Life Cycle

CSE 403, Winter 2006
Software Engineering

http://www.cs.washington.edu/education/courses/403/06wi/

Readings and References

• Reading

• Other References
  » Anchoring the Software Process, Barry Boehm, USC, 1995
    • http://citeseer.ist.psu.edu/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**

1. Identify next-level stakeholders
2. Identify stakeholders
4. Evaluate product and process alternatives. Resolve Risks
5. Define next level of product and process - including partitions
6. Validate product and process definitions
7. Review, commitment

**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