15th Edition

Understanding Computers

Today and Tomorrow

Comprehensive

Chapter 12

Information Systems and System Development

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Learning Objectives

1. Understand what information systems are and why they are needed.
2. Discuss who uses information systems in a typical organization.
3. Identify several types of information systems commonly found in organizations and describe the purpose of each.
4. Explain the individuals responsible for system development.
5. Identify and describe the different steps of the system development life cycle (SDLC).
6. Discuss several approaches used to develop systems.

Overview

- This chapter covers:
  - How information systems are used by different levels of employees
  - Common types of information systems
  - Computer professionals who develop systems and their primary responsibilities
  - The system development life cycle (SDLC)
  - The major approaches to system development

What Is an Information System?

- System
  - Collection of elements and procedures that interact to accomplish a goal
    - Football game, transit systems, etc.
- Information System
  - A system used to generate the information needed to support the users in an organization
- Digital Ecosystem
  - The collection of people, products, services, and business processes related to a digital element
    - Apple digital ecosystem = Apple hardware, software, and online services

What Is an Information System?

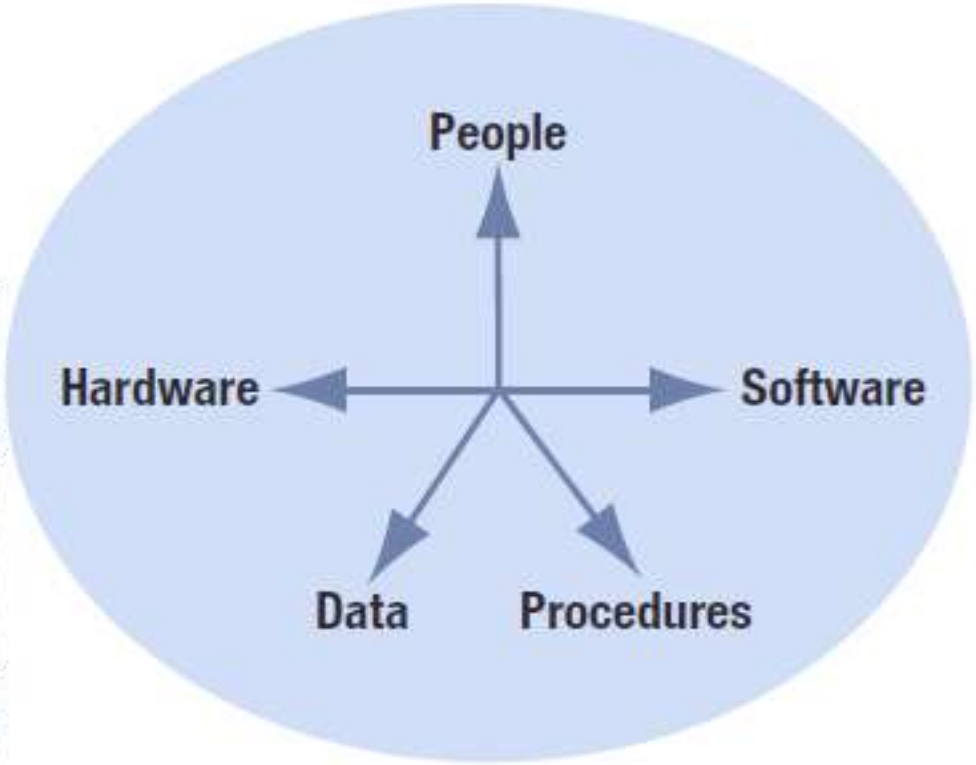


FIGURE 12-1
Components of an information system.

What Is an Information System?

- The Need for System Development
  - Systems development
    - Process of designing and implementing a new or modified system
  - System development may be required because of:
    - New laws (Sarbanes-Oxley Act, HIPAA etc.)
    - Changes to the legal requirements for retaining business data (e-disclosure, etc.)
    - Introduction of new technology

What Is an Information System?

- Enterprise Architecture
  - Provides a detailed picture of an organization, its function, its systems, and the relationship among them
  - Allows managers to organize and maximize the use of IT resources and make better decisions
  - Not easy to develop and requires time and effort, but once in place, it is an invaluable decision support tool

What Is an Information System?

- Business Intelligence (BI)
  - The process of gathering, storing, accessing, and analyzing data in order to make better business decisions
  - Business analytics (BA)
    - The process of analyzing data to evaluate a company's operations
  - Data Warehouse
    - Comprehensive collection of data about a company and its customers
    - Data mart is smaller and typically stores data related to a particular subject or department

What Is an Information System?

- Data Mining
  - The use of intelligent software to find subtle patterns that may not be otherwise evident
  - Can identify processes that need improvement
  - Can be used for customer profiling
  - Web Mining
    - Data mining used in conjunction with Web data
  - Text Mining
    - Analysis of text-based data (online forms, emails, call-center notes)

What Is an Information System?

- Social media analytics – mining and analyzing data from blogs and social media sites
- Often used with the massive amounts of data generated today – called Big Data

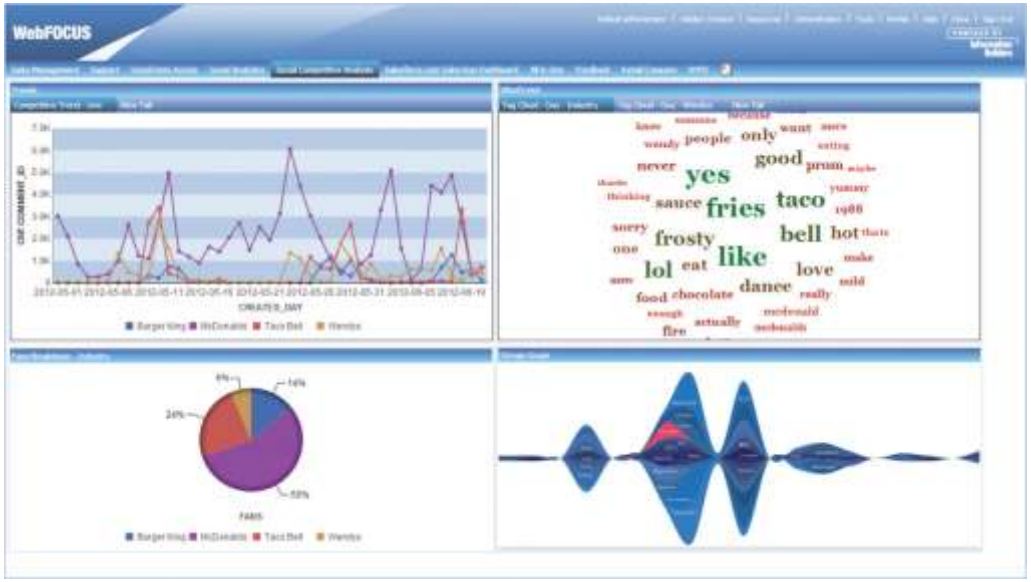


FIGURE 12-2
Social media analytics.

How It Works Box

Big Data … For Everything

- Sports teams, casinos, airlines, museums, and more are gathering and analyzing big data
- Point Defiance Zoo & Aquarium uses big data analytics to uncover patterns and trends to help drive ticket sales, enhance visitor experiences, and raising awareness of wildlife conservation

AP Photo/Elaine Thompson

Analytics used at the Point Defiance Zoo & Aquarium has helped increase sales, enhance visitor experiences, and increase awareness of wildlife conservation.

What Is an Information System?

- Users of Information Systems
  - Used by one person or all employees
  - Enterprise Systems
    - A system that is used throughout an entire enterprise
  - Inter-enterprise Systems
    - Used by a business and its suppliers and other business partners
  - Some information systems are designed for management decision making

What Is an Information System?

- User Groups
  - Executive managers
  - Middle managers
  - Operational managers
  - Nonmanagement workers
  - External users

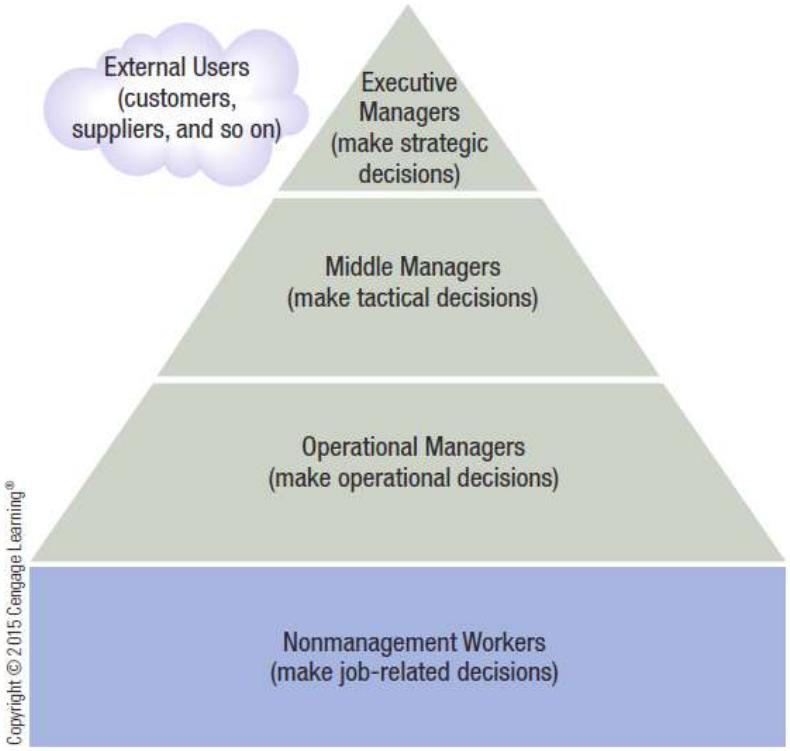


FIGURE 12-3
Information system users. Include managers, nonmanagement employees, and external users.

Types of Information Systems

TYPE OF SYSTEM	DESCRIPTION
Office and user productivity systems	Facilitate communications and enhanced productivity in office tasks
Transaction processing systems	Process and record business transactions
Decision making support systems	Provide needed information to decision makers
Integrated enterprise systems	Integrate activities throughout an entire enterprise
Design and manufacturing systems	Help with the design and/or manufacturing of products
Artificial intelligence systems	Perform actions based on characteristics of human intelligence

FIGURE 12-4
Types of information systems.

Types of Information Systems

- Office and User Productivity Support Systems
  - Office System
    - A system used to facilitate communications and enhance productivity
  - Document Processing Systems
    - Hardware and software used to create electronic documents
  - Document Management Systems (DMSs)
    - Stores, organizes, and retrieves electronic documents

Types of Information Systems

- Content Management Systems (CMSs)
  - DMS that also includes multimedia files, images, and other content
- Communication Systems
  - Allow employees to communicate with each other, with business partners, and with customers

Courtesy Ergotron Inc.

FIGURE 12-5

Digital X-rays.

X-rays are one type of unconventional document now being created and stored in digital form.

Types of Information Systems

- Transaction Processing Systems (TPSs)
  - Processes and records data created by an organization's business transactions
  - Usually processed in real time
    - Contrasts with batch processing in which a set or batch of transactions are collected over a period of time and processed together
  - Specialty TPSs used in law enforcement, the military, etc.

Types of Information Systems

- Order Entry Systems
  - E-commerce systems
    - Financial transactions performed over the Internet
  - Point-of-sale (POS) systems
    - Used for purchases that occur in person, such as at a brick-and-mortar store
- Payroll Systems
  - Used to compute employee taxes, deductions, and pay
- Accounting Systems
  - Accounts receivable systems
  - Accounts payable systems
  - General ledger systems

Types of Information Systems

- Decision Making Support Systems
  - Help individuals make decisions
  - Management Information Systems (MISs)
    - Provides decision makers with regular, routine, and timely information that is used to make decisions
    - Usually provides information in the form of computer-generated reports
      - Detailed, summary, exception
    - Much of the time, this information is generated from data obtained from transaction processing
    - Most frequently used to make moderately structured, middle-management decisions

Types of Information Systems

- Decision Support Systems (DSSs)
  - Provides people with the tools and capabilities to organize and analyze their decision making information
  - Typically are interactive and provide information on demand
  - Most often used by middle and executive managers who require unstructured, unpredictable on-demand information
  - Incorporates internal and external data
  - Usually tailored to help with specific types of decisions such as sales and transportation
  - Executive Information system (EIS)
    - A DSS targeted directly to upper management

Types of Information Systems

- Geographic Information Systems (GISs)
  - Combines geographical information with other types of data to provide a better understanding of relationships among the data
  - Commonly used to make decisions about locations (e.g. new facility locations, disaster risk, geographical crime patterns)
  - Also used in emergency relief and disaster relief systems to create search and rescue maps, maps of where electrical power is restored, etc.

Types of Information Systems

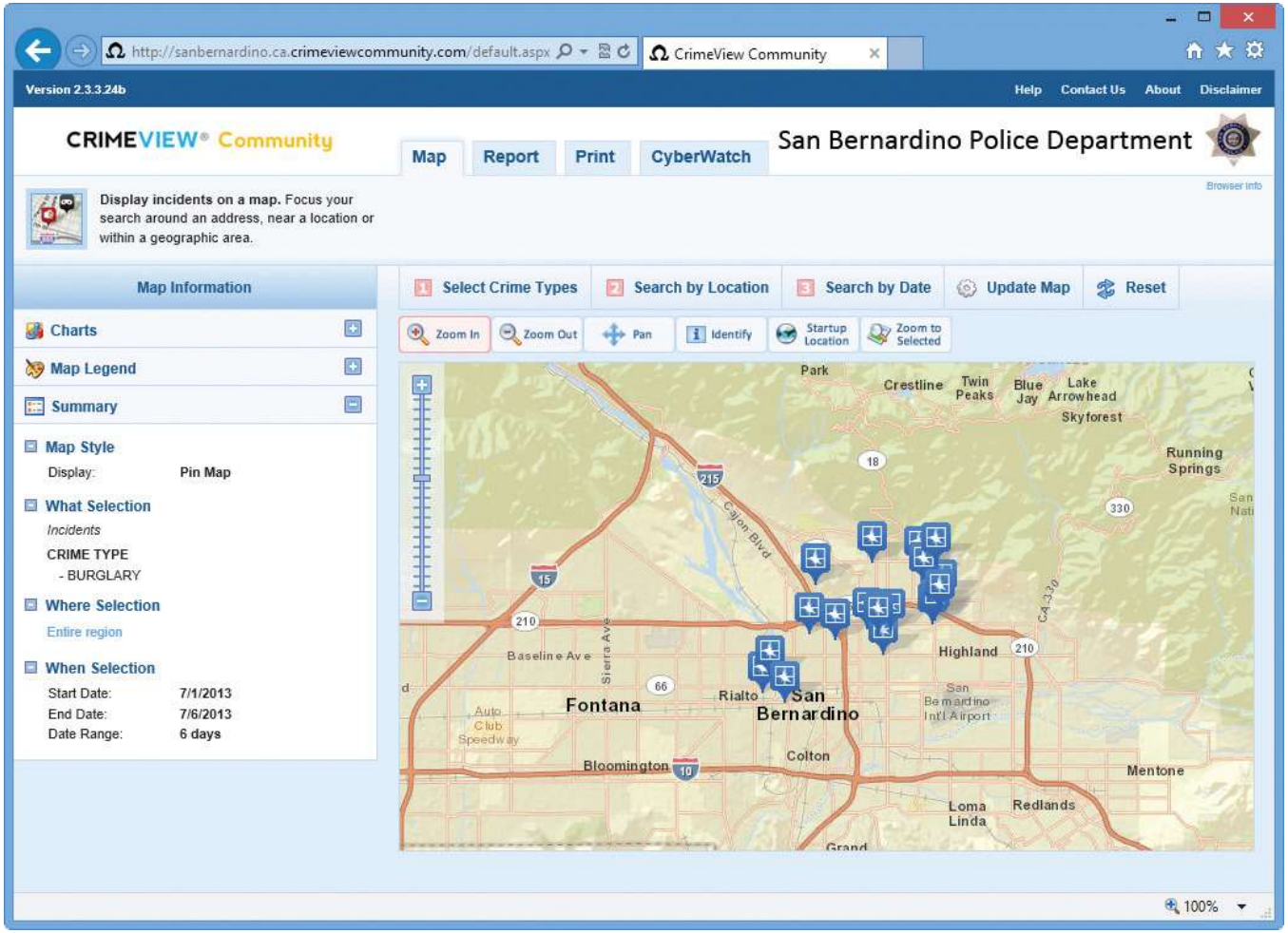


FIGURE 12-9
Geographic information systems (GISs). This GIS shows the locations of crime incidents based on the selected crime type, location, and date range.

Types of Information Systems

- Integrated Enterprise System
  - Electronic Data Interchange (EDI)
    - Transfers data between different companies using the Internet or another network
    - Often used to automate reordering materials and products
  - Enterprise Resource Planning (ERP)
    - Large integrated system that ties together all of a business's activities
    - Enterprise Application Integration (EAI)
      - Exchanging information from an ERP or other internal system among different applications and organizations

Types of Information Systems

- Inventory and Product Management Systems
  - Tracks and manages inventory
  - Can help optimize ordering
  - Supply Chain Management (SCM)
    - Oversees materials, information, and finances as they move from original supplier to the consumer

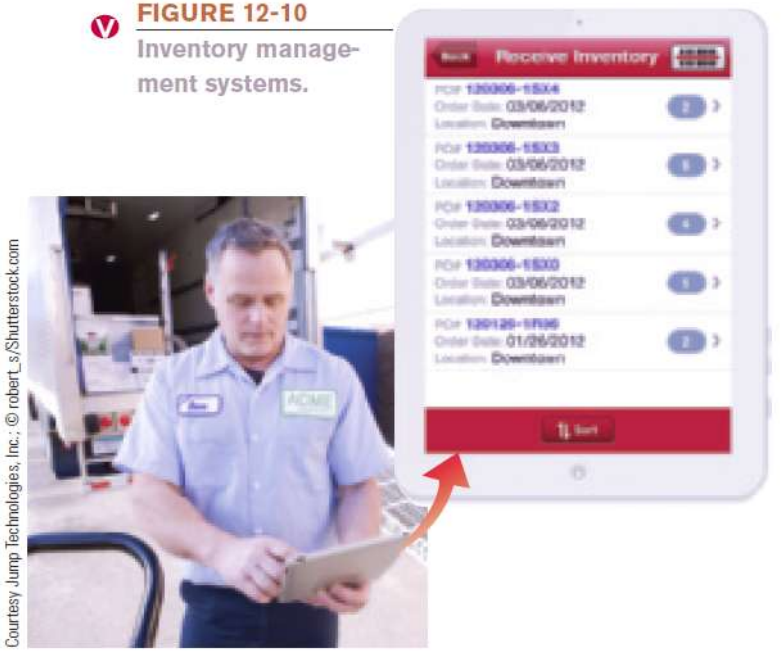


FIGURE 12-10
Inventory management systems.

Courtesy Jump Technologies, Inc.; © robert_s/Shutterstock.com

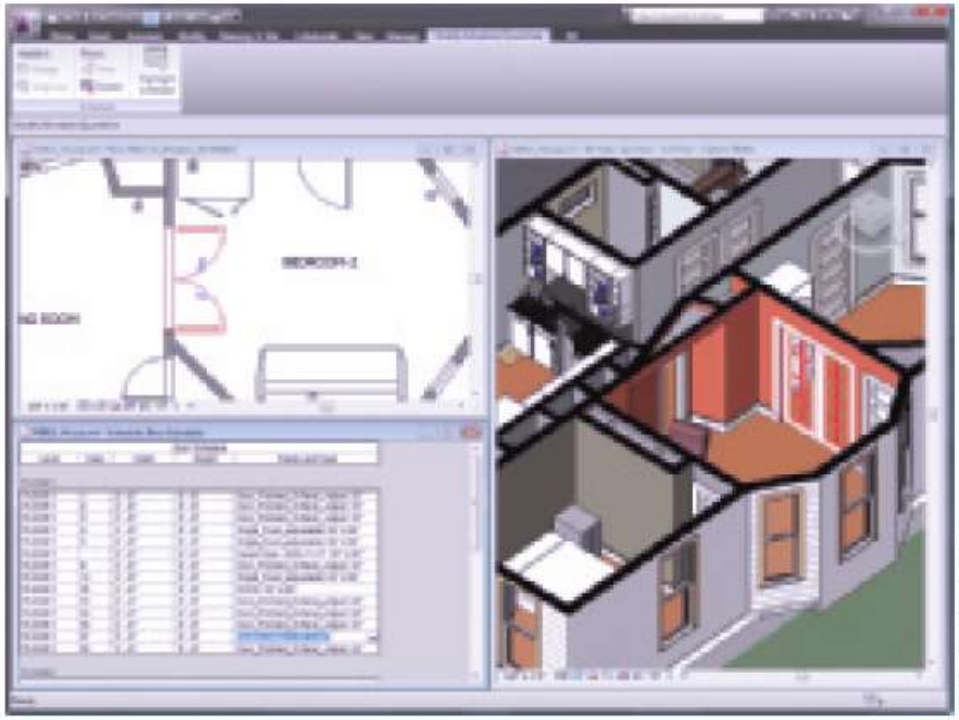
Types of Information Systems

- Just-in-time (JIT)
  - Resources are limited to the right amount at the right time to fill orders
- Warehouse Management Systems (WMS)
  - Acts as a complete distribution system
- Product Lifecycle Management (PLM)
  - Organizes and correlates all information about a product from design to retirement

Types of Information Systems

- Design and Manufacturing Systems
  - Used to improve productivity at the product design stage and manufacturing stage
  - Computer-aided design (CAD)
    - Use of computer technology to automate design functions
  - Computer-aided manufacturing (CAM)
    - Use of computer technology to automate manufacturing functions

Types of Information Systems



Courtesy Autodesk Inc.

FIGURE 12-11

Computer-aided design (CAD). CAD programs can be used for a wide variety of design applications.

Types of Information Systems

- Artificial Intelligence Systems
  - A system in which a computer performs actions that are characteristic of human intelligence
    - Initial advances in AI made through chess-playing programs
    - Watson supports human interactions

Courtesy ChessBase.com

KRAMNIK VS. DEEP FRITZ
Deep Fritz beat world champion Vladimir Kramnik 4 games to 2 in 2006.

Courtesy of IBM Corporation

WATSON VS. *JEOPARDY!* CHAMPIONS
Watson easily beat both champions in 2011.

FIGURE 12-12
AI and game playing.

Inside the Industry Box

The Turing Test and the Loebner Prize

- AI researchers are working to create machines that think and act like people
- Alan Turing – one of the first AI researchers
  - Turing Test – if a computer could repeatedly fool a human into thinking it was human then it should be viewed as intelligent
- Loebner Prize – offered for the first computer who passes the Turing Test

The Loebner Prize gold medal.

Types of Information Systems

- Intelligent Agents
  - Programs that perform specific tasks to help to make a user's work environment more efficient or entertaining and that typically modifies its behavior based on the user's actions
  - Application assistants
  - Personal assistants (Google Now, Siri)
  - Shopping bots
  - Entertainment bots
  - Chatterbots
  - May be part of Semantic Web

FIGURE 12-13
Mobile personal assistants.

Types of Information Systems

- Expert Systems
  - Provides the type of advice that would be expected from a human expert and has two main components
  - Knowledge Base
    - Database containing facts provided by human experts and rules the system should use to make decisions based on those facts
  - Inference Engine
    - Program that applies the rules to the data stored in the knowledge base, in order to reach decisions
  - Is only as good as the knowledge base and inference engine; also needs honest, correct information from the user in order to work correctly

Types of Information Systems

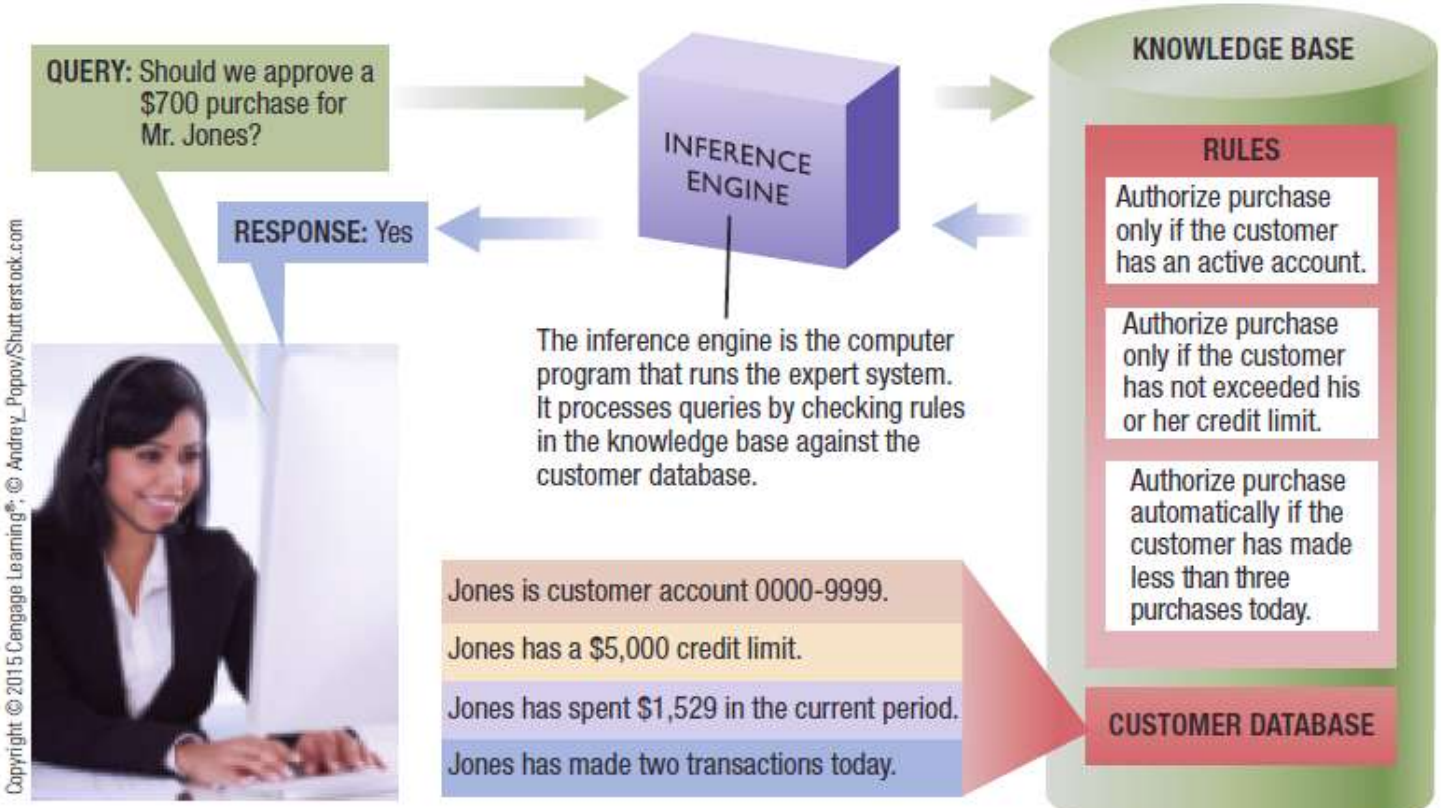


FIGURE 12-15
An expert system at work.

Types of Information Systems

- Neural Networks
  - A system in which the human brain's pattern-recognition process is emulated by the computer
  - Used in:
    - Handwriting, speech, and image recognition
    - Medical imaging
    - Crime analysis
    - Biometric identification
    - Vision systems

FIGURE 12-16
Neural network systems. Neural networks are often used in biometric identification systems, such as to analyze fingerprints.

Courtesy of Crossmatch

Types of Information Systems

- Robotics
  - The study of robot technology
  - Robot
    - A device, controlled by a human operator or a computer, that can move and react to sensory input
  - Military Robots
    - Investigate caves, buildings, trails, etc., before soldiers enter
    - Locate and defuse explosive devices
    - Provide surveillance
    - Used in Unmanned Aerial Vehicles (UAVs)

Types of Information Systems

- Exoskeleton Suit
  - » Wearable robotic systems designed to give an individual additional physical capabilities and protection

Courtesy iRobot

PACKBOT ROBOT
Designed to investigate dangerous, hostile, or inaccessible areas prior to human entry.

Courtesy of Lockheed Martin

HULC EXOSKELETON
Designed to give soldiers enhanced mobility and endurance while carrying heavy loads.

FIGURE 12-17
Military robotic applications.

Types of Information Systems

- Business and Industrial Robots
  - Look for gas leaks, intruders, other hazards
  - Work on factory assembly lines
  - Mine coal, repair oil rigs
  - Locate survivors in collapsed mines
  - Facilitate video-conferencing and other remote presence applications

FIGURE 12-18
Business robots.

Photo courtesy of KUKA Robotics Corporation

ASSEMBLY LINE ROBOTS

Courtesy iRobot

REMOTE PRESENCE ROBOTS

Types of Information Systems

- Personal Robots (Service Robots)
  - Entertainment robots
  - Toy robots
  - Robots designed for household tasks
    - Mow lawns, clean floors, etc.
    - Expected to be more humanoid in the future

FIGURE 12-19
Personal robots.

Courtesy LEGO

TOY ROBOTS
This robot is designed to be built and used by children.

Courtesy Robomow

HELPER ROBOTS
This robot is designed to automatically mow the lawn within a prescribed area.

Technology and You Box

Self-Driving Cars

- Google's self-driving car has logged half a million miles during testing
- Need to determine laws and policies regarding autonomous vehicles before they are sold
- Issues include:
  - How cars and riders should be licensed
  - Limitations on use for safety
  - How cars will be insured
  - How to protect cars against hackers

Types of Information Systems

- Societal Implication of Robots
  - Adds convenience to our lives
  - Replaces humans for dangerous tasks
  - Monitors and assists the disabled and elderly
  - Concern exists that as true artificial intelligence becomes closer to reality, a class of robots with the potential for great harm could be created

Quick Quiz

1. A system using knowledge from medical experts that is used to help diagnose patients would be a type of
   a. neural network
   b. natural language system
   c. expert system
2. True or False: An order-entry system would be classified as a management information system.
3. A(n) _____ is a device, controlled by a human, that can move and react to sensory input.

Answers:

1) c; 2) False; 3) robot

Responsibility for System Development

- The Information Systems (IS) Department
  - Responsible for an organization's computers, systems, and other technology
  - Also called the Information Technology (IT) department
  - Systems Analyst
    - Studies systems in order to determine what work needs to be done, and how this work may best be achieved
  - Other IT personnel include:
    - Business analysts, application programmers, operations personnel, and security specialists

Responsibility for System Development

Application programmer Codes application software.	**Multimedia developer** Develops multimedia content for Web sites and applications.
Business analyst Identifies the business needs of a system and makes sure systems meet those needs.	**Network and computer system administrator** Responsible for planning and implementing computers and networks within an organization.
Chief information officer (CIO) Oversees routine transaction processing and information systems activities, as well as other computer-related areas. Also known as the **vice president of information systems**.	**Network engineer** Responsible for the overall implementation, maintenance, and optimization of network hardware, software, and communications; called **cloud network engineer** when the infrastructure is cloud based.
Cloud architect Evaluates a company's computing needs and deploys appropriate cloud solutions to meet them.	**Network operator/troubleshooter** Responsible for overseeing the day-to-day activities for a network, such as troubleshooting problems, documenting network events, and performing necessary duties to keep the network operating smoothly.
Cloud engineer Plans and conducts technical tasks associated with the implementation and maintenance of virtualized or cloud systems.	**Network systems and data communications analyst** Manages the networks in an organization and determines what changes, if any, are needed. Also known as a **network architect**.
Cloud product manager Plans the concepts, strategies, positions, and sales used with cloud-based products.	**Network technician** Installs, maintains, and upgrades networking hardware and software.
Cloud services developer Designs and builds the end-user interfaces and tools used with cloud services.	**Security specialist** Responsible for seeing that an organization's hardware, software, and data are protected from hackers, malware, natural disasters, accidents, and the like. Also known as the **chief security officer (CSO)**.
Communications analyst Analyzes, maintains, and troubleshoots data communications networks and assists with connectivity.	**Software engineer** Designs and builds complex software applications. Also known as an **application software engineer** or a **systems software engineer**; called a **cloud software engineer** when the software is cloud based or integrates with cloud services.

FIGURE 12-20
Computer and networking jobs.

Responsibility for System Development

Computer operations manager Oversees the computer operations staff and facility.	**System administrator** Responsible for maintaining a large, multiuser system; called **cloud systems administrator** when the system is cloud based.
Database administrator Responsible for setting up and managing large databases within an organization.	**System programmer** Codes system software, fine-tunes operating system performance, and performs other system software-related tasks.
Database analyst Responsible for designing and developing an organization's data flow models and database architecture.	**Systems analyst** Studies systems in an organization to determine what changes need to be made and how to best accomplish these changes.
Data center architect Manages the whole data center environment, including servers, virtualization, power, cooling, security, and so on.	**Systems engineer** Oversees and coordinates the various engineering tasks performed during systems development.
Data entry operator Responsible for keying data into a computer system.	**Trainer** Trains users about a particular program, system, or technology.
Help desk technician Assists users in solving software and hardware problems.	**Webmaster** Responsible for all technical aspects of a Web site.
Information engineer Analyzes an organization's data to locate trends, problems, and other useful information for management.	**Web designer/developer** Designs and develops Web sites.
Knowledge engineer Responsible for setting up and maintaining the expert knowledge base used in expert system applications.	**Web programmer** Writes the program code necessary for a Web site, such as to provide animation and database connectivity.

FIGURE 12-20
Computer and net-working jobs.

Responsibility for System Development

- Outsourcing
  - Hiring outside vendors to perform specific business tasks
  - Offshore
    - Outsourced to another country
  - Nearshoring
    - Outsourcing to nearby countries
  - Homesourcing (homeshoring)
    - Outsourcing to home-based workers

Responsibility for System Development

- Crowdsourcing
  - Taking job traditionally performed by an employee and outsourcing it to a large, undefined group of people
  - Often performed via the Web
- Advantages
  - Lower costs
  - Flexible staffing
    - Global sourcing
    - Strategic sourcing
    - Socially responsible outsourcing

Responsibility for System Development

- Disadvantages
  - Personnel changes at the outsourcing company
  - Conflicts between in-house and outsourcing personnel
  - Communication problems
  - Cultural differences
  - Quality control and security
- Captive offshoring
  - U.S. companies own facilities in other countries and hire employees in that country
  - Gives company more control over employees and procedures than with conventional outsourcing

Trend Box

Digital Badges

- Consist of icons that represent academic achievements or acquired skills
- Offered by educational institutions, Web sites, companies, etc.
- Can be standard or customized
- Displayed via a digital badge system

Quick Quiz

1. Which term refers to outsourcing work to another country?
   a. Homeshoring
   b. Offshoring
   c. System development
2. True or False: The IT worker who codes computer programs is called the computer operator.
3. The IT employee most involved with system development is the _____.

Answers:

1) b; 2) False; 3) systems analyst

The System Development Life Cycle (SDLC)

- SDLC = The development of a system from the time it is first studied until the time it is updated or replaced

FIGURE 12-22
The system development life cycle (SDLC). Each phase of the system development life cycle produces some type of documentation to pass on to the next phase.

The System Development Life Cycle (SDLC)

- Preliminary Investigation
  - A feasibility study is performed to assess whether or not a full-scale project should be undertaken
  - Documentation: Feasibility Report
    - Contains findings on status of existing system and benefits/feasibility of changing to a new system
    - Includes system analysts' recommendations regarding whether or not the project should move on to the next stage in the SDLC

The System Development Life Cycle (SDLC)

- System Analysis
  - Examines the problem area to determine what should be done
  - Data Collection
    - Gathering information about the system (organizational chart, observation, interviewing users, etc.)
  - Data Analysis
    - Analyzing information to determine the effectiveness and efficiency of current system and/or requirements for new or modified systems

The System Development Life Cycle (SDLC)

- Entity-Relationship Diagrams (ERDs) and Data Flow Diagrams (DFDs)
  - Used to model the entities in a system and the flow of data within the system
  - Provides a visual representation of the data movement in an organization
- Decision Tables and Decision Trees
  - Useful for identifying procedures and summarizing the decision making process of one step of a system

The System Development Life Cycle (SDLC)

	RULES	POSSIBLE ORDER SCENARIOS							
CONDITIONS	New customer?	Y	Y	Y	Y	N	N	N	N
	New customer information complete?	N	Y	Y	Y	–	–	–	–
	30+ day balance>0?	–	–	–	–	N	Y	N	N
	Valid quantity and product number?	–	Y	N	Y	Y	–	N	Y
	Quantity in stock?	–	Y	–	N	Y	–	–	N
ACTIONS	Valid order—proceed to assembly stage		X			X			
	Valid backorder—send backorder notices to customer and assembly stage				X				X
	Invalid order	X		X			X	X	

DECISION TABLES
This decision table describes the actions taking place in the "Verify order is valid" process. Each column represents one scenario; N = No, Y = Yes, and X indicates the resulting action for each scenario. The rules in this decision table determine whether or not an order moves on to the order assembly stage.

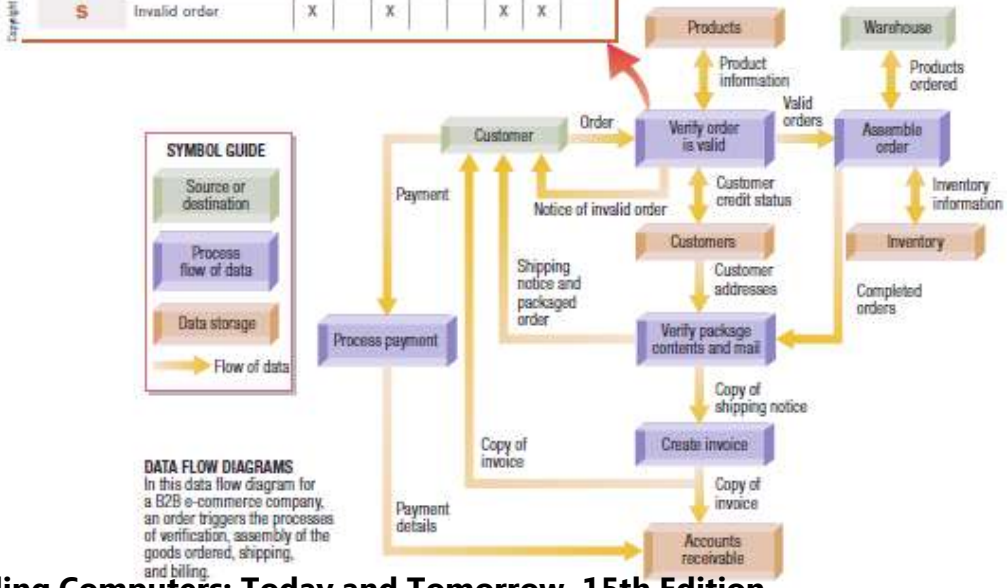


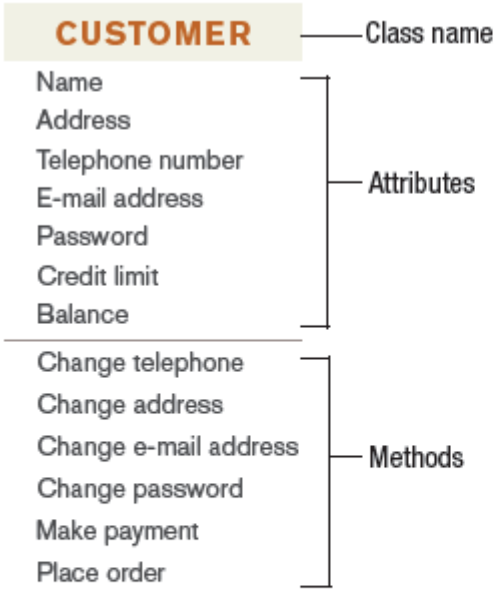
FIGURE 12-24
Data flow diagrams and decision tables. These tools are frequently used to analyze a system during the system analysis phase of the SDLC.

The System Development Life Cycle (SDLC)

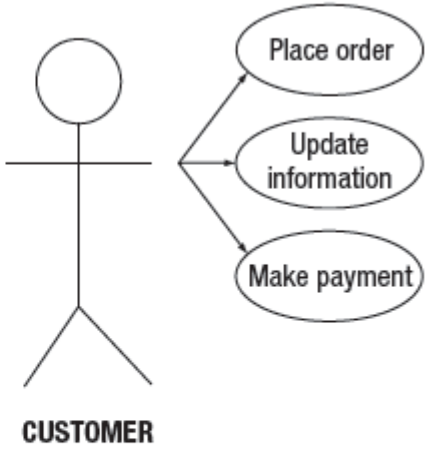
- Business Process Modeling Notation (BPMN)
  - A graphical, standardized notation used to model business processes
  - Used to model the business processes used within systems
  - Designed to be understood by all individuals involved in the system
  - Expresses processes graphically using diagrams similar to flowcharts

The System Development Life Cycle (SDLC)

- Class Diagrams and Use Case Diagrams
  - Used to illustrate systems that are based on the concept of objects



CLASS DIAGRAM
Lists the attributes and methods that all instances in the class (in this case the Customer class) possess.



USE CASE DIAGRAM
Lists a user of the system (in this case a real customer) and its use cases (the actions the user may take).

FIGURE 12-25
Class and use case diagrams. These tools are frequently used to model object-oriented systems.

The System Development Life Cycle (SDLC)

- Documentation: Diagrams, Tables, Trees, and Models
  - Consists of any instruments used for data gathering and the resulting diagrams, trees, models, and other tools used to summarize and analyze the data
    - Questionnaires
    - Interview questions
    - Diagrams, models, etc.

The System Development Life Cycle (SDLC)

- System Design
  - Specifies what the new system will look like and how it will work
  - Developing the Design and Specifications for the New System
    - Model of new system is developed
    - Diagrams can include:
      - Data dictionary: describes all data in a system
      - Data flow and/or class diagrams of the new system
      - User interface (UI) designs

The System Development Life Cycle (SDLC)

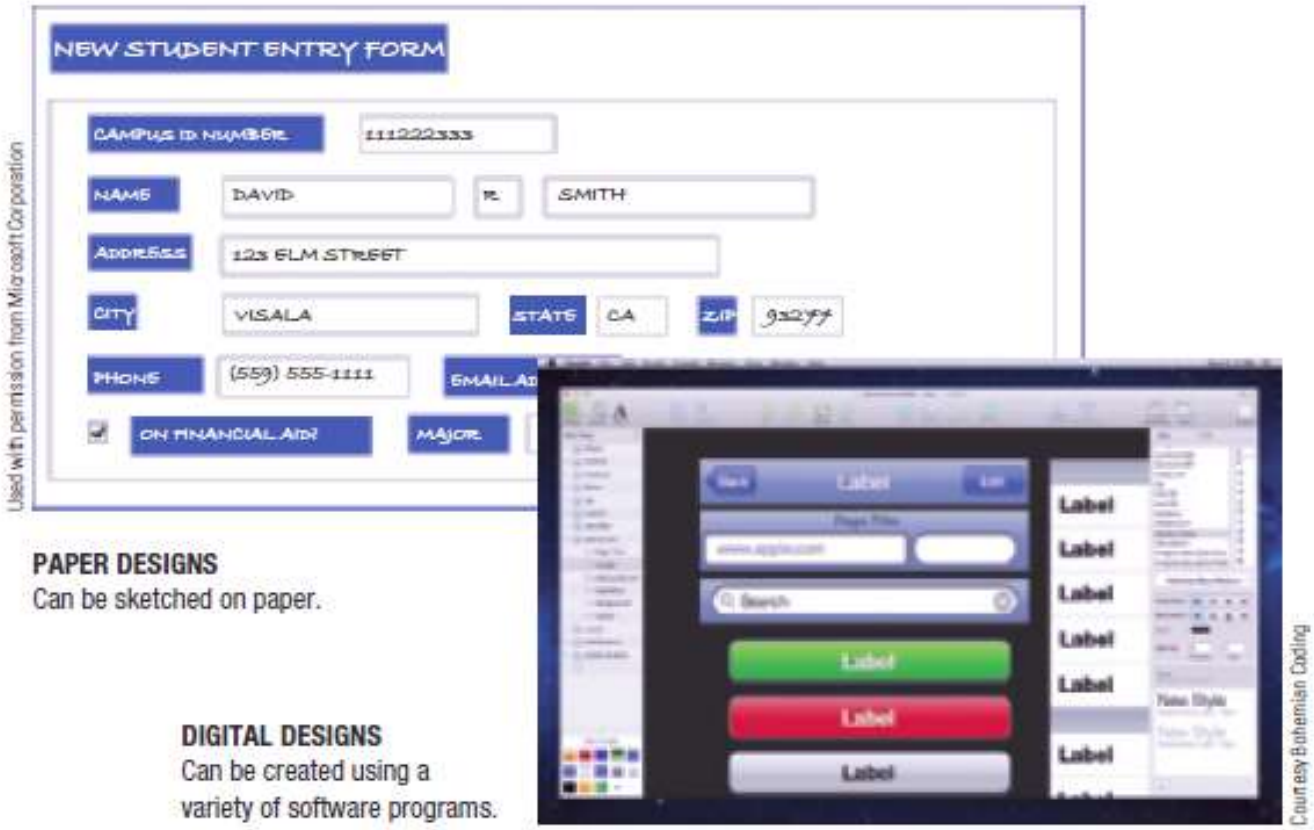


FIGURE 12-26

User interface (UI) designs are created during the system design phase.

The System Development Life Cycle (SDLC)

- Cost-Benefit Analysis
  - Considers both tangible and intangible benefits to determine if the benefits of the new system outweigh the cost
- Documentation: System Design/Specifications
  - Developed during the system design phase
  - Consists of all documentation necessary to illustrate the new system

The System Development Life Cycle (SDLC)

- System Acquisition
  - System analysts determines where to obtain the necessary hardware, software, and other system components
  - The Make-or-Buy Decision
    - Determining if the software needed will be purchased from a vendor or developed in-house
      - If developed in-house, software to be developed moves into the program development process (Chapter 13)

The System Development Life Cycle (SDLC)

- RFPs and RFQs
  - RFP is a Request for Proposal
    - » Contains list of technical specifications for equipment, software, and services needed
  - RFQ is a Request for Quotation
    - » Names desired items needed and asks for a quote

– Evaluating Bids

- Most companies have procedures for evaluating bids
  - Benchmark test

The System Development Life Cycle (SDLC)

  - Documentation: RFPs, RFQs, and Vendor Evaluation Materials
    - Includes RFP or RFQ sent to potential vendors
    - Proposals received
    - Documentation produced during the evaluation of bids
- System Implementation
  - The new system is installed, tested, and made operational
    - Data migration
  - System must be thoroughly tested
    - Test data should be realistic and include incorrect data

The System Development Life Cycle (SDLC)

- System Conversion
  - Once testing phase is completed, system is installed
    - Direct conversion
      - » Old system deactivated and new system is immediately implemented
    - Parallel conversion
      - » Both systems are operated simultaneously until it is determined that the new system works properly
    - Phased conversion
      - » System is implemented by module

The System Development Life Cycle (SDLC)

- Pilot conversion
  - » New system used at just one location within the organization
- User Training
  - All training manuals should be developed and given to users
  - Training takes place on the actual system
  - Can occur one-on-one or in groups
- Documentation: Implementation Schedule, Test Data and Results, and Training Materials
  - Implementation schedule, test data, test results, training materials should be saved for future reference

The System Development Life Cycle (SDLC)

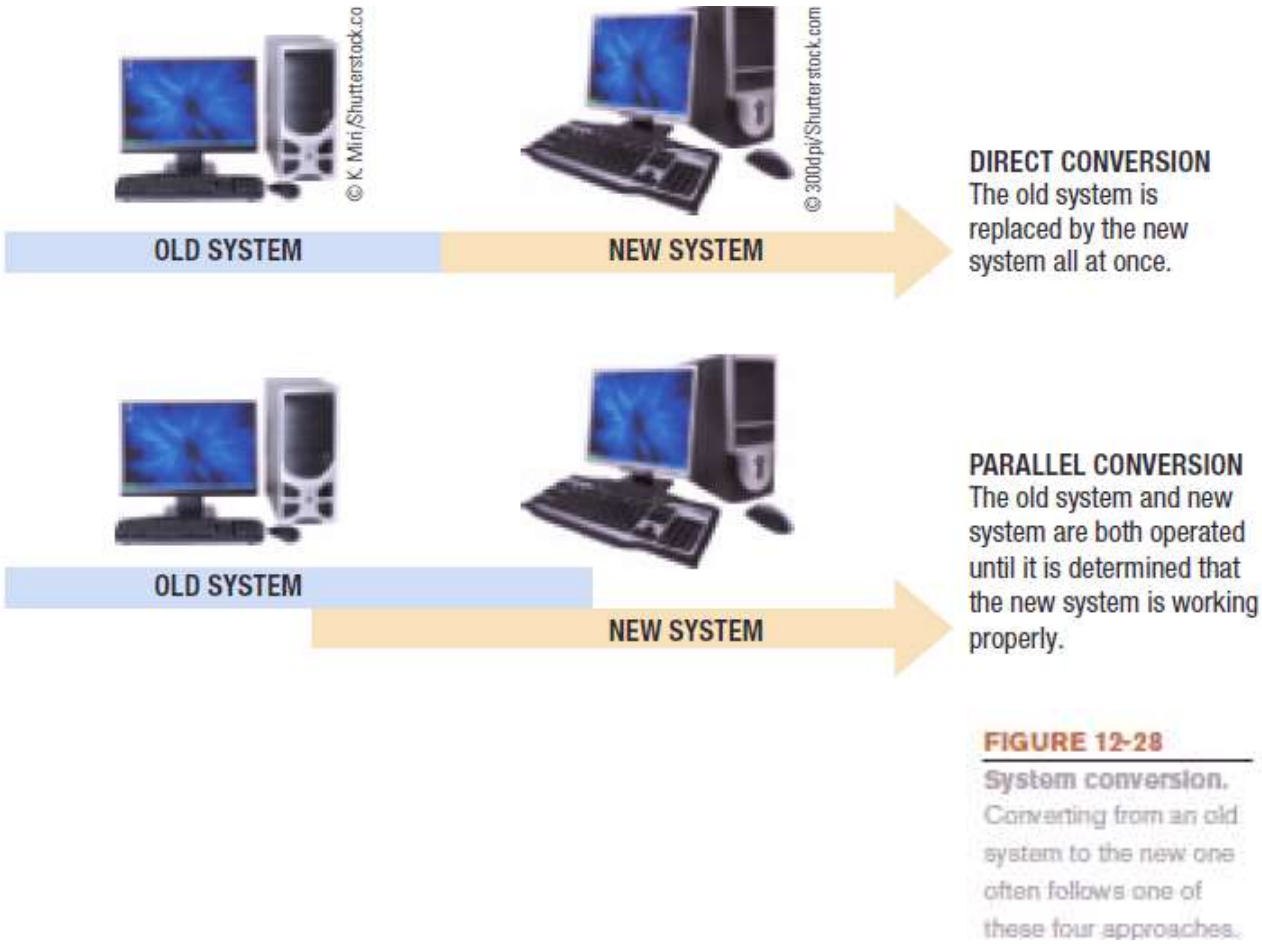


FIGURE 12-28
System conversion. Converting from an old system to the new one often follows one of these four approaches.

The System Development Life Cycle (SDLC)

PHASED CONVERSION
The system is implemented by module (each module can be implemented using either direct or parallel conversion).

PILOT CONVERSION
The new system is used at only one location within the organization. After it is determined that the new system is working correctly, it is installed at the other locations.

FIGURE 12-28
System conversion. Converting from an old system to the new one often follows one of these four approaches.

The System Development Life Cycle (SDLC)

- System Maintenance
  - Maintenance is an ongoing process
  - Minor adjustments are made to the finished system to keep it operational until the end of the system's life or until the time that the system needs to be redesigned
  - Post-Implementation Review
    - Identifies any glitches in the new system that need to be fixed
  - When a major change is needed, the project goes through the SDLC again

The System Development Life Cycle (SDLC)

- Documentation: Completed Project Folder
  - Results of the post-implementation review are added to the accumulated documentation
  - Information can be useful to auditors who may check to see that proper procedures were followed

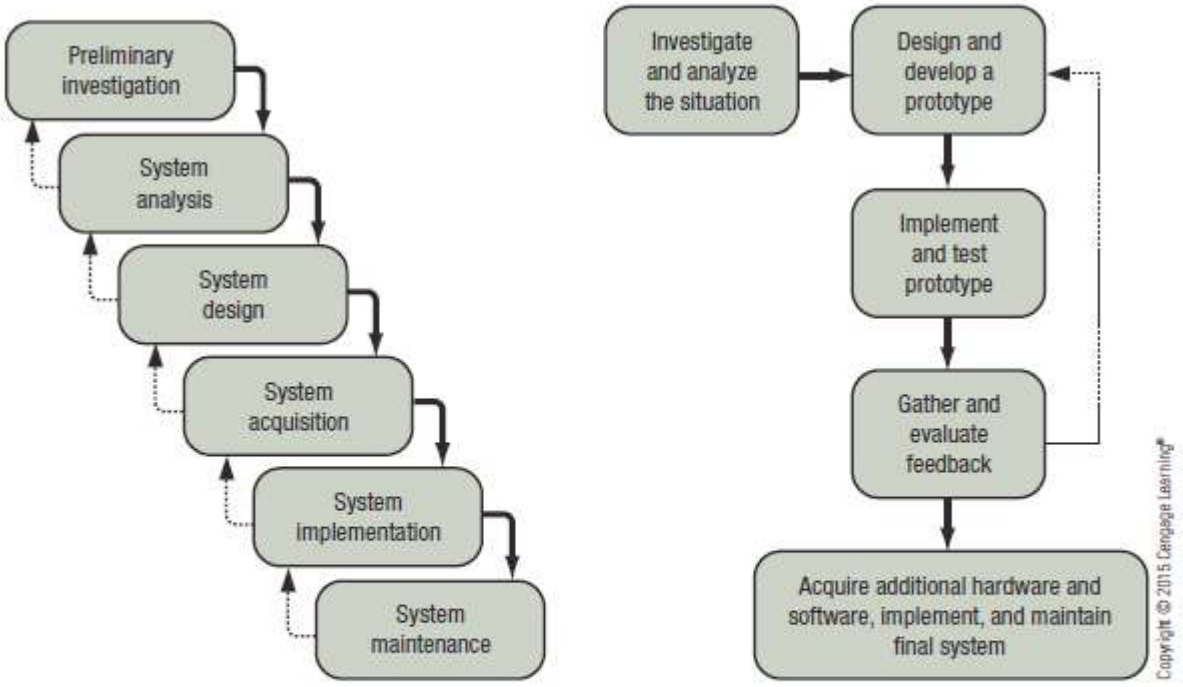
Approaches to System Development

- The Traditional Approach
  - SDLC phases are carried out in a preset order
    - Preliminary investigation
    - System analysis
    - System design
    - System acquisition
    - System implementation
    - System maintenance

The System Development Life Cycle (SDLC)

  - Referred to as the waterfall model
    - Each phase begins only when previous one is completed
  - Time-consuming
- The Iterative Approach
  - System is developed incrementally
    - Steps are repeated until the system is finalized
  - Prototyping
    - Small model, or prototype, of the system is built before the full-scale development effort is undertaken

The System Development Life Cycle (SDLC)



WATERFALL METHOD (TRADITIONAL APPROACH)
Each step in the SDLC is carried out in order, although some interaction typically occurs.

PROTOTYPING (ITERATIVE APPROACH)
An iterative process in which a prototype is designed, developed, and tested, and then an improved prototype is developed and tested, and the process is repeated until the final version is reached.

FIGURE 12-29
Two different approaches to system development.

The System Development Life Cycle (SDLC)

- The End-User Development Approach
  - User is primarily responsible for the development of the system
  - Most feasible when system being developed is small and inexpensive
  - Measures must be taken to ensure that the system is compatible with existing systems and no new problems are introduced

Quick Quiz

1. The first step of in the system development life cycle is _____.
   a. to design the system
   b. to perform a preliminary investigation
   c. to implement the system
2. True or False: The traditional approach to systems development also is referred to as the waterfall model.
3. A test used to evaluate or measure a systems performance is called a(n) _____.

Answers:

1) b; 2) True; 3) benchmark test

Summary

- What Is an Information System?
- Types of Information Systems
- Responsibility for System Development
- The System Development Life Cycle (SDLC)
- Approaches to System Development