Systems Analysis and Design 11ᵗʰ Edition

Chapter 1
Introduction to Systems Analysis and Design

Chapter Objectives

- Describe the impact of information technology
- Define systems analysis and design and the role of a systems analyst
- Explain how to use business profiles and models

Chapter Objectives (Cont.)

- 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

- Information helps companies:
  - Increase productivity
  - Deliver quality products and services
  - Maintain customer loyalty
  - Make sound decisions
- Use of information technology is vital for organizational success

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 used to manage, access, communicate, and share information
- ## Changing Nature of Information Technology
  - ◦ Change is dramatic and continuous
  - ◦ Advances influence change in business organizations

FIGURE 1-2 An employee clocking in with a punch card in 1953.
ClassicStock.com/Superstock

What Is Information Technology?
(Cont.)

- **Systems Analysis and Design**
  - Step-by-step process for developing high-quality information systems
    - **Information systems**: Combination of technology, people, and data to perform certain business functions
- **What Does a Systems Analyst Do?**
  - Plans, develops, and maintains information systems
  - Manages IT projects, including tasks, resources, schedules, and costs
  - Conducts meetings, delivers presentations, and writes memos, reports, and documentation

Modeling Business Operations

- Business Profile
  - Overview of a company's mission, functions, organization, products, services, customers, suppliers, competitors, constraints, and future direction
- Business Process
  - Specific set of transactions, events, and results that can be described and documented
  - **Business process model (BPM)**
  - **Business process modeling notation (BPMN)**

Modeling Business Operations

(Cont.)

FIGURE 1-8 A simple business model might consist of an event, three processes, and a result.
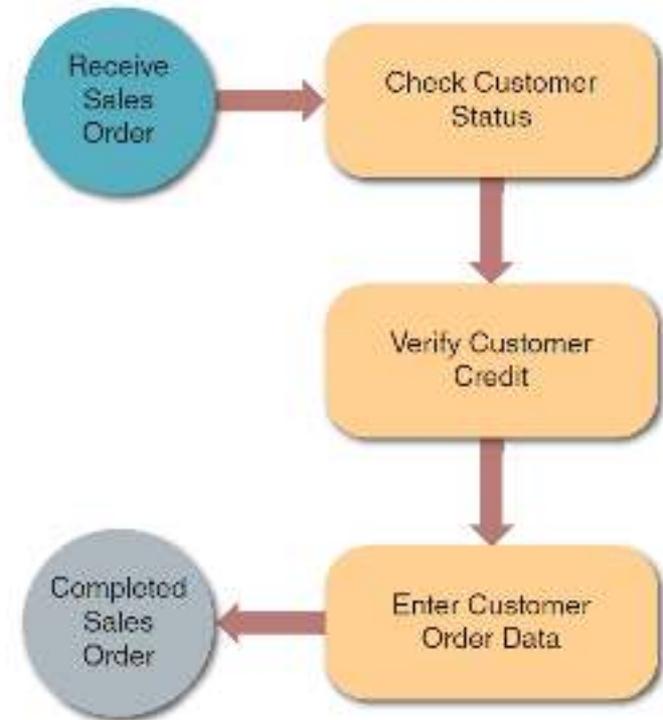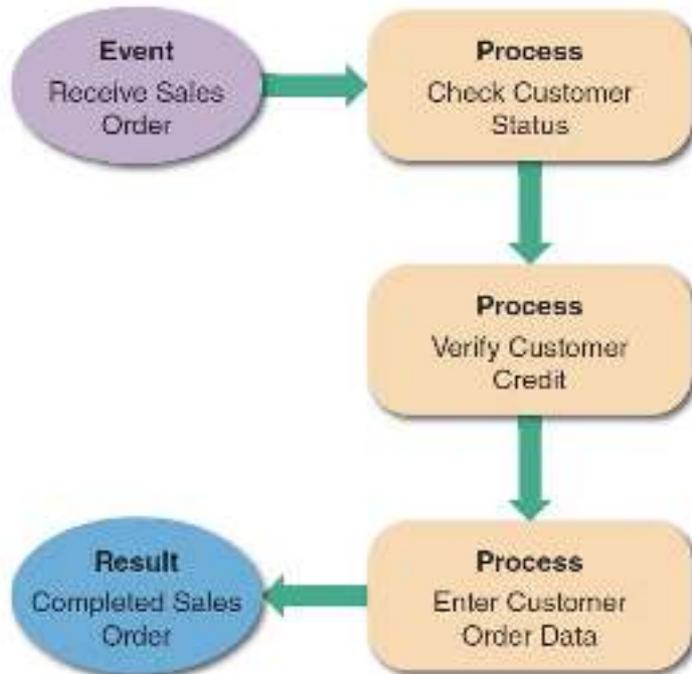

FIGURE 1-9 This sample uses business process modeling notation (BPMN) to represent the same events, processes, and workflow shown in Figure 1-8.

Source: Drawio.com
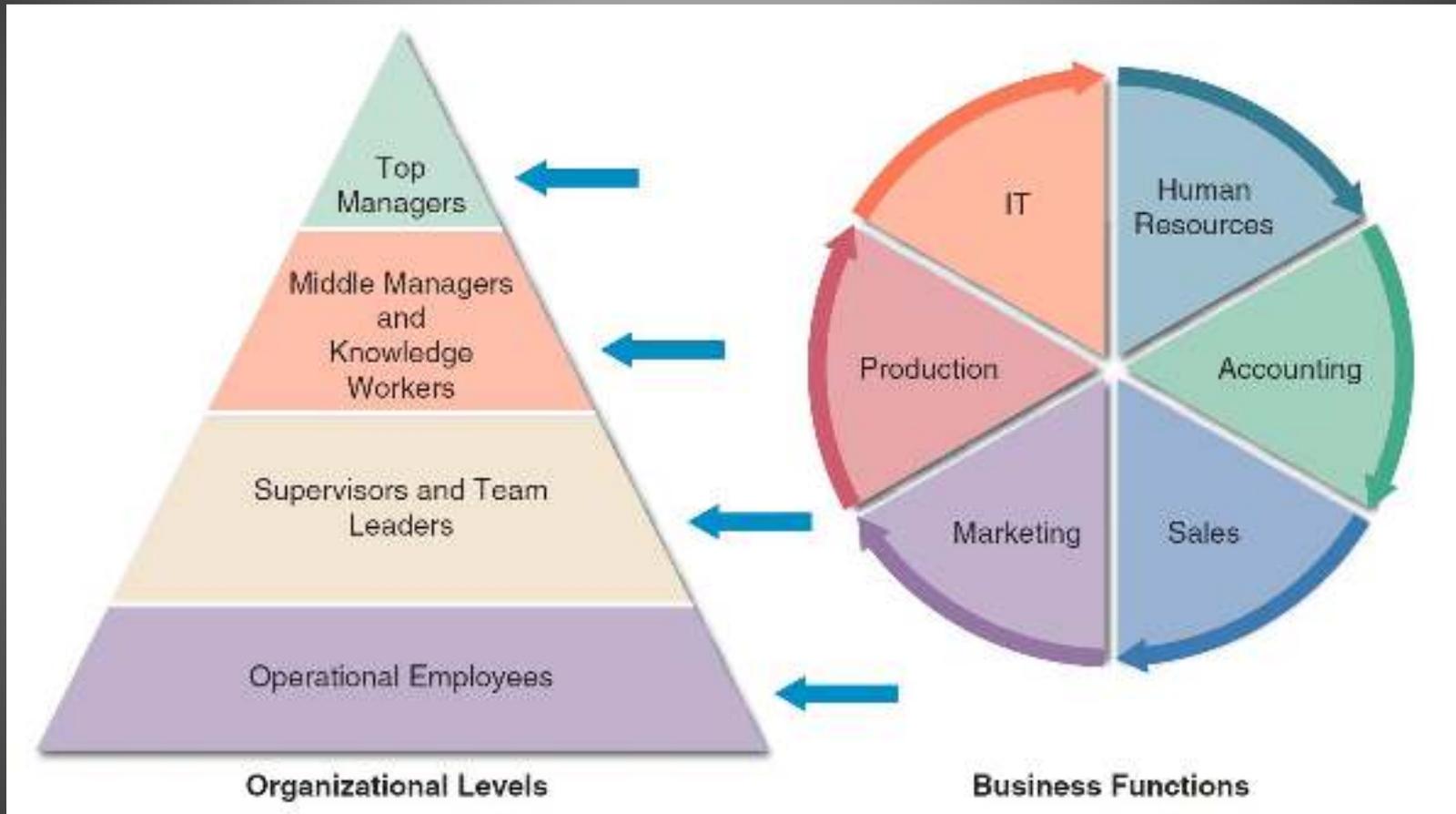
8

What Information Do Users Need?

FIGURE 1-14 A typical organizational model identifies business functions and organizational levels.

What Information Do Users Need?
(Cont.1)

- **Top Managers**
  - Use IT to develop long-range **strategic plans**
    - Require information such as economic forecasts, technology trends, competitive threats, and governmental issues
- **Middle Managers and Knowledge Workers**
  - Middle managers provide direction, resources, and performance feedback to supervisors and team leaders
    - Require more detailed information than top managers
  - Knowledge workers provide support for the organization's basic functions

What Information Do Users Need?
(Cont.2)

- **Supervisors and Team Leaders**
  - Oversee operational employees and carry out day-to-day functions
    - Require 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
  - **Empowered** to handle tasks and make decisions that were assigned previously to supervisors

Systems Development Tools

▸ **Modeling**
  ◦ Graphical representation of a concept or process
    • **Business model**
    • Data model
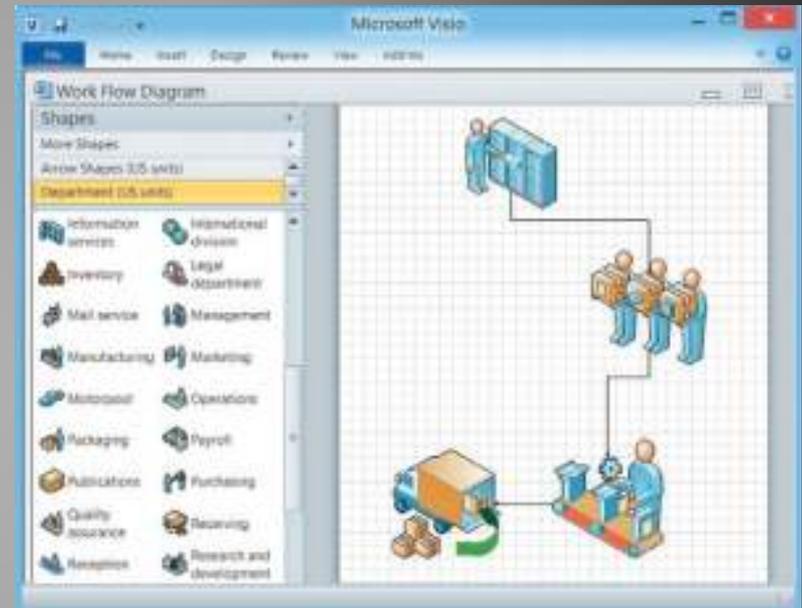   • Object model
    • Network model
    • Process model

FIGURE 1-15 Microsoft Visio allows you to drag and drop various symbols and connect them to show a business process.
Source: Microsoft Visio 2010

Systems Development Tools (Cont.1)

- **Prototyping**
  - Early working version of an information system
    - Disadvantage – Important decisions might be made 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.2)

- **Computer–Aided Systems Engineering (CASE) Tools**
  - Known as **computer–aided software engineering**
  - Provide an overall framework for systems development
  - Support design methodologies
    - Structured analysis
    - Object–oriented analysis
  - Generate program code
    - Speeds the implementation process

Systems Development Methods

Structured Analysis

Object-Oriented (O-O) Analysis

Agile/Adaptive Methods

Systems Development Methods
(Cont.1)

▶ **Structured Analysis**
◦ Time-tested and easy to understand
◦ Uses the **systems development life cycle (SDLC)**
◦ Based on predictive approach
◦ Process-centered technique
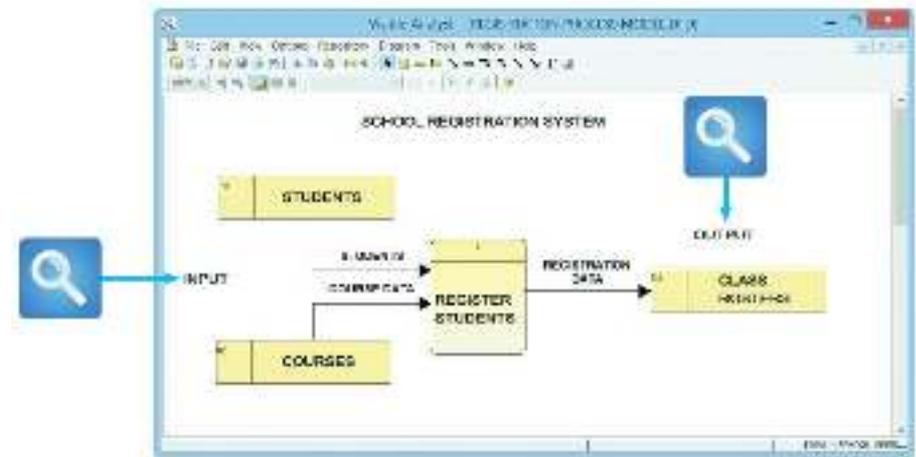 • Uses process models to graphically describe a system

FIGURE 1-18 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.
Source: Visible Systems Corporation

Systems Development Methods
(Cont.2)

- ◦ Addresses data organization and structure, relational database design, and user interface issues
- ◦ The SDLC describes activities and functions that all systems developers perform, regardless of which approach they use

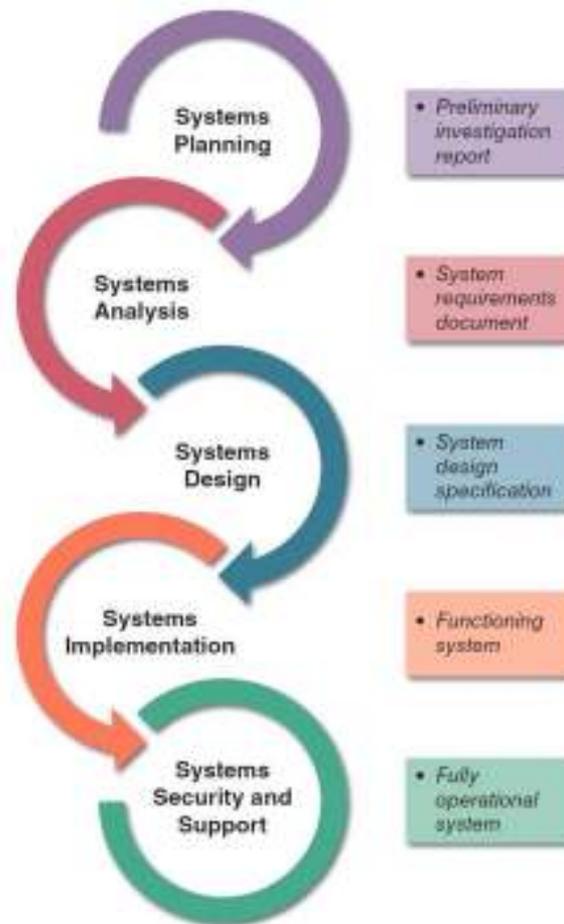# Systems Development Methods

(Cont.3)

FIGURE 1-19 Development phases and deliverables are shown in the waterfall model. The circular symbols indicate interaction among the phases.

Systems Development Methods
(Cont.4)

- **Steps in the SDLC Model**
  - **Systems planning**
    - Initiated by a **systems request**
    - Goal – To perform a **preliminary investigation**
    - **Feasibility study**: Reviews anticipated costs and benefits and recommends a course of action
  - **Systems analysis**
    - Goal – To build a logical model of the new system
    - **Requirements modeling**: Analyst investigates business processes and documents the functions to be performed by the new system
    - Deliverable – **System requirements document**

Systems Development Methods
(Cont.5)

- Systems design
  - Goal – To create a physical model that satisfies all documented requirements
  - User interface is designed and application architecture is determined
  - Outputs, inputs, and processes are identified
  - Deliverable - **System design specification**
  - Management and user involvement is critical

Systems Development Methods

(Cont.6)

- ◦ **Systems implementation**
  - New system is constructed, programs are written, tested, and documented, and the system is installed
  - Deliverable - A completely functional and documented information system
  - Includes systems evaluation
- ◦ **Systems support and security**
  - IT staff maintains, enhances, and protects the system
  - A well-designed system must be secure, reliable, maintainable, and **scalable**

Systems Development Methods
(Cont.7)

▶ **Object–Oriented Analysis**
◦ Combines data and the processes that act on the data into objects
- **Object**: Member of a **class**, which possesses **properties**
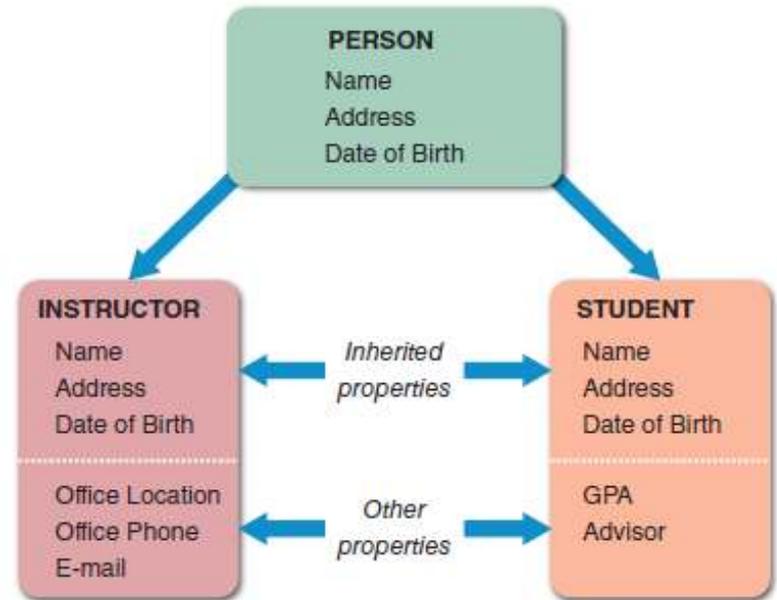- O–O methodology provides easy transition to O–O programming languages like Java

FIGURE 1-20 The PERSON class includes INSTRUCTOR and STUDENT objects, which have their own properties and inherited properties.
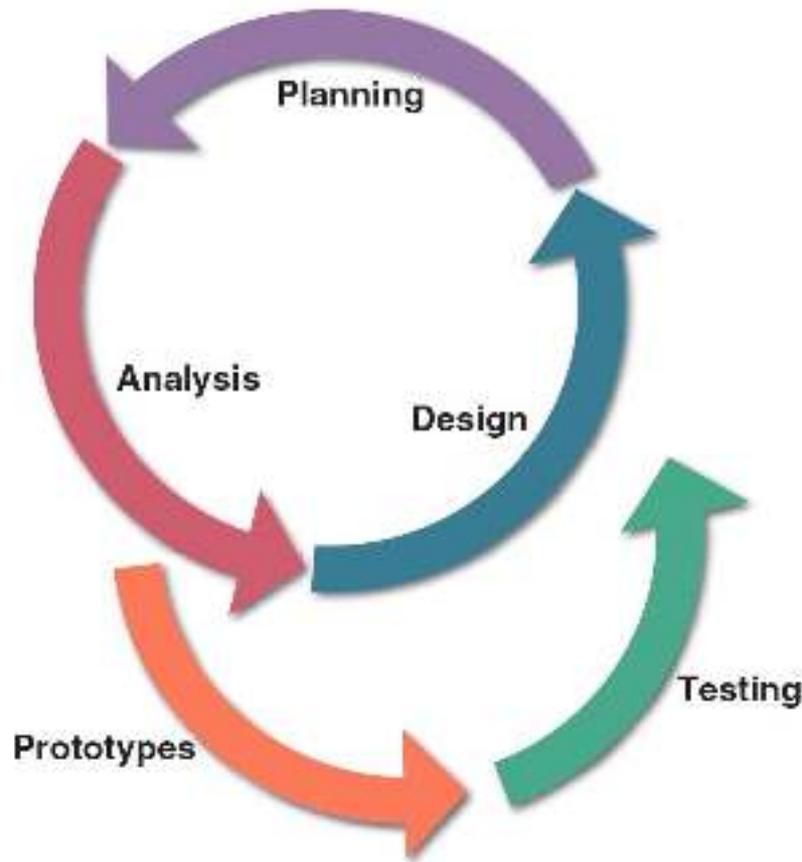
Systems Development Methods

(Cont.8)

FIGURE 1-21 In a typical O-O development model, planning, analysis, and design tasks interact continuously to generate prototypes that can be tested.

Systems Development Methods
(Cont.9)

- **Agile Methods**
  - ◦ Involve building and constantly adjusting a series of prototypes to user requirements
  - ◦ Use a spiral model
    - **Spiral model**: Series of **iterations** based on user feedback
    - Feedback from prior steps is incorporated in each incremental step
  - ◦ Allow developers to be more flexible and responsive

Systems Development Methods

(Cont.10)

- ◦ Disadvantages
  - Riskier than traditional methods
  - Weak documentation and blurred lines of accountability
  - Lack of emphasis on the larger business picture

▸ **Other Development Methods**

- ◦ **Joint application development (JAD)**
  - Focuses on team-based fact-finding
- ◦ **Rapid application development (RAD)**
  - A compressed version of the entire development process

The Information Technology Department

IT Department

- Director Information Technology
  - Application Development
  - Systems Support and Security
  - User Support
  - Database Administration
  - Network Administration
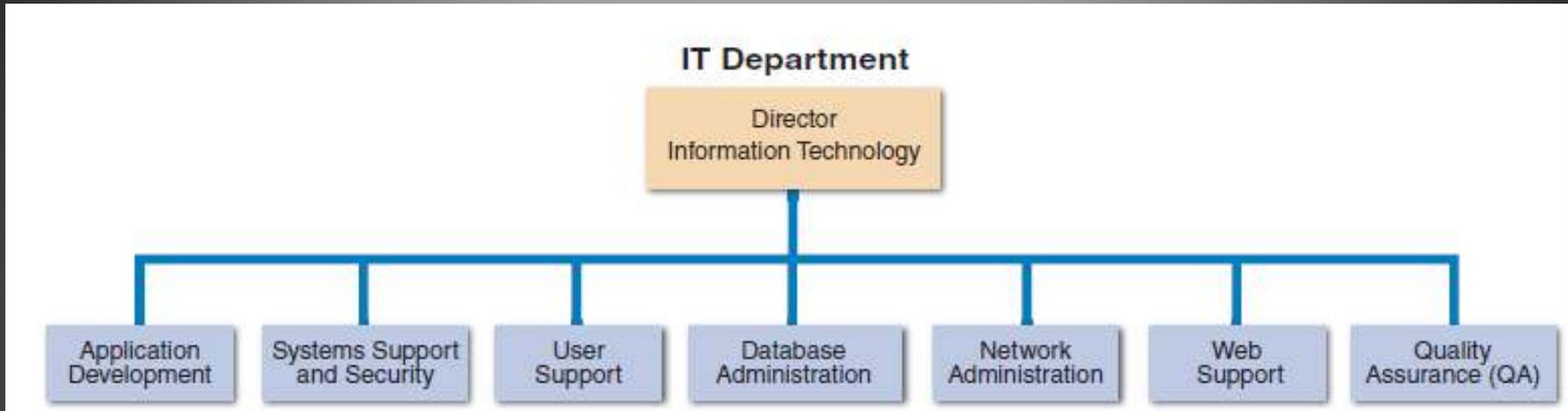 - Web Support
  - Quality Assurance (QA)

FIGURE 1-23 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.1)

- **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
    - Known as a **help desk**

The Information Technology Department (Cont.2)

▶ **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 and manage hardware and software
    • Link Web-based applications information systems to the company's information systems

The Information Technology Department (Cont.3)

- **Quality Assurance (QA)**
  - QA team reviews and tests all applications and systems changes to verify specifications and software quality standards

The Systems Analyst

- Investigates, analyzes, designs, develops, installs, evaluates, and maintains a company's information systems
- Constantly interacts with users and managers within and outside the organization

The Systems Analyst (Cont.1)

- Roles
  - Acts a translators to managers and programmers
  - A company's best line of defense in an IT disaster
  - Most valuable skill – The ability to listen
  - Seeks feedback from users to ensure that systems do not deviate from accomplishing set objectives
- Knowledge, Skills, and Education
  - Technical knowledge
  - Communication and business skills
  - **Critical thinking skills**

The Systems Analyst (Cont.2)

- Education – A college degree in information systems, science, or business
  - Some IT experience is required
- **Certification**
- Helps IT professionals learn new skills and gain recognition for their efforts

The Systems Analyst (Cont.3)

▶ **Career Opportunities**
  ◦ Companies will need systems analysts to apply new information technology
  ◦ Explosion in e-commerce will fuel IT job growth
  ◦ Important factors
    • Job titles
    • Company organization
    • Company size
    • Salary, location and future Growth
    • **Corporate culture**

Trends in Information Technology

- IT is one of the fastest evolving industries
- Knowledge of current trends is vital to a systems analyst
- Key trends
  - Agile methods
  - Cloud computing
  - Mobile devices and apps
  - IT firms now offer a mix of products, services, and support
  - Social media

Chapter Summary

- IT – Combination of hardware and software resources
  ◦ Used by companies to manage, access, communicate, and share information
- Essential components of an information system
  ◦ Hardware, software, data, processes, and people
- Successful companies offer a mix of products, technical and financial services, consulting, and customer support

Chapter Summary (Cont.1)

▸ Organization structure includes top managers, middle managers and knowledge workers, supervisors and team leaders, and operational employees

36

Chapter Summary (Cont.2)

- Systems analysts use modelling, prototyping, and computer-aided systems engineering (CASE) tools
- Popular system development approaches
  ◦ Structured analysis, object-oriented analysis, and agile methods
- In addition to technical knowledge, a systems analyst must understand the business, think critically, and communicate effectively