SOFTWARE TESTING RESEARCH:FACES AND LEVELS OF TEST EXECUTION

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ABSTRACT

Testing plays an important role in achieving and asessing the quality of a software product.On the other hand ,we improve the quality of the products as we repeat a test-find defects-fix cycle during development.Testing is performed at different levels involving the complete system or parts of it throughout the life cycle of a software product. A software system goes through four stages of testing before it is actually deployed. These four stages are known as unit,integration,system and acceptance level testing.As per the study and research done testing types can be categorized under three major testing techniques which are Functional, Performance and Security Testing and major software testing process called as Analysis, Preparation and Execution and closure.Their are various faces of software testing such as why it is required ,when it is required.The importance of testing is never more aparent than when some piece of software is released without having undergone sufficient vetting.The results of which can be broadly harm large economic losses,and even diminished quality of life.Fortunately,increasingly innovative techniques exits for testing system in different domains,which helps ensures reliability.

KEYWORDS— software testing, change request

I. INTRODUCTION

Before release, any software product goes through various levels of testing to make sure that it is working properly.software testing is divided into four levels and in this article, we will focus on the 4 main levels of testing.software testing levels are the different stages of the software development lifecycle where testing is conducted. There are four levels of software testing: Unit >> Integration >> System >> Acceptance.In unit testing,programmers test individual program units, such as a procedures,functions,methods,or classes,in isolation.After ensuring that individual unit work to a satisfactory extent ,modules are asembled to construct larger subsystems by following integration testing techniques.Integration testing is jointly performed by software developers and integration test engineers .The objective of integration testing is to construct a reasonably stable system that can withstand the rigor of system level testing.System level testing includes a wide spectrum of testing,such as functionality testing,security testing,robustness testing,load testing,stabality testing,stress testing ,performance testing,and reliability testing.System testing is a cricical phase in a software development process because of the need to meet a tight schedule close to delivery date,to discover most of the faults,and to verify that fixes are working and have not resukted in new faults.System testing comprises a number of distinct activities :creating a test plan ,designing a test suit,preparing test environment,executing the tests by following a clear strategy and monitoring the process of test environment.After the comletion of system -level testing,the product is delivered to the customer.The customer performs their own series of tests,commonly known as acceptance testing.

II. TESTING ACTIVITY

In order to test a program,a test engineer must perform a sequence of testing activities.Most of these activites are identify an objective to be tested,select inputs,compute the expected outcome,set up the execution environment of the program,execute the program,analyze the test result.

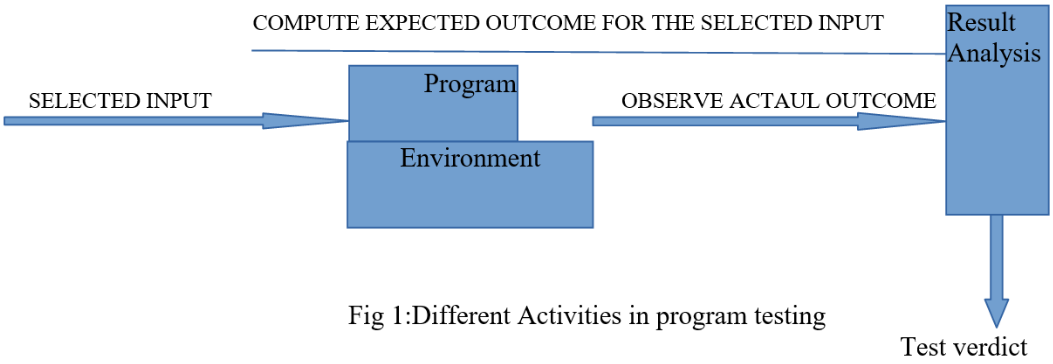

Fig 1:Different Activities in program testing

III. FACES OF SOFTWARE TESTING

Why:There are several reasons which clearly tells us as why Software Testing is important and what are the major things that we should consider while testing of any product or application. Software testing is very important because of the following reasons: Software testing is really required to point out the defects and errors that were made during the development phases. It’s essential since it makes sure of the Customer’s reliability and their satisfaction in the application. It is very important to ensure the Quality of the product. Quality product delivered to the customers helps in gaining their confidence. Testing is necessary in order to provide the facilities to the customers like the delivery of high quality product or software application which requires lower maintenance cost and hence results into more accurate, consistent and reliable results. Testing is required for an effective performance of software application or product. It’s important to ensure that the application should not result into any failures because it can be very expensive in the future or in the later stages of the development. It’s required to stay in the business.

What:what is it that we execute? Given the system under test, we can observe its execution either taking it as a whole, or focusing only on a part of it, which can be more or less big we can say unit testing .

Where:where do we perform the observation? Strictly related to what do we execute, is the question whether this is done in house, in a simulated environment or in the target final context. This question assumes the highest relevance when it comes to the testing of embedded systems.

How:which sample do we observe, and how do we choose it? This is the problem of test selection , which can be done ad hoc, at random, or in systematic way by applying some algorithmic or statistical technique. It has inspired much research, which is understandable not only because it is intellectually attractive, but also because how the test cases are selected the test criterion- greatly influences test efficacy.

IV. TESTING LEVELS

1. Unit Testing

Unit testing refers to testing program units in isolation.Some examples of commonly understood units are functions,procedures or methods.A program unit is tested in isolation ,that is standalone manner.There are two reasons for testing a unit in isolation ,that is, in a stand alone manner.First,errors found during testing can be attributes to a specific unit so that it can be easily fixed.Second,during testing it is desirable to verify that each distinct execution of a program unit produces the expected result. Their are various tools which are used for unit testing ,some well known tools are code auditor,bound checker,documenters,static code analyzer,software inspection support,test data generator,traffic generator,simulators and emulators,software inspection support,memory leak detectors.programmers can benefit from using tools in unit testing by reducing testing time without sacrificing thoroughness.Unit testing is conducted in two phases: Static Unit testing and dynamic unit testing. Static Unit testing : In static unit testing,code is reviewd by applying techniques known as inspection and walkthrough.

Inspection and walkthrough generally done through code review process.

Steps of code review process:

STEP1:**Readiness** : The author of the unit ensures that the unit under test is ready for review.

STEP2:**Preparation**:Before the meeting,each reviewer carefully reviews the work package.

STEP3:**Examination**:The author makes a presentation of the procedural logic used in the code.

STEP4:**Rework**:At the end of the meeting ,the recordkeeper produces a summary of the meeting .

STEP5:**Validation**:The CR are independently validated by the moderator or another person.

STEP6:**Exit:** It includes the Summarizing the review process.

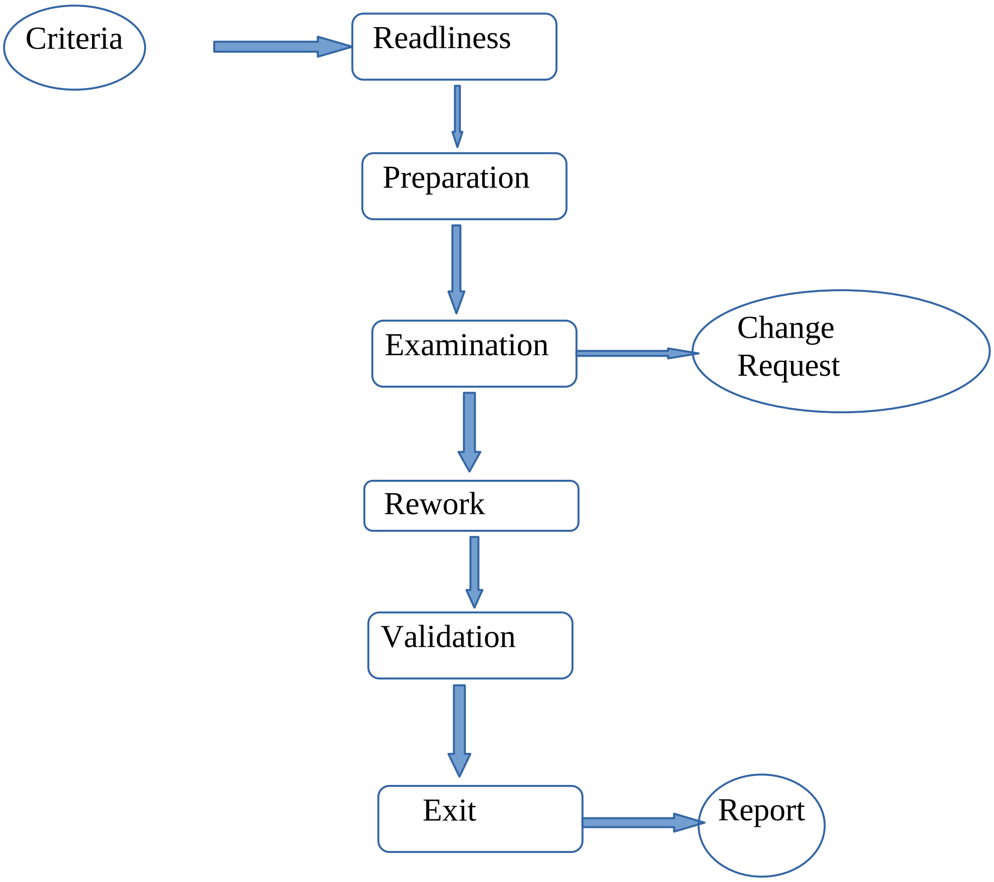

Fig.2 Steps in the code review process

Dynamic Unit Testing: Execution based unit testing is referred to as dynamic unit testing.In this testing,a program unit is actually executed in isolation ,as we commonly understand it.However ,this execution differs from ordinary execution.:A unit under test is taken out of its actual execution environment.The actual execution environment is emulated environment can be compiled together.

2.Integration Testing

Integration testing is a level of software testing where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units.Test drivers and test stubs are used to assist in Integration Testing.Testing performed to expose defects in the interfaces and in the interactions between integrated components or systems.

Integration techniques

Big bang technique integrates all the modules in one go i.e. it does not go for integrating the modules one by one. It verifies if the system works as expected or not once integrated. If any issue is detected in the completely integrated module, then it becomes difficult to find out which module has caused the issue.

Bottom-up testing, as the name suggests starts from the lowest or the innermost unit of the application, and gradually moves up. The Integration testing starts from the lowest module and gradually progresses towards the upper modules of the application. This integration continues till all the modules are integrated and the entire application is tested as a single unit.

Top -Down Technique,this technique starts from the topmost module and gradually progress towards the lower modules. Only the top module is unit tested in isolation. After this, the lower modules are integrated one by one. The process is repeated until all the modules are integrated and tested.

Sandwich testing which combines the features of both Top-down and bottom-up approach. When we test huge programs like Operating systems, we have to have some more techniques which are efficient and boosts more confidence. Sandwich testing plays a very important role here, where both, the Top down and bottom up testing are started simultaneously.

3.System Testing

Sytem testing is a level of software testing where a complete and integrated software is tested. The purpose of this test is to evaluate the system’s compliance with the specified requirements.Test engineer can prioritize their tasks based on test categories.

Basic Test: This provide an evidence that the system can be installed ,configured,and brought to an operational state.

Functionality Test:This provide comprehensive testing over the full range of the requirements within the capabilities of the system.

Robustness Tests:This determine how well the system recovers from various input errors and other failure situations.

Interoperability Tests: This determine wheather the system can interoperate with other third party products.

Performane Tests:This measure the performance characterstics of the system.

Scalibilty Tests:This test determine the scaling limits of the system in terms of user scaling,geographic scaling,and resource scaling.

Stress Tests: This test put a system under stress in order to determine the limitations of a system and,when it fails,to determine the manner in which the failure occurs.

Load and stability Test: This provide the system remains stsble for a long period of time.

Reliability Tests: This measure the ability of the system to keep operating for a long time without developing failures.

Regression Test: This test determine that the system remains stable as it cycles through the integration of other susbsytems and through maintaenance tasks.

Documentation Tests:This test ensures that the system user guides are accurate and usable.

Regulatory Tests: This test ensures that the system meets the requirements of government regulatory bodies in the countries where it will be deployed.

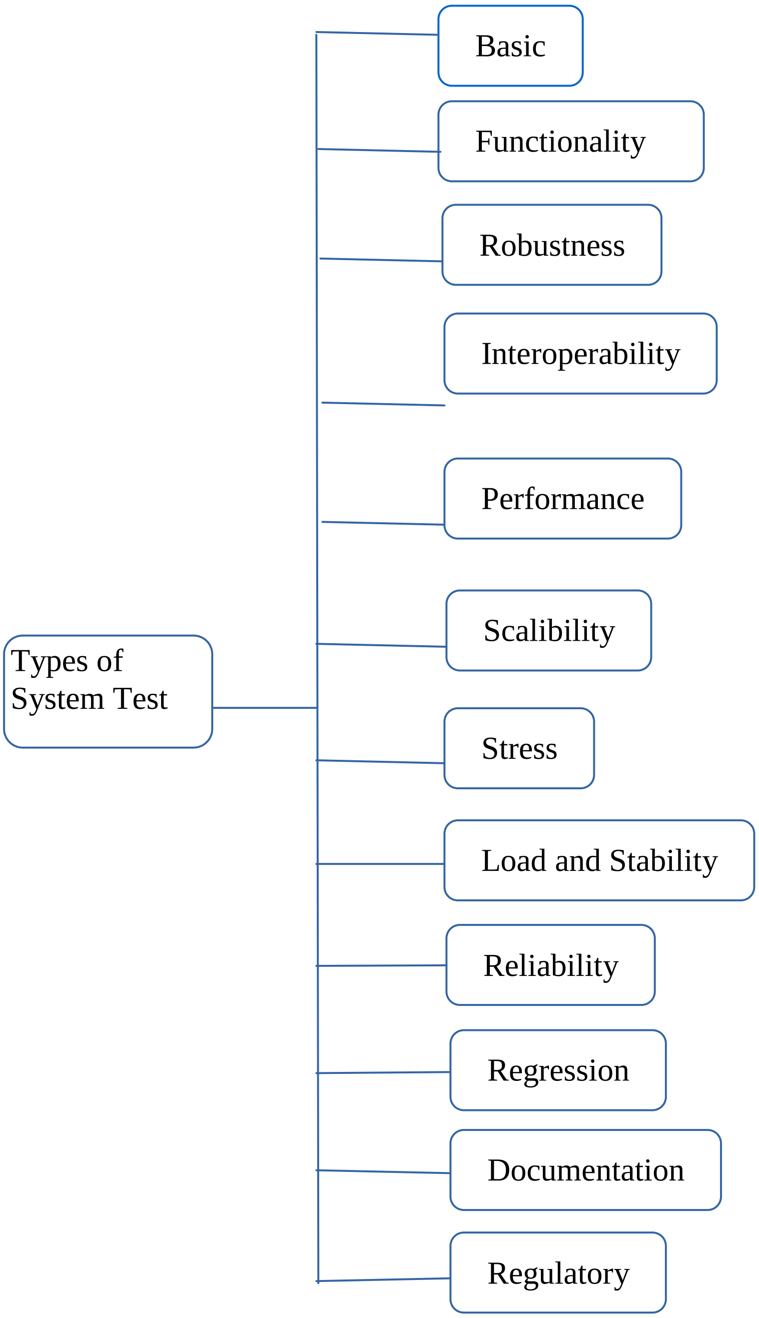

Fig.3 Types of System test

4.Aceeptance Testing

Acceptance testing is a level of software testing where a system is tested for acceptability. The purpose of this test is to evaluate the system's compliance with the business requirements and assess whether it is acceptable for delivery.

Their are two types of acceptance testing. User acceptance testing and business acceptance testing.UAT is to assess whether the Product is working for the user, correctly for the usage. Specific requirements which are quite often used by the end-users are primarily picked for the testing purpose. This is also termed as End-User Testing. The term "User" here signifies the end-users to whom the Product/application is intended and hence, testing is performed from the end-users perspective and from their point of view.BAT mainly focuses on business benefits (finances) which are quite challenging due to the changing market conditions/advancing technologies so that the current implementation may have to undergo changes which result in extra budgets. Even the Product passing the technical requirements may fail BAT due to these reasons.

V. CONCLUSION

Testing is the most critical part of the Software Development Lifecycle, as it is something upon which the final delivery of the product is dependent. It is time consuming and an intensive process, therefore, enhanced techniques and innovative methodologies are requisite.The intent of this paper is to research on various faces of software testing and different types of tests are used like unit testing,integration testing,system testing and acceptance testing are used to test a system.To carry out software testing in a more effectice manner,this paper provides a faces and levels of testing.

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