Software Engineering Concepts
Lecture 15
Part-1
Generic Testing Types

Chapter 3: Testing in Software Life
Cycle

Agenda for today

❖ Remaining Levels of Testing

❖ System Testing

❖ Different Types of System Testing

❖ Acceptance Testing

❖ Acceptance Testing different Forms

❖ Generic Types of Testing

❖ Functional Testing

❖ Non-functional Testing

❖ Testing of Software Structure

❖ Testing related to changes and regression testing

System testing

- Testing the behavior of the system as per SRS

- Testing of a complete and fully integrated software/hardware product

- **Investigates both** functional and non functional requirements

- **First level of testing where application is tested as whole**.

- **It is black box testing**

- **Example:** Complete Pen

Different Types of System Testing

- **Usability Testing -** Focuses on the user's ease to use the application

- **Load Testing –** Checks software solution will perform under real-life loads.

- **Regression Testing- -** Changes made over the course of the development process have caused new bugs

- **Recovery Testing -** Software solution is reliable

- **Migration Testing -** Software can be moved from older system infrastructures to current system infrastructures without any issues.

- **Functional Testing -** To make sure that functionality of the product is working as per the requirements defined

- **Hardware/Software Testing -** Check interaction of software and hardware are they working fine.

- **Security Testing:** Check system does not allow unauthorize access

What Types of System Testing Should Testers Use?

Specific types used by a tester depend on several variables. **Those variables include:**

- Who the tester works for

- Time available for testing

- Resources available to the tester

- Software Tester's Education

- Testing Budget

Acceptance Testing

- **Check** whether system meets user needs and expectations.

- **The purpose is to evaluate** the system's compliance with the business requirements and assess whether it is acceptable for delivery.

- **The goal of acceptance testing** is to establish confidence in the system.

- **Acceptance testing** is most often focused on a validation type testing.

Forms of Acceptance Testing

There are various forms of acceptance testing:

• **Contract acceptance Testing**

   - Based on criteria and specifications which are predefined and agreed upon in a contract.

• **User acceptance Testing**

   - Testing a software by the user/client to determine whether it can be accepted or not first organization employees test software

• **Operational acceptance Testing**

   - Testing assures the acceptance of the system by the system administrators.

• **Field Testing (alpha and beta testing)**

   - Alpha Testing takes place in development environment

   - Beta Testing takes place in customer's environment

Generic Types of Testing

The following types of testing can be distinguished:

- **Functional Testing**

    - describe the functionality of the software system

- **Non functional testing**

    - describe the behaviour of the software system etc

- **Testing of software structure**

    - objective is to design and run enough test cases to completely cover all structural items.

- **Testing related to changes and regression testing**

    - When changes are implemented, parts of the existing software are changed so regression testing may be performed.

Functional Testing

- Describe the behaviour/execution of the software system

- Functional requirements are the what i.e. what the system does

- Ensures proper working of all the functionalities of an application

- Ensures all the requirements are met

- Produces a defect-free product

- Analyze integrating pieces of an application

- **Example:** Website to pay utility bills

Functional Testing

Five steps need to be keeping in mind for functional testing:

1. Preparation of test data based on the specifications of functions

2. Business requirements are the inputs to functional testing

3. Based on functional specifications find out of output of the functions

4. The execution of test cases

5. Observe the actual and expected outputs

Non Functional Testing

- **Emphasizes the behaviour** of the product and not the functionality

- **Non functional testing** will answer How.

- **It increases** the ease of use, efficiency, maintainability, and portability of the product.

- **It helps reducing** production risk and the cost associated with non-functional aspects of the product.

- **Optimize the way** the product is installed, configured, executed, managed and monitored.

- **Improve and enhance** the knowledge of the behaviour of the product and its uses.

- **Example**: Website to pay utility bills (application security, page loading)

Functional Vs Non Functional Testing with example

Functional testing	Nonfunctional testing
When inputs are valid, app login functions	After login, the dashboard loads within 3 seconds
When email notifications are on, and user receives a new message, an email notification is sent	The email notification is sent within 5 minutes
When a JPG file under 1MB is uploaded, the uploader accepts the file	When eight files or less (each under 1MB) are uploaded at the same time, the queues all
When the settings menu item is clicked, the settings page loads	The settings page has a matching appearance to the rest of the GUI

Testing Related to Changes and Regression Testing

- When changes are implemented, parts of the existing software are changed or new modules are added

- **Regression Testing** is nothing but a full or partial selection of already executed test cases which are re-executed to ensure existing functionalities work fine.

- How much retest and regression test?

1. Rerunning of all the tests that have detected failures whose reasons have been fixed in the new software release

2. Testing of all program parts that were changed or corrected

3. Testing of all program parts or elements that were newly integrated Testing of the whole system

Selection of regression test cases

- Repeating only the high-priority tests according to the test plan

- In the functional test, omitting certain variations (special cases)

- Restricting the tests to certain configurations only

- Restricting the test to certain subsystems or test levels

Software Testing

Dynamic Analysis-Test Design Techniques

Agenda for Today

❖ Test Object Execution

❖ Test Bed and why it's necessary

❖ Systematic and Stepwise Approach for Test cases

❖ Test Design Techniques

❖ Static and Dynamic Testing

❖ Introduction to Black box Testing

❖ Functional and Non Functional Testing

❖ Testing Approaches

Dynamic Analysis: Test Object Execution

Test Object must be executable

- Provided with the input data

- Must be embedded in the test bed

Test Bed?

- An execution environment.

Fig. Test Bed

- **E.g** specific hardware, OS, configuration of the product under test, other application or system software, etc.

- Drivers and Stubs combined established the test bed.

- Point of Control(PoC)
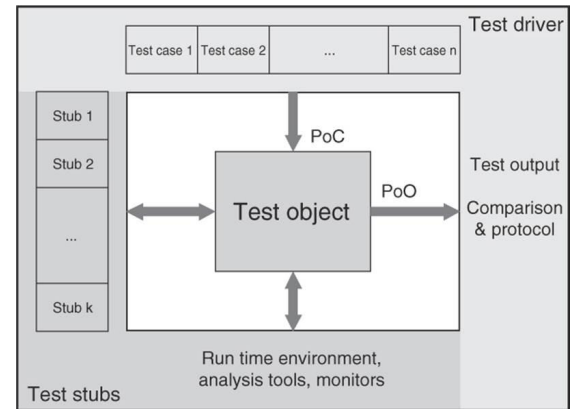
- Point of Observation(PoO)

Systematic and Stepwise approach for determining test cases

Systematic Approach:

❖Many requirements should be checked.

❖Little cost

❖This goal requires systematic approach

Stepwise Approach:

❖Determine conditions and preconditions

❖Specify the individual test cases

❖Determine how to execute the tests

General Test Cases Tasks

❖**Conditions, preconditions, and goals**

- What must be tested

- The failure risk should especially be taken

❖**Traceability**

- Effects of changed specifications on the test cases

- Creation of New test cases and removal or change of existing

❖**Determining expected result and behaviour**

- Results should be determined and documented

❖**Test case execution**

- Execute whole sequence of test cases

Software Test Design Techniques

First of all we should know

❖ Technique?

   - Efficient way

❖ Tester design technique?

   - Select good set of tests

❖ Why we need to use the tester design technique?

  - Exhaustive testing not possible

  - Intelligent process needed for selection

Static vs Dynamic Testing

❖ **Static Testing**

   - Without execution

   - Verification process

   - Prevention of defects

   - Defects finding cost is less

   - Loads of meetings

   - Walkthrough, Inspection, reviews etc.

❖**Dynamic Testing**

   - With execution

   - Validation process

   - Finding and fixing defects

   - Defects finding cost is high

   - Lesser meetings

  - Specification based, structure based, Experience based, unit testing, integration testing etc.

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Static vs Dynamic Testing Example

❖**Example of Online Shopping Cart**

❖Static Test Techniques

  - Review the requirement documents, design documents

  - GUI of the application

  - Database structure of the application

❖Dynamic Testing Techniques

  - Functionality of the different page

  - Checkout process and payment methods

  - Interfaces between different pages
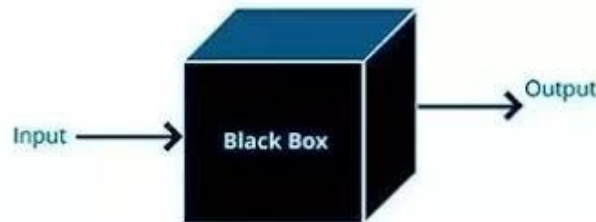
Static vs Dynamic Testing
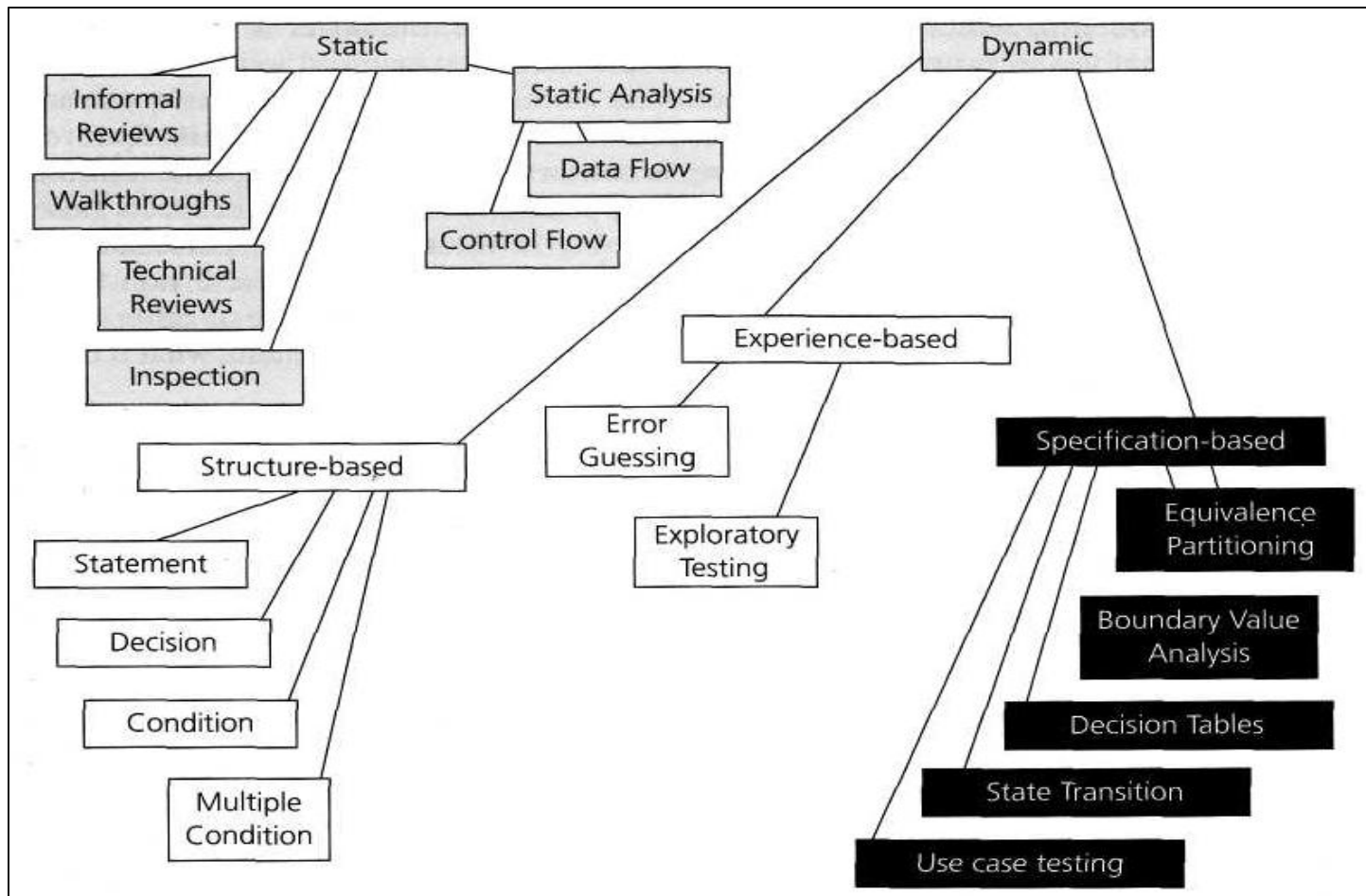
Categories of Test Design Techniques

Typically we have 3 categories:

❖Black-box (specification-based)

❖White-box (structured-based)

❖Experience-based

Black Box Testing

❖ **Without knowing internal knowledge**

❖**Black-Box can be any software system**

❖Focus on the input and output
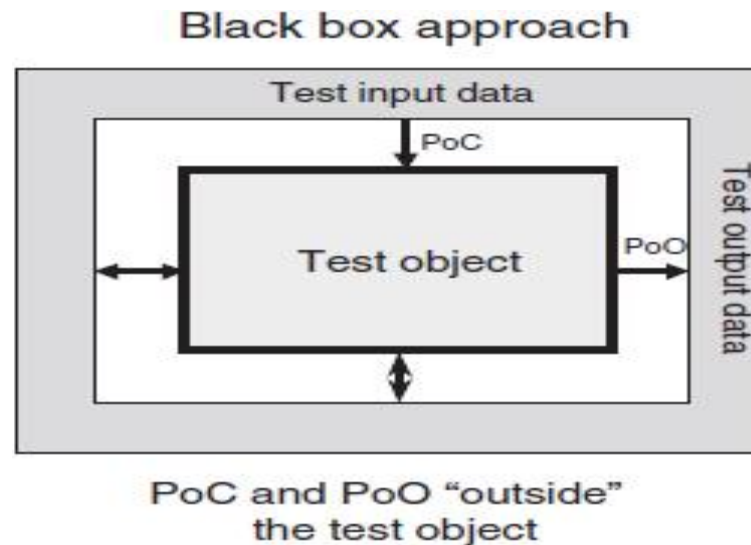
❖Helps in overall functionality verification

❖Helps in identifying inconsistent and incomplete requirements

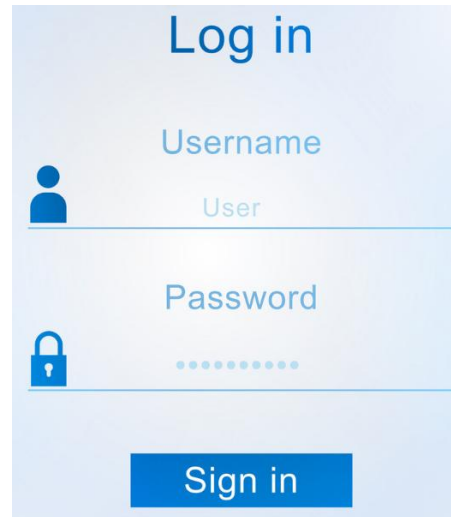❖Finds defects like: Incorrect functions, errors in data structures, behaviour, initialization etc.

❖**Tools can be**: QTP, Selenium, LoadRunner, Jmeter etc

Black Box Testing

❖Point of observation and Point of control situated at outside the test object.

❖Test object can be your module/component, System.

❖PoC are appropriate test data, appropriate test precondition.

❖PoO is output, result

Black box approach

Test input data

PoC

Test object

PoO

Test output data

PoC and PoO "outside"
the test object

Black Box Testing Example

❖ **This form of testing technique will check the input and output.**

    - A user logged in when inputs correct username and correct password
    - A user receives an error message when enters username and incorrect password

❖ **Black box testing checks scenarios where the system can break.**

Black Box Testing

The generic steps followed to carry out any type of Black Box Testing.

❖Initially requirements and specifications of the system are examined.

❖Tester chooses valid inputs (positive test scenario) to check whether Software under test(SUT) processes them correctly . Also some invalid inputs (negative test scenario) are chosen to verify that the SUT is able to detect them.

❖Tester determines expected outputs for all those inputs.

❖Software tester constructs test cases with the selected inputs.

❖The test cases are executed.

❖Software tester compares the actual outputs with the expected outputs.

❖Defects if any are fixed and re-tested.

Types of Black Box Testing

❖ **Functional Testing**

- Focus area is customer requirement's

- Mainly black box involved

- Requirement

- Functionality

- **Examples (**Unit, Smoke, Integration testing etc)

❖ **Non functional Testing**

- It focusses on customer's expectation.

- Requirements

- Functionality

- **Examples** (Performance, Load, Reliability testing etc)

Functional Testing vs Non functional Testing : Example

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Testing Approaches

❖ **Manual Testing:**
  - Checks the system as a user.
  - Processing time
  - Not much reliable
  - UI change
  - Suitable when the test cases are run once or twice

❖ **Automated UI Testing:**
  - user interaction with the system is recorded to find errors
  - Reliable
  - Processing time
  - Time required for automated testing is less
  - Testing Tools: Selenium, Quick Test Professional (QTP) , Cross-Browser testing, Loadrunner, JMeter etc

▸Questions and Answers