

A Conceptual Requirements-based Test Case Prioritization Approach to Improve Testing Efficiency

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ABSTRACT: Software testing is a crucial stage and yet costly to guarantee the readiness and the quality of software before released. Therefore, ranking the test cases and selecting a relevant set for execution plays a vital role to achieve quality confidence. This paper presents a requirement-based test case prioritization approach to scrutinize requirements importance based on MoSCoW Method with embedded requirements dependencies tracing to prioritize test cases. The research adopts the empirical software engineering method, where the proposed approach will be put in use and evaluated. The outcome of this research will contribute towards having an efficient way to do testing while taking care of the end product quality. The benefit is twofold as the efficiency will save the testing cost and at the same time improves the customers' confidence towards the software system delivered to them.

Keywords: *test case prioritization, requirements-based test cases*

1. INTRODUCTION

Software testing is a crucial stage to guarantee the quality of the software before it is released. A survey has been done to show that the testing activities consume a longer time in execution and the most expensive task among all stages of software development [1]. For this, further efforts are needed to come up with ways to reduce execution time in the testing process.

However, exploration of software testing research to achieve optimal testing is still lacking. Therefore, test cases prioritization is seen as beneficial to improve testing practice. Test-case prioritization has been studied for quite some time, and a large number of prioritization techniques have been proposed in the literature [2].

Still, no work in the literature considers 'just-enough' testing to accommodate constrained time and cost while having optimal test cases coverage for essential functionalities with traceability of their dependencies. Therefore, requirements-based test case prioritization to scrutinize requirements importance with embedded requirements dependencies tracing to prioritize test cases will carefully isolate important test cases and eventually improve efficiency in developing test suite for testing execution.

Following Introduction, Section 2 presents study background. This is followed by Section 3 presenting the conceptual requirements-based test case prioritization approach and Section 4 describes methodology. Finally, Section 5 concludes the paper.

2. STUDY BACKGROUND

There have been several reviews being conducted regarding test case prioritization (TCP) research which shows the importance of the area [2,3,4].

Among many methods, requirements-based TCP is starting to gain popularity [3]. A study has been done to design TCP based on requirements dependency [5]. The algorithm used to prioritize test cases takes into account the objectives of optimization, error detection, and cost for the software development team making informed decision. Similarly, a study [6] shows that TCP based on requirements correlation improves error detection rate in testing. Besides, Yoon et.al [7] studied TCP through correlation of requirement and risk. They reported the technique of risk based testing (RBT) for TCP using defined risk item and estimated the risk exposure. It is expected to be useful for risk identification process. Their empirical study shows that the TCP technique using risk exposure is promising in term of effectiveness in detecting severe faults and benefits in term of time and cost efficiency. Similar study utilizes the correlation of requirements to build TCP [8]. The TCP technique was verified to be efficient on a small experiment example, and the results showed that the proposed method is better than sorting method.

Thus, it is anticipated that efforts to further improve TCP is beneficial.

3. REQUIREMENTS-BASED TEST CASE PRIORITIZATION APPROACH

The requirements-based test case prioritization approach proposed here is intended to address the problem, with the following reasons:

- Starts in the first stage of software development so that error correction will be the cheapest;
- Starts at the requirements stage where most of the bugs can be traced more easily; and
- Differentiate the requirements value, as common practices consider all requirements are equally

important and all faults are equally severe.

In this research, MoSCoW Method [9] is adapted to determine requirements priority (RP) which is represented by customer-perceived priority (CP) and developer perceived priority (DP). Test cases (TC) that relate to the RPs will be then isolated. The isolated RPs are further examined for dependencies to ensure thorough coverage to determine the Test Suite (TS) for testing execution.

Figure 1 shows an overview of the proposed approach. In essence, the approach is divided into two main constructs.

1. Requirements being elicited from stakeholders will be checked for importance based on MoSCoW Method. The method is used to help key stakeholders understand the significance of initiatives in a specific release and therefore, the requirements will be ranked according to Must, Should, Could, and Won't (MoSCoW).
2. The requirements will be then grouped according to the rank and individually checked for dependencies. Subsequently, test cases are mapped to every requirement to form a test suite for testing execution. Requirements within a cluster will be treated as having the same level of importance as they are interrelated.

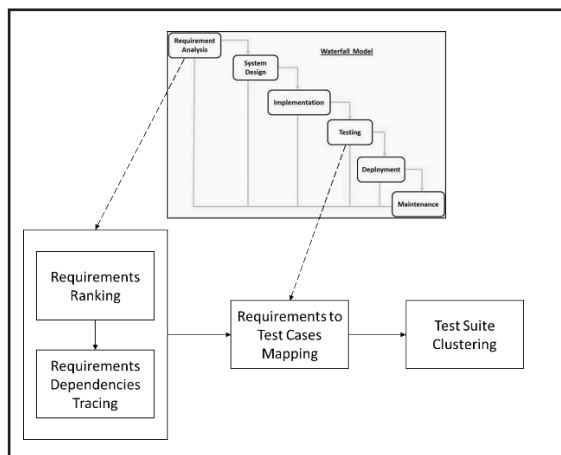


Figure 1 An Overview of the Proposed Approach

4. METHODOLOGY

The research adopts an empirical software engineering method, where the proposed approach will be put in use and evaluated. To test the hypothesis, we set to implement a system testing using the proposed approach for Digital Documents Repository System which has been developed to manage the students' final year project supervision and artifacts. The approach will be evaluated for its efficiency.

5. CONCLUSION

Test case prioritization is beneficial to improve software testing in many ways. In addition, having test cases being mapped to the importance of software requirements from the perspectives of various stakeholders will increase the customers' confidence towards the software system delivered to them.

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