CHAPTER 11

Payment Systems for Electronic Commerce

Learning Objectives

In this chapter, you will learn:

- What the most common online payment systems are and how they function
- How payment cards are used in online retail transactions
- What stored-value cards are and how they are used in electronic commerce
- What challenges and opportunities are presented by the use of digital cash

Learning Objectives

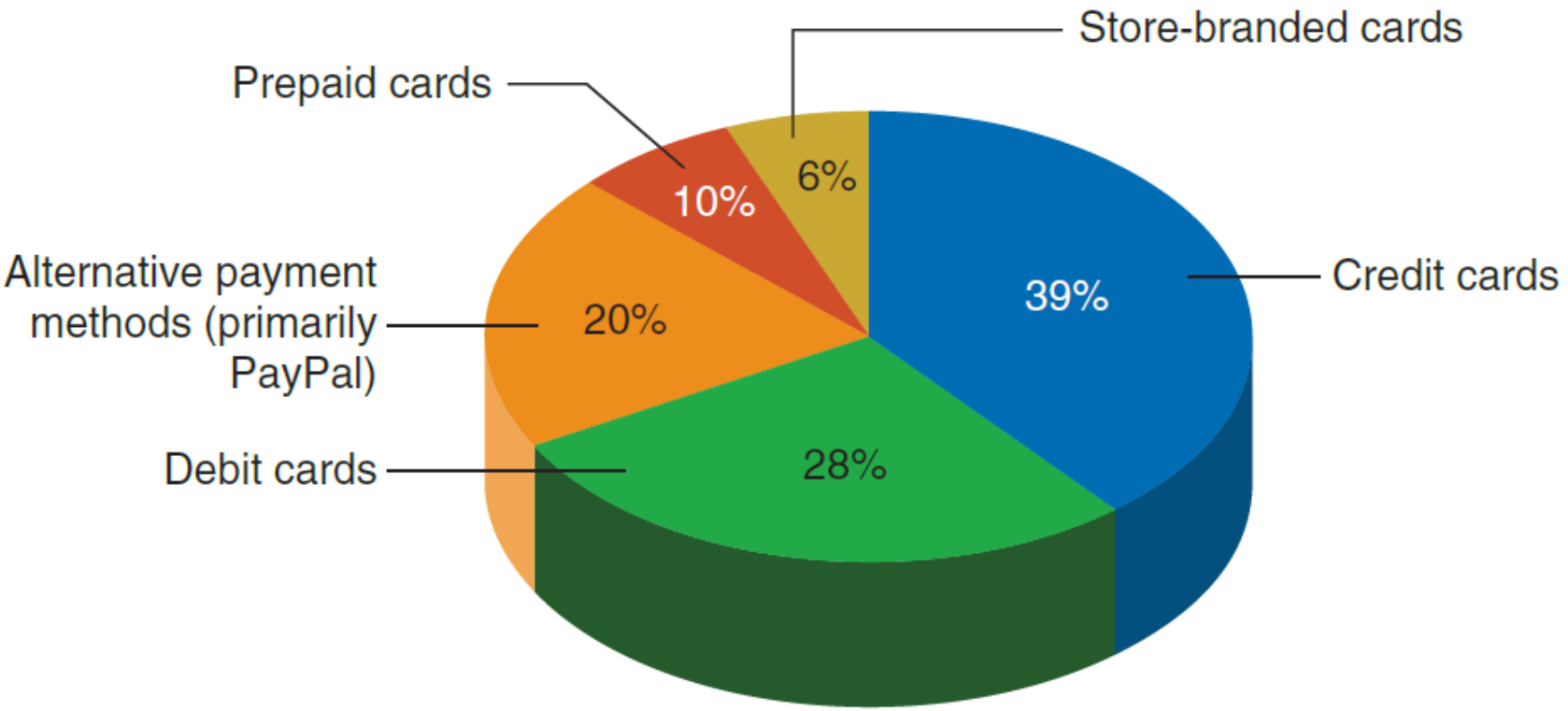
- How digital wallets facilitate online transactions through computers and mobile devices
- How the banking industry uses Internet technologies

Introduction

- Financial technology (fintech) is the use of powerful Internet-connected computers that use tools to improve quality and reduce cost of services
  - Existing and entirely new financial products
  - Includes online payment system not operated by banks
    - Facilitates purchases and other money transfers
    - Convenient and becoming widely adopted
  - Has also revolutionized lending
    - Online loan services takes banks out of value chain at a reduced cost

Common Online Payment Methods

- Cash, checks, credit cards, debit cards are the most common world methods used to pay for purchases
  - More than 90% of all US consumer payments
- Electronic transfer is a small percentage
  - Mostly automated payments from checking accounts
- Credit and debit cards used for more than 60% of online payments with alternative systems such as PayPal used for the remainder
  - Convenient for customers and cost effective for businesses and provides a significant environmental impact



Adapted from forecasts by *Internet Retailer*, Javelin Strategy & Research and *The Nilson Report*

FIGURE 11-1 Forms of payment for U.S. online transactions, estimates for 2018

Electronic Bill Presentment and Payment Systems

- Designed to deliver bills and accept payments
  - Success depends on ease of use and time required
- Consumers choosing this option is increasing
  - 70% of bills paid by check are now paid electronically which is a huge savings in paper, postage and time
- Biller-direct systems are used by large companies who want to manage the systems themselves
- Consolidator systems aggregate all a customer's bills on one system mostly via banks
  - Not as attractive to billers because it requires a fee and delays receipt of funds

Micropayments and Small Payments

- Micropayments are Internet payments for items costing few cents to a dollar
  - Barrier is people prefer to buy small value items in fixed price chunks rather than small payments in varying amounts
  - Many companies have developed micropayment systems but none gained broad acceptance
- Small payments are payments of less than $10
  - Offered through mobile telephone carrier but held back by substantial charges for providing service
    - One of the largest markets is music downloads

Payment Cards

- Payment cards are plastic cards used for purchases
  - Categories: credit cards, debit cards, charge cards, prepaid cards, and gift cards
- Credit cards (Visa, MasterCard) have a spending limit based on user's credit history
  - Pay off entire credit card balance or minimum amount with interest charged on unpaid balances
  - Widely accepted and provides consumer protection: 30-day dispute period
  - Card not present transactions include an extra degree of risk for merchant and bank

Payment Cards (cont'd.)

- Debit card (electronic funds transfer at point of sale (EFTPOS) cards) removes funds from cardholder's bank account and transfers it to seller's account
  - Issued by bank with major credit card issuer's name
- Charge card (American Express) has no spending limit with entire amount due at end of billing period
- Retailers may offer their own store charge cards
- Prepaid cards are called gift cards
- Single-use cards had disposable numbers, valid for one transaction, but not adopted by consumers

Advantages and Disadvantages of Payment Cards

- Advantage for merchants include fraud protection
  - Can authenticate and authorize purchases using a payment card processing network
    - Interchange network is a set of connections between banks and associations owning credit cards
- Advantage for U.S. consumers is limited fraud liability of $50 which is often waived if card is stolen
- Merchants view the per-transaction and monthly processing fees as a cost of doing business
- Consumers pay a slightly higher cost for goods due to these cards and some charge an annual fee

Payment Acceptance and Processing

- US online and mail order stores must ship merchandise within 30 days of charging payment
  - Significant violation penalties so most stores charge account when order shipped
- Processing payment card transactions online is a two step process
  - Payment acceptance is establishing card validity and verifying card's limit not exceeded by transaction
  - Clearing the transaction includes all steps to move funds from card holder's bank account into the merchant's bank account

Open and Closed Loop Systems

- With a closed loop system the card issuer pays merchant directly without a bank or clearinghouse
  - American Express, Discover Card
  - Issue cards directly to consumers
- Open loop systems add additional payment processing intermediaries to the closed loop system
  - Visa, MasterCard issued by local bank
  - Visa and MasterCard are credit card associations operated by customer issuing banks who evaluate credit standing, establish credit limits and absorb non-payment losses

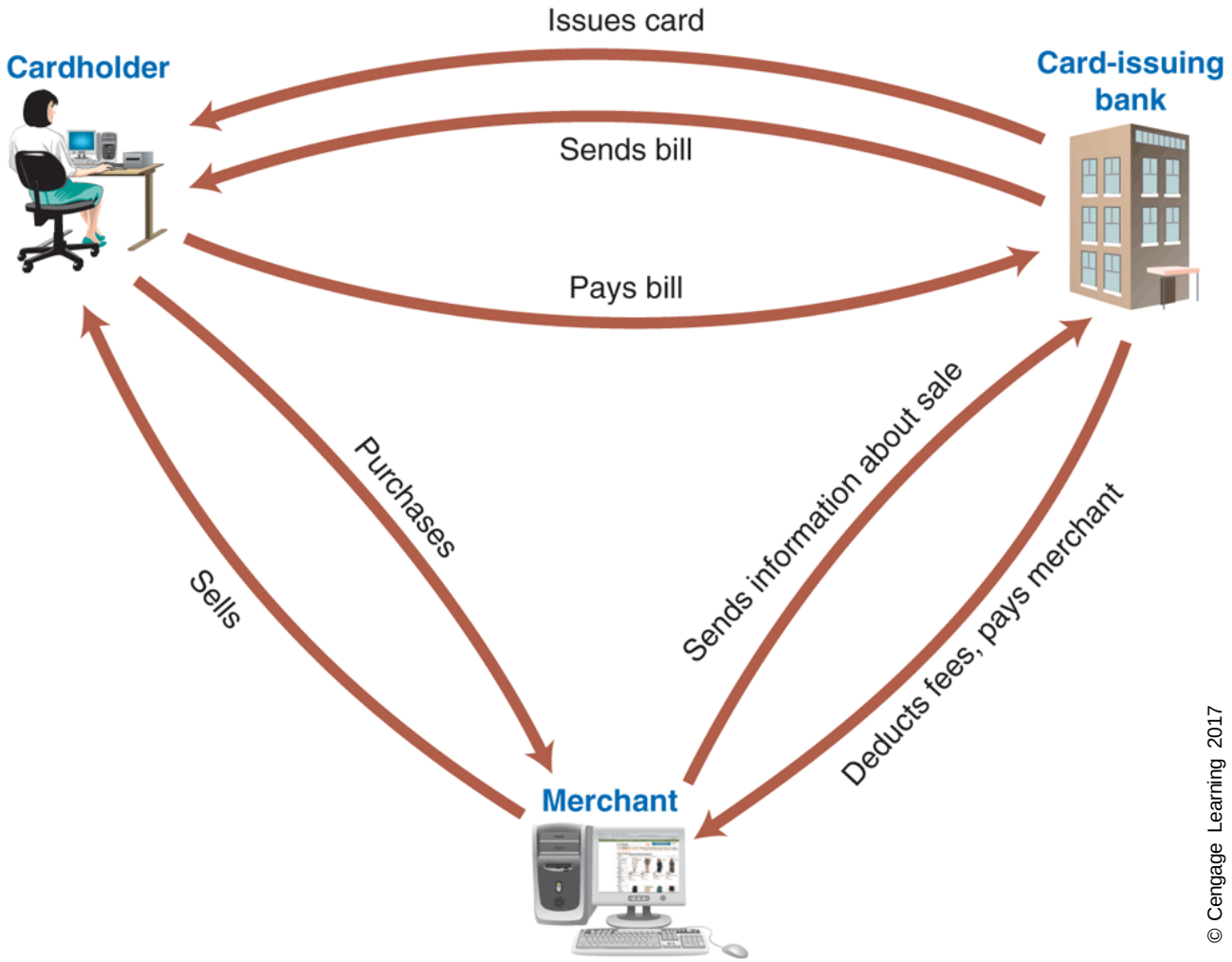


FIGURE 11-2 Closed loop payment card system

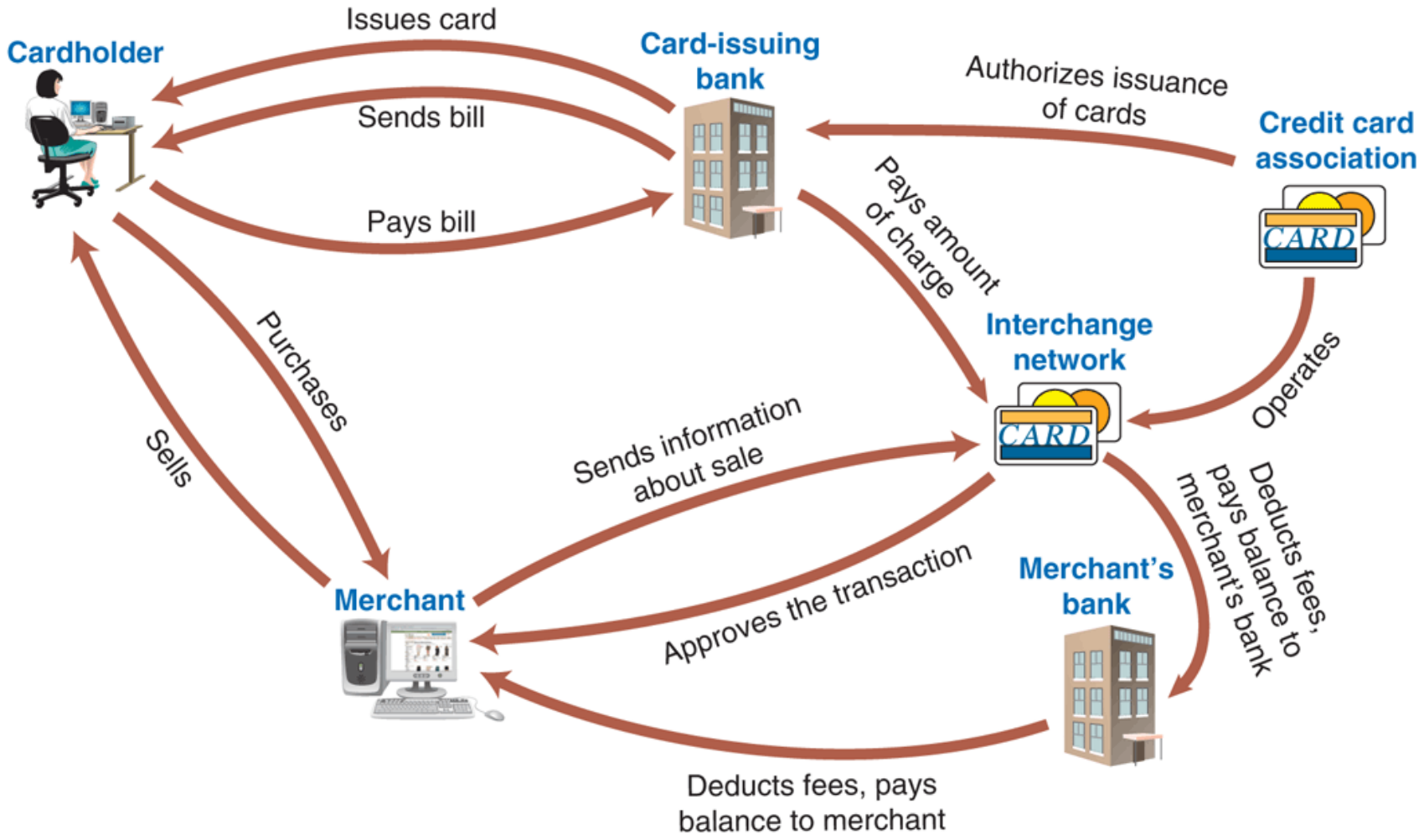


FIGURE 11-3 Open loop payment card system

Merchant Accounts

- Acquiring bank does business with sellers that want to accept payment cards
  - Business must set up a merchant account with acquiring bank to process Internet transactions
    - One type similar to a checking account with bank collecting accounts net of processing fees
    - Commonly account acts like a credit line where the acquiring bank makes a non-interest bearing loan in the amount of daily net receipts, reduced by collections
- Obtaining account requires merchant to provide business information and the bank to assess risk

Merchant Accounts (cont'd.)

- Chargeback occurs when cardholder successfully contests charge
  - Acquiring bank must retrieve money from merchant account which may have funds on deposit
- Acquirer fees are charges for providing payment card processing service
  - Per month and transaction, set by the acquiring bank
- Interchange fees are charged at rates that depend on the merchant's industry
  - Set by card association, charged to acquiring bank and usually passed along to merchant

Merchant Accounts (cont'd.)

- Level of fraud is higher online
  - Under 15% of all credit card transactions responsible for 64% percent of total dollar amount of credit card fraud (declining since 2008)
- Antifraud measures include
  - Scoring services that provide risk ratings for individual transactions in real time
  - Shipping only to card billing address and requiring card card verification numbers (CVNs) for card not present transactions
    - Three- or four-digit number printed on the credit card but not encoded on the card's magnetic strip

Payment Card Transaction Processing

- Most online merchants accept both closed loop and open loop system cards and some accept direct deductions from customers' checking accounts
  - Automated Clearing House (ACH) is a network of banks involved in direct deduction transactions
- Processing depends on size of business
  - Large build and manage their own systems
  - Mid-size use purchased software with skilled staff to manage system
  - Small rely on service payment processing service providers

Payment Card Transaction Processing (cont'd.)

- Front-end processor (payment gateway) obtains and stores transaction authorization
- Back-end processor takes front-end processor transactions and coordinates information flows
  - Handles chargebacks, other reconciliation items through the interchange network and acquiring and issuing banks, including ACH transfers
- Some processors handle all elements of payment processing and others specialize in one element or a particular industry
  - Known company provides level of comfort to buyers

Stored-Value Cards

- Plastic card with embedded microchip that can store information and perform calculations
  - Most incorporate near field communication (NFC) technology which allows for contactless data transmissions over short distances
    - Allows interacts with readers and other devices
- Can hold much more data than a magnetic card
  - Safer because data can be encrypted
- Used in Europe and Asia but less successful in U.S.
  - U.S. use has increased in recent years but still not widespread

Digital Cash

- Also called electronic cash or e-cash
- Describes any value storage and exchange system created by private (nongovernmental) entity
  - Does not use paper documents or coins
  - Can serve as substitute for government-issued physical currency
  - No common standard adopted so far
  - None adopted so far
- Can be held in online storage or offline storage

Digital Cash (cont'd.)

- With online cash storage consumer has no personal possession of digital cash
  - Trusted third party (online bank) involved in all transfers, holds consumers' cash accounts
  - Merchant contacts consumer's bank for payment
  - Helps prevent fraud (confirm valid cash)
- Fills a need in developing countries that rely on cash as they conduct B2C electronic commerce
  - Need does not exist here because U.S. consumers already have payment cards

Digital Cash (cont'd.)

- Bitcoin is the most well-known provider today
  - Online ledger book that tracks balances while participants remain anonymous
  - Public-key cryptography is used (cryptocurrency)
  - Large percentage of uses involve illegal purchases and currency speculation
- Concerns include privacy and security, independence, portability, convenience
  - Must be impossible to spend more than once, easy to use and not traceable to the person who spent it
    - Anonymous digital cash

The Double-Spending Issue

- Spending electronic cash twice by submitting the same electronic currency to two different vendors
  - Not enough time to prevent fraudulent act
  - Main deterrent is threat of detection and prosecution so system must provide traceability back to origin
- Two-part lock provides anonymous security and signals an attempt to double-spend cash

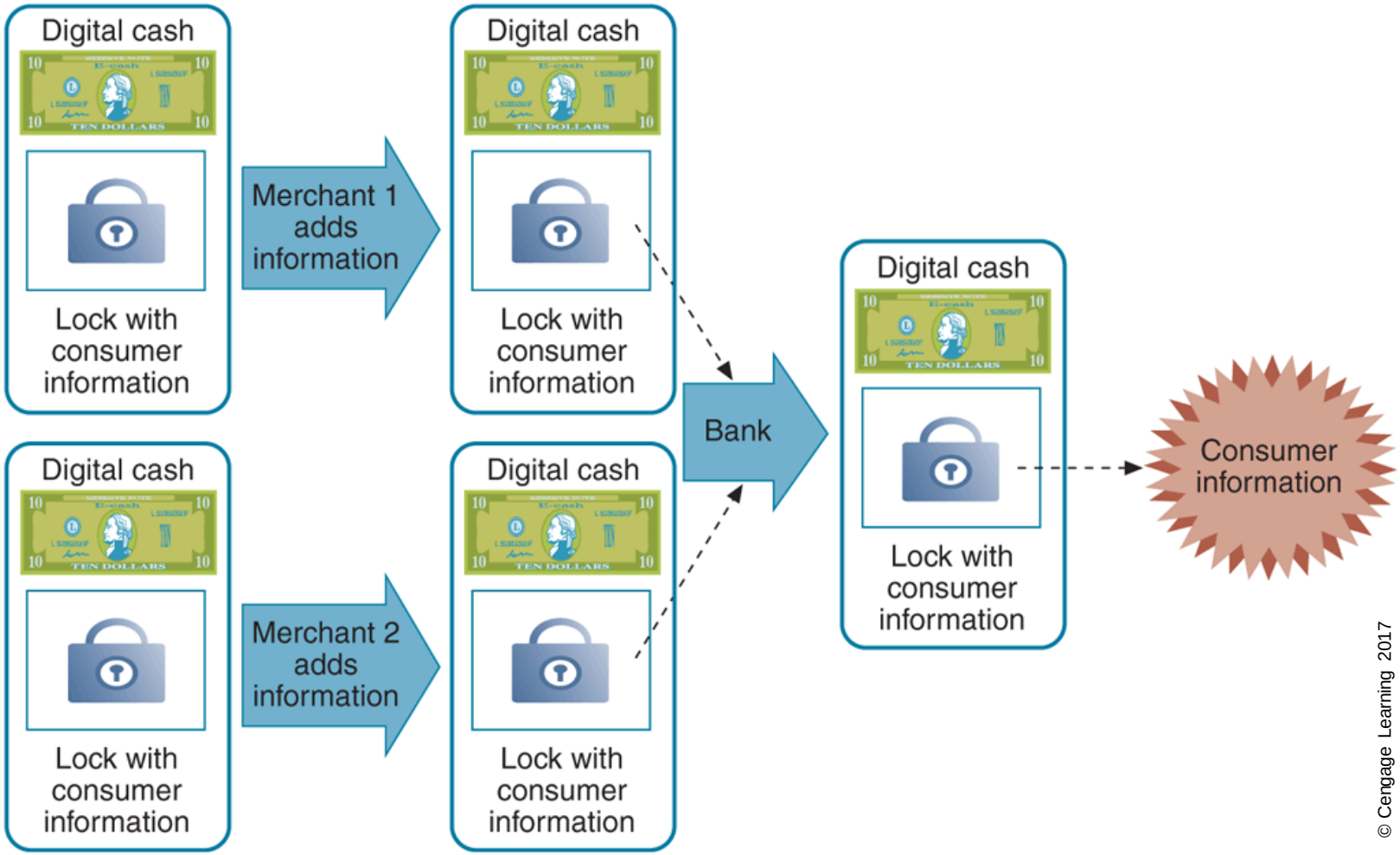


FIGURE 11-4 Detecting double spending of electronic cash

Advantages and Disadvantages of Digital Cash

- Can be more efficient (less costly) than traditional payment methods
  - Less than processing credit card transactions or conventional money exchange systems
  - Does not require authorization
- No audit trail (similar to physical cash) makes it non-traceable which can lead to money laundering
  - Convert illegally-obtained money into money spendable without being linked to illegal activity

Digital Wallets and Software-Based Digital Wallets

- Allows customer to store name, address, credit card information on an electronic device or software
  - Benefit is customer enters information just once
- Server-side digital wallet stores information on remote server of merchant or wallet publisher
  - Security breach can reveal thousands of users' personal information to unauthorized parties
    - Google Wallet, Microsoft Windows Live ID, Yahoo! Wallet
- Client-side digital wallet stores information on consumers computers
  - Must download wallet software onto every computer

Hardware-Based Digital Wallets

- Implemented using smart phones or tablets
- Store owner's identity credentials (driver's license, medical insurance card, store loyalty cards, etc.)
- Transmit portions of information using Bluetooth or wireless transmission to nearby terminal
- Near field communication (NFC) technology can be used if equipped with NFC chip
- Google Wallet, Android Pay and Apple Pay
- Security and privacy are major concerns
  - Must prevent unauthorized access

Internet Technologies and the Banking Industry

- Paper checks still the largest dollar volume of payments in the word today
  - Processed through world's banking system
- Other major payment forms also involve banks
- Internet technologies are providing new tools and creating new threats for the banking industry

Check Processing

- Old method of physical check processing
  - Person wrote check which was deposited by retailer and sent to clearinghouse to manage funds transfer
  - Paper check transported to consumer's bank and cancelled check sent to consumer
  - Disadvantages include transportation cost and float
    - Delay between time check is written and clears
- Check Clearing for the 21st Century Act (Check 21) permits bank to eliminate movement of physical checks and use image scanning technology
  - Instant check clearing eliminates float

Mobile Banking

- Banks exploring mobile commerce potential
- Most banks offer apps for mobile devices
  - Check and transfer balances between accounts
  - View statements
  - Find an ATM
- Some bank apps allow checks to be deposited by taking a picture
- Vendors such as GoPayment and Square offer a tiny credit card reader that can be attached to a mobile device to take payments

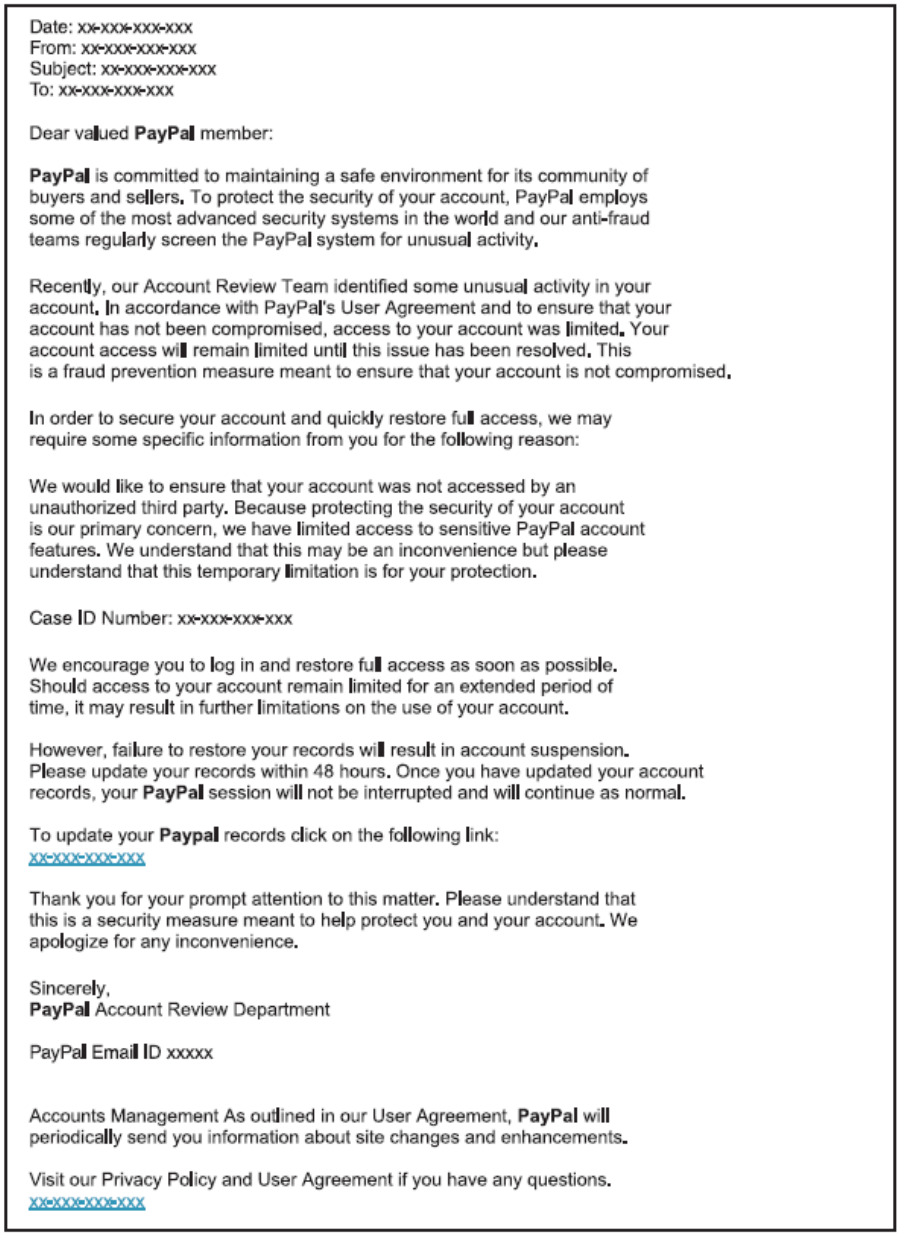
Payment System Threats: Phishing and Identity Theft

- Online payment systems offer attractive arena for criminals and criminal enterprises
- Phishing attacks are techniques for committing fraud against online businesses customers
  - Particular concern to financial institutions

Phishing Attacks

- Attacker sends e-mail message to accounts with potential for an account at targeted Web site
  - E-mail message tells recipient account compromised and recipient must log in to correct problem
    - Includes link that appears to be Web site login page
    - Actually leads to perpetrator's site so that victim's log in information can be captured and used
- Spear phishing is a carefully designed phishing attack targeting a particular person or organization
  - Requires considerable research which increases change of e-mail being opened

FIGURE 11-5
Phishing e-mail message



Date: xx-xxx-xxx-xxx
From: xx-xxx-xxx-xxx
Subject: xx-xxx-xxx-xxx
To: xx-xxx-xxx-xxx

Dear valued **PayPal** member:

PayPal is committed to maintaining a safe environment for its community of buyers and sellers. To protect the security of your account, PayPal employs some of the most advanced security systems in the world and our anti-fraud teams regularly screen the PayPal system for unusual activity.

Recently, our Account Review Team identified some unusual activity in your account. In accordance with PayPal's User Agreement and to ensure that your account has not been compromised, access to your account was limited. Your account access will remain limited until this issue has been resolved. This is a fraud prevention measure meant to ensure that your account is not compromised.

In order to secure your account and quickly restore full access, we may require some specific information from you for the following reason:

We would like to ensure that your account was not accessed by an unauthorized third party. Because protecting the security of your account is our primary concern, we have limited access to sensitive PayPal account features. We understand that this may be an inconvenience but please understand that this temporary limitation is for your protection.

Case ID Number: xx-xxx-xxx-xxx

We encourage you to log in and restore full access as soon as possible. Should access to your account remain limited for an extended period of time, it may result in further limitations on the use of your account.

However, failure to restore your records will result in account suspension. Please update your records within 48 hours. Once you have updated your account records, your **PayPal** session will not be interrupted and will continue as normal.

To update your **Paypal** records click on the following link:
xx-xxx-xxx-xxx

Thank you for your prompt attention to this matter. Please understand that this is a security measure meant to help protect you and your account. We apologize for any inconvenience.

Sincerely,
PayPal Account Review Department

PayPal Email ID xxxxx

Accounts Management As outlined in our User Agreement, **PayPal** will periodically send you information about site changes and enhancements.

Visit our Privacy Policy and User Agreement if you have any questions.
xx-xxx-xxx-xxx

Phishing Attacks (cont'd.)

- Example: 2008 government stimulus checks
  - Phishing e-mails that seemed to be from the IRS appeared within one week of passage
- E-mail link disguise the real URL by using "@" which causes the Web site to ignore characters before it
  - https://www.paypal.com@218.36.41.188/fl/login.html
  - Phony site invisible due to JavaScript code
- Pop-up windows look exactly like browser address bar including Web site graphics to make it even more convincing

Using Phishing Attacks for Identity Theft

- Organized crime (racketeering) is unlawful activities conducted by highly organized, disciplined association for profit
  - Differentiated from less-organized groups
  - Internet providing new criminal activity opportunities
    - Generates spam, phishing, identity theft
- Identity theft is a criminal act where perpetrator gathers victim's personal information
  - Goal is to obtain credit
  - Perpetrator runs up account charges and disappears

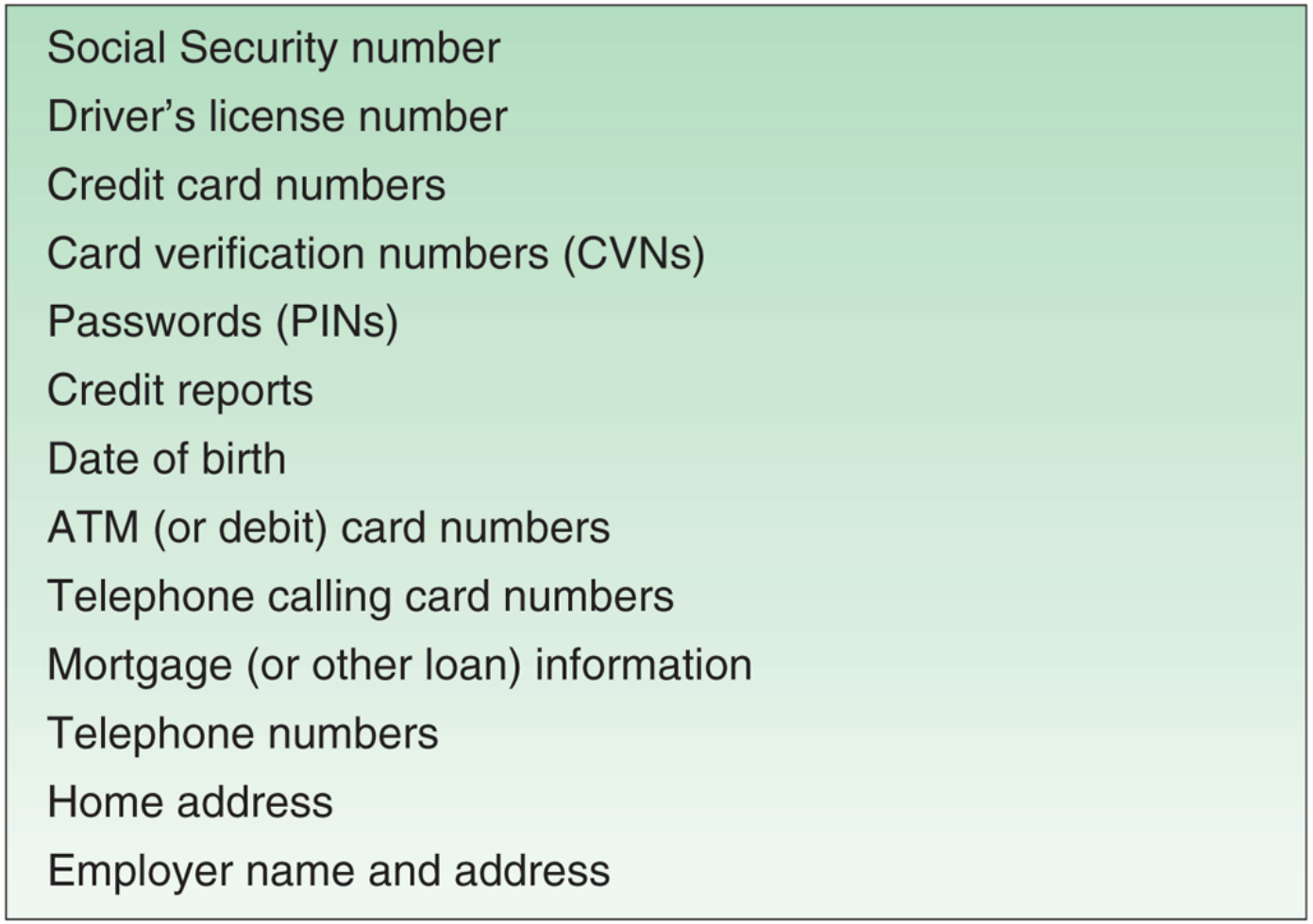


FIGURE 11-6 Types of personal information most useful to identity thieves

Using Phishing Attacks for Identity Theft (cont'd.)

- Large criminal organizations can be highly efficient perpetrators of identity theft
- Zombie farm is a large number of computers implanted with zombie programs
  - Pharming attack is the use of a zombie farm, often by organized crime, to launch a massive phishing attack
- Phishing needs both collectors and cashers (users) of information which requires different skills
  - Crime organizations increase efficiency and volume by facilitating and participating in these transactions
  - Over a million victims and $1.5 billion lost annually

Phishing Attack Countermeasures

- Spam is a key element of phishing attacks
  - Any protocol changes that improve e-mail recipients' ability to identify message source reduces phishing
- Educate Web site users
- Contract with consulting firms specializing in anti-phishing work
  - Monitor online chat rooms used by criminals
- Incidence of phishing has grown rapidly over the past two years and experts expect it will continue
  - Extremely profitable criminal activity