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Software Testing

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***Abstract*—The aim of the software testing is to find errors in the software and fix them in order to improve the quality of the software product.The process also enables to identify risk and future problems.Software Testing is becoming more popular and crucial in software development industry. Software testing is a very vast area, which involves many other technical and non-technical areas, such as specification, design and implementation, maintenance, process and management issues in software engineering. Software Testing plays a major role in assuring quality of software, verification, validation and reliability estimation of the software product.It is wiser to start testing process in the initial stages, in order to avoid problems getting highlighted in the later stages.**

***Index Terms*—Software Testing, Importance of software testing in SDLC, Software test Life cycle (STLC),Manual Testing and Automation testing.**

I. INTRODUCTION

Software Testing is the process of exercising the software product in pre-defined ways tocheck if the behavior of the software is the same as the expected behavior. In Software testing, the organization finds the defects in the software and fixes the defects before deploying the software product to the client. Software testing also involves verifying and validating the software product to ensure that it meets customer requirements and achieves desired quality. [1]

Software testing is not an event, but a set of diverse activities capable of playing a critical role in identifying problems ofvaried types throughout the project lifecycle, far in advance of end-user access to the delivered system. [2]

It is the process of executing a program/application under positive and negative conditions by manual or automated means. It checks for the:-

- Specification
- Functionality
- Performance

Other key points of Software testing are as follows:-

- Uncover as many as errors (or bugs) as possible in a given product.
- Demonstrate a given software product matching its requirement specifications.
- Validate the quality of software testing using the minimum cost and efforts.
- Generate high quality test cases, perform effective tests, and issue correct and helpful problem reports.

II. TESTING TERMINOLOGY

When software doesn't behave as it is intended to behave, it gives rise to four testing terms which are as follows:

A. Failure

One defect can lead to multiple failures. After deployment of software at client side, if any defect occurs then it leads to failure of software.

B. Bug

The presence of error at the time of execution of the software.

C. Error

Error is the incorrect human action.

D. Defect

It is the variance between the expected output and the actual output.

III. IMPORTANCE OF SOFTWARE TESTINGIN SOFTWARE DEVELOPMENT LIFE CYCLE

Before proceeding with the importance of software testing in SDLC, First let's see what is SDLC.

SDLC comprises of different phases which a software has to undergo. Standard model used word wide to develop a software. A framework that describes the activities performed at each stage of a software development project. Necessary to ensure the quality of the software. Logical steps taken to develop a software product. These phases are as follows:

A. Requirement GatheringAnalysis

In this phase, requirements are gatheredfrom the customers to get a clear idea of what customer wants from the system. Business Analyst gathers the requirements and creates BRS (Business Requirement Specification) depending upon the requirements gathered. Depending upon this BRS, Software requirement specification (SRS) is made by the technical

person. SRS contains the technical specification of the software.

B. Design phase

Designers build the design of the software. It comprises of High Level Design (HLD) and Low Level Design (LLD).

C. Coding

Developers actually write code and we get executable file (.exe) & source code as an output of this phase.

D. Testing

It involves testing the software that is developed for any errors in case if any, the errors are fixed. This phase is performed by software testers. Testing can be done manually or by using various automation tools.

E. Implementation and maintenance

The software is installed and deployed at the client side. The software that is developed must be open to make any changes, that is your software should be updated.

Major importance of testing in SDLC:

a. Identification of Bugs & defects
b. Information to stakeholders and maintaining reputation of the company.
c. Improvement in the quality.
d. Verification and validation.
e. Reliability Estimation.
f. Ensures proper usability and operability.

IV. Software Test Lifecycle(STLC)

A. Test Planning and Control

In this phase, test plan is prepared which comprises of decisions like how to test, what to test ,when to start testing ,who is assigned the testing job. Senior test engineer often prepares the test plan.

B. Test analysis & Designs

Analyze the requirements and develop the test scenario.

C. Test implementation & Execution

Test cases are prepared and executed in order to test if the actual output matches the expected output.

D. Evaluating exit criteria and reporting

Exit criteria specify when to stop testing. Exit criteria is mentioned in the test plan. Reporting involves preparation of defect report.

E. Test closure Activities

All the formal documentation for closing of the testing activity is undertaken.

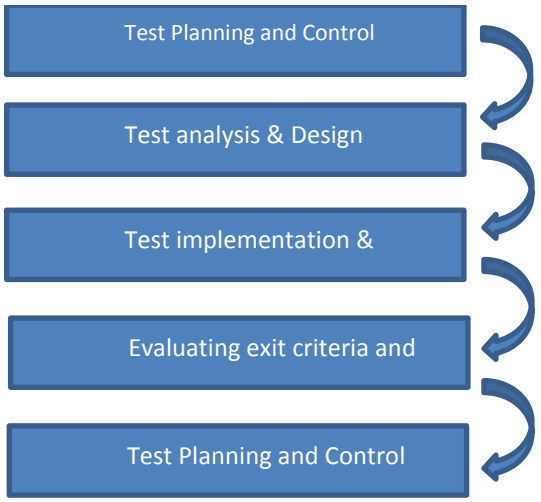

Fig (1). Software Testing Lifecycle in pictorial format

V. Manual Testing

Manual testing is the process of manually testing software for defects. It requires a tester to play the role of an end user and use most of all features of the application to ensure correct behavior. To ensure completeness of testing, the tester often follows a written test plan that leads them through a set of important test cases.

Process workflow of Manual Testing:-

A. Review the Project

In this process,we review the projects business requirements along with a business analyst and the project managers so that we get a brief overview of the project and its flow. Here the decisions are made about general baselines of the assumed mobile application testing, desktop testing or web site testing.

B. Project plan

The next step will be to develop a test plans in who will test what etc.

C. Test case development and Running Tests

Develop test cases for every condition using various techniques (use case, decision table, etc.) following the test case template. Once the build is ready, perform Smoke testing for checking the basic links and project flow. Execute test cases and perform positive and negative tests. Compare the expected and actual results and log defects.

D. Defect Fixing

Get defects fixed by developers and move them to the regression testing phase.

E. Regression Testing

Herein we re-test whether all the reported bugs have to be fixed. After this the testing team performs regression

testing to make sure that the errors do not exist anymore, and no new ones appeared.

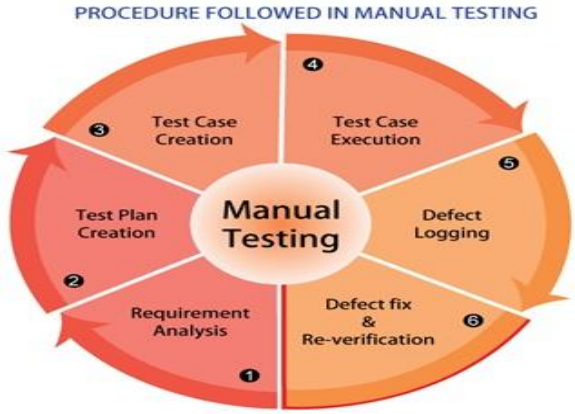

Fig. (2). Manual Testing Workflow [Adapted from http://www.xoriant.com/] [4]

VI. AUTOMATION TESTING

Automated testing is the process through which automated tools run tests that repeat predefined scripts, comparing a developing program's expected and actual outcomes. Automated testing is good to use when the project is large, there are many system users, or when filling out forms. Since everything is scripted so there are less chances in missing out things to test . There are various tools available for automation testing but the one majorly used is SELENIUM - Selenium operations are highly flexible, allowing many options for locating UI elements and comparing expected test results against actual application behavior.[3]

Process workflow of Automation Testing :-

A. Identify Requirements

Business and technical requirements of the project are understood.

B. Develop test plan

A test plan captures the set of test cases required to validate a software release. The test plan describes the scope of the overall test effort and provides a record of the test planning process. The test plan can be configured to meet the needs of your team.

C. Develop test case and test suite

A test case is a set of conditions on which the tester determines whether the system satisfies all the requirements and works correctly. Test suite is basically the collection of all the test cases.

D. Develop Test scripts

A test script in software testing is a set of instructions that will be performed on the system under test to test that the system functions as expected.

E. Run Test case and Test suite

Run the written test case that are the test scripts in particular test suite, to verify the expected and actual results.

F. Report Defects

If actual and expected output are not the same we record the defects and report defects to the test designers for evaluation of overall test results.

G. Generate reports

The reports are generated for pass and fail test cases via TestNG installed in selenium.

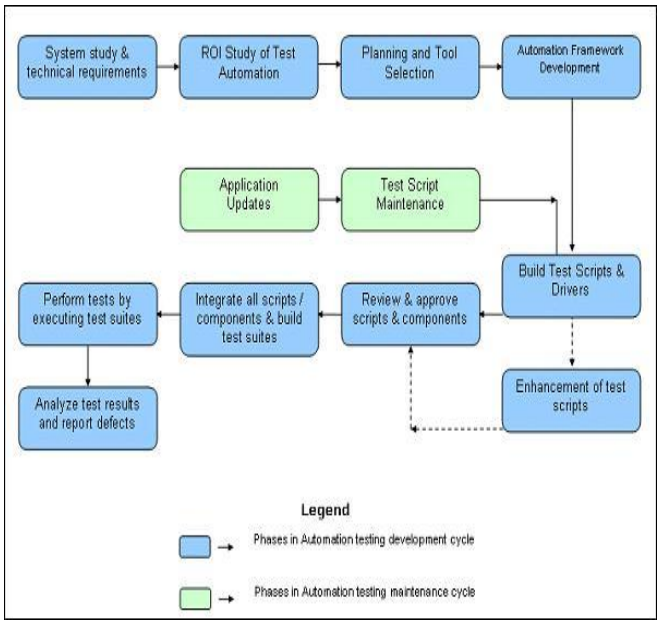

Fig. (3). Automation Testing Workflow [Adapted from http://www.xoriant.com/] [4]

VII. CONCLUSION

Software testing should be performed at different levels, including module level testing, unit level testing, interface testing and system level testing. There are various type of SDLC model, (Waterfall Model, RAD Model, Iterative Model, Proto-Type Model, Spiral Model, V-Model, etc.). But in all these models, testing is applied after a particular stage and not in all the phases .Hence the Software testing life cycle(STLC) explained should be carried out at every phase of SDLC. Not at a particular stage as the defects can be detected and fixed at early stages of the project life cycle.

Our paper also states the workflows used in manual testing and automation testing and how this two work flows differ from each other. We end up concluding how automation testing is convenient than manual testing with respect to speed,performance,quality of the software product. Automation testing also results efficient regression testing , repeated test case execution, faster feedback to developers. It

also results in reduce human effort and enables testing same application on multiple environments.

VIII. REFERENCES

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