Readings and References

Lifecycle

CSE 403, Spring 2003 Software Engineering

http://www.cs.washington.edu/education/courses/403/03sp/

• Reading

7-April-2003

- » The Mythical Man-Month, Brooks
 - Chapters 6-10
- » Rapid Development, Steve McConnell
 - Chapter 7, Lifecycle Planning
- Other References
 - » Anchoring the Software Process, Barry Boehm, USC, 1995

cse403-04-Lifecycle © 2003 University of Washington

• http://citeseer.nj.nec.com/boehm95anchoring.html

cse403-04-Lifecycle $\ensuremath{\textcircled{O}}$ 2003 University of Washington

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



2

- 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

3

"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

7-April-2003	cse403-04-Lifecycle © 2003 University of Washington	5	7-April-2003	cse403-04-Lifecycle © 2003 University of Washington	6

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

7-April-2003

7

_

Detailed

Design

Coding and Debugging

> System Testing

Architectural Design

Classic Waterfall

Software

Concept

Requirements



- Very difficult to specify all requirements completely and correctly all at once
 - » completely \rightarrow lots and lots of detail
 - » correctly \rightarrow 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

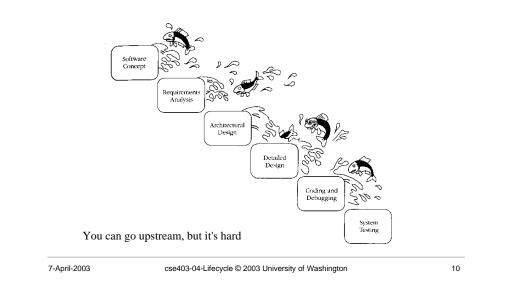
More issues

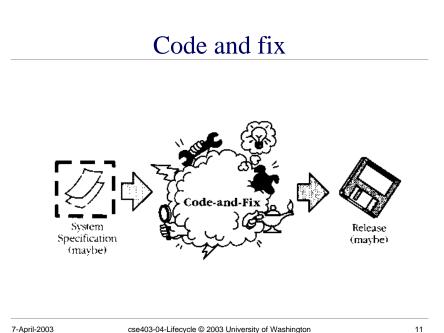
- Since so much is resting on getting it right before leaving each stage, the reviews tend to be massive affairs
 - » a lot of work goes into preparing for each review
 - » that makes it even more expensive to change direction if a review shows problems
 - » if a review is delayed or problems are found,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

cse403-04-Lifecycle © 2003 University of Washington

9

Salmon lifecycle model





cse403-04-Lifecycle © 2003 University of Washington

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

7-April-2003

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?

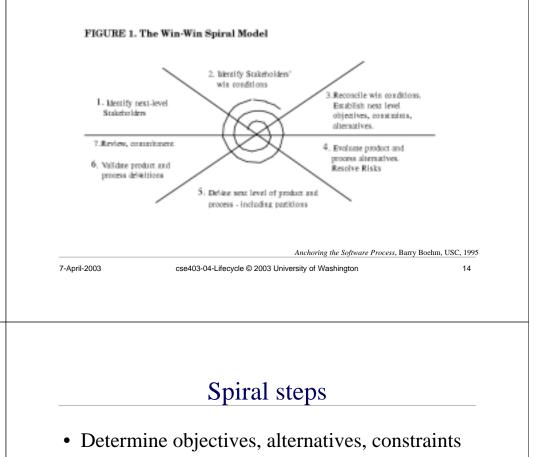
cse403-04-Lifecvcle © 2003 University of Washington

Cumulative cost

• should the company be in this business?

7-April-2003





Determine objectives, Identify and alternatives, and resolve risks constraint Risk analysis Risk analysis Evaluate Risk Commit to an alterna-Operationa analysis approach for tives prototype Risk the next analysis iteration Prototype 3 Prototype 2 START Prototype 1 Review Partition Simulations. Requirements models plan, lifecycle Concept o operation/Software benchmarks plan requirements Detailed Software Developmen Requirements product design olan validation design Code Unit Integration Plan the nex Design validation iteration and test plan : and verification test Integration and test Develop the Acceptance deliverables for the test iteration and verify Rapid Development, Steve McConnell Release that they are correct

- 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

13

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

cse403-04-Lifecycle © 2003 University of Washington

18

Elements of Lifecycle Objectives (LCO)

cse403-04-Lifecvcle © 2003 University of Washington

- 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

7-April-2003

19

17

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 offthe-shelf software (COTS) in place, ...
- User, operator, maintainer preparation
 - » training, team building, for everyone who will be actually working with the darn thing

7-April-2003	cse403-04-Lifecycle © 2003 University of Washington	21