Exploring Testing Life Cycle of a Software

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Abstract—Many software applications are developed and introduced in the market but not all the software developed meet the set quality standards. For this reason software testing is developed which is the process of questioning a product in order to evaluate it. Software testing is used to identify the correctness, completeness, security and quality of software product against a specification. Each software has its testing life cycle to ensure success. Software testing life cycle is set of a procedure that recognizes the best time to bring out the test procedure and also the best time to finish it off. In this paper I have described about software testing life cycle and its different generic phases through which each software product goes before its release.

Index Terms—Defect Life Cycle, Phases, Software Testing Life Cycle

1 INTRODUCTION

WE can define software testing life cycle as a course of software being tested in a well planned way. It is an integral part of software development life cycle. [1] Various testing activities are identified by software testing life cycle and what is the best time to accomplish those activities. STLC is a comprehensive group of testing related step followed to deliver a best quality product which is according to the customer specification. [2]

Even though testing differs between organization, there is a testing life cycle which consists of various stages of testing through which a software product goes, and it also describe various different activities which will be performed on the product.

There are 14 essential stages in software testing life cycle, they are as follows:

1. Requirement Gathering Phase
2. Test Planning
3. Test Analysis
4. Test Design
5. Construction and Verification
6. Test Execution
7. Test Result Analysis
8. Test Reporting
9. Bug Tracking/Defect Tracking
10. Reporting and Defect Retesting
11. Implementation and Final Testing
12. Post Implementation
13. Test Closure
14. Delivery of Products

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2 SOFTWARE TESTING LIFE CYCLE

The 14 different phases of software testing life cycle are described below:

2.1 Requirement Gathering Phase

The initial stage of software testing life cycle is requirement gathering phase. To avoid releasing erroneous software the testing team should be involved from the requirement phase itself. This is a phase in which the developers take part in analyzing the main requirement for designing a product. [3] As the testers think from users side and the developer can't, so the tester must involve them in this phase. Thus, a panel of users, testers and developers can be formed and help in determining what expect of a design are testable and with what parameters those test work. The entire requirement should be documented properly so that they can be further used as software requirement specification or SRS.

2.2 Test planning

Test planning is a key phase in software testing life cycle. This phase determines the overall flow of testing process. This is a phase where the project manger has to decide what are the essential things which are needed to be tested. Good and proper planning at this stage would greatly reduce the risk of low quality software. [4]

Test planning is predetermining a plan well in advance to reduce further risk. Once the testers are finished with the requirement phase a test plan is documented.

The proper test plan structure is as follows [5] [3]

1. The testers have to describe the objective of the test plan.
2. Complete list of features that are to be tested which are based on the customer requirements, and in this step we can also list the features that can be skipped from the testing like incomplete modules etc.

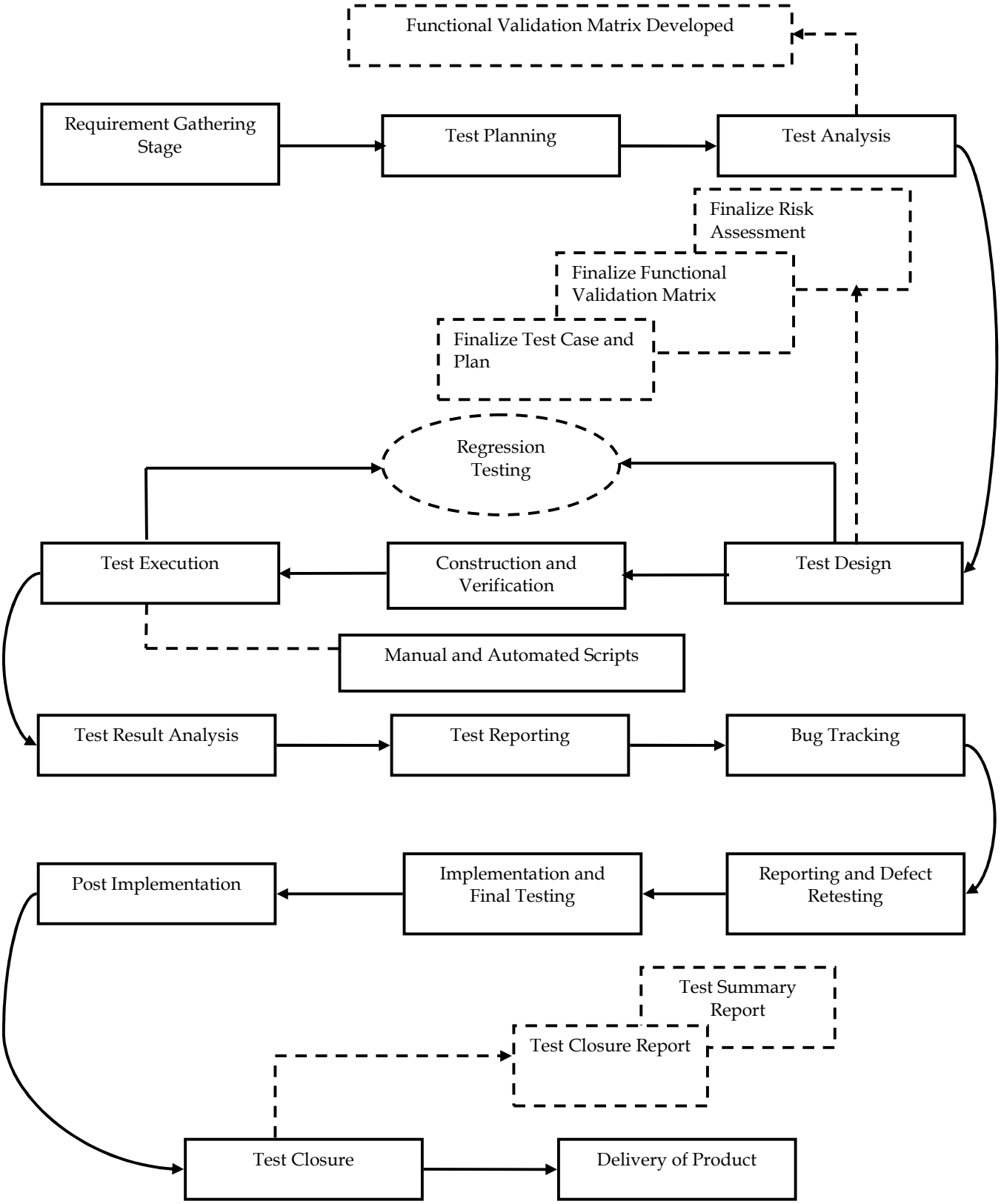


Fig. 1. Represent phases of software testing life cycle

3. Which testing approach to be followed.
4. The testing methodologies which are used have to explain test item as passed or failed.
5. Number of man hours required and give the proper training on the testing tools to be used to be given to the staff members who are responsible for the application.
6. List of all the resources required for the whole testing process which also includes the environment in which the application has to be design are tested.
7. List of testing tools that are to be used.
8. What are probable risks that can occur and what can be done in such situation.
9. Plan to manage all test cases in a database, either manual or automated.

2.3 Test Analysis

Once the test plan is made and decided upon, the next stage is to analyze what types of software testing should be carried out at various stages of software testing life cycle. The software project can't be successful unless there is frequent interaction among testing team; project managers and development team because they all are involved in coding and testing. [3][6]

This will provide an opportunity to again discuss the strategies decided for testing, if any deficiency in the decided test plan came into surface.

In this stage we need to develop functional validation matrix based on business requirement. To ensure that all system requirements are covered by one or more test cases, begin review of documentation, and identify which test cases to automate i.e. product specification, product externals etc. In this phase the automation team begins to setup variable files and high level scripts in auto tester and setup TRACK and auto advisor for tracking component of automated system. Define areas for stress and performance testing. The developer has to define base line data for each test case. [7][8]

2.4 Test Design

In this phase the test plans and cases which were developed in the analysis phase are revised. Revision and finalization of matrix for functional validation. Finalization of risk assessment methodologies are done in this phase. Formalize details for automated testing, multi-user testing, stress testing and performance testing. This phase decides whether manual or automated testing is to be done. In automation testing different path for testing are to be identified first and writing of scripts comes second if required. Unit testing standard defined here, pass/fail criteria etc. [3][8][6]The test case design is the most critical one which decides the test case preparation. So the test design assesses the quality of testing process.

2.5 Construction and Verification

In this phase developer have to finalize all the test plan and test cases, completion of the script creation for the test cases decided for automation. Complete the plan for stress and performance testing. Integration testing and bug reporting is done in Construction and Verification phase of software testing life cycle. Testing team will support the development team in unit testing phase. Bug login in bug repository and preparation of detailed bug report. In the last step run Quality assurance acceptance test suite to certify software is ready to turnover to Quality Assurance. [4][8]

2.6 Test Execution

Planning and execution of various test cases is done in this phase. The functionality of the test is done in this phase, to find out failure and bugs top level testing is done as soon as they are found. They are reported immediately to the development team, for this we have to established approaches such as black box/white box, proven testing tools such as AdHoc /exploratory testing and adjusted reporting document templates such as scripted testing.

2.7 Test Result Analysis

After the successful execution of the test cases i.e. once the bug is fixed by the development team; the testing team has to compare the expected values with the actual value by retesting and declares the result fail/pass. [3]

2.8 Test Reporting

In this phase tester will create test closure memo or report, and tester also generate metrics and make final reports, and check whether or not the software tested is ready for release. The test reports are well documented and spotted bugs are reported to the developer after the testing is completed.

2.9 Bug Tracking/Defect Tracking

Once any defect has been detected, at once that defect must be reported to the development team so that it must be 'FIXED'.

The initial stage of the defect is 'NEW', and once the tester examines that defect he/she set that defect to one of the following status

1. Duplicate: By duplicate we mean the existing bug is already having a duplicate bug.
2. Invalid Bug: When the bug in some way is not valid as per the design of the system.
3. Deferred: Some time the bug is expected to be fixed in future releases due to some reason such as low priority of bug, lack of time etc.
4. Document: A part from the open status if any other status has been set to the bug to which development team does not agree then they set the status of a bug as Document.
5. Open: The open status indicates that the developer is working on a bug to find solution
6. As Designed: This is an intended functionality as per the system requirement.

If the development team at once started working on a defect they set the status of a defect as 'WIP' (work in

progress) and if they are waiting for some technical feedback to start their work they set the status of the defect as 'DEVWAITING'. Once the defect is fixed by a development team they set the status of defect as 'Fixed' and it means the defects is ready to Retest.

DEFECT LIFE CYCLE

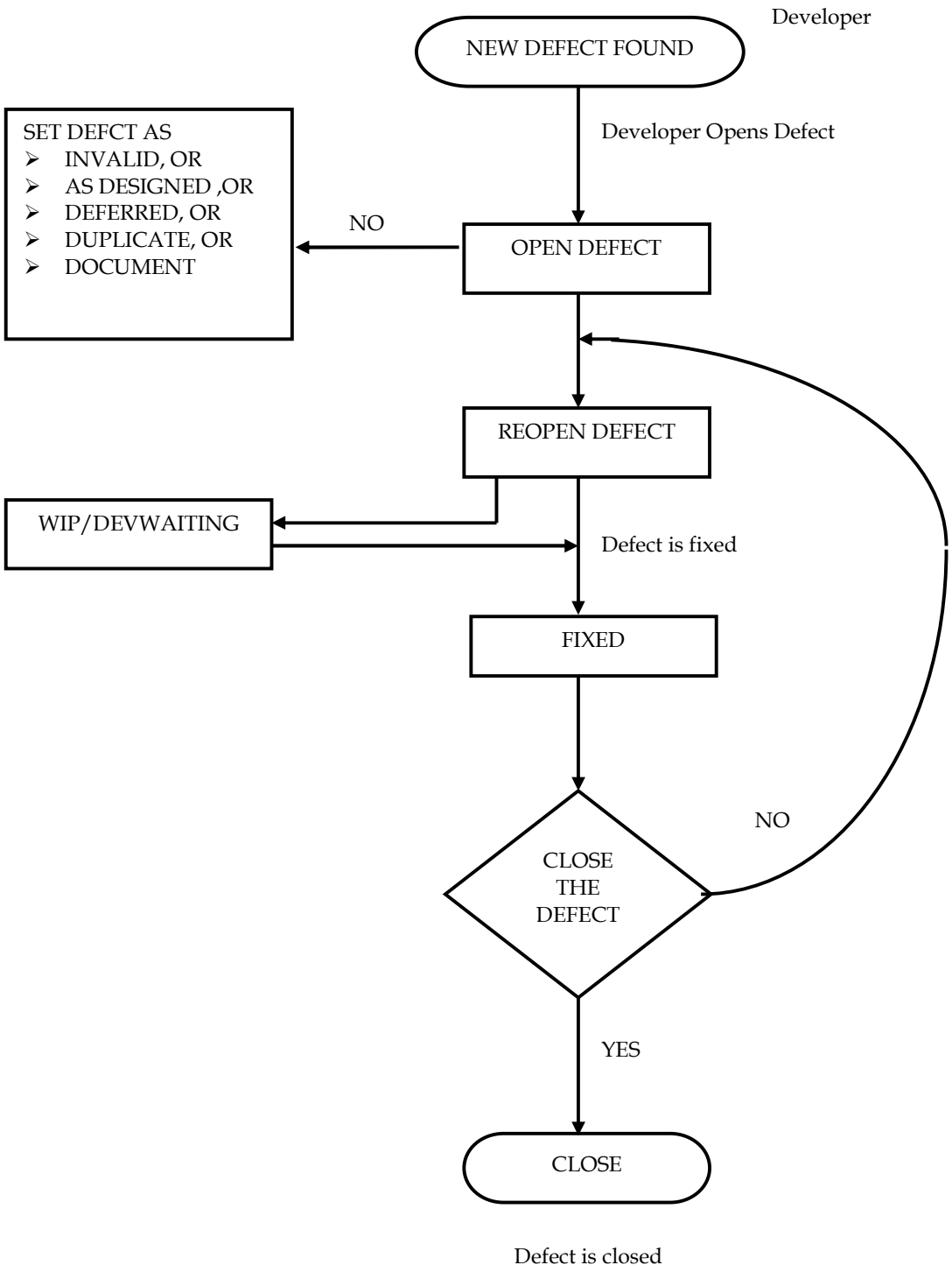


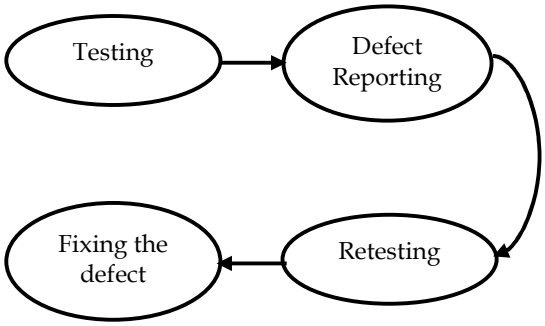
Fig. 2. Represent Defect Life Cycle

After retesting, if the developer still feels that the defect exists then the 'REOPENED' status is assigned to that defect and same cycle repeats again but if the developer feels that the defect which is fixed satisfied the requirement then they assigned 'CLOSE' status to that defect.

A mismatch in the application and its specification is a defect. A software error is present when the program does not do what it is expected to do. In my article I am explaining the various stage of Defect Life Cycle. [9]

2.10 Reporting and Defect Retesting

Testing is an iterative process. Once the defect has been reported and fixed by the development team, it has to undergo the testing process again to assure that the defect found is resolved (by resolution testing). When the developer makes sure that the software is ready to release, again the software has to undergo one more round of testing. [4]



For finding defects we used best bug tracking tool such as Jira, Bugzilla. During this phase review of test plan and test cases could also be carried out.

2.11 Implementation and Final Testing

Final testing is done when the planned test cycles are completed. It focuses on the remaining levels of testing such as acceptance testing, load testing, stress testing and recovery testing. This phase involves execution of all frontend test cases (manual or automated) and backend test cases (automated or manual). The developer provides on-going defect tracking matrices and also provide on-going complexity and design matrices. [8] All the other remaining documentations are completed in this phase of software testing life cycle.

2.12 Post Implementation

In this phase the testing is evaluated and lessons learnt are properly documented to prevent similar problems in future project. Creates various plans to improve the process archival of test cases and clearing up of testing environment are done. [7] Mc-Cabe tools helps in analyzing and producing final reports. Post implementation evaluation is the process of reviewing the entire project.

2.13 Test Closure

Testing has been completed and test results are make available for user acceptance and if everything goes fine, the software testing project is signed off and the test closure report is prepared.

2.14 Delivery of the Product

After the product has undergone several test, the acceptance test is done by client i.e. UAT, where in the used cases were executed and product is accepted to go line. [1]

3 Conclusion

Software testing life cycle can help ensure the quality of a software product. STLC deals with all the flavours of software testing i.e. "manual", "automated" and "performance". In general STLC has 14 generic phases they are as follows: Requirement Gathering Phase, Test Planning, Test Analysis, Test Design, Construction and Verification, Test Execution, Test Reporting, Test Result Analysis, Bug Tracking/Defect Tracking, Reporting and Defect Retesting, Implementation and Final Testing, Post Implementation, Test Closure, Delivery of Products and through each phase each software product goes and testing are carried out on the product. STLC is a systematic approach that identifies what test a tester to carry out and when to accomplish those test activities. In short we can say software testing life cycle is a road map to the product success.

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