

A Review Paper on Software Testing

Raju Ranjan, Department Of Computer Science and Engineering
Galgotias University, Yamuna Expressway Greater Noida, Uttar Pradesh
E-mail id - ranjanr.cs@gmail.com

ABSTRACT: *Testing is a task, which is performed to check the quality of the software and also this process is done for the improvement in software at the same time. Software testing is just testing software for the purpose of checking whether the behavior of the software is correctly working or not according to the user expectations. For knowing the full details of any software development there is a concept of software development life cycle (SDLC) which describes all the stages of the software development. There are various phases i.e., Analysis (ideation), Requirements (Documentation), Design, Development (implementation), Testing, Deployment (release), maintenance which is used to actual development of software according to the users requirement. The main goal of the software development life cycle is to provide error free software and fulfill the user's expectations within the time limit. Testing of any software is basically a process which is used to assist in recognizing the completeness, correctness and the standard of the developed computer software. The main aim of this review paper is to in brief discussion about the how software development life cycle is useful for the purpose of develop an efficient software and also how to keep the better quality assurance of the product using software testing life cycle process.*

KEYWORDS:- *Software, Software development life cycle (SDLC), Software Testing Life Cycle (STLC), Unit Testing, Integration Testing, System Testing, Acceptance Test, Levels of Testing, Requirement Gathering Analysis (RGA) etc.*

INTRODUCTION

Software Testing is the process of identifying errors, gaps or anything missing in any system versus what are the actual expectations or requirements of the user from that system[1]. For the finding difference between existing conditions and required conditions is done by the process of "Testing". The main aim of the testing process is to detect defects/errors in any software and also resolve those problems so that the quality of the software will be increased. In software development life cycle (SDLC) in this parallel software testing will be performed to enhance the quality of the software[2], [3]. There are various phases in software testing life cycle i.e., Requirement Analysis, Test Planning, Test case development, Environment setup, Test execution, Test cycle closure/reporting and all these phases have their specific goal in order to provide better quality of any developed software[4]–[6]. Different organizations have different processes for the testing but fundamental steps are common, which is above written. Nowadays for the development of software there is a method that is used named as software development life cycle and for the purpose of conducting the testing process of the software there is a process named as software testing life cycle and also software testing techniques used for the enhancing the quality of the software[7], [8]. If development of any software is done using the method of software development life cycle so the quality of the software will be increased and also the development process will be completed before the time deadline which is allocated for the development of that software. Software testing just checks the behavior of a software which is working or not in that proper way what users expect from the software and also detects the error if any available and as well as do validation to check what output will be there is related to actually meet the user requirements or not[9], [10].

SOFTWARE DEVELOPMENT LIFE CYCLE

In the software industry for the purpose of design, development and doing the testing at the same time so that the quality of the software will be improved, and these all processes are done by using a method named as software development life cycle. The standard ISO/IEC 12207 is followed by software development life cycle (SDLC) for the proper development of any type of software or product. The main goal of software development life cycle (SDLC) is to provide the software in the term of quality must be best. And the software must satisfy the expectations of the customers/users.

Steps of Software Development Life Cycle

There are seven basic steps for the software development in this method (software development life cycle). I.e., Ideation/project initiation, Requirement gathering analysis, Design (High Level Design and Low Level Design), Implementation/development, Testing, Deployment, Maintenance. All the steps/phases of the SDLC have their own specific work and outputs.

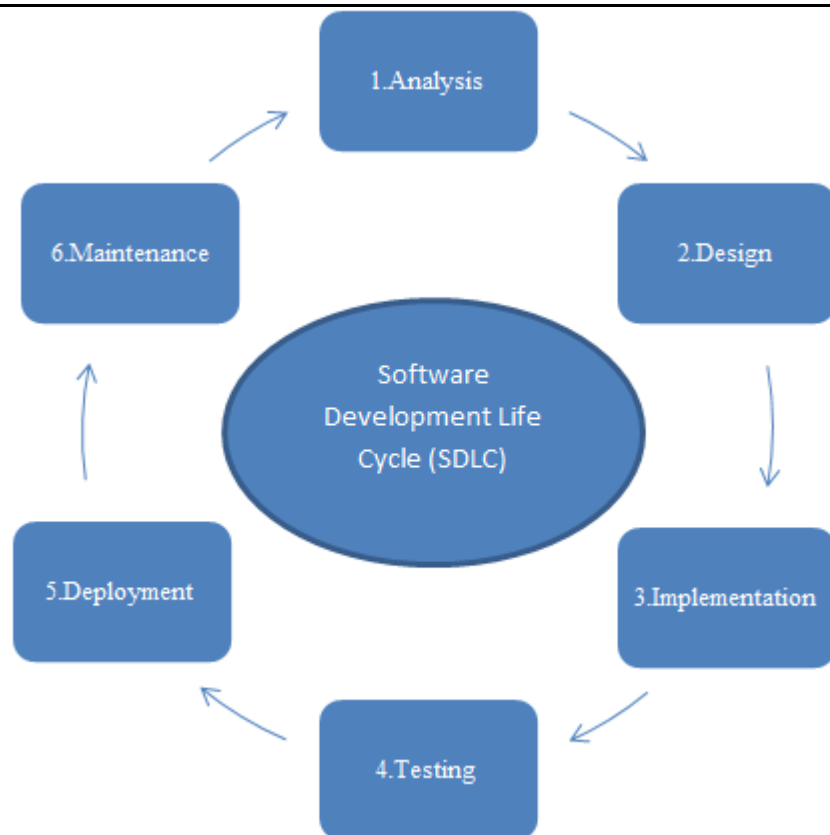


Figure 1: Phases of Software Development Life Cycle (SDLC)

1. Ideation:

In this phase basically all the ideas will be analyzed for the purpose of getting a solution to a particular problem which is faced by many users.

2. Requirement Gathering Analysis:

This is the simplest and most important phase of the software development life cycle. In this step of the software development life cycle, here all types of documents will be collected about the requirements of any projects after communicating with users and stakeholders. Requirement just means what are the needs of the users. The Requirements are divided into two parts i.e., Functional and Non-Functional Requirement. Whatever software does in actual is comes under functional requirement.

EX: - Android phone (Some basic Functional Requirement of Android phone is to make phone calls, listening music, playing videos and also surfing internet, online payments, sending mails, update live location using GPS in the phone).

Further Functional requirements are divided into two types i.e., Explicit and Implicit Requirement. Requirements are introduced by the customer in explicit requirement. But in Implicit requirements here requirements are not mentioned/introduced by the customer/users but these all requirements should be available in the product.

In Non-Functional Requirement, means of this requirement is to know about how will be the look and work of the software, how users feel about using that software and also what are the performance and design of that application (software).

EX: -Android phone (Non-Functional Requirement of Android phone is to smoothly work all the applications of the phone or the design of the phone or structure of that and also check the capability and scalability and availability of that particular software).

After Completion of this phase the output is software requirement specification (SRS) document, which is further used in the next phases.

3. Design:

In this phase, a software requirement specification document is used as an input in the designing of any software/product. For the purpose of knowing all the specifying hardware which is used in any particular software also the design phase helps to define overall a structure of the software. There are two types design phases i.e., High level /System level/Architectural design (this is basically acknowledged about the whole system. and also identify the important components which are used for the development design of the interface and software) and low level/Program level/Structural design (In this basically work will be done such as about the coding part and how and which data structures will be used these all comes under in low level design).

4. Implementation/Coding/Development Phase:

The main work starts from this phase, most important work is done by this phase, and coding will be done by the developer. After completion of the design phase the next phase is the coding phase which is most important for the software development. In this phase the low level designing part is taken as an input. In this the main aim of this phase is to take input from the design phase and convert that into a computer language/programming. In this phase source code which is developed by the developer will be taken as in the form of a document and the output/executable file is built.

5. Testing

The Fundamental work of this phase is to find errors, bugs and defects in a product, after development of that product. The main of this phase of the software development life cycle is to make satisfied customers through enhancing the quality of the product and also fulfill the requirements of the customers. In the starting in this phase a SRS is built to take requirements of the customers or expectations of the customers from the product. And after that according to the customer requirements here test planning, test case development, and according to that environment setup will be done. And after that all the test cases will be executed and in test cycle will be stop and a test report/document will be there if any bug or error or defect is there then their problem is mentioned in that report means where is the problem and if no any problem will be detect after testing then All ok message will there in testing report.

6. Deployment

After the completion of the testing phase when the product is delivered to the users/customers then their deployment phase will be done. All the software will be installed in this phase by the Installation team who has a good experience in that field. When a new product buying by someone then there will be a user manual and User guide associated with that product, so these all documents comes under this phase.

7. Maintenance

In the maintenance phase, when a developed product is delivered to the user, then the user starts the using of that product then in actual various types of problems occurs at the time of using that product. And these all problems must be solved from a limited time. In this phase, If any feature will required to update, or any restriction or bugs are resolved in this phase and basically if any type of error or bugs or defects will be then these all problem will be solved/fixed in this phase

SOFTWARE TESTING

For the purpose of enhancing the quality and providing better services towards the customers so that testing of software is most important, because during development of software there are various mistakes may be done by the developers. In that mistakes may be some mistakes are not important, and some of them are most important because they can affect the performance of the system or may be that problem so dangerous for the system. So for resolve these problems here conduction of testing process is must to identify the major problems which may create the problems for that software. So for the improvement of all the mistakes and error or for the improvement the quality of the software here testing of software is must.

Software Testing Life Cycle (STLC) is basically a process in which there are seven fundamental steps that will be executed for the purpose of testing. The different steps are of the software testing life cycle includes i.e., Requirement Analysis, Test Planning, Test case development, Environment setup, Test execution, and at last after completion of evaluation Reporting and Closure activity of the Test.

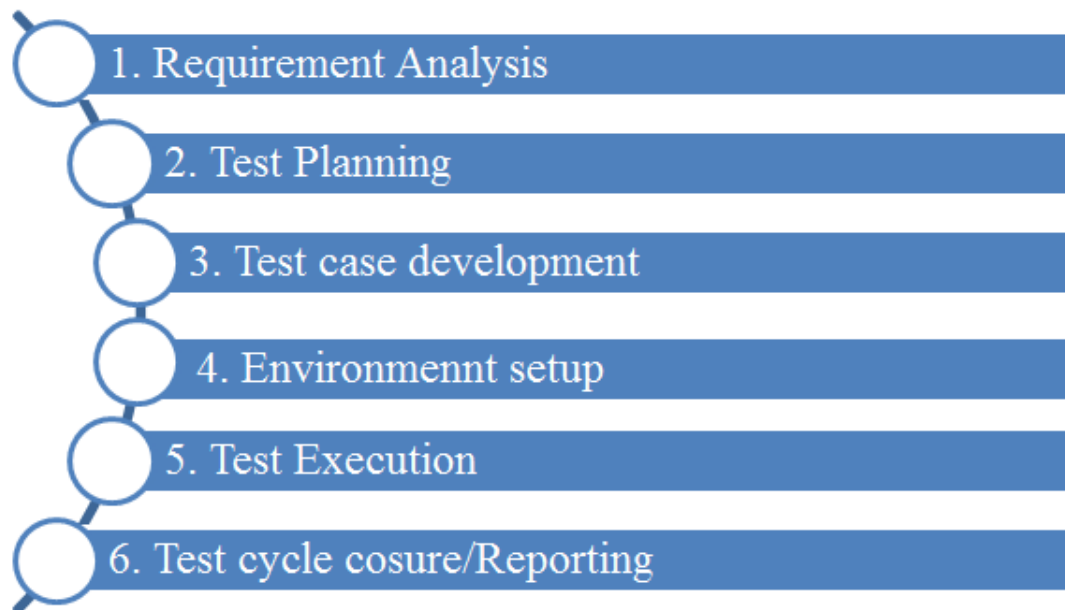


Figure 2: Software Testing Life Cycle (STLC)

1. Requirement Analysis

In this phase of software testing life cycle, the test team gathers the information according to the test prospective means identification about what are the requirements on that product which is must testable. The team which is working for improvement of the quality of any software may interact with the clients, Technical leads... etc. to know the requirements in details. Requirements may be either functional or non-functional.

2. Test Planning

In this phase basically planning of the software testing is done by the team leader of the testing or by the manager of the testing team which is responsible for the planning for how the testing will be done. This test analysis will be scheduled that includes various tasks of tests and items of tests.

Controlling various activities of the test is done by the test control phase, which is responsible for analyzing and also measuring the output of the testing. And also all the tasks in this phase are done by the senior manager of quality assurance, who determines the cost and efforts which are already fixed by the manager at the time of initiating that project. After that decision will be taken by the senior quality assurance manager about the final decision for the test planning.

3. Test Case Development

In this phase here verification will be done in order to know all the testing processes which will be tested before this phase is properly worked or not. All the test cases will be previewed two or three times to verify all the details for the purpose of checking if all the functionality is properly working or not. In this phase test cases will be created and also review all basic tests and if a test environment is available then also creates a test data for the verification.

4. Test Environment setup

This phase will decide in what conditions the hardware and software a product/software is tested. This is the very critical part of the testing process and this should be done in parallel with the testing process. If the development team provides an environment to the customers for the purpose of testing their product from time to time to know the performance status of the product or system then here the professional test team is not required for the testing process.

5. Test Execution

In the Test Execution phase, various test cases are executed. In this basically comparing will be done between what customer's expectations versus what result will come. And In the Test implementation phase, here the product verification for that test case environment setup will be working correctly or not there are various test cases are implemented for testing will be done on that product.

6. Test cycle closure/Reporting

This phase will work after executing all the process of testing. Work of this phase will be done when all the implemented test cases are executed successfully. Test cycle closure has parameters (depends on the various types of organizations) that have a deadline defined to complete their work in that deadline.

Test Reporting is also a very-very important work for getting details about whether your product is smoothly working or not, and if not then what are the various problems these all details are given in the form of a report. And this report may be provided by the Team leader or senior person on the basis of per day, or may be on a week or Monthly or otherwise On the basis of yearly.

This phase is basically all about the closure part of the testing process, this is done when all the requirements or expectations which will be noted down at the starting phase of the testing process is met then the testing cycle must be closed or completed. This is basically used for the signal or message which is provided after the completion of any job.

TESTING METHODS

After development of software, There are two paths using that testing can be done : named as white box testing and black box testing

1. White Box Testing
2. Black Box Testing

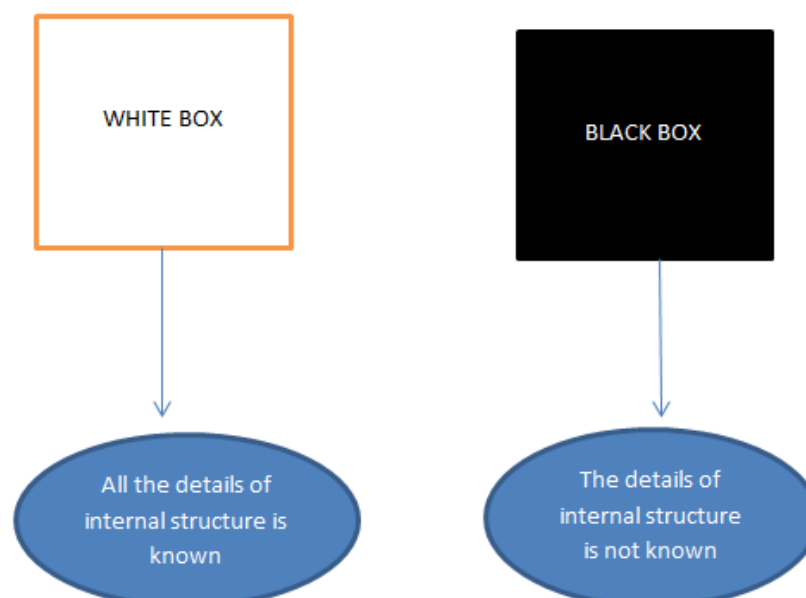


Figure 3: Difference between White box and Black box

1. White Box Testing/White box analysis:

This testing is also known as structural testing. This is the basically an important part of testing, in this all the details of coding in the program and internal structure already known and maximum errors will be detected before the system gets in trouble. This is a way for the debugging means just finding the faults or errors in the product or software. This is also involves in security testing.

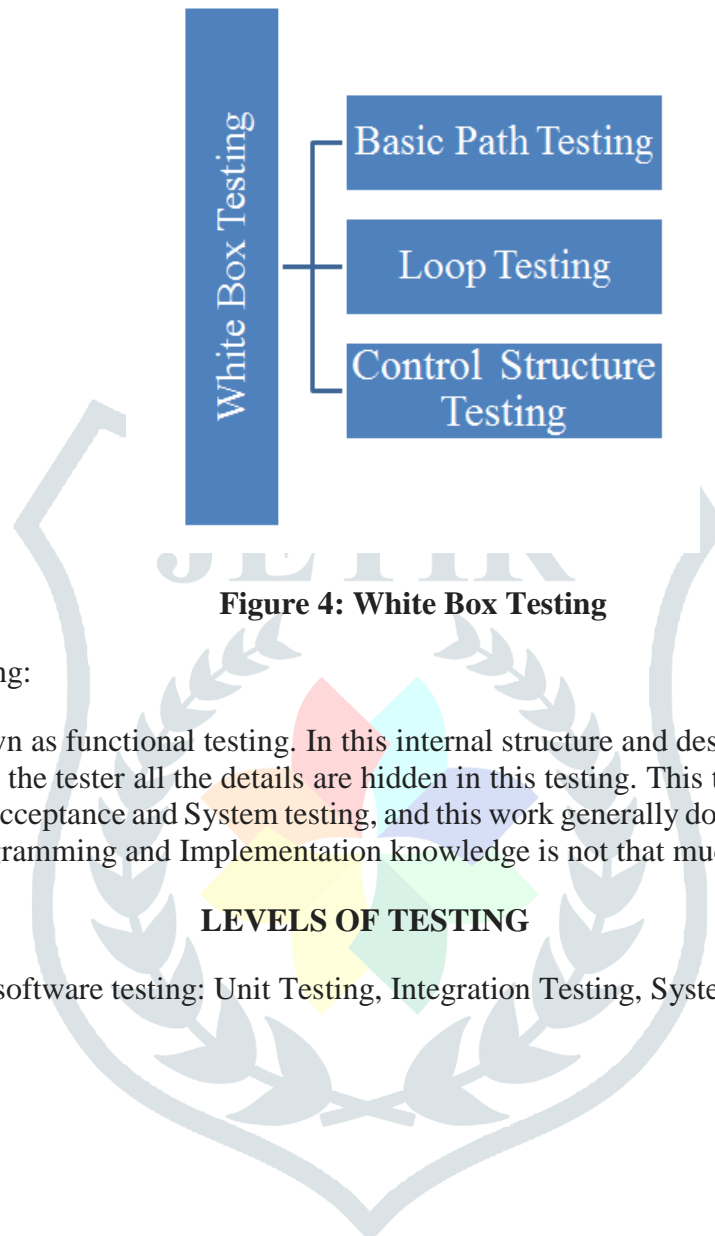


Figure 4: White Box Testing

2. Black Box Testing:

This testing is also known as functional testing. In this internal structure and design of the software or the product is not known by the tester all the details are hidden in this testing. This testing is done in the high level of testing such as Acceptance and System testing, and this work generally done by the software testers. And for this testing programming and Implementation knowledge is not that much required.

LEVELS OF TESTING

There are four levels in software testing: Unit Testing, Integration Testing, System Testing, and Acceptance Testing.

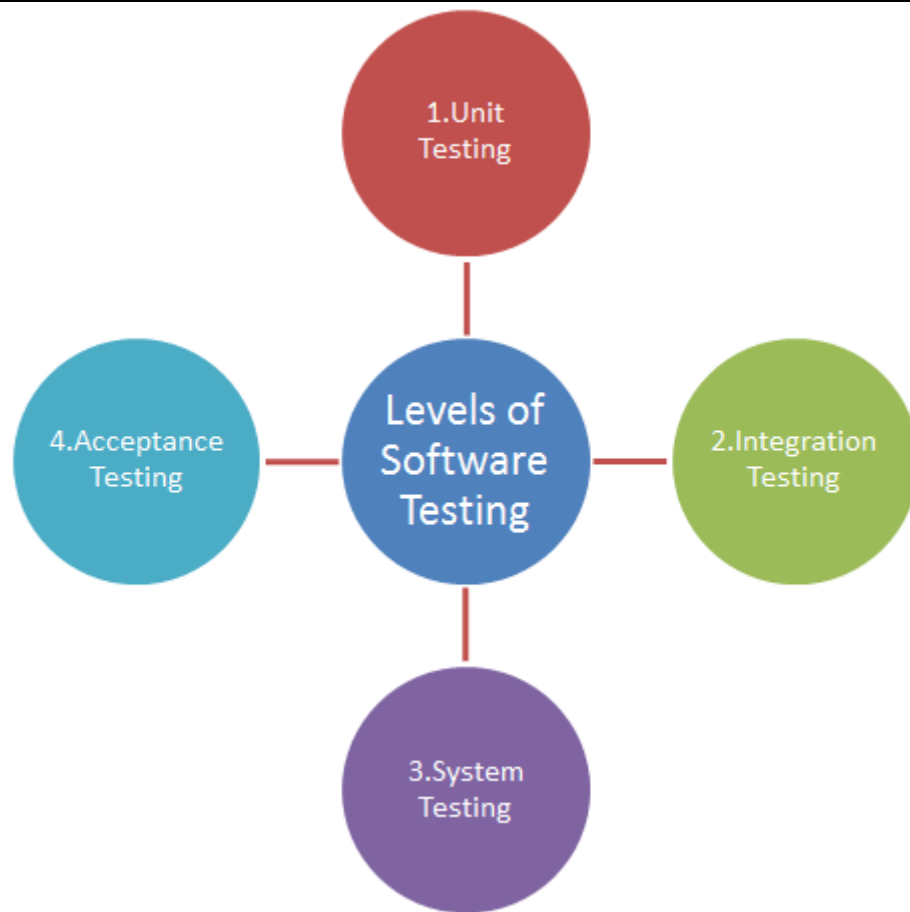


Figure 5: Levels of Testing in Software

1. Unit Testing/Component Testing/Module Testing:

Unit testing is done in various individual components of a system. And this is also used for the validation of whether each component is working is same as user requirements or not. This test is done by three approaches i.e., Black box testing and with the help of white box testing, and unit test is done by the developers of the software.

2. Integration testing:

In Integration testing, a test will be done between the components and interfaces and also checks the interaction with various aspects of the system. This test is also done by the developer. In this also there are three approaches will work named as; top Down Approach, Bottom Up and Integration Testing.

3. System Testing:

In this whole software will be checked, and this work is done by the Tester. System testing includes two types of testing i.e., Functional and Non-Functional Testing. This testing mainly works on performance and security of the system and also usability and external interfaces of the system.

4. Acceptance Testing:

Acceptance Testing comes in the last phase of the software testing is done after the system testing and also this testing is done before the delivery of the system to the users.

CONCLUSION

This review paper is discussed about the software development life cycle and software testing life cycles in detail. Software testing is the most important for the provide better quality in software development. After reviewing many papers conclusion is that software testing is the fundamental job of software development life cycle. Testing basically finds out the defects, bugs and errors which is present in a system or developed software. Software Testing is an important part of software quality control (SQC). This is

basically used for controlling the quality of the software products, and all work will be done using tests of that system. These tests may be Unit testing, Integration testing, System testing, Acceptance testing. Is there no any prove is that after testing process no any faults are remaining in that system. There are various responsibilities given to the different-different teams. For example: System testing is done by a separate team and developers of components are responsible for the component testing; like that Interface testing is done to find the faults in the interfaces of complex components. Test automation decreases the costs of testing by giving support for automatic testing software tools.

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