

Importance of Testing Maturity Model

Sukhdev Singh¹, Gurmeet Kaur², Parminder Kaur³

D.A.V. College (Lahore), Ambala City

sukhdev_kuk@rediffmail.com, gurmeet_g@rediffmail.com, parminder.kaur.pam@gmail.com

Abstract: Software testing is a systematic process. It is a way to produce software with quality for demanding clients in the software market. In order to deliver best quality software, the quality of the software testing process must also be ensured. There are several existing process evaluation and assessment models like CMM, CMMI. But these existing maturity models don't address testing issues nor has the nature of a mature testing process been well defined. Because of the vital role of testing in software process and product quality, we are focusing on TMM (Testing Maturity Model).

Keywords: Software Testing, Testing Process, CMM, TMM.

INTRODUCTION

A testing process is not static entity-it has to change to improve so that the products produced using the processes are of high quality. Improving the testing process in turn improves the quality of the products. There are models for improving the software development process, but little focus is on improving the testing process.

Model which recognizes the testing activities under some key process areas and concentrates on them, so as to achieve the goals a test maturity model was required. It will complement the Software Engineering Institute's Capability Maturity Model (CMM). This paper discusses the attributes of a mature testing process, components, levels and key process areas of Testing Maturity Model (TMM).

Before explaining the test process maturity model we must be aware about the term mature testing.

MATURE TESTING

The term "maturity" relates to the degree of formality and optimization of processes, from *ad-hoc* practices, to formally defined steps, to managed result metrics, to active optimization of the processes.

A mature testing process is managed, measured, monitored, and effective. Test process maturity includes planning, staffing, directing, controlling, and organizing components. A mature testing process is supported by management and it is a part of the organizational culture. A mature testing process is well-understood and has the capability of continuous growth and improvement. A mature testing process has the following attributes:

- **A set of defined testing policies.** All the testing policies are well defined and documented that are applied throughout the organization.
- **Test planning process.** A test planning process,

which is well documented, is considered that describes the specification of test objectives and goals, allocation of test resources, test designs, test cases, test schedules, testing costs, and test tasks.

- **Test lifecycle.** A test lifecycle consists of set of phases and activities. It includes planning, plan reviews, designing, implementation and maintenance of test work products.
- **Test Team.** There is a tester and a testing team to instruct and provide training opportunities to educate and motivate the test staff.
- **Test-related metrics.** A set of test-related metrics is defined for the organization; data is collected and analyzed to support the appropriate actions needed for test process improvement.
- **Testing Tools.** Appropriate tools are available to help the testing team with testing tasks and to analyze the collected, test-related data.
- **Controlling and tracking.** The test manager monitors and controls the test process. In order to keep track of Progress, appropriate actions are taken whenever problem occurs, and evaluates the performance and capability of test process.
- **Product quality control.** Various testing methods are used to meet quality standards. Product quality is also monitored, defects are tracked, and analysis is applied for defect prevention.

TMM (Testing Maturity Model) was developed, in 1996, at the Illinois Institute of Technology. TMM contains a set of maturity levels through which an organization can progress towards process maturity.

COMPONENTS OF THE TMM

The TMM has two key components. Each of these has many subcomponents. The key components are described as follows:

- Maturity Model (having 5 levels)

- Assessment Model

The Set of Levels

The TMM consists of five well-defined levels. Every level describes maturity of testing process. Each level is characterized by their testing capability and organizational goals. Level 1 is totally unstructured whereas all other levels are structured. The structure of each level contains:

- A set of maturity goals. Each level has some maturity goal that must be addressed to achieve maturity at that level.
- Supporting sub goals. They define the scope, boundaries, and needed actions for a particular level.
- Activities, tasks, and responsibilities. In order to achieve the goals at each level some activities and tasks should be performed.

The Assessment Model

The assessment model is composed of the following items:

- **The Questionnaire:** A set of questions are designed to determine a level of testing maturity. These questions are related to the maturity goals and process issues described at each level. They will help in determining the extent the organization has mechanisms to achieve those goals and for resolving the maturity issues.
- **The Assessment Procedure:** On the basis of interviews with key personnel and responses to the questionnaire, the test process maturity level can be determined. The assessment procedure gives the guidelines to assessment team about interviewees and collected data from questionnaires and personal interviews. A procedure used for determining maturity levels from the collected results are a part of the assessment procedure. A reporting mechanism is used to support distribution of results and approvals for test process improvement, with high priority items identified.

LEVELS OF TMM

The TMM consists of 5 maturity levels that reflect a degree of test process maturity. For each maturity level, a number of Key process areas are defined. A process area is a set of related activities within the test process. When these activities are performed effectively, they will contribute to an improved test process. All the levels of the TMM support an organization to determine the maturity of its test process and to identify the next

improvement steps that are necessary to achieve a higher level of test maturity.

Level 1: Initial

At level 1, testing is a disordered, indefinite process and is considered as a part of debugging. The objective of testing at this level is to show that the software runs without major failures. In the field, the software does not often fulfill needs of user is not stable. At this level testing process lacks of resources, tools and well-educated testers. There are no process areas at this level.

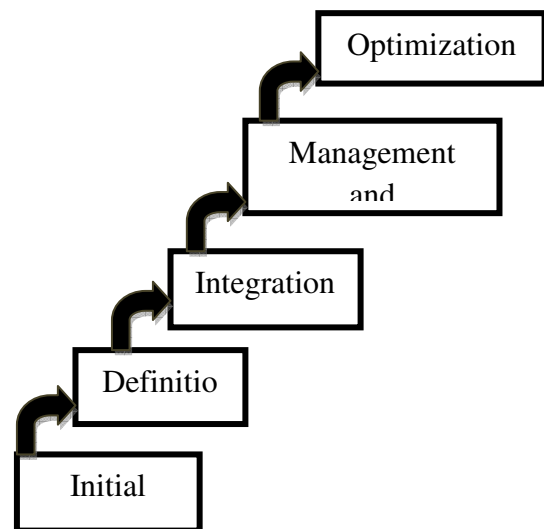


Fig. 1 TMM Levels

Level 2: Definition

At level 2, testing is a defined process and is clearly separated from debugging. In order to structure the test process, test plans are established containing a test strategy. For deriving and selecting test cases from requirement specifications, formal test design techniques are applied.

The main objective of testing is to verify that the software satisfies the specified requirements.

Process areas at level 2 are:

- Test Policy and Goals
- Test Planning
- Test Techniques and Methods
- Test Environment

Level 3: Integration

At level 3, testing is fully integrated in the software life cycle. It is recognized at all levels of the V-model. Test planning is done at an early project stage by means of a

master test plan. The test strategy is determined using risk management techniques. A testing team exists with a test training program and testing is perceived as being a profession. Reviews are carried out. In addition, to verify that the software satisfies the requirements, testing is very much focused towards invalid testing.

Process areas at level 3 are:

- Test Organization
- Test Training Program
- Test Life Cycle and Integration
- Control and Monitor

Level 4: Management and Measurement

Testing is a thoroughly defined and measurable process. Reviews and inspection are taking place throughout the software life cycle and are considered to be part of testing. Software quality assurance activities are performed to measure quality characteristics such as reliability, usability and maintainability. Test cases are gathered, stored and managed in a central database for re-use and regression testing. A test measurement program provides information and visibility regarding the test process and product quality.

Process areas at level 4 are:

- Peer Reviews
- Test Measurement
- Software Quality Evaluation

Level 5: Optimization

On the basis of all results that have been achieved by fulfilling all the improvement goals of the previous levels, testing is now a completely defined process and one is capable of controlling the costs and the testing effectiveness. At level 5 the methods and techniques are optimized and there is a continuous focus on test process improvement.

A procedure exists for selecting and evaluating test tools. Tools support the test process as much as possible during test design, test execution, regression testing test case management etc. Testing is a process with the objective to prevent defects.

Process areas at level 5 are:

- Defect Prevention
- Quality Control
- Test Process Optimization

CONCLUSION

This paper has discussed the need of a Testing Maturity Model (TMM) which has been developed for test process improvement and positioned as being complementary to the CMM.

FUTURE SCOPE

We consider CMM for the improvement of software development process in the similar way for the continuous improvement of the test process TMM play a vital role. The organizations can work on the key

process areas and strive for different TMM levels. In this way, a suitable environment for TMM along with CMM can be established. Moreover, the work can be continued on the software metrics to measure the parameters in a TMM level.

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