

Analysis of an Artifact Oriented Test Process Model and of Testing Aspects of CMMI*

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Abstract. The CMMI model for Software Engineering provides guidance for improving an organization's processes and the ability to develop software systems. The CenPRA test process is a generic software testing model defined by selecting software testing "best practices"; it evolved over the last years and has been published in specific forums. The CenPRA test process, which defines a set of partially ordered activities and test artifacts, has been validated and improved based on the experience of its application at software development companies in Brazil. In this work we carried out an evaluation of the CenPRA test process under the perspective of CMMI. We evaluated essentially which aspects of CMMI are taken into account by the CenPRA test process. We also evaluate how the CenPRA model can be used to supplement software testing related aspects of CMMI. Our results pointed to improvements in the CenPRA test process, and also identify testing tasks and artifacts not considered by CMMI, which can significantly improve an organization testing practices.

1 Introduction

Software testing is the process of executing a program in a controlled way aiming to check if the program behaves as defined in its specification. It is an essential activity to achieve a good quality level in software products. A testing process defines a set of partially ordered activities, methods and practices used for testing software, as well as the artifacts used and produced in these activities. Taking into account the fact that the quality of the test process is directly related to the final quality of the developed product, improving the test process is crucial for the success of software development organizations. Improving testing practices may lead to a testing process which is more efficient (within budget and schedule) and more effective (fewer bugs deployed to users).

Software process assessment and improvement models define a set of best practices, methods for the assessment of processes capabilities, and provide a rational guide for the process improvement. These models have been recognized as an effective way for the controlled and stepwise improvement of the practices used for software development [9, 10].

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This paper reports results of the analysis of a test process model under the perspective of a process improvement model and the opposite, that is, the analysis of a process improvement model under the perspective of a test process model. More specifically, we evaluate the generic test process model defined at CenPRA (Centro de Pesquisas Renato Archer) [3] using as a reference the process improvement model CMMI [11]; conversely, we use the test process model defined at CenPRA as a basis for supplementing testing aspects of CMMI.

The evaluation reveals strong aspects in the CenPRA process and confirms our experience that development organizations can achieve significant improvements in their testing practices by using the CenPRA testing process as a basis for the definition of the organization's testing processes. Aspects in CMMI which are not considered in the CenPRA test process model point to improvements in this model. On the other hand, important testing aspects not detailed in CMMI were identified and used for the definition of a set of Supplementation Notes for the standard. In a previous work we performed a similar analysis using the ISO/IEC 15504 model [1].

Section 2 of the paper presents concepts of software testing and of software process improvement models; Section 3 describes succinctly the CMMI model; Section 4 presents the CenPRA testing methodology; Section 5 describes the assessment of the CenPRA Test Process Model under the perspective of CMMI and discuss the analysis results; Section 6 presents the analysis and supplementation of CMMI software testing practices; Section 7 discuss briefly the results of our analysis and summarizes the conclusions of this work.

2 Software Testing and Software Process Improvement Models

Testing is a fundamental activity for ensuring that the software meets the user requirements, it is the final evaluation of the quality of the developed product. [7]. A test process is a set of partially ordered steps composed of activities, methods and practices used for testing a software product. Testing is usually performed through levels which correspond to the different development phases and is based on techniques that define how the test cases are selected and evaluated [3].

Process improvement is an approach for furthering an organization's objectives by improving the capability of the organization's most important processes. The capability of a process in an organization is the extent to which the process is executed, explicitly managed, defined, measured, controlled, effective and continually improved. Process improvement models have shown in practice to be a viable, effective and efficient approach for the improvement of software development organizations [10].

Process improvement approaches use as reference a process model that systematizes and represents the best practices, defines a metric for the evaluation of processes capabilities, and provides a rational roadmap for process improvement. Examples of models are: the SW-CMM [8], the ISO/IEC 12207 standard, the ISO/IEC 15504 model [12] and the CMMI model [11]. In this paper we use the CMMI model as a reference for the analysis.