
Life Cycle

CSE 403, Spring 2004
Software Engineering

<http://www.cs.washington.edu/education/courses/403/04sp/>

Readings and References

- Reading
 - » *Rapid Development*, Steve McConnell
 - Chapter 7, Lifecycle Planning
- Other References
 - » *Anchoring the Software Process*, Barry Boehm, USC, 1995
 - <http://citeseer.nj.nec.com/boehm95anchoring.html>

The dreams of yesterday

- Boehm [1995]
 - » "For a few golden moments in the mid-1970's, it appeared that the software field had found a sequence of common anchor points"
 - » "a sequence of milestones around which people could plan, organize, monitor, and control their projects"

A Lifecycle

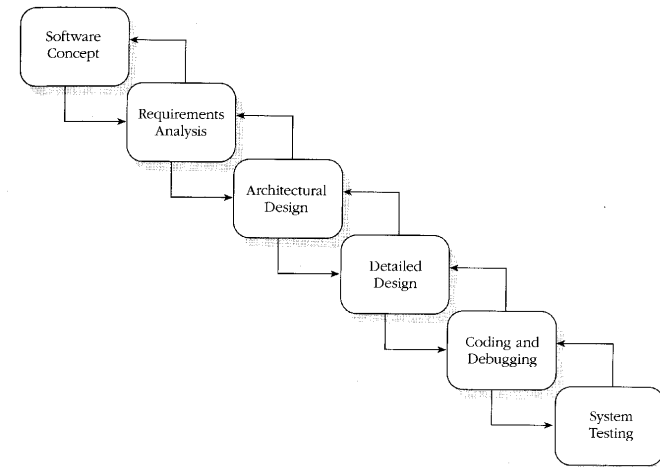


- The main function of a lifecycle model is to establish order in which project events occur
- Typical events include
 - » specification, prototype, design, implementation, test, deliver, and do it again
- But they usually don't happen in nice clean little stages like this
 - » so we develop various models and tweaks to try to maintain the benefits and still be realistic

"good enough" now vs "perfect" later

- The goal is often
 - » not to achieve what you said you would at the beginning of the project
 - » but to achieve the maximum possible within the time and resources available
 - » Sherman 1995, reference in McConnell
- Do deliver a small and useful tool on time
- Don't deliver a monster way too late
 - » Fancy doodads have a tendency to be junk anyway

Classic Waterfall



Characteristics

- Orderly sequential model
- Stages are disjoint
 - » they don't overlap and you can't go forward until you've completed the current stage
 - » you can't go back except with extreme difficulty
- Reviews at each stage to determine if ready to advance to next stage
- Document driven
 - » specific documents *will be complete* at each stage
 - yeah, right

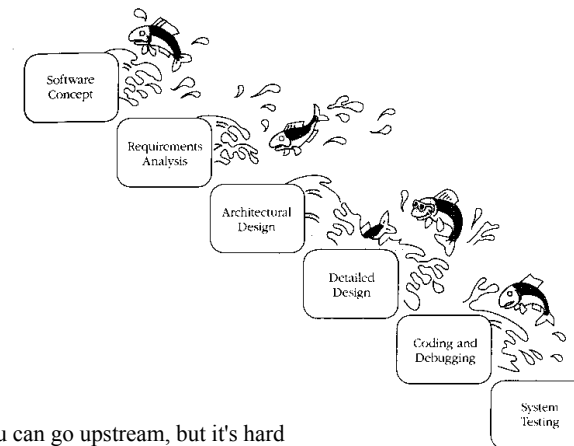
Some issues

- Very difficult to specify all requirements completely and correctly all at once
 - » completely → lots and lots of detail
 - » correctly → every single detail is correct
 - » produces masses and masses of detail that will be irrelevant if some early decision changes
- Difficult to accurately say everything at once
- Gold plating requirements is tempting
- Inflexible solutions based on invalid detail

More issues

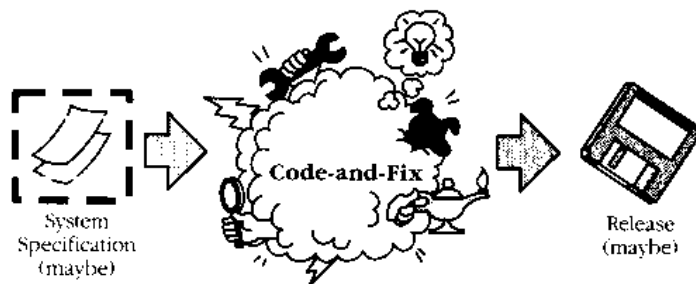
- Since so much is resting on getting it right before leaving each stage, the reviews tend to be massive affairs
 - » a lot of work goes into preparing for each review
 - » that makes it even more expensive to change direction if a review shows problems
 - » if a review is delayed or problems are found, the entire project sits in a loop while the problems are resolved - \$\$\$

Salmon lifecycle model



You can go upstream, but it's hard

Code and fix



Code and fix is dangerous

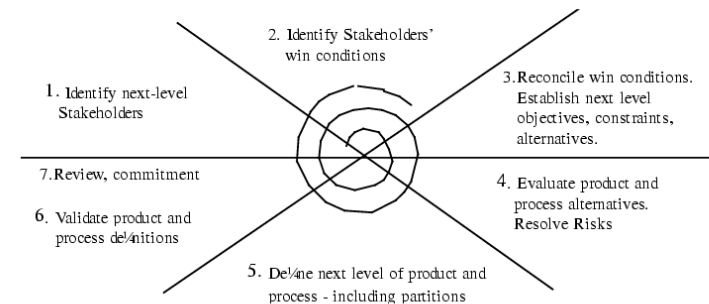
- No means of assessing progress
 - » nasty surprises are not a good thing for your career
 - » Yes: "I'm not worried, I know where they are in the project and they always deliver a useful product on time."
 - » No: "I don't know. You remember the project when they were 95% complete for three months and then cancelled?"
- Risk of complete project failure right up to delivery

Spiral Model

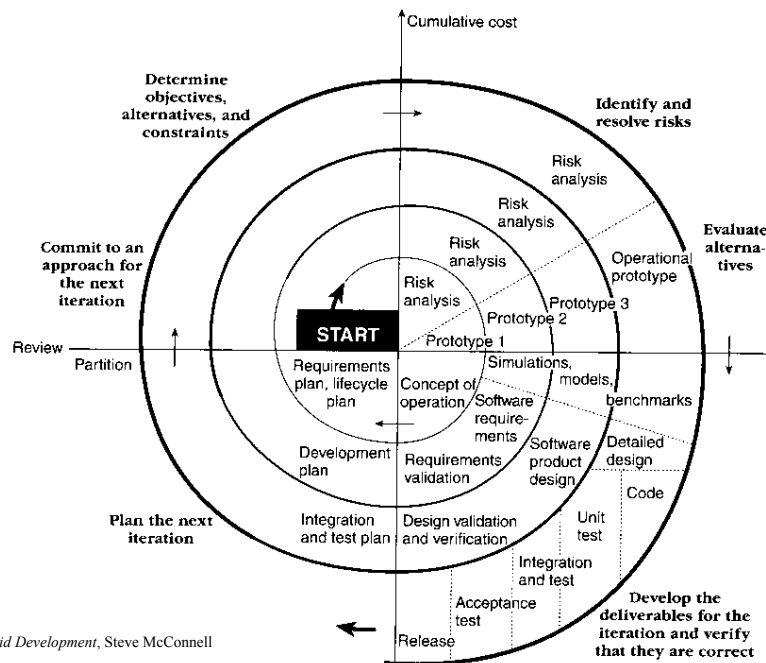
- Oriented towards phased reduction of risk
- Take on the big risks early and make some decisions
 - » are we building the right product?
 - » do we have any customers for this product?
 - » is it possible to implement the product with the technology that exists today? tomorrow?
 - » does the company want to be in this business?
 - should the company be in this business?

Spiral Model

FIGURE 1. The Win-Win Spiral Model



Anchoring the Software Process, Barry Boehm, USC, 1995



Spiral steps

- Determine objectives, alternatives, constraints
- Identify and resolve risks
- Evaluate alternatives
- Develop the deliverables for the iteration and verify that they are correct
- Plan the next iteration
- Commit to an approach for accomplishing the next iteration or cancel the project

Spiral early and often

- The spiral model is especially appropriate at the beginning of the project when the requirements are still fluid
- Risk reduction is the key element
 - » early cancellation of bad projects is a major benefit
 - » confidence that you're building the right product is a major benefit

Milestones

- Key elements of project milestones
 - » stakeholder concurrence on the system's objectives
 - » determination and validation of system architecture
- Traditional
 - » Requirements review, preliminary design review, final design review, acceptance test
- Boehm Spiral
 - » Lifecycle Objectives, Lifecycle Architecture, Initial Operating Capability

Elements of Lifecycle Objectives (LCO)

- Operational Concepts - **What is it?**
 - » Top level system objectives and scope
- System Requirements - **What does it do for us?**
 - » essential system features at an appropriate level
- System and software architecture - **How?**
 - » support analysis of feasibility at this level
- Lifecycle plan - **Who wants it? Who'll support it?**
 - » identification of the major stakeholders now, future
- Feasibility Rationale - **Is this really true?**
 - » Evaluate conceptual integrity and compatibility

Elements of Lifecycle Architecture (LCA)

- Operational Concepts - **What is it?**
 - » Elaboration of objectives and concepts
- System Requirements - **What does it do for us?**
 - » Functions and interfaces, identify TBDs
- System and software architecture - **How?**
 - » What is the actual design selection. Any risks?
- Lifecycle plan - **Who wants it? Who'll support it?**
 - » Elaboration of who does what over the lifecycle
- Feasibility Rationale - **Is this really true?**
 - » Evaluate conceptual integrity and compatibility

Initial Operational Capability (IOC)

- Software preparation
 - » Are we really ready to go live?
 - » Good release, support software, docs, data, ...
- Site preparation
 - » Facilities, equipment, supplies, commercial off-the-shelf software (COTS) in place, ...
- User, operator, maintainer preparation
 - » training, team building, for everyone who will be actually working with the darn thing