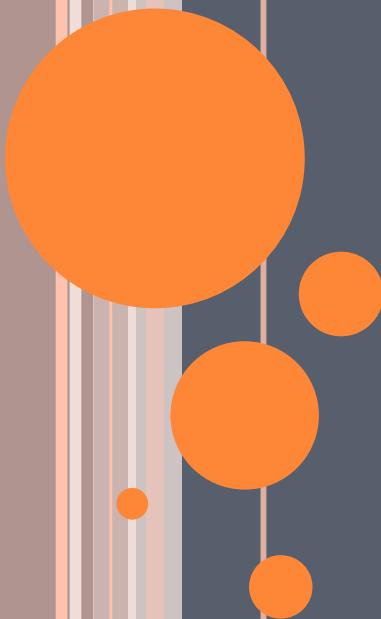


## Chapter 1

# Introduction to Systems Analysis and Design



MUTEGANDA AMON

## CHAPTER OBJECTIVES

- Describe the impact of information technology
- Define systems analysis and design and the role of a systems analyst
- Define an information system and describe its components
- Explain how to use business profiles and models
- Explain Internet business strategies and relationships, including B2C and B2B

## CHAPTER OBJECTIVES (CONT.)

- Identify various types of information systems and explain who uses them
- Distinguish among structured analysis, object-oriented analysis, and agile methods
- Explain the waterfall model, and how it has evolved
- Discuss the role of the information technology department and the systems analysts who work there

# INTRODUCTION

- Companies use information as a weapon in the battle to increase productivity, deliver quality products and services, maintain customer loyalty, and make sound decisions
- Information technology can mean the difference between success and failure



**FIGURE 1-1** These headlines show the enormous impact of information technology on our lives.

# WHAT IS INFORMATION TECHNOLOGY?

- **Information Technology (IT)**

- Combination of hardware and software products and services that companies use to manage, access, communicate, and share information

- **Welcome to the 21<sup>st</sup> Century: The IT Journey Continues**

- Changes in the world
- Changes in technology
- Changes in client demand



**FIGURE 1-3** How times have changed!

# WHAT IS INFORMATION TECHNOLOGY? (CONT.)

## ○ Systems Analysis and Design

- Step-by-step process for developing high-quality information systems

### ● What Does a Systems Analyst Do?

- Plan, develop, and maintain information systems
- Also manages IT projects, including tasks, resources, schedules, and costs
- Conducts meetings, delivers presentations, and writes memos, reports, and documentation

# INFORMATION SYSTEM COMPONENTS

- A system is a set of related components that produces specific results
- Mission-critical systems are vital to a company's operations

e.g. Order processing systems

- Information systems have five key components: hardware, software, data, processes, and people

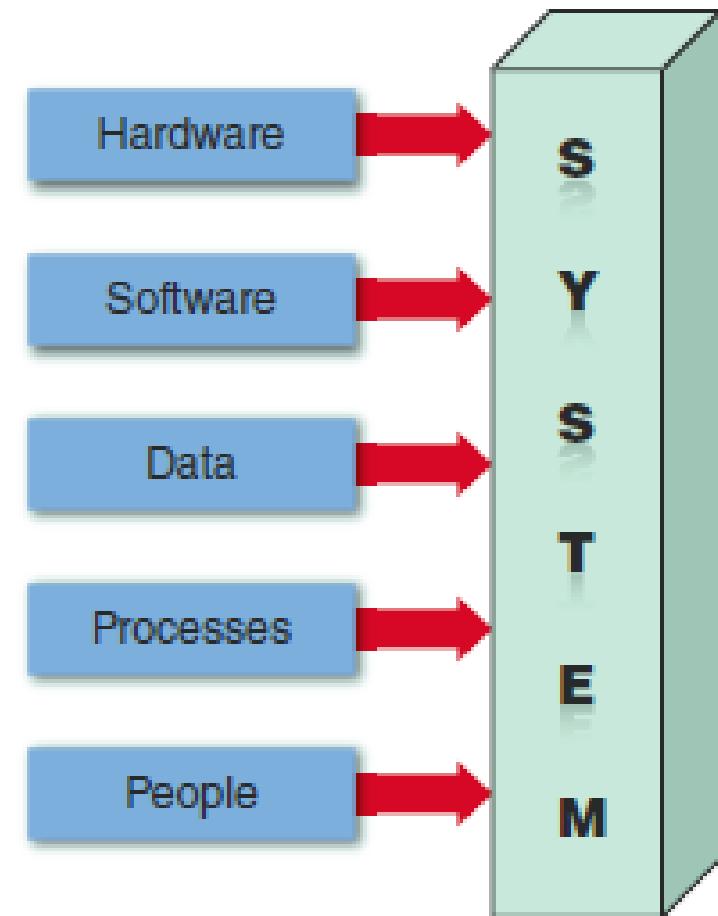


FIGURE 1-6 An information system needs these components. 7

# INFORMATION SYSTEM COMPONENTS (CONT.)

- **Hardware**

- Is the physical layer of the information system
- Moore's Law

- **Software**

- System software
- Application software
  - Horizontal system
  - Vertical system
  - Legacy systems



**FIGURE 1-7** Server farms provide the enormous power and speed that modern IT systems need.

# INFORMATION SYSTEM COMPONENTS

(CONT.)

## ○ Data

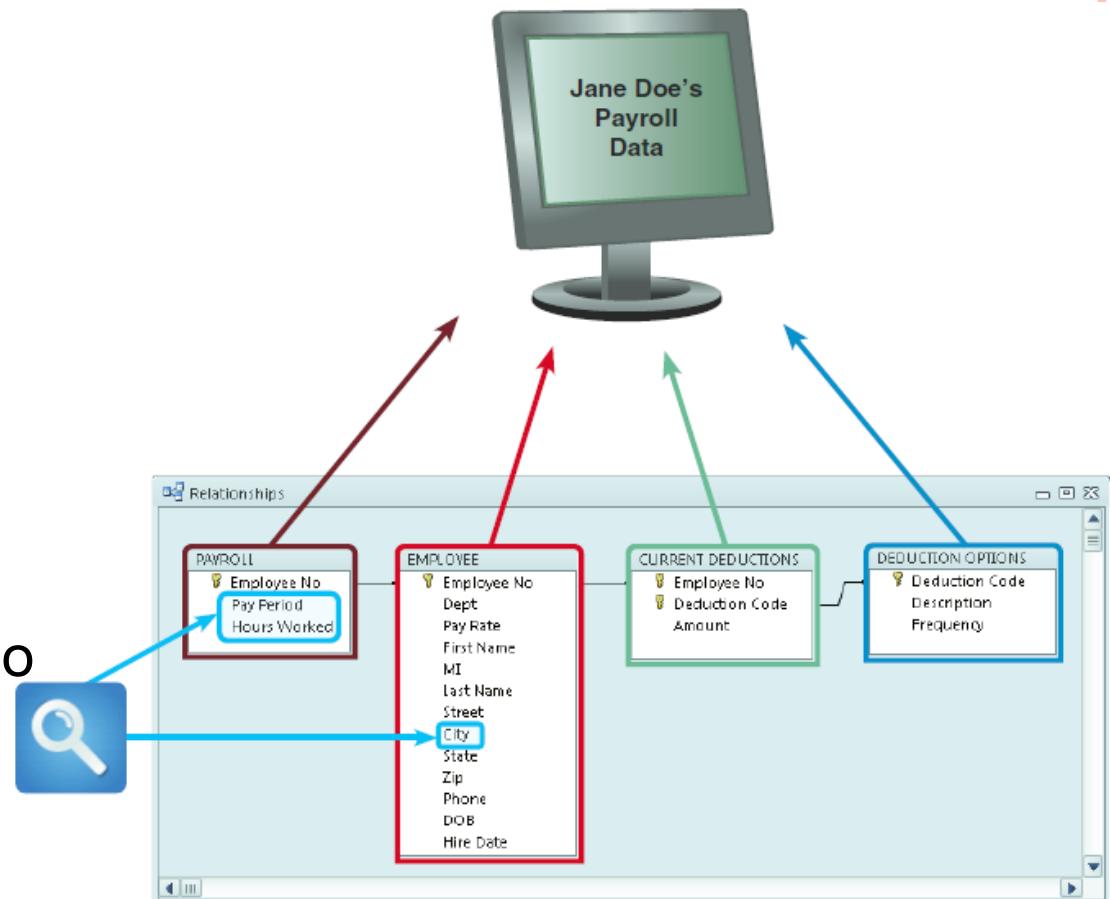
- Tables store data
- Linked tables work together to supply data

## ○ Processes

- Describe the tasks and business functions that users, managers, and IT staff members perform to achieve specific results

## ○ People

- Stakeholders
- Users or end users



**FIGURE 1-8** In a typical payroll system, data is stored in separate tables that are linked to form an overall database.

# BUSINESS IN THE 21<sup>ST</sup> CENTURY

- Three major trends:
  - Rapidly increasing globalization
  - Technology integration for seamless information access
  - Rapid growth of cloud-based computing and services
- All trends are Internet-centric and driven by the immense power of the Web

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

- E-commerce or I-commerce
- B2C (Business-to-Consumer)
- B2B (Business-to-Business)
  - EDI(electronic data interchange)
  - Supply chain management (SCM)
  - Supplier relationship management (SRM)
- **What's Next?**
  - Traditionally, IT companies were product-oriented or service-oriented
  - Today's IT companies offer a mix of products, services, and support

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

- Internet-dependent firms

- Primary business depends on the Internet rather than a traditional business channel

- Brick-and-mortar firms

- Have physical stores where customers can see and touch the products
  - Have expanded their Web-based marketing channels to increase sales and serve customers better
    - Combine convenience of online shopping and the alternative of hands-on purchasing
    - Lowe's, Costco, Target, and Wal-Mart are examples

## BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

- The Web-based business model leveled the playing field for small firms that now can reach a global marketplace
- Discount coupon business gets a new life
  - eBay and Groupon
  - Firms now using global positioning system (GPS) coordinates to tempt buyers with nearby deals

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

- **Business Profiles**

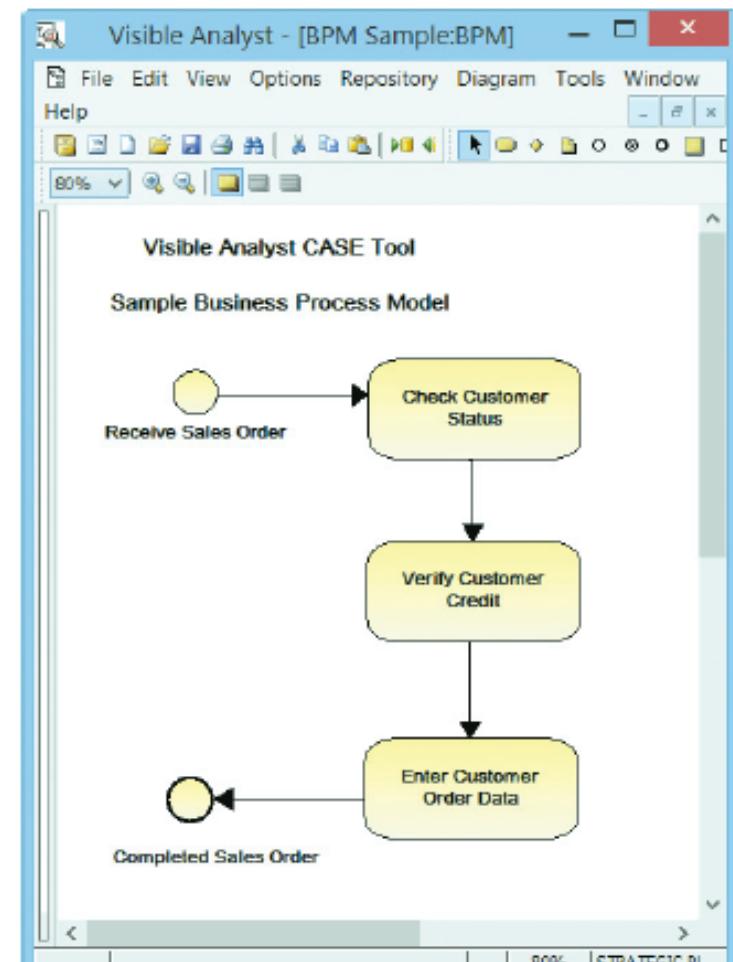
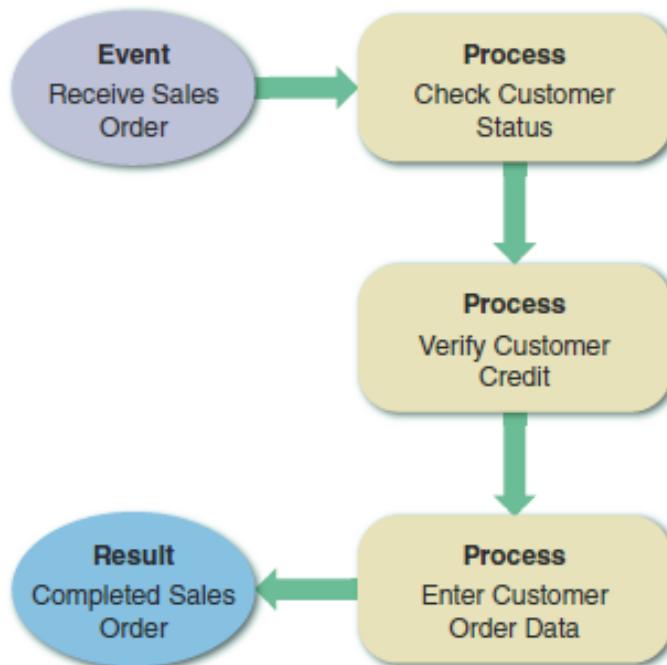
- Overview of a company's mission, functions, organization, products, services, customers, suppliers, competitors, constraints, and future direction

- **Business Processes**

- Specific set of transactions, events, and results that can be described and documented
  - A **business process model (BPM)** graphically displays one or more business processes

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

**FIGURE 1-14** A simple business model might consist of an event, three processes, and a result.



**FIGURE 1-15** This sample uses business process modeling notation (BPMN) to represent the same events, processes, and workflow shown in Figure 1-14.

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

## Business Information Systems

- The old way:
  - Administrative staff used office systems
  - Operational people used operational systems
  - Middle managers used decision support systems
  - Top managers used executive information systems
- The “now” way
  - All employees use office productivity systems
  - Operations users require decision support systems

## BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

- A new set of system definitions
  - Enterprise computing systems
  - Transaction processing systems
  - Business support systems
  - Knowledge management systems
  - User productivity systems

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

## Enterprise Computing

- Information systems that support company-wide operations and data management requirements
- Examples:
  - Wal-Mart's inventory control system
  - Boeing's production control system
  - Hilton Hotels' reservation system
- Applications called enterprise resource planning (ERP) systems provide cost-effective support for users and managers throughout the company

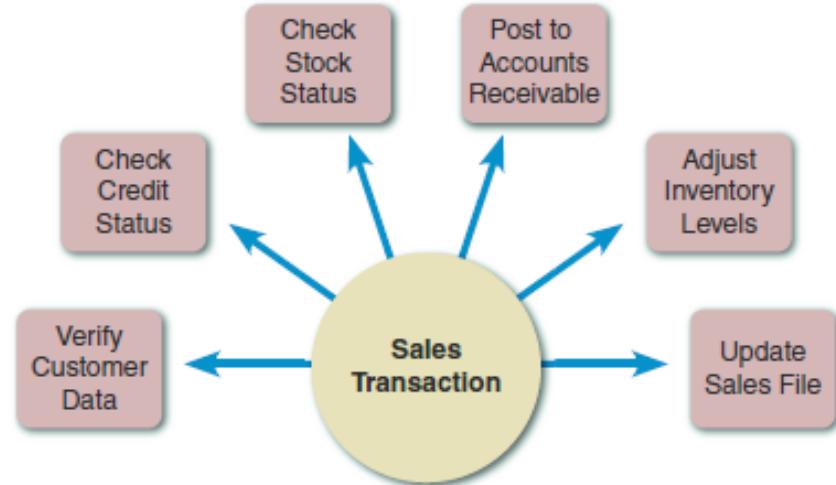
# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

## Transaction Processing

- Transaction processing (TP) systems process data generated by day-to-day business operations
- Examples:

- Customer order processing
- Accounts receivable
- Warranty claim processing

- A TP system verifies customer data, checks customer credit, checks stock status, posts to accounts receivable, adjusts inventory levels, and updates the sales file



**FIGURE 1-17** A single sales transaction consists of six separate tasks, which the TP system processes as a group.

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

## Business Support

- Provide job-related information support to users at all levels of a company
  - Can work hand-in-hand with a TP system
  - New development is RFID
- Radio frequency identification (RFID) technology uses high-frequency radio waves to track physical objects.



**FIGURE 1-18** With an RFID tag, items can be tracked and monitored throughout the shipping process.

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

## ○ Knowledge Management

- Uses a large database called a knowledge base
- Allows users to find information by entering keywords
- Uses inference rules, which are logical rules that identify data patterns and relationships

# BUSINESS IN THE 21<sup>ST</sup> CENTURY (CONT.)

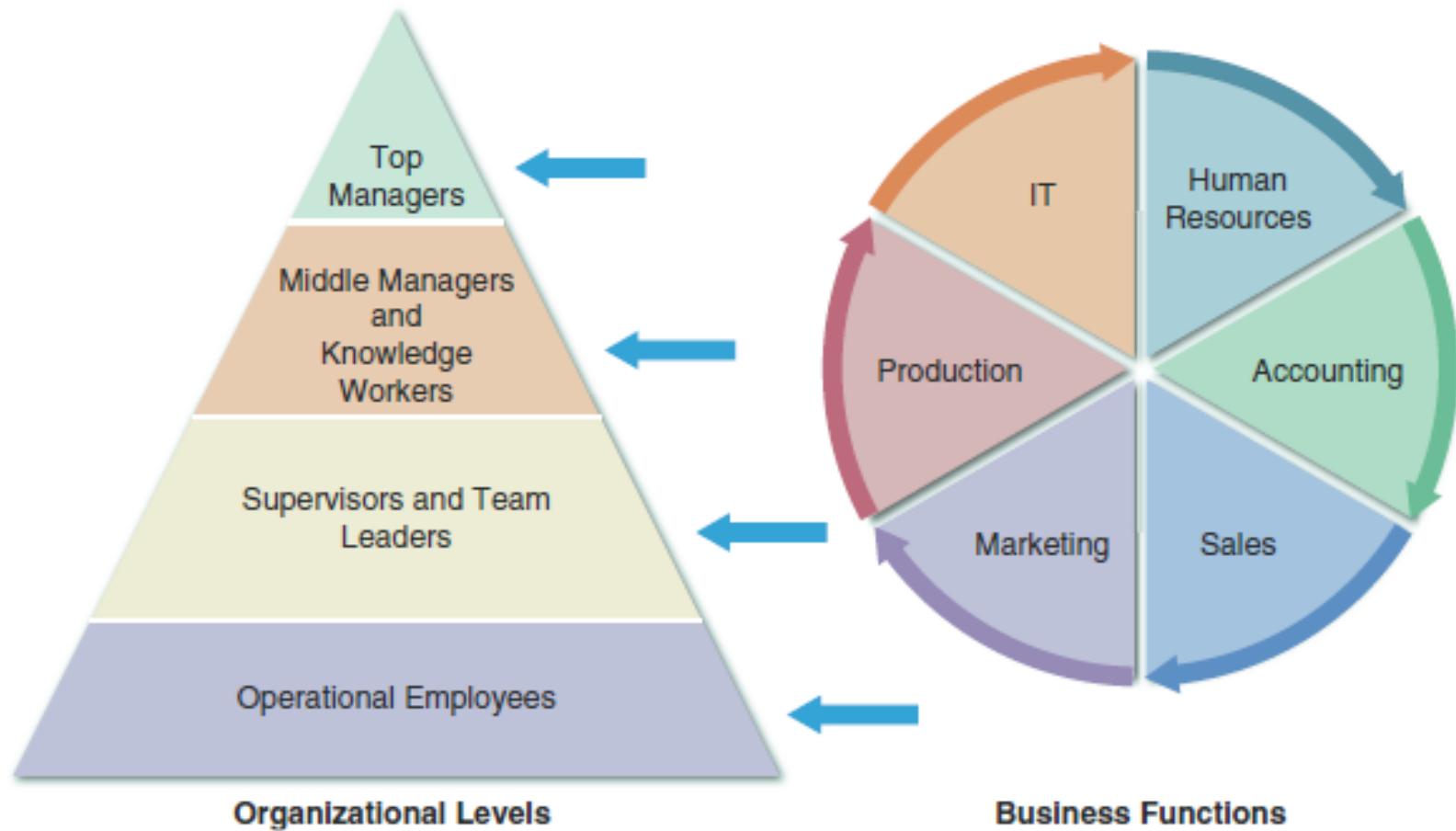
## ○ User Productivity

- Technology that improves productivity
- Groupware

## ○ Systems Integration

- Most large companies require systems that combine transaction processing, business support, knowledge management, and user productivity features

# WHAT INFORMATION Do USERS NEED?



**FIGURE 1-20** A typical organizational model identifies business functions and organizational levels.

# WHAT INFORMATION Do USERS NEED? (CONT.)

## ○ Top Managers

- Develop long-range **strategic plans**, which define the company's overall mission and goals
- Need information on economic forecasts, technology trends, competitive threats, and governmental issue

## ○ Middle Managers and Knowledge Workers

- Provide direction, necessary resources, and performance feedback to supervisors and team leaders
- Need more detailed information than top managers

# WHAT INFORMATION Do USERS NEED? (CONT.)

## ○ Supervisors and Team Leaders

- Oversee operational employees and carry out day-to-day functions
- Need decision support information, knowledge management systems, and user productivity systems

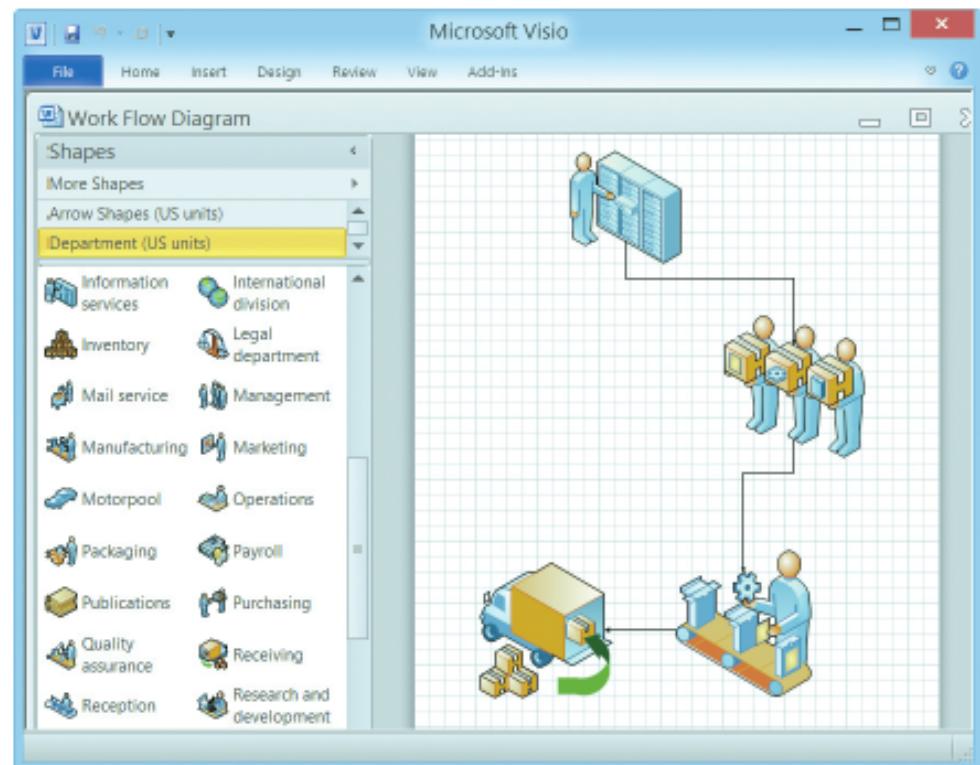
## ○ Operational Employees

- Rely on TP systems to enter and receive data they need to perform their jobs
- Need information to handle tasks and make decisions previously made by supervisors

# SYSTEMS DEVELOPMENT TOOLS

## ○ Modeling

- Data model
- Object model
- Process model



**FIGURE 1-21** Microsoft Visio allows you to drag and drop various symbols and connect them to show a business process.

# SYSTEMS DEVELOPMENT TOOLS (CONT.)

## ○ **Prototyping**

- Early working version of an information system
- Speeds up the development process significantly
- Important decisions might be made too early, before business or IT issues are thoroughly understood
- A prototype based on careful fact-finding and modeling techniques can be an extremely valuable tool

# SYSTEMS DEVELOPMENT TOOLS (CONT.)

## ○ Computer-Aided Systems Engineering (CASE) Tools

- Provide an overall framework for systems development and support a wide variety of design methodologies such as:
  - Structured analysis
  - Object-oriented analysis
- Can generate program code, which speeds the implementation process

# SYSTEMS DEVELOPMENT METHODS

- **Structured Analysis**

- Traditional method for developing systems
- Organized into phases

- **Object-Oriented Analysis**

- More recent method for developing systems
- Objects represent actual people, things, or events

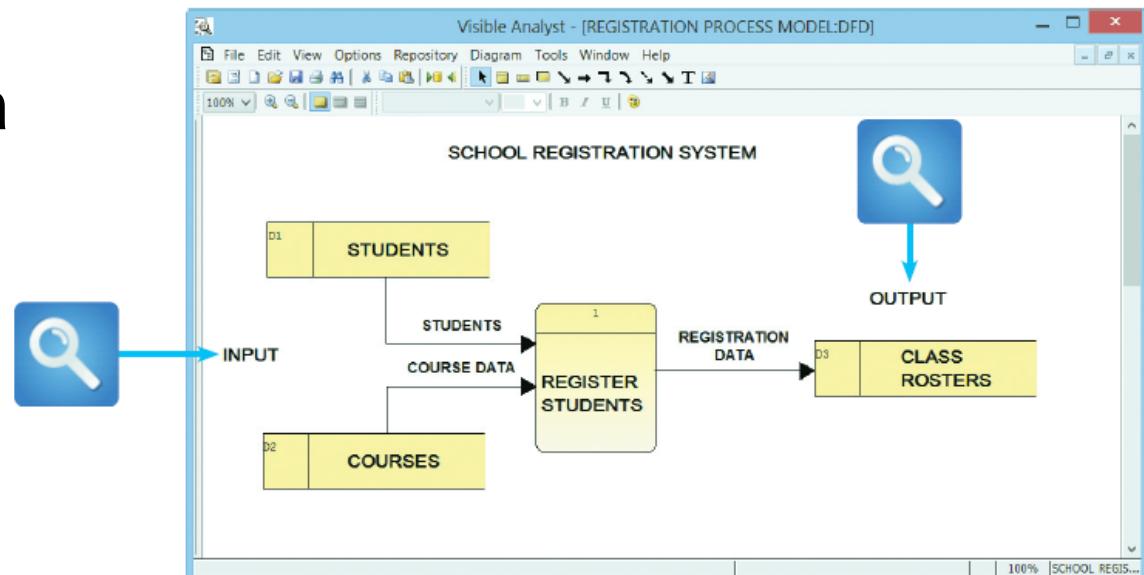
- **Agile/Adaptive Methods**

- Latest trend in software development
- Team-based effort broken down into cycles

# SYSTEMS DEVELOPMENT METHODS (CONT.)

## ○ Structured Analysis

- Time-tested and easy to understand
- Uses phases called the systems development life cycle (SDLC)
- Predictive approach
- Uses process models to describe a system graphically

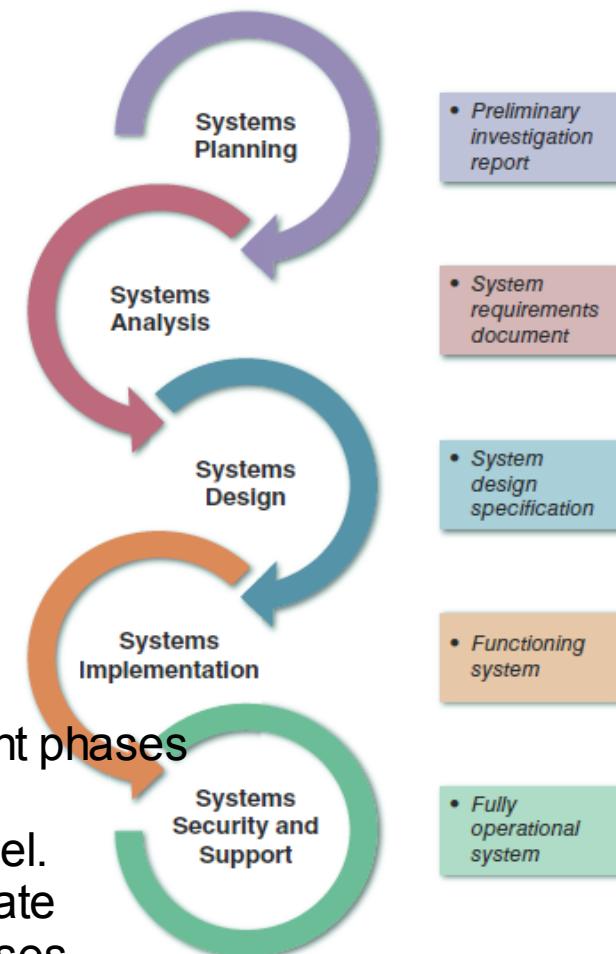


**FIGURE 1-24** This Visible Analyst screen shows a process model for a school registration system. The REGISTER STUDENTS process accepts input data from two sources and transforms it into output data.

# SYSTEMS DEVELOPMENT METHODS (CONT.)

- The SDLC model usually includes five steps
  - Systems Planning
  - Systems Analysis
  - Systems Design
  - Systems Implementation
  - Systems Security and Support

**FIGURE 1-25** Development phases and deliverables are shown in the waterfall model. The circular symbols indicate interaction among the phases.



# SYSTEMS DEVELOPMENT METHODS (CONT.)

## ○ Systems Planning

- Systems request – begins the process and describes problems or desired changes
- Purpose of this phase is to perform a preliminary investigation – a critical step
- Key part of preliminary investigation is a feasibility study

# SYSTEMS DEVELOPMENT METHODS (CONT.)

## ○ Systems Analysis

- Build a logical model of the new system
- Perform fact-finding techniques
- Build business models, data and process models, and object models
- Deliverable is the system requirements document

# SYSTEMS DEVELOPMENT METHODS (CONT.)

## ○ Systems Design

- Create a physical model that satisfies all documented requirements
- Design user interface
- Identify outputs, inputs, and processes
- Deliverable is the system design specification
- Management and user involvement is critical

# SYSTEMS DEVELOPMENT METHODS (CONT.)

## ○ Systems Implementation

- New system is constructed
- Programs are written and tested
- System is installed
- Deliverable is a completely functioning and documented information system

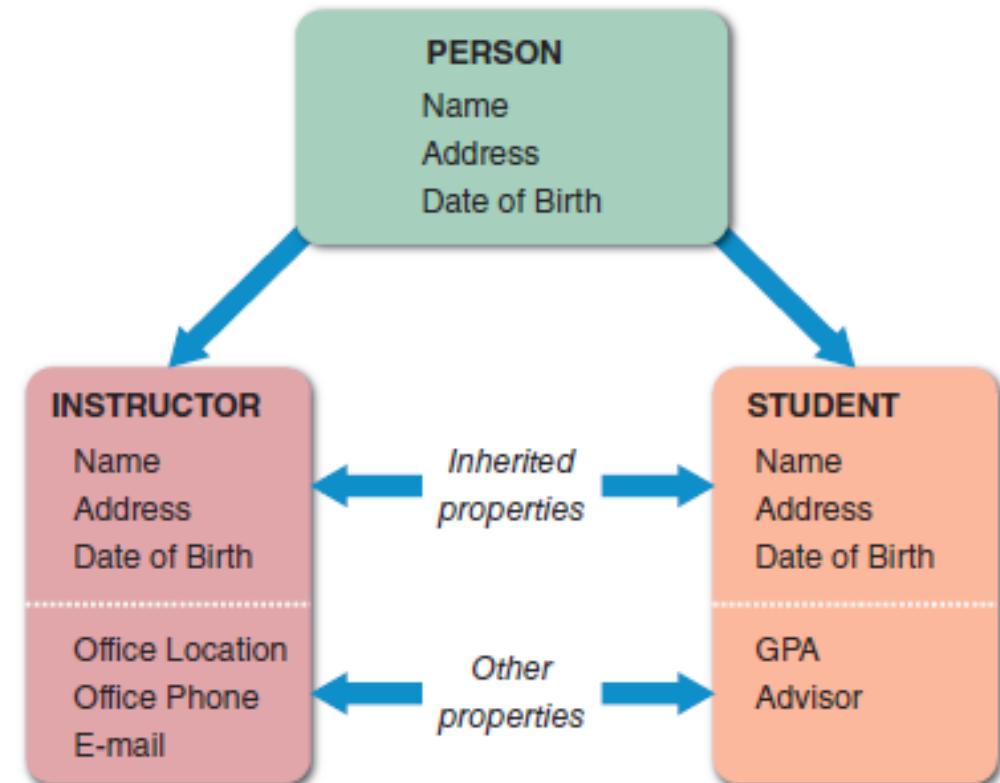
## ○ Systems Support and Security

- A well-designed system must be secure, reliable, maintainable, and scalable
- Most information systems need to be updated significantly or replaced after several years of operation

# SYSTEMS DEVELOPMENT METHODS (CONT.)

## Object-Oriented Analysis

- Combines data and the processes that act on the data into things called objects
- Objects are members of a class, which is a collection of similar objects
- Built-in processes, called methods, can change an object's properties
- O-O methodology provides easy transition to O-O programming languages like Java



**FIGURE 1-26** The PERSON class includes **36** INSTRUCTOR and STUDENT objects, which have their own properties and inherited properties.

# SYSTEMS DEVELOPMENT METHODS (CONT.)

## ○ Agile Methods

- Newest development technique as systems are developed incrementally
- A series of prototypes are built and adjusted to meet user requirements
- As the process continues, developers revise, extend, and merge earlier versions into the final product
- Agile method emphasizes continuous feedback
  - Iterative development
- Agile community has published the Agile Manifesto
- Spiral model

# SYSTEMS DEVELOPMENT METHODS (CONT.)

- **Other Development Methods**

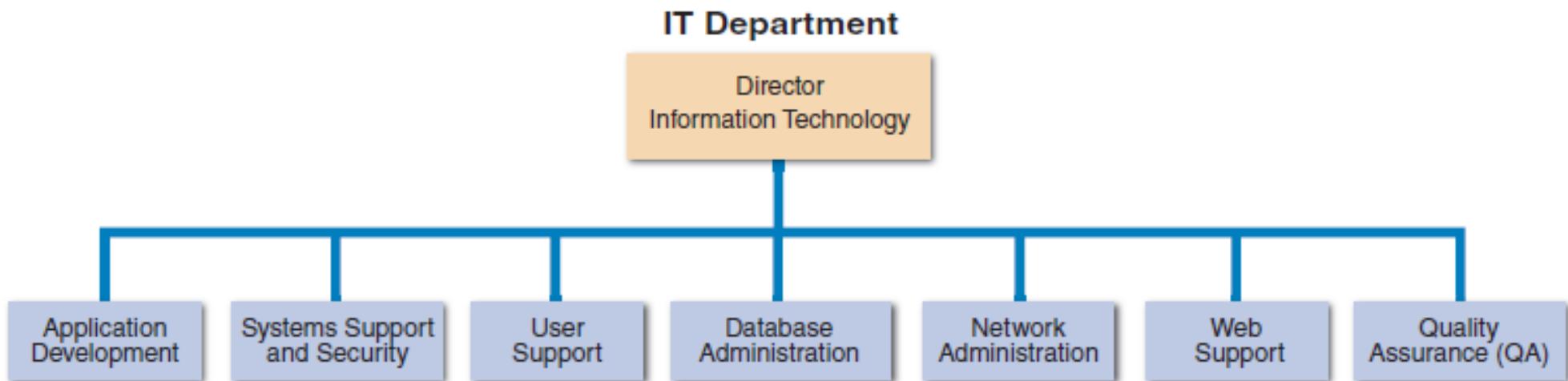
- Teams consists of IT staff, users, and managers
  - joint application development (JAD)
    - Focuses on team-based fact-finding

**Class Task: describe the RAPID APPLICATION DEVELOPMENT (RAD) its pros and cons.**

## SYSTEMS DEVELOPMENT METHODS (CONT.)

- Develop a project plan
- Involve users and listen carefully to them
- Use project management tools to identify tasks and milestones
- Develop accurate cost and benefit information
- Remain flexible

# THE INFORMATION TECHNOLOGY DEPARTMENT



**FIGURE 1-29** Depending on its size, an IT department might have separate organizational units for these functions, or they might be combined into a smaller number of teams.

# THE INFORMATION TECHNOLOGY DEPARTMENT

(CONT.)

## Application Development

- Systems are developed by teams consisting of users, managers, and IT staff members
- Knowledge, Skills, and Education
  - Need technical knowledge, strong oral and written communication skills and analytic ability, an understanding of business operations, and critical thinking skills
- Certification
  - Important credential

# THE INFORMATION TECHNOLOGY DEPARTMENT

(CONT.)

## Application Development

- Systems are developed by teams consisting of users, managers, and IT staff members

## Systems Support and Security

- Provides vital protection and maintenance services

## User Support

- Provides users with technical information, training, and productivity support

# THE INFORMATION TECHNOLOGY DEPARTMENT

(CONT.)

## Database Administration

- Involves data design, management, security, backup, and access systems

## Network Administration

- Includes hardware and software maintenance, support, and security

## Web Support

- Web support specialists design and construct Web pages, monitor traffic, manage hardware and software, and link Web-based applications to the company's information systems

## Quality Assurance

- Team that reviews and tests all applications and systems changes to verify specifications and software quality standards

# THE SYSTEMS ANALYST

- **Role**

- Analysts build a series of models, diagrams, and decision tables and uses other descriptive tools and techniques
- An analyst's most valuable skill is the ability to listen
- An effective analyst will involve users in every step of the development process

- **Knowledge, Skills, and Education**

- Technical Knowledge
- Communication Skills
- Business Skills
- Critical Thinking Skills
- Education
- Certification

# THE SYSTEMS ANALYST (CONT.)

- **Career Opportunities**

- Companies will need systems analysts to apply new information technology, and the explosion in e-commerce will fuel IT job growth

- **What's important?**

- Job Titles
- Company Organization
- Company Size
- Salary, Location and Future Growth
- Corporate Culture

## BASIC SYSTEMS DEVELOPMENT FUNCTIONS

- Develop an overall project plan and stick to it.
- Ensure users are involved in systems development process, especially when identifying and modelling system requirements.
- Use project management tools.
- Develop accurate cost and benefit information.
  
- Remain flexible.

## CHAPTER SUMMARY

- IT refers to the combination of hardware and software resources that companies use to manage, access, communicate, and share information
- The essential components of an information system are hardware, software, data, processes, and people
- Successful companies offer a mix of products, technical and financial services, consulting, and customer support

## CHAPTER SUMMARY (CONT.)

- Information systems are identified as enterprise computing systems, transaction processing systems, business support systems, knowledge management systems, or user productivity systems
- Organization structure includes top managers, middle managers and knowledge workers, supervisors and team leaders

## CHAPTER SUMMARY (CONT.)

- The IT department develops, maintains, and operates a company's information systems
- Systems analysts need a combination of technical and business knowledge, analytical ability, and communication skills
- Systems analysts need to consider salary, location, and future growth potential when making a career decision