Chapter 14
Systems Analysis and Design:
The Big Picture
Objectives

- Define the terms “system,” “analysis,” and “design”
- Describe the principal functions of the systems analyst
- List and describe the phases of the systems development life cycle
- Describe the various data-gathering and analysis tools
Objectives

- Describe a selection of systems design tools
- Explain the concept of prototyping
- Explain the role of the maintenance task in the systems development life cycle
Computer Systems

- System – an organized set of related components established to accomplish a certain task
  - Computer system – a system that has a computer as one of its components
Systems Analysis

- Studying an existing system to determine how it works and how it meets users’ needs
  - Typically happens as a result of some impetus for change, combined with the authority to make the change
Systems Design

- The process of developing a plan for an improved system, based on the result of the systems analysis
Individuals Involved in Systems Analysis

- Systems analyst – performs analysis and design
  - May perform some programming as well
- Client – the person or organization contracting to have the work done
- User – the people who will have contact with the system
A Change Agent

- The catalyst or persuader who overcomes the reluctance to change within an organization
- Systems analyst can function as change agent, but it works best if it is someone inside the organization
  - The common term for this is user involvement
What It Takes to Be a Systems Analyst

- Coordination of many people, tasks, and schedules
- Communication, both oral and written
- Planning and design
- Specific personal qualities
Personal Qualities

- An analytical mind
- Good communication skills
- Self-discipline and self-direction
- Good organizational skills
- Creativity
- The ability to work without tangible results
The Systems Development Life Cycle

- Preliminary investigation
- Analysis
- Design
- Development
- Implementation
Preliminary Investigation

- A brief study of the problem to determine whether the project should be pursued
  - Also called the feasibility study or system survey
  - Defines the problem
- Also involves working with the users
  - Organization chart – a hierarchical drawing showing the organization’s management
Defining the Problem

- Two points that must be agreed upon
  - The nature of the problem
  - The scope (boundaries) of the problem
- Agreeing on the problem helps define the objectives of the system
An Organization Chart
Analysis

- Understand the existing system
- Two tasks are involved
  - Data gathering
  - Data analysis
Data Gathering

- A number of techniques can be used
  - Written documents
  - Interviews with users and managers
    - Structured interview – includes only questions that have been written out in advance
    - Unstructured interview – interviewer has a general goal but few, if any questions prepared
  - Questionnaires
  - Observation
  - Sampling
Data Analysis

- Two typical tools for data analysis
  - Data flow diagram
  - Decision table
- Create system requirements
- Report to management
Data Flow Diagram

- A map that graphically shows the flow of data through a system
  - Used to diagram existing procedures and data flows
Decision Tables

- Show the table of logical decisions that must be made
  - Useful in cases that involve a series of interrelated decisions
  - Help to ensure no alternatives are overlooked

<table>
<thead>
<tr>
<th>Order procedure</th>
<th>Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid requisition</td>
<td>Y</td>
</tr>
<tr>
<td>Available warehouse</td>
<td>Y</td>
</tr>
<tr>
<td>Available another store</td>
<td>Y</td>
</tr>
<tr>
<td>Required order volume</td>
<td>Y</td>
</tr>
<tr>
<td>Special customer order</td>
<td>Y</td>
</tr>
<tr>
<td>Transfer goods from warehouse</td>
<td>X</td>
</tr>
<tr>
<td>Transfer goods from store</td>
<td>X</td>
</tr>
<tr>
<td>Determine vendor</td>
<td>X</td>
</tr>
<tr>
<td>Send purchase order</td>
<td>X</td>
</tr>
<tr>
<td>Hold requisition</td>
<td>X</td>
</tr>
<tr>
<td>Send back order notice</td>
<td>X</td>
</tr>
<tr>
<td>Reject requisition</td>
<td>X</td>
</tr>
</tbody>
</table>
System Requirements

- A detailed list of things the system must be able to do
  - The design of the new system will be based on these requirements
  - Analyst and management must come to a clear agreement on requirements

**Swift Sport Shoes: Requirements**

The requirements for the Swift Sport Shoes inventory system are as follows:

- Capture inventory data from sales transactions
- Implement automatic inventory reordering
- Implement a standardized interstore transfer system
- Provide both on-demand and scheduled management reports
- Provide security and accounting controls throughout the system
- Provide a user-oriented system whose online usage can be learned by a new user in one training class
- Reduce operating costs of the inventory function by 20%
Report to Management

- Summarizes the problems found in the current system
- Describes the requirements for the new system, including a cost analysis
- Makes a recommendation on what course to take next
Design

- The new system is actually planned
- Divided into two sub-phases
  - Preliminary design
  - Detail design
Preliminary Design

- Several key decisions must be made
- Build a prototype
Key Decisions

- Write custom software or buy a software package (make or buy decision)
  - Software packages may need to be customized
- Outsource software development or create in-house
- Develop alternatives (candidates)
  - All candidates meet the client’s requirements but with variations in features and cost
Prototyping

- **Building a model of the system**
  - Typically a limited working system or subset of a system
  - Developed very quickly
  - Designed to give the user an idea of what the system will look like

- **Computer-aided software engineering (CASE) tools**
  - Automate many of the tasks of the development process
Detail Design

- Develop detailed design specifications
  - Output requirements
  - Input requirements
  - Files and databases
  - System processing
  - System controls and backups
Output Requirements

- Things to consider
  - The medium (paper, screen, etc.) of the output
  - The types of reports needed and what data is needed for the reports
Input Requirements

- Things to consider
  - The input medium (captured at the source, keyed from source document)
  - The fields needed, how they are laid out on the input screen, etc.
  - Input validation may be necessary
Files and Databases

Things to consider

- How files are organized
  - Sequentially, directly, or by another method
- The format of the records making up the data files
System Processing

- Use a flowchart to show the flow of data through the system
System Controls and Backup

- Controls are used to make sure data is input and processed correctly
  - Also used to prevent fraud and tampering
  - Types of controls differ depending on whether data is processed in a batch or online

- Transaction and master files should be backed up on a regular basis
  - Copies should be stored in a safe location
System Development

- Schedule and monitor the two principal activities
  - Programming
  - Testing
- There are several project scheduling tools available
Programming

- Prepare program design specifications
- Use logic flowcharts and pseudocode to facilitate code development
Testing

- **Unit testing** – verifies that individual program units work
  - Perform testing with test data
- **System testing** – determines whether all program units work together as planned
- **Volume testing** – uses real data in large amounts
  - Determines whether the system can handle a large volume of data
Implementation

- Steps involved in starting the new system
  - Training
  - Equipment conversion
  - File conversion
  - System conversion
  - Auditing
  - Evaluation
  - Maintenance
Training

- Teach users how to use the system
  - The system will do no better than the people using it
  - Develop user’s manual to aid users who are not familiar with the system
  - Hands-on training is best
Equipment Conversion

- Items to consider
  - Delivery schedules must be coordinated
  - Terminals or personal computers must be networked
  - Devices on the system must be compatible
File Conversion

- If existing files are manual, they must be keyed in or scanned into the system
  - Manual files must be kept current while data is being input into the new system
- If existing files are computer-based, programs must be written to convert the files into the format needed for the new system
System Conversion

Four approaches

- Direct conversion – the user simply stops using the old system and starts using the new one
- Phased conversion – the system is implemented one part at a time
- Pilot conversion – the entire system is used by a designated set of users
- Parallel conversion – the old and new systems are both used until users are satisfied the new system works
Auditing

- Systems to trace data in the system back to a source document
  - Very helpful in tracing security violations
Evaluation

- Determines how well the system is meeting the original requirements, benefits, and budgets
  - Evaluation can be performed by the analyst and someone from the organization
  - Evaluation can also be performed by an independent third party
Maintenance

- An ongoing activity that lasts the lifetime of the system
- Several types of maintenance activities
  - Enhancements to the system
  - Fix bugs in the system as they are identified