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# CONTEXTDRIVEN TEST PROCESS IMPROVEMENT WITH TMMi

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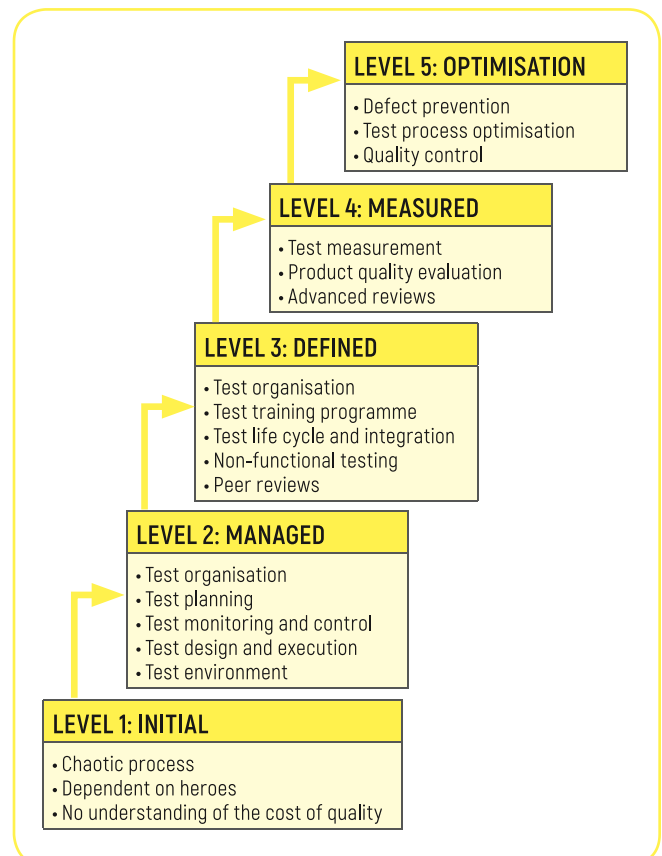


Software has become immensely important for today's society. Despite many quality initiatives, the IT-industry is still far from being able to deliver zero-defect software. In recent years, the way software is being developed has changed dramatically in most countries. There has been a large shift towards adopting an Agile and/or DevOps way of working. This typically has benefits such as the ability to better manage changing priorities, improved project status visibility, increased team productivity and better delivery predictability. However, many organizations are struggling with Agile, and it has become apparent that moving towards Agile does not automatically also guarantee improved software quality. Testing, although organized differently compared to within traditional organizations, is still and will remain an important part of software development. This is not only due to the importance of software in today's society, but also due to the many (technical) challenges that IT projects are facing, e.g., increasing complexity, new technologies, systems-of-systems, variety of devices and OS's and security vulnerabilities.

To cut a long story short, the authors strongly believe that there is high need for better and mature testing. TMMi is the de-facto world-wide standard for test process improvement with today no less than 16 so-called TMMi Local Chapters that market and organize TMMi based services locally in their country or region. TMMi is a five level staged test improvement model that allows organizations to advance through the model step by step from level 1 (initial) to level 5 (optimization). This is also how most organizations use the model to get better in

testing and mature their test processes step by step. However, in this paper, Erik van Veenendaal and Jan Jaap Cannegieter explore the possibilities to use TMMi in a different, more context driven way. Two approaches are presented and discussed, together with some practical experiences: a top-down approach centred around the TMMi goals and a bottom-up approach centred around the practices hereafter referred to as cherry picking.

## Top-down: Goal based TMMi



TMMi model overview



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Jan Jaap Cannetieger Jan Jaap Cannetieger has over 25 years of experience in ICT; he did assignments in requirements, testing, quality assurance, process improvement, Agile coaching and digitalization. Jan Jaap is Principal Consultant at Squerist, a consultancy company of 100 employees specialized in process management and testing. Within Squerist Jan Jaap is responsible for coaching, knowledge management and product development. He is also a Test consultant for different clients of Squerist. Jan Jaap is the well-known author of several articles and books in the Netherlands and is a regular (keynote) speaker and workshop leader on international conferences.

With goal based TMMi one typically does not start considering where to improve using the TMMi model and its maturity level. The first step is always to clearly define the problems the organization is having and the business reasons why test improvement is needed. Based on those, the TMMi goals that can add business value in the specific context are subsequently selected.

A goal within the TMMi model is a process area component described at a rather high-level. Goals are very well usable as an improvement suggestion. Examples of specific TMMi improvement are: 'Establish Test Estimates' (part of the TMMi level 2 process area Test Planning) and 'Establish an Organization Test Training Capability' (part of the TMMi level 3 process area Test Training Program). Within the TMMi the goals are elaborated into practices, sub-practices, examples and example work products. These non-required TMMi components contain a lot of useful information to support the implementation of a goal in an organisation.

As an example, a software development company with a dedicated test organization in transition from traditional to an Agile way of working started to discuss the rationale to test improvement with management. This resulted in the following agreed upon reasons for starting a test improvement project:

- If possible test both more efficient and effective; development projects, including testing, take too much time. In other words getting more work done in less time
- More visibility is required in the status of testing and the status of product risks, open and clear communication to various stakeholders.

With the support of an external test process improvement consultant the specific goals within TMMi level 2 were identified that could support more efficient, effective testing and/or more visibility of the testing status and product risks. This activity is sometimes referred to as goal mapping. Some examples of the identified interesting TMMi improvement goals for the software development organization are:

- Establish a Test Strategy (process area Test Policy)
- Perform a Product Risk Assessment (process area Test Planning)
- Establish a Test Approach (process area Test Planning)
- Monitor Test Progress against Plan (Process area Test Monitoring and Control)
- Monitor Product Quality against Plan and Expectations (Process area Test Monitoring and Control)
- Perform Test Analysis and Design using Test Design Techniques (Test Design and Execution).

Note, after some discussion it was decided to limit the goal identification exercise to TMMi level 2 only since there was already enough interesting improvement goals to be found at TMMi level 2 and also the maturity of testing was probably not ready yet to implement the TMMi level 3 improvement goals.

## TMMi quick scan

When doing goal-based TMMi this is most often supported by doing a TMMi quick-scan. A quick-scan differs from a formal TMMi assessment in many ways. The most important differences in the context of this paper are that it does not provide a formal maturity rating and that the evaluation takes place on a goal level rather than at practice level. In the above mentioned test improvement project for the software development organization, the so-called Interim Maturity Method (IME) was used to do the TMMi quick scan. An IME based TMMi quick scan is typically carried out in only 2 or 3 days (including reporting and feedback sessions) and can be seen as a guided self-assessment.

It is important to start the quick-scan with defining the scope. Which TMMi maturity levels and process area will be evaluated and taken into account? At the example, after some discussion, it was decided to take in full into account only the process areas that have at least one specific goal on the identified list of interesting TMMi improvement goals.

At the beginning of the quick-scan the assessor will browse through some process and project documentation, e.g., test plan, test design and test report, to get a feeling of the current status and is able to ask critical questions throughout the session. In the IME only the specific goals will be scored, whereas in an assessment typically all practices are evaluated one-by-one. To ensure that scoring is as good as possible, a representation of the actual status, scoring is done against three evaluation dimensions: Approach, Deployment and Results.

- Approach: commitment of the organization and the support from management for that goal, as well as the ability of the organization to implement the goal, e.g., Are testers trained?, Is there sufficient time provided?, Are necessary templates and/or tool available?, etc.
- Deployment: the proportion of projects implementing the activities related to the goal and the consistency of the implementation across projects.
- Results: the proportion of projects with a positive result and the consistency of the positive results over time and across projects.

Goal scoring is done by the individual participants during the quick-

IMPROVEMENT GOAL	SCORE
Establish a Test Strategy	4,3
Perform a Product Risk Assessment	1,4
Establish a Test Approach	4,4
Monitor Test Progress against Plan	4,7
Monitor Product Quality against Plan and Expectations	5,2
Perform Test Analysis and Design using Test Design Techniques	8,1



scan meeting. The participation of representatives of different roles across projects or product streams will ensure a broad coverage of the test process within the projects. The goals are scored on a scale from 1 to 10 whereby a supporting form is available to guide the participants in what a score typically represents. Scoring starts with an explanation of the TMMi process area and goal by the assessor where after all participants first perform the scoring individually. Immediately after individual scoring, consensus on scores that deviate is discussed and ideally consensus is achieved by the participants. The discussion typically reveals many interesting shortcomings and improvement ideas for the quick scan report. The resulting scores for the software development organization from the already stated examples of identified interesting TMMi improvement goals were as follows:

The result of the quick-scan clearly revealed the goals/areas in which software testing was less strong. But more important, focusing the test improvement effort on these goals would specifically support the achievement of earlier defined business objectives. After implementing a set of specific goals, a particular process area or even maturity level could be implemented entirely, but this is typically not the objective when using TMMi in a goal based improvement manner. With goal based TMMi one what needs to be improvement based on the business context and subsequently the relevant goals are selected.

### Bottom-up: Cherry Picking

The essence of using TMMi as source for cherry picking is that the organization or tester(s) already know what they want to improve and use TMMi as a source for how this can be done. The TMMi model is very rich in providing helpful testing practices, sub-practices, examples and example work products. All of this is most often very useful for an organization or tester without them even caring about the overall TMMi model and structure. Ideas what to improve can come from many different sources, typically with cherry picking not from an TMMi assessment, e.g., attending a testing course or testing conference. Participants often come back to the workplace with various open-ended improvement ideas. They heard about something new, listened to an interesting case study, etc. and see an added value for this within their own organization. Other sources for improvement ideas could be papers, blogs or even a simple tweet, where all kinds of interesting content are presented. When selecting and prioritizing improvement ideas the business perspective and value should of course be taken into consideration (see also previous section).

Improvement ideas from courses, conferences or publications are often not detailed and/or elaborated enough to serve as a basis for deployment. This is where TMMi comes in and we start looking for specific interesting cherry's that are context-driven. Evaluate which TMMi process area relates to a high-level improvement idea, and study the corresponding practices, example work products, sub practices and examples. During this activity always ask the question, "Does this support me in achieving my objective?", and also "Does this fit in my context, or does it need to be adapted to my context?". Remember, there are no best practices, only good practices in context. Typically don't use TMMi as a cookbook with detailed steps one has to follow. TMMi, especially when used in this way, is a highly organized list of great ideas, hints and examples. The practices and other components will basically be used as a well-designed checklist to support the elaboration of high level test improvement ideas.

With cherry picking the TMMi model is essentially used bottom-up or even upside down. Typically people use TMMi top-down, they start with a maturity level, select the process areas and specific goals they want to implement and subsequently they study the practices, work products, sub practices and examples. This of course completely makes sense when using the staged maturity level approach of TMMi and aiming to achieve

a certain TMMi level. The TMMi improvement goals are in this situation mandatory and probably therefore the most interesting component. However, when using TMMi as a source for cherry picking, the lower part of model being the practices, work products, sub practices and examples are the most interesting components. A word of warning is probably needed here as well. Just following the standard TMMi staged approach is easier, identifying and selecting improvements yourself that are needed and fit best in the context of an organization is harder. Therefore applying the cherry picking approach to TMMi does require experienced testers or test consultants to be involved that can draw on previous experiences of what would be best for the organization. This is not a straightforward, nor easy thing to do.

As stated one of the challenges when you use TMMi this way is to find out which practice, work product, example work fits best to your context. Besides studying the context and TMMi components, and discussing it with fellow testers, a good way forwards is typically to experiment in a pilot project. After running the pilot project, the results are analysed. Based on the result one can decide to update the initial idea, try something (slightly) different and run another pilot project. Ideally, the pilot project is successful and the deployment can start, maybe even organization wide. In the end, the actual implementation in an organization may very well (in detail) be different from how it is defined in TMMi. This of course is totally fine, TMMi has provided support finding a solution to an initial idea and by not treating TMMi as a rigid framework, a new or updated test practice is deployed that fits best your context.

## Practical Experiences

### *Risk-Based Testing*

A DevOps team decided that risk based testing would assist them in doing more effective and efficient testing. This was the outcome of a retrospective session, in which the team came to the conclusion that no explicit decisions were made about what should be tested and the level of thoroughness. As always, the time available for testing was limited and the team wanted to dedicate their time as effective as possible, based on product risks.

The team studied the various practices under the specific goal Perform a Product Risk Assessment within the process area Test Planning. As a result the team started with a high-level product risk assessment; "Which product risks can be identified looking at the overall system?". This led to a list of relevant non-functional quality attributes and technical risks, whereby the technical risks were subdivided into three categories (back-end, front-end, mobile). This is basically an implementation of the TMMi specific practice 'Define product risk categories and parameters'. Another result of the high-level product risk assessment was a list of features identified as highly critical from a user perspective and that should be available 24/7. This feature list was subsequently the basis for building a regression test set.

In addition to the high-level product risk assessment, the team decided to add product risk analysis as an activity during user story refinement sessions. For every user story risks were identified and discussed, both from a technical and business/user perspective. In practice this proved to be not only good input for testing, it also made the user story refinement itself better and estimations more reliable.

In summary, the whole way of working as implemented was largely derived from the TMMi specific practices within the specific goal Perform a Product Risk Assessment. Full compliance with this TMMi goal was certainly not an objective as set by the team, but the TMMi

specific goal description and practices supported the team to achieve their defined improvement objective.

### *Defect prevention*

A development organization with 8 Scrum teams, whereby testers are part of the Agile Scrum teams. To further enhance testing knowledge and skills, share experiences and create common test processes a test guild was established. During various discussions the members of the test guild discovered that often they were finding the same kind of defects. As a result, it was agreed upon that defect prevention at a cross-team level would most likely be beneficial. In order to set this up in a more professional way, they started looking for references on defect prevention and came across the TMMi level 5 process area Defect Prevention.

In the beginning there was some concern regarding using a standard model of framework. However, when the content of the defect prevention process area was presented in a non-prescriptive way and as a possible set of ideas on how this could be set up the attitude changed rapidly. Especially the sub practices of the specific practice "Analyse causes of selected defects", which contains examples of supporting techniques to determine root causes and examples of categories of common root causes, were considered to be very useful. This example shows that sometimes even the goals and practices of high maturity level process areas can be useful to solve a specific problem in an organization. Not everything of the TMMi process area Defect Prevention was implemented, but many sub practices and practices were considered to be useful in this specific context.

## Conclusion

In today's IT based society, testing and test process improvement are definitely of utmost importance. TMMi, being the world's most popular test process improvement model, is considered to be a great resource for test improvement ideas and a source of good testing practices. The structure of TMMi, with maturity levels and process areas, doesn't always have to be used in the standard way. It can also be used more context driven by selecting specific goals or by cherry picking as described in this paper. TMMi contains many best practices, and by also using the extension document "TMMi and Agile" (see [www.tmmi.org](http://www.tmmi.org)) it becomes highly applicable in an Agile context as well. The TMMi content as such, can be used as a heuristic: a fallible method to solve a problem. Using TMMi in this way, it becomes a highly valuable source of good testing practices instead of a standard prescriptive maturity model.

Especially Agile organizations are recommended to critically choose and only implement the TMMi practices that matter and have added value. Whilst TMMi is comprehensive, to be successful, organizations must identify the key testing practices and improvements that require focus. Somewhat contrasting with what TMMi formally encourages, one may at a relatively early stage even consider already selectively using TMMi level 4 and 5 practices with Agile techniques to address key business objectives. You do not need to wait and you shouldn't. Be flexible and do not get stuck on TMMi level 2 and 3 testing practices. Use the model based on your business drivers and use process areas, goals and practices that have the most value in your context. As such, use TMMi in a more continuous mode to some extent, and don't use the maturity levels too strictly.