Titles

- Overview of Electronic Payment systems
- Cybercash
- Smart cards
- Electronic banking
- Types of electronic fund transfers
- E-cash
- E- cheque
- Payment systems on internet
- Risk of electronic payment systems
- Secure electronic transaction protocol
- Digital token-based electronic payment system

ON GOING TRANSITION

FROM PAPER TO PLASTIC.....

What Electronic Payment system is?

Electronic Payment is a financial exchange that takes place online between buyers and sellers. The content of this exchange is usually some form of digital financial instrument (such as encrypted credit card numbers, electronic cheques or digital cash) that is backed by a bank or an intermediary, or by a legal tender.

Electronic payment system is a system which helps the customer or user to make online payment for their shopping.

Characteristics of electronic payment system

- Applicability
- Easy to use
- Security
- Reliability
- Trust
- Scalability
- Convertibility
- Interoperability
- Efficiency
- Traceability
- Authorization type

Requirements For E-payments

The various factors that have lead the financial institutions to make use of electronic payments are:

1. Decreasing technology cost:
   The technology used in the networks is decreasing day by day.
2. Reduced operational and processing cost:
   Due to reduced technology cost the processing cost of various commerce activities becomes very less. A very simple reason to prove this is the fact that in electronic transactions we save both paper and time.
3. Increasing online commerce:

Some Examples Of EPS:-

- Online Reservation
- Online Bill Payment
- Online Order Placing (Nirulas)
- Online Ticket Booking (Movie)

Two Storage Methods

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

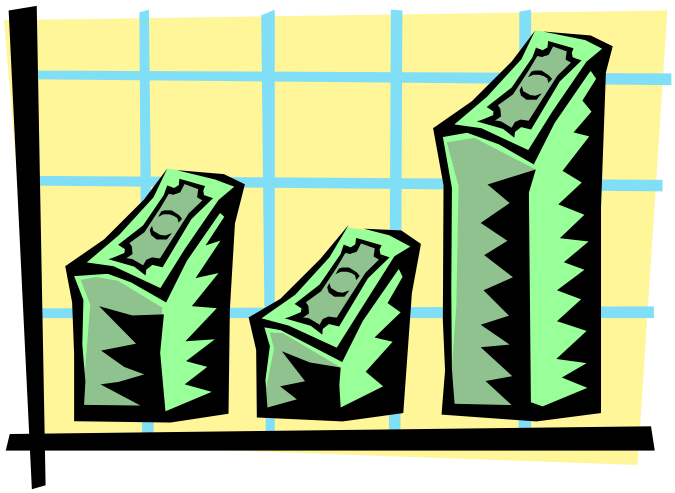
Outline

- Trandition Payment Methods
- E-Payment Methods

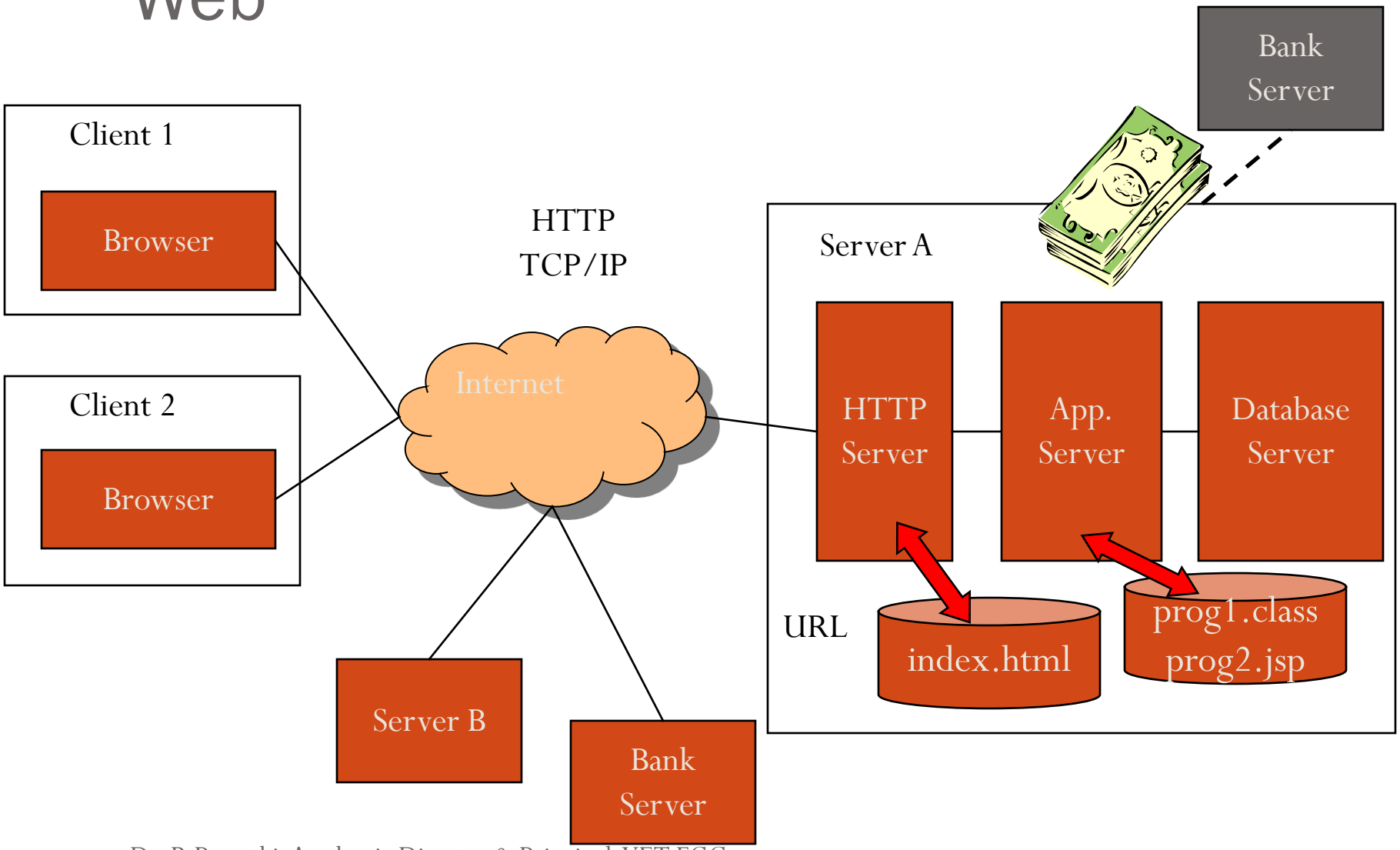
Traditional Payment Methods

Payment: *The transfer of money from one individual or legal entity to another*

- Cash
- Personal Cheques
- Money orders (Bank note)
- Credit cards
- Debit cards



Major Architectural Components of the Web

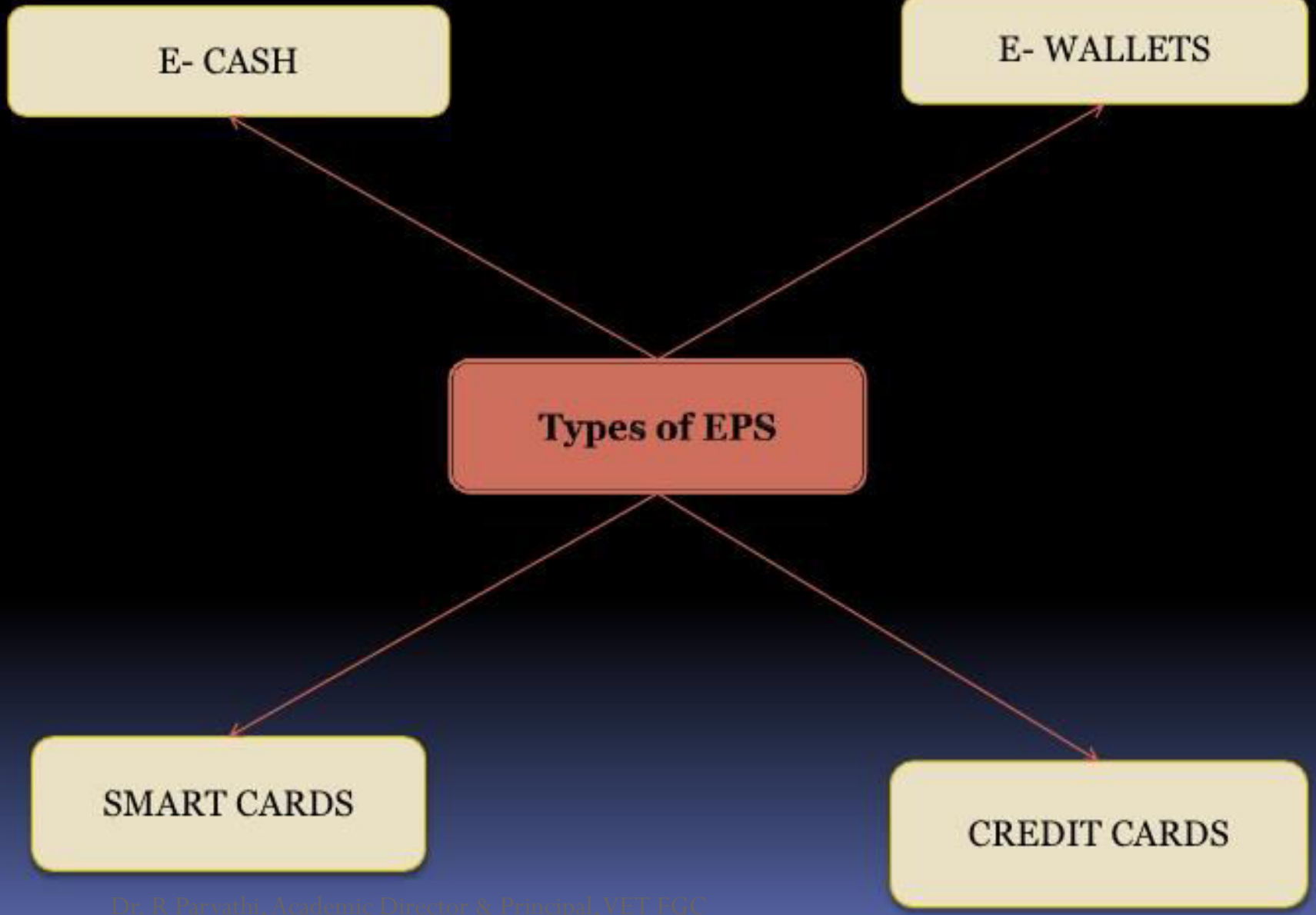


Selection of Payment Method

- Based on:
  - Convenience
  - Trace-ability
  - Repudiation
  - Financial risk
  - Fraud protection
- Attacks on traditional methods?

Various E-Payment Methods

- Credit and Debit card
- Digital Currency
- E-Wallets
- Peer-to-Peer Methods
- Smart card
- Micro-payments
- B2B


E- CASH
E- WALLETS
Types of EPS
SMART CARDS
CREDIT CARDS

Requirements of E-Payment Methods

- Enable an honest customer to convince a seller to accept payment
- Prevent a dishonest customer from making unauthorized or fraudulent payments
- Ensure the privacy of honest participants
- Scalable to very large numbers of customers
- Integrate with existing and evolving systems

NOT EASY!

Desirable Properties of Digital Money

- Universally accepted
- Transferable electronically
- Divisible
- Private (no one except parties know the amount)
- Anonymous (no one can identify the payer)

No known system satisfies all.

E-Payment Pros/Cons

- Pros:
  - Potential for great flexibility
  - Low transaction costs
  - Rapid and diverse purchase power
- Cons:
  - Perfect copying of transactions is possible
  - Vulnerability to world-wide attack
  - Lack of anonymity, potential for privacy intrusion

Objectives

In this chapter, you will learn about:

- The basic functions of online payment systems
- The use of payment cards in electronic commerce
- The history and future of electronic cash
- How electronic wallets work
- The use of stored-value cards in electronic commerce
- Internet technologies and the banking industry

Online Payment Basics

- Scrip: Any substitute for currency which is not legal tender, and is often a form of credit.
  - For example…
    - Digital cash minted by a company instead of by a government (e.g., Linden Dollars)
    - Gift certificates or gift cards
    - Subway tokens or arcade tokens

Payment Cards

- The term payment card describes all types of plastic cards used to make purchases
- Credit card
  - Has a spending limit based on a user's credit history
- Debit card
  - Removes an amount from a cardholder's bank account
  - Transfers it to the seller's bank account
- Charge card
  - Carries no spending limit
  - Amount charged is due at the end of the billing period

Credit cards

- It is a Plastic Card having a Magnetic Number and code on it.
- It has Some fixed amount to spend.
- Customer has to repay the spend amount after sometime.

Credit Cards

- Credit card
  - Used for the majority of Internet purchases
  - Has a preset spending limit
  - Currently most convenient method
  - Most expensive e-payment mechanism
    - MasterCard: $0.29 + 2% of transaction value
  - Disadvantages
    - Does not work for small amount (too expensive)

Processing a Payment Card Order

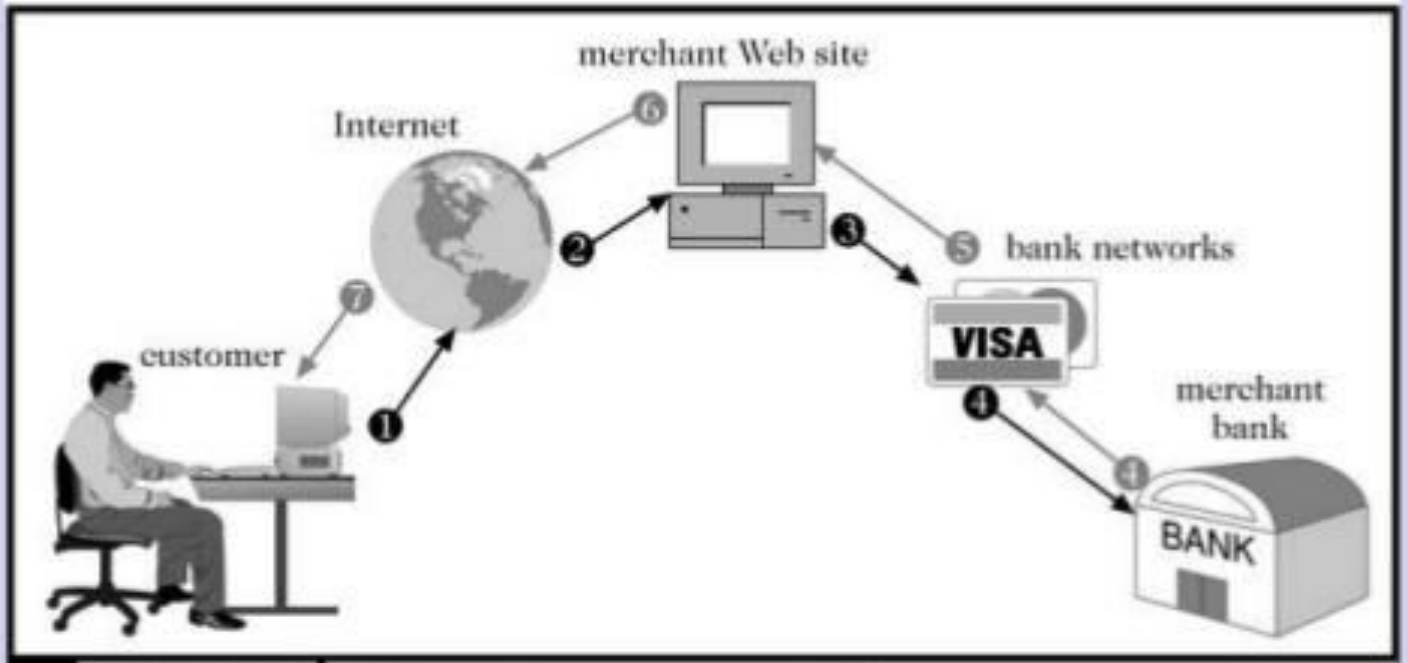
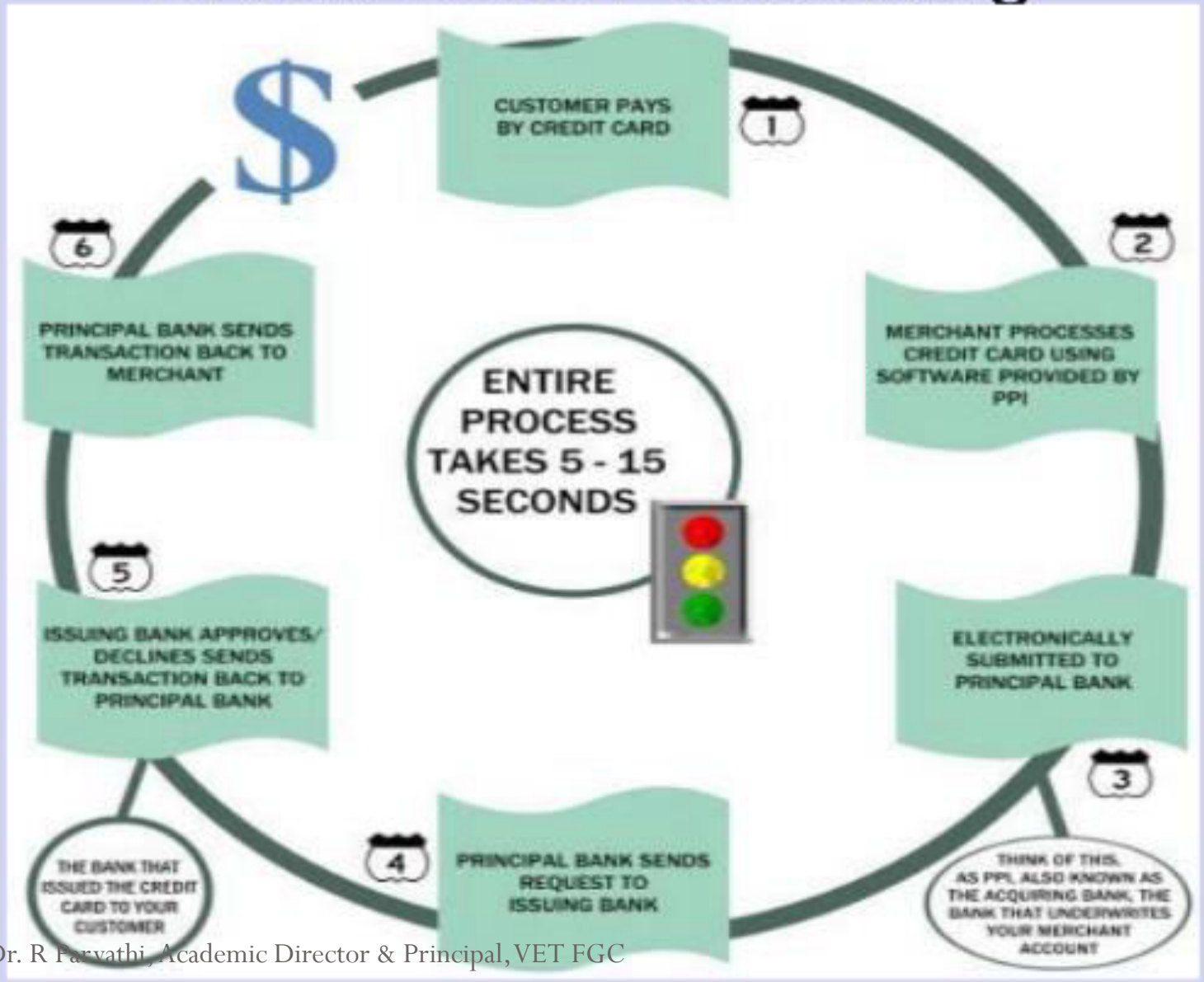


FIGURE 7-13 *Processing a payment card order*

Credit Card Processing



Debit Card

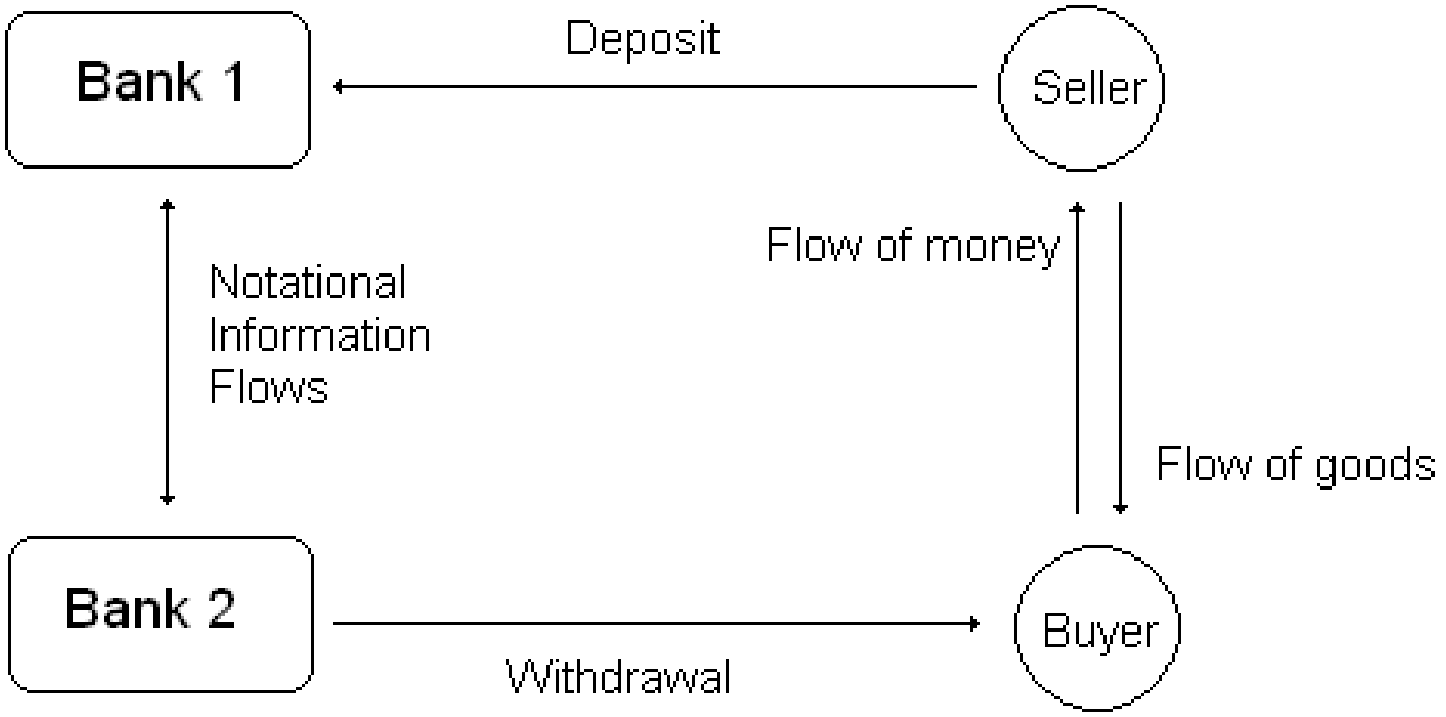
- A **debit card** is a plastic card which provides an alternative payment method to cash when making purchases. Physically the card is an ISO 7810 card like a credit card;
- Depending on the store or merchant, the customer may swipe or insert their card into the terminal, or they may hand it to the merchant who will do so. The transaction is authorized and processed and the customer verifies the transaction either by entering a PIN or, occasionally, by signing a sales receipt.

Credit card VS Debit card

- You can obtain credit in credit card but not in debit card.
- Credit card charges interest for using the bank's money. (debit card is free from this problem)

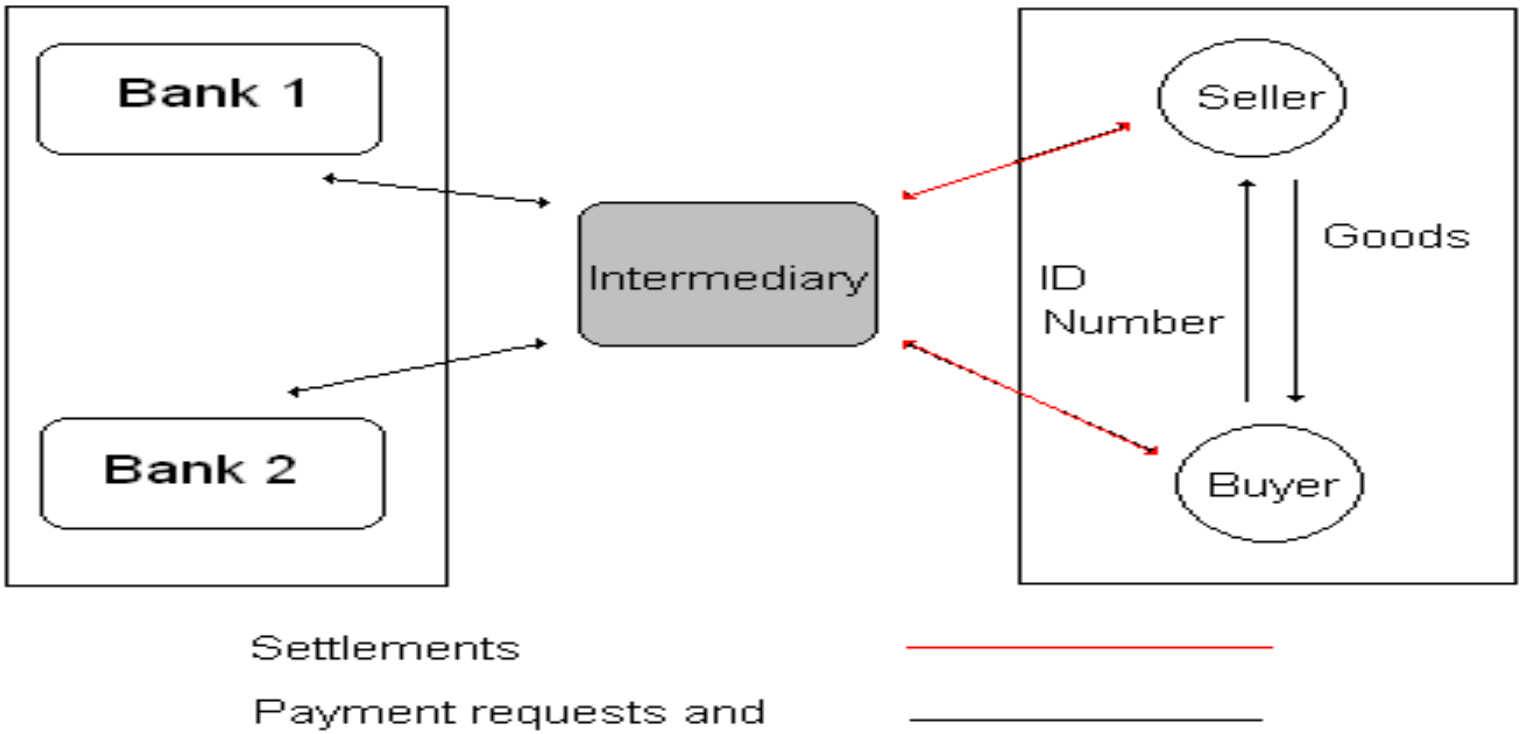
Electronic Payment Systems

- Transaction reconciliation
  - Cash or check



Electronic Payment Systems

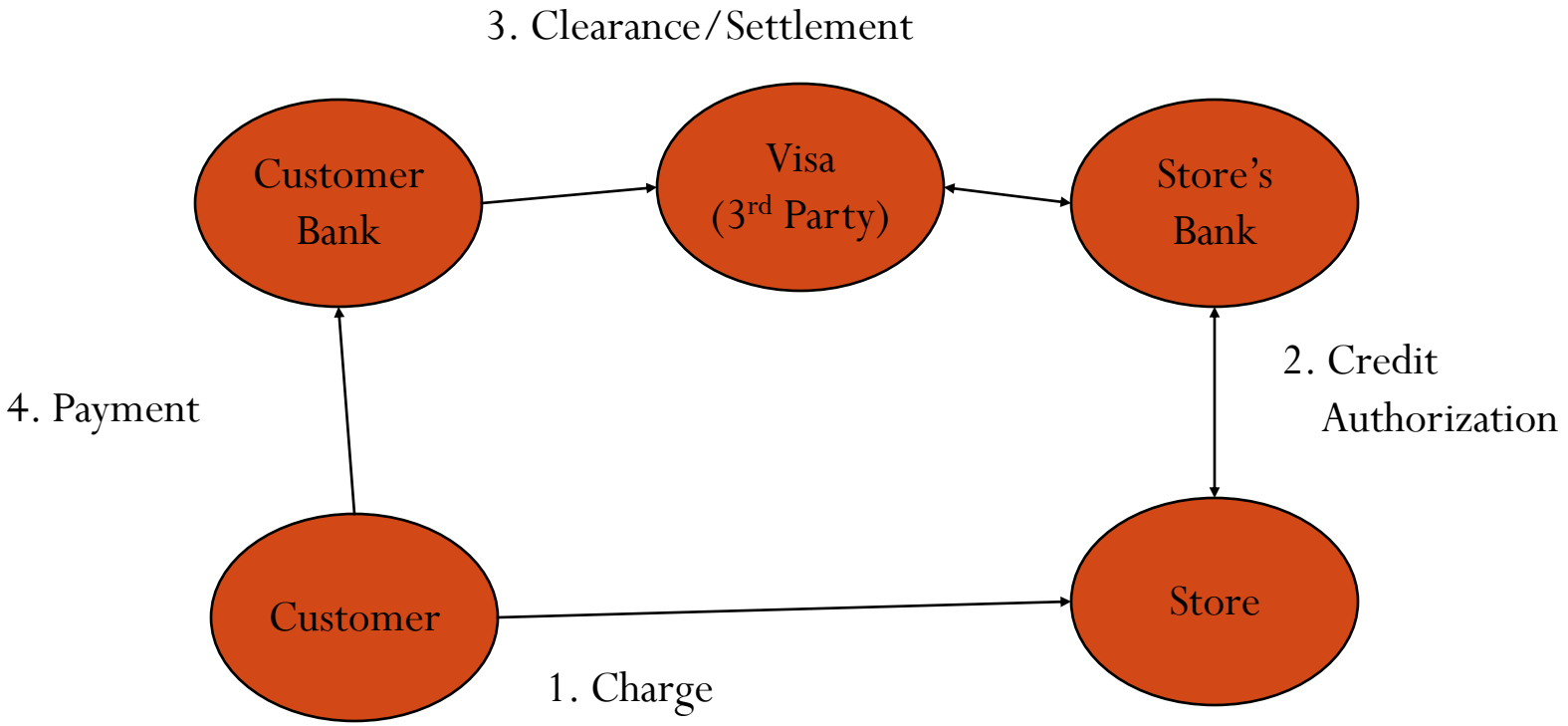
- Intermediated reconciliation (credit or debit card, 3rd party money order)



Credit Cards

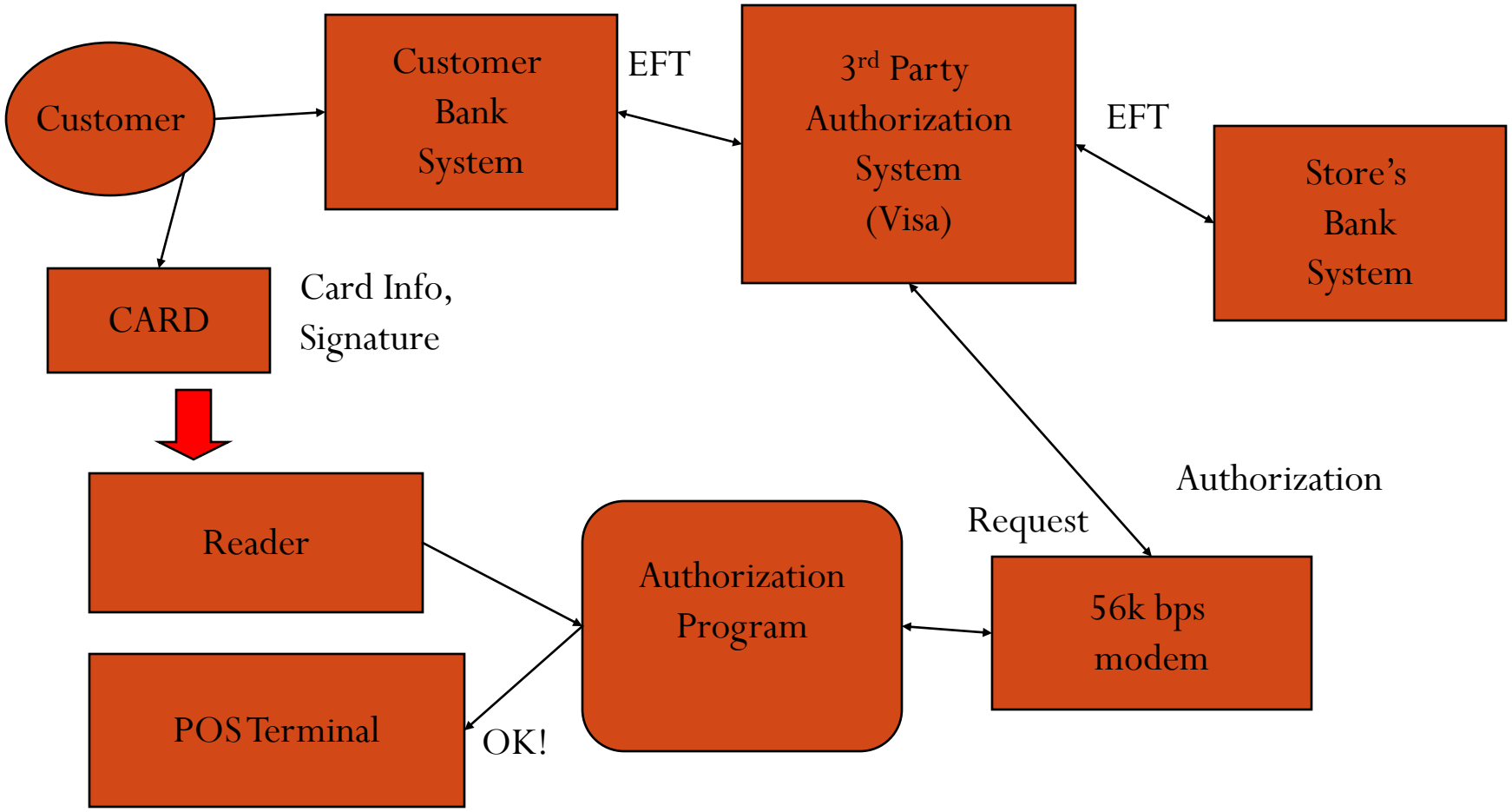
- A very common method of payment
- Cards are issued by a bank
- Unique 16-digit number (including check digits) and an expiration date
- Third party authorization companies verify purchases

Credit Card - Business Model Logical Money Flow



What can you do if your statement shows a fraudulent purchase?

Credit Card - IT Physical Data Flow



Advantages and Disadvantages of Payment Cards

- Advantages:
  - Widespread acceptance
  - Usually have built-in security for merchants
- Disadvantage:
  - Payment card service companies charge merchants per-transaction fees and monthly processing fees

Payment Acceptance and Processing

- Steps followed once a merchant receives a consumer's payment card information:
  - Merchant authenticates payment card
  - Merchant checks with payment card issuer
    - To ensure that credit or funds are available
    - Puts a hold on the credit line or the funds needed to cover the charge
  - Settlement of balance with the issuer

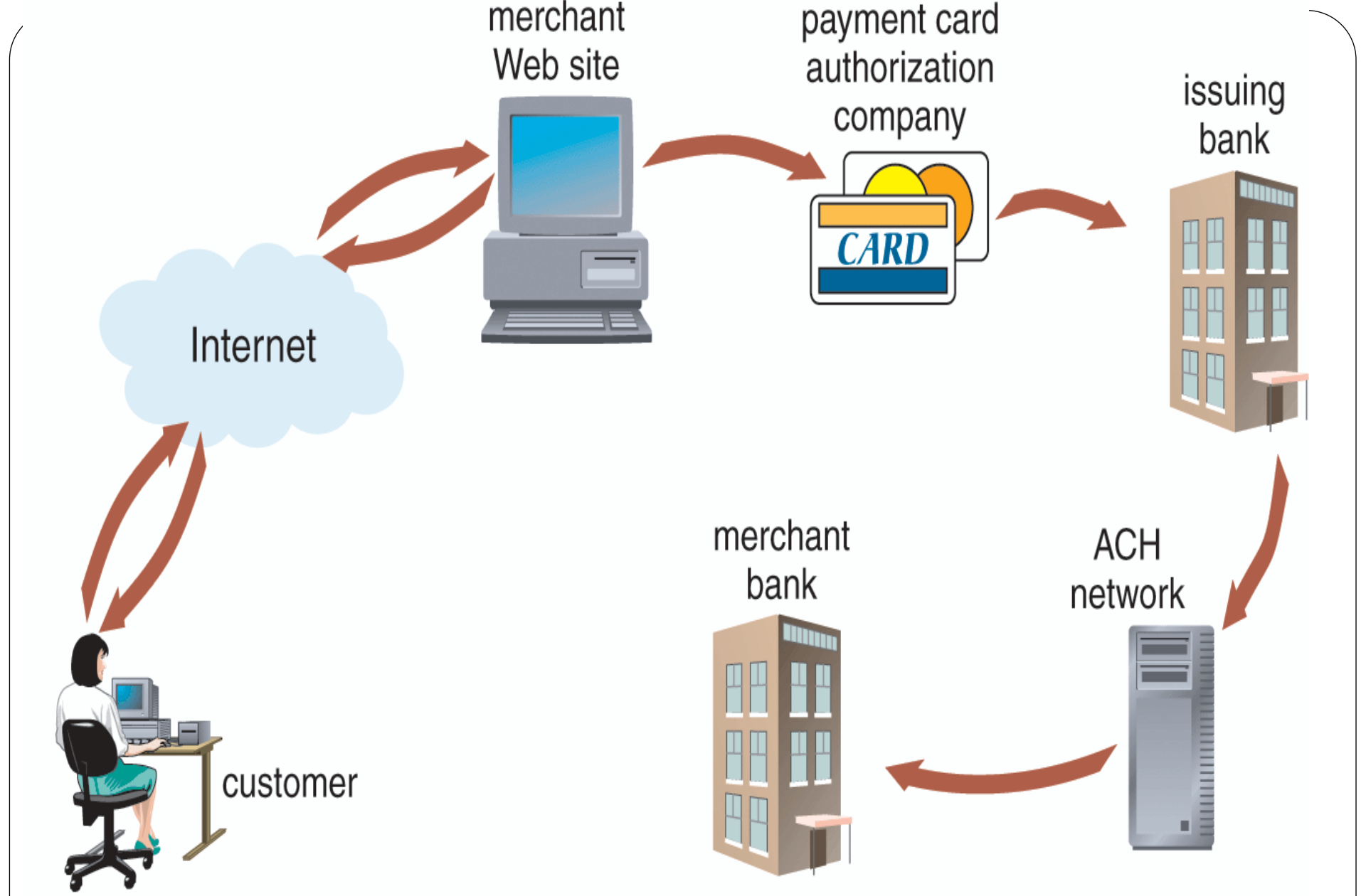


FIGURE 11-3 Processing a payment card transaction

Digital token based electronic payment systems

- E-cash
- E-cheque

E-Cash

- A system that allows a person to pay for goods or services by transmitting a number from one computer to another.
- Like the serial numbers on real currency notes, the E-cash numbers are unique.
- This is issued by a bank and represents a specified sum of real money.
- It is anonymous and reusable.

Electronic Cash

- Term that describes any value storage and exchange system created by a private entity that:
  - Does not use paper documents or coins
  - Can serve as a substitute for government-issued physical currency

Requirements of E-Payment Methods

- Enable an honest customer to convince a seller to accept payment
- Prevent a dishonest customer from making unauthorized or fraudulent payments
- Ensure the privacy of honest participants
- Scalable to very large numbers of customers
- Integrate with existing and evolving systems

NOT EASY!

Micropayments and Small Payments

- Micropayments
  - Internet payments for items costing from a few cents to around $1
- Small payments
  - Payments of less than $10

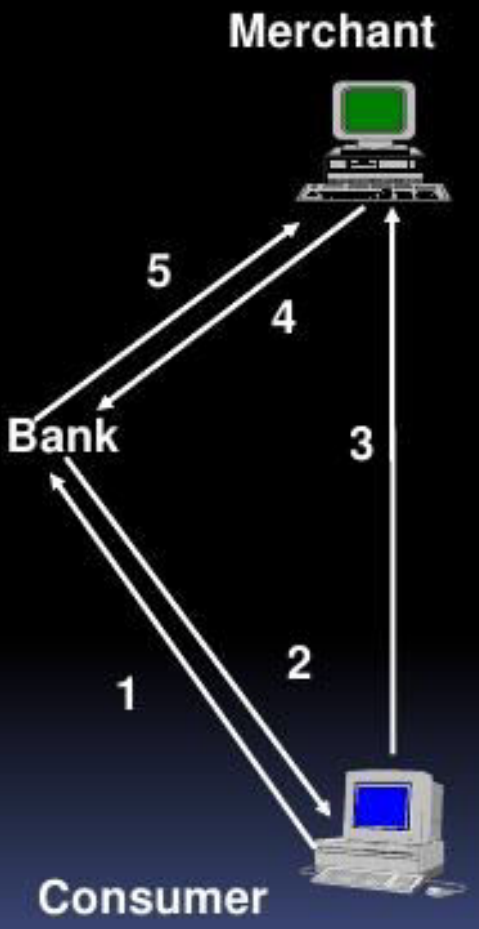
Privacy and Security of Electronic Cash

- Concerns about electronic payment methods include:
  - Privacy and security
  - Independence
  - Portability
  - Convenience
- Advantages of electronic cash include being:
  - Independent and portable

Electronic Cash Security

- Complex cryptographic algorithms prevent double spending
  - Anonymity is preserved unless double spending is attempted
- Serial numbers can allow tracing to prevent money laundering

E-Cash Processing



1) Consumer buys e-cash from Bank
2) Bank sends e-cash bits to consumer (after charging that amount plus fee)
3) Consumer sends e-cash to merchant
4) Merchant checks with Bank that e-cash is valid (check for forgery or fraud)
5) Bank verifies that e-cash is valid
6) Parties complete transaction

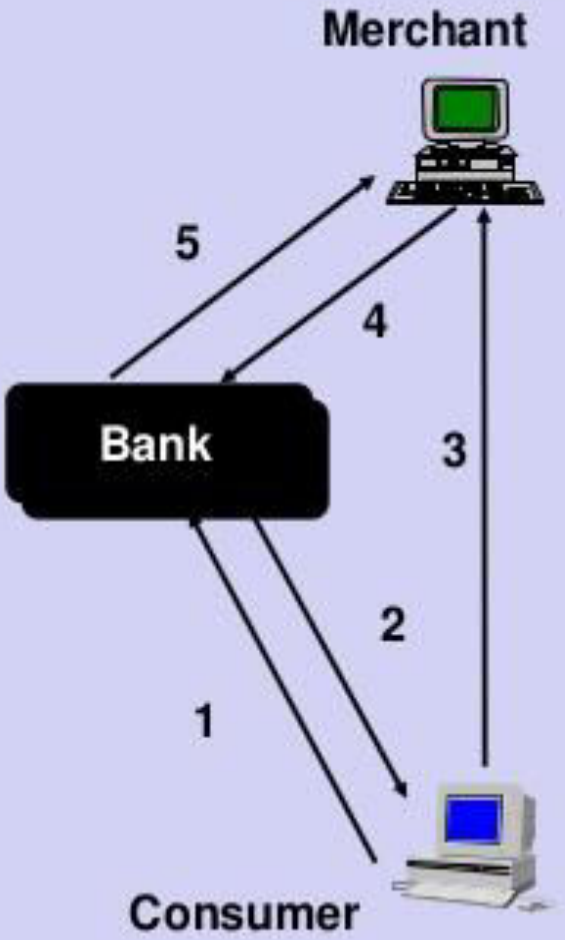
E-Payment Pros/Cons

- Pros:
  - Potential for great flexibility
  - Low transaction costs
  - Rapid and diverse purchase power
- Cons:
  - Perfect copying of transactions is possible
  - Vulnerability to world-wide attack
  - Lack of anonymity, potential for privacy intrusion

Holding Electronic Cash: Online and Offline Cash

- Online cash storage
  - Trusted third party is involved in all transfers of electronic cash
  - Holds consumers' cash accounts
- Offline cash storage
  - Virtual equivalent of money kept in a wallet
  - No third party is involved in the transaction
- Double-spending
  - Spending electronic cash twice

E-cash Concept



1. Consumer buys e-cash from Bank
2. Bank sends e-cash bits to consumer (after charging that amount plus fee)
3. Consumer sends e-cash to merchant
4. Merchant checks with Bank that e-cash is valid (check for forgery or fraud)
5. Bank verifies that e-cash is valid
6. Parties complete transaction: e.g., merchant present e-cash to issuing back for deposit once goods or services are delivered

Electronic Cash

- Primary advantage is with purchase of items less than $10
  - Credit card transaction fees make small purchases unprofitable
  - Micropayments
    - Payments for items costing less than $1

Past and Present E-cash Systems

- **E-cash not popular in U.S., but successful in Europe and Japan**
  - Reasons for lack of U.S. success not clear
    - o Manner of implementation too complicated
    - o **Lack of standards and interoperable software** that will run easily on a variety of hardware and software systems

Past and Present E-cash Systems

- CyberCash
- CyberCoins
- DigiCash
- Coin.Net

Advantages and Disadvantages of Electronic Cash

- Advantages of electronic cash:
  - Transactions are more efficient
  - Costs less than processing credit card transactions
- Disadvantages of electronic cash:
  - No audit trail
  - Money laundering and fraud
  - Susceptible to forgery

ADVANTAGES OF ELECTRONIC CASH

- Electronic cash transactions are more efficient and less costly than other methods.
- The distance that an electronic transaction must travel does not affect cost.
- The fixed cost of hardware to handle electronic cash is nearly zero.
- Electronic cash does not require that one party have any special authorization.

DISADVANTAGES OF ELECTRONIC CASH

- Electronic cash provides no audit trail.
- Because true electronic cash is not traceable, money laundering is a problem.
- Electronic cash is susceptible to forgery.
- So far, electronic cash is a commercial flop.

Electronic Cash Systems

- CheckFree
  - Largest ACH (Automated Clearing House) in the world
  - Provides online payment processing services
- Clickshare
  - Clickshare allows a consumer to have one account at a most-trusted website and buy from other websites without having to pass around a credit-card number, register or give out personal information. One ID, one account, one bill.

Electronic Cash Systems

- PayPal
  - Founding in 2000 and purchased by eBay in 2002
  - Provides payment processing services to businesses and to individuals
  - Peer-to-peer (P2P) payment system
    - Free payment clearing service for individuals

dentification as
part of eBay

IGURE 11-6 PayPal home page

Electronic Wallets

- Hold credit card numbers, electronic cash, owner identification, and contact information
- Give consumers the benefit of entering their information just once
- Make shopping more efficient

E-Wallet

- The E-wallet is another payment scheme that operates like a carrier of e-cash and other information.
- The aim is to give shoppers a single, simple, and secure way of carrying currency electronically.
- Trust is the basis of the e-wallet as a form of electronic payment.

Electronic Wallets

- Server-side electronic wallet
  - Stores a customer's information on a remote server belonging to a particular merchant or wallet publisher
- Client-side electronic wallet
  - Stores a consumer's information on his or her own computer

Electronic Wallets

- **Stores credit card, electronic cash, owner identification and address**
  - Makes shopping easier and more efficient
    - o Eliminates need to repeatedly enter identifying information into forms to purchase
    - o Works in many different stores to speed checkout
  - Amazon.com one of the first online merchants to eliminate repeat form-filling for purchases

An Electronic Checkout Counter Form

Please fill in the information below. Items in red are required for us to process your order. You can submit this form online, or if you are concerned about online security, you can call our Customer Service department at 1-800-465-5846 (or 406-325-7000 for orders originating outside the US) and place your order over the phone. Our Customer Service hours are 6:30AM until 5:00PM, Monday through Friday, Pacific Standard Time.

We are currently experiencing shipping delays of up to 84 hours. For faster delivery, please place your order with our Customer Service Department at 1(888)465-5846. We apologize for any inconvenience this may cause.

Step 3: Email Address

Enter your email address. Note that all order confirmations, order tracking, etc is emailed to this address. Please double check your e-mail address; this is our only means of communicating with you regarding your order.

Email

Step 4: Billing Address

Please give us your billing address and contact information.

First Name
Last Name
Company
Address1
Address2
City
State (abbrev) State or Province (if non-US) ZipPostal Code
Country USA
Phone Fax

FIGURE 7-9 *A typical electronic checkout counter form*

Electronic Wallets

- Agile Wallet
  - Developed by CyberCash
  - Allows customers to enter credit card and identifying information once, **stored on a central server**
  - Information pops up in supported merchants' payment pages, allowing one-click payment
  - Does not support smart cards or CyberCash, but company expects to soon
- eWallet
  - Developed by Launchpad Technologies
  - Free wallet software that stores credit card and **personal information on users' computer**, not on a central server; info is dragged into payment form from eWallet
  - Information is encrypted and password protected
  - Works with Netscape and Internet Explorer

Electronic Wallets

- Microsoft Wallet
  - Comes pre-installed in Internet Explorer 4.0, but not in Netscape
  - All information is encrypted and password protected
  - Microsoft Wallet Merchant directory shows merchants setup to accept Microsoft Wallet

Entering Information Into Microsoft Wallet

FIGURE 7-10 *Entering credit card information into Microsoft Wallet*

Procedure for using an e-wallet

1. Decide on an online site where you would like to shop.
2. Download a wallet from the merchant's website.
3. Fill out personal information such as your credit card number, name, address and phone number, and where merchandise should be shipped.
4. When you are ready to buy, click on the wallet button, the buying process is fully executed.

Digital Wallet

Digital wallet authenticates the consumer through the use of digital certificates or other encryption methods, stores and transfers value, and secure the payment process from the consumer to the merchant.

Authentication

Confirms identities via Digital certificates, SET, or other forms of encryption.

4. Digital Accumulating Balance Payment System

- used for making micro payments
- accumulates debit balance
- billed at the end of the month
- ideal for purchasing intellectual property from Net

Example : qPass

iPIN

Millicent

5. Digital Credit Card Payment System

- extends functionality of existing Credit Card Systems
- safer than traditional Credit Card
- authenticates both parties by verifying digital certificates
- automatic form completion
- credit card bills paid at month end by credit or debit account or a bank account

Digital Checking

- extends functionality of a existing checking account
- Account information not revealed
- less expensive (almost half) for merchants than credit cards
- faster than paper based checking system
- Examples Peer to Peer Achex

  B to C Echecks

  BillPoint Electronic checks

  (used only at eBay)

eChange

4. Authenticate merchant & consumer

5. Verify account & balances

2. eChange approves application downloads digital wallet to consumer's computer

Participating Merchant

Consumer's Issuing Bank

SSL secure encrypted connection

3. Consumer uses eCharge at participating merchant

Consumer

1. Consumer signs up for eChange account

6. Monthly statements issued showing debit to eCharge

Microsoft .NET Passport

- An electronic wallet operated by Microsoft
- Passport consists of four integrated services:
  - Passport single sign-in service (SSI)
  - Passport Wallet service
  - Kids Passport service
  - Public profiles

Yahoo! Wallet

- Server side electronic wallet offered by Yahoo!
- Lets users store information about several major credit and charge cards
- Many industry observers and privacy rights activist groups are concerned about electronic wallets

W3C Micropayment Standards Development Activity

- Common Markup for Micropayment Per-Fee-Links
  - Standards developed by W3C Electronic Commerce Interest Group (ECIG)
  - Provide extensible and interoperable way to embed micropayment information in a Web page
- Extensible system
  - One that developers can add to (or extend) without voiding any earlier work on the system

The ECML Standard

- Electronic Commerce Modeling Language is a protocol that dictates how online retailers structure and setup their checkout forms
  - Proposed alternative standard that would replace electronic wallet standards with a single standard

Stored-Value Cards

- Stored-value cards can be an elaborate smart card with a microchip that records a currency balance
- Common stored-value cards include:
  - Prepaid phone, copy, subway, and bus cards

Magnetic Strip Cards

- Magnetic strip cards
  - Cannot send or receive information
  - Cannot increment or decrement value of cash stored on the card
  - Processing must be done on a device into which the card is inserted

Smart Cards

- Cards with computer chips embedded on their faces – very common in Europe
- Used for health care, transportation, ID, retail, pay phones, loyalty programs, banking machines
- Smart card readers interface with card and request user PIN for access
- Bank machines can load cards with cash and then merchants can download cash from card
- Returns anonymity of purchase to customer
- GemPlus, MasterCard are leading supplier of SCs

Smart Cards

- Plastic card containing an embedded microchip
- Available for over 10 years
- So far not successful in U.S., but popular in Europe, Australia, and Japan
- Smart cards gradually reappearing in U.S.; success depends on:
  - Critical mass of smart cards that support applications
  - Compatibility between smart cards, card-reader devices, and applications

Smart Card Applications

- Ticketless travel
  - Seoul bus system: 4M cards, 1B transactions since 1996
  - Planned the SF Bay Area system
- Authentication, ID
- Medical records
- Ecash
- Personal profiles
- Government
  - Licenses
- Mall parking

. . .

Smart Cards

- Stored-value cards that…
  - Can hold private user data, such as financial facts
  - Can store about 100 times more information than a magnetic strip plastic card
  - Safer than conventional credit cards

Smart Cards

- Smart Card Alliance:
  - Promotes benefits of smart cards
  - Promotes widespread acceptance of multiple-application smart card technology
  - Members include companies in banking, financial services, computer technology, and healthcare
  - Promotes compatibility among smart cards, card reader devices, and applications

Advantages and Disadvantages of Smart Cards

- Advantages:
  1. Atomic, debt-free transactions
  2. Feasible for very small transactions (information commerce)
  3. (Potentially) anonymous
  4. Security of physical storage
  5. (Potentially) currency-neutral
- Disadvantages:
  1. Low maximum transaction limit (not suitable for B2B or most B2C)
  2. High Infrastructure costs (not suitable for C2C)
  3. Not (yet) widely used

Mondex Smart Card

- Holds and dispenses electronic cash (Smart-card based, stored-value card)
- Developed by MasterCard International
- **Requires specific card reader, called Mondex terminal**, for merchant or customer to use card over Internet
- Supports micro-payments and works both online and off-line at stores or over the telephone
- Secret chip-to-chip transfer protocol

Internet Technology and the Banking Industry

- Paper checks
  - Used to make the largest dollar volume payments
- Check Clearing for the 21st Century Act (Check 21)
  - Permits banks to eliminate the movement of physical checks entirely
    - That's why Wal-mart returns your check to you after the transaction is finished

Phishing Attacks

- Basic structure:
  - Attacker sends e-mail messages to a large number of recipients
  - Message states that an account has been compromised and the matter should be corrected
  - Message includes a link
  - User enters a login name and password, which the perpetrator captures
  - Once inside a victim's account, the perpetrator can access personal information

Phishing Attack Countermeasures

- Most important step that companies can take today is to educate Web site users
- Many companies contract consulting firms that specialize in anti-phishing work
- Anti-phishing technique
  - Monitor online chat rooms used by criminals

e-PAYMENT SYSTEM IN INDIA

- Ever-increasing technology changes.
- Growing Internet access and mobile subscriber base
- Rising consumer confidence.
- Convenient delivery/payment models
- India has been one of the fastest growing country for payment cards in the Asia-Pacific region.
- India currently has approximately 130 million cards (both debit and credit) in circulation.

REGULATION-

- The Reserve Bank of India (RBI) has been supportive in the development of electronic payments.

- In this direction, the "Payments and Settlement System Act" was enacted .

- Apart from being supporting, the RBI has also initiated various programs to encourage e-payments.

CHANNELS OF PAYMENT-

- Indian banks have put in place various channels of electronic payments in place to encourage customers to adopt the electronic mode.

- Channels like the Internet, mobile, ATMs, and drop boxes are some of the most frequently used channels apart from bank branches.

MARKET MAPPING-

- E-payments processing market has two major players, namely Tech Process, and Bill Desk, which is a pure play electronic transaction processing company.

The Indian Payment System Is Transforming From Paper Mode To Electronic Mode.

Two main reasons for such shift are:-

1. The regulator has mandated routing all high-value transactions electronically to minimize movement of money and risk.

2. At the retail end, customers are realizing the efficiency of electronic payments.

Summary

- Most popular forms of payment on the Internet include:
  - Credit cards
  - Debit cards
  - Charge cards (payment cards)

Summary

- Electronic cash is:
  - A form of online payment
  - Slow to catch on in the United States
  - Especially useful for making micropayments
- Advantages of electronic cash:
  - Portable, anonymous, and usable for international transactions

Summary

- Electronic wallets
  - Provide convenience to online shoppers
  - Eliminate the need to reenter payment card and shipping information at a site's electronic checkout counter
- Smart cards are intended to replace the collection of plastic cards people now carry
- Phishing expeditions create a significant threat to online financial institutions and their customers