Chapter 9
Information Systems Analysis

and Design

Section A: Information Systems

Chapter Preview
After this chapter, you should be able to:
– Describe how information systems help organizations fulfill their missions, deal with threats, and take advantage of opportunities
– Contrast and compare the characteristics of office automation systems, transaction processing systems, management information systems, decision support systems, and expert systems
– Describe various models for the system development life cycle (SDLC)

Chapter Preview
– List the activities that take place in each phase of the system development life cycle
– Apply the PIECES framework to classify problems that reduce the effectiveness of an information system
– Describe alternative hardware and software solutions that a project team might typically consider
– Explain the differences between unit testing, integration testing, system testing, and acceptance testing

Chapter Preview
– Describe the advantages and disadvantages of direct conversion, parallel conversion, phased conversion, and pilot conversion
– Explain the feedback mechanism that helps system operators identify and fix “bugs”

Information Systems in Organizations: What is an information system?

• An information system collects, stores, and processes data to provide useful, accurate, and timely information, typically within the context of an organization
• The term “information system” always refers to a system that uses computers, and usually includes communications networks

Who uses information systems?
• An information system is used by the people in an organization and its customers
• Not everyone in an organization uses an information system in the same way
• An organizational chart depicts the hierarchy of employees in a typical organization
• Workers are the people who carry out the organization’s mission
• Managers determine organizational goals and plan how to achieve those goals

Who uses information systems?
• This emphasis on long-range and future goals is referred to as strategic planning
• Mid-level managers set incremental goals that can be achieved in a year or less—a process referred to as tactical planning
• Low-level managers are responsible for scheduling employees, ordering supplies, and
other activities that make day-to-day operations run smoothly—a process referred to as operational planning

9 How do information systems help the people in an organization?

- An information system can help the people in an organization perform their jobs more quickly and effectively by automating routine tasks
- One of the major functions of an information system is to help people make decisions in response to problems
- All problems are not alike, but they can be classified into three types: structured, semi-structured, and unstructured

10 How do information systems help the people in an organization?

- An everyday, run-of-the-mill, routine problem is called a structured problem
- A semi-structured problem is less routine than a structured problem
- An unstructured problem requires human intuition as the basis for finding a solution
- An information system’s ability to assist with problem solving and decision making depends on the data that it collects and then makes available

11 Do organizations require different kinds of information systems?

- Because organizations have different missions, face different threats, and encounter different opportunities, they require different kinds of information systems

12 What is a transaction processing system?

- A transaction processing system (TPS) provides a way to collect, process, store, display, modify, or cancel transactions
- Early transaction processing systems used batch processing to collect and hold a group of transactions for processing until the end of a day or pay period
- Most modern transaction processing systems use online processing. Such systems are often referred to as OLTP (online transaction processing systems)

13 What is a transaction processing system?

14 What are common examples of transaction processing systems?

- A point-of-sale (POS) system records items purchased at each cash register, and calculates the total amount due for each sale
- An order-entry/invoice system provides a way to input, view, modify, and delete customer orders
- A general accounting system records the financial status of a business by keeping track of income, expenses, and assets
- An e-commerce system collects orders and processes credit card payments

15 Management Information Systems: What is a management information system?

- A management information system (MIS, pronounced EM EYE ESS) refers to a type of information system that uses the data collected by a transaction processing system, but manipulates that data to create reports that managers
can use to make routine business decisions in response to structured problems

16 What is a management information system?

17 What is a management information system?
• One of the major goals of an MIS is to increase the efficiency of managerial activity
• A summary report combines or groups data and often shows totals
• An ad hoc report is a customized report, generated to supply specific information not available in scheduled reports
• An exception report contains information that is outside of normal or acceptable ranges
• Scheduled reports follow a fixed format and are produced according to a preset timetable

18 Decision Support Systems: What’s a decision support system?
• A decision support system (DSS) helps people make decisions by directly manipulating data, analyzing data from external sources, generating statistical projections, and creating data models of various scenarios
• A special type of decision support system, called an executive information system (EIS), is designed to provide senior managers with information relevant to strategic management activities based on information provided by the organization’s database

19 What’s a decision support system?
• A DSS does not make decisions, however. That task remains the responsibility of the human decision maker
• A decision model is a numerical representation of a realistic situation
• A decision query is a question or set of instructions describing data that must be gathered to make a decision
• A DSS typically includes modeling tools so managers can create a numerical representation of a situation and explore “what-if” alternatives

20 What’s a decision support system?

21 Expert Systems and Neural Networks: What is an expert system?
• An expert system, sometimes referred to as a “knowledge-based system,” is a computer system designed to analyze data and produce a recommendation, diagnosis, or decision based on a set of facts and rules
• The facts and rules for an expert system are typically derived by interviewing one or more experts, and then incorporated into a knowledge base
• The knowledge base is stored in a computer file and can be manipulated by software called an inference engine

22 What is an expert system?

23 How are expert systems built?
• Expert systems can be created with a computer programming language or an expert system shell
• An expert system shell is a software tool that contains an inference engine and a user interface that provides a way to enter facts and rules

24 Can an expert system deal with uncertainty?
• Using a technique called fuzzy logic, an expert system can deal with imprecise data by asking for a level of confidence
Is it possible to build an expert system without an expert?

- An expert system begins with a set of facts and rules. But if the rules are not known, a computer can “learn” how to make decisions based on hundreds or thousands of lightning-fast trial and error attempts
- A neural network uses computer circuitry to simulate the way a brain might process information, learn, and remember

Chapter 9
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and Design
Section B: Systems Analysis

Planning Phase: How does an information system project begin?

- An information system project begins with a planning phase
- The goal of these activities is to create a Project Development Plan
- This planning document includes:
  - A short description of the project, including its scope
  - A justification for the project
  - A list of project team participants
  - A schedule for the project, including an outline of its phases

Who participates in the process of building an information system?

- A system development project team is a group of people who are assigned to analyze and develop an information system
- In addition to the project team, other members of the organization might be asked to participate
- A widely accepted technique called joint application design (JAD) is based on the idea that the best information systems are designed when end users and systems analysts work together on a project as equal partners

Justify Project: Why are new information systems developed?

- The justification for a new information system usually emerges from a serious problem with the current system, or from an opportunity to improve an organization’s products or services using technology

What kinds of threats and opportunities can affect an organization?

What is a system development life cycle?

- A system development life cycle (SDLC) is an outline of a process that helps develop successful information systems
  - The original waterfall SDLC approaches each phase as a discrete step in the development process
  - A modified waterfall SDLC allows overlap between SDLC phases
  - An iterative SDLC allows phases to repeat, if necessary, as the project progresses
What is a system development life cycle?

How do different SDLCs affect project development?
- A methodology called rapid application development (RAD) proceeds with the project team creating a series of prototypes that users can evaluate
- Different SDLCs also affect the project schedule
- The tools for analyzing and designing an information system are directly related to the methodology

Analysis Phase: What happens in the analysis phase?
- The goal of the analysis phase is to produce a list of requirements for a new or revised information system

Determine System Requirements: How does the project team determine what the new system should do?
- System requirements are the criteria for successfully solving the problem or problems identified in an information system
- They also serve as an evaluation checklist at the end of the development project, so they are sometimes called success factors

How does the project team document system requirements?

What marks the end of the analysis phase of the SDLC?
- The analysis phase concludes when the project team produces a written report that documents its findings
- The System Requirements Report typically contains diagrams that illustrate what the new information system should do

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Section C: System Design

Design Phase: What happens in the design phase?
- In the design phase of the SDLC, the project team must figure out HOW the new system will fulfill the requirements specified in the System Requirements Report

Identify Potential Solutions: How does the project team come up with solutions?
- There might be more than one way to solve the problems and meet the requirements identified in the analysis phase of the SDLC
- The project team should identify several potential hardware and software solutions by “brainstorming” and researching case studies on Web sites and in computer magazines
**What hardware alternatives are available?**
- The project team should consider the pros and cons of different levels
  - **Level of automation and computerization**
  - **Processing methodology**
  - **Network technology**

**What software alternatives are available?**
- The project team might consider software alternatives, such as whether to construct the system “from scratch,” use an application development tool, or commercial software
- Creating an information system “from scratch” using a programming language can take many months or years
- An **application development tool** is essentially a type of software construction kit containing building blocks that can be assembled into a software product

**What software alternatives are available?**
- **Commercial software** for an information system is usually a series of pre-programmed software modules, supplied by a software developer, consulting company, or **value-added reseller (VAR)**
- A **turnkey system** is essentially an “information system in a box” which consists of hardware and commercial software designed to offer a complete information system solution
- A turnkey system must be extensively evaluated to determine whether it can satisfy system requirements

**How does the team choose the best solution?**

**What's an RFP?**
- A **request for proposal (RFP)** is a document that describes the information system problem and the requirements for the solution

**What's an RFQ?**
- A **request for quotation (RFQ)** is a request for a formal price quotation on a list of hardware and software

**Develop Application Specifications: What happens after the project team selects a solution?**
- Exactly what happens next in the system design phase depends on the type of solution selected
- If the project team selected a solution that requires custom programming, the team’s systems analysts will create a set of **application specifications**

**What happens to the completed specifications?**
- Application specifications are similar to the pages of an architectural blueprint that show the detailed plan for electrical wiring or plumbing
- In a large information systems project, the specifications are given to a programming team or application developer who creates the software
- In a small information systems project, you as the user might develop your own specifications

**Obtain Approval to Implement the New System: When can the project team actually begin to build the new information system?**
- In the design phase of the SDLC, the project team chooses a solution, selects hardware and software, and designs detailed application specifications
• Before the solution is implemented, the project team typically must seek approval from management

**Chapter 9**  
*Information Systems Analysis and Design*  
*Section D: Implementation and Maintenance*

**Implementation Phase: What happens during the implementation phase?**
• During the *implementation phase* of the SDLC, the project team supervises the tasks necessary to construct the new information system

**Purchase and Install Hardware and Software: Does a new information system typically require new hardware?**
• Most new information systems require new hardware, which can either replace old equipment, or be connected to existing equipment

**How about new software?**
• Many information systems require new software, such as a commercial application, a programming language, an application development tool, or an expert system shell

**Create Applications: What’s the next step in the implementation phase?**
• The next step in the implementation phase depends on the software tools selected for the project  
  • *Software customization* is the process of modifying a commercial application to reflect the needs of a particular organization  
  • The process of designing, entering, and testing the rules in an expert system is referred to as *knowledge engineering*

**What is application testing?**
• *Application testing* is the process of trying out various sequences of input values and checking the results to verify that the application works correctly  
  • As each application module is completed, it undergoes *unit testing* to ensure that it operates reliably and correctly  
  • When all modules have been completed and tested, *integration testing* is performed to ensure that the modules operate together correctly

**What is application testing?**
• A *test area* is a place where software testing can occur without disrupting the organization’s regular information system  
  • When a problem is discovered during unit testing or integration testing, the team must track down the source of the problem and correct it  
  • *System testing* ensures that all hardware and software components work together correctly

**Finalize Documentation**
• The documentation for an information system can be roughly categorized as
system or user documentation
- **System documentation** describes the feature of the system
- **User documentation** describes how to interact with the system to accomplish specific tasks

59 Train Users: How do employees learn how to use the new information system?
- In preparation for using a new information system, users need extensive training, which might include software orientation, hardware operation, data entry, and backup procedures
- Training sessions can be conducted by members of the team or professional trainers
- A **procedure handbook** is a type of user documentation that contains step-by-step instructions for performing a specific task

60 Convert Data: What happens to the data from the old system?
- The data for a new information system might exist in card files, file folders, or an old information system
- When converting data from a manual system to a computer system, the data can be typed or scanned electronically into the appropriate storage media
- When converting data from an existing computer system to a new system, a programmer typically writes conversion software to read the old data and convert it into a format that is usable by the new system

61 Covert to New System: How does a business switch from the old information system to the new system?
- **System conversion** refers to the process of deactivating an old information system and activating the new one
- A **direct conversion** means that the old system is completely deactivated and the new system is immediately activated
- A **parallel conversion** avoids some of the risk because the old system remains in service while some or all of the new system is activated
- In a **phased conversion**, the new system is activated one module at a time

62 How does a business switch from the old system to the new system?
- A **pilot conversion** works well in organizations with several branches that have independent information processing systems
  - The new information system is activated at one branch
  - If the system works correctly at one branch, it is activated at the next branch

63 When is the new information system formally “live”?
- A new or upgraded information system undergoes a final test called acceptance testing
- **Acceptance testing** is designed to verify that the new information system works as required

64 Maintenance Phase: What happens during the maintenance phase?
- The **maintenance phase** of the SDLC involves day-to-day operation of the system, making modifications to improve performance, and correcting problems
The maintenance phase of the SDLC is the most expensive because it lasts until the system is retired.

**Who is responsible for system maintenance?**
- The **system operator** performs system backups and data recovery, monitors system traffic, and troubleshoots operational problems.
- The **systems programmer** is the operating system guru.
- In an information system that is centered on a microcomputer network, a **network manager** or **network specialist** is typically responsible for day-to-day operations and system maintenance.

**Why do maintenance activities include user support?**
- Even after-in-depth training, employees sometimes forget procedures, or have difficulty when they encounter a new set of circumstances.
- Many organizations establish a **help desk** to handle end-user problems.
- The help desk is staffed by support specialists.

**What happens during the maintenance phase?**

**When does the maintenance phase end?**
- The maintenance phase continues until an information system is no longer cost effective, or until changes in the organization make the information system obsolete.

**Conclusion**

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**Conclusion**

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**Conclusion**

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