Software Engineering

Iteration and Incrementation

Art and Engineering Discipline

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2.5 Iteration and Incrementation

- In real life, we cannot speak about “the analysis phase”
  - Instead, the operations of the analysis phase are spread out over the life cycle
- The basic software development process is iterative
  - Each successive version is intended to be closer to its target than its predecessor

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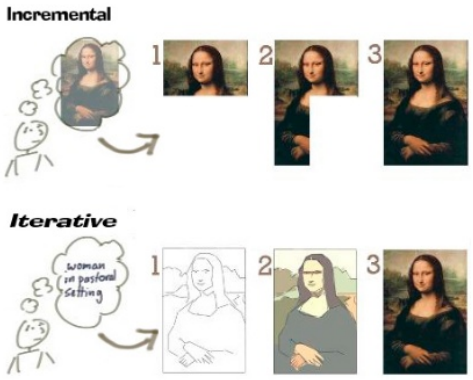
Incremental vs. Iterative



http://www.infoq.com/resource/news/2008/01/iterating-and-incrementing/en/resources/Patton_Incremental_Iterative_MnaLisa.jpg

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Miller's Law

- At any one time, we can concentrate on only approximately seven *chunks* (units of information)
- To handle larger amounts of information, use *stepwise refinement*
  - Concentrate on the aspects that are currently the most important
  - Postpone aspects that are currently less critical
  - Every aspect is eventually handled, but in order of current importance
- This is an *incremental* process

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Iteration and Incrementation (contd)

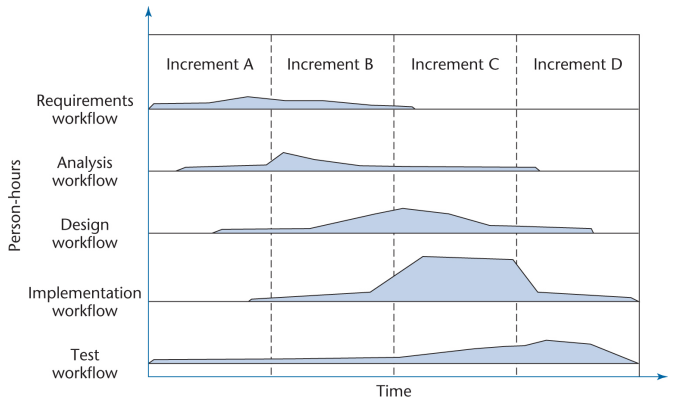

Figure 2.4

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Iteration and Incrementation (contd)

- Iteration and incrementation are used in conjunction with one another
  - There is no single "requirements phase" or "design phase"
  - Instead, there are multiple instances of each phase

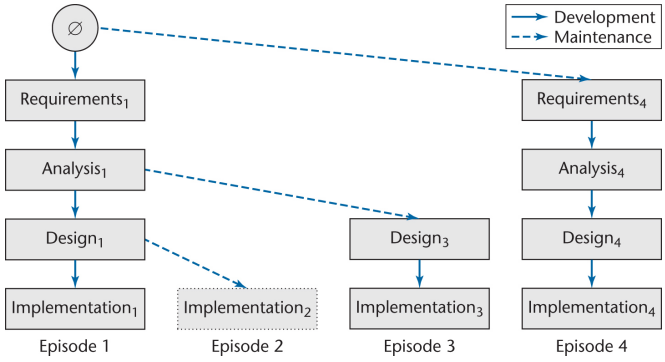

Figure 2.2 (again)

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Iteration and Incrementation

- The number of increments will vary — ~~it does not have to be~~ It won't be four!

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Classical Phases versus Workflows

- Sequential phases do not exist in the real world
- Instead, the five core workflows (activities) are performed over the entire life cycle
  - Requirements workflow
  - Analysis workflow
  - Design workflow
  - Implementation workflow
  - Test workflow

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Iteration and Incrementation (contd)

Iteration is performed during each incrementation

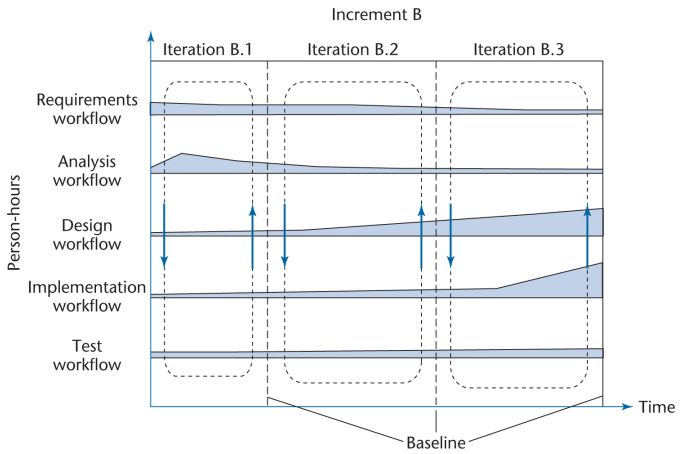

Figure 2.5

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Iteration and Incrementation

- Again, the number of ***iterations*** will vary—it is not always three.
- **It won't be three.**

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2.7 Risks and Other Aspects of Iter. and Increm.

- We can consider the project as a whole as a set of mini projects (increments)
- Each mini project extends the
  - Requirements artifacts
  - Analysis artifacts
  - Design artifacts
  - Implementation artifacts
  - Testing artifacts
- The final set of artifacts is the complete product

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Risks and Other Aspects of Iter. and Increm.

- During each mini project we
  - Extend the artifacts (incrementation);
  - Check the artifacts (test workflow); and
  - If necessary, change the relevant artifacts (iteration)

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Risks and Other Aspects of Iter. and Increm. (contd)

- Each iteration can be viewed as a small but complete **waterfall life-cycle model**
- During each iteration we select a portion of the software product
- On that portion we perform the
  - Classical requirements phase
  - Classical analysis phase
  - Classical design phase
  - Classical implementation phase

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Strengths of the Iterative-and-Incremental Model

- There are multiple opportunities for checking that the software product is correct
  - Every iteration incorporates the test workflow
  - Faults can be detected and corrected early
- The robustness of the architecture can be determined early in the life cycle
  - **A*rchitecture* — the various component modules and how they fit together**
  - *Robustness* — the property of being able to handle extensions and changes without falling apart

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Strengths of the Iterative-and-Incremental Model (contd)

- We can *mitigate* (resolve) risks early
  - Risks are invariably involved in software development and maintenance
- We have a working version of the software product from the start
  - The client and users can experiment with this version to determine what changes are needed
- Variation: Deliver partial versions to smooth the introduction of the new product in the client organization

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Strengths of the Iterative-and-Incremental Model

- There is empirical evidence that the life-cycle model works
- The CHAOS reports of the Standish Group (see overleaf) show that the percentage of successful products increases
- Page 51 in your book

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2.8 Managing Iteration and Incrementation

- The iterative-and-incremental life-cycle model is as regimented as the waterfall model …
- … because the iterative-and-incremental life-cycle model *is* the waterfall model, applied successively
- Each increment is a waterfall mini project

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Conclusion

Discipline is always required

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