Systems Analysis And Design

Chapter Five:

Implementation and Operation

Learning Objectives

- Describe the process of coding, testing, and installing an organizational information system and outline the deliverables and outcomes of the process.

- Apply four installation strategies: direct, parallel, single location, and phased installation.

- List the deliverables for documenting the system and for training and supporting users.

- Discuss the issues of providing support for end users.

- Explain why systems implementation sometimes fails.

- Explain and contrast four types of maintenance.

- Describe several factors that influence the cost of maintaining an information system.

SDLC

- ✓ Coding
- ✓ Testing
- ✓ Installation
- ✓ Documentation
- ✓ Training
- ✓ Support
- ✓ Maintenance

Systems Planning and Selection

Systems Analysis

Systems Design

Systems Implementation and Operation

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System Implementation and Operation

- Seven major activities:
  - Coding
  - Testing
  - Installation
  - Documentation
  - Training
  - Support
  - Maintenance

System Imp'n and Oper'n (Cont.)

- Purpose:
  - To convert final physical system specifications into working and reliable software
  - To document work that has been done
  - To provide help for current and future users
  - To modify the system to entertain changes

The Process of Coding, Testing, and Installation

- *Coding*
  - Physical design specifications are turned into working computer code.

- *Testing*
  - Tests are performed using various strategies.
  - Testing is performed in parallel with coding.

- *Installation*
  - The current system is replaced by a new system.

Deliverables for Coding, Testing, and Installation

1. Coding
   a. Code
   b. Program documentation
2. Testing
   a. Test scenarios (test plan) and test data

   b. Results of program and system testing

3. Installation
   a. User guides
   b. User training plan
   c. Installation and conversion plan
      i. Software and hardware installation schedule
      ii. Data conversion plan
      iii. Site and facility remodeling plan

Documenting the System, Training Users, and Supporting Users

- Two audiences for final documentation:
  - Information systems personnel who will maintain the system throughout its productive life
  - People who will use the system as part of their daily lives
- User Training
  - Application-specific
  - General for operating system and off-the-shelf software

Deliverables for Documenting the System, Training, and Supporting Users

1. Documentation
   a. System documentation
   b. User documentation
2. User Training Plan
   a. Classes
   b. Tutorials
3. User Training Modules
   a. Training materials
   b. Computer-based training aids
4. User Support Plan
   a. Help desk
   b. Online help
   c. Bulletin boards and other support mechanisms

The Process of Maintaining Information Systems

- Four major activities occur within maintenance:
  - Obtaining maintenance requests
  - Transforming requests into changes
  - Designing changes
  - Implementing changes
- Deliverables and outcomes of this process are:
  - the development of a new version of the software
  - new versions of all design documents
  - training materials developed or modified during the maintenance process.

Software Application Testing

- A master test plan is developed during the analysis phase.

- During the design phase, unit, system and integration test plans are developed.

- The actual testing is done during implementation.

- Written test plans provide improved communication among all parties involved in testing.

Seven Different Types of Tests

- Static or dynamic techniques
  - Static testing means that the code being tested is not executed.
  - Dynamic testing involves execution of the code.
- Test is automated or manual
  - Automated means computer conducts the test.
  - Manual means that people complete the test.

Seven Different Types of Tests

- **Inspection**: a testing technique in which participants examine program code for predictable language-specific errors

- **Walkthrough**: a peer group review of any product created during the systems development process, including code

- **Desk checking**: a testing technique in which the program code is sequentially executed manually by the reviewer

Seven Different Types of Tests (Cont.)

- **Unit testing**: each module is tested alone in an attempt to discover any errors in its code

- **Integration testing**: the process of bringing together all of the modules that a program comprises for testing purposes
  - Modules are typically integrated in a top-down incremental fashion.

Seven Different Types of Tests (Cont.)

- **System testing**: the bringing together of all of the programs that a system comprises for testing purposes
  - Programs are typically integrated in a top-down, incremental fashion.
- System testing is also about testing if the system meets its objective.

Seven Different Types of Tests (Cont.)

- **Stub testing**: a technique used in testing modules, especially where modules are written and tested in a top-down fashion, where a few lines of code are used to substitute for subordinate modules

The Testing Process

- The purpose of testing is to confirm that the system satisfies the requirements.

- Testing must be planned.
  - **Test case** is a specific scenario of transactions, queries or navigation paths.

The Testing Process (Cont.)

- Test cases represent either:
    - Typical system use
    - Critical system use, or
    - Abnormal system use.
- Test cases and results should be thoroughly documented so they can be repeated for each revision of an application.

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Test Case Results

Test Case Number:
Date:

Program Name:
Module Under Test:

Explanation of difference between actual and expected output:

Suggestions for next steps:

Test case results form

Testing Harness

- Automated testing environment
- Reviews code for:
  - Errors
  - Standards violations
  - Other design flaws
- Expand the scope of the tests beyond the current development platform

Combining Coding and Testing

- Coding and testing often go together.

- Big companies have dedicated test staff.

- With eXtreme programming (XP) a common technique is *refactoring*.

- **Refactoring** = making a program simpler after adding a new feature

Acceptance Testing by Users

- **Acceptance testing**: the process whereby actual users test a completed information system, the end result of which is the users' acceptance of it

Acceptance Testing by Users (Cont.)

- **Alpha testing**: user testing of a completed information system using simulated data

- **Beta testing**: user testing of a completed information system using real data in the real user environment

- **Regression Testing:** ?

Acceptance Testing by Users (Cont.)

- Types of Alpha Test:
  - *Recovery testing* — forces software (or environment) to fail in order to verify that recovery is properly performed
  - *Security testing* — verifies that protection mechanisms built into the system will protect it from improper penetration
  - *Stress testing* — tries to break the system
  - *Performance testing* — determines how the system performs on the range of possible environments in which it may be used

Installation

- **Installation**: the organizational process of changing over from the current information system to a new one

- Four installation strategies:
  - Direct Installation
  - Parallel Installation
  - Single-location installation
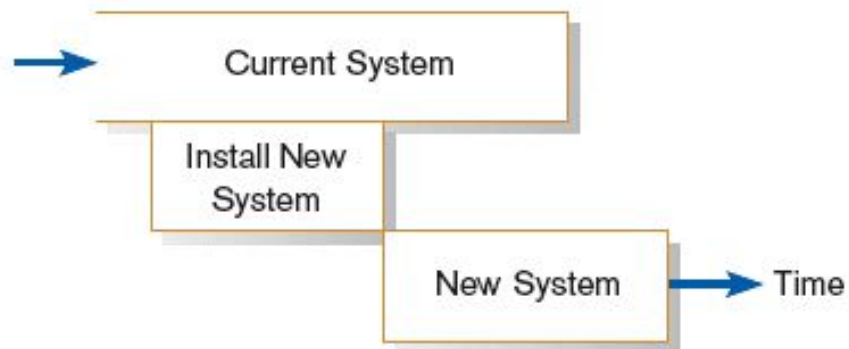 - Phased Installation

Direct Installation

- **Direct installation**: changing over from the old system to a new one by turning off the old system when the new system is turned on
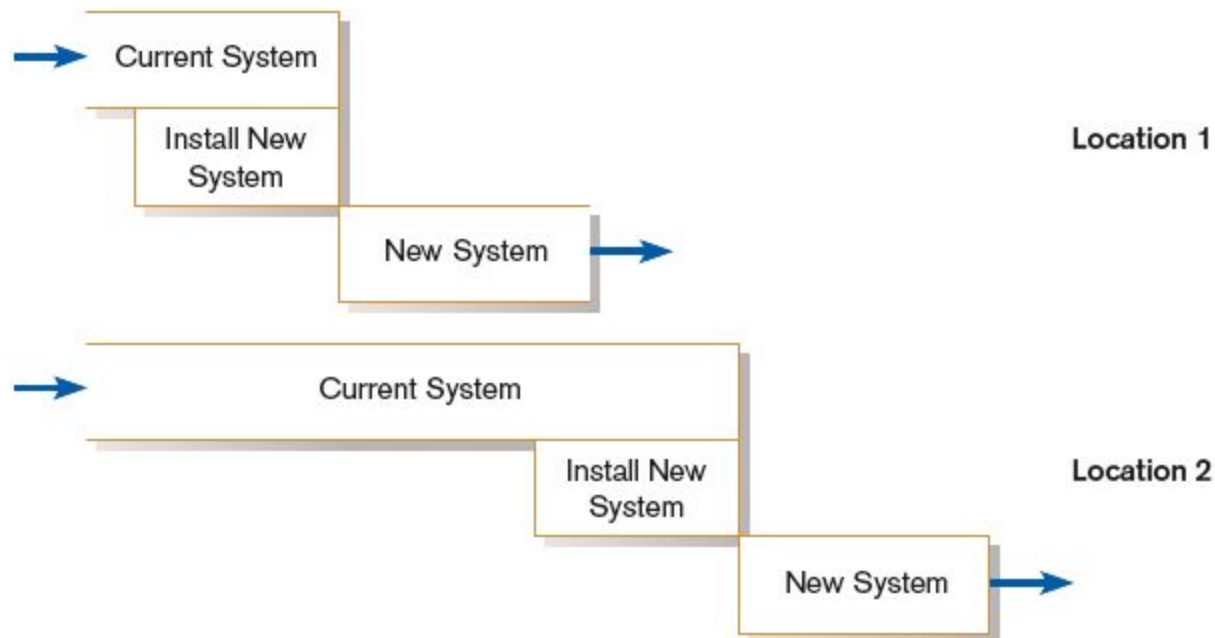
Parallel Installation

- **Parallel installation**: running the old information system and the new one at the same time until management decides the old system can be turned off

Single-Location Installation

- **Single-location installation**: trying out an information system at one site and using the experience to decide if and how the new system should be deployed throughout the organization

- Also known as location or pilot installation (piloting).

Single-Location Installation (cont.)

Current System

Install New System

New System

Location 1

Current System

Install New System

New System

Location 2

Phased Installation

- **Phased Installation**: changing from the old information system to the new one incrementally, starting with one or a few functional components and then gradually extending the installation to cover the whole new system

Phased Installation (cont.)
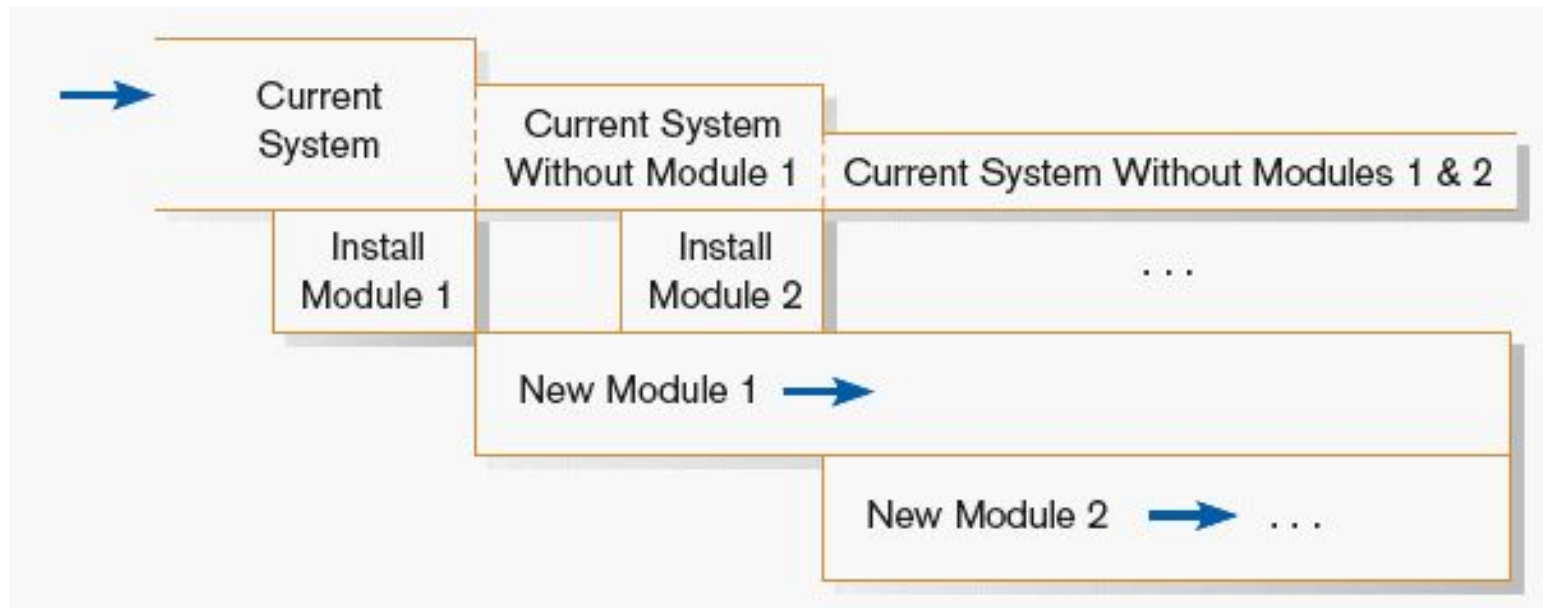
Planning Installation

- Considerations
  - Data conversion
    - Error correction
    - Loading from current system
  - Planned system shutdown
  - Business cycle of organization

Documenting the System

- **System documentation**: detailed information about a system's design specifications, its internal workings, and its functionality

- **User documentation**: written or other visual information about an application system, how it works, and how to use it

Training and Supporting Users

- **Support**: providing ongoing educational and problem-solving assistance to information system users

- For in-house developed systems, support materials and jobs will have to be prepared or designed as part of the implementation process.

Training Information Systems Users

- Potential training topics
  - Use of the system
  - General computer concepts
  - Information system concepts
  - Organizational concepts
  - System management
  - System installation

Types of Training Methods

- Resident expert
- Traditional instructor-led classroom training
- E-learning, distance learning
- Blended learning (instructor plus e-learning)
- Software help components

Training Information Systems Users (Cont.)

- **Electronic performance support system** (**EPSS**): component of a software package or an application in which training and educational information is embedded

- An **EPSS** can take several forms, including a tutorial, an expert system shell, and hypertext jumps to reference materials.

Supporting Information Systems Users

- Support is important to users.

- Providing support can be expensive and time-consuming.

- Organization tend to rely on Vendors for support as they move towards using sophisticated systems.

Automating Support

- One approach is through automation.
  - Internet-based online support forums
  - Voice response systems
  - Knowledge bases

Providing Support Through a Help Desk

- **Help desk**: a single point of contact for all user inquiries and problems about a particular information system or for all users in a particular department

Providing Support Through a Help Desk (Cont.)

- Requires
  - *Technical skills*: extensive knowledge about how to use the system and typical problems that can be encountered
  - *People skills*: good listening and communication, dealing with complaints and frustrations

Organizational Issues in Systems Implementation

- Why does implementation sometimes fail?

- Traditional wisdom of primary success factors:
  - Management support
  - User involvement
  - But these are not enough

- Other important factors
  - Commitment to project
  - Commitment to change
  - Extent of project definition and planning

Organizational Issues in Systems Implementation

Commitment to the project: managing the project so that the problem being solved is well understood and the system being developed will solve it.

Commitment to change: being willing to change behaviors, procedures, and other aspects of the organization.

Extent of project definition and planning: measure of how well the project was planned.

Another important factor related to implementation success is user expectations.

Organizational Issues in Systems Implementation

- There are many ways to determine if an implementation has been successful.

- The two most common and trusted are:

    - The extent to which the system is used, and
    - The users' satisfaction with the system.

Factors Influencing System Use

 Factors that influence the extent to which a system is used
- Personal stake of users
- System characteristics
- User demographics
- Organizational support
- Performance
- Satisfaction

Project Close-Down

- Evaluate team.
  - Reassign members to other projects.
- Notify all affected parties that the development project is ending and that you are switching to operation and maintenance mode.
- Conduct post project reviews.
- Close out customer contract.
  - Formal signoff

Conducting Systems Maintenance

- **Maintenance** refers to changes **made to a system to fix or enhance its functionality**.

- A significant portion of an organization's budget for information systems goes **to the maintenance of existing systems**.

Conducting Systems Maintenance

Four major activities occur within maintenance:

- Obtaining maintenance requests
- Transforming requests into changes
- Designing changes
- Implementing changes

Deliverables and Outcomes

- The development of a **new version** of the software and new versions of all design **documents** developed or modified during the maintenance process.

Types of Maintenance

Type	Description	Approximate Percentage of Maintenance Effort
Corrective	Repair design and programming errors	70
Adaptive	Modify system to environmental changes	10
Perfective	Add new features or improve system performance	15
Preventive	Safeguard system from future problems	5

The Cost of Maintenance

- Information systems maintenance costs are a significant expenditure.

- **Maintainability** is the ease with which software can be understood, corrected, adapted, and enhanced.

- Systems with *low maintainability* result in uncontrollable maintenance expenses.

The Cost of Maintenance cont'd..

- Factors influencing the maintainability of a system:
  - *Latent defects:* This is the number of unknown errors existing in the system after it is installed.
  - *Number of customers for a given system:* In general, the greater the number of customers, the greater the maintenance costs.
  - *Quality of system documentation:* Without quality documentation, maintenance effort can increase exponentially.
  - *Maintenance personnel*
  - *Tools*
  - *Well-structured programs*

Other Maintenance Issues

- **Managing maintenance personnel**
  - How organizations manage and assign maintenance personnel (separate, combined, functional).

- **Measuring maintenance effectiveness**
  - Number of failures
  - Time between each failure
  - Type of failure

- **Controlling maintenance requests**
  - Categorization
  - Prioritization

- **Configuration management**: the process of ensuring that only authorized changes are made to a system