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Improving Test Maturity Levels of Test Organizations With Visual Method

Kidu Kim*, R. YoungChul Kim**

* *Telecommunications Technology Association, Gyeonggi, Korea*
E-mail: kdkim@tta.or.kr

** *SE Lab., Dept. Of CIC(Computer and Information Communication), Hongik University, Sejong Campus, 339-701, Korea*
E-mail: bob@hongik.ac.kr

Abstract

The present paper concerns the software quality improvement via previously proposed test-related models. Specifically, based on the established method of test process improvement using TMMi and TPI Next, this paper proposes a visual method to enhance test competencies. By mapping TPI Next onto TMMi, unsatisfactory test activities were found in organizations that had been assessed with the TPI Next. The proposed visual method is conducive to improving test competencies by visualizing the unsatisfactory areas of test activities in their test processes for test organizations.

Key Words: TMM (Test Maturity Model), TMMi (Test Maturity Model integration), TPI (Test Process Improvement), TPI(Test Process Improvement) Next

1. Introduction

Now, what users want from software is not just novel functionality but also stability and high quality with fewer faults and errors. There are many ways to develop high-quality software products. First, good developers using good methodologies and processes can make good software programs. Second, performing a complete test on newly developed software helps remove its faults and improve its quality. Third, using software test models in performing test-related activities improves the quality of software. The first option is hard to apply to all organizations. Regarding the second option, it is impossible to perform a perfect test in practice. The authors have delved into using test-related models to develop high-quality software. This paper explores a method of improving the quality using test models. Extending the prior study [1], where the established TMMi and TPI Next were used for test process improvement, the present paper proposes a method to improve the test competencies of test organizations by mapping TMMi and TPI Next onto each other.

2. Related Works

TPi Next[2] originated from TPI[3] developed by a software company SOGETI in 1997 for test process improvement. Based on TPI, the enhanced TPI Next features the Enablers

synchronizing software lifecycle with other processes for test process improvement as well as the structural clusters of checkpoints. TMMi[4] originated in TMM[5][6] developed by IIT (C.R. Carlson, Ilene. Burnstein) to reinforce CMM's test activities. TMMi incorporates the established TMM and other models including CMMI[7] and TPI. <Table 1> compares the characteristics of test-related models.

Table 1. Comparison between the models

Model	TPI	TPI Next	TMM	TMMi
Organization	Sogeti	Sogeti	IIT	TMMi Foundation
Type	Maturity model	Maturity model	Maturity model	Maturity model
Year	1997	2010	1996	2010
Levels	14	4	5	5
Key Area	20	16	14	16
Reference Model	-	TPI, ISTQB	CMM	TMM, CMMI, TPI, ISTQB
Evaluation Type	Checklist	Checklist	Questionnaire	Questionnaire
Evaluation Object	Test process level	Test process level	Test execution level	Test execution level & Test process level
Feature	Test process oriented	Business-driven approach	Weak test process evaluation	Partial test process improvement

3. Improving Test Maturity Level for Test Organizations Based on TPI Next

Since 2005, the authors have researched on mapping the test process model onto the test maturity model, and found TMM(i) and TPI (Next) are mapped onto each other. At the same time, we have presented a method of improving the test process competencies of test organizations via TPI Next.[8] Also, we proposed a method of improving the test process in organizations that had achieved TMMi levels in "A Mechanism to Compare Heterogeneous Maturity Models"[9] in 2012. Here, the inter-model mapping is performed based on previous studies. The mapping follows three steps as below.

Step 1: Identify the items to compare in the inter-model mapping.

Step 2: Extract the mapping rules.

Step 3: Define the method of processing the results from association analysis.

Step 4: Apply the "Vitamin Basket Rule".

In Step 1, TMMi and TPI Next are selected for mapping. The prior study mapped TPI Next onto TMMi(TMM -> TPI Next) to improve the test process, whereas the present study maps TMMi onto TPI Next (TPI Next->TMMi). As found in related literature, all heterogeneous models have no identical structures or areas of measurement. Therefore, comparing heterogeneous models is challenging and inappropriate. We have found the models to compare based on the identifiers in their structures. For comparison between TMMi and TPI Next, TMMi's 'Specific Practice' and TPI Next's 'Check Points' are the focus of comparative analysis. Although TMMi's and TPI Next's structures use distinct terminology, their areas of measurement are highly comparable. In "Models to Improve Your Test Process", it was found and described that TPI Next's 'Checkpoints' were included in, and paralleled, TMMi's 'Goal' and 'Practice'.

In Step 2, a few mapping rules are proposed for the mapping between currently certified models and other heterogeneous models to be acquired in the future. Mapping non-/common areas by comparing simple keywords as in a previous study [Kim 12] has shortfalls, in that the areas cannot be verified up to the level required by a model. To address this issue, a mapping rule is established so that the mapping encompasses the scope of performance and the content signified by the areas to be compared.

Table 2. Mapping Rule

Correlation score	Analysis result	Mapping process
0	No relation	Exclude from the common elements
1~2	Little relation	Exclude from the common elements
3	Same relation	Include in the common elements
4~5	High relation	Include in the common elements

In Step 3, it is difficult to present a method of reusing the existing efforts with a view to transferring to other certification models based on simple analysis of the association between two models. To address this issue, this paper proposes a method of processing the results from association analysis for the purpose of reusing the assets used for achieving the existing levels. To process the results from association analysis, the areas of non-/commonality are determined based on the non-/commonality scores of the compared areas when selecting non-/common areas. A high score indicates a high likelihood of being reused later on in certifying heterogeneous models.

Table 3 shows the partial results of mapping acquired via step 1 ~3. As seen in Table 3, not every area is mapped 1:1 between the two models (TPI Next versus TMMi). Also, even in the presence of association, the scores of association are measured in diverse ways (1 ~ 5).

Table 3. Mapping Result (TPI Next → TMMi(Level2))

Key Area	Level	Seq	Checkpoint	TMMi(Level 2) Mapping(Score)
Stakeholder commitment (SHC)	C	1	The principal stakeholder is defined (not necessarily documented) and known to the testers.	PA2.1-SG1-SP3 :Distribute the test policy to stakeholders(3) PA2.1-SG2-SP3 : Distribute the test strategy to stakeholders(5) PA2.2-SG4-SP3 : Plan stakeholder involvement(3) PA2.3-SG1-SP5 : Monitor stakeholder involvement(2)
		2	Budget for test resources is grated by and negotiable with the principal stakeholder.	PA2.2-SG3-SP3 : Determine estimates for test effort and cost(3) PA2.2-SG5-SP2 : Reconcile work and resource levels(4)
		3	Stakeholders actually deliver the committed resources.	PA2.2-SG5-SP2 : Reconcile work and resource levels(4) PA2.2-SG3-SP3 : Determine estimates for test effort and cost(1)
		4	The principal stakeholder is responsible for a documented product risk analysis(the input for the test strategy)	PA2.1-SG2-SP1 : Perform a generic product risk assessment(5) PA2.2-SG1-SP1 : Define product risk categories and parameters(5) PA2.2-SG1-SP2 : Identify product risks(5) PA2.2-SG4-SP4 : Identify test project risks(1) PA2.1-SG2-SP2 : Define test strategy(5) PA2.2-SG1-SP3 : Analyze product risks(5)
	E	1	All relevant stakeholders are defined (not necessarily documented) and known to the testers.	PA2.2-SG4-SP3 : Plan stakeholder involvement(4) PA2.2-SG4-SP2 : Plan for test staffing(1)
		2	Stakeholders actively acquire information on the quality of both the test process and the test object.	PA2.2-SG4-SP3 : Plan stakeholder involvement(1)
		3	Stakeholders proactively take action on aspects that affect the test process. This includes changes in the delivery sequence of the test object and changes in the project scope.	PA2.2-SG5-SP3 : Obtain test plan commitments(5) PA2.5-SG3-SP3 : Co-ordinate the availability and usage of the test(3)
	O	1	Line management acknowledges that test process improvement comes with the need for increased learning time for which resources are provided.	-
		2	Stakeholders are willing to adapt their way of working to suit the test process. This includes the software development and requirement management.	-

Step 4 concerns reinforcing the unsatisfactory parts of test competencies in test organizations based on the results from association analysis and guiding them to improve their test competencies via the "Vitamin Basket Rule". The "Vitamin Basket Rule" refers to a rule that suggests one should evenly take in all the nutrients to stay fit. That is, despite excessive intakes of other nutrients, a paucity of even a single nutrient will disrupt the balance in one's body. This notion is applied to the improvement guide. If even a single area fails to reach a satisfactory level, the total level measured reflects the single unmet level, although most of the other areas reach a high level. That is, to reach a current goal, one should achieve the target levels and above in all areas without ending up in an unsatisfactory level even in a single area.

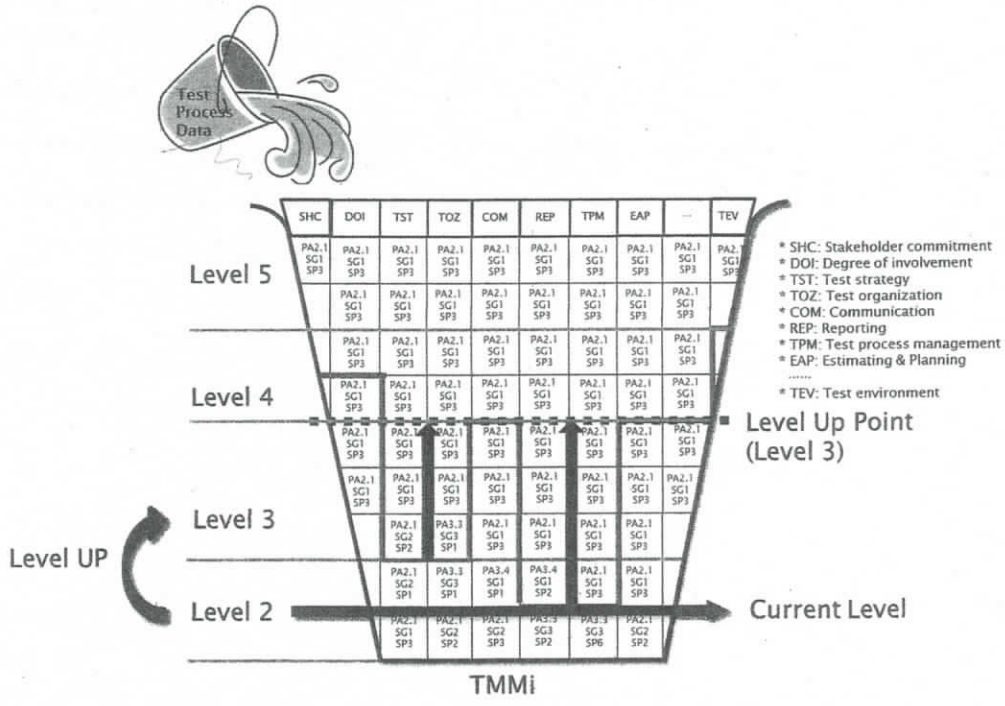

Figure 1. Vitamin Basket Rule (partial)

Here, the "Vitamin Basket Rule" sheds light on the unsatisfactory performance of such items as Test Strategy(TST), Test Organization(TOZ) and Reporting(REP) in organizations carrying out TPI Next. Moreover, the identified unsatisfactory items were found to possibly rise to the next level of TMMi(Level 3) when the performance met the level required by TMMi.

4. Conclusion

The present paper proposes a method to improve test competencies based on the established test process improvement method. Organizations, whose test process levels are diagnosed through TPI Next, can find out their unsatisfactory areas of test activities via TMMi mapping. Also, the "Vitamin Basket Rule" helps test organizations pinpoint the areas of unsatisfactory test activities, take additional actions and thus enhance their competencies. Yet, the present paper is limited to a partial application of TPI Next and TMMi, which warrants a further study applying all levels of TPI Next in tandem with TMMi.

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**Corresponding author: R. Young Chul Kim

Dept. Of Computer and Information Communication (CIC),

Hongik University,

Sejong Campus, 339-701, Korea

E-mail: bob@hongik.ac.kr

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