

CS 350 slide set 8

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Reading

- Appendix C: Software Inspections

Outline

- What are inspections?
- What makes inspections effective?
- Inspection methods
- Inspection data
- The inspection report: from INS

What are inspections?

- Two or more programmers review someone else's work to identify:
 - defects
 - problems
- The purpose is NOT to fix, just to identify.
 - Fixing too often becomes a distraction from inspecting.
- Can be used for almost any items produced in software development
 - Requirements, test designs, HLD, DLD, test data, user manuals, ...

Inspection phases

- Briefing
 - Often developer of item brings inspectors up to speed
- Review
 - Must be done before meeting, so inspectors are prepared
- Meeting
 - The formal review process
- Repair
 - Done after meeting
- More effective if done with a script

Why are inspections effective? - 1

- Reviewing decisions so you can be ready to explain them helps you improve your decisions
- Figuring out how to explain your work to someone else often helps you discover problems in it.

Effective? - 2

- Use collective knowledge
 - The group often has a broader experience base than the developer alone; some may know what the common problems are
 - Helps if inspectors can look at product from points of view:
 - Use, tester, coder, designer, ...
- Can give opportunity to look at entire item at once
 - Testing (the alternative) tends to look only at details – one test case at a time

Other observations

- Testing is still needed even when inspections are conducted effectively
- Only inspect reviewed products
 - Respect time of other people
 - Trivial errors can distract from serious, perhaps subtle, flaws
 - Saves embarrassment

Checklists

- For this kind of detailed activities, most of us work better from checklists.
- Checklists should be developed over time
 - Most of use tend to make the same kinds of errors repeatedly
 - Should be personal checklists

Inspection rates for preparation: guidelines only

- Requirements: fewer than 2 pages/hr.
- High level design: fewer than 5 pages/hr.
- Detailed design: fewer than 100 pseudocode lines/hr
- Code: fewer than 200 loc/hr
- All of these are probably optimistic
Assumes you're shooting for an A rather than a C

More rates:

- These things vary a lot;
 - Depends on complexity of product
 - Experience of developers and inspectors
- Plan to spend about 50% of design time in inspection

Inspection yield

- High inspection yield saves time
- Humphrey reports on Air Force project where with the use of inspections, testing time went from 22% of development schedule to 2.7%

Testing Concepts Review - 1

- It a lot of work and can easily take more time, creativity than coding!
 - NASA builds simulators to plug the code into
- Concept (other approaches are sometimes better):
 - Each module uses inputs to produce outputs
 - The tester makes up inputs and determines the outputs a correct program should produce from them.
 - This can be very difficult!
 - The tester prepares a file of inputs and expected outputs

Testing Concepts - 2

- A test driver feeds the file inputs to a module, then compares the module's output with those in the file.
- The test driver produces a report
- Note: code to be tested can fail in lots of ways besides getting wrong answers!
 - May not compile, may not like, may loop, may abort so that no run report is produced by the test driver.
- So after you've completed testing, you have:
 1. Files of test cases, perhaps many
 2. Code for a test driver & (if needed) several stubs
 3. A collection of reports, one report for each test case
 - Some generated by the test driver, some written by the tester

Test Concepts - 3

- Problems:
 - How do you know what to test?
 - Requirements coverage
 - Programming experience
 - Special cases
 - Extremes
 - Critical functionality
 - How do you create expected outputs?

Traditional inspection roles —non-TSP version

- Developer of item (code, test plan, requirements, user doc) – present to answer questions
- Presenter – present items being inspected, line by line
- Inspectors, usually at least two – the come prepared with a list of defects that they identify when presenter gets there
- Recording – takes notes, follows up
- Moderator – decides if inspectors are prepared, runs meeting, controls behavior

Typical Time script

- 1 week before inspection, developer briefs inspectors, providing them a complete set of items to be inspected
- Inspection should go no longer than 2 hours
- Moderator must stop inspection if inspectors are not prepared
- Follow-up options:
 - If simple, left to recorder to sign off that all defects have been removed
 - If not, may need to schedule a follow-up meeting

For TSP

- Follow inspection script in text (outline below)
- Use forms provided
- Use smaller group, maybe only 3 or 4 people with moderator covering role of presenter and recorder also

Estimating yield with 2 inspectors

- A: number of defects found by ins. 1
- B: number of defects found by ins. 2
- C: number of defects found by both
- Estimated defects: $A \times B / C$
- Found defects: $A + B - C$
- Est. remaining: $A \times B / C - (A + B - C)$
- Yield: $[100(A + B - C) \times C] / (A \times B)$

2 inspector report - 1

Name	Defects		Prep Time			Est. Yield
	Major	Minor	Size	Time	Rate	
George	7	3	380	85	268	58.3
Sue	5	4	380	68	335	41.7
	12	7	760	153	298	75.0

Sent to moderator; prepared before inspection

Inspection form - 2

No.	Defect Des.	Defects		Inspectors (finding maj defects)		
		Maj	Min			
				A	B	
1	}=>)	1				1
9	.=>;	1			1	
12	Converter	1			1	
13	Test not dcl	1			1	
19	N = 1000	1			1	1
...	...					
Tot		9			7	5
	Unique defects			4	2	

Completed during inspection by moderator

Computations

- From previous slides:
 - A = 7 (for George)
 - B = 5 (for Sue)
 - C = 3 (found by both)
- Est. Defects: $(5 \times 7) / 3$ or 12
- Yield is Found/Est. or 9/12
- George's yield: 7/12
- Sue's yield: 5/12

Inspection form - 3

Inspection summary	Product size	380	Size measure	LOC	
Total defects for A:	7	Total defects for B:	5	Common	3
Total defects (A/B/C)	12	Number found(A+B-C)	9	Number left	3
Meeting time:	43	Total inspection hrs	4.7	Overall rate	80.9

Mechanics - 1

- The person who has completed the product arranges the inspection
- The moderator is the quality/process manager
- Moderator assess readiness of product for the inspection
- Min group size to do this is 3: producer, moderator/inspector, inspector

Mechanics - 2

- Before meeting, moderator gets INS forms from inspections (top part)
- Moderator may defer meeting if inspectors aren't ready
 - No reason to waste everyone's time
- Moderator does a walk-through of inspection item

Mechanics - 3

- At each line, inspectors identify any defects for question related to that line
- Moderator decides if it is major or minor
- Product owner records major defects in LOGD form so they can be included in SUMP and SUMQ forms
- At the end, the moderator decides how defect corrections will be verified.

INS script - 1

Step	Activity	Description
1	Plan the inspection	The developer (programmer): <ul style="list-style-type: none"> ■ Arranges with the quality/process mgr to be moderator ■ Sets up and runs the meeting The moderator <ul style="list-style-type: none"> ■ Reviews the product to ensure it is ready to inspect (If not, has the developer fix problems before proceeding) ■ Selects the other inspection member(s)
2	Hold the ins. briefing	The moderator describes the inspection process The producer familiarizes the team with the item The reviewers select viewpoints or areas for concentration (e.g., operation, recovery, installation, size, performance) In design inspection, reviewers also ensure that <ul style="list-style-type: none"> ■ At least one reviewer will verify each segment of the design ■ At least one reviewer will use a trace table The moderator sets the date for the meeting

INS script - 2

Step	Activity	Description
3	Review the item	<ul style="list-style-type: none"> ■ Reviewers separately make detailed item reviews ■ They mark the defects found on item documentation ■ They record their preparation time
4	Open the ins. mtg	Moderator opens the inspection meeting and <ul style="list-style-type: none"> ■ If any reviewers are not prepared, reschedules meeting ■ Outlines the inspection meeting procedure
5	Conduct item walkthrough	Moderator steps through the item sections, one by one, and <ul style="list-style-type: none"> ■ Has the reviewers describe every defect found ■ Confirms with producer ■ Enters major defect data on INS form ■ Notes who found each major defect ■ The producer enters each major defect in LOGD

INS script - 3

Step	Activity	Description
6	Estimate remaining defects	<ul style="list-style-type: none"> ■ Moderator estimates the defects remaining after the inspection ■ Moderator determines reviewer's yields ■ Reviewers note any items to add to their review checklist
7	Conclude mtg	Inspection team decides <ul style="list-style-type: none"> ■ Whether another inspection is warranted, who should do it, and when ■ How to verify the corrections Moderator completes LOGD and INS forms
8	Rework item, verify fixes	Producer <ul style="list-style-type: none"> ■ Makes repairs, updates documentation ■ Holds needed reviews and/or reinspections ■ Has the fixes verified as decided in step 7

Other estimation techniques

- If estimation of remaining defects is important, consider
- Capture/recapture method:
 - Experienced programmer inserts several "typical" errors into item to be inspected (called "salting")
 - Inspectors inspect.
 - Assume the ratio of "salted-found" to "salted-unfound" is the same as unsalted errors.
 - If 25 errors found, 5 of them salted:
 - Assume 5/25 of all errors were found.
 - So 100 errors remaining.
