

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
- ▶ 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

- ▶ 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 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

Information System Components

- ▶ **System:** Set of related components that produces specific results
 - **Mission-critical systems** are vital to a company's operations
- ▶ All systems require input data
 - **Data:** Basic facts that serve as raw material
 - **Information:** Data transformed into output

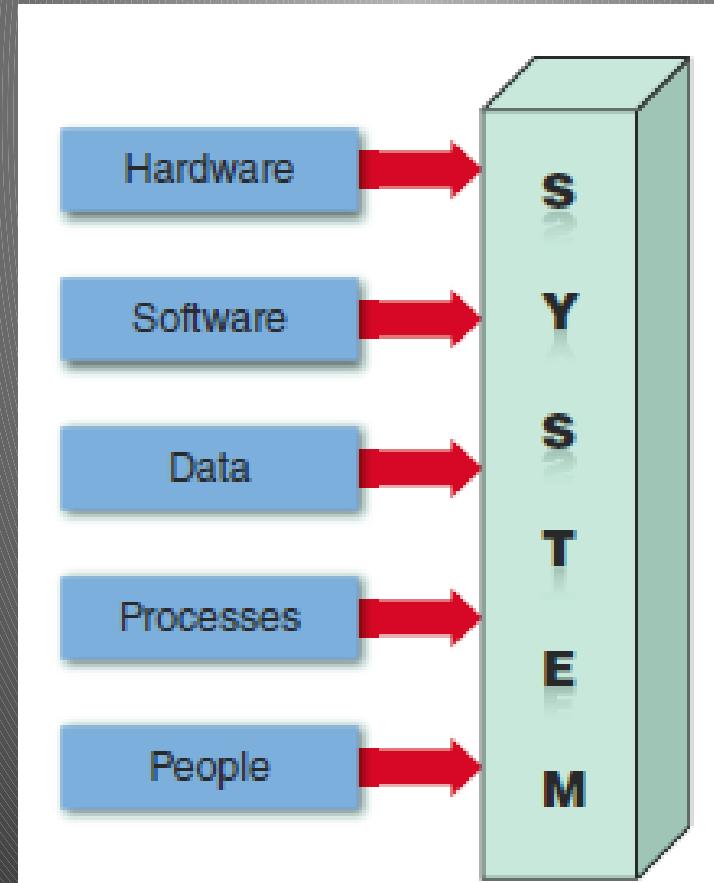


FIGURE 1-5 An information system needs these components.

Information System Components

(Cont.1)

▶ Hardware

- Physical layer of the information system
- **Moore's Law** was integral to the development of hardware

▶ Software

- Controls hardware
- **System software**
- **Application software**
 - **Horizontal system**
 - **Vertical system**
 - **Legacy system**



dotshock/Shutterstock.com

FIGURE 1-6 Server farms provide the enormous power and speed that modern IT systems need.

dotshock/Shutterstock.com

Information System Components

(Cont. 2)

▶ Data

- Stored in tables

▶ Processes

- Describe the tasks and business functions performed to achieve specific results

▶ People

- **Stakeholders:**

Individuals interested in an information system

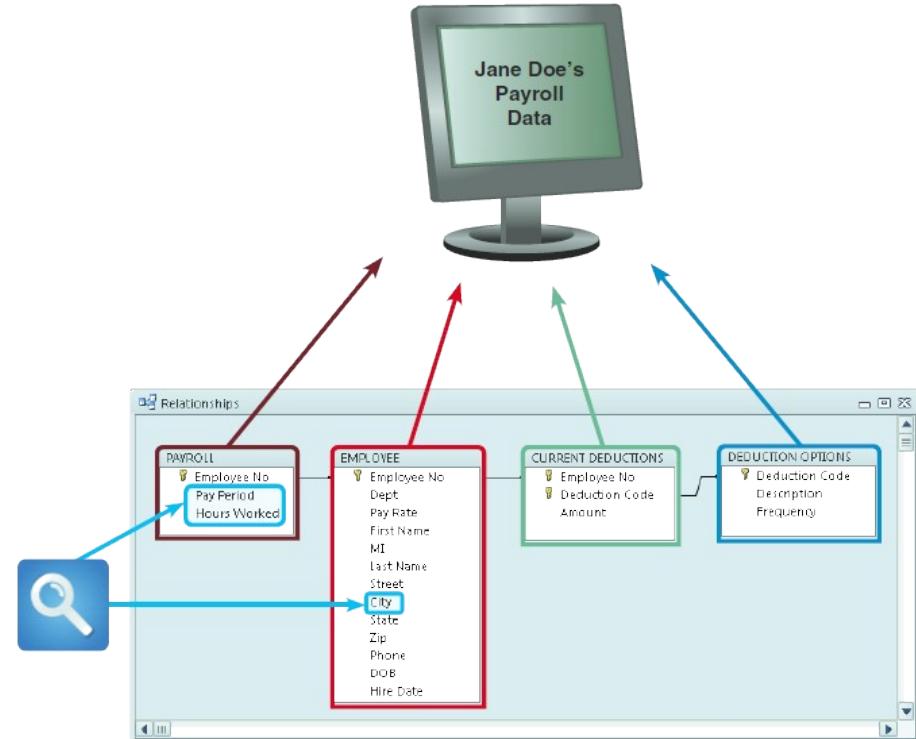


FIGURE 1-7 In a typical payroll system, data is stored in separate tables that are linked to form an overall database.

Business Today

- ▶ Influenced by:
 - Rapidly increasing globalization
 - Technology integration for seamless information access
 - Rapid growth of cloud-based computing and services
- ▶ All trends are Internet-centric

Business Today (Cont.1)

► The Internet Model

- **Ecommerce (electronic commerce)**
- User interface - Enables communication between a data-base management software and a web-based server
 - Mobile devices interact with the system using **apps**
- Sectors
 - B2C (business-to-customer)
 - B2B (business-to-business)

Business Today (Cont.2)

- ▶ **B2C (Business-to-Customer)**
 - In a single convenient session, customers can:
 - Do research and compare prices and features
 - Check availability and arrange delivery
 - Choose payment methods
- ▶ **B2B (Business-to-Business)**
 - Ecommerce was initially carried out using **electronic data interchange (EDI)**
 - Most firms use **supply chain** management (SCM) software, which helps businesses manage inventory levels, costs, alternate suppliers

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.

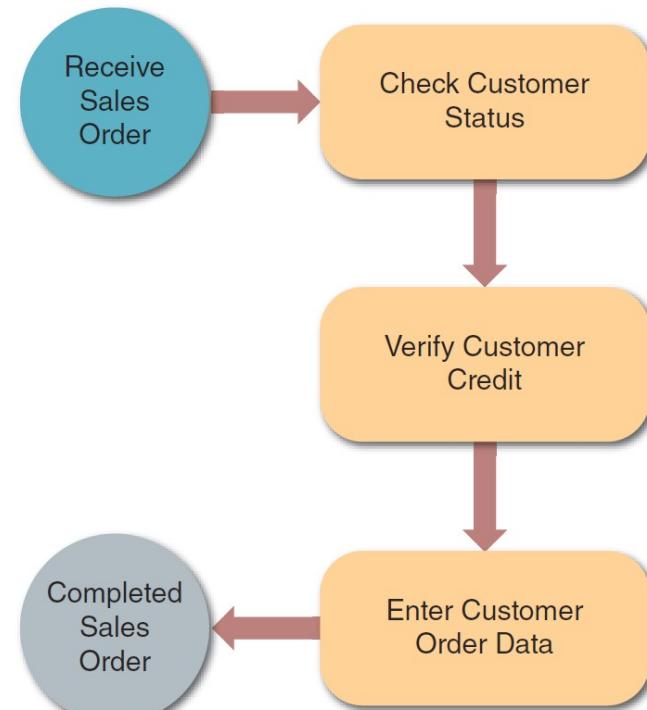
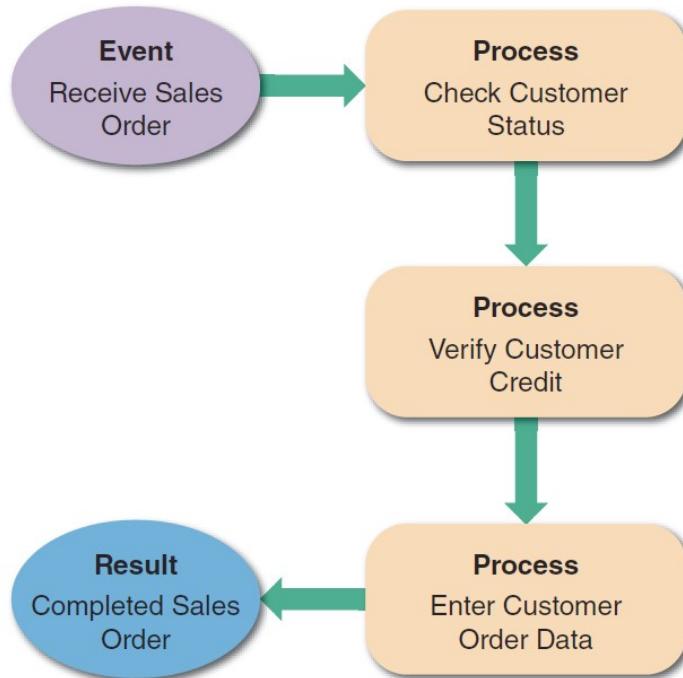


FIGURE 1-9 This sample uses business process modeling notation (BPMN) to represent the same events, processes, and workflow shown in Figure 1-8.

Source: Drawio.com

Business Information Systems

► Current Method

- All employees use office productivity systems
- Operations users require decision support systems
- Systems are defined by their functions and features

► Enterprise Computing

- Supports company-wide operations and data management requirements
 - **Enterprise resource planning (ERP)** systems provide cost-effective support for users and managers throughout the company

Business Information Systems

(Cont.1)

► Transaction Processing (TP) Systems

- Processes data generated by day-to-day business operations
- Examples - Customer order processing, accounts receivable, and warranty claim processing

► Business Support Systems

- Provide job-related support to users company
 - Can work hand-in-hand with system

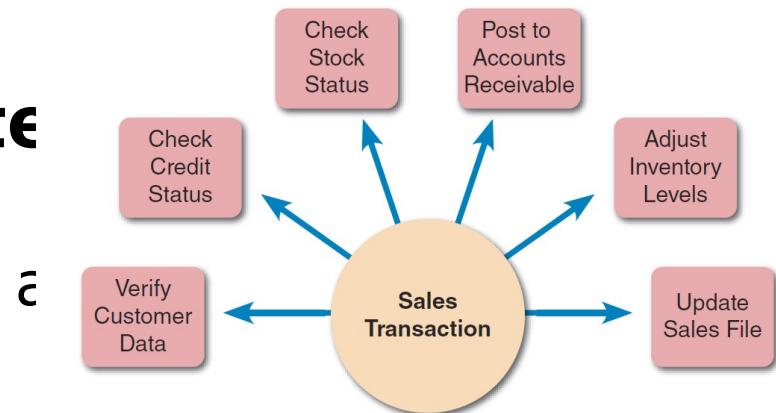


FIGURE 1-11 A single sales transaction consists of six separate tasks, which the TP system processes as a group.

Business Information Systems

(Cont.2)

- **Management Information Systems (MIS)**
 - **Radio frequency identification (RFID)**
 - Uses high-frequency radio waves to track physical objects
- ▶ **Knowledge Management**
- Uses a knowledge base and rules
 - **Knowledge base:** Large databases allows users to find information by keywords
 - **Inference rules:** Identify data and relationships



FIGURE 1-12 With an RFID tag, items can be tracked and monitored throughout the shipping process.

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Business Information Systems

(Cont.3)

► **User Productivity Systems**

- Technology that improves productivity
- **Groupware:** Enables data sharing and coordination of efforts

► **Systems Integration**

- Combination of transaction processing, business support, knowledge management, and user productivity features

What Information Do Users Need?

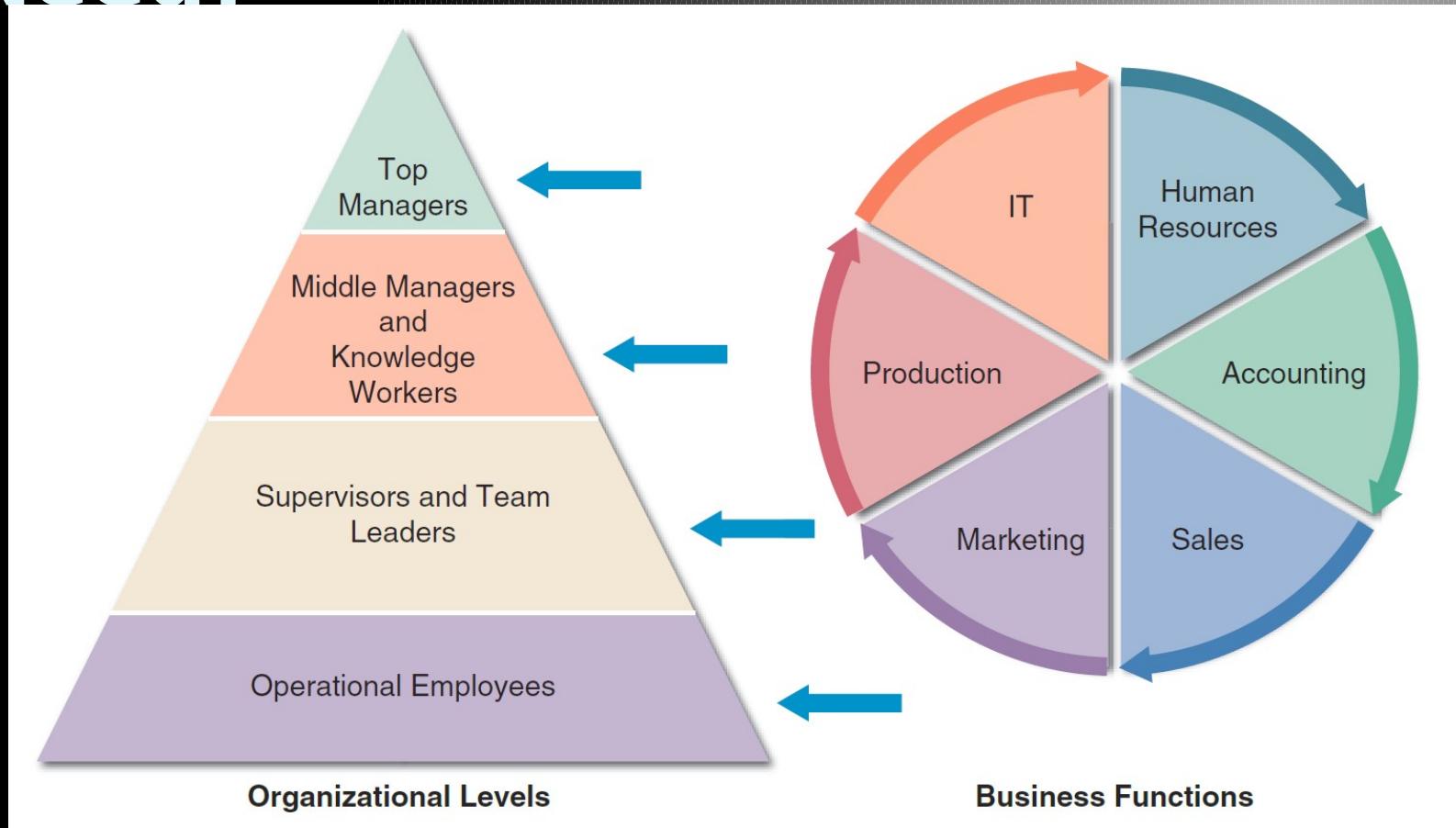


FIGURE 1-14 A typical organizational model identifies business functions and organizational levels.

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

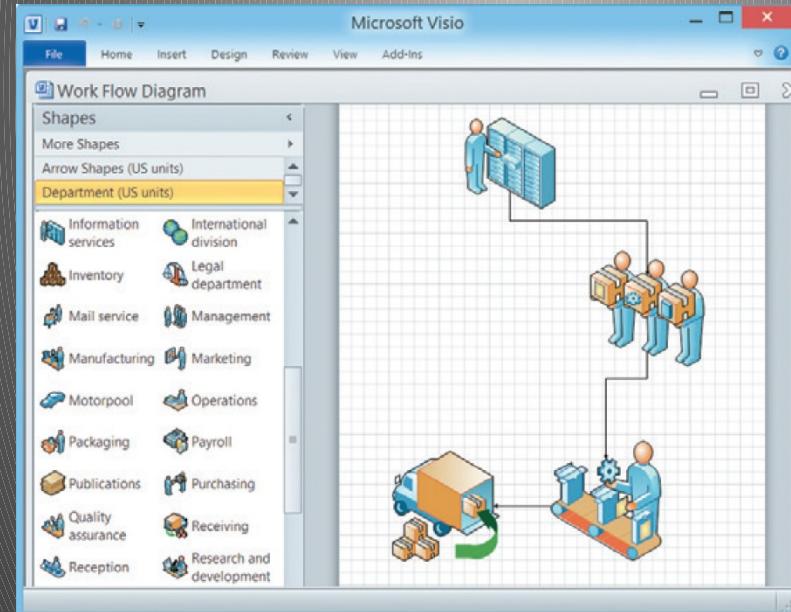


FIGURE 1-15 Microsoft Visio allows you to drag and drop various symbols and connect them to show a business process.

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
- Process-centered
 - Uses process models describe

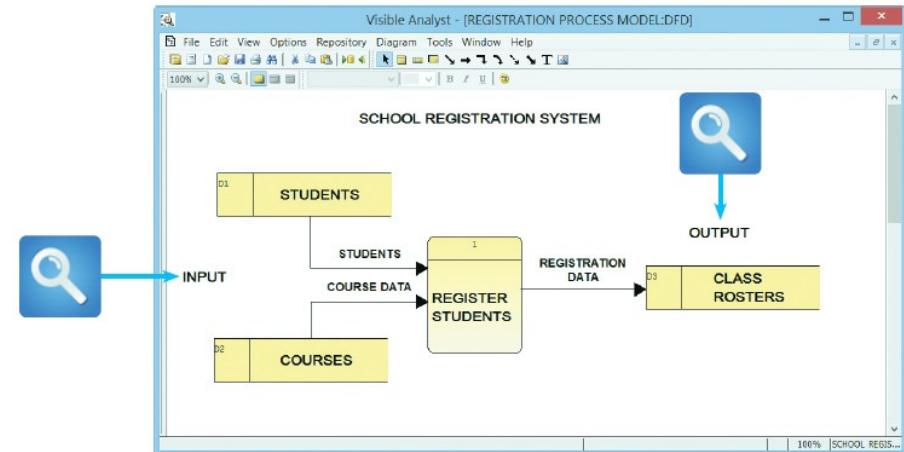


FIGURE 1-18 This Visible Analyst screen shows a process model for a school registration system. The REGISTER STUDENTS process accepts input data from two sources and transforms it into output data.

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)

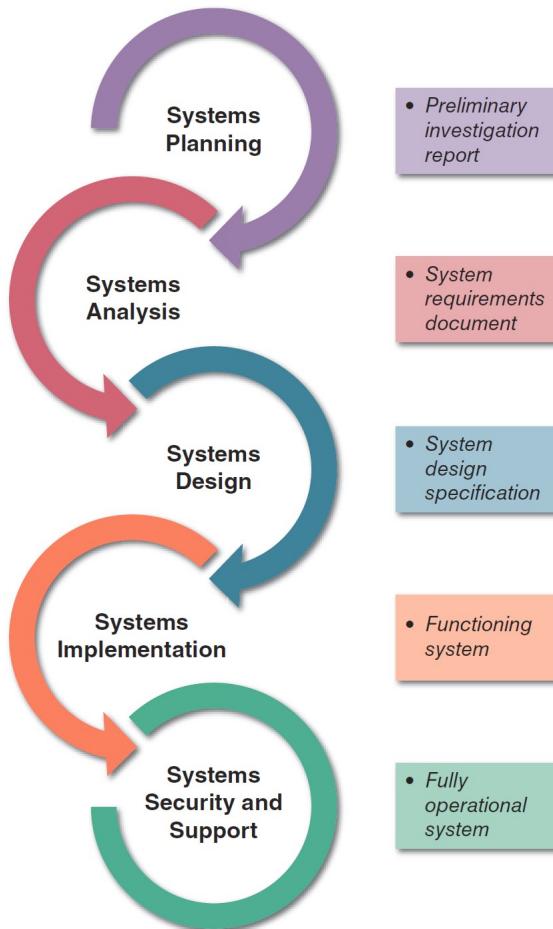


FIGURE 1-19 Development phases and deliverables are shown in the waterfall model. The circular symbols indicate interaction among the phases.

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**

- **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**

- **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
 - I **Object:** Member of a **class** which possesses **properties**
 - I O-O methodology provides easy transition to O-O programming languages like Java

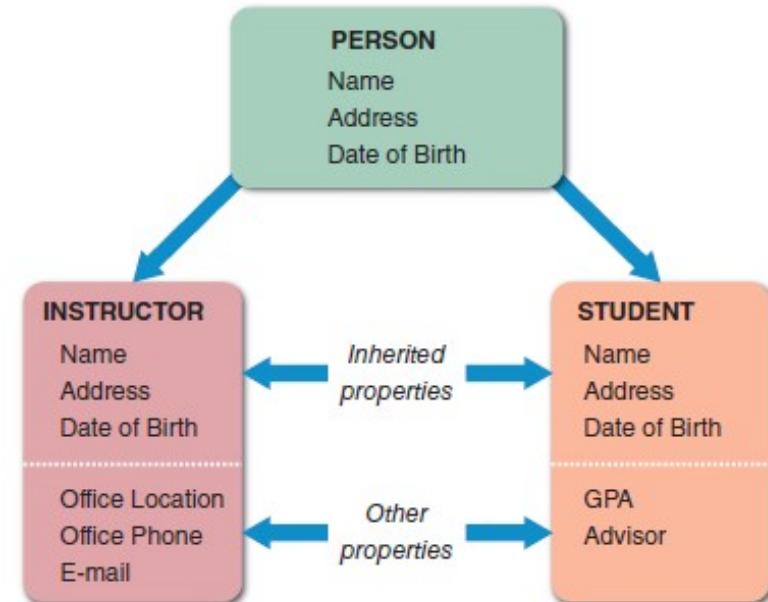


FIGURE 1-20 The PERSON class includes INSTRUCTOR and STUDENT objects, which have their own properties and inherited properties.

Systems Development Methods

(Cont. 2)

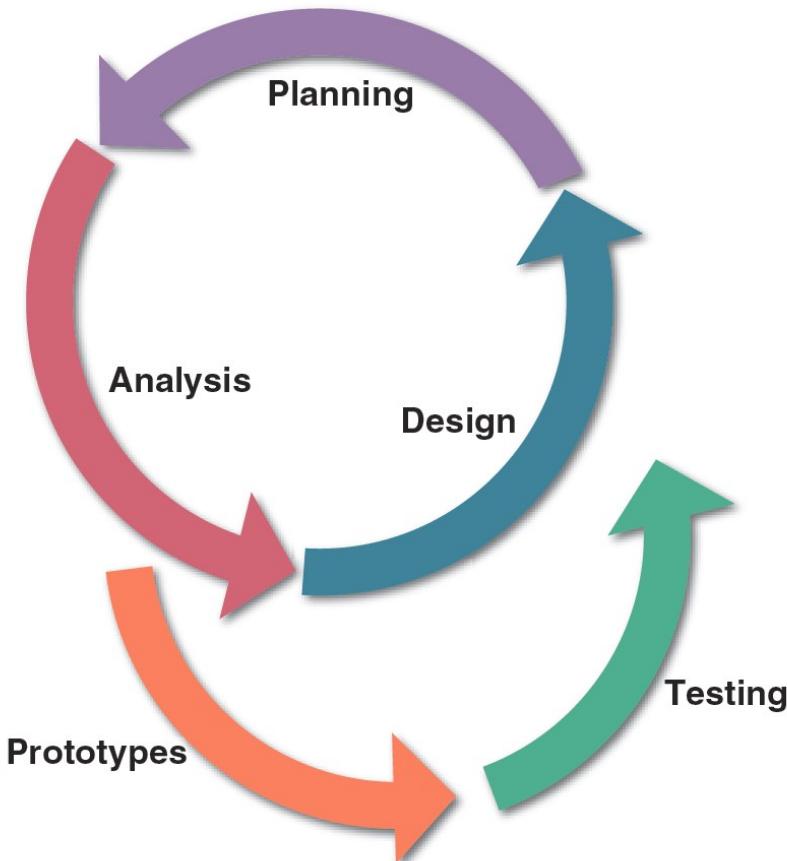


FIGURE 1-21 In a typical O-O development model, planning, analysis, and design tasks interact continuously to generate prototypes that can be tested.

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

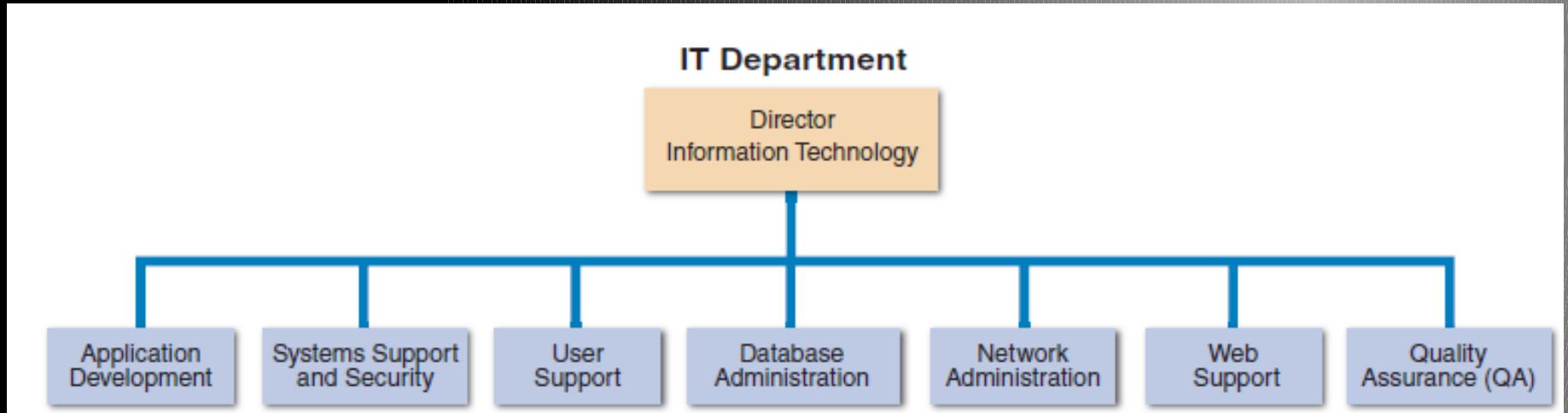


FIGURE 1-23 Depending on its size, an IT department might have separate organizational units for these functions, or they might be combined into a smaller number of teams.

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)

- ▶ Types of information systems
 - 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, and operational employees

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