4) Test Management

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4.1 Test Planning :-

Test Plan is the project plan required to perform testing of an application or a system. It does not contain any kind of test design specifications or set of test cases. In reality test plan do not actually address that level of detail.

Following are some of the major activities done as a part of test planning

1. Preparing a test plan
2. Scope Management
3. Deciding Test Approach
4. Setting up criteria for testing
5. Identifying responsibilities
6. Staffing and training needs
7. Resource requirements
8. Test deliverables
9. Testing tasks

1. Preparing a test plan :-

Writing a test plan is one of the primary tasks in testing. While writing a test plan, you specify the scope and objectives for the testing are specified

It usually includes following information :-

* Scope :- In this the priority levels of different phases during the testing are described.
* Methodology :- Respective person who is going to perform the testing and method that says how you perform involve participants.

* Requirements :- The kind of hardware, software, human resources, tools you need.
* Criteria for pass-fail :- The criteria to determine pass or fail status of test.
* Schedule :- Plan of scheduling of all testing activities.

Test Plan types :-

* Master Test Plan :- A single high-level test plan for a project / product that unifies all other test plans.
* Testing level specific test plans :- Plans for each level of testing :
  - Unit Test plan
  - Integration Test plan
  - System Test plan
  - Acceptance Test plan
* Testing Type Specific Test plans :- Plans for major types of testing like Performace Test plan and Security Test Plan.

(5) Scope Management :-
With the help of scope management we can avoid the continuously growing scope projects along with the list of requirements. In project scope, we usually define who is included, who is not included in the project / system.

In general scope includes
* Objectives and requirements of the project
* Constraints or limitations for the project that typically involves time, budget, resource, legal, technological and management constraints
* Assumptions about the statements that are considered for planning purposes.
* Risks involved in the project implementation that has reasonable impact on the project. It focuses on possible risk characteristics including possibility of its occurance.

③ Deciding Test Approach :-
The choice of test approaches or test strategy is useful in the success in test effort. It also provides the accuracy to test plan and its estimates. It is decided by testers and test leaders.

Following are the major types of test strategies:
* Analytical :- Analysis of certain things forms the basis of planning.
  - Risk based strategy :- A risk analysis is performed using project documents and stakeholder input then planning.
  - Analytical test strategy :- An analysis of the requirement specification forms the basis for planning, estimating and designing tests.

SUT = System Under Test

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* Model based :- During requirement and design phase of project, formal and informal models are created. If the result of SUT is equal to the result of model then it is concluded that system is working according to that model.
* Methodical :- It involves strategies that are preplanned, developed in house or outside.
* Processor standard-complaint :- Process strategies involves externally developed approach to testing.
* Dynamic :- Dynamic strategies such as exploratory testing concentrating on finding as many defects possible during test execution
* Regression averse :- Regression averse strategies have in common a set of procedures - usually automated - that allow them to detect regression defects.

(4) Setting up criteria for testing :-
* Pass or Fail criteria :- Specify the criteria that will be used to determine whether each test item has passed or failed testing.
* Suspend criteria :- Specify criteria to be used to suspend testing activitity.
* Resume criteria :- Specify testing activities which must be redone when testing is resumed.

UAT = User Acceptance Test

⑤ Identifying Responsibilities :-

This section lists the responsibilities of early responsibilities of team (role / individual. It specifies the number of testing staff and their roles.

Along with this, it identities people related to test environment.

⑥ Staffing and Training needs :-

These needs are essential to deliver the acceptance of designed test plan. These needs communicate the resource requirements and get the approval for these resources.

Training :-

* Product training is provided to test analyst on the application or system.
* Test design techniques are provided to business users involved in UAT.
* Training for use of test execution and reporting tools provided to all users.

Staffing needs :-

First, provide the information about the test team size and number of resources required to be delivered to them.

Then our test plan must give information about description and distribution of every task in high level terms.

⑦ Resource requirements:-
This is one of the important activity under the test planning. A test manager has to estimate the hardware, software, people requirement during the phase. It also includes environmental need like support staff and office space.

Some resources required are as follows:-
* To run the processes machines with required configuration include RAM, Processor, Hard Disk, etc
* Supporting software and Operating System must be available.
* Required number of license copies of all software.
* Supporting tools like configuration management tools, test data generators, compilers, etc.
* Special testing tools for load test and performance test.

⑧ Test deliverables:-
These are different types of artifacts which are given to the stakeholders of software project during the SDLC.
The different types of Test deliverables are:-
* Test case documents
* Test plan
* Testing strategy
* Test scripts
* Test data
* Test Traceability matrix
* Test results/reports
* Test summary report
* Install/Configuration guides
* Defect reports
* Release notes

⑨ Testing tasks

First identify the various tasks required to perform testing. Then identify interdependencies among different testing related tasks.
-(Read for Text book)-

4.2 Test Management:

① Choice of standards
② Test infrastructure management
③ Test people management
④ Integrating with product release

Test management is the practice of organizing and controlling the process and artifacts required for the testing effort.

① Choice of standards:-

In software development and testing field standards are defined and used for coding, testing, reviewing, designing, requirement analysis phase.

Testing standards are mainly used to control activities that come under this phase. Mainly two types of standards:-
External & Internal.

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External standards :-

It is made by an entity other than the organisation. These standards are defined by regulatory authorities. These can be treated as legal requirements for a product.

Three types of external standards :-

<i> Customer standards
<ii> National standards
<iii> International standards.

<i> Customer standards :- These standards are defined by the customers. The aim in defining these standards lies in business requirement of certain product.

<ii> National standards :- These standards are defined by the regulatory authorities. These standards are applicable to both producer and customer who reside in that specific area / country. Violating leads to legal actions.

<iii> Internal standards :- These standards are developed by the software development organisations for their internal use purpose.

<iii> International standards :- These standards are globally defined and applicable to all producer and customers. Organisations like ISO, IEEE etc. prescribes such standards.

Internal standards:-
These standards are developed by the software development organisations for their internal use purpose.
In some cases these standards may be derived from some national or international standards.
Ex:- Templates of defect report, test plan, test cases.

(2) Test Infrastructure management:-
It consists of testing activities, even tasks and processes. The testing infrastructure generally include :-
* Test plan document
* Test cases
* Baseline the test data
* Test environment
* Test case database
* A method to prioritize test cases
* Coverage analysis metrics
* Defect tracking database.
* Risk management metrics
* Version control system
* Configuration management system
* A Requirement tracing tool
* Metrics required to measure improvement

The testing infrastructure serves many purposes such as :-

* Allows to run automated tests
* Provides a test environment to avoid conflicts between manual and automated testing.
* Helps to track the results of test cases i.e pass or fail.
* Gives report to test coverage levels
* Keeps expected results remain consistent across the test runs.
* A test lab to conduct multi-user and stress testing.

(3) Test people management :-

The importance of skilled testing teams has been proven during many software projects. The team needs to work together, follow the applied test processes and deliver the work within the specified schedule. This generates the need for test management which is performed by a test lead.

Test lead skills :-

The primary responsibility of the test lead is to lead a team of testers with full efficiency. This is required to meet the product goals and ultimately organisation goals.

Test lead responsibility:

* Identify how the test teams is formed and aligned within an organisation.
* Decide the way through which roadmap for the project and organisation is achieved.
* Identify the scope of the testing using requirement document.
* Put on the test plan after discussion with test team.
* Identify the required metrics and work to have them in place.
* Calculate size of project and then decide the required testing efforts and create test plan for the same.
* Identify if there are skill gaps present or not.
* Identify the tools for test reporting, test management, test automation, etc. and provide training to the team.
* Create healthy environment for all resources to gain maximum throughput.

To manage test team effectively, following activity set is required:

* Initiate the test planning activities for test case design.
* Encourage the team to conduct review meetings and incorporate meeting comments.
* Monitor the test progress, check available resources and re-balance or re-allocate them as required.

* Check for any delays in schedule, discuss and resolve issues of testers, propose plan to resolve risks if any.
* Initiate timely status to the stakeholders and management.
* Bridge any gaps between the testing team and the management.

Consideration for Test team management:-

(a) Understand the testers:-

Understanding tester's mindset is an important thing for test leads and management people.

(b) Testers work environment:-

It is important to keep the work environment nice because if there is frustration among testers, it may not yeild proper output.

(c) Role of test team:-

It is important to know roles of every member in the test team. If it doesn't, this may create a big letdown for testers irrespective of their roles skills and vision.

④ Integrating with product release :-
The product release is related with schedules of testing phase so the project plan of entire product must include seperate plan for development activities and test activities.

4.3 Test Process :-

Fundamental test process is divided into following basic steps :-

* Test planning and control
* Test analysis and design
* Test implementation and execution
* Evaluation of exit criteria and Test reporting
* Test closure activities

Base Lining a Test Plan :-

It is one of the types of non-functional testing. It involves the important process of validation of document and specifications using which test cases would be planned and designed.

The test plan is also base-lined. If any changes are required to be made then first it is made in test plan then it is again approved and process continues. By using baseline testing majority of the issues can be solved.

Test case specification

A test case specification is a requirement to be satisfied by one or more actual test cases. Test case specification is provided for each unit. For this first determine the feature to be tested for selected unit. For this use the approach specified in the test plan. The plan is refined again and again and finally a specific test technique is selected along with test evaluation criteria.

Update of Traceability Matrix:-

Traceability matrix is a matrix which associates the requirements to its work products and test cases. This can also be used to associate the use case to the requirements.

When a test case is finished, the corresponding requirement which is being tested is updated with test specification identifier. By doing this, a two way connection between requirement and test case is formed.

Executing Test Cases:-

Test case execution has following major tasks:-

* Follow the test procedure to execute test suites and individual test cases.
* Do the confirmation testing or re-testing to re-execute the tests that previously failed in order to confirm a fix.

* Log the result of test execution followed by recording the versions of the software and test. A test log contains information about what are the test cases, order of execution who executed it, and the pass / fail status of the test case.
* Comparison of actual ~~scope~~ result with expected results.
* In case of differences between actual and expected results, defect occurrence is reported.

Read

Collecting and Analyzing Metrics:-
The test metrics is derived from raw test data and used in test management. It helps in showing progress of testing and in decision making:-
Some of the test metrics are as below:-
* Requirements volatility
Formula = {(No. of requirements added + No. of requirements deleted + No. of requirements modified) / No. of initial approved requirements} X 100
Unit of measure = Percentage

* Review efficiency :-
Components:
- No. of critical, major and minor review defects
- Effort spent on review in hours

Weight - age Factors for defects
Critical = 1 ; Major = 0.4 ; Minor = 0.1
Formula = (No. of weighted review defects / Effort spent on review)
Unit of measure = Defects per person hour.

* Productivity in test execution :-
Formula = (No. of test cases executed / Time spend in test execution)
Unit of measure = Test cases per person per day

* Defect rejection ratio :-
Formula = (No. of defects rejected / Total no. of defects raised) x 100
Unit of measure = percentage

* Defect fix rejection ratio :-
Formula = (No. of defect fixes rejected / No. of defects fixed) * 100
Unit of measure = percentage.

* Delivered defect density :-

Components :

- No. of critical, majors and minors review defects
- Weightage Factors for defects

Critical = 1; Major = 0.4; Minor = 0.1

Formula = [(No. of weighted defects found during validation / customer review + acceptance testing) / (size of work product)]

Unit of measure = Defects for the work product/ cycle

* Outstanding defect ratio :-

Formula = (Total number of open defects / Total number of defects found) x 100

Unit of measure = Percentage

Preparing Test Summary Report :-

— (Read detailed from Text book) —

Below are the steps for typical test summary report template :-

Step 1 :- Purpose of the document
Step 2 :- Overview of an application
Step 3 :- Testing Scope
Step 4 :- Metrics
Step 5 :- Types of testing performed
Step 6 :- Information of Test environment & tools
Step 7 :- Lessons learned.

Step 8 :- Recommendations

Step 9 :- Best Practices

step 10 :- Exit criteria

step 11 :- Conclusion / signoff

step 12 :- Definition, Acronyms and Abbreviations.

4.4 Test Reporting :-

Once testing is completed, testers generate metrics and make final reports on their test efforts and whether or not the software tested is ready for release.