E-Commerce: The Second Wave
Fifth Annual Edition

Payment Systems For Electronic Commerce

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

Online Payment Basics

- Cash, checks, credit cards, and debit cards
  - Account for more than 90 percent of all consumer payments in the United States
- Most popular consumer electronic transfers are automated payments of
  - Auto loans
  - Insurance payments
  - Mortgage payments made from consumers' checking accounts

Payment Methods for all Types of U.S. Consumer Transactions, 2005 Projections

Type	Number of transactions	Dollar value of transactions
Cash	44%	19%
Checks	25%	41%
Credit cards	18%	25%
Debit cards	9%	7%
Electronic transfers	2%	5%
Other	2%	3%

Adapted from Table 1162, *2002 Statistical Abstract of the United States,* Washington, D.C.: U.S. Census Bureau, p. 727.

Figure 11-1 *Payment methods for all types of U.S. consumer transactions, 2005 projections*

Online Payment Basics (Continued)

- Scrip
  - Digital cash minted by a company instead of by a government
  - Cannot be exchanged for cash
  - Like a gift certificate that is good at more than one store

Payment Cards

- Describe all types of plastic cards used to make purchases
- Credit card
  - Has spending limit based on user's credit history

Payment Cards (Continued)

- Debit card
  - Removes amount from cardholder's bank account
  - Transfers it to seller's bank account
- Charge card
  - Carries no spending limit
  - Amount charged is due at end of billing period

Advantages and Disadvantages of Payment Cards

- Advantage
  - Worldwide acceptance
  - 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 merchant receives 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 credit line or the funds needed to cover the charge
  - Settlement occurs

Open and Closed Loop System

- Closed loop systems
  - Card issuer pays merchants that accept the card directly and does not use an intermediary
- Open loop systems
  - Involve three or more parties
  - Systems using Visa or MasterCard are examples

Merchant Accounts

- To process payment cards for Internet transactions
  - Online merchant must set up merchant account
- New merchant must supply
  - Business plan
  - Details about existing bank accounts
  - Business and personal credit history

Processing Payments Online

- InternetSecure
  - Provides secure payment card services
- First Data
  - Provides merchant payment card processing services with the following programs
    - ICVERIFY, PCAuthorize, and WebAuthorize
- Banks connect to an Automated Clearing House (ACH) through
  - Highly secure, private leased telephone lines

Processing a Payment Card Transaction

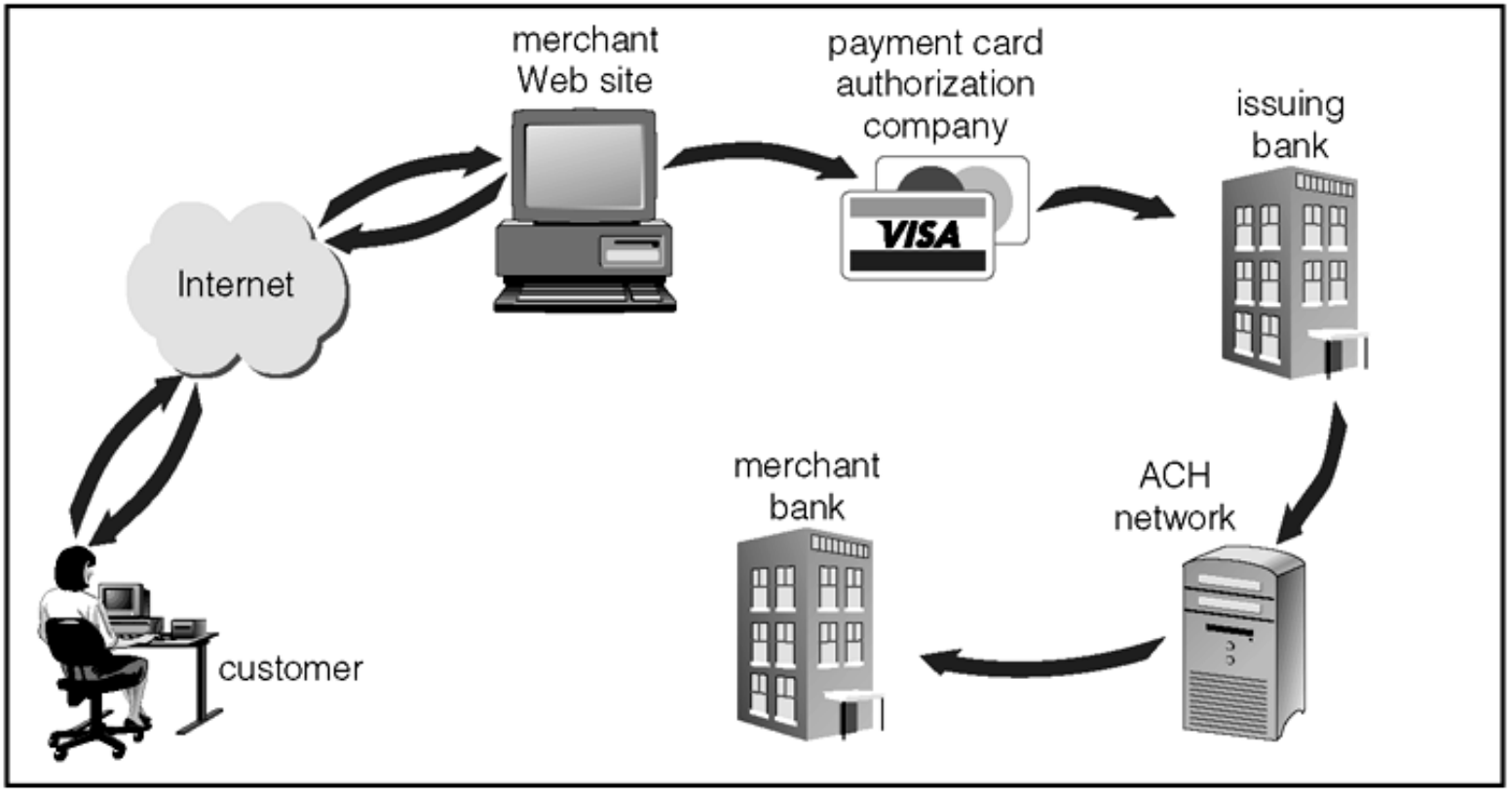

Figure 11-3 *Processing a payment card transaction*

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
- Attractive in two arenas
  - Sale of goods and services of less than $10
  - Sale of higher-priced goods and services to those without credit cards

Micropayments and Small Payments

- Micropayments
  - Internet payments for items costing from a few cents to approximately a dollar
- 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
  - Independent and portable

eCharge Home Page

Figure 11-4 *eCharge home page*

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

Advantages and Disadvantages of Electronic Cash

- Advantages of electronic cash
  - Transactions are more efficient
  - Transfer on the Internet costs less than processing credit card transactions
- Disadvantages of electronic cash
  - Use provides no audit trail
  - Problem of money laundering arises
  - Susceptible to forgery

Providing Security for Electronic Cash

- Cryptographic algorithms
  - Keys to creating tamperproof electronic cash that can be traced back to its origins
- Anonymous electronic cash
  - Electronic cash that cannot be traced back to the person who spent it
- Creating truly anonymous electronic cash
  - Requires bank to issue electronic cash with embedded serial numbers

Detecting Double-Spending of Electronic Cash

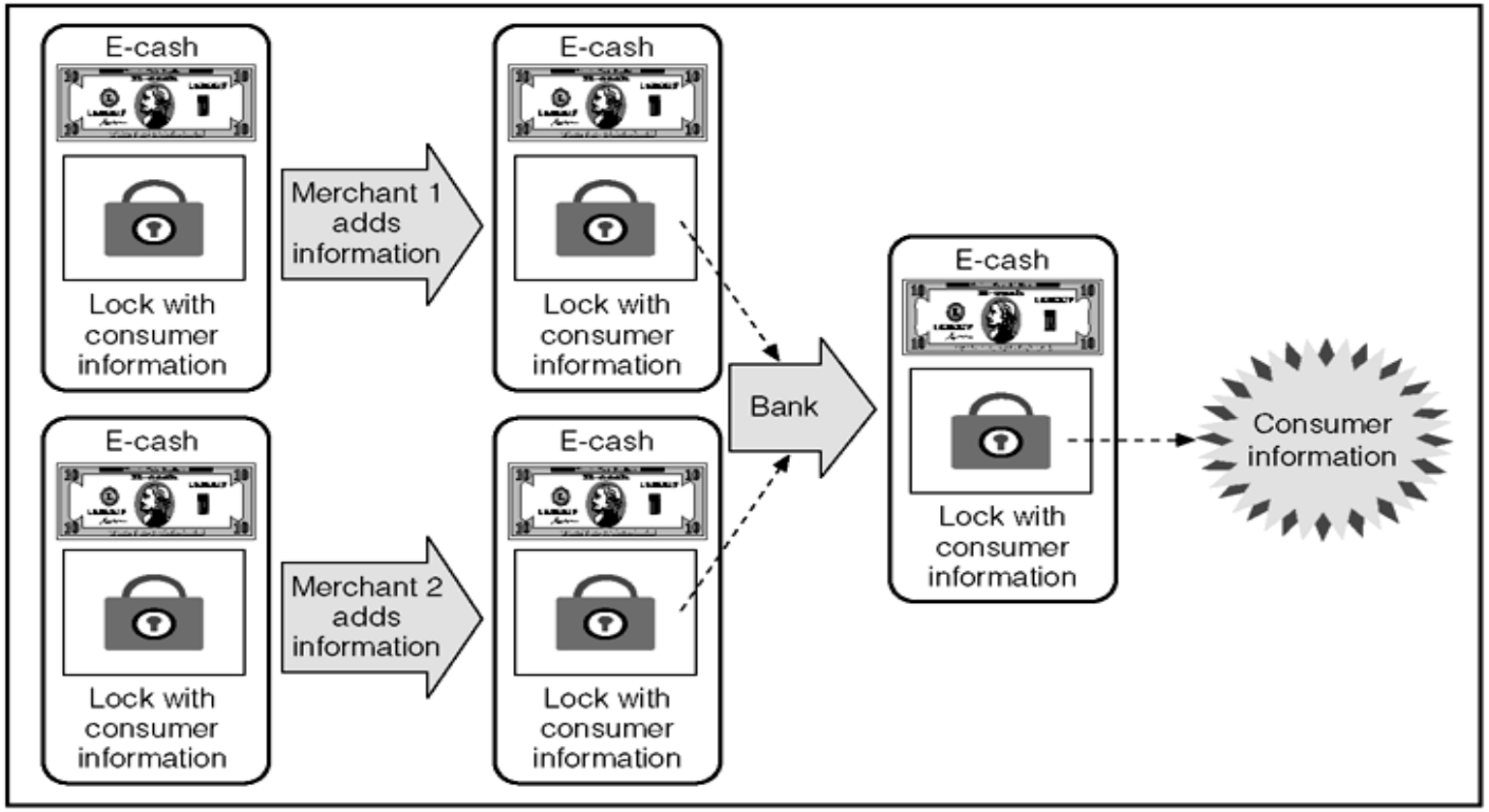

Figure 11-5 *Detecting double-spending of electronic cash*

Electronic Cash Systems

- CheckFree
  - Largest online bill processor in the world
  - Provides online payment processing services
- Clickshare
  - An electronic cash system aimed at magazine and newspaper publishers

Electronic Cash Systems (Continued)

- InternetCash
  - Provides electronic currency that is very similar to traditional cash
  - Customers must first purchase an InternetCash card from a store
- PayPal
  - Provides payment processing services to businesses and to individuals
  - Peer-to-peer (P2P) payment system
    - Free payment clearing service for individuals

PayPal Payment Method Search Option on eBay Main Search Page

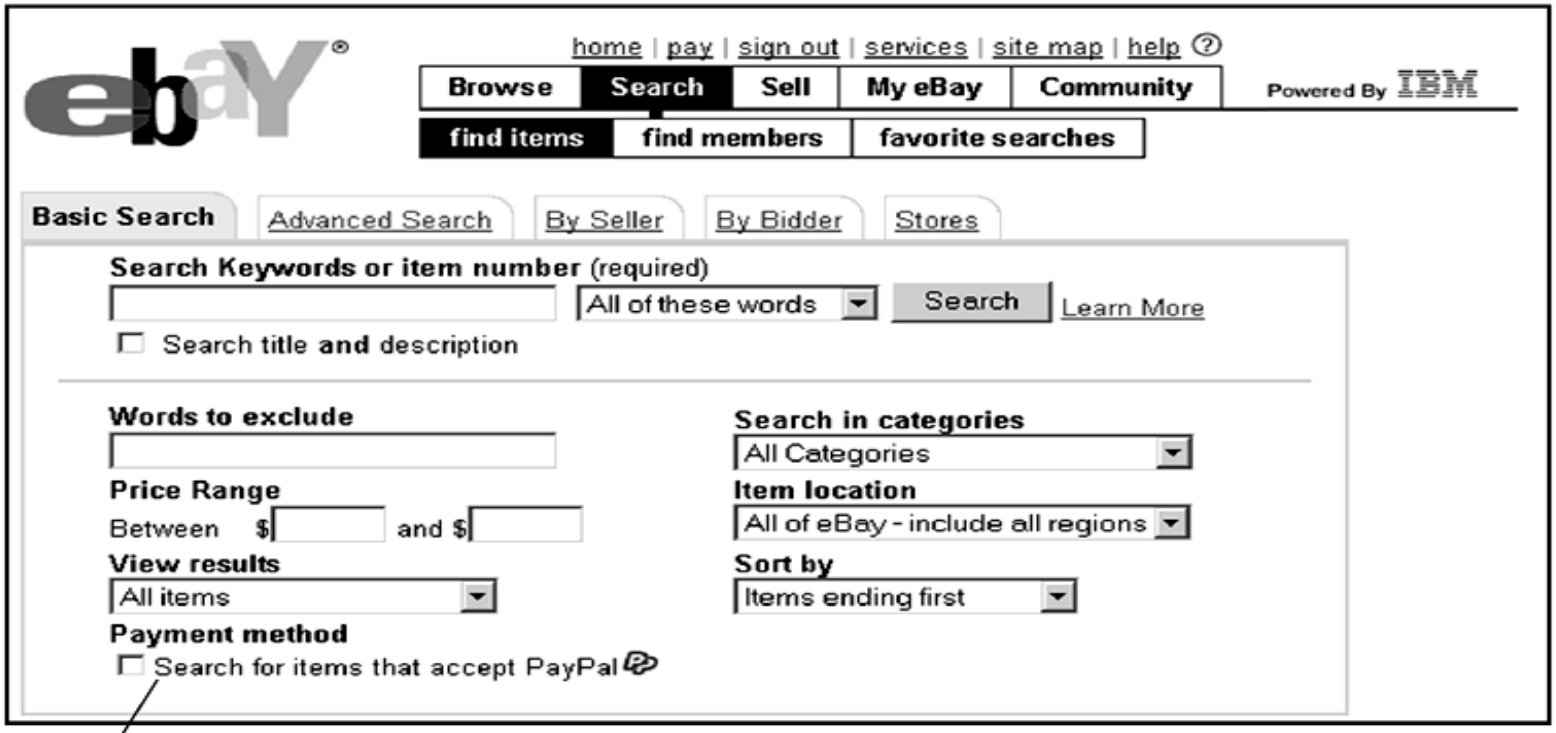

Figure 11-9 *PayPal payment method search option on eBay main search page*

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

Electronic Wallets (Continued)

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

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

Microsoft .NET Passport Home Page

Figure 11-10 *Microsoft .NET Passport home page*

Yahoo! Wallet

- An electronic wallet offered by the Web portal site 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 Web page
- Extensible system
  - One that developers can add to (or extend) without voiding any earlier work on the system

W3C Proposed Micropayment HTML Tags

Field name	Short description	Format	Requirements
merchanturl	Identifies the merchant site	URL	*must* be provided
merchantname	Specifies a merchant designation	character string	*may* be provided
buyurl	Identifies what the client is buying	relative URL	*must* be provided
textlink	Describes textually what the client is buying; the text source of the fee link	character string	*must* be provided
imagelink	Describes graphically what the client is buying; the graphic source of the fee link	URL	*may* be provided
price	Specifies amount and currency	character string	*must* be provided
duration	Indicates the time after purchase any URL can be retrieved with payment	integer number	*should* be provided
longdesc	Describes in detail the content of the client's purchase	character string	*should* be provided
requesturl	Indicates what the client is actually requesting	relative URL	*may* be provided
expiration	Identifies a date until which the offer from the merchant is valid	character string: YYYY-MM-DDThh:mm:ssTZD	*may* be provided
specific field	Provides information unique to each payment system	URL and character string	*may* be provided

Figure 11-11 *W3C proposed micropayment HTML tags*

The ECML Standard

- Electronic Commerce Modeling Language (ECML)
  - Users can enter credit card and address information once into an ECML-capable electronic wallet
  - Any existing wallet can be redesigned to follow the ECML standard
  - Users control access to their ECML electronic wallets

Stored-Value Cards

- Can be an elaborate smart card with a microchip that records currency balance
- Common stored-value cards
  - Prepaid phone, copy, subway, and bus 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 card is inserted
- Smart card
  - Better suited for Internet payment transactions

Smart Cards

- Stored-value cards
- 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

Octopus Smart Card Information on the Hong Kong Citybus Site

Figure 11-12 *Octopus smart card information on the Hong Kong Citybus site*

Smart Cards (Continued)

- 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

Mondex

- Smart card that holds and dispenses electronic cash
- Introduced in 1990 and now part of MasterCard International
- Can accept electronic cash directly from a user's bank account
- Card carries real cash in electronic form
  - Risk of theft may deter users from loading it with very much money

Mondex (Continued)

- Steps in using a Mondex card to transfer electronic cash from buyer to seller

1. Card user inserts Mondex card into reader
2. Merchant's terminal requests payment
3. Customer's card checks merchant's digital signature

Steps in using a Mondex Card to Transfer Electronic Cash from Buyer to Seller (Continued)

4. Merchant's terminal checks customer's just-sent digital signature for authenticity

5. Once electronic cash is deducted from the cardholder's card

   - Same amount is transferred into the merchant's electronic cash account

Mondex Smart Card Processing

1. User opens account and receives smart card.
2. User downloads currency onto card.
3. User inserts card in reader.
4. Currency is transferred from user card to vendor.
5. Goods are delivered.
6. Vendor redeems currency.

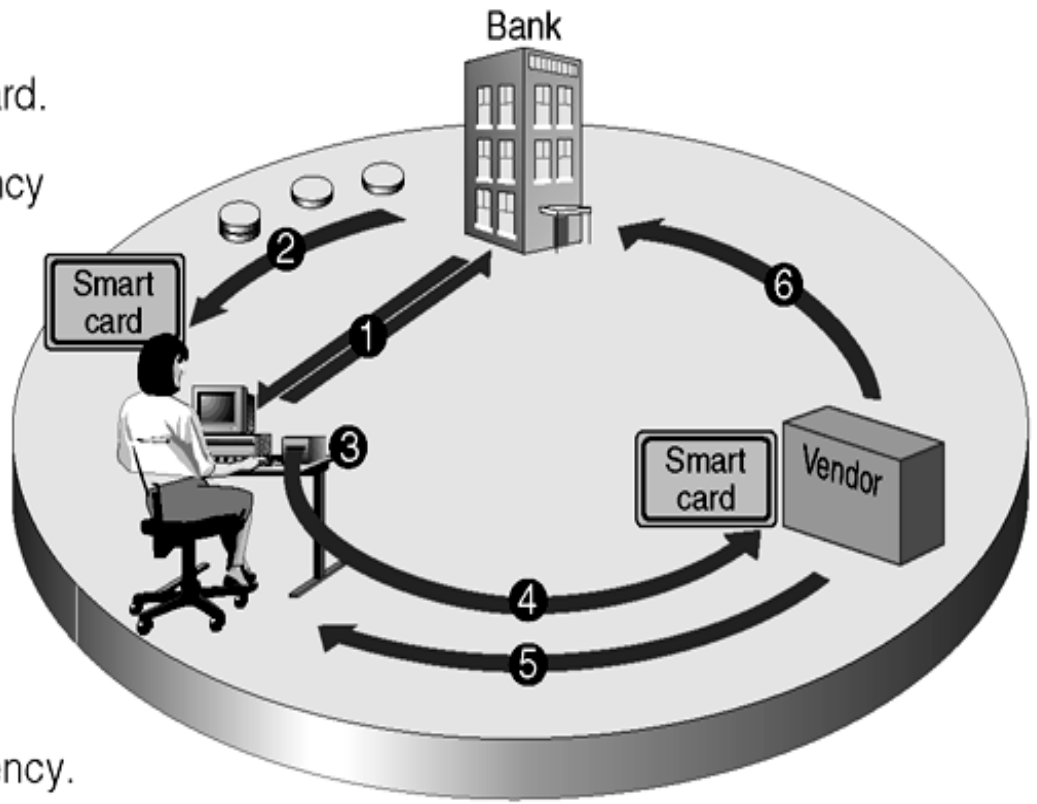

Figure 11-14 *Mondex smart card processing*

Summary

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

Summary

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

Summary

- Electronic wallets
  - Provide convenience to online shoppers
  - Eliminate need to reenter payment card and shipping information at site's electronic checkout counter
- Stored-value cards
  - Physical devices that hold information
- Smart cards
  - Intended to replace collection of plastic cards people now carry