

Unit- III

SYLLABUS: Types of Electronic Payment Systems, Digital Token-Based Electronic Payment Systems, Smart Cards & Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk & Electronic Payment Systems, Designing Electronic Payment Systems.

Types of Electronic Payment Systems

- Electronic payment systems are proliferating in banking, retail, health care, on-line markets, and even government—in fact, anywhere money needs to change hands.
- Organizations are motivated by the need to deliver products and services more cost effectively and to provide a higher quality of service to customers.
- The emerging electronic payment technology labeled electronic funds transfer (EFT).
- EFT is defined as “any transfer of funds initiated through an electronic terminal, telephonic instrument, or computer or magnetic tape so as to order, instruct, or authorize a financial institution

EFT can be segmented into three broad categories:

- Banking and financial payments
 - Large-scale or wholesale payments (e.g., bank-to-bank transfer)
 - Small-scale or retail payments (e.g., automated teller machines)
 - Home banking (e.g., bill payment)
- Retailing payments
 - Credit Cards (e.g., VISA or MasterCard)
 - Private label credit/debit cards (e.g., J.C. Penney Card)
 - Charge Cards (e.g., American Express)
- On-line electronic commerce payments
 - 1. Token-based payment systems
 - Electronic cash (e.g., DigiCash)
 - Electronic checks (e.g., NetCheque)
 - Smart cards or debit cards (e.g., Mondex Electronic Currency Card))
 - 2. Credit card-based payments systems
 - Encrypted Credit Cards (e.g., World Wide Web form-based encryption)
 - Third-party authorization numbers (e.g., First Virtual)

1) Digital Token-Based Electronic Payment Systems

Electronic tokens are three types:

1. Cash or Real-time

- Transactions are settled with exchange of electronic currency.
- Ex: on-line currency exchange is electronic cash (e-cash).

2. Debit or Prepaid

- Users pay in advance for the privilege of getting information.
- Ex: prepaid payment mechanisms are stored in smart cards and electronic purses that store electronic money.

3. Credit or Postpaid

- The server authenticates the customers and verifies with the bank that funds are adequate before purchase.
- Ex: postpaid mechanisms are *credit/debit cards* and *electronic checks*.

Properties of Electronic Cash:

- There are many ways that exist for implementing an e-cash system, all must incorporate a few common features.
- Specifically, e-cash must have the following four properties:

1. Monetary value
2. Interoperability
3. Retrievability
4. Security

Electronic Cash in Action

- Electronic Cash is based on cryptographic systems called “digital signatures”.
- This method involves a pair of numeric keys: one for locking (encoding) and the other for unlocking (decoding). (Through public key and private key).

Purchasing E-cash from Currency Servers

The purchase of e-cash from an on-line currency server (or bank) involves two steps:

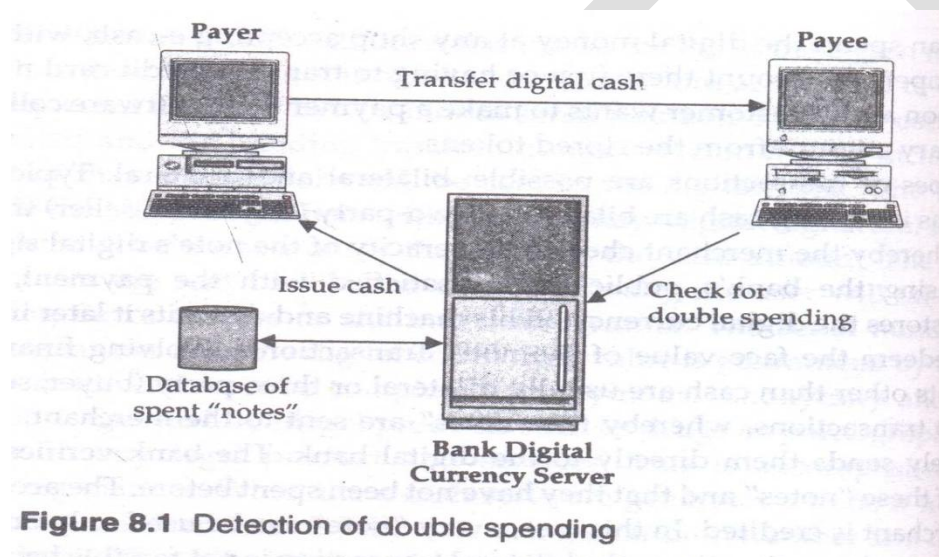
- Establishment of an account and

- Maintaining enough money in the account to bank the purchase.

Some customers might prefer to purchase e-cash with paper currency, either to maintain anonymity or because they don't have a bank account.

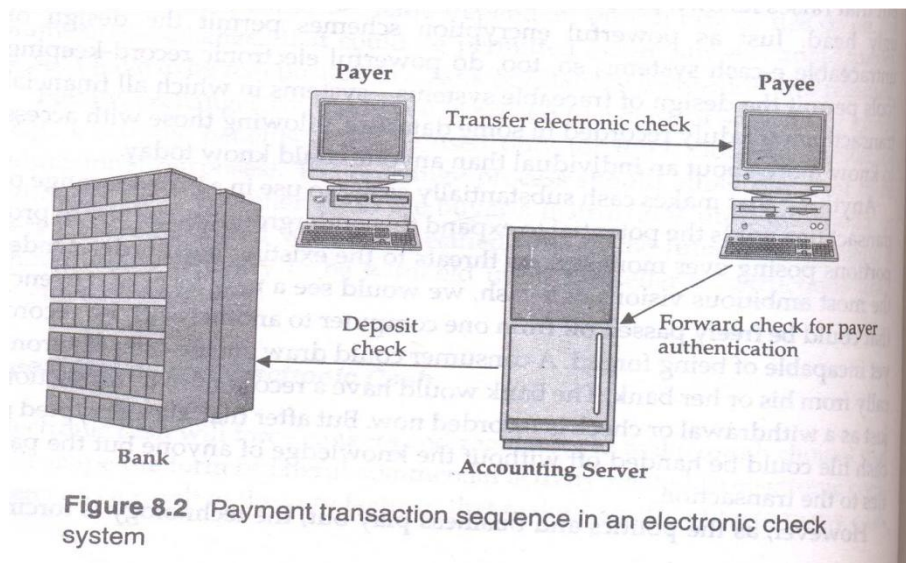
Using the Digital Currency

- Once the tokens are purchased, the e-cash software on the customer's PC stores digital money undersigned by a bank.
- The users can spend the digital money at any shop accepting e-cash, without having to open an account there or having to transmit credit card numbers.
- As soon as the customer wants to make a payment, the software collects the necessary amount from the stored tokens.



Electronic Checks

- It is another form of electronic tokens.
- In the given model shown in fig, buyers must register with third-party account server before they are able to write electronic checks.
- The account server acts as a billing service.
- The advantages are:
 1. They work in the same way as traditional checks.
 2. These are suited for clearing micropayments
 3. They create float & availability of float is an important for commerce
 4. Financial risk is assumed by the accounting server & may result in easier acceptance.



Smart Cards & Electronic Payment Systems

- Smart cards have been in existence since the early 1980s and hold promise for secure transactions using existing infrastructure.
- Smart cards are credit and debit cards and other card products enhanced with microprocessors capable of holding more information than the traditional magnetic stripe.
- The smart card technology is widely used in countries such as France, Germany, Japan, and Singapore to pay for public phone calls, transportation, and shopper loyalty programs.

Smart cards are basically two types:

- Relationship-Based Smart Credit Cards
- Electronic Purses, which replace money, are also known as debit cards and electronic money.

Relationship-Based Smart Credit Cards

- It is an enhancement of existing cards services &/ or the addition of new services that a financial institution delivers to its customers via a chip-based card or other device
- These services include access to multiple financial accounts, value-added marketing programs, or other information card holders may want to store on their card
- It includes access to multiple accounts, such as debit, credit, cash access, bill payment & multiple access options at multiple locations

Electronic Purses

- To replace cash and place a financial instrument are racing to introduce “electronic purses”, wallet-sized smart cards embedded with programmable microchips that store sums of money for people to use instead of cash for everything
- The electronic purse works in the following manner:
 1. After purse is loaded with money at an ATM, it can be used to pay for candy in a vending machine with a card reader.
 2. It verifies card is authentic & it has enough money, the value is deducted from balance on the card & added to an e-cash & remaining balance is displayed by the vending machine.

2) Credit Card-Based Electronic Payment Systems

Payment cards are all types of plastic cards that consumers use to make purchases:

- Credit cards
 - Such as a Visa or a MasterCard, has a preset spending limit based on the user’s credit limit.
- Debit cards
 - Removes the amount of the charge from the cardholder’s account and transfers it to the seller’s bank.
- Charge cards
 - Such as one from American Express, carries no preset spending limit.

Advantages:

- Payment cards provide fraud protection.
- They have worldwide acceptance (nearly!).
- They are good for online

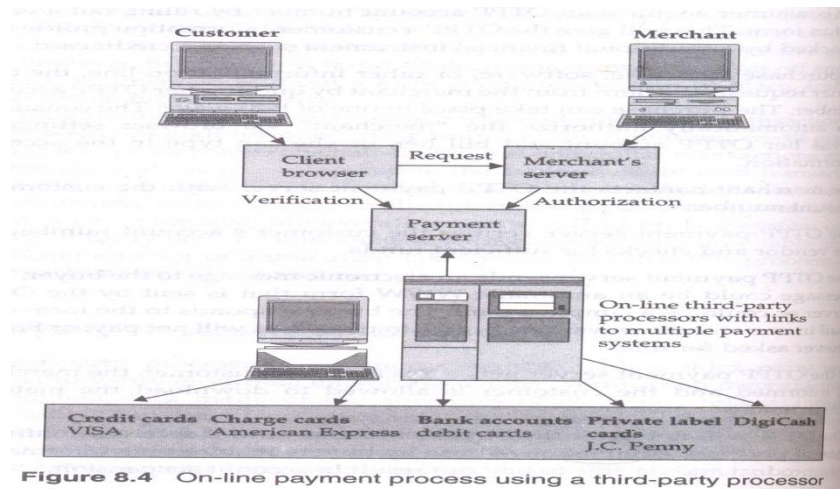
transactions. Disadvantages:

- Payment card service companies charge merchants per-transaction fees and monthly processing fees.

Payment Acceptance and Processing

- Open loop (such as VISA) and closed loop (such as American Express) systems will accept and process payment cards.
- A merchant bank or acquiring bank is a bank that does business with merchants who want to accept payment cards.

Software packaged with your electronic commerce software can handle payment card processing automatically.



- Electronic cash is a general term that describes the attempts of several companies to create value storage and exchange system that operates online in much the same way that government-issued currency operates in the physical world.
- Concerns about electronic payment methods include:
 - Privacy
 - Security
 - Independence
 - Portability
 - Convenience

Electronic Cash Issues

- Primary advantage is with purchase of items less than £5
 - Credit card transaction fees make small purchases unprofitable
 - Facilitates Micropayments – eg for items costing less than £1
 - Must be anonymous, just like regular currency
- Safeguards must be in place to prevent counterfeiting
- Must be independent and freely transferable regardless of nationality or storage mechanism.

Electronic Cash Storage

- Two methods
 - On-line
 - Individual does not have possession personally of electronic cash
 - Trusted third party, e.g. e-banking, bank holds customers' cash accounts
 - Off-line
 - Customer holds cash on smart card or electronic wallet
 - Fraud and double spending require tamper-proof encryption

Risks in Electronic Payment systems

- Customer's risks
 - Stolen credentials or password
 - Dishonest merchant
 - Disputes over transaction
 - Inappropriate use of transaction details
- Merchant's risk
 - Forged or copied instruments
 - Disputed charges
 - Insufficient funds in customer's account
 - Unauthorized redistribution of purchased items
- Main issue: Secure payment scheme

Electronic payments Issues

- Secure transfer across internet
- High reliability: no single failure point
- Atomic transactions
- Anonymity of buyer
- Economic and computational efficiency: allow micropayments
- Flexibility: across different methods

- Scalability in number of servers and users

Designing Electronic Payment systems

It includes several factors:

- **Privacy.** A user expects to trust in a secure system; just as a telephone is a safe
- **Security.** A secure system verifies the identity of two-party transactions through “user authentication” & reserves flexibility to restrict information/services through access control
- **Intuitive interfaces.** The payment interface must be as easy to use as a telephone.
- **Database integration.** With home banking, for ex, a customer wants to play with all his accounts.
- **Brokers.** A “network banker”-someone to broker goods & services, settle conflicts, & financial transactions electronically-must be in place
- **Pricing.** One fundamental issue is how to price payment system services. For e.g., from cash to bank payments, from paper-based to e-cash. The problem is potential waste of resources.
- **Standards.** Without standards, the welding of different payment users into different networks & different systems is impossible.