Static Testing cont…

Dr. Durga Prasad Mohapatra
Professor, Dept. of CSE
N.I.T Rourkela

Variants of inspection process

Active Design Reviews (ADR)

- Several reviews are conducted targeting a particular type of bug and conducted by the experts in that area.
- These are conducted in the following stages:
  - Overview - The overview explains the modular structure in case it is unfamiliar to reviewers, and shows them where the module belongs in the structure.
  - Review- Reviewers are assigned sections of the document to be reviewed and questionnaires based on the bug type.
  - Meeting - The designers read the completed questionnaires and meet the reviewers to resolve any queries that the designers may have about the reviewer's answers to the questionnaires.

FTArm

- Stands for Formal Technical Asynchronous review method (FTArm)
  - It is a type of asynchronous inspection process that is carried out without having a meeting of the members.
  - This process consists of the following steps
    - Setup (choosing the members and preparing the document)
    - Orientation (same as overview step of inspection process)
    - Private review (same as preparation phase of inspection process)
    - Public review (all comments provided privately are made public and all inspectors are able to see each other's comments and put forward their suggestions.)
    - Consolidation (the moderator analyses the result of private and public reviews and lists the findings)
    - Group meeting (any unresolved issues are discussed in this step)
    - Conclusion (final report of the inspection with analysis is produced)

Gilb inspection

- Defect detection is carried out by individual inspector at his level rather than in a group.
- Three different roles identified:
  - Leader is responsible for planning and running the inspection
  - Author of the document
  - Checker is responsible for finding and reporting the defects in the document.

Steps of Gilb inspection

- Entry - The document must pass through an entry criteria so that the inspection time is not wasted on a document which is fundamentally flawed.
- Planning -The leader determines the inspection participants and schedules the meeting.
- Kick-off - The relevant documents are distributed, participants are assigned roles and briefed about the agenda of the meeting.
- Checking - Each checker works individually and finds defects.

Steps of Gilb inspection cont …

- Logging - Potential defects are collected and logged.
- Brainstorming - In this stage, process improvement suggestions are recorded based on the reported bugs.
- Edit - After all the defects have been reported, the author takes the list and works accordingly.
- Follow-up - The leader ensures that the edit phase has been executed properly.
- Exit - The inspection must pass the exit criteria as fixed for the completion of the inspection process.

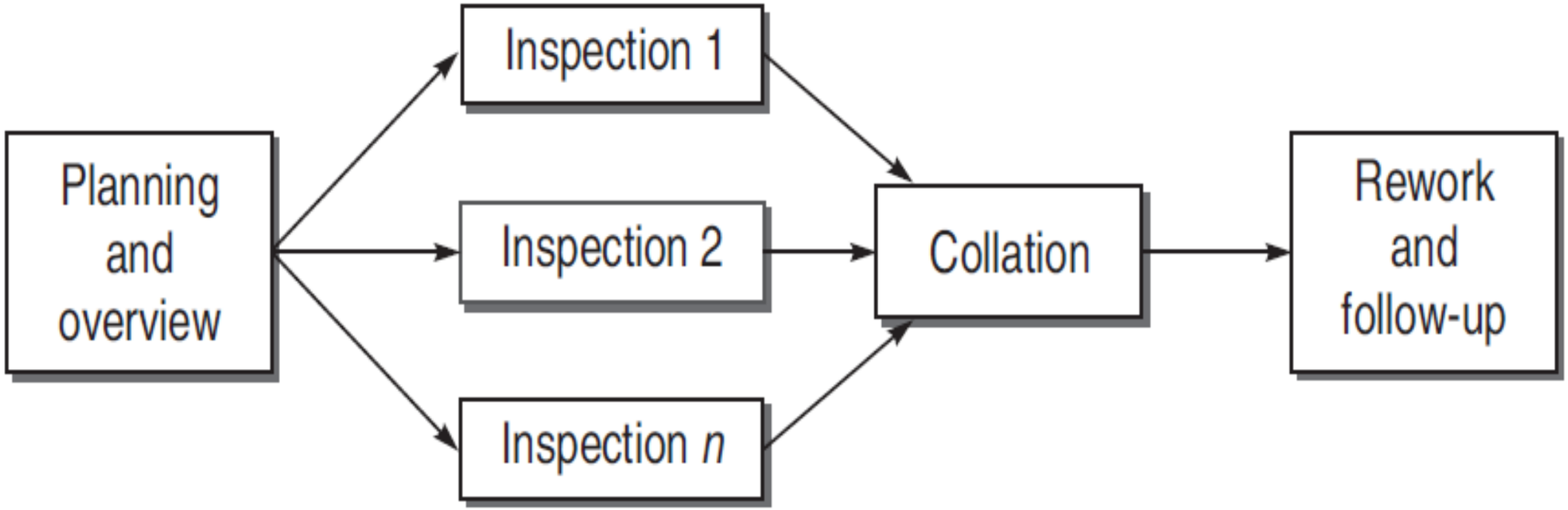
Humphrey's inspection

- Preparation phase emphasizes the finding and logging of bugs, unlike Fagan inspection.
- Includes an analysis phase wherein individual logs are analyzed & combined into a single list.
- The steps are:
  - Planning
  - Overview
  - Preparation
  - Analysis
  - Inspection
  - Rework
  - Follow-up

N-Fold inspections

- Inspection process's effectiveness can be increased by replicating it by having multiple inspection teams.
- This process consists of the following stages:
  - Planning and overview
  - Inspection stages
  - Collation phase
  - Rework and follow-up

N-fold inspection



Phased inspection

- Phased inspections are designed to verify the product in a particular domain by experts in that domain only.
- There are two types of phases:
  - Single inspector
    - A rigorous checklist is used to verify the features specified.
  - Multiple inspector
    - Checklist cannot be used.
    - Each inspector prepares their self developed questionnaire.

Reading techniques

- Reading technique can be defined as a series of steps whose purpose is to guide an inspector to acquire a deep understanding of the inspected product.

- It can be regarded as a mechanism or strategy for the individual inspector to detect defects in the inspected product.

Reading techniques cont …

- The various reading techniques are:
  - Adhoc method
    - No direction or guidelines provided for inspection
  - Checklists
  - Scenario-based reading
  - Perspective-based reading
  - Usage-based reading
  - Abstraction driven reading
  - Task driven reading
  - Function-point based scenarios

Reading techniques

- Checklists
  - Are in the form of questions and are used by the inspection team members to verify the item.
  - Drawbacks:
    - The questions are not sufficiently tailored to take into account a particular development environment.
    - Instructions for using them are missing.
    - Probability of missing defects, not detected earlier.

Structured Walkthroughs

- The idea of structured walkthrough was proposed by Yourdon.
- An informal code analysis technique:
  - Undertaken after coding of a module is complete.
- A few members of the development team select some test cases:
  - simulate execution of the code by hand using these test cases.

Structured Walkthroughs cont …

- Even though an informal technique:
  - several guidelines have evolved over the years
  - making this naive but useful analysis technique more effective.
  - These guidelines are based on
    - personal experience, common sense, and several subjective factors.

Structured Walkthroughs cont …

- The guidelines should be considered as examples:
  - rather than accepted as rules to be applied dogmatically.
- Discussion should focus on discovery of errors:
  - and not on how to fix the discovered errors.
- To foster cooperation:
  - avoid the feeling among engineers that they are being evaluated in the code walk through meeting,
  - managers should not attend the walk through meetings.

Structured Walkthroughs

- The team performing code walk through should not be either too big or too small. Ideally, it should consist of between three to seven members.
- A typical structured walkthrough team consists of the following members:
  - Coordinator
    - Organizes, moderates, and follows up the walkthrough activities.
  - Presenter/developer
    - Optional member, introduces the item to be inspected.

Structured Walkthroughs cont…

- Scribe/recorder
  - Notes down the defects found and suggestions proposed by the members.
- Reviewer/tester
  - Finds the defects in the item
- Maintenance Oracle
  - Focuses on the long term implications
- Standards Bearer
  - Assesses adherence to standards
- User representative/ Accreditation agent
  - Reflects the needs and concerns of the user.

Structured Walkthroughs cont…

- The steps of the walkthrough process are:
  - Organization
  - Preparation
  - Walkthrough
  - Rework and follow-up

Walkthrough vs Inspection

- Walkthrough is less formal and rigorous than inspection, has fewer steps and does not use a checklist, whereas the inspection team uses a checklist for uncovering errors.

- In walkthrough, the tester brings in test cases that are mentally executed in the meeting, i.e. the test data are walked through the logic of the program, whereas in inspection, the program is simply read and discussed during meeting.

Technical reviews

- A technical review is intended to evaluate the software in the light of development standards, guidelines and specifications.
- A review is similar to an inspection and walkthrough, except that the review team also includes management.
- Therefore considered to be a higher level technique.

Technical reviews cont…

- Review agendas focus less on technical issues and more on foresight.
- The purpose is to evaluate the system relative to specifications and standards.
- The moderator should gather and distribute the documentation to all team members.

Technical reviews cont…

- A set of indicators is prepared to measure the following points:
  - Appropriateness of the problem definition and requirements
  - Adequacy of all underlying assumptions
  - Adherence to standards
  - Consistency
  - Completeness
  - documentation

Technical reviews cont…

- The moderator may also prepare check list to help team focus on key points.
- The result of the review is a document recording the events of the meeting, deficiencies and recommendations.
- Appropriate actions are then taken to correct any deficiency and address recommendations.

Clean Room Testing

- The term **cleanroom** was first coined at IBM by drawing analogy to the semiconductor fabrication units where defects are avoided by manufacturing in an ultra-clean atmosphere.
- This type of testing relies heavily on walkthroughs, inspection, and formal verification.
- The programmers are not allowed to test any of their code by executing the code other than doing some syntax testing using a compiler.

Clean Room Testing cont…

- This technique reportedly produces documentation and code that is more reliable and maintainable than other development methods relying heavily on code execution-based testing.
- Software testing in the cleanroom process is carried out as a statistical experiment.
- Based on the formal specification, a representative subset of software input/output trajectories/paths is selected and tested.
- This sample is then statistically analysed to produce an estimate of the reliability of the software, and a level of confidence in that estimate.

Limitations of Clean Room Testing

- The main problem with this approach is that testing effort is increased as walkthroughs, inspection, and verification are time consuming for detecting all simple errors.
- Also testing-based error detection is efficient for detecting certain errors that escape manual inspection.

Summary

- Discussed variants of inspection technique.
- Discussed about structured walkthrough – a kind of static testing technique.
- Briefly explained technical reviews - a kind of static testing technique.
- Presented the concept of clean room testing.

References

1. Rajib Mall, Fundamentals of Software Engineering, (Chapter – 10), Fifth Edition, PHI Learning Pvt. Ltd., 2018.
2. Naresh Chauhan, Software Testing: Principles and Practices, (Chapter – 6), Second Edition, Oxford University Press, 2016.

Thank You