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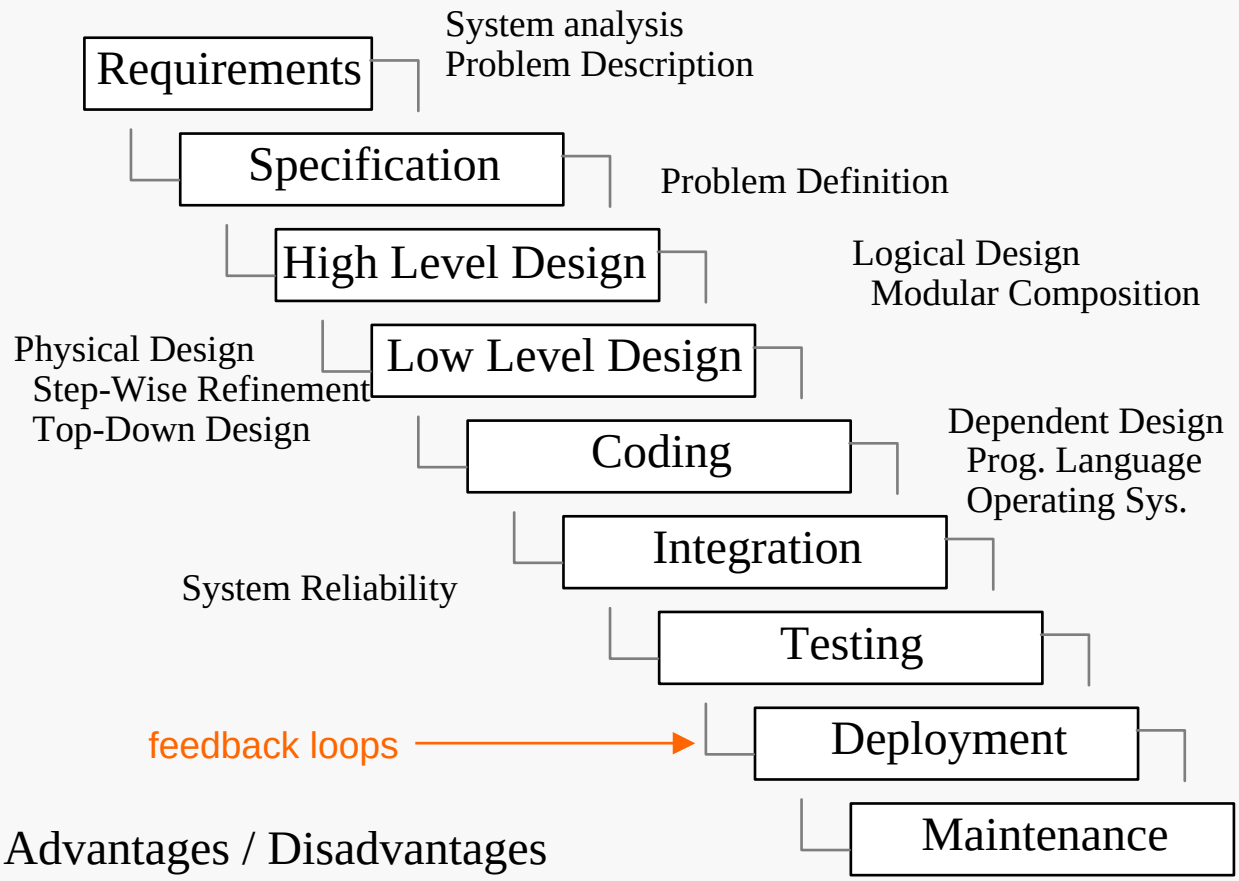
Waterfall Model

Phases



Advantages / Disadvantages

- Most-widely used process model
- Controls schedules, budgets & documentation
- Tends to favor well-understood system aspects over poorly understood system components, (no risk analysis)
- Does not detect development areas behind schedule early in the lifecycle stages.

Document-driven process

- Deliverables: documents produced at the end of each phase, usually in accordance to contract deadlines

Waterfall Model: Phases

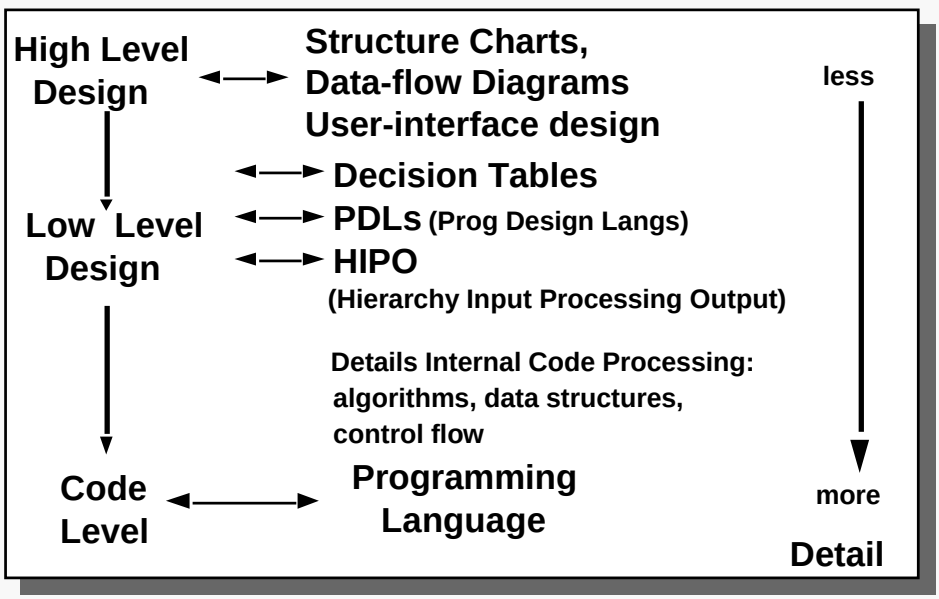
Requirements

- A statement of the functions and behavior of the system required by its users & operators
- General Requirements
  - † Defines broad & detailed objectives of the system
  - † e.g., reliable, correct, efficient, user-friendly, expandable
- Gives relationship of Qualitative & Quantitative System Goals

Specification

- Listing of specific, **measurable** behavioral system constraints that satisfy system requirements
- Clearly communicates system operations with end user(s)
  - † complete, unambiguous, minimal, understandable, testable
- Cross-reference indexed to requirement items
- Defines the design validation & final system testing criteria
- Provides chief mechanism for estimating the project's progress

Design: Representation or model of a system



Coding and Debugging (implementation)

- Translation of design into a programming language
- Indispensable Programmer Phenomena
- Program Unit Notebooks
  1. Documents programmer's work activities
  2. Maintains current unit (module) documentation
  3. Passed from programmer to programmer during development

Unit Name:_____ Programmer:_____
Routines Included:_____

SECTION	CONTENTS	DUE DATE	COMPLETED DATE	REVIEWER/DATE
1.	RQMTS.			
2.	ARCH. DESIGN			
3	DETAIL DESIGN			
4.	TEST PLAN			
5.	TEST RESULTS			
6.	CHANGE REQUESTS			
7.	SOURCE CODE			
8.	NOTES			

RELEASE APPROVAL:_____ DATE:_____

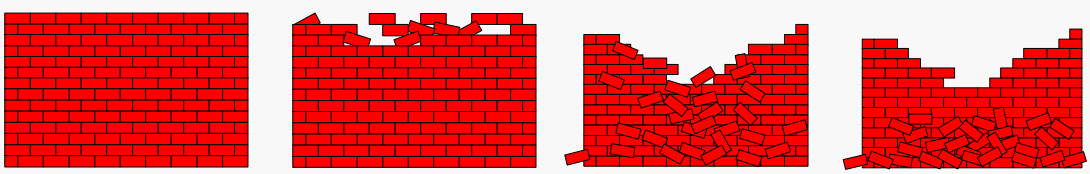
Waterfall Model: Phases (cont)

Integration and Testing

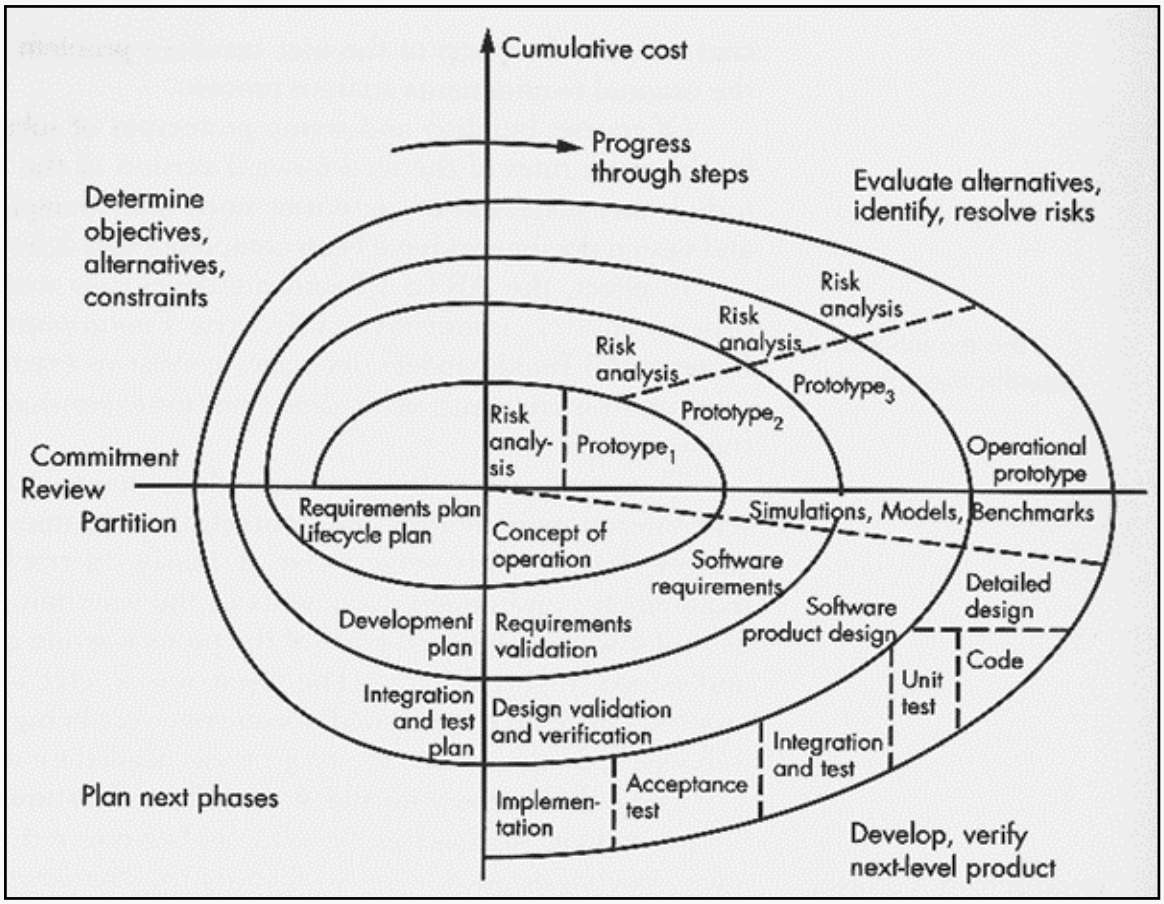
- Unit testing: individual modules (functions) are tested separate from other modules
- Integration testing: system modules are tested together

Deployment & Maintenance

- Requires previous phases to be repeated
- Makes up **70%-90%** of total system cost
- Majority of maintenance time (50%) spent on system understanding -> system documentation
- Maintenance Tasks
  - † collection, analysis and prioritization of user trouble reports
  - † new system release installations
  - † documentation (user's manuals) changes
  - † configuration control issues



The Spiral Software Process Model Diagram



Barry Boehm, "A Spiral Model of Software Development and Enhancement", Computer, (May 1988), pp. 61-72, © 1988 IEEE.

- Development phases reiterates through four cycles:
  - † Set goals and determine constraints for the phase
  - † Evaluate and resolve risks for the phase
  - † Develop the prototype for the phase
  - † Plan the next stage activities
- Step 2 involves a Risk Analysis that identifies:

  less understood system areas
  systems areas that pose the greatest jeopardy to development

Spiral Model (cont)

Prototype Based

- Prototype: a limited, semi-functional, task restricted, partially operational system
  - † Analogous to a model or mockup that allows evaluation of development alternatives before commitment
- Rapid Prototyping Systems
  - † Authoring/scripting (multimedia) systems used to quickly develop multiple interfaces for user evaluation, cannot serve as a kernel for future iterative system prototype development
  - † Users tend to view prototypes as final versions of the system

Mimic

- Risk analysis produces a risk-resolution strategy
  - † Feasibility Study: determination of a strategy achieving set goals and requirements within stated constraints.
    - ‡ Address development factors of expertise, experience, resources and motivation
  - † Extension of cost/benefit analysis
    - ‡ cost & benefits are estimated for best & worst case outcomes which are multipled by their probability of occurrence giving an expected value.
    - ‡ Decisions on strategies are made to minimize cost and maximize benefits
- Cycles are modified to concentrate on different areas of system development driven by the risk-resolution plan
- Spiral model tends to behave like other process models due to differing cycles