

Inspections—Outline

- Why inspect
 - Inspections save time, money, and improve quality.
 - You can inspect anything: code, documents, formal specs, proofs.
 - Detecting faults early is a big win.
- Inspection basics
 - Types of inspections
 - Components of an inspection
 - Variabilities in inspections
- Experimental Results
 - Usefulness of inspections
 - Merits of various approaches.

Results

Defect detection effectiveness

Researcher	Artifact	Corp.	Size	% faults
Fagan	C & D	IBM	6000	93%
Fagan	C & D	Aetna	4000	82%
Weller	C& D	Bull HN	... N/A ...	70%

C—Code, D—Design

Cost Savings

1. Fagan: (Bank of South Africa), with 143K line system: 93% reduction in maintenance costs.
2. Russell: (Bell Northern) 1 defect per man/hr; each defect saves 33 man/hrs of post-release effort.
3. Bush: (JPL) 300 inspections, over 10 years. 1.5 to 2 man/hrs per defect (\$105 per defect). \$1700 per defect, post release
4. Kelly: (JPL) 203 inspections; 1.6 man/hrs per defect, 5-17 hrs per defect post-release.
5. Frans & Shih (HP) Inspection is 4 times as effective (return on investment) as testing (Hours of post-release time/hours of pre-release effort). (all artifacts)

A Typical Inspection

1. The victim (er, initiator) prepares the artifact, and identifies the inspection team and a moderator.
2. The victim prepares a guidebook and distributes it for study:
 - (a) The artifact to be inspected.
 - (b) Clarify Assumptions and define Interfaces
 - (c) Properties to check for
 - (d) Possibly scenarios to be "simulated"
 - (e) Defects found in similar inspections of similar artifacts.
 - (f) Questions that inspectors must answer (Comprehension test). Also Including evaluation questions!
3. Conduct the review.
 - (a) Victim presents the design and reviews the guidebook briefly.
 - (b) Reviewers ask questions and make observations, moderated by neutral, *uninvolved* moderator. Attitude is critical: supportive, egoless, impersonal.
 - (c) Scribe records faults (Assumptions, inputs, problem, possible fix).
 - (d) Victim goes out and celebrates his/her survival.
4. Follow up: Victim defines resolutions for the problem, and distributes it with a thank you note to reviewers.
5. If defects serious and numerous enough, follow up inspection. (ouch!)

Inspection Variations

- Types of inspections
 - Walkthroughs: Informal—the creator of the artifact controls the proceedings—describes the entire artifact, and the participants may comment.
 - Formal Inspections: The participants play an active role: the independently examine the artifact, and question the creator.
- Varieties of formal inspection
 1. What is inspected?
 2. The participants? (who and how many?)
 3. What are the steps?
 4. How are the defects collected, and where are they reported?
 5. Is it physical? or electronic?
 6. One meeting? Several? In Parallel? Sequential with intervening fault correction?

Inspection of Lifecycle documents

Document	Participants	Criteria
Requirements	C,D, T& P	Completeness Understandability Consistency Testability
Design	C?, D, P, T	Traceability Understandability Evolvability Bottlenecks
Code	D, P, T	Style, conventions

C—customers, D—designers, P—programmers, T—testers

Variables in an inspection–1

- How many people can participate in an inspection? (2 and up)
 - Buck (IBM) no difference in defect detection rates with 3,4 or 5.
 - Porter (UMd/Bell Labs) 2-4 no difference.
- Does actually meeting together help?
 - Votta: (Lucent) not much "meeting gain" (5%) with design documents.
 - Porter: (UMd) 25-30% gain with code.
- What approach to inspections help? (Ad Hoc, Check List, Delegated scenarios)
 - Porter: (UMd) Ad Hoc & Checklist nearly identical.
 - Porter: (UMd) Scenarios significantly better (+35% detection rate).

Variables in Inspections–2

- Distributed (internet) vs. Physical.
 - Only a minor difference!
- Using Personnel. Is it better to have m teams of n/m , or just one team of n ?
 - Porter (UMd): Doesn't make a difference. Groups tend to find different faults—but the total detection rate is the same.
- Phasing: Inspections can be carried out in one sitting, or can be done phased. With or without bug fixing between stages.
 - Porter (UMd): Takes much longer with several phases, but no real benefits.
 - Fixing bugs between phases has no impact on defect detection.

Summary

- If you can afford it, inspect!! if you can't, inspect anyway!!
 - Lucent 5ESS Switch: 5M lines, 0.5M Lines/release...1500 inspections per release. (\$1M+ in inspections per release!!)
- Small teams are just as effective.
- Don't bother with phasing.
- Inspection with actual meetings seems to work particularly well for code.
- Scenario-based approaches work best. Otherwise, use either Adhoc/Checklist (no difference).