SWE 4603

Software Testing and Quality Assurance

Lecture 9

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Lesson Outcome

- Test Organization
- Structure of of Testing Group
- Test Planning
- Test Design and Test

Week on:

- Chapter 9: Test Management

Testing Organization

- is the process of setting up and managing a suitable test organizational structure and defining explicit roles.
- Since testing is viewed as a process, it must have an organization such that a testing group works for better testing and high quality software.
- members of such a testing group are called test specialists or test engineers or simply testers.
- He is responsible for ensuring that testing is effective and quality issues are being addressed.

Test organization

Responsibility of testing Group:

- Maintenance and application of test policies
- Development and application of testing standards
- Participation in requirement, design, and code reviews
- Test planning
- Test execution
- Test measurement
- Test monitoring
- Defect tracking
- Acquisition of testing tools
- Test reporting

Test organization

Skills a tester should have:

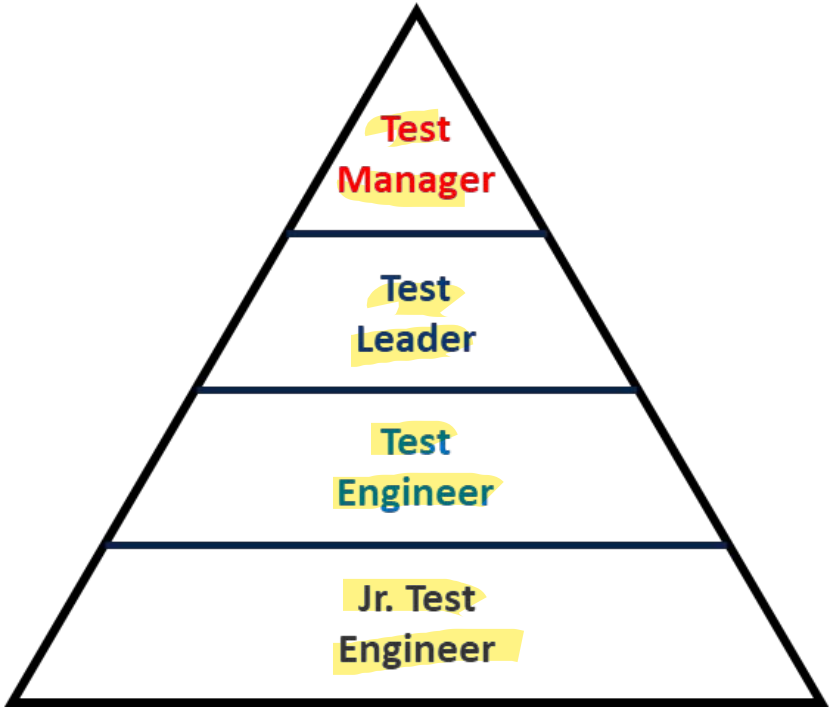
Technical Skills

- technically sound, capable of understanding software engineering principles and practices.
- good in programming skills.
- understanding of testing basics, principles, and practices.
- understanding and practice of testing strategies and methods to develop test cases.
- ability to plan, design, and execute test cases with the goal of logic coverage.
- technical knowledge of networks, databases, operating systems, etc. needed to work in a the project environment.
- knowledge of configuration management.
- knowledge of testware and the role of each document in the testing process.
- know about quality issues and standards.

Personal and Managerial Skills

- able to contribute in policy-making and planning the testing activities.
- able to work in a team.
- able to organize and monitor information, tasks, and people.
- able to interact with other engineering professionals, software quality assurance staff, and clients.
- capable of training and mentoring new testers.
- creative, imaginative, and experiment-oriented.
- have written and oral communication skills.

Structure of Testing Group



Testing Group Hierarchy

Structure of Testing Group

Test Manager

- key person in the testing group who will interact with other team.
- Responsible for making test strategies with detailed master planning and schedule.
- Interacts with customers regarding quality issues.
- Acquires all the testing resources including tools.
- Monitors the progress of testing and controls the events.
- Participates in all static verification meetings.
- Hires, fires, and evaluates the test team members.

Structure of Testing Group

Test Leader

- Planning the testing tasks given by the test manager.
- Assigning testing tasks to test engineers who are working under him.
- Supervising test engineers.
- Helping the test engineers in test case design, execution, and reporting.
- Providing tool training, if required.
- Interacting with customers.

Structure of Testing Group

Test Engineers

- Designing test cases.
- Developing test harness.
- Set-up test laboratories and environment.
- Maintain the test and defect repositories.

Jr. Test Engineers

- are newly hired testers.
- They usually are trained about the test strategy, test process, and testing tools.
- participate in test design and execution with experienced test engineers..

Test Planning

- A **test plan** is defined as a document that describes the scope, approach, resources, and schedule of intended testing activities.
- Test plan is driven with the business goals of the product.
- In order to meet a set of goals, the test plan identifies the following:
  - Test items
  - Features to be tested
  - Testing tasks
  - Tools selection
  - Time and effort estimate
  - Who will do each task
  - Any risks
  - Milestones

Testing Planning

Components of a Test Plan [IEEE Std 829–1983]

Test Plan Components

- Test Plan Identifier
- Introduction
- Test-Item to be tested
- Features to be tested
- Features not to be tested
- Approach
- Item Pass/Fail Criteria
- Suspension criteria and resumption requirements
- Test deliverables
- Testing tasks
- Environmental needs
- Responsibilities
- Staffing and training needs
- Scheduling
- Risks and contingencies
- Testing costs
- Approvals

Each test plan is tagged with a unique identifier so that it is associated with a project.

The test planner gives an overall description of the project with:

- Summary of the items and features to be tested.
- The requirement and the history of each item (optional).
- High-level description of testing goals.
- References to related documents, such as project authorization, project plan, QA plan, configuration management plan, relevant policies, and relevant standards.

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- Name, identifier, and version of test items.
- Characteristics of their transmitting media where the items are stored, for example, disk, CD, etc.
- References to related documents, such as requirements specification, design specification, users' guide, operations guide, installation guide.
- References to bug reports related to test items.
- Items which are specifically not going to be tested (optional).

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- This is a list of what needs to be tested from the user's viewpoint.
- All software features and combinations of features are to be tested.
- References to test-design specifications associated with each feature and combination of features.

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- All the features and the significant combinations of features which will not be tested.
- Identify why the feature is not to be tested. There can be many reasons:
  1. Not to be included in this release of the software.
  2. Low-risk, has been used before, and was considered stable.
  3. Will be released but not tested or documented as a functional part of the release of this version of the software.

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- Overall approach to testing.
- For each major group of features or combinations of features, specify the approach.
- Specify major activities, techniques, and tools which are to be used to test the groups.
- Specify the metrics to be collected.
- Specify the number of configurations to be tested.
- Specify a minimum degree of comprehensiveness required.
- Identify which techniques will be used to judge comprehensiveness.
- Specify any additional completion criteria.
- Specify techniques which are to be used to trace requirements.
- Identify significant constraints on testing, such as test-item availability, testing-resource availability, and deadline.

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- defines a set of criteria based on which a test case is passed or failed.

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- Suspension criteria specify the criteria to be used to suspend all or a portion of the testing activities, while resumption criteria specify when the testing can resume after it has been suspended.
- For example, system integration testing in the integration environment can be suspended in the following circumstances:
  - Unavailability of external dependent systems during execution.
  - When a tester submits a ‘critical’ or ‘major’ defect, the testing team will call for a break in testing while an impact assessment is done.
- System integration testing in the integration environment may be resumed under the following circumstances:
  - When the ‘critical’ or ‘major’ defect is resolved.
  - When a fix is successfully implemented and the testing team is notified to continue testing.

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- Identify deliverable documents: test plan, test design specifications, test case specifications, test item transmittal reports, test logs, test incident reports, test summary reports, and test harness (stubs and drivers).
- Identify test input and output data.

All testing-related tasks and their interdependencies can be shown through a **work breakdown structure (WBS).**

- Identify the tasks necessary to prepare for and perform testing.
- Identify all the task interdependencies.
- Identify any special skills required.

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- Specify necessary and desired properties of the test environment: physical characteristics of the facilities including hardware, communications and system software, the mode of usage (i.e. stand-alone), and any other software or supplies needed.
- Specify the level of security required.
- Identify any special test tools needed.
- Identify any other testing needs.
- Identify the source for all needs which are not currently available.

- Identify the groups responsible for managing, designing, preparing, executing, checking, and resolving.
- Identify the groups responsible for providing the test items identified in the test items section.
- Identify the groups responsible for providing the environmental needs identified in the environmental needs section.

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- Specify staffing needs by skill level.
- Identify training options for providing necessary skills.

- Specify test milestones.
- Specify all item transmittal events.
- Estimate the time required to perform each testing task.
- Schedule all testing tasks and test milestones.
- For each testing resource, specify a period of use.

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Specify the following overall risks to the project with an emphasis on the testing process:

- Lack of personnel resources when testing is to begin.
- Lack of availability of required hardware, software, data, or tools.
- Late delivery of the software, hardware, or tools.
- Delays in training on the application and/or tools.
- Changes to the original requirements or designs.
- Complexities involved in testing the applications.

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following is a list of costs to be included:

- Cost of planning and designing the tests
- Cost of acquiring the hardware and software required for the tests
- Cost to support the environment
- Cost of executing the tests
- Cost of recording and analyzing the test results
- Cost of training the testers, if any
- Cost of maintaining the test database

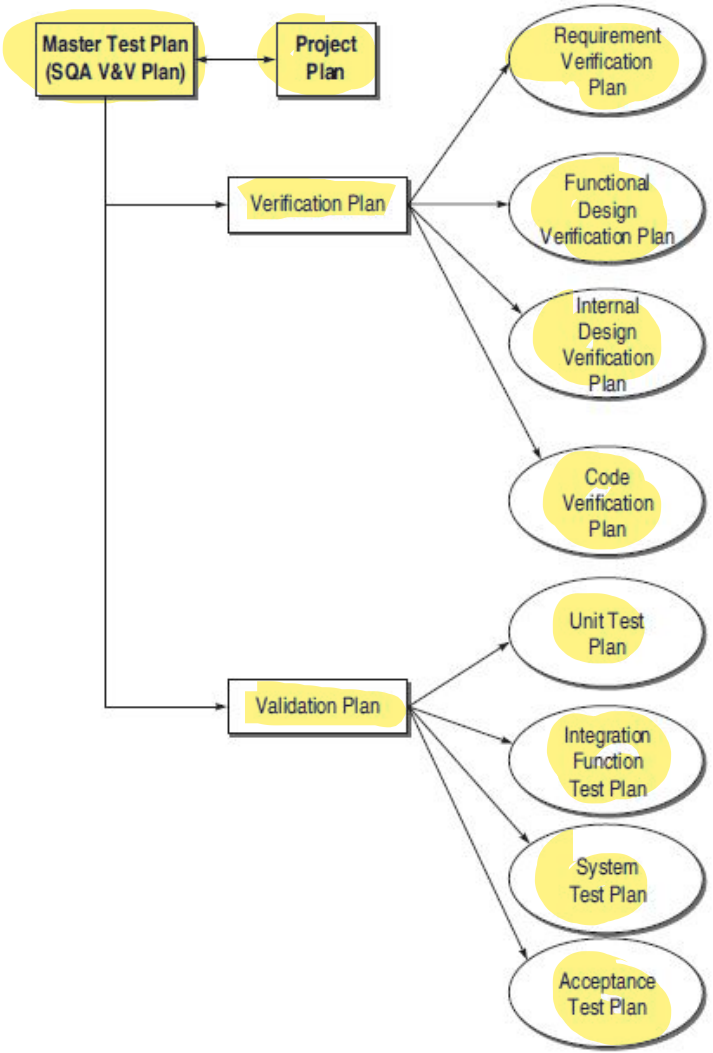
- Specify the names and titles of all the people who must approve the plan.
- Provide space for signatures and dates.

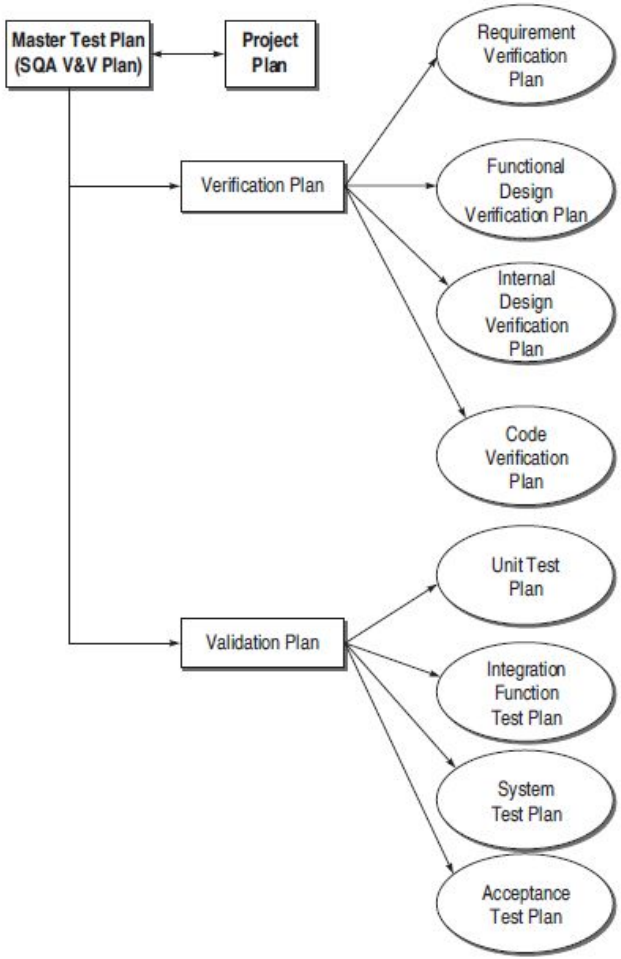
Testing Planning

Test Plan Hierarchy

Master test plan:
The following topics must be addressed before planning:

- Project identification
- Plan goals
- Summary of verification and validation efforts
- Responsibilities conveyed with the plan
- Software to be verified and validated
- Identification of changes to organization standards





Verification Test Plan

- The item on which verification is to be performed.
- The method to be used for verification: review, inspection, walkthrough.
- The specific areas of the work product that will be verified.
- The specific areas of the work product that will not be verified.
- Risks associate
- Prioritizing the areas of work product to be verified.
- Resources, schedule, facilities, tools, and responsibilities.

Validation Test Plan

- Testing techniques
- Testing tools
- Support software and documents
- Configuration management
- Risks associated, such as budget, resources, schedule, and training

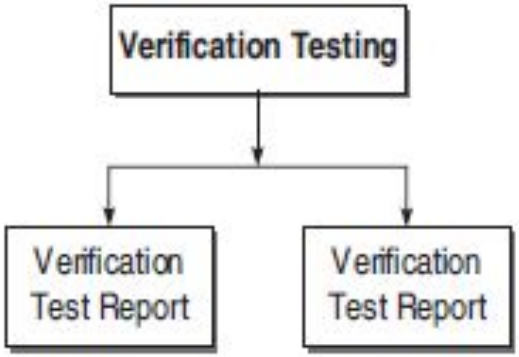
Test Design Specification

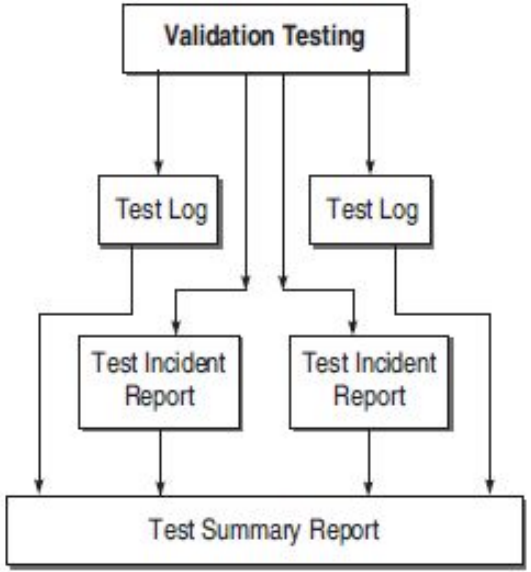
Already discussed before midterm exam

Test Procedure Specification

A test procedure is a sequence of steps required to carry out a test case or a specific task. This can be a separate document or merged with a test case specification.

Test Result Specification





Test Log

- Test log is a record of the testing events that take place during the test.
- Test log is helpful for bug repair or regression testing.
- The developer gets valuable clues from this test log, as it provides snapshots of failures.

- **Test Log Identifier**
  TL2
- **Description**
  Function 3.5 in SRS v 2.1. The function tested in Online environment with Internet.
- **Activity and Event Entries**
  Mention the following:
  (i) Date: 22/03/2009
  (ii) Author of test: XYZ
  (iii) Test case ID: T2
  (iv) Name of the personnel involved in testing: ABC, XYZ
  (v) For each execution, record the results and mention pass/fail status
  The function was tested with the following inputs:

Inputs	Results	Status
4102645876	S12	Pass
21A2345672	S14	Fail
234	Enter correct 10 digit PNR number	Pass
asdgggggggg	RAC12	Fail

  (vi) Report any anomalous unexpected event before or after the execution.
  Nil

Test Incident Report

- This is a form of bug report. It is the report about any unexpected event during testing which needs further investigation to resolve the bug.
- Therefore, this report completely describes the execution of the event.
- It not only reports the problem that has occurred but also compares the expected output with actual.

The bug reporting specification you already learned can be applied

Test Summary Report

- It is basically an evaluation report prepared when the testing is over.
- It is the summary of all the tests executed for a specific test design specification.
- It can provide the measurement of how much testing efforts have been applied for the test.

- **Test Summary Report Identifier**
  TS2
- **Description**
  SRS v 2.1

S. No.	Functionality	Function ID in SRS	Test cases
1	Login the system	F3.4	T1
2	View reservation status	F3.5	T2
3	View train schedule	F3.6	T3
4	Reserve seat	F3.7	T4
5	Cancel seat	F3.8	T5
6	Exit the system	F3.9	T6

- **Variances**
  Nil
- **Comprehensive Statement**
  All the test cases were tested except F3.7, F3.8, F3.9 according to the test plan.
- **Summary of Results**

S. No.	Functionality	Function ID in SRS	Test cases	Status
1	Login the system	F3.4	T1	Pass
2	View reservation status	F3.5	T2	Bug Found. Could not be resolved.
3	View train schedule	F3.6	T3	Pass

- **Evaluation**
  The functions F3.4, F3.6 have been tested successfully. Function F3.5 couldn't be tested as the bug has been found. The bug is that the PNR number entry has also accepted alphabetical entries as wrong