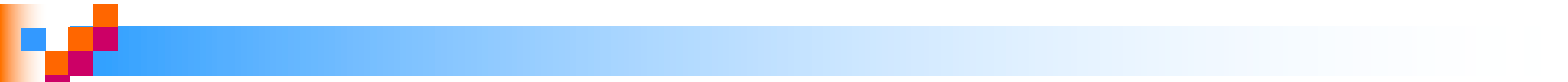# Modern Systems Analysis and Design
Seventh Edition

Jeffrey A. Hoffer
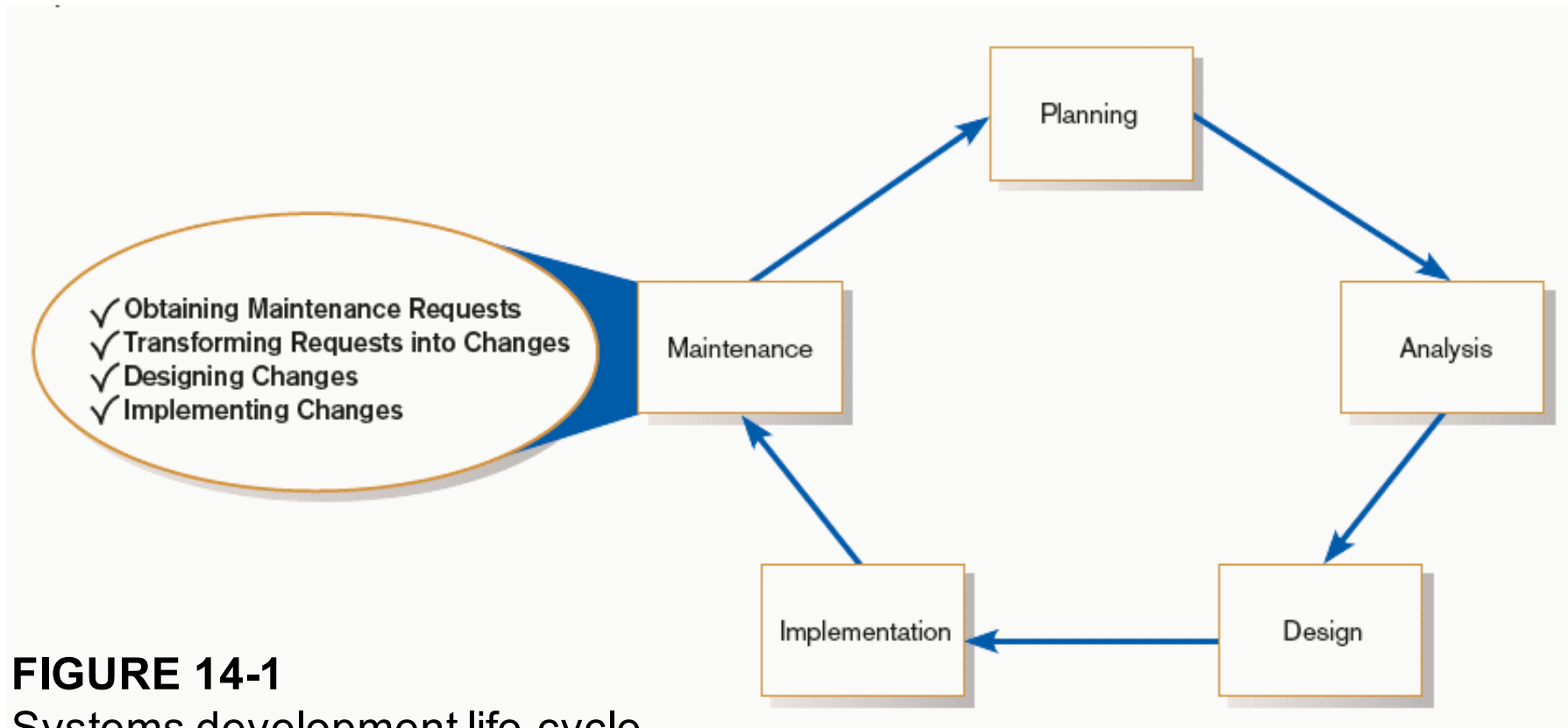
Joey F. George

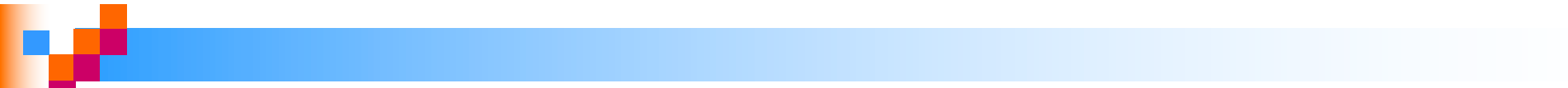**Joseph S. Valacich**

Chapter 14
Maintaining Information Systems

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.

Maintaining Information Systems
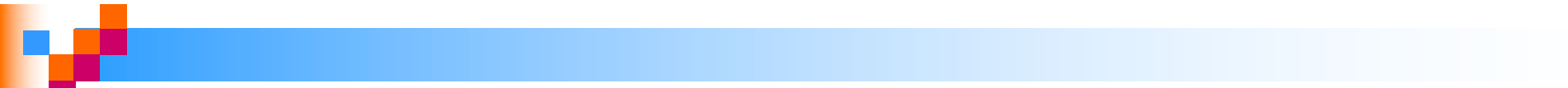
FIGURE 14-1

Systems development life cycle

The diagram shows a cycle with the following boxes connected by arrows:
- Maintenance
- Planning
- Analysis
- Design
- Implementation

An oval on the left lists:
- ✓ Obtaining Maintenance Requests
- ✓ Transforming Requests into Changes
- ✓ Designing Changes
- ✓ Implementing Changes

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

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

Pine Valley Furniture
System Service Request

REQUESTED BY ___Juanita Lopez___ DATE ___November 5, 2014___

DEPARTMENT ___Purchasing, Manufacturing Support___

LOCATION ___Headquarters, 1-322___

CONTACT ___Tel: 4-3267   FAX: 4-3270   e-mail: jlopez___

TYPE OF REQUEST   URGENCY

[X]   New System   [   ]   Immediate—Operations are impaired or
                                                          opportunity lost
[   ]   System Enhancement   [   ]   Problems exist, but can be worked around
[   ]   System Error Correction   [X]   Business losses can be tolerated until new
                                                          system is installed

PROBLEM STATEMENT

Sales growth at PVF has caused greater volume of work for the manufacturing support unit within Purchasing. Further, more concentration on customer service has reduced manufacturing lead times, which puts more pressure on purchasing activities. In addition, cost-cutting measures force Purchasing to be more aggressive in negotiating terms with vendors, improving delivery times, and lowering our investments in inventory. The current modest systems support for manufacturing purchasing is not responsive to these new business conditions. Data are not available, information cannot be summarized, supplier orders cannot be adequately tracked, and commodity buying is not well supported. PVF is spending too much on raw materials and not being responsive to manufacturing needs.

SERVICE REQUEST

I request a thorough analysis of our current operations with the intent to design and build a completely new information system. This system should handle all purchasing transactions, support display and reporting of critical purchasing data, and assist purchasing agents in commodity buying.

IS LIAISON   Chris Martin (Tel: 4-6204   FAX: 4-6200   e-mail: cmartin)

SPONSOR   Sal Divario, Director, Purchasing

------------------------- TO BE COMPLETED BY SYSTEMS PRIORITY BOARD -------------------------

[   ]   Request approved   Assigned to _____
                                            Start date _____

[   ]   Recommend revision
[   ]   Suggest user development
[   ]   Reject for reason _____
                                  _____
                                  _____

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Deliverables and Outcome

- The maintenance phase of the SDLC is basically a subset of the activities of the entire development process.
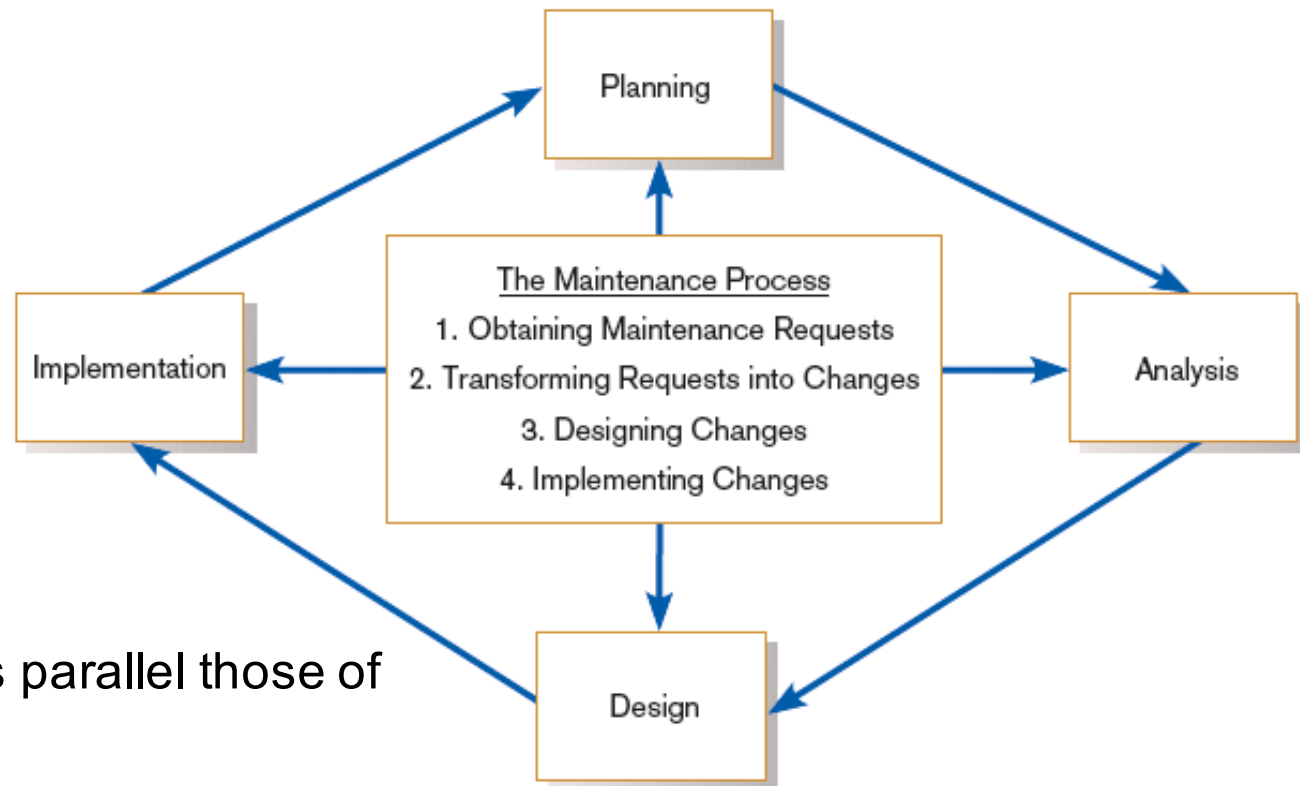
Deliverables and Outcome (Cont.)

- 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.

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Deliverables and Outcome (Cont.)

Planning

The Maintenance Process
1. Obtaining Maintenance Requests
2. Transforming Requests into Changes
3. Designing Changes
4. Implementing Changes

Implementation

Analysis

Design

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

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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.)
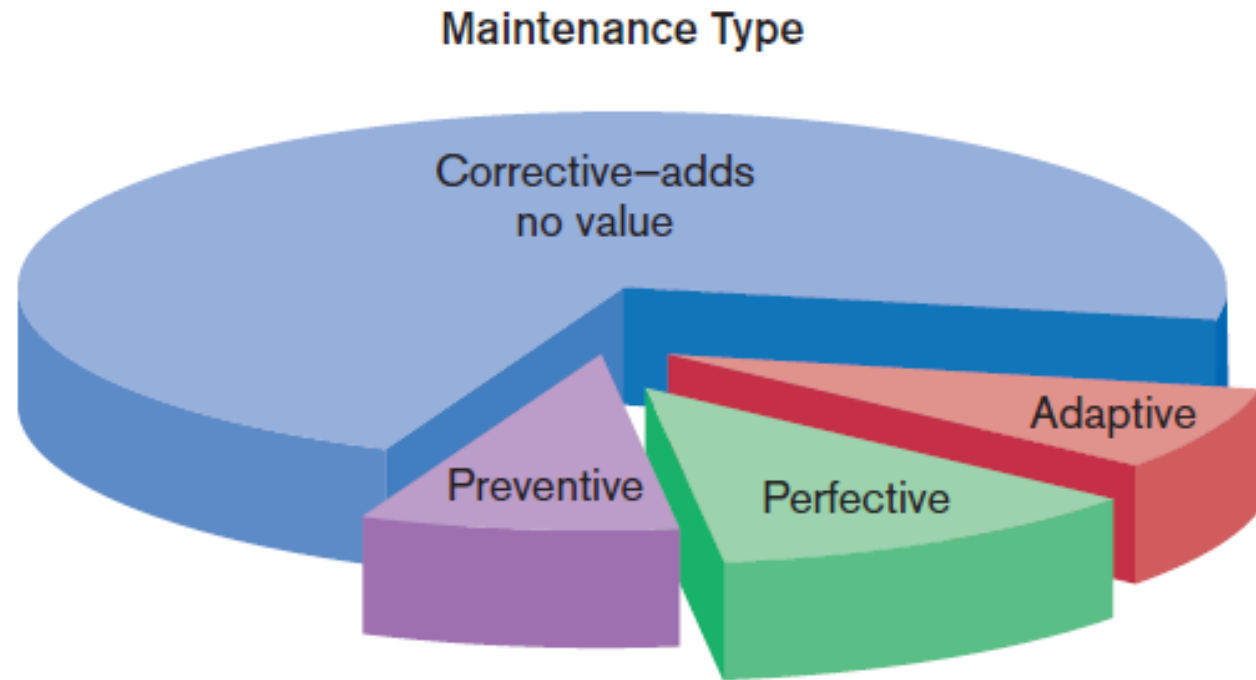
Maintenance Type

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.

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

The Cost of Maintenance (Cont.)

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

(*Source:* Based on Pressman, 2005.)

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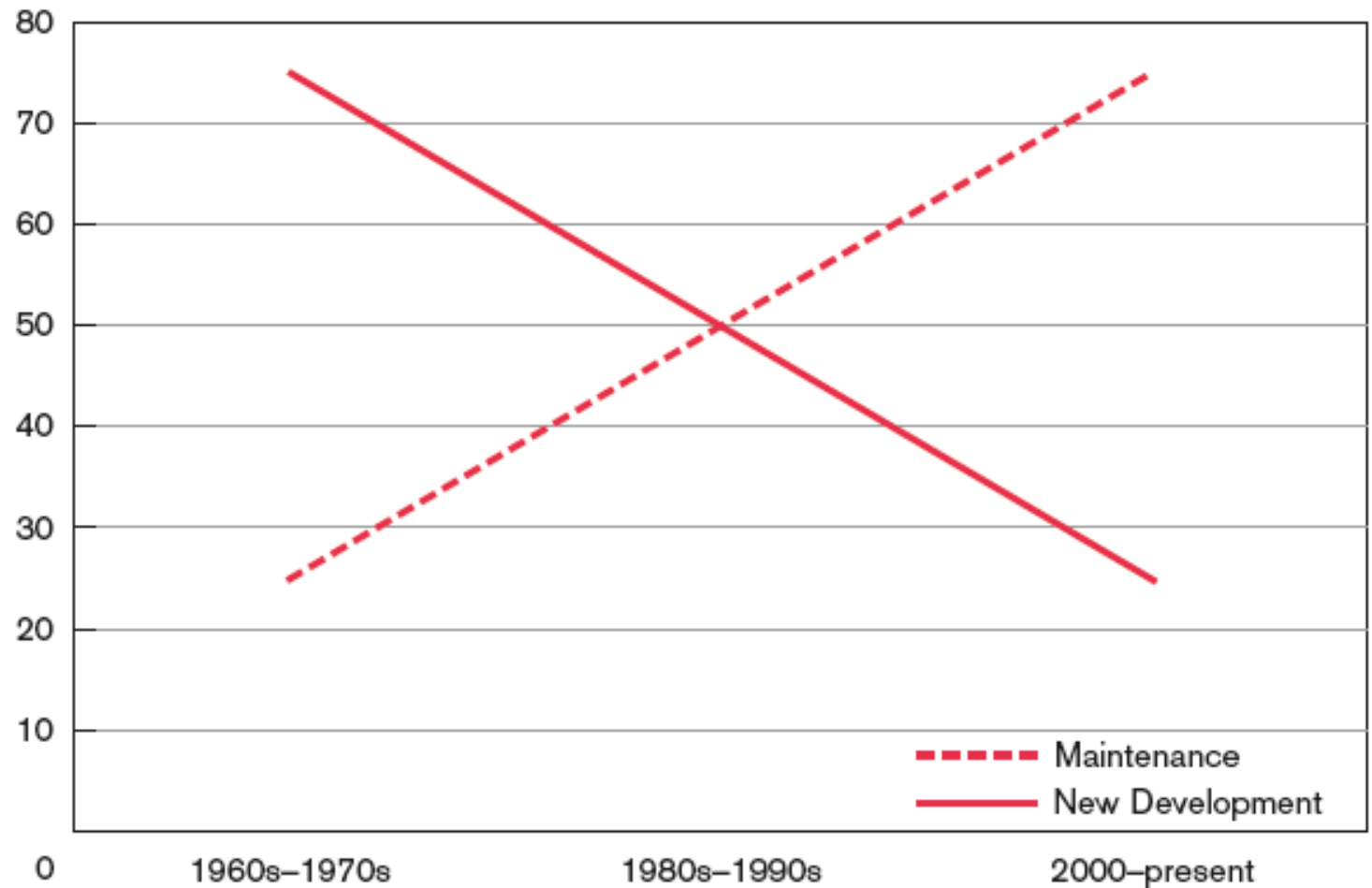
The Cost of Maintenance (Cont.)

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

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The Cost of Maintenance (Cont.)

FIGURE 14-6
Quality documentation
eases Maintenance

(*Source: Based on
Hanna, M. 1992.
"Using Documentation
as a Life-Cycle Tool."
Software Magazine
[December]*: 41–46.)
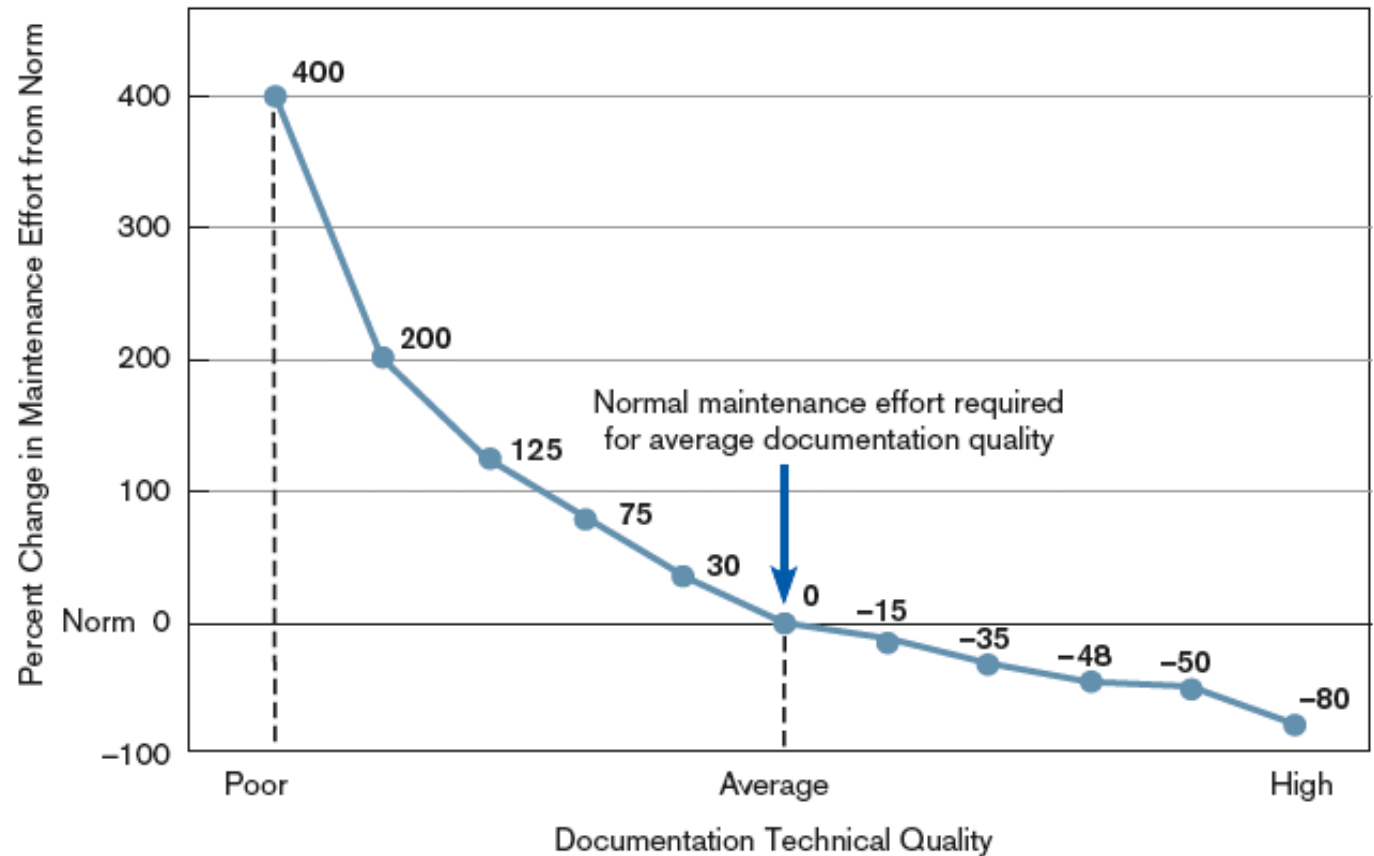
Managing Maintenance Personnel

- 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 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

Managing Maintenance Personnel (Cont.)
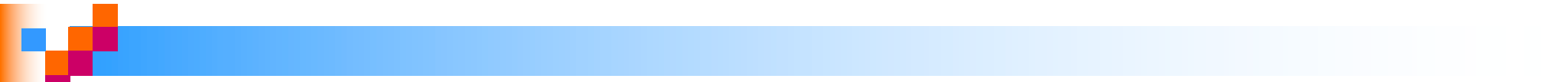
Maintenance Organization Type	Advantages	Disadvantages
Separate	Improved system and documentation quality	Ignorance of critical undocumented information
Combined	Maintenance group knows all about system	Less emphasis on good documentation
Functional	Personnel have vested interest	Limited job mobility and human or technical resources

Measuring Maintenance Effectiveness

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

Measuring Maintenance Effectiveness (Cont.)

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

Measuring Maintenance Effectiveness (Cont.)

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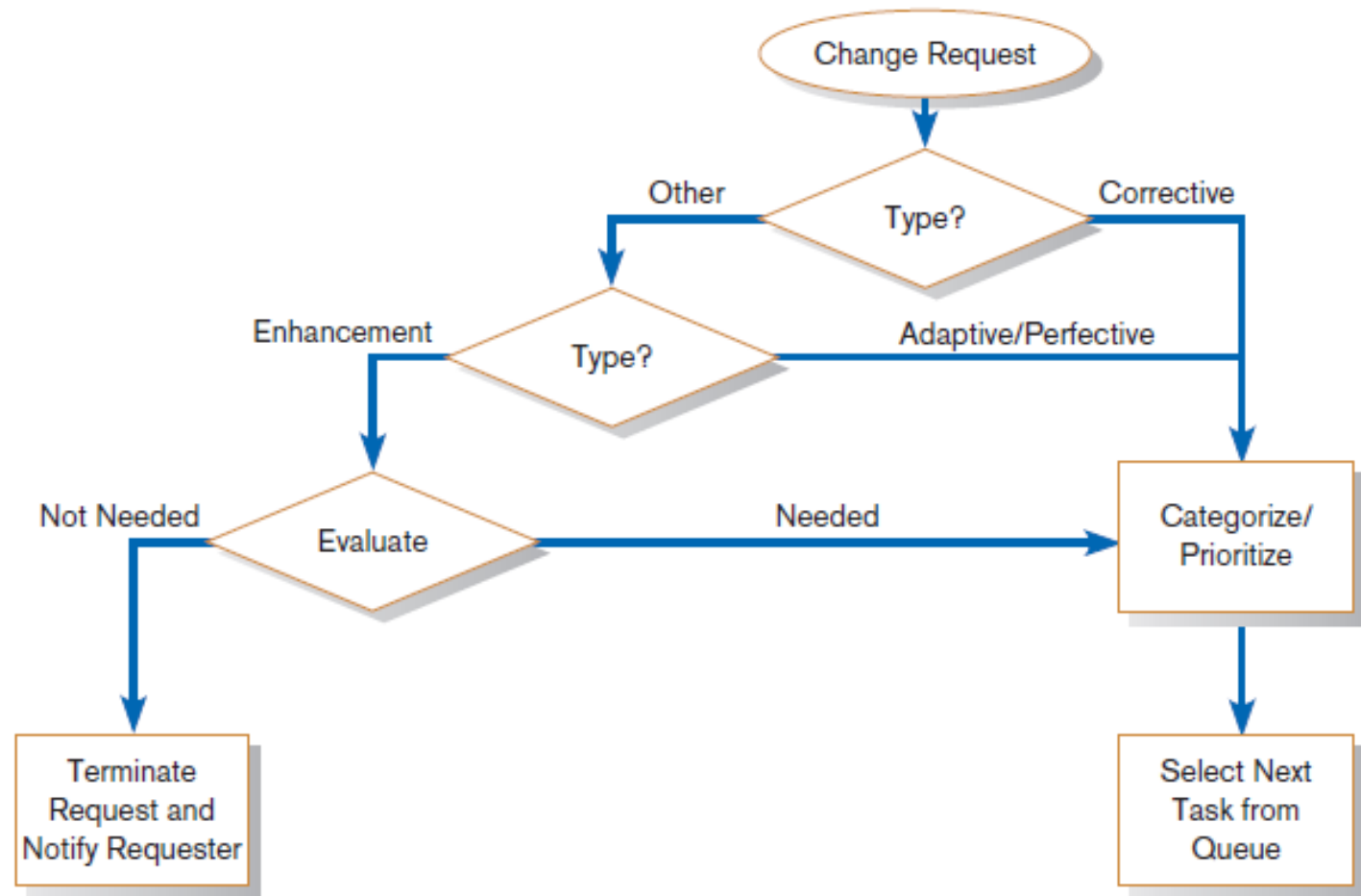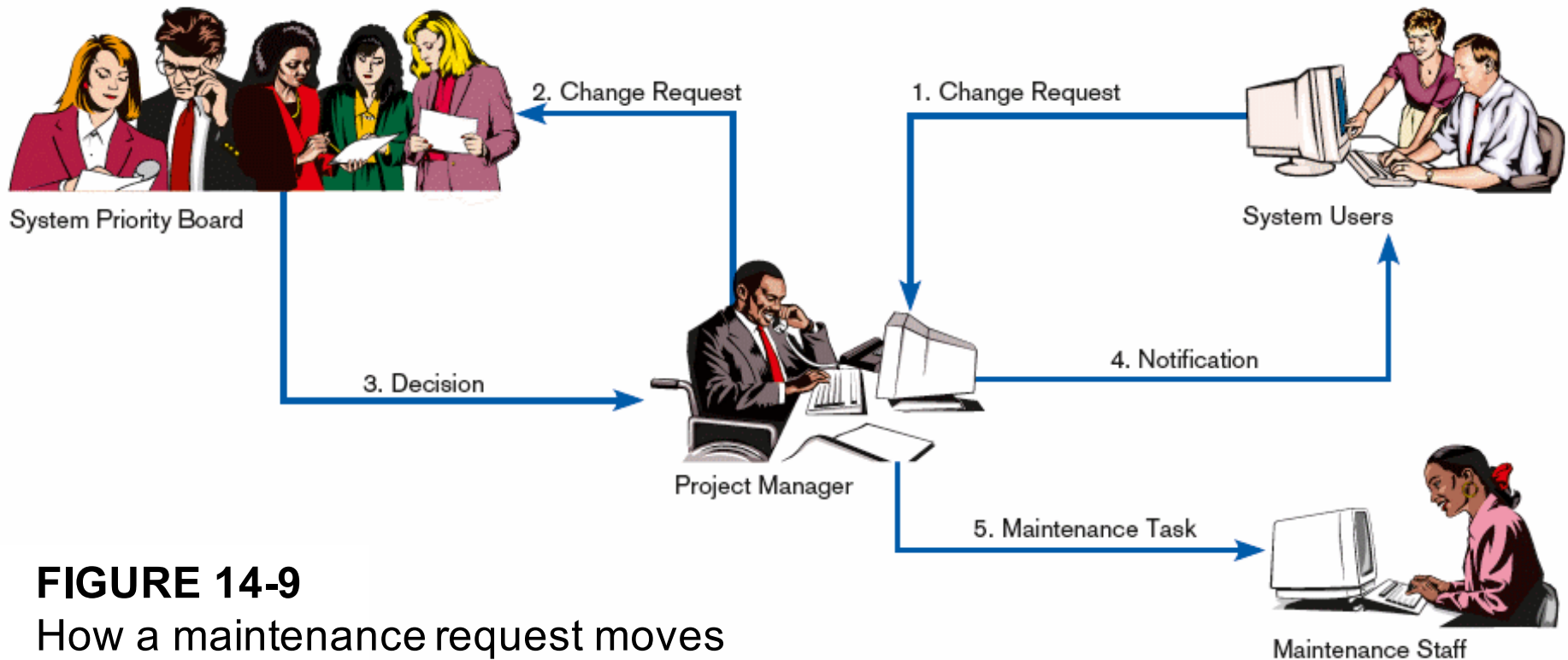How the mean time between failures should change over time

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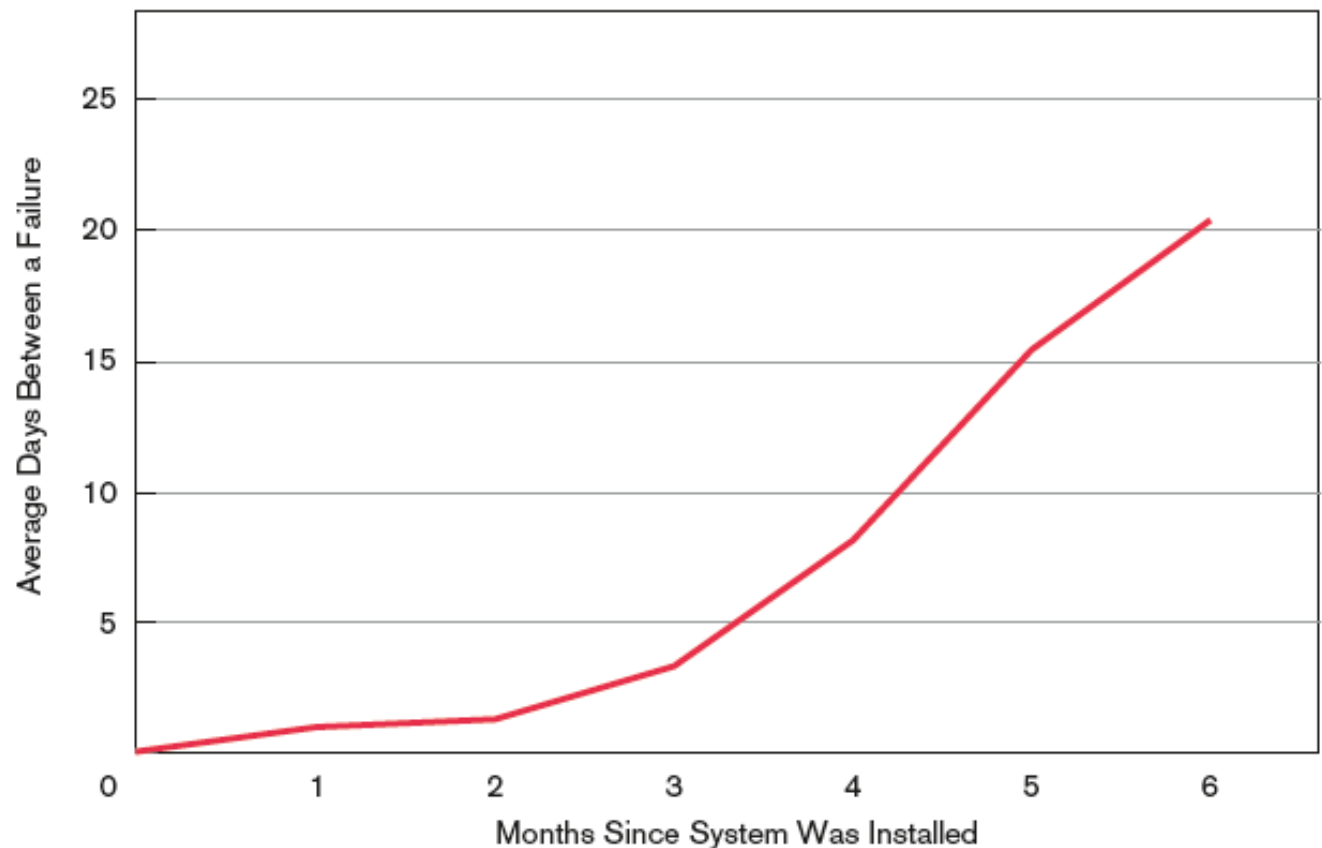
Controlling Maintenance Requests

- 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.)

System Priority Board

2. Change Request

1. Change Request

System Users

3. Decision

4. Notification

Project Manager

5. Maintenance Task

Maintenance Staff

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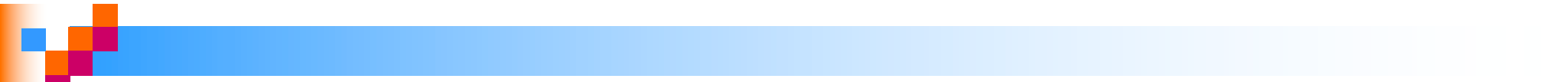
- **Baseline modules**: software modules that have been tested, documented, and approved to be included in the most recently created version of a system
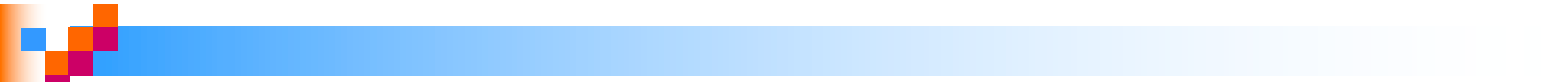
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Configuration Management (Cont.)

- **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

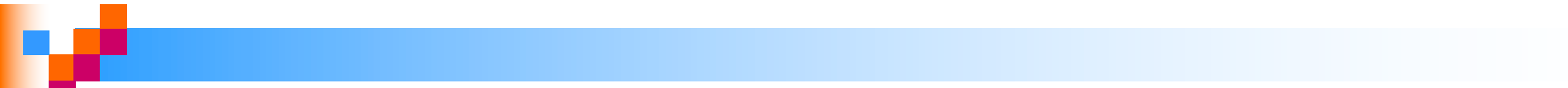# Role of CASE and Automated Development Tools in Maintenance

- **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.

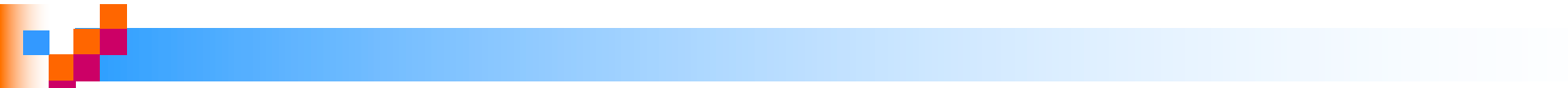# Role of CASE and Automated Development Tools in Maintenance (Cont.)

- **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.

# Role of CASE and Automated Development Tools in Maintenance (Cont.)

- **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

Role of CASE and Automated Development Tools in Maintenance (Cont.)
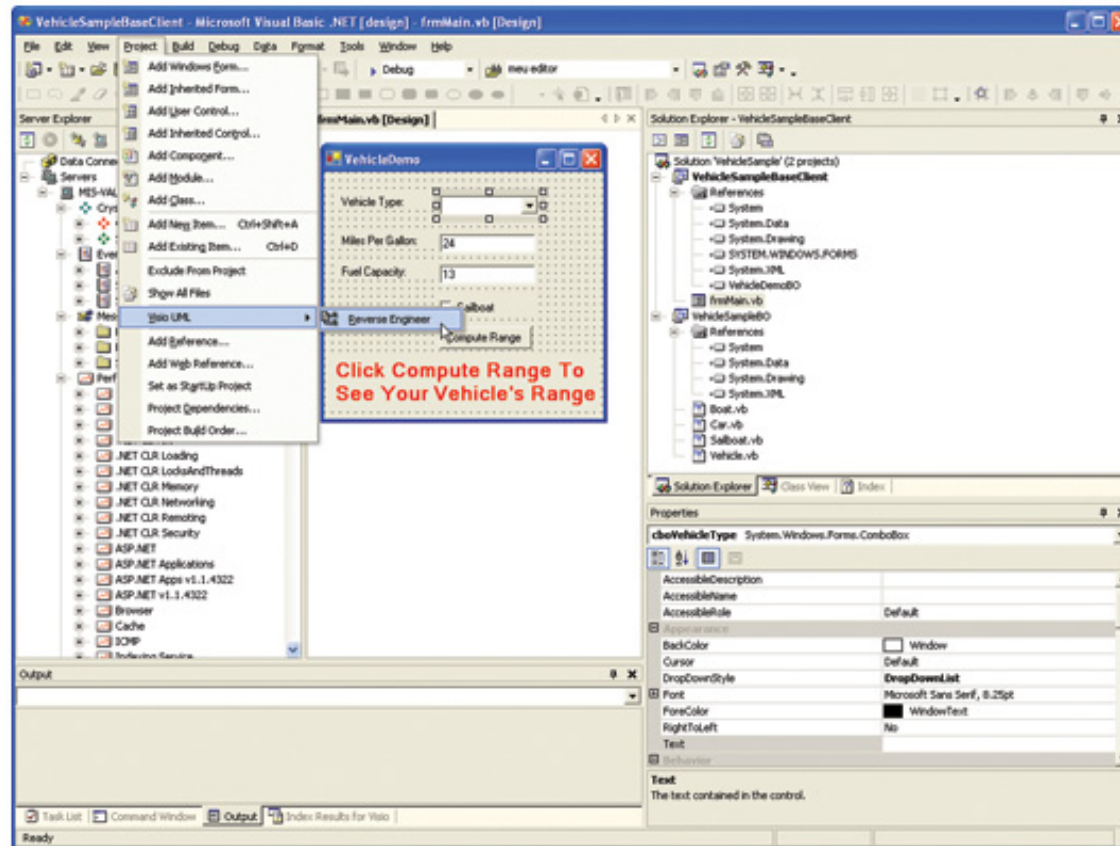
Figure 14-10 Visual Studio .NET engineer applications into Visio UML diagrams (*Source:* Microsoft Corporation.)

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Web Site 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.

Web Site 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.

Web Site Maintenance (Cont.)

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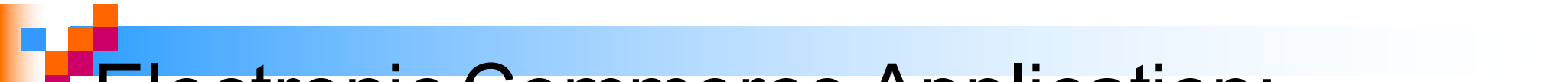
- Consistency is important to users.
- Post indications of future changes to the site.
- Batch changes.

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?"

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Electronic Commerce Application: Maintaining an Information System for Pine Valley Furniture's WebStore (Cont.)

- 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.