This is an entity that provides X.509V3 public-key certificates to cardholders, merchants and payment gateways.
- vi) Payment Gateway: This is the system through which merchant is connected to the payment system. It acts as an interface between merchant's website and the payment processing bank.

⑤ How SET Protocol Works?

1. Customer browses the website and decides on what to purchase.
2. Customer sends order and payment information, which includes two parts in message: Purchase order and Card information.
3. Merchant forwards card information to their bank.
4. Merchant's bank checks with the issuer for payment authorization.
5. Issuer sends authorization to the merchant's bank.
6. Merchant's bank sends authorization to merchant.
7. Merchant completes the order and sends confirmation to customer.
8. Merchant captures the transaction from their bank.
9. Issuer prints credit card bill to the customer.

④ SET Protocol Phases:

1) Cardholder Registration: This is the initial step for cardholders. The agent C sends to a certification authority CA the information on the credit card he wants to use. The CA replies with a registration form, which C completes and returns, together with the signing key that C wants to register. Then, CA checks that the credit card is valid and releases the signature certificate for C who stores it for future use. All the information such as credit card details must be protected and this makes the protocol steps complicated.

2) Merchant Registration: This phase performs the analogous function for merchants. In contrast with Cardholder Registration, the merchant M can not only register a public key for signature but also a public key for encryption. The process is shorter because there is no confidential information to be protected.

3) Purchase Request: We reach this phase if C has decided to buy something. C sends to M the order information and the payment instructions. M processes the order and starts the Payment Authorization phase by forwarding the payment instructions to the PG_i.

4) Payment Authorization: After receiving the payment instructions from the merchant, the PG_i, in cooperation with Issuers and banks, checks that everything is fine. If so, it sends the payment authorization to M, who sends to C the confirmation and possibly the purchased goods. C acknowledges the result and M passes to the next stage.

5) Payment Capture: In this last phase, M sends to PG one or more payment requests and the corresponding capture tokens obtained during the previous steps. PG checks that everything is satisfactory and replies to M. The actual funds transfer from C to M is done outside the protocol.

④. Dual Signature:

The dual signature is a concept introduced with SET, which aims at connecting two information pieces meant for two different receivers:

- Order Information (OI) for merchant.
- Payment Information (PI) for bank.

Here, PI stands for payment information and OI stands for order information. The merchant does not need to know the customer's credit-card number, and the bank does not need to know the details of the customer's order. The customer is afforded extra protection in terms of privacy by keeping these two items separate.

⑤ Virtual Currency:

A virtual currency is a digital representation of value only available in electronic form. It is stored and transacted through designated software, mobile, or computer applications.

Transactions involving virtual currencies occur through secure, dedicated networks or over the Internet. They are issued by private parties or groups of developers and are mostly unregulated.

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 advantage include faster transaction speeds and ease of use. The disadvantage of virtual currencies are that they can be hacked and do not provide much legal recourse to investors because they are not regulated.

④ Status of E-Payment Systems in Nepal:

As internet developed, lots of possibilities emerged in the Nepal also in recent years. Now, internet has changed people's way of thinking and living. In Nepal, now there are also many online companies that help send and receive money online, purchase air tickets, pay utility bills, buy mobile recharge cards, pay internet bills etc. Nepal also has many online payment systems, such as eSewa, Khalti, and different mobile banking applications.

Account Transfer in Nepal is the best and secure process to transfer the bigger and smaller amount in other banks of Nepal. There are an estimated 4 million digital wallet users in Nepal now. They have graduated from ATM debit/credit cards to e-banking and mobile banking to the M-wallet movement. The use of digital payment systems and credit or debit cards has significantly increased in Nepal in recent years which is evident by the data provided by the Nepal Rastra Bank (NRB). Digital transaction or cashless payments in 2018 was NPR 712 billion while in 2019, the amount increased to NPR 1,559 billion and is gradually increasing in recent years.

⑤ Functions/Advantages of E-payment systems:

- Reduced Transaction Costs
- Secure E-Payment Transactions
- Saved Time and Resources
- Speed of E-payments.
- Complete visibility and transparency throughout entire payment process.

④ Properties of e-Cash:

- i) Monetary value: Monetary value should be backed by bank certified cashier's cheque or cash, bank authorized credit cards.
 - ii) Interoperability: E-cash should be interoperable, that is, exchangeable for other e-cash, goods or services, and paper cash.
 - iii) Retrievability: E-cash should be retrievable and storable.
 - iv) Security: E-cash must not be simple to copy or tamper.