

Units: Implementation & Maintenance

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5.1 System Implementation

* Introduction

- This is the phase where we implement the design into source code through coding. The information is coded, tested, installed and supported in the organization.
- It is a process of converting the physical system specification into working and reliable software & hardware.
- It is a way of carrying out a developed system into working condition and documenting the work to provide help for current and future users.
- System Implementation consists of following activities:
 - Coding
 - Testing
 - Installation
 - Documentation
 - Training
 - Support.

i) Coding

- This involves writing the actual code for the software based on the design and requirements specified in the previous phases.
- Regardless of the development methodology followed, once coding has begun, the testing process can begin & proceed in parallel.

ii) Testing

- This involves verifying that the software functions as intended & identifying and fixing any bugs or errors that are found.
- As each program module is produced, it can be tested individually, then as a part of a larger program.
- **Validation**: It is the process of validating & verifying the software.

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IV) Installation

- It is the process during which the current system is replaced by a new one.
- It involves setting up the new software on the target system & configuring it to run properly.
- This includes conversion of existing data, software, documents & work procedures those consistent with new system.
- Four approaches are followed for installations:
 - Direct installation : Changing over from old IS to a new one by turning off old system when new one is turned on
 - Parallel installation : Running old & new system at the same time until management decides to turn old system off
 - Single-location installation : Trying out new IS at one site & using the experience to decide it & how it should be displayed
 - Phase-installation : Changing from old system to new incrementally. Starting with one or few functional components & then gradually extending the installation to cover whole new system

V) Documentation

- This involves creating documentation that explains how to use and maintain the software, including user manuals, technical manuals & help files.
- It includes graphical models, system charts & high level pseudo codes.
- Documentation enhances productivity, supports user training & promotes consistency
- Although the process of documentation proceeds throughout the life cycle, it receives formal attention during implementation phase because this is where the analysis teams end their involvement in systems development.
- On the negative side, creating & maintaining effective document is expensive.
- **Type:** System documentation (system's design), User documentation (ER diagrams), Internal documentation (source code), External doc

V) Training and support

- This involves training the users and IT staff on how to use the system & troubleshoot any issues that may arise.
- And providing ongoing support for the system, including answering user questions, providing technical assistance and addressing any issues that arise.
- Common methods for training include: tutorial, course, Interactive training manuals, software help component and so on.

* Deliverables & outcomes for documenting the system, Training & Supporting users:

- Documentation: System & user documentation
- User training plan: Classes & tutorials
- User support plan: Helpdesk, online help.

* Software application testing

It is a method of testing the functionality of a software program and verifying & validating that a software or application is bug free and meets the technical requirements. It also measures the efficiency, accuracy and usability of software or application.

Types of testing: Black box & white box testing
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Black-box Testing

It is the software testing method used to test the software without knowing the internal structure of code or program.

i) This type of carried out by testers.

ii) Implementation & programming knowledge isn't required.

iii) Testers mainly focus on the functioning of the system.

iv) Black box testing means functional test or external test.

(Techniques)

Levels of testing:

i) Unit test → test individual component or software module.

ii) Integration test → testing integrated components or modules i.e. combining multiple modules & testing them. It is a gradual process.

iii) System testing → Testing the entire system for errors and bugs. It is carried out by interfacing the hardware & software components of the system.

It comes under blackbox testing.

iv) Acceptance testing → User acceptance testing. System is tested in the environment where it will eventually be used.

v) Beta testing → Once system is implemented, allowing few users to test it.

White-box testing.

i) Internal structure is known to the tester who is going to test the software.

ii) This type of test is carried out by software programmers.

iii) Required.

iv) Testers mainly focus on program code of the system.

v) It means structural test or interior test.

Note: Alpha testing → testing with simulated data
Beta testing → testing with live users & data in real environment

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Maintaining Information Systems

→ Correcting and upgrading process of system after it is implemented is called maintenance of IS. Maintenance is necessary to eliminate errors in the working system during its working life. Four major activities that occur with maintenance are (Steps of maintenance)

i) Obtaining Maintenance Requests: In this step, a formal process is established where users can submit maintenance requests.

ii) Transforming Request into changes: Once a request is received, analysis must be performed to identify the scope of request. It must be determined how request will affect the current system.

iii) Designing changes: A change request can be transformed into a formal design change.

iv) Implementing changes: Proposed changes are implemented in respective components of system.

→ Types of system maintenance.

i) Corrective maintenance: It refers to changes made to repair defects in design, coding or implementation of the system. They take up to 75% of all maintenance activities and are mostly urgent.

ii) Adaptive maintenance: It involves gradually improving the system as per the changing business needs. It is usually less urgent than cooperative maintenance.

(iii) Perfective maintenance :- It involves making enhancement to the system to improve its processing performance or to add new features to the system. The system needs to adapt to new technologies, change in government laws, policies. So it need to be maintained perfectly.

(iv) Preventive maintenance :- It involves changes made to a system to reduce the chance of future system failure. Restructuring, optimizing code & updating documentation are common preventive changes.

The cost of maintenance

Information systems maintenance cost are a significant expenditure. For some organizations, as much as 60 to 80 percent of their information systems budget is allocated to maintenance activities. On average, 52% of a company's programmers are assigned to maintain existing software. Only 3% are assigned to new application development.

Factors affecting maintenance cost (maintainability)

i) Latent defects :- It is the no. of unknown errors existing in the system after it is installed.

ii) Maintenance personnel :- Highly skilled people require high cost for maintenance.

iii) No. of customers :- Greater the no. of customers, greater the cost of system documentation quality. Without quality documentation, maintenance cost can increase exponentially.

iv) Well Structured programs :- They are easier to understand & fix so they lower maintenance costs.

v) Using automated tools :- It can help reduce maintenance cost.

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* Managing maintenance

- Maintenance activities consume more and more system development budget, so managing maintenance has become very important.
- The following things are needed to manage maintenance

1) Managing maintenance personnel

- There are 3 major options
- Having a separate maintenance & development group
- Having a combined group of both
- Having end users have their own maintenance personnel

2) Measuring Maintenance effectiveness

- It means understanding the quality of development and maintenance efforts.

Following factors are to be measured to measure the effectiveness

- Number of failures
- Time between each failure
- Type of failure

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Questions asked:

- Q. What is testing? Explain any four different testing techniques.
(2028 (5 marks))
- Q. List major activities of maintenance. Explain different types of maintenance activities. (2026 (new) - 5 marks)