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

- 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 21st 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
- Information systems have five key components: hardware, software, data, processes, and people

FIGURE 1-6 An information system needs these components.
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 21st 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
E-commerce or I-commerce
B2C (Business-to-Consumer)
B2B (Business-to-Business)
  ◦ EDI
  ◦ 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
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
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 21st 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
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 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
A new set of system definitions
• Enterprise computing systems
• Transaction processing systems
• Business support systems
• Knowledge management systems
• User productivity systems
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
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 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.
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 21st 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**
  - Business model
  - Requirements model
  - Data model
  - Object model
  - Network 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.
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
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 INSTRUCTOR and STUDENT objects, which have their own properties and inherited properties.
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
Agile Methods

- Agile process determines the end result
- Other adaptive variations and related methods exist
- Two examples are Scrum and Extreme Programming (XP)
- Analysts should understand the pros and cons of any approach before selecting a development method
Other Development Methods

- Teams consists of IT staff, users, and managers
  - joint application development (JAD)
    - Focuses on team-based fact-finding
  - Rapid application development (RAD)
    - A compressed version of the entire development process
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
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
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
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