Chapter 3

Part 3

2-Dimensional Life Cycle Models Review

Improving the Process

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3.11 One- and Two-Dimensional Life-Cycle Models

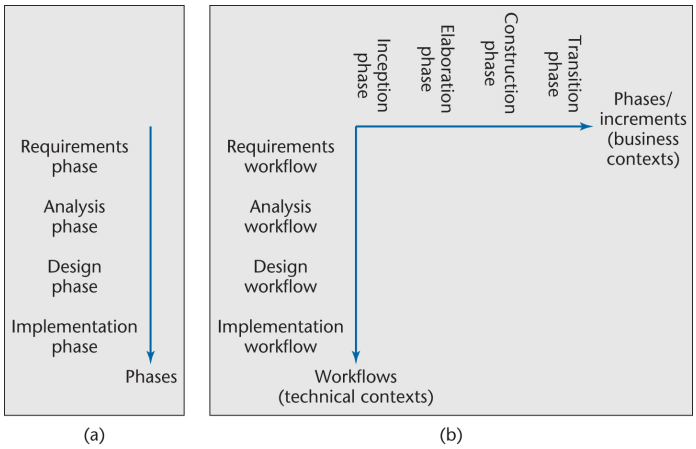

Figure 3.2

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Why a Two-Dimensional Model?

- A traditional life cycle is a one-dimensional model
  - Represented by the single axis on the previous slide
    - Example: Waterfall model
- The Unified Process is a two-dimensional model
  - Represented by the two axes on the previous slide
- The two-dimensional figure shows
  - The workflows (technical contexts) and
  - The phases (business contexts)

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Why a Two-Dimensional Model?

- The waterfall model
- One-dimensional

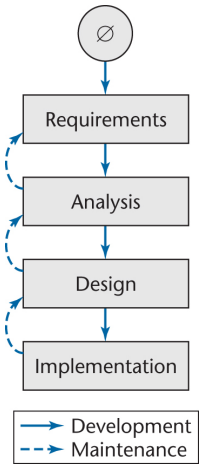

Figure 2.3 (again)

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Why a Two-Dimensional Model?

- Evolution tree model
- Two-dimensional

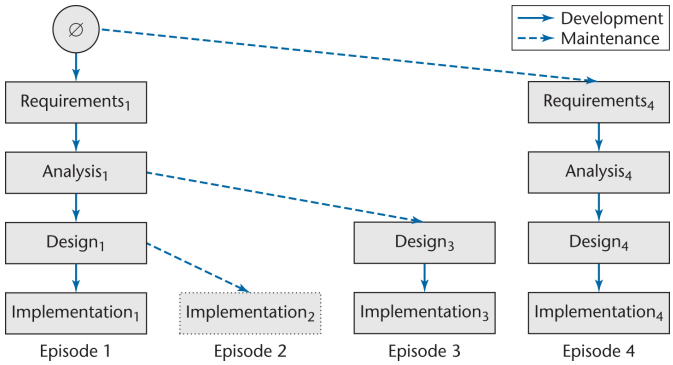

Figure 2.2 (again)

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Why a Two-Dimensional Model?

- Are all the additional complications of the two-dimensional model necessary?
- In an ideal world, each workflow would be completed before the next workflow is started

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3.12 Improving the Software Process

- Example:
- U.S. Department of Defense initiative
- Software Engineering Institute (SEI)
- The fundamental problem with software
  - The software process is badly managed

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Improving the Software Process

- Software process improvement initiatives
  - Capability maturity model (CMM)
  - ISO 9000-series
  - ISO/IEC 15504

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3.13 Capability Maturity Models

- Not life-cycle models
- Rather, a set of strategies for improving the software process
  - SW–CMM for software
  - P–CMM for human resources (“people”)
  - SE–CMM for systems engineering
  - IPD–CMM for integrated product development
  - SA–CMM for software acquisition
- These strategies are unified into CMMI (capability maturity model integration)

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SW–CMM

- A strategy for improving the software process
- Put forward in 1986 by the SEI
- Fundamental ideas:
  - Improving the software process leads to
    - Improved software quality
    - Delivery on time, within budget
  - Improved management leads to
    - Improved techniques

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SW–CMM

- Five levels of *maturity* are defined
  - Maturity is a measure of the goodness of the process itself
- An organization advances stepwise from level to level

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Level 1. Initial Level

- Ad hoc approach
  - The entire process is unpredictable
  - Management consists of responses to crises
- Most organizations world-wide are at level 1

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Level 2. Repeatable Level

- Basic software management
  - Management decisions should be made on the basis of previous experience with similar products
  - Measurements ("metrics") are made
  - These can be used for making cost and duration predictions in the next project
  - Problems are identified, immediate corrective action is taken

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Level 3. Defined Level

- The software process is fully documented
  - Managerial and technical aspects are clearly defined
  - Continual efforts are made to improve quality and productivity
  - Reviews are performed to improve software quality
  - CASE environments are applicable *now* (and not at levels 1 or 2)

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Level 4. Managed Level

- Quality and productivity goals are set for each project
  - Quality and productivity are continually monitored
  - Statistical quality controls are in place

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Level 5. Optimizing Level

- Continuous process improvement
  - Statistical quality and process controls
  - Feedback of knowledge from each project to the next

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Summary

5. Optimizing level: Process control	Defect prevention Technology change management Process change management
4. Managed level: Process measurement	Quantitative process management Software quality management
3. Defined level: Process definition	Organization process focus Organization process definition Training program Integrated software management Software project engineering Intergroup coordination Peer reviews
2. Repeatable level: Basic project management	Requirements management Software project planning Software project tracking and oversight Software subcontract management Software quality assurance Software configuration management
1. Initial level: Ad hoc process	Not applicable

Figure 3.3

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Experiences with SW–CMM

- It takes:
  - 3 to 5 years to get from level 1 to level 2
  - 1.5 to 3 years from level 2 to level 3
  - SEI questionnaires highlight shortcomings, suggest ways to improve the process

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Key Process Areas

- There are key process areas (KPAs) for each level

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Key Process Areas

- Level-2 KPAs include:
  - Requirements management
  - Project planning
  - Project tracking
  - Configuration management
  - Quality assurance
- Compare
  - Level 2: Detection and correction of faults
  - Level 5: Prevention of faults

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Summary

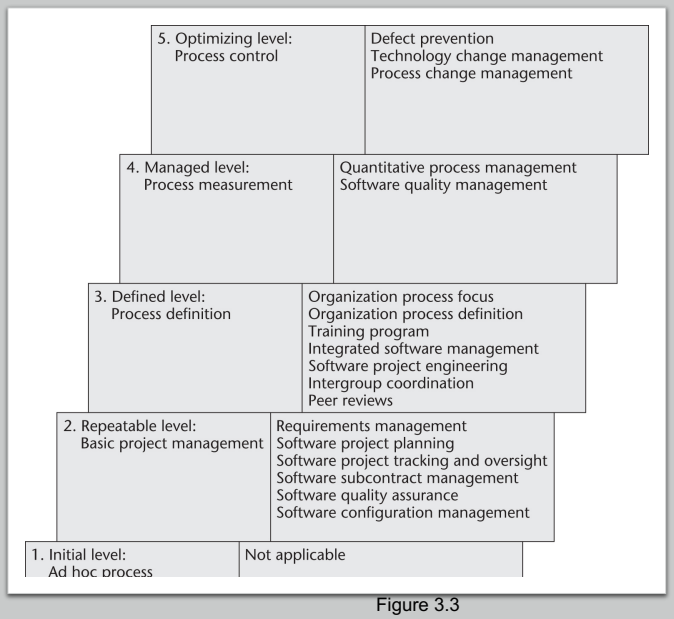

Figure 3.3

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Goals

- Original goal:
  - Defense contracts would be awarded only to capable firms
- The U.S. Air Force stipulated that every Air Force contractor had to attain SW–CMM level 3 by 1998
  - The DoD subsequently issued a similar directive
- The CMM has now gone far beyond the limited goal of improving DoD software

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3.14 Other Software Process Improvement Initiatives

- Other software process improvement (SPI) initiatives include:
  - ISO 9000-series
  - ISO/IEC 15504

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ISO 9000

- A set of five standards for industrial activities
  - ISO 9001 for quality systems
  - ISO 9000-3, guidelines to apply ISO 9001 to software
  - There is an overlap with CMM, but they are not identical
  - *Not* process improvement
  - There is a stress on documenting the process
  - There is an emphasis on measurement and metrics
  - ISO 9000 is required to do business with the EU
  - Also required by many U.S. businesses, including GE
  - More and more U.S. businesses are ISO 9000 certified

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The End

Chapter 3

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