Learning Objectives

- Explain and contrast four types of system maintenance.
- Describe several factors that influence the cost of maintaining an information system and apply these factors to the design of maintainable systems.
- Describe maintenance management issues, including alternative organizational structures, quality measurement, processes for handling change requests, and configuration management.
- Explain the role of CASE tools in maintaining information systems.
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.
- Maintenance is the longest phase in the SDLC.
The Process of Maintaining Information Systems (Cont.)

- Four major activities:
  - Obtaining maintenance requests
  - Transforming requests into changes
  - Designing changes
  - Implementing changes

**FIGURE 14-2**
System Service Request for purchasing fulfillment system (Pine Valley Furniture)
Deliverables and Outcome

- The maintenance phase of the SDLC is basically a subset of the activities of the entire development process.

Deliverables and Outcome (Cont.)

- The deliverables and outcomes from the process are 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
Types of System Maintenance (Cont.)

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

- **Adaptive maintenance**: changes made to a system to evolve its functionality to changing business needs or technologies
Perfective maintenance: changes made to a system to add new features or to improve performance

Preventive maintenance: changes made to a system to avoid possible future problems
The Cost of Maintenance

- Many organizations allocate 60-80% of information systems budget to maintenance.
- **Maintainability**: the ease with which software can be understood, corrected, adapted, and enhanced.

**FIGURE 14-5**
New development versus maintenance as a percentage of the software budget over the years

(Source: Based on Pressman, 2005.)
The Cost of Maintenance (Cont.)

- Factors that influence system maintainability:
  - Latent defects
  - Number of customers for a given system
  - Quality of system documentation
  - Maintenance personnel
  - Tools
  - Well-structured programs

FIGURE 14-6
Quality documentation eases Maintenance

Managing Maintenance Personnel

- Number of people working in maintenance has surpassed number working in development.
- Maintenance work is often viewed negatively by IS personnel.

Managing Maintenance Personnel (Cont.)

- Organizations often rotate personnel in and out of maintenance roles in order to lessen negative feelings about maintenance.
- Organizations have historically have rewarded people involved in new development better than maintenance personnel.
Managing Maintenance Personnel (Cont.)

- Three possible organizational structures:
  - *Separate* — maintenance group consists of different personnel than development group
  - *Combined* — developers also maintain systems
  - *Functional* — maintenance personnel work within the functional business unit

<table>
<thead>
<tr>
<th>Maintenance Organization Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate</td>
<td>Improved system and documentation quality</td>
<td>Ignorance of critical undocumented information</td>
</tr>
<tr>
<td>Combined</td>
<td>Maintenance group knows all about system</td>
<td>Less emphasis on good documentation</td>
</tr>
<tr>
<td>Functional</td>
<td>Personnel have vested interest</td>
<td>Limited job mobility and human or technical resources</td>
</tr>
</tbody>
</table>
Measuring Maintenance Effectiveness

- Must measure the following factors:
  - Number of failures
  - Time between each failure
  - Type of failure

Mean time between failures (MTBF): a measurement of error occurrences that can be tracked over time to indicate the quality of a system.

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Measuring Maintenance Effectiveness (Cont.)

FIGURE 14-7
How the mean time between failures should change over time

Controlling Maintenance Requests

- Maintenance requests can be frequent.
- Prioritize based on type and urgency of request.
- Evaluations are based on feasibility analysis.
Controlling Maintenance Requests (Cont.)

FIGURE 14-8
How to prioritize maintenance requests

Controlling Maintenance Requests (Cont.)

FIGURE 14-9
How a maintenance request moves through an organization
Configuration Management

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

Configuration Management (Cont.)

- **Baseline modules**: software modules that have been tested, documented, and approved to be included in the most recently created version of a system
Configuration Management

- **System librarian**: a person responsible for controlling the checking out and checking in of baseline modules when a system is being developed or maintained.

- **Build routines**: guidelines that list the instructions to construct an executable system from the baseline source code.

Role of CASE and Automated Development Tools in Maintenance

- **Traditional systems development**
  - Emphasis is on coding and testing.
  - Changes are implemented by coding and testing first.
  - Documentation is done after maintenance is performed.
  - Keeping documentation current is often neglected due to time-consuming nature of task.
Role of CASE and Automated Development Tools in Maintenance (Cont.)

- Development with CASE
  - Emphasis is on design documents.
  - Changes are implemented in design documents.
  - Code is regenerated using code generators.
  - Documentation is updated during maintenance.

Reverse engineering: automated tools that read program source code as input and create graphical and textual representations of design-level information such as program control structures, data structures, logical flow, and data flow.
Role of CASE and Automated Development Tools in Maintenance (Cont.)

- **Reengineering**: automated tools that read program source code as input; perform an analysis of the program’s data and logic; and then automatically, or interactively with a systems analyst, alter an existing system in an effort to improve its quality or performance.

**Figure 14-10** Visual Studio .NET engineer applications into Visio UML diagrams
Website Maintenance

Special considerations:

- 24 X 7 X 365
  - Nature of continuous availability makes maintenance challenging.
  - Pages under maintenance can be locked.
    - Consider using date and time stamps to indicate when changes are made instead.

Website Maintenance (Cont.)

- Check for broken links
- HTML Validation
  - Pages should be processed by a code validation routine before publication.
- Reregistration
  - When content significantly changes, site may need to be reregistered with search engines.
Website Maintenance (Cont.)

Future Editions
- Consistency is important to users.
- Post indications of future changes to the site.
- Batch changes.

Electronic Commerce Application: Maintaining an Information System for Pine Valley Furniture’s WebStore

To maintain PVF’s WebStore, the following questions need to be addressed:
- “How much is our Web site worth?”
- “How much does it cost our company when our Web site goes down?”
- “How reliable does our Web site need to be?”
Electronic Commerce Application: Maintaining an Information System for Pine Valley Furniture’s WebStore

Pine Valley Furniture needs to immediately develop a plan for addressing the WebStore’s service level problems.

Summary

In this chapter you learned how to:

- Explain and contrast four types of system maintenance.
- Describe several facts that influence the cost of maintaining an information system and apply these factors to the design of maintainable systems.
- Describe maintenance management issues, including alternative organizational structures, quality measurement, processes for handling change requests, and configuration management.
- Explain the role of CASE tools in maintaining information systems.
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Publishing as Prentice Hall