Lecture 6:
Formal Inspections

→ Types of Inspection

→ Benefits of Inspection

↳ Inspection is more cost effective than testing

→ How to conduct an inspection

↳ who to invite

↳ how to structure it

→ Some tips

Reviews, Walkthroughs, Inspections...

→ **"Management reviews"**
  ➢ E.g. preliminary design review (PDR), critical design review (CDR), ...
  ➢ Used to provide confidence that the design is sound
  ➢ Attended by management and sponsors (customers)
  ➢ Often just a "dog-and-pony show"

→ **"Walkthroughs"**
  ➢ developer technique (usually informal)
  ➢ used by development teams to improve quality of product
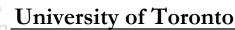 ➢ focus is on finding defects

→ **"(Fagan) Inspections"**
  ➢ a process management tool (always formal)
  ➢ used to improve quality of the development process
  ➢ collect defect data to analyze the quality of the process
  ➢ written output is important
  ➢ major role in training junior staff and transferring expertise

→ **These definitions are not widely agreed!**
  ↳ Other terms used:
    ➢ Formal Technical Reviews (FTRs)
    ➢ Formal Inspections

→ **"Formality" can vary:**
  ↳ informal:
    ➢ meetings over coffee,
    ➢ regular team meetings,
    ➢ etc.
  ↳ formal:
    ➢ scheduled meetings,
    ➢ prepared participants,
    ➢ defined agenda,
    ➢ specific format,
    ➢ documented output

Benefits of formal inspection

Source: Adapted from Blum, 1992, Freedman and Weinberg, 1990, & notes from Philip Johnson.

→ Formal inspection works well for programming:

↳ For applications programming:
- more effective than testing
- most reviewed programs run correctly first time
- compare: 10-50 attempts for test/debug approach

↳ Data from large projects
- error reduction by a factor of 5; (10 in some reported cases)
- improvement in productivity: 14% to 25%
- percentage of errors found by inspection: 58% to 82%
- cost reduction of 50%-80% for V&V (even including cost of inspection)

↳ Effects on staff competence:
- increased morale, reduced turnover
- better estimation and scheduling (more knowledge about defect profiles)
- better management recognition of staff ability

→ These benefits also apply to requirements inspections

↳ Many empirical studies investigated variant inspection processes
↳ Mixed results on the relative benefits of different processes

Inspection Constraints

Source: Adapted from Blum, 1992, pp369-373 & Freedman and Weinberg, 1990.

→ **Size**

- "enough people so that all the relevant expertise is available"
  - min: 3 (4 if author is present)
  - max: 7 (less if leader is inexperienced)

→ **Duration**

- never more than 2 hours
  - concentration will flag if longer

→ **Outputs**

- all reviewers must agree on the result
  - accept or re-work or re-inspect
- all findings should be documented
  - summary report (for management)
  - detailed list of issues

→ **Scope**

- focus on small part of a design, not the whole thing
- Fagan recommends rates:
  - 130-150 SLOC per hour

→ **Timing**

- Examines a product once its author has finished it
- not too soon
  - product not ready - find problems the author is already aware of
- not too late
  - product in use - errors are now very costly to fix

→ **Purpose**

- Remember the biggest gains come from fixing the process
  - collect data to help you not to make the same errors next time

Choosing Reviewers

Source: Adapted from Freedman and Weinberg, 1990.

→ **Possibilities**

⮩ **specialists in reviewing (e.g. QA people)**

⮩ **people from the same team as the author**

⮩ **people invited for specialist expertise**

⮩ **people with an interest in the product**

⮩ **visitors who have something to contribute**

⮩ **people from other parts of the organization**

→ **Exclude**

⮩ **anyone responsible for reviewing the author**

➢ **i.e. line manager, appraiser, etc.**

⮩ **anyone with known personality clashes with other reviewers**

⮩ **anyone who is not qualified to contribute**

⮩ **all management (?)**

⮩ **anyone whose presence creates a conflict of interest**

Roles

Formal Walkthrough

→ **Review Leader**
- ⮩ chairs the meeting
- ⮩ ensures preparation is done
- ⮩ keeps review focussed
- ⮩ reports the results

→ **Recorder**
- ⮩ keeps track of issues raised

→ **Reader**
- ⮩ summarizes the product piece by piece during the review

→ **Author**
- ⮩ should actively participate (e.g. as reader)

→ **Other Reviewers**
- ⮩ task is to find and report issues

Fagan Inspection

→ **Moderator**
- ⮩ must be a competent programmer
- ⮩ should be specially trained
- ⮩ could be from another project

→ **Designer**
- ⮩ programmer who produced the design being inspected

→ **Coder/Implementor**
- ⮩ programmer responsible for translating the design to code

→ **Tester**
- ⮩ person responsible for writing/executing test cases

Guidelines

Source: *Adapted from Freedman and Weinberg, 1990.*

→ # Prior to the review

- schedule Formal Reviews into the project planning
- train all reviewers
- ensure all attendees prepare in advance

→ # During the review

- review the product, not its author
  - keep comments constructive, professional and task-focussed
- stick to the agenda
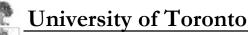 - leader must prevent drift
- limit debate and rebuttal
  - record issues for later discussion/resolution
- identify problems but don't try to solve them
- take written notes

→ # After the review

- review the review process

Opening Moments

Source: Adapted from Wiegers 2001.

1) Don't start until everyone is present

2) Leader announces:

"We are here to review product X for purpose Y"

3) Leader introduces the reviewers, and explains the recording technique

4) Leader briefly reviews the materials

↳ check that everyone received them
↳ check that everyone prepared

5) Leader explains the type of review

Note: The review should not go ahead if:

↳ some reviewers are missing
↳ some reviewers didn't receive the materials
↳ some reviewers didn't prepare

Structuring the inspection

→ Checklist
↳ uses a checklist of questions/issues

↳ review structured by issue on the list

→ Walkthough
↳ one person presents the product step-by-step

↳ review is structured by the product

→ Round Robin
↳ each reviewer in turn gets to raise an issue

↳ review is structured by the review team

→ Speed Review
↳ each reviewer gets 3 minutes to review a chunk, then passes to the next person

↳ good for assessing comprehensibility!

Fagan Inspection Process

Source: Adapted from Blum, 1992, pp374-375

1 Overview

- ⮩ communicate and educate about product
- ⮩ circulate materials
- ⮩ Rate: 500 SLOC per hour

2 Preparation

- ⮩ All participants perform individually
- ⮩ review materials to detect defects
- ⮩ Rate: 100-125 SLOC per hour

3 Inspection

- ⮩ a reader paraphrases the design
- ⮩ identify and note problems (don't solve them)
- ⮩ Rate: 130-150 SLOC per hour

4 Rework

- ⮩ All errors/problems addressed by author
- ⮩ Rate: 16-20 hours per 1000 SLOC

5 Follow-up

- ⮩ Moderator ensures all errors have been corrected
- ⮩ if more than 5% reworked, product is re-inspected by original inspection team

Tactics for problematic review meetings

→ **Devil's advocate**

↳ deliberate attempt to adopt a contrary position

→ **Bebugging**

↳ put some deliberate errors in before the review

➢ with prizes for finding them!

→ **Money bowl**

↳ if a reviewer speaks out of turn, he/she puts 25c into the drinks kitty

→ **Alarm**

↳ use a timer to limit 'speechifying'

→ **Issues blackboard**

↳ appoint someone to keep an issues list, to be written up after the review

→ **Stand-up review**

↳ no tables or chairs!

Summary

→ **Inspections are very effective**

↳ *Code* inspections are better than testing for finding defects

↳ For *Specifications*, inspection is all we have (you can't "test" a spec!)

→ **Key ideas:**

↳ Preparation: reviewers inspect individually first

↳ Collection meeting: reviewers meet to merge their defect lists

↳ Log each defect, but don't spend time trying to fix it

↳ The meeting plays an important role:

➢ Reviewers learn from one another when they compare their lists

➢ Additional defects are uncovered

↳ Defect profiles from inspection are important for process improvement

→ **Wide choice of inspection techniques:**

↳ What roles to use in the meeting?

↳ How to structure the meeting?

↳ What kind of checklist to use?

References

Freedman, D. P. and Weinberg, G. M. "Handbook of Walkthroughs, Inspections and Technical Reviews". Dorset House, 1990.

> Good practical guidebook, full of sensible advice about conducting reviews. Not so strong on the data collection and process improvement aspects of Fagan inspections, though.

Ackerman, A. F. "Software Inspections and the Cost Effective Production of Reliable Software". From "Software Engineering", Dorfman & Thayer, eds., IEEE Computer Society Press, 1997.

> This paper summarizes some of the practical aspects of introducing inspections, including how inspectors are trained.

Karl E. Wiegers, "Peer Reviews in Software: A Practical Guide", Addison-Wesley, 2001

> We'll be using the forms from this book for the practical inspection exercise.

Blum, B. "Software Engineering: A Holistic View". Oxford University Press, 1992

> Section 5.2 provides one of the best overview of walkthroughs and inspections anywhere. Blum manages to cut through a lot of the confusion about 'walkthroughs', 'inspections' and 'reviews' managing to get to the key issues.