CSE584: Software Engineering

Lecture 10: Wrap-up

David Notkin
Computer Science & Engineering
University of Washington
http://www.cs.washington.edu/education/courses/584/

Tonight

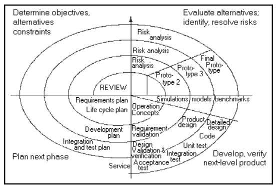
- A few brief technical topics
- Fred Brooks video
- Course evaluations (during or after video)

Unassigned papers in course pack

- B.W. Boehm (1988). A spiral model of software development and enhancement.
- L. Hatton (1997). Reexamining the fault density: Component size connection.
- N.G. Leveson (1986). Software safety: Why, what and how.
- D.L. Parnas & P. Clements (1986). A rational design process: How and why to fake it.
- D.L. Parnas & D.M. Weiss (1985). Active design reviews: Principles and practices.

Spiral model

- A risk-reduction software process
- In the waterfall model, “bad” decisions are identified very late
  - Vastly increasing the cost of fixing them
- In the spiral model, the risks are explicitly identified and accounted for
  - Iteratively



Reexamining the fault density: Component size connection

- Conventional wisdom is that smaller components contain proportionately fewer faults
- Hatton empirically found that medium-sized components were proportionately more reliable than large or small ones
- That is, there may be a “sweet spot” in component size with respect to faults

More

- It seems plausible, on another basis, that this sweet spot might exist
- Many system faults occur because of problems that arise at the interfaces of components
- Having a large number of small components, like in OO, may increase the number of interfaces and hence potential problems at the interfaces
- None of this should recommend building components of specific sizes
  - But it should keep our minds open about conventional wisdom, among other things

Software safety

- Software safety concerns reducing the risk of harm to people, the environment, or the economy when systems containing software fail
  - If you don't read comp.risks, you might want to peek at it now and then
- It is distinct from reliability, which focuses on increasing the chances that a system works properly
- Leveson literally wrote the book on this topic: *Safeware: System Safety and Computers*, Addison-Wesley, 1995
- Much of it is rooted in system analysis, with a focus on software requirements and specifications
  - The abilities of the human play a key role in her work
  - She's also worked more recently on human-centered design for safety

Rational design process

- A rational design process is one in which every step has a reason
- Even if a design is achieved through a muddled (not fully top-down nor bottom-up) process, it doesn't mean there aren't reasons
- Faking a rational design process after the fact allows revisionist history to be used to write clear documentation
- The inability to do so indicates a lack of clarity and conceptual integrity in the design

Active design reviews

- There is significant evidence that design reviews reduce errors in software systems
  - Boehm/Basili's rule of thumb is that peer reviews catch 60% of the defects
- Active design reviews are (in essence) disciplined and structured reviews
  - Not just a bunch of geeks in a room looking over a design
  - Another Boehm/Basili rule of thumb is that perspective-based reviews catch 35% more defects than nondirected reviews

Cost

- The cost of reviews is a key question
- The cost of preparing and holding the reviews is reasonably easy to identify
- The scheduling cost to a project due to delays in scheduling reviews is less clear

Bohem/Basili rules of thumb:
IEEE Computer January 2001

- Finding and fixing a software problem after delivery is often 100 times more expensive than finding and fixing it during the requirements and design phase
- Current software projects spend about 40-50% of their effort on avoidable rework
- About 80% of avoidable rework comes from 20 percent of the defects
- About 80 percent of the defects come from 20 percent of the modules, and about half the modules are defect free

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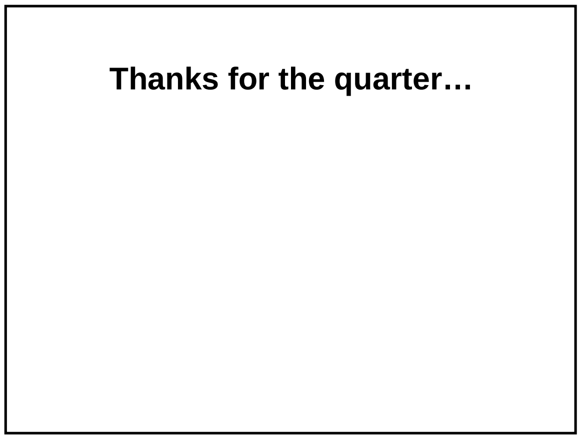
- About 90% of the downtime comes from, at most, 10 percent of the defects
- [already shown]
- [already shown]
- Disciplined personal practices can reduce defect introduction rates by up to 75%
- All other things being equal, it costs 50% more per source instruction to develop high-dependability software products than to develop low-dependability software products. However, the investment is more than worth it if the project involves significant operations and maintenance costs
- About 40-50% of user program contain nontrivial defects

Comments? Questions?

If not, let’s roll the movie…



Thanks for the quarter…