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QUALITY MATTERS

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TMMi, the world standard for TEST PROCESS IMPROVEMENT – *ALSO IN THE AGILE ERA*

Test Maturity Model integration (TMMi)

The TMMi framework has been developed by the TMMi Foundation as a guideline and reference framework for test process improvement, addressing those issues important to test managers, test engineers, developers and software quality professionals. Testing as defined within TMMi in its broadest sense encompasses all software product quality-related activities. TMMi uses the concept of maturity levels for process evaluation and improvement. Furthermore process areas, goals and practices are identified. Applying the TMMi maturity criteria will improve the test process and has shown to have a positive impact on product quality, test engineering productivity, and cycle-time effort. TMMi has been developed to support organizations with evaluating and improving their test processes.

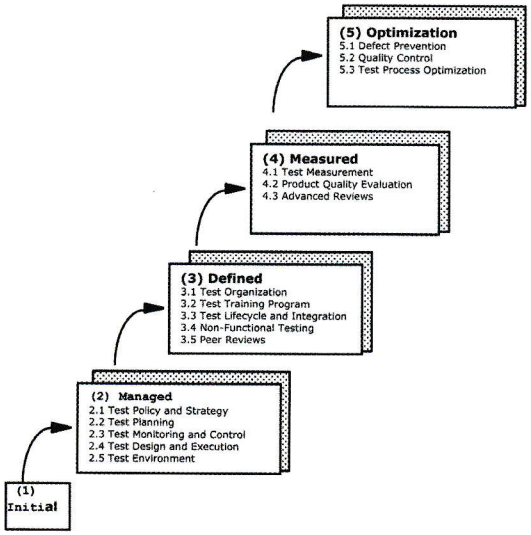
TMMi is aligned with international testing standards, and the syllabi and terminology of the International Software Testing Qualifications Board (ISTQB). The TMMi Foundation has consciously not introduced new or their own terminology but reuses the ISTQB terminology. This is an advantage for all those test professionals who are ISTQB certified (approximately 500,000 worldwide at the time of this writing). TMMi is an objective and business-driven model. Testing is never an activity on its own. By introducing the process area Test Policy and Goals already at TMMi level 2, testing becomes aligned with organizational and quality objectives early in the improvement model. It should be clear to all stakeholders why there is a need to improve and what the business case behind this initiative is.

With TMMi, organizations can have their test processes objectively evaluated by certified assessors, improve them, and even have their test processes and organization formally accredited if it complies with the requirements. Many organizations worldwide are using TMMi for their internal test improvement process. Other organizations have already formally achieved a TMMi level and have subsequently been TMMi certified at that level. It's also possible for test professionals and consultants to be personally certified for their TMMi knowledge. A full certification scheme is available called TMMi Professional.

TMMi has a staged architecture for process improvement. It contains stages or levels through which an organization passes as its testing process evolves from one that is ad hoc and unmanaged to one that is managed, defined, measured, and optimized. Achieving each stage ensures that all goals of that stage have been achieved and the improvements form the foundation for the next stage. The internal structure of TMMi is rich in testing practices that can be learned and applied in a systematic way to support a quality testing process that improves in incremental steps. There are five levels in TMMi that prescribe the maturity hierarchy and the evolutionary path to test process improvement. Each level has a set of process areas that an organization must implement to achieve maturity at that level. The process areas for each maturity level of TMMi are shown in *Figure 1.*

A main underlying principle of the TMMi is that it is a generic model applicable to various life cycle models and environments. Most goals and practices as defined by the TMMi have shown to be applicable with both sequential and iterative life-cycle models, including Agile. Note that within TMMi, only the goals are mandatory, the practices are not. TMMi is freely available on the web site of the TMMi Foundation (www.tmmi.org). The model has been translated in Spanish, French and Chinese. TMMi is also available in published book format.

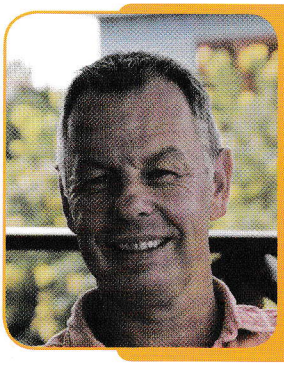
Figure 1: TMMi maturity levels and process areas



TMMi and Agile

The mistaken belief is that the TMMi and Agile approaches are at odds. Agile approaches and TMMi can not only co-exist, but when successfully integrated will bring substantial benefits. There is also a challenge of looking at testing differently, being fully integrated within Agile development and what that means in the context of a "test" improvement programme. Note that the "i" in TMMi refers to the fact that testing should be an integrated part of software development, and not be treated as something that is totally separate. Literature and presentations on testing in Agile projects tend to focus on unit testing, test automation and exploratory testing, but of course there is more! Using the TMMi model in an Agile context provides reminders of critical testing practices that are often "forgotten". The challenge is to apply lean principles to empower Agile practices and facilitate TMMi practices.

When implementing TMMi one must take into account that the intent of the TMMi model is not to "impose" a set of practices on an organization, nor is it to be applied as a standard to which one must "prove compliance". Used appropriately, TMMi can help you locate the specific testing areas where change can provide value given the business objectives. This is true regardless of the lifecycle model that is being applied. It is important to always remember that TMMi practices are an expected component, but can also be achieved by what is referred to as "alternative" practice with respect to a defined TMMi practice. Always think, what is the intent of the practice, what is the rationale and how does it add value to the business? Often in an Agile culture the intent is already achieved but through an alternative practice. Typically "any" solution is compliant as long as it's driven by business needs! When using TMMi don't be too prescriptive, this was not how TMMi was intended in the first place. Always interpret the TMMi goals and practices to the context of your situation. In general by first establishing the process needs within your specific business context, decisions can be taken on how to focus and drive process improvement priorities.



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Erik van Veenendaal is a leading international consultant and trainer, and a recognized expert in the area of software testing and requirement engineering. He is one of the core developers of the TMap testing methodology and the TMMi test improvement model, and currently the CEO of the TMMi Foundation. For his major contributions to the field of testing, Erik received the European Testing Excellence Award (2007) and the ISTQB International Testing Excellence Award (2015).

Moving from traditional based software development to Agile can also bring out the initiative to prune and lean the processes as they are defined today. In this way TMMi based organizations will benefit from the Agile way of thinking. There has been a tendency for people to read things into the TMMi model that are not there and thus create unnecessary non-value-added process and work products. By going back to the roots and improvement goals and using the TMMi model as it is intended, one will support the alignment of real value-added processes with real process needs and objectives. Pruning and leaning processes with an Agile mindset will result in processes that reflect what people really do and will ensure that only data that is used is being collected. The Agile mindset will also bring a focus on keeping things as simple as possible, which is typically not easy but will bring a benefit for those practicing a TMMi implementation. Improvements within Agile will typically take place through small empowered teams that can take rapid action, which is another way where TMMi can benefit from being Agile.

Let's take the TMMi level 2 process areas Test Policy and Strategy and Test Planning as an example to see how TMMi is also applicable in an Agile context.

Test Policy and Strategy

Any organization that embarks on a test improvement project should start by defining a test policy. The test policy defines the organization's overall test objectives, goals and strategic views regarding testing and test professionals. It is important for the test policy to be aligned with the overall business (quality) policy of the organization. Test improvements should be driven by clear business goals, which in turn should be documented in the test (improvement) policy. A test policy is necessary to attain a common view of testing and its objectives between all stakeholders within an organization. This common view is required to align test (process improvement) activities throughout the organization.

The above is also true in an organization that practices Agile software development. Indeed within many organizations there is much discussion on the changing role of testing, independence of testing, test automation and professional testers in Agile software development. These items and others are typically issues that should be addressed in a discussion with management and other stakeholders and documented in a test policy. Any organization, including those that practice Agile, that wants to start a test improvement project, needs to identify and define the business drivers and needs for such an initiative. Why else start an improvement project? By spending time to capture the true business needs, one can provide the context in which to make the decision on where to focus the (test) improvement priorities, e.g., on which process area.

However, there is an important consideration for Agile in relation to the test policy and especially defined test (improvement) goals. Although there may be overall goals that relate to test process improvement in the organization, this needs to be balanced with individual projects and Agile teams being responsible for improving their own process. The Agile process improvement challenge is to guide and frame the improvement on an organization level while not reducing an individual Agile team's sense of ownership of its own process.

Test Planning

The purpose of Test Planning is to define a test approach based on the identified risks and the defined test strategy, and to establish and maintain well-founded plans for performing and managing the testing activities. Beware that the key to successful test planning is in upfront thinking ("the activity"), not in defining the associated test plan ("the document").

For Agile lifecycles, two kinds of planning typically occur, release planning and iteration planning. The Test Planning process area at TMMi level 2 focuses on the testing related activities at both release and iteration planning. Release planning looks ahead to the release of a product at the start of a project. Release planning requires a defined product backlog and may involve refining larger user stories into a collection of smaller stories. Release planning provides the basis for a test approach and test plan spanning all iterations. Release plans are high-level. After release planning is done, iteration planning for the first iteration starts. Iteration planning looks ahead to the end of a single iteration and is concerned with the iteration backlog.

The Test Planning process area has a number of specific practices. The TMMi doesn't state when or how to conduct these practices. It doesn't state you can't plan incrementally either. The traditional approach has been to solidify as many decisions as one can up front, so the related cost and schedule can also be solidified. The rationale for this approach has been to better estimate work and reduce the risk of scope creep. Agile approaches typically take the position that we gain greater value by continuous refinement of the plan based on the latest information and on-going collaboration with the customer.

Benefits

Executing an improvement program using TMMi requires an investment. It is often said that the benefits of test process improvement are difficult to measure. Most organizations find it relatively simple to measure the costs, but more difficult to measure the benefits. The direct benefits of TMMi are often measured by comparing the old situation, the one before the implementation of TMMi, to the new situation. Indirect benefits, such as "increase in customer satisfaction" or "increase in personnel motivation", can be measured by conducting interviews or using questionnaires.

To illustrate the possible outcomes (returns), some results of organizations that conducted a TMMi improvement program in which the author was involved are shown below. An IT organization that achieved TMMi level 3 reported results in shortening the completion time of the test execution phase *(Figure 2)* and a higher Defect Detection Percentage (DDP) during the system test *(Figure 3)*. Here Defect Detection Percentage has been defined as "the number of defects found by a test phase, divided by the number found by that test phase and any other means afterwards" [6].

Figure 2: System Test execution time in weeks

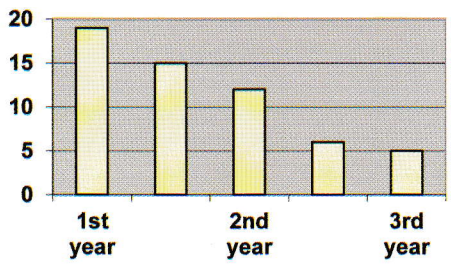
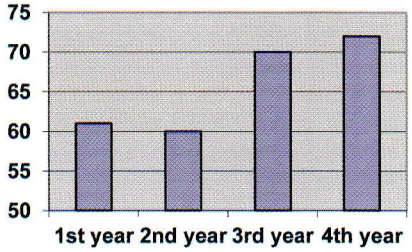
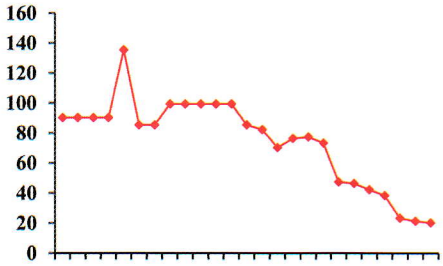


Figure 3: Defect Detection Percentage



After a certain amount of time almost every organization reports an improved predictability of the testing process. An example of this can be seen in *Figure 4*, a report of an organization at TMMi level 2. Initially around 100% deviation (and more), but after spending on test process improvement deviation was controlled and within 20%.

Figure 4: Predictability improvement with TMMi



Some more metrics and benefits can be found in the State of the Testing Report [7]. Examples of benefits stated in this report, which focuses specifically on TMMi, include:

- Savings of up to 40% on the lifecycle costs
- Predictable quality, being sure when going live
- A 99% defect detection rate before going live
- Defect levels reducing by over 50%
- Improved revenues due to the better quality
- Lower support costs
- Significantly increased staff morale
- Recognition as a high performance organization.

Expert's opinion

The ISTQB expert level background book "Improving the Testing Process – Implementing Improvement and Change" provides a great summary on the TMMi which is partly repeated below as a final conclusion / overview regarding TMMi.

TMMi uses a staged representation:

- Five successive maturity levels are defined, each of which requires that specific testing activities (process areas) are performed.
- The sequence to follow for improving test process maturity is simple to understand

The improvement focus within the TMMi is on detailed coverage of a limited number of process areas per maturity level. This supports the organization in having a clear focus during the improvement program. Each process area can be assessed at a detailed level based on scoring the testing practices. The interactions from TMMi to CMMI are covered in detail. This enables testing to be considered within the context of the software development process. At higher maturity levels testing issues,

such as testability reviews, quality control, defect prevention and test measurement program, are covered in detail.

There is a strong focus within the TMMi on obtaining management commitment and defining business objectives upfront to drive the test improvement program. The formal assessment approach is described in a separate guideline: the TMMi Assessment Method Application Requirements (TAMAR). Assessments may be conducted formally with certified TMMi assessors, or informally. Conducting an assessment requires that performance of all process areas, that are applicable, and practices at a certain maturity level are evaluated. A formal assessment can result in certifying a specific organization at a certain TMMi maturity level.

The model is based on independent research and is not aligned to a specific testing methodology. The model corresponds to international testing standards. Standard testing terminology is used which is strongly aligned to the ISTQB glossary of testing terms.

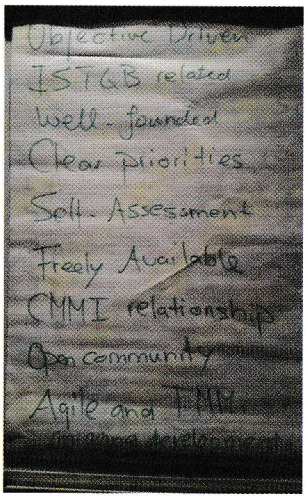
User's opinion

The above is stated in a book written by experts in the field of test process improvement, however I personally value the opinion of users as least as much. During a recent TMMi Professional course in Eastern Europe, I asked the attendees what they liked most about the TMMi (see *Figure 5).*

These were their answers:

- The model supports an objective driven application, e.g. through the test policy, - do the things that matter and not just because it is stated in the model.
- The fact that it is ISTQB related, e.g., same terminology and can easily be linked to the content in the various syllabi.
- It's not just another commercial model, but well founded, based on research and linked to international standards.
- By using a staged approach there are clear priorities on which process areas to focus on. This makes it easy to use.
- The TMMi does not need a full (expensive) assessment; there are many ways of doing an easy self-assessment that will get you started.
- The TMMi model and related deliverable are all freely available on the web.
- For organizations that are already doing CMMI, having the same structure as the CMMI and a clearly defined relation helps enormously.

Figure 5: What do you like about TMMi?



- The TMMi is an open community and easy to get involved with, e.g., become a member of the TMMi Foundation, but also through the various TMMi Local Chapters.
- It is an on-going project, there are constantly new developments related to TMMi thereby keeping it up-to-date, e.g., the TMMi and Agile document recenty published, and work in progress on TMMi and DEVOPS.

Local Chapters

The latest initiative for the TMMi is the establishment of so-called local chapters. The TMMi Foundation has been successful in developing the TMMi model, the TMMi Professional certification scheme and other TMMi artefacts. To increase the uptake of TMMi worldwide the TMMi Board of Directors is working with ISTQB Member boards to effectively also become TMMi local chapters. A TMMi Local Chapter shall perform TMMi marketing in their region and will become the local point of contact for TMMi. Already ten TMMi Local Chapters have been established, including the SEETB who has become the TMMi Local Chapter for the South East European region.