The University of Iowa

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Object-Oriented Software Development

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Iterative Evolutionary Development

by

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Iterative and Evolutionary Development

Software development approach emphasizing

early programming and

testing of a partial system

in repeating cycles

Iterative and Evolutionary Development

- Development starts before all the requirements are defined in detail
- Feedback is used to clarify and improve evolving specifications
- Relies on short quick development steps, feedback, and adaptation to clarify the requirements and design

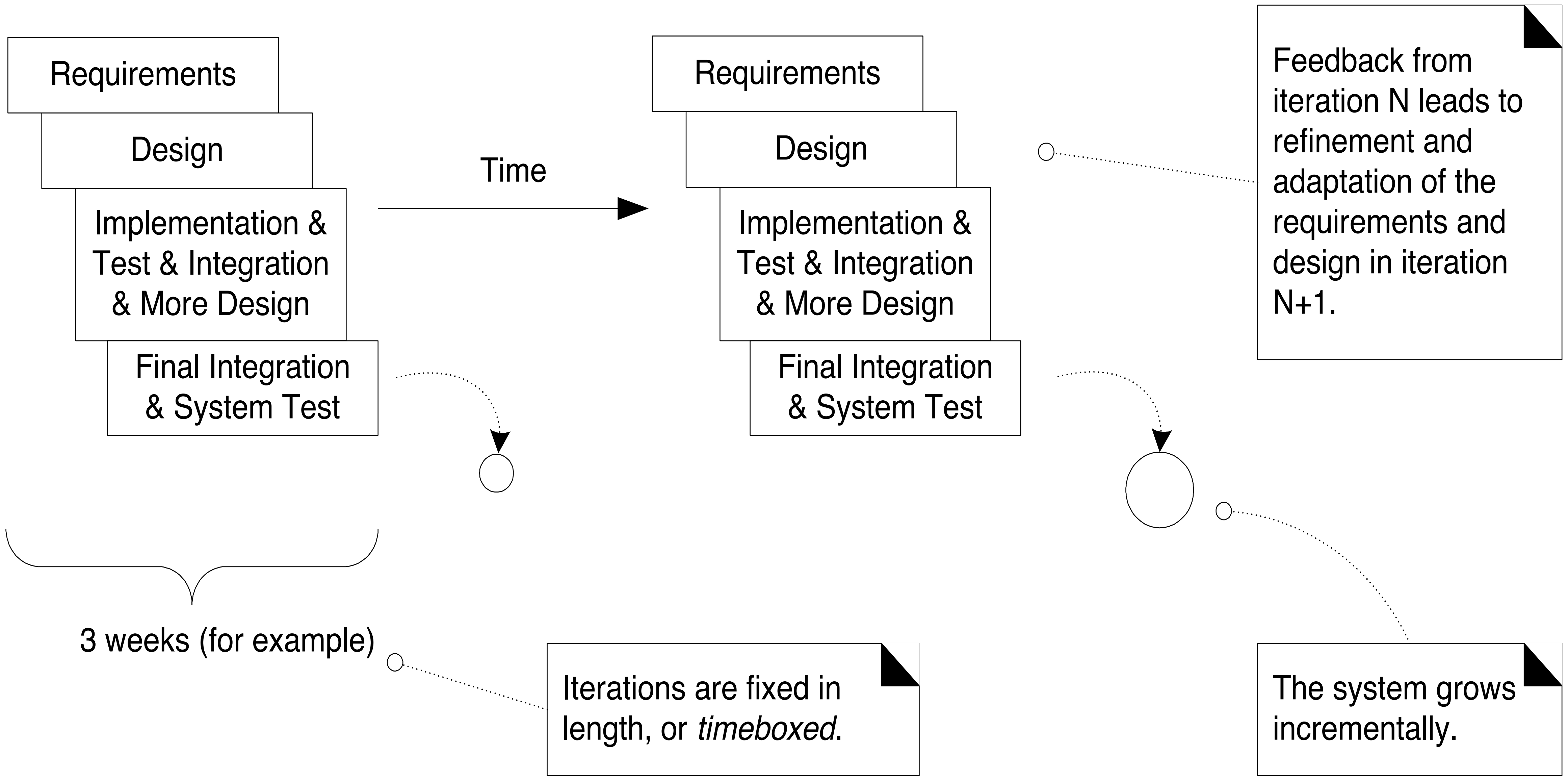
The Unified Process

- Popular iterative process for projects using OO analysis and design
- Combines commonly accepted best practices into a cohesive and well-documented process
- For us, it is an example how to do, and so explain, OO analysis and design
- It promotes iterative and evolutionary development

Iterative Development

- Development is organized into a series of short, fixed-length mini-projects (iterations)
- The outcome of each iteration is a tested, integrated, and executable partial system
- Each iteration includes its own requirements analysis, design, implementation, and testing activities

Iterative and evolutionary development


Requirements
Design
Implementation & Test & Integration & More Design
Final Integration & System Test
Time
Requirements
Design
Implementation & Test & Integration & More Design
Final Integration & System Test
3 weeks (for example)

Feedback from iteration N leads to refinement and adaptation of the requirements and design in iteration N+1.

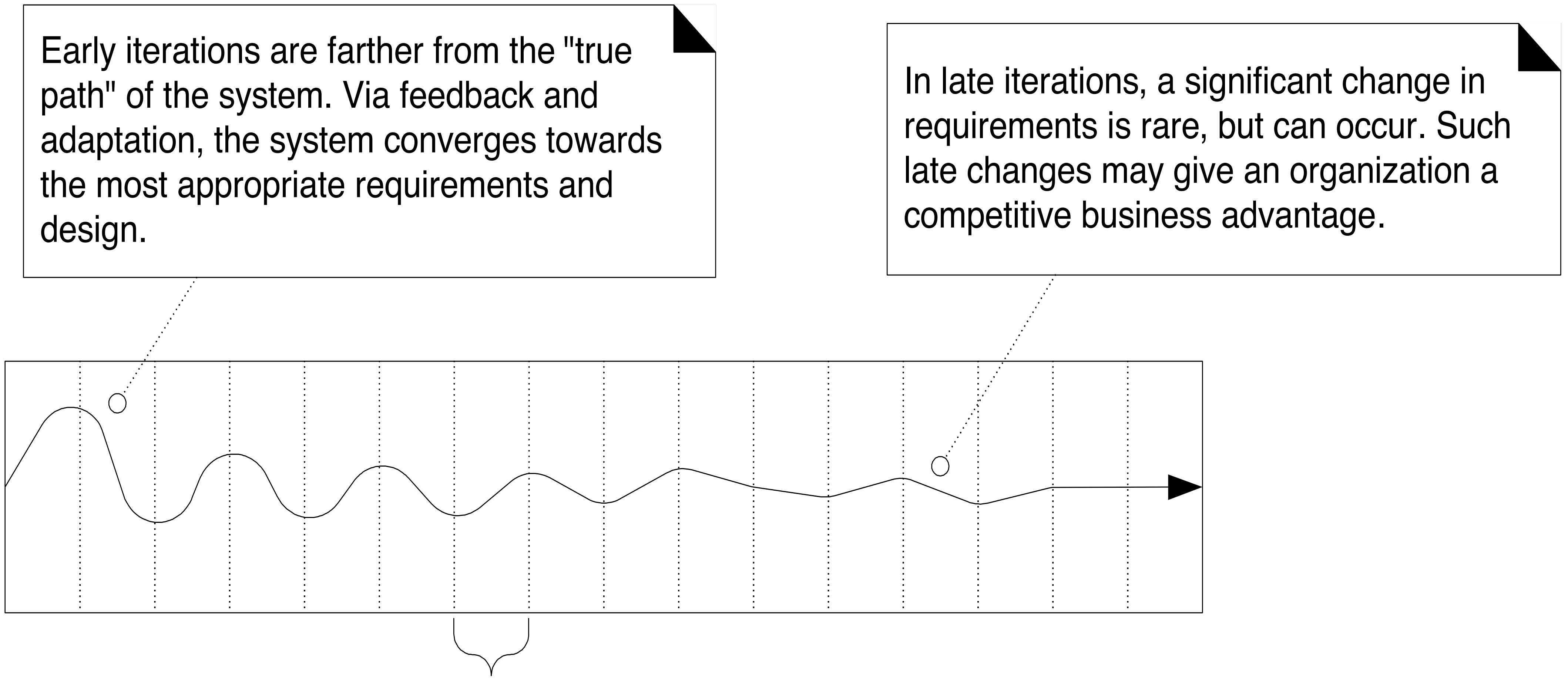
Iterations are fixed in length, or *timeboxed*.

The system grows incrementally.

Iterative Development

- The process lifecycle is based on the successive enlargement and refinement of a system through multiple iterations
- Cyclic feedback and adaptation are core drivers to converge upon a suitable system
- The system grows incrementally over time, iteration by iteration
- Specification and design evolve as a result of feedback and adaptation

Iterative and evolutionary development


Early iterations are farther from the "true path" of the system. Via feedback and adaptation, the system converges towards the most appropriate requirements and design.
In late iterations, a significant change in requirements is rare, but can occur. Such late changes may give an organization a competitive business advantage.

one iteration of design, implement, integrate, and test

Benefits

- Fewer project failures, better productivity, and lower defect rates
- Early rather than late mitigation of high risks (technical, requirements, objectives, usability, ...)
- Early visible progress

Benefits

- A refined system that more closely meets the real needs of the stakeholders
- Managed complexity (the team is not overwhelmed by "analysis paralysis" or very long and complex steps)
- The learning within an iteration can be methodically used to improve the development process itself

Risk-Driven and Client-Driven Iterative Planning

- The UP encourages a combination of
  - risk-driven iterative planning and
  - client-driven iterative planning
- Early iterations aimed at
  1. identifying and reducing the highest risks
  2. building visible features the client cares most about

Other Critical UP Practices

- Tackle high-risk and high-value issues in early iterations
- Continuously engage users for evaluation, feedback, and requirements
- Build a cohesive, core architecture in early iterations
- Continuously verify quality; test early, often, and realistically

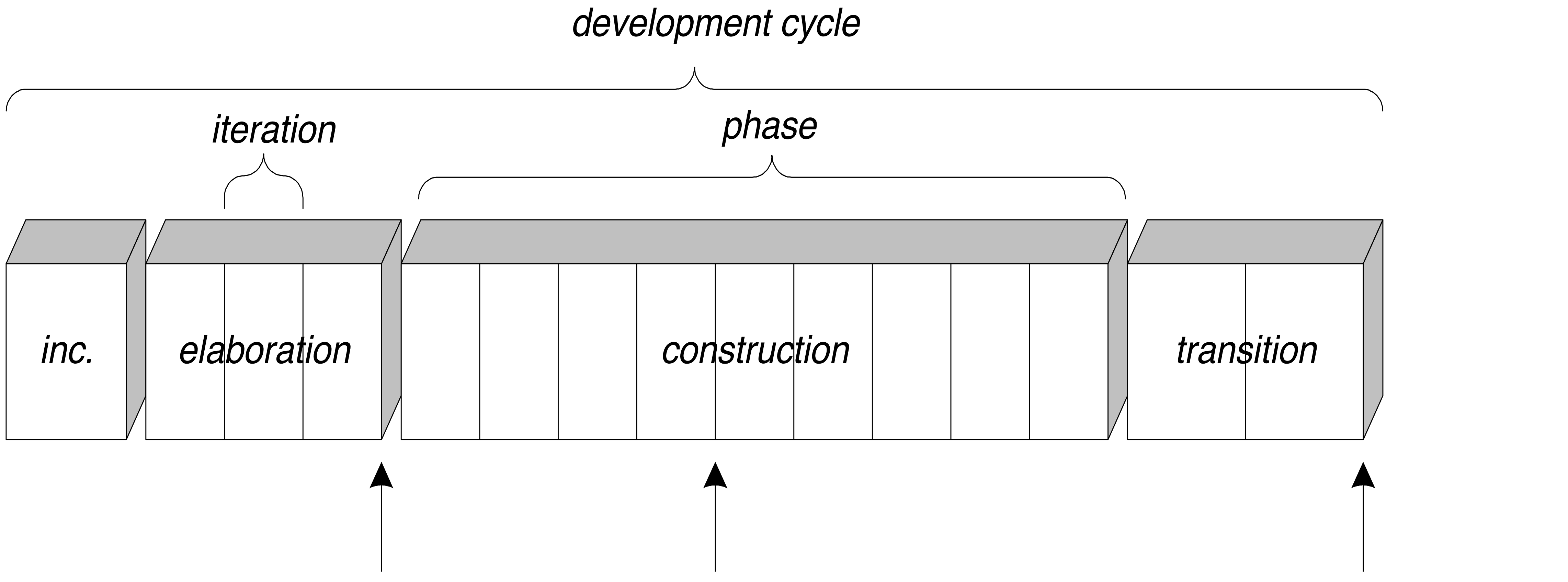
Other Critical UP Practices

- Apply use cases where appropriate
- Do some visual modeling (with UML)
- Carefully manage requirements
- Practice change request and configuration management

UP Phases

1. **Inception**—approximate vision, business case, scope, vague estimates
2. **Elaboration**—refined vision, iterative implementation of the core architecture, resolution of high risks, identification of most requirements and scope, more realistic estimates
3. **Construction**—iterative implementation of the remaining lower risk and easier elements, and preparation for deployment
4. **Transition**—beta tests, deployment

UP Development Cycle



milestone

An iteration end-point when some significant decision or evaluation occurs.

release

A stable executable subset of the final product. The end of each iteration is a minor release.

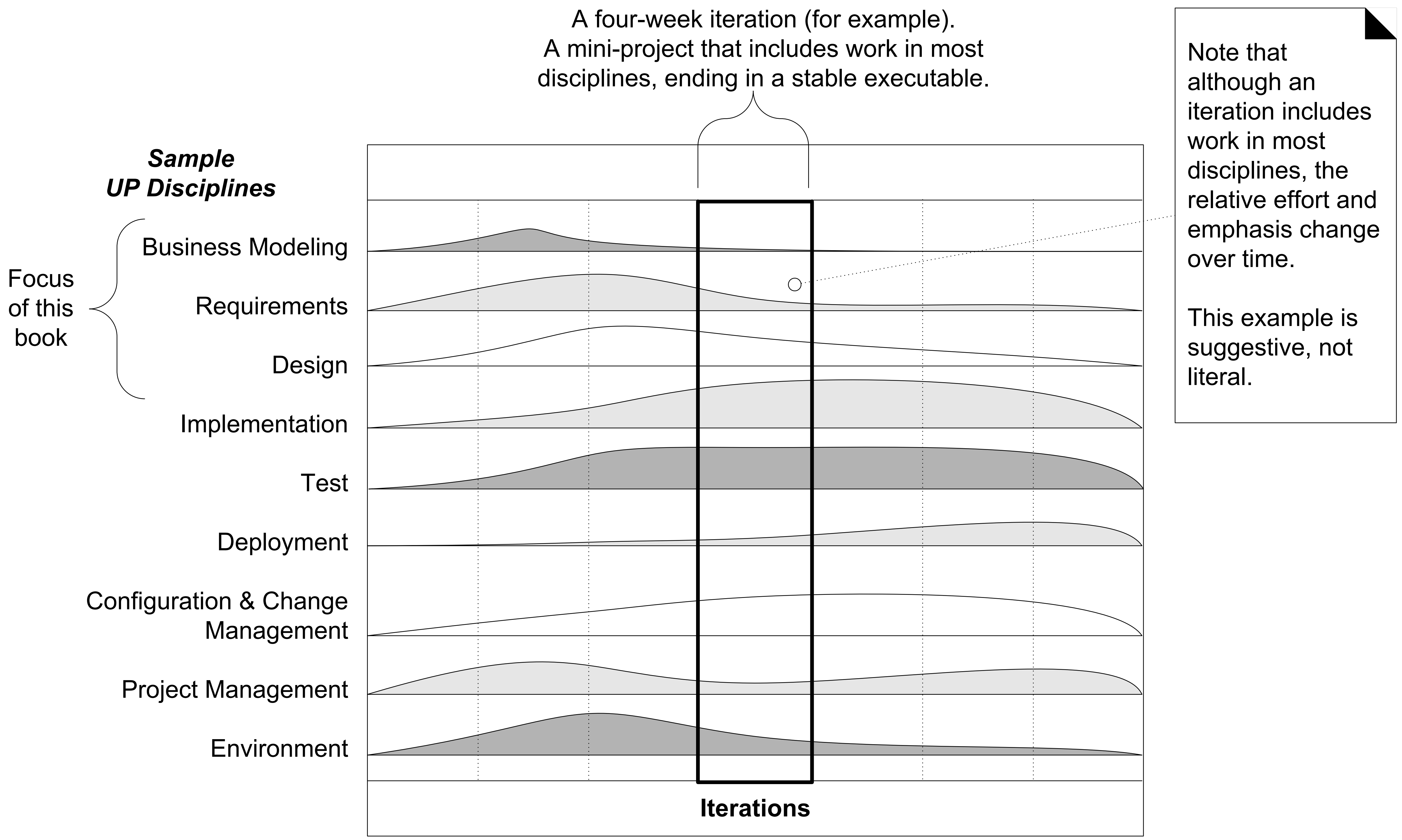
increment

The difference (delta) between the releases of 2 subsequent iterations.

final production release

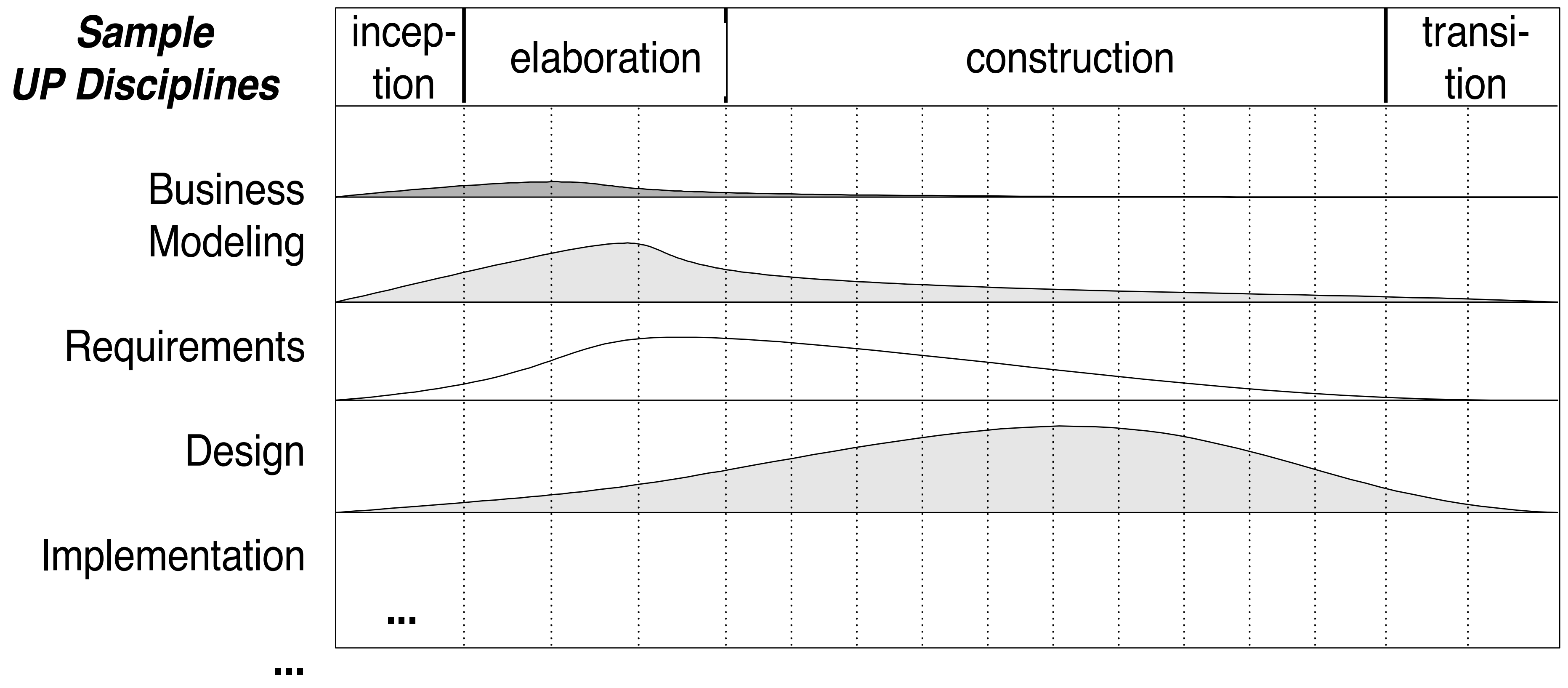
At this point, the system is released for production use.

UP Disciplines



A four-week iteration (for example).
A mini-project that includes work in most disciplines, ending in a stable executable.
Note that although an iteration includes work in most disciplines, the relative effort and emphasis change over time.
This example is suggestive, not literal.
Sample UP Disciplines
Focus of this book
Business Modeling
Requirements
Design
Implementation
Test
Deployment
Configuration & Change Management
Project Management
Environment
Iterations

Disciplines across Phases



The relative effort in disciplines shifts across the phases.

This example is suggestive, not literal.

Credits

Notes and figures adapted from

Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development by C. Larman. 3rd edition. Prentice Hall/Pearson, 2005.