At the completion of this lecture you should:

- be aware of the significance of maintenance activity in the work of an IS department
- be aware of the types of maintenance activity that IS departments may carry out and the role of each type
- be aware of the tasks involved in the maintenance of an information system

Lecture Objectives

Maintenance

- “Once the product has passed its acceptance test, it is handed over to the client. Any changes after the client has accepted the product constitute maintenance.”
  - Schach, 1993

- Maintenance can be up to 75% of IS department budget

Transition to Maintenance

- Need to develop systems that are more correct, cheap to operate, maintain and modify

System Costs to IS Department

- 50% of D.P. budget consumed by maintenance and enhancements
- Testing consumes about 50% of systems development costs

What is Maintenance

- Maintenance is NOT just bug-fixing!
- 4 types of maintenance
  - Corrective maintenance
  - Adaptive maintenance
  - Perfective maintenance
  - Preventative maintenance

Corrective Maintenance

- Corrects analysis, design and implementation errors
  - Most corrective problems arise soon after installation or after major system changes
  - Should have been isolated and corrected during development
  - Professional practice during development should minimise the need (but will not remove it completely)
  - Adds little or no value - focus on removing defects rather than adding anything new
  - Accounts for up to 75% of all maintenance activity
Corrective Maintenance

- Can be the most expensive kind of maintenance
  - costs of functions not working correctly
  - having to undo what has been developed
- Requires immediate attention
  - typically urgent, interfere with normal operations
- Needs skilled maintenance staff to ensure rapid diagnosis of errors and their correction
  - must have or quickly develop high level of familiarity with the system
  - software tools for diagnosis

Adaptive Maintenance

- To satisfy changes in the environment, changing business needs or new user requirements
  - changes in tax laws, takeovers and mergers, new OS, etc
  - new type of report, new class of customer etc.
- Less urgent - changes occur over time
- Adaptive maintenance is inevitable, does add value
- Maintenance staff need strong analysis and design skills as well as programming skills
  - changes often require a complete SDLC
  - also need good understanding of the system

Preventative Maintenance

- Pay now or pay more later
  - defects or potential problems found and corrected before they cause any damage
  - reduce chance of future system failure
  - eg expand number of records beyond needs, standardise formats across platforms
- A natural by-product of maintenance work - identify and fix any potential problems noted while fixing other errors

Perfective Maintenance

- To enhance performance, maintainability, usability
  - adds desired features rather than required
  - better run times, faster transaction processing
- To meet user requirements not previously recognised or given high priority
  - missed in development or not known about
  - considered unimportant

Perfective Maintenance

- Legacy systems (old systems running for at least 10 years) are likely candidates for perfective maintenance
- May involve technical systems specialists as well as general maintenance staff
  - network specialist to change network design for improved performance

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Topic: Maintenance

Distribution of Maintenance Effort

Costs of Maintenance

- There are many factors or cost elements affecting the ‘maintainability’ of a system
- Maintainability
  - the ease with which software can be understood, corrected, adapted and enhanced
- Low maintainability results in uncontrollable maintenance expenses

Cost Elements of Maintenance

- The following factors affect ‘maintainability’
  - Defects
  - Customers
  - Documentation
  - Personnel
  - Tools
  - Software structure
- Defects, customers and documentation have a significant effect on maintainability

Cost Elements of Maintenance

- Defects
  - the number of latent or unknown errors existing after system installation
  - influences most maintenance costs, drives all other cost factors
  - few errors -> low maintenance costs
- Customers
  - the number of customers/users of system
  - more customers, more maintenance effort/cost
  - greater need for high maintainability

Cost Elements of Maintenance

- Documentation
  - quality of system documentation
  - exponential effect on maintenance costs
- Personnel
  - quality of maintenance personnel
  - highly skilled programmers, typically not original programmers, to quickly understand and carefully change system
  - separate from development? in-house? dedicated end-user support?

Cost Elements of Maintenance

- Tools
  - appropriate automated development tools
  - programming tools, code generators, debuggers, hardware, CASE, diagnostics, etc
  - reverse engineering for no documentation
- Software structure
  - quality of software structure and maintainability
  - formalisation of code, comments, versioning
  - structure charts, OO

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There is a need to measure maintenance to understand quality of development/maintenance effort.

- We measure the following factors:
  - number of failures
  - time between each failure
  - type of failure

- Mean Time Between Failures (MTBF) is calculated using number of failures and time between each failure, widely used measure of quality.

Software Maintenance Life Cycle (SMLC):
- receive a Maintenance Request
- transform the Maintenance Request to a Change (analysis)
- specify the Change (design)
- develop the Change (code)

Overall goal is to manage change effectively:
- Organisations implement change management systems in an attempt to reduce the confusion and complexity of developing and maintaining systems.

The aims of change management systems are:
- restrict access to production source and object code
- reduce errors being introduced into production
- single version of source and object code in production
- improve quality and reliability of software
- increase security and control
- increase software productivity

Occasionally system failure is inevitable!
Topic: Maintenance

References
