# Guidelines for Testing Maturity

## Part 2: Test Maturity Model level 2

*Continuing the series on test maturity, Erik van Veenendaal presents guidelines for achieving TMM level 2. In the previous issue the Test Maturity Model (TMM) was introduced. In part 2, the four level 2 key areas are discussed to provide the testing community with a better understanding of TMM level 2. For level 1 organisations, according to the TMM the maturity goals as described in this paper should be the focus of their test improvement process activities. A short quick scan questionnaire is included in this paper for those who want to score their test processes against the TMM reference model.*

TMM is a staged model that aims at supporting organisations during test process improvement activities. The TMM consist of 5 levels, whereby level 1 is for free. As with CMM, if you exist you're level 1. Recent studies have shown that almost 90% of the companies are still at TMM level 1. The level 2 guidelines therefore reflect the test improvement areas for most companies and projects. Within TMM level 2, four key areas can be distinguished:
- Test policy and goals
- Test planning
- Test techniques and methods
- Test environment

Except for the first key area "Test Policy and Goals", all improvement goals are very much test project focused. A test planning process, the usage of test designs and procedures and a well-controlled test environment are the basics for any test project. "Test Policy and Goals" addresses the management commitment and involvement that comes as a pre-requisite for successful test process improvement.

**Test Policy and Goals**
The purpose of Test Policy and Goals is to develop and establish a test policy and an overall test approach containing test goals, responsibilities and main tasks for each test level.

When an organisation wants to improve its test process, it should first clearly define a test policy. The test policy defines the organisation's overall test objectives, viewpoints regarding testing and the level of independence. It is important that the test policy is aligned with the overall business (quality) policy of the organisation. A test policy is necessary to attain a common view on testing between all relevant stakeholders within an organisation. This common view is indispensable to align further test process improvement activities.

Within the test policy the objectives of test process improvement should be stated. These objectives should be translated into a set of high-level key test performance indicators. The establishment of performance objectives and indicators provides clear direction and communication of expected and achieved levels of performance.

Within this process area an overall test approach is also defined. The overall test approach is a high-level test process description. The overall test approach can be based on existing generic overall test approaches for example: the V-model or the incremental model. Within the overall test approach, test levels are identified, for example: unit, integration, system and acceptance test. In addition, goals, responsibilities and main tasks for each test level are defined. The overall test approach serves as a starting point for the test projects. Test projects are set up according to the overall test approach. When an overall test approach is defined and followed, less overlap between the test levels is likely to occur leading to a more efficient test process.

Maturity goals of the Test Policy and Goals process area are:
- A test policy, aligned with the business (quality) policy, is defined and agreed upon.
- An overall test approach is defined and deployed, identifying the test levels including goals, responsibilities and main tasks for each test level.
- A set of test process performance indicators is defined and deployed.

**Test Planning**

The purpose of Test Planning is defining a committed test strategy and approach, and to establish well-founded plans for performing and managing the test. Planning is essential for a process that is to be repeatable defined and managed.

After confirmation of the test assignment, a general study is made of the system to be tested, the project, the functional and quality requirements, and the organisation of the development process. As part of test planning, the test strategy is defined by means of a risk assessment. Depending on the risks, it is decided which properties of the system will be tested, and in what depth. For it is impossible to test the entire system, as test techniques providing 100% coverage exists only in theory. Moreover, no single company would be willing to afford the resources required for this purpose. The objective is to provide the best possible degree of coverage in the right place. Such matters are, of course, agreed specifically with the stakeholders. Testers should not take these decisions themselves. Within test planning, the test organisation is also set up, the test deliverables that are to be provided are identified, and aspects relating to infrastructure and management are defined. Finally, the test plan is prepared and agreed upon.

Maturity goals of the Test Planning process area are:
- A project's test strategy is defined and agreed upon.
- Test project activities and commitments are planned and documented.
- Estimates are documented for use in planning and monitoring the test project.

**Test Techniques and Methods**

The purpose of Test Techniques and Methods is to improve test process capability during test design and execution by applying basic test techniques and methods.

Well-founded testing means that formal techniques and methods are applied, supported (if possible and useful) by tools. Test design techniques are used to derive and select test cases from requirements and development documentation. A test case consists of the description of the starting situation (including the test input), the change process, and the expected result. The test cases are documented in a so-called test design. At a later stage, as more information becomes available on the actual implementation, the test designs are translated into test scripts. In a test script, the specific test actions and checks are arranged in an executable sequence. The tests can subsequently be executed using these test scripts. The test design and execution follow the predefined test strategy in the test plan.

During the test execution test incident reports are documented and tracked until closure. Incidents are logged using an incident management system and a clear communication about the incidents with the stakeholders is realised.

Maturity goals of the Test Techniques and Methods process area are:
- Test design techniques are evaluated, recommended and consistently applied throughout test design.
- Test execution is performed using formal test scripts.
- Supporting tools are evaluated, recommended and consistently applied where possible for test design and test execution.
- Incidents found during testing are managed and reported.

**Test Environment**
The purpose of Test Environment is to establish and maintain an integrated software and hardware environment in which it is possible to execute tests in a manageable and repeatable way.

A test environment is needed to obtain test results under conditions which are as close as possible to the "real-life" situation, at least as far as high level testing is concerned. Furthermore, at any test level the reproducibility of test results should not be endangered by undesired or unknown changes in the test environment.

Specification of the test environment is carried out early in test projects. Specifications are reviewed to ensure their correctness, suitability, feasibility and its representativeness towards the "real-life" environment. Early specification has the advantage that there is more time to develop any special simulators, like stubs or drivers.

Availability of a test environment encompasses a number of issues, which need to be dealt with: Is it necessary for testing to have an environment per test level? A separate test environment can be very expensive. It must therefore be decided how to use them as efficiently as possible. Maybe it is possible to have the same environment shared between testers and developers. But then strict management and control is necessary as both testing and development activities are done in the same environment. When poorly managed, this situation can cause many problems ranging from conflicting reservations to people finding the environment in an unknown or undesired state when starting one's activities. Reconfiguring an environment to reach a known initial state can take days, depending on its size and complexity. Another approach for test environments is to let them 'grow' in parallel with the test levels. For example, one can decide to test a certain requirement at a higher test level to prevent the development of stubs that are needed to simulate specific subsystems that *are* available at higher levels.

Throughout the project the test environment is subject to changes due to for example hardware changes, incremental test environment development and changes in the test object. Thorough (configuration) management on the test environment is needed to cope with these changes.

Maturity goals of the Test Techniques and Methods process area are:
-   Test environments are specified and their availability is ensured on time in projects.
-   For higher test levels the test environment is as much as possible "real-life".
-   Test environments are managed and controlled according to documented procedures.

*For a more detailed description of TMM level 2, including the key testing activities, examples and literature references sent an email request to Erik van Veenendaal (eve@improveqs.nl).*

## TMM level 2 Quick Scan

Read the statements and tick to show whether your organisation follows these testing rules, set by the Test Maturity Model at level 2.

*Test policy and Goals*
- A documented test policy exists and has been approved by management
- A V-model is unambiguously defined, stating the goals, activities, deliverables and responsibilities for each test level.
- The test policy and defined V-model clearly separate (module) testing from debugging activities.
- The test and software engineers are informed on the policy and defined V-model; the documents are distributed to the people involved.
- A basic set of test process performance indicators is defined and deployed

*Test Planning*
- A project test plan describing objectives, test strategy, answering the "what to test" and "how to test" questions is developed.
- A documented procedure and template exist for test planning.
- Test managers are specifically trained on test planning.
- A documented technique and procedure is consistently applied to determine the test strategy. This technique deals with risk-analysis and prioritisation of parts of the system and quality characteristics to be tested.
- A documented technique and procedure is consistently applied for test estimation and scheduling.

*Test techniques and methods*
- Software engineers apply test coverage techniques for module testing.
- Test engineers apply structured test design techniques such as Equivalence Partitioning and C/E graphing, for system and acceptance testing.
- Engineers are specifically trained on test design techniques.
- Tests are executed using documented test procedures or test scripts.
- An incident management procedure is documented and followed throughout the (test) project.
- Supporting tools are applied during test design and execution, e.g. incident management, coverage analysis and record & playback.

*Test Environment*
- A detailed specification of the test environment is documented in the test plan
- Test environments are managed and controlled according to documented procedures for configuration management
- An adequate back-up and restore procedure exists for the test environment and it's databases
- For higher level tests, the test environment is as much as possible real-life