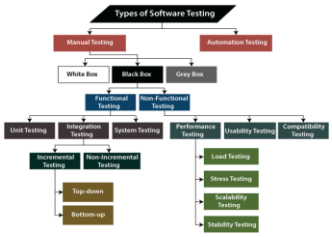
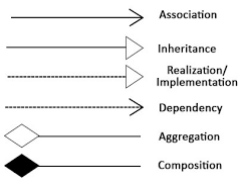
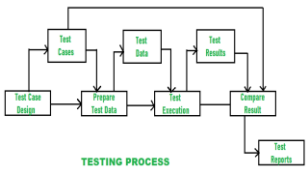


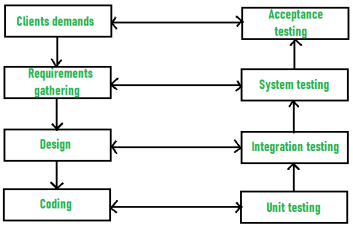




Software Design and Testing

Static Testing

Chapter 6



Outline

- Inspection
- Structured Walkthroughs
- Technical Reviews

Introduction

- Static testing is complementary to dynamic testing and improves the software quality.
- Some bugs are detectable only through static testing.
- There are 3 types of static testing: Inspection, Walkthroughs and Reviews.
- **Inspections** are the most widely used formal technique for static testing at early stage.
- **Walkthrough** is a less formal and less rigorous as compared to inspection.
- **Review** is higher level technique as compared to inspection or walkthrough, as it also includes management.

3

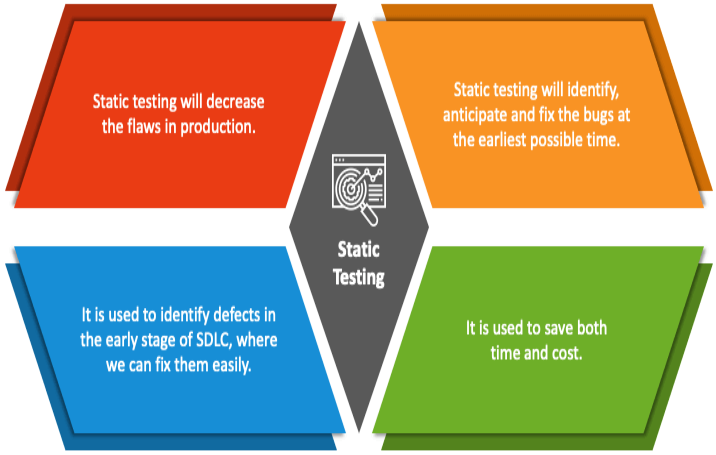
Static Testing

- Do not execute the code, so no bulk of test cases are required.
- Do not demonstrate that the software is operational or one function of software is working;
- Checks the software product at each SDLC stage for conformance with the required specifications or standards.
- Requirements, design specifications, test plans, source code, user's manuals, maintenance procedures are some of the items that can be statically tested.
- Cost-effective technique of error detection.
- A bug is found at its exact location whereas a bug found in dynamic testing provides no indication to the exact source code location.

4

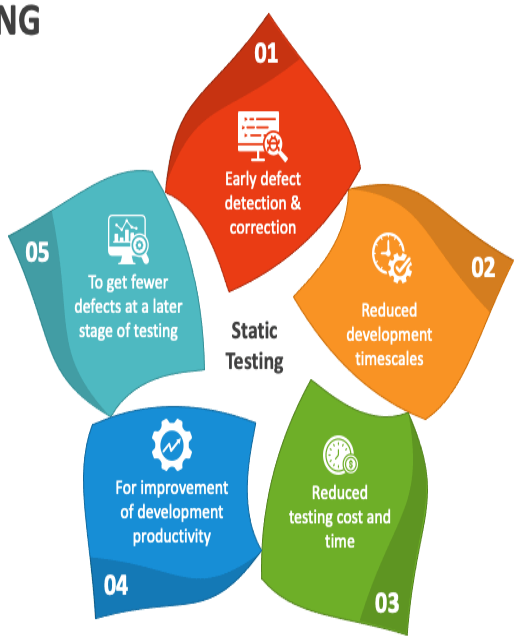
STATIC TESTING

Objectives of Static Testing

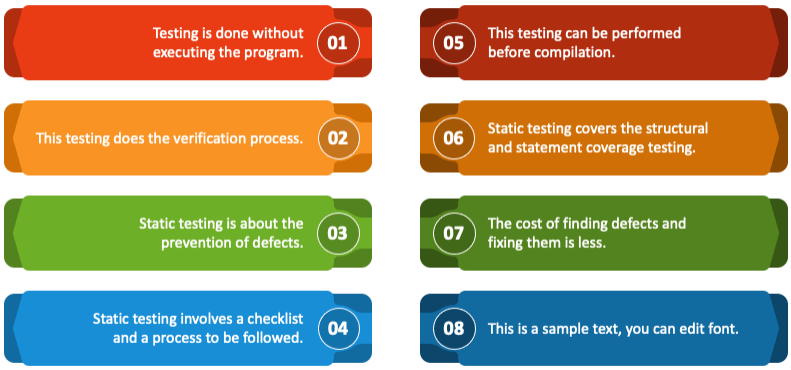


STATIC TESTING

Why Static Testing?



STATIC TESTING



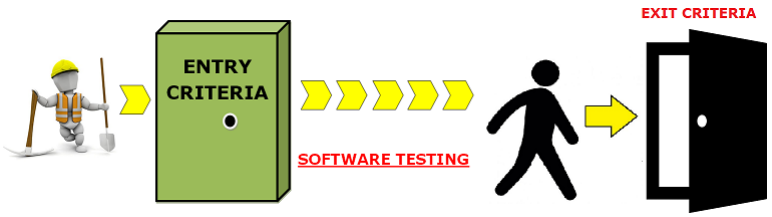
Inspection

- Tackles software quality problems because they allow detection and removal of defects after each phase of the software development process.
- An in-process manual examination of an item to detect bugs.
- Embedded in the process of developing products and are done in early stages of each phase.
- Carried out by a group of peers. The group of peers first inspects the product at individual level.
- It includes discussion of potential defects of the product observed in a formal meeting.
- Formal process of verification. The documents which can be inspected are SRS, SDD, code and test plan.
- Inspection process involves the interaction of the following elements: **Inspection steps, Roles for participants, Item being inspected.**

8

Inspection

- The entry and exit criteria are used to determine whether an item is ready to be inspected or not.
- For e.g. code inspection entry criterion is that the code has been compiled successfully.
  - **Exit criterion** is that once item has been given for inspection it should not be updated, otherwise it will not know how many bugs have been reported and corrected through inspection process.



9

Inspection

Entry Criteria

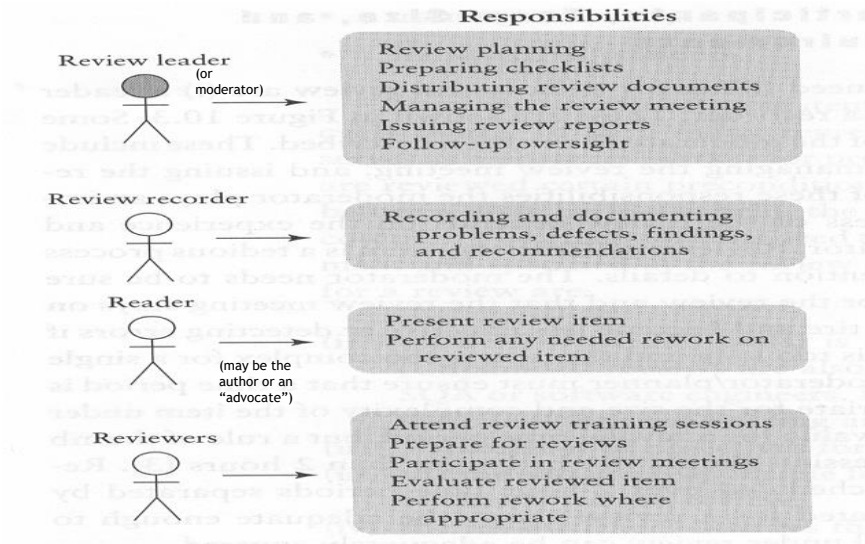
Entry criteria is the condition or the set of conditions, which should be **achieved before the testing process**. It consists of factors that are specified during the **planning phase** that are executed to mark the beginning of the software testing activities.

Exist Criteria

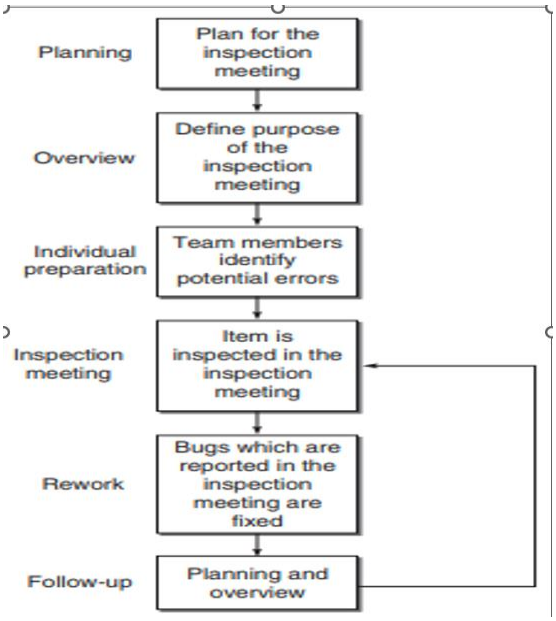
Exit criterion is the condition or set of conditions that decides the **completion or termination of the testing task** as well as the accomplishment of the targets and goals. It is also defined and outlined during the test **planning phase.**

10

Inspection Team



Inspection Process



Inspection Process

- **Planning** : The planning phase starts with the selection of a group review team. A moderator plans the activities performed during the inspection and verifies that the software entry criteria are met.

- Planning is the foundation stone

- **Overview** : The overview phase intends to disseminate information regarding the background of the product under review. Here, a presentation is given to the inspector with some background information needed to review the software product properly.

- Meeting is setting the right foot forward

13

Inspection Process

- **Preparation** :In the individual preparation phase, the inspector collects all the materials needed for inspection. Each reviewer studies the project individually and notes the issues they encounter.

- Preparation is a major step towards final accomplishment

- **Meeting** : The moderator conducts the meeting to collect and review defects. Here, the reader reads through the product line by line while the inspector points out the flaws. All issues are raised, and suggestions may be recorded.

- Inspection draws our attention towards the right conclusion

14

Inspection Process

- **Rework** : Based on meeting notes, the author changes the work product.

- The idea is not to mislead, hence rectify the loopholes

- **Follow-up** : In the last phase, the moderator verifies if necessary changes are made to the software product, compiling a defect summary report.

- Consistency defines success

15

Benefits of Inspection Process

- **Bug Reduction**: the number of bugs is reduced through the inspection process. L . H. Fenton [86] reported that through the inspection process in IBM, the number of bugs per thousand lines of code has been reduced by two-thirds.
- **Bug Prevention** : Based on experience of previous inspections, analysis can be made for future inspections or projects, thereby preventing bugs which have appeared earlier.
- **Productivity**: Since all phases of SDLC may be inspected without waiting for code development and its execution, the cost of finding bugs decreases, resulting in an increase in productivity.
  - Errors are found at their exact places, therefore reducing the need of dynamic testing and debugging.

16

Benefits of Inspection Process

- **Real-time Feedback to Software Engineers**: The inspections also benefit software engineers/developers they get feedback on their products on a relatively real time basis.
  - Developers find out the types of errors and the error density.
  - Since they get feedback in early stages of development, they may improve their capability.
- **Reduction in development resource**: the cost of rework is surprisingly high if inspections are not used and errors are found during development or testing.
  - Inspections reduce the effort required for dynamic testing and any rework during design and code, thereby causing an overall net reduction in the development resource.

17

Benefits of Inspection Process

- **Quality Improvement**: The direct consequence of static testing also results in the improvement of quality of the final product.
  - Inspections help to improve the quality by checking the standard compliance, modularity, clarity, and simplicity.
- **Project Management**: A project needs monitoring and control. It depends on some data obtained from the development team.
  - Inspection is another effective tool for monitoring the progress of the project.
- **Learning through inspection**: Inspection also improves the capability of different team members, as they learn from discussions on various types of bugs and the reasons why they occur.
  - It is more beneficial for new members. They can learn about the project in a very short time.

18

Benefits of Inspection Process

- **Checking coupling and cohesion**: The modules' coupling and cohesion can be checked easily through inspection as compared to dynamic testing.
  - This also reduces the maintenance work.
- **Process Improvement**: An analysis of why error occurred or frequent places where the errors occurred by inspection team members.
- The issues of process improvements are following:
  - Finding most error-prone modules: through the inspection process, the modules can be analyzed based on their error-density of the individual modules. So we can take some decision to
  - Redesign module,
  - check and rework on the code of module
  - Take extra precautions and test cases to test the module

19

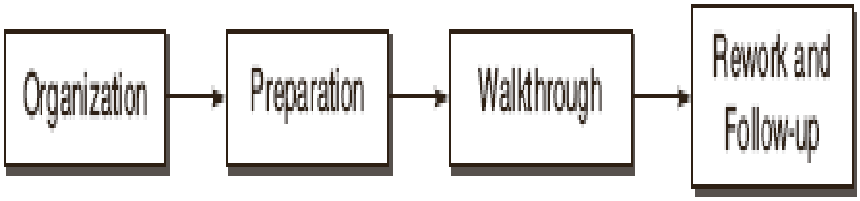
Benefits of Inspection Process

- **Distribution of error types**: inspections can also provide data according to the error-types.
- We can analyze the data of the percentage of bugs in a particular type of bug category.
- If we get data very early in process , then we can analyze which particular types of bugs may be repeating.

20

Structured Walkthrough

- The idea of structured walkthrough was proposed by yourdon.
- It is less formal and less rigorous technique as compared to inspection.
- The basic purpose of a walkthrough is error detection, not error correction.



21

Participants in Structured Walkthrough

- **Author**: The author of the work product is responsible for requesting the walkthrough when a meaningful portion of the product has been developed and is free of casual errors or defects. The author attends the walkthrough as an observer and answers reviewer's general questions.
- **Presenter**: They usually develop the agenda for the walkthrough and present the work product that is being reviewed. The presenter should be familiar with the work product and should be a member of the project team.
- **Moderator**: The main responsibility of the moderator is to facilitate the walkthrough session and ensure that the walkthrough agenda is followed. Moderators also encourage the participation of all reviewers. Moreover, the moderator can also be the scribe.

22

Participants in Structured Walkthrough

- **Reviewers**: Evaluate the work product to determine if it is technically accurate. The reviewers also assess whether the project guidelines or standards are being followed, the project requirements are met, and whether the product is properly prepared.
- **Scribe**: The scribe takes notes during the walkthrough. Their responsibility is to record the errors that are identified and any other technical comments, suggestions, and unresolved questions. Also, a scribe cannot be a reviewer.

23

Why is Structure Walkthrough Important?

- Walkthroughs are one of the most important method used in Quality Assurance.
- It does not require actual design or system alteration during the whole process.
- Walkthrough can take place throughout system development.
- It begins when the physical and logical models of the existing system have been completed.
- The walkthroughs checks the existing system to detect emission and inaccuracies in them.
- Should be carried out on new logical design to detect flows, weakness, errors and omissions in the proposed design.
- It bridges the gap between the designer, who as a staff person has an expert perspective, and the user with a generalised or marginal view.

24

Structure Walkthrough

- Walkthroughs differ significantly from inspection process.
- A walkthrough is less formal, has fewer steps and does not use a checklist to guide or a written report to document the team's work.
- The person designated as a tester comes to the meeting armed with a small set of paper test cases- representative sets of inputs and expected outputs for the program or module.
- During the meeting each test case is mentally executed.
- That is, the test data are walked through the logic of the program.
- The state of program is monitored on a paper or any other presentation media.

25

Difference between Structure Walkthrough & Inspection

S.No.	Inspection	Walkthrough
1.	It is formal.	It is informal.
2.	Initiated by project team.	Initiated by author.
3.	A group of relevant persons from different departments participate in the inspection.	Usually team members of the same project take participation in the walkthrough. Author himself acts walkthrough leader.
4.	Checklist is used to find faults.	No checklist is used in the walkthrough.
5.	Inspection processes includes overview, preparation, inspection, and rework and follow up.	Walkthrough process includes overview, little or no preparation, little or no preparation examination (actual walkthrough meeting), and rework and follow up.

26

Difference between Structure Walkthrough & Inspection		
S.No.	**Inspection**	**Walkthrough**
6.	Formalized procedure in each step.	No formalized procedure in the steps.
7.	Inspection takes longer time as list of items in checklist is tracked to completion.	Shorter time is spent on walkthrough as there is no formal checklist used to evaluate program.
8.	Planned meeting with the fixed roles assigned to all the members involved.	Unplanned
9.	Reader reads product code. Everyone inspects it and comes up with detects.	Author reads product code and his teammate comes up with the defects or suggestions.
10.	Recorder records the defects.	Author make a note of defects and suggestions offered by teammate.

Difference between Structure Walkthrough & Inspection		
S.No.	**Inspection**	**Walkthrough**
11.	Moderator has a role that moderator making sure that the discussions proceed on the productive lines.	Informal, so there is no moderator.

Technical Review

- A technical review is intended to evaluate the software in the light of development standards, guidelines, and specifications and to provide the management with evidence that the development process carried out according to stated objectives.
- A review is similar to an inspection or walkthrough, except that the review team also includes management.
- Therefore, it is considered a higher-level technique than inspection or walkthrough.
- A technical review team is generally comprised of management-level representatives of the User and Project Management.
- Review agendas should focus less on technical issues and more on oversight than an inspection.

29

Technical Review

- The purpose is to evaluate the system relative to specifications and standards, recording defects and deficiencies.
- The moderator should gather and distribute the documentation to all team members for examination before the review.
- He should also prepare set of indicators to measure the following points.
  - Appropriateness of the problem definition and requirements.
  - Adequacy of all underlying assumptions.
  - Adherence to standards.
  - Consistency, Completeness, Documentation.
- The moderator may also prepare a checklist to help the team focus on the key points. The result of the review should be a document recording the events of meeting, deficiencies identified, and review team recommendations.

30

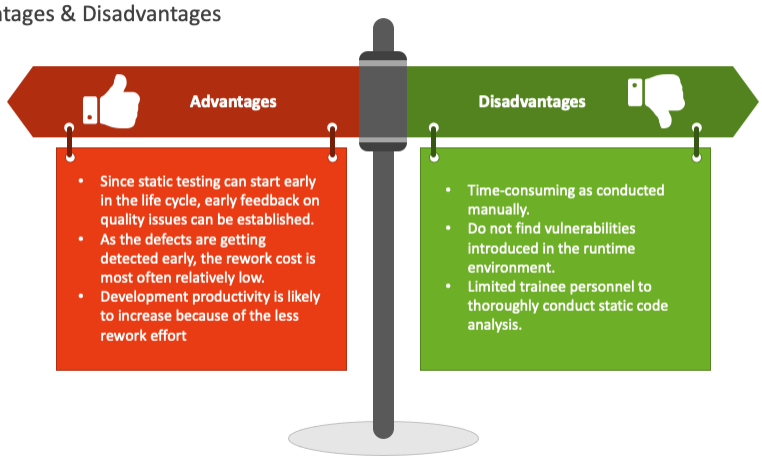
Difference between Software Inspection& Software Testing

Types of Bugs/Errors	Software Inspection	Software Testing
Checks the complexity of Code	Yes	No
Reviews Code Structure	Yes	No
Identifies interface defects at module level	Yes	No
Checks if new features are to be added	Yes	No
Identifies and resolves boundary level defects	Yes	Yes
Resolve performance errors	Yes	Yes
Checks if any features are implemented incorrectly	Yes	Yes

31

STATIC TESTING

Advantages & Disadvantages




THANKS