

5. System Implementation and Maintenance

BCA

Notes

5.1. System Implementation

Nepal

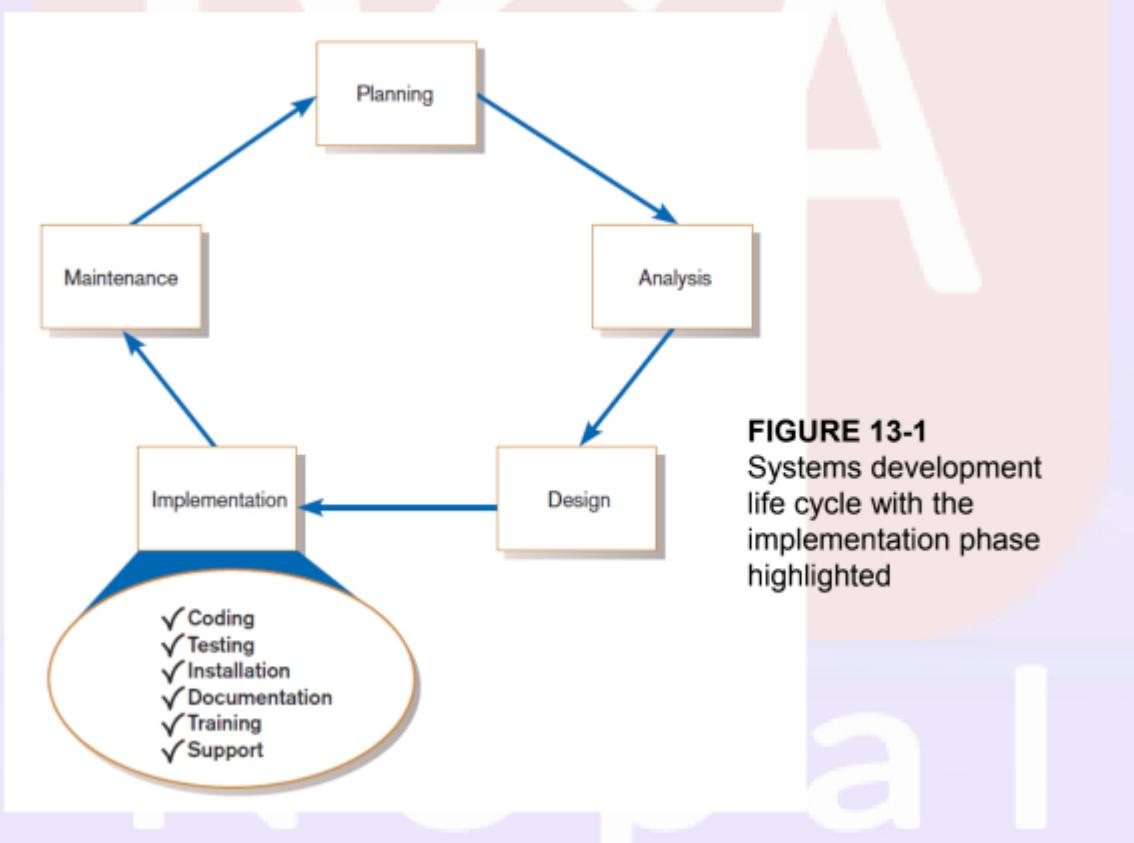


FIGURE 13-1
Systems development life cycle with the implementation phase highlighted

System Implementation

- Six major activities:
 - Coding
 - Testing
 - Installation
 - Documentation
 - Training
 - Support

System Implementation (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

Coding, Testing, and Installation Process

- *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.

TABLE 13-1 Deliverables for Coding, Testing, and Installation

- | | |
|---|--|
| 1. Coding | 3. Installation |
| a. Code | a. User guides |
| b. Program documentation | b. User training plan |
| 2. Testing | c. Installation and conversion plan |
| a. Test scenarios (test plan) and test data | i. Software and hardware installation schedule |
| b. Results of program and system testing | 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

TABLE 13-2 Deliverables for Documenting the System, Training, and Supporting Users

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

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.

TABLE 13-3 Table of Contents of a Master Test Plan

1. Introduction	4. Procedure Control
a. Description of system to be tested	a. Test initiation
b. Objectives of the test plan	b. Test execution
c. Method of testing	c. Test failure
d. Supporting documents	d. Access/change control
2. Overall Plan	e. Document control
a. Milestones, schedules, and locations	5. Test-Specific or Component-Specific Test Plans
b. Test materials	a. Objectives
i. Test plans	b. Software description
ii. Test cases	c. Method
iii. Test scenarios	d. Milestones, schedule, progression, and locations
iv. Test log	e. Requirements
c. Criteria for passing tests	f. Criteria for passing tests
3. Testing Requirements	g. Resulting test materials
a. Hardware	h. Execution control
b. Software	i. Attachments
c. Personnel	

(Source: Adapted from Mosley, 1993.)

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.

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

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.

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.

Different Types of Tests (Cont.)

- **Positive and Negative Testing:**

- Testing with correct input
 - Testing with incorrect input

- Boundary Value Testing

- Testing with Extreme values

The Testing Process

- The purpose of testing is to confirm that the system satisfies the requirements.
- To identify the errors present in the program
- 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.

FIGURE 13-4
Test case results form

(Source: Adapted from
Mosley, 1993.)

Pine Valley Furniture Company <i>Test Case Results</i>
Test Case Number: Date:
Program Name: Module Under Test:
Explanation of difference between actual and expected output:
Suggestions for next steps:

Combining Coding and Testing

- Coding and testing often go together.
- Big companies have dedicated test staff.
- a common technique is *refactoring*.
- **Refactoring:** making a program simpler after adding a new feature

Testing by Users

- **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

Testing by Users

- **Types of Beta Testing**
 - **Validation Testing**
 - Testing for conformance of the requirements
 - **Acceptance testing**
 - Testing for usability
 - **I/O Testing**
 - Positive, Negative and Boundary Value testing

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

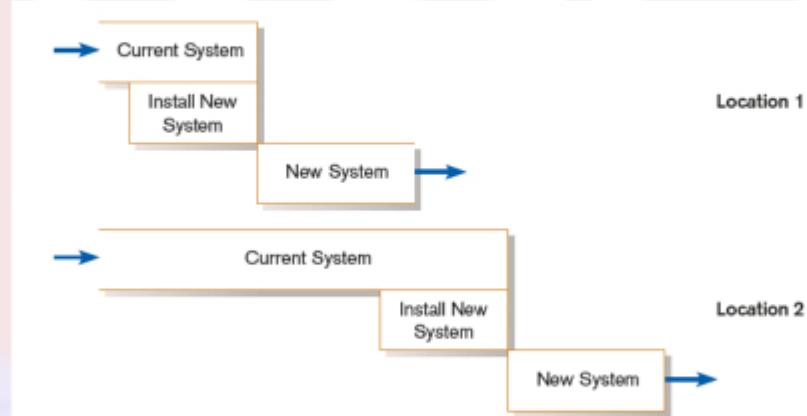
- **Parallel installation:** running the old information system and the new one at the same time until management decides the old system can be turned off



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

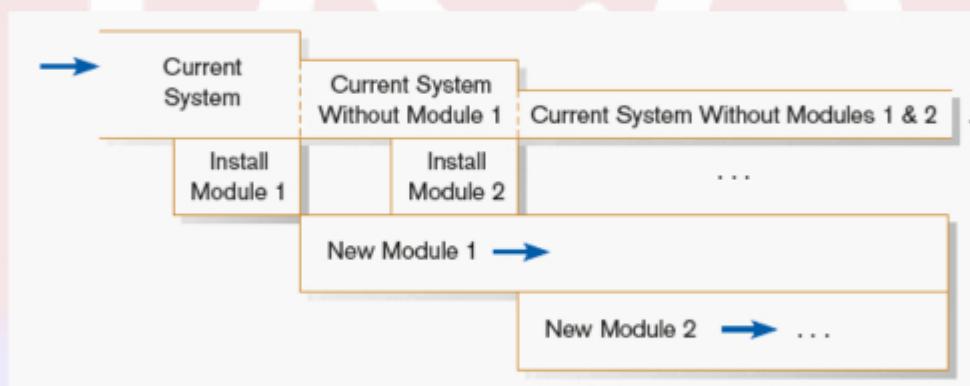
Single-Location Installation (cont.)



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.)



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

Documenting the System (Cont.)

- **Internal documentation:** system documentation that is part of the program source code or is generated at compile time
- **External documentation:** system documentation that includes the outcome of structured diagramming techniques such as data flow and E-R diagrams

TABLE 13-5 SDLC and Generic Documentation Corresponding to Each Phase

Generic Life-Cycle Phase	Generic Document
Requirements Specification	System Requirements Specification Resource Requirements Specification
Project Control Structuring	Management Plan Engineering Change Proposal
System Development	Architecture Design Document Prototype Design Document Detailed Design Document Test Specifications
Architectural design	
Prototype design	
Detailed design and implementation	
Test specification	
Test implementation	Test Reports
System Delivery	User's Guide Release Description System Administrator's Guide Reference Guide Acceptance Sign-Off

(Source: Adapted from Bell and Evans, 1989.)



Figure 13-7
Example of online user documentation
(Source: Microsoft Corporation.)

Generic User's Guide Outline

Preface

1. Introduction

- 1.1. Configurations
- 1.2 Function flow

2. User interface

- 2.1 Display screens
- 2.2 Command types

3. Getting started

- 3.1 Login
- 3.2 Logout
- 3.3 Save
- 3.4 Error recovery
- 3.n [Basic procedure name]

n. [Task name]

Appendix A—Error Messages
([Appendix])

Glossary

Terms

Acronyms

Index

Source: Adapted from
Bell and Evans, 1989.)

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
- External sources (e.g. bots)

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, but has often been inadequate.
- Providing support can be expensive and time consuming.
- Vendors usually charge for their support

Automating Support

- One approach is through automation.
 - Internet-based online support forums
 - On-demand fax
 - 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

Factors Influencing System Use

- Personal stake of users
- System characteristics
- User demographics
- Organizational support
- Performance
- Satisfaction

Success Factors

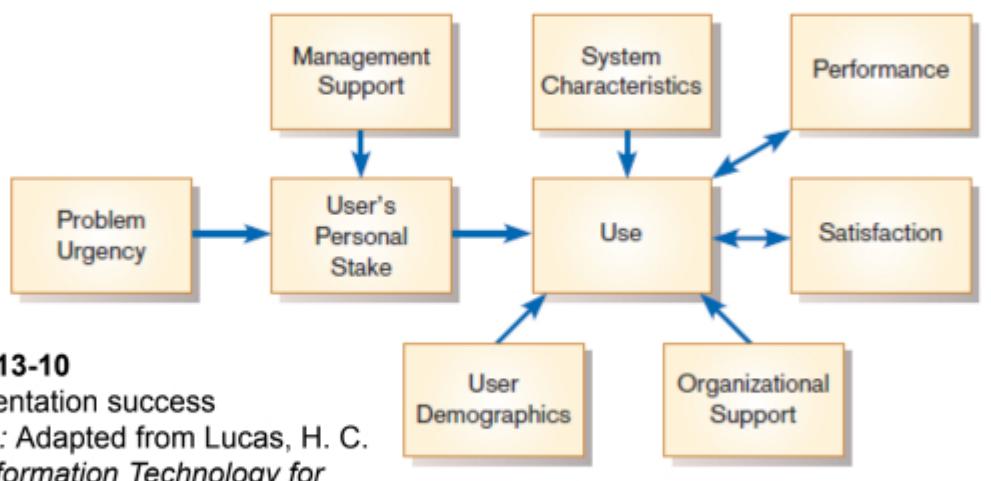


Figure 13-10

Implementation success
(Source: Adapted from Lucas, H. C. 1997. *Information Technology for Management*. New York: McGraw-Hill, with the permission of the McGraw-Hill Companies. All rights reserved.)

Security Issues

- Increasingly important issue for organizations and their management
- **Malicious software (malware)**: includes Trojan horses, worms, viruses, and other kinds
- External sources of threats include laptop theft, system penetration, and denial of service.

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 sign-off

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Maintaining Information Systems

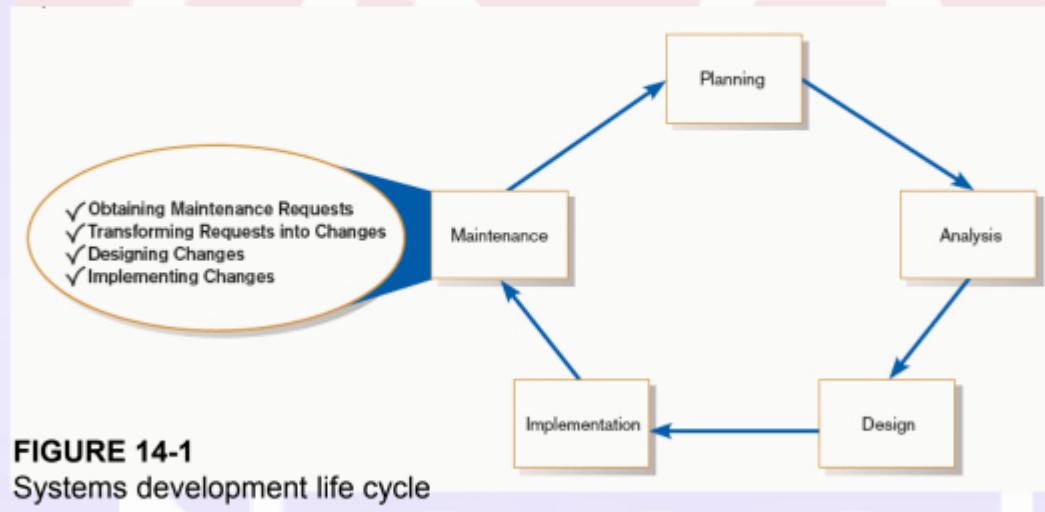


FIGURE 14-1
Systems development life cycle

The Process of Maintaining Information Systems

- Process of returning to the beginning of the SDLC and repeating development steps focusing on system change until the change is implemented

The Process of Maintaining Information Systems (Cont.)

■ Four major activities:

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

Deliverables and Outcome

- The development of a new version of the software and new versions of all design documents created or modified during the maintenance effort.

Deliverables and Outcome (Cont.)

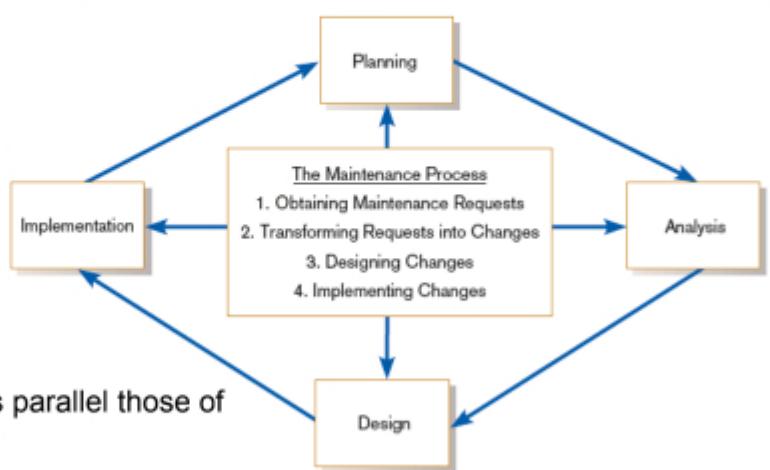


FIGURE 14-3

Maintenance activities parallel those of the SDLC

Types of System Maintenance

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

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Types of System Maintenance (Cont.)

- **Corrective maintenance:** changes made to a system to repair flaws in its design, coding, or implementation

Types of System Maintenance (Cont.)

- **Adaptive maintenance:** changes made to a system to evolve its functionality to changing business needs or technologies

Types of System Maintenance (Cont.)

- **Perfective maintenance:** changes made to a system to add new features or to improve performance

Types of System Maintenance (Cont.)

- **Preventive maintenance:** changes made to a system to avoid possible future problems

Types of System Maintenance (Cont.)

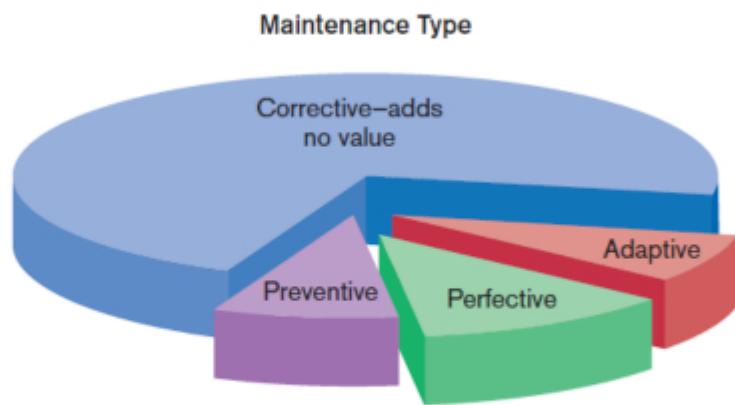


Figure 14-4

Value and non-value adding of different types of maintenance

(Sources: Based on Andrews and Leventhal, 1993; Pressman, 2005.)

The Cost of Maintenance

- Many organizations allocate 60-80% of information systems budget to maintenance

Notes Nepal

