Lecture 4

Software Testing Fundamentals

Lecture Overview

1. **Introduction to the Testing Life Cycle**
2. **Phases of the Software Testing Life Cycle (STLC)**
    1. Requirement Analysis
    2. Test Planning
    3. Test Case Development
    4. Environment Setup
    5. Test Execution
    6. Test Closure
3. **Testing Process Management: Tools and Tracking**

Testing Life Cycle and Process Management

1.Introduction to the Testing Life Cycle

- **Definition**: The testing life cycle outlines the various stages involved in the testing process. It provides a structured approach to ensure comprehensive testing coverage.
- **Purpose**: Ensuring every functional and non-functional requirement is met with a focus on quality, efficiency, and cost-effectiveness.

2. Phases of the Software Testing Life Cycle (STLC)

Phase 1: Requirement Analysis

- Requirement Analysis is the first step of the Software Testing Life Cycle (STLC). In this phase quality assurance team understands the requirements like what is to be tested. If anything is missing or not understandable then the quality assurance team meets with the stakeholders to better understand the detailed knowledge of requirements.

The activities that take place during the Requirement Analysis stage include:

- Reviewing the software requirements document (SRD) and other related documents
- Interviewing stakeholders to gather additional information
- Identifying any ambiguities or inconsistencies in the requirements
- Identifying any missing or incomplete requirements
- Identifying any potential risks or issues that may impact the testing process

the testing team should have a clear understanding of the software requirements and should have identified any potential issues that may impact the testing process. This will help to ensure that the testing process is focused on the most important areas of the software and that the testing team is able to deliver high-quality results.

Testing Life Cycle and Process Management

Phase 2: Test Planning

Objective: Test Planning is the most efficient phase of the software testing life cycle where all testing plans are defined.
In this phase manager of the testing, team calculates the estimated effort and cost for the testing work.
This phase gets started once the requirement-gathering phase is completed.

Activities:

- Identifying the testing objectives and scope
- Developing a test strategy: selecting the testing methods and techniques that will be used
- Identifying the testing environment and resources needed
- Identifying the test cases that will be executed and the test data that will be used
- Estimating the time and cost required for testing
- Identifying the test deliverables and milestones
- Assigning roles and responsibilities to the testing team
- Reviewing and approving the test plan

Example:

- For a **Banking App**: Emphasize security testing and allocate a significant budget towards secure transactions and user data protection.

Testing Life Cycle and Process Management

Phase 3: Test Case Development

Objective: The test case development phase gets started once the test planning phase is completed.
In this phase testing team notes down the detailed test cases.
The testing team also prepares the required test data for the testing.
When the test cases are prepared then they are reviewed by the quality assurance team.

The activities that take place during the Test Case Development stage include:

- Identifying the test cases that will be developed
- Writing test cases that are clear, concise, and easy to understand
- Creating test data and test scenarios that will be used in the test cases
- Identifying the expected results for each test case
- Reviewing and validating the test cases

At the end of this stage, the testing team should have a set of comprehensive and accurate test cases that provide adequate coverage of the software or application. This will help to ensure that the testing process is thorough and that any potential issues are identified and addressed before the software is released.

Example: **For** an **E-commerce App Login**:

- Positive Case: User logs in with valid credentials.
- Negative Case: User attempts to log in with an incorrect password.

Testing Life Cycle and Process Management

Phase 3: Test Case Development

Example of Test Cases for a Banking App Login

Test Case ID	Description	Steps	Expected Result
TC01	Valid Login	Enter valid username/password, click login	User is logged in successfully
TC02	Invalid Password	Enter valid username and wrong password	Error message "Invalid password" appears
TC03	Password Reset Functionality	Click "Forgot Password"	Password reset page appears

Testing Life Cycle and Process Management

Phase 4: Environment Setup

Objective: Prepare the hardware and software required for testing.

Activities:

- Set up necessary servers, databases, and tools.
- Configure the test environment to match the production environment.
- Verify environment stability before test execution.

Example:

The team sets up a secure test environment for the banking app that mirrors the production environment.
They include firewalls, secure data handling configurations, and SSL certificates to ensure realistic testing conditions.

Testing Life Cycle and Process Management

Phase 4: Environment Setup

Objective: Prepare the hardware and software required for testing.

Activities:

- Set up necessary servers, databases, and tools.
- Configure the test environment to match the production environment.
- Verify environment stability before test execution.

Example:

The team sets up a secure test environment for the banking app that mirrors the production environment.
They include firewalls, secure data handling configurations, and SSL certificates to ensure realistic testing conditions.

Testing Life Cycle and Process Management

Phase 5: Test Execution

Objective: Run test cases, record outcomes, and report defects.

The activities that take place during the test execution stage of the Software Testing Life Cycle (STLC) include:

- **Test execution:** The test cases and scripts created in the test design stage are run against the software application to identify any defects or issues.
- **Defect logging:** Any defects or issues that are found during test execution are logged in a defect tracking system, along with details such as the severity, priority, and description of the issue.
- **Test data preparation:** Test data is prepared and loaded into the system for test execution
- **Test environment setup:** The necessary hardware, software, and network configurations are set up for test execution
- **Test execution:** The test cases and scripts are run, and the results are collected and analyzed.
- **Test result analysis:** The results of the test execution are analyzed to determine the software's performance and identify any defects or issues.
- **Defect retesting:** Any defects that are identified during test execution are retested to ensure that they have been fixed correctly.
- **Test Reporting:** Test results are documented and reported to the relevant stakeholders.

It is important to note that test execution is an iterative process and may need to be repeated multiple times until all identified defects are fixed and the software is deemed fit for release.

Example:

- For a **Mobile App**: Run tests on different devices and OS versions, logging any display or functionality issues.

Testing Life Cycle and Process Management

Phase 6: Test Closure

Test closure is the final stage of the Software Testing Life Cycle (STLC) where all testing-related activities are completed and documented. The main objective of the test closure stage is to ensure that all testing-related activities have been completed and that the software is ready for release.

At the end of the test closure stage, the testing team should have a clear understanding of the software's quality and reliability, and any defects or issues that were identified during testing should have been resolved. The test closure stage also includes documenting the testing process and any lessons learned so that they can be used to improve future testing processes.

The main activities that take place during the test closure stage include:

- **Test summary report:** A report is created that summarizes the overall testing process, including the number of test cases executed, the number of defects found, and the overall pass/fail rate.
- **Defect tracking:** All defects that were identified during testing are tracked and managed until they are resolved.
- **Test environment clean-up:** The test environment is cleaned up, and all test data and test artifacts are archived.
- **Test closure report:** A report is created that documents all the testing-related activities that took place, including the testing objectives, scope, schedule, and resources used.
- **Knowledge transfer:** Knowledge about the software and testing process is shared with the rest of the team and any stakeholders who may need to maintain or support the software in the future.
- **Feedback and improvements:** Feedback from the testing process is collected and used to improve future testing processes

It is important to note that test closure is not just about documenting the testing process, but also about ensuring that all relevant information is shared and any lessons learned are captured for future reference. The goal of test closure is to ensure that the software is ready for release and that the testing process has been conducted in an organized and efficient manner.

Testing Life Cycle and Process Management

Phase 6: Test Closure

Example : In the test closure phase, the team concludes that all critical functionalities, including login and transactions, have been tested thoroughly. They create a test summary report, noting any challenges faced (e.g., some data issues) and suggesting improvements for the next testing cycle.

Testing Life Cycle and Process Management

Testing Process Management

Effective process management helps ensure that testing progresses smoothly through each phase. This involves monitoring test progress, managing test data, tracking defects, and updating stakeholders.

Key Aspects of Testing Process Management

- **Progress Tracking**: Monitor the number of test cases executed, passed, and failed to assess progress.
- **Defect Management**: Track defects from detection to resolution and verify fixes with retesting.
- **Communication**: Keep stakeholders informed on test status, challenges, and major defects.