Optimized Test Case Prioritization with multi criteria for Regression Testing

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***Abstract*—Regression testing is one of the best part to be consider while software testing. Regression testing is about saving resources for testing by technique like partial code testing. Test case priority is one of the best methods for providing suitable regression testing. In this paper, regression testing is based on multiple criteria's such as statement coverage, fault coverage, branch coverage and code coverage. Through research on software testing , seeking the most appropriate testing method to achieve most reasonable testing volume and optimal testing result. Various experiences from industrial companies will be fetched and will be implemented according to the proposed optimized parameters added for software testing. Software testing has been done by various tools and has linked to proposed theory. Test case model selection and test volume evaluation method has been applied to the software testing work of Industrial applications and has been compared with traditional method.**

***Index Terms*—Test Case Prioritization, Regression Testing, Software Testing, Performance Testing, Reliability Testing, Reusability**

I. INTRODUCTION

SOFTWARE engineering has been achieved great heights in different development fields. Besides great challenges in many development parts like knowledge sharing practices, different practices implementations, searching and applying innovative global ideas. Software engineering tends to adopt better practices for development so that they achieve better heights and stability in their produced products.

The main aim of software testing is to find all the errors in a program. However, in practice, even after satisfactory completion of the testing phase, it is not possible to guarantee that a program is error free. The reason behind this is that the input values of most of the programs are very large and it is not practical to test the program exhaustively with respect to each value that the input can assume. Even with this limitation of testing process, we should not underestimate the importance of software testing.

We must know that software testing can expose most of the defects that are in a program and therefore software testing provides a practical way of reducing defects in a system [6].

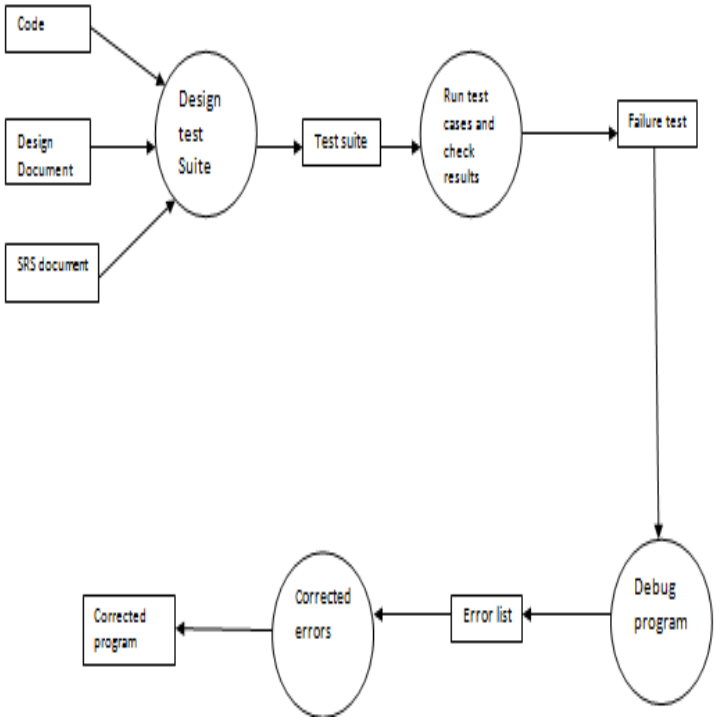

Figure 1: The Testing Process

II. TEST CASE AND SDLC DEVELOPMENT

When test cases are designed based on random input data, many of test cases do not contribute to the significance of the test suite, that is, they do not help to detect any additional defects not already being detected by other test case in test suite.

In other words, testing a system using a large collection of test cases that are selected at random does not guarantee that all of the error in the system will be uncovered. Let us try to

understand why the number of test cases in a test suite does not indicate the effectiveness of testing.

A life cycle model describes the different activities that need to be carried out to develop a software product and sequencing of these activities. The software development life cycle is also sometimes referred to as software life cycle.

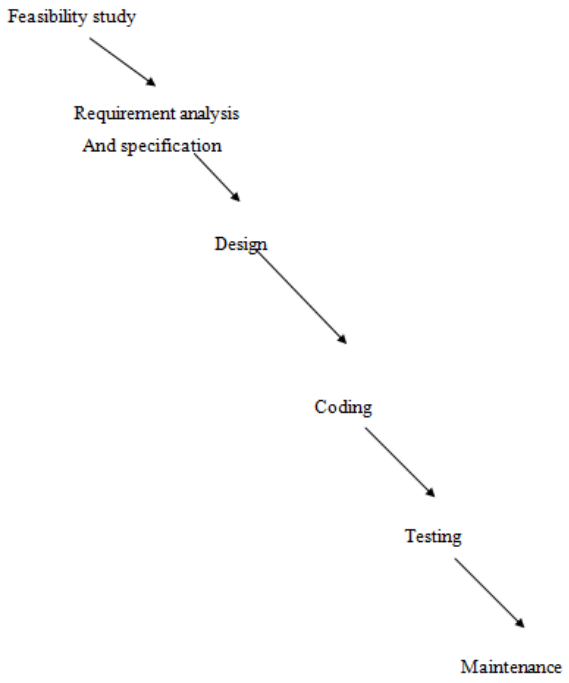

Figure 2: Software Development Life Cycle phases

Every software product starts with a request for the product by the customer. This is called product conception. Starting with this stage, it undergoes transformation through a number of stages until and unless it is fully developed and released to the customer. After release, the product is used by the customer and it is finally retired when it is no longer in use. This forms the essence of the life cycle of every software product.

Test case prioritization techniques involve scheduling test cases for regression testing in an order that increases their effectiveness at meeting some performance goal [3]. This is inefficient to re execute all the test cases in regression testing following the software modifications [4]. Using information obtained from previous test case execution, prioritization techniques order the test cases for regression testing so that most beneficial are executed first thus allows an improved effectiveness of testing. [6]

Effective and reliable test case prioritization technique for regression testing is necessary to ensure optimum utility and no side effect in the software after modification [8]. Test case prioritization is rearranging the test case order based on certain constraints so that the most beneficial test cases may be executed first. Most of the existing research works on test case prioritization methods are based on single coverage criterion [9]. A prioritized test suite which covers more than one coverage criteria is considered to be a stronger coverage goal than a test suite which covers single coverage criteria [11].

III. Proposed Structural Work

In our Research we focused on improving this model description by adding more criteria for selection of test cases for testing of the software in regression testing. Various testing have been fetched on industrial experience. Application based on JAVA language and C++ has been implemented according to the proposed optimized proposed work for software testing. We have tried to introduce more testing dependencies. In regression testing, we have added code coverage, branch coverage, reusability coverage, path coverage and fault coverage dependencies test which is helpful in finding issues in overall testing phase. Software testing has been done by various tools and we have linked to proposed theory. Test model selection and test volume evaluation method has been applied to the software testing work of Industrial applications and has been compared with traditional method.

IV. Experimentation and Results

The primary concern of the software testing process is to save testing resources and to find maximum output in form of bugs finding from limited resources. For providing optimized solution for the same we have done changing in regression testing process by introduction of multiple criteria's for testing. Basically we did here in our research ad hoc regression testing, testing in which test cases are made only if any bug found in application. Testing is done in two programming languages for checking compatibility and test case prioritization is consider in both of the languages for same application.

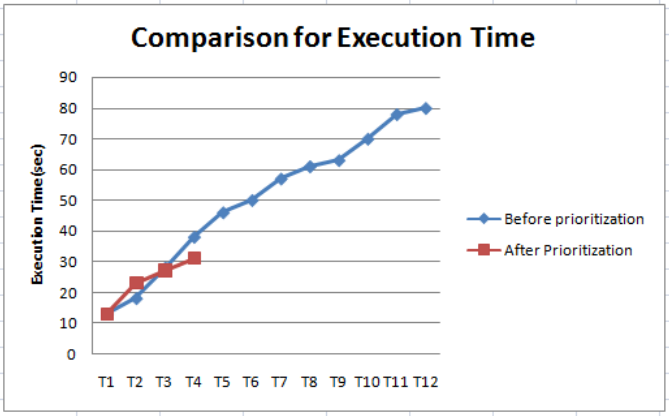

Fig 3.1 Execution time variation of proposed and existing work in java

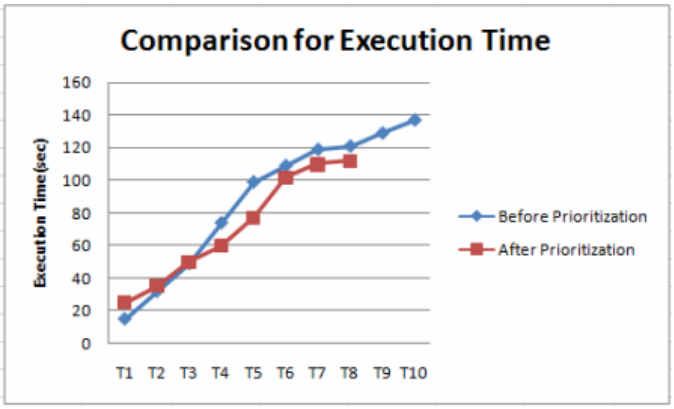

Figure 3.2: Execution time variation of proposed and existing work in C++

The execution work of the proposed work is less as compared to the already existing work due to more selection criteria has been used for selection of test cases which make the test cases low in testing process and hence improve the execution time in testing.

The basic comparison of proposed work and related study [1] is done and estimated cost of proposed work is found better in term of cost of testing as shown in figure 4 below.

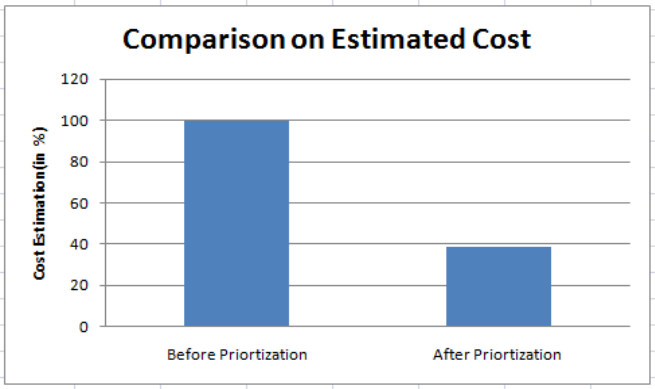

Fig4.1 Cost variation of proposed and existing work in java

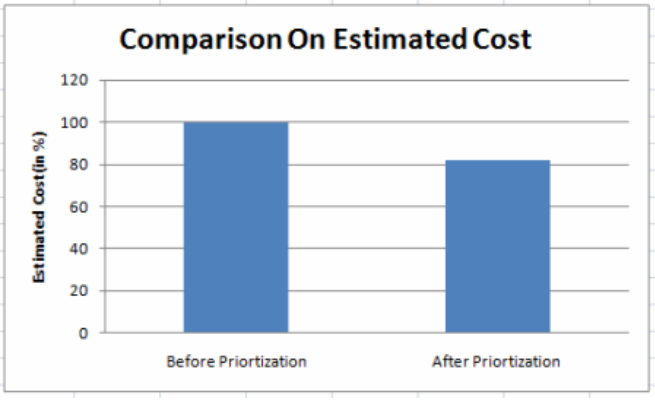

Fig4.2: Cost variation of proposed and existing work in C++

The cost of the testing is very important factor to be consider for comparison and from this research it is found that the cost of the proposed work is low as compared to the existing study. Software testing is required to be low and in this experimentation. We have considered the same and focused on cost cutting of overall testing.

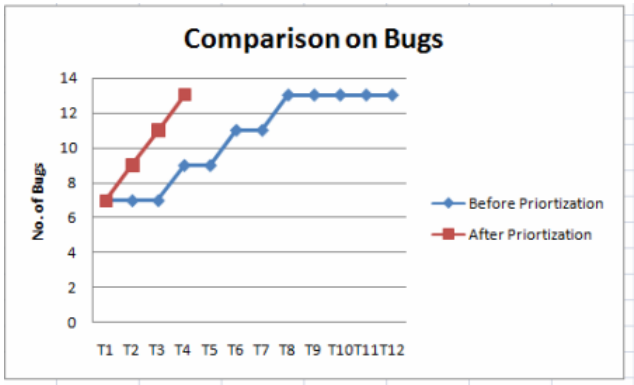

Fig5.1 Bugs found variation of proposed and existing work in java.

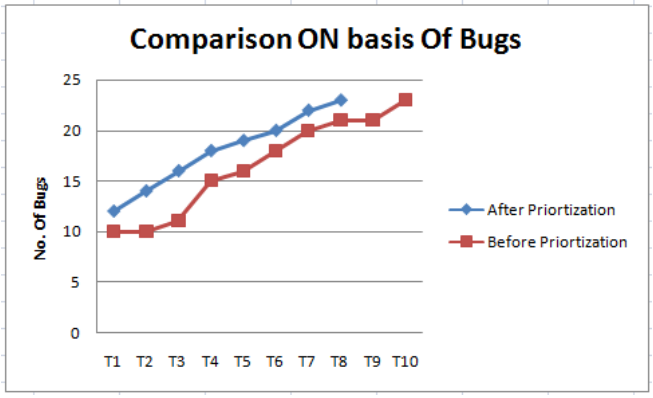

Fig 5.2.: Bugs found variation of proposed and existing work in C++

The basic comparison of proposed work and related study [1] is done and performance of the proposed work is found better in term of number of bugs found in testing as shown in figure 5 above.

The number of bugs found is high in proposed work as compared to existing related work [1]. The time to find the same number of bugs is very less and test cases are less in

number so proposed work provides better bug finding in particular time as compared to existing work.

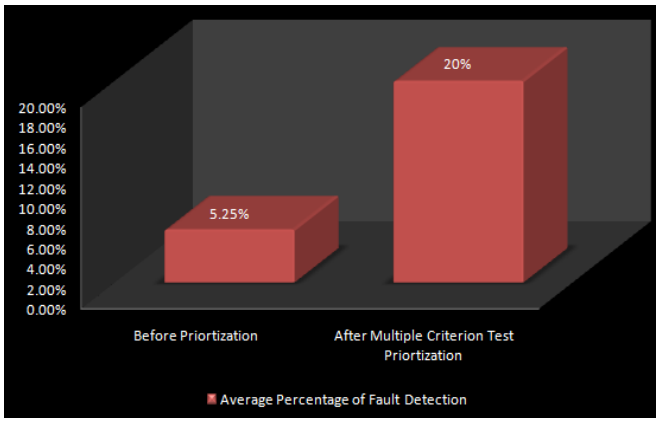

Fig 6: Fault Detction while testing with and without priority

The comparison of proposed work and related study [1] is done and performance of the proposed work is found better in term of fault detction in testing as shown in figure 6 above. Fault Detction is compratively high with priority testing .

V. CONCLUSION

In this paper, we have discussed that software testing is the art of testing essential parts and functionalities of software development procedure for providing quality and assurance to the user. To make software testing effective, test cases are the good option which can control the resources used in testing and can provide good level of quality. The proposed work shows better result with 40% more bug finding with execution time which is 20% less than traditional software testing cycle. In this paper, multiple criteria based test case selection process for software testing with some more features addition has been considered. The addition of more filtering criteria provides good feedback of testing and provides better regression testing by saving resources of testing.

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KanwalpreetKaurwas born in Ropar, India. She received the B.Tech from IET Bhaddal College and M.Tech.degrees in Computer Science from the BSBEC Fatehgarh Sahib , PTU , in 2013. Her interested area for research consist of Softsware Testing.

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