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**Standards -
What about it?**

The Test SPICE Approach

Test process assessments follow in the footsteps of software process assessments

by Monique Blaschke, Michael Philipp, Tomas Schweigert

When reviewing commonly used test assessment approaches such as ISTQB, TMMi® and TPI®/TMAP® one soon arrives at the conclusion that there has yet to be an approach that conforms to the ISO/IEC 15504 II standard. The new Test SPICE approach fills this gap. The ISO/IEC 15504-5 standard was used as a starting point for Test SPICE. This article describes the new model.

The ISO/IEC 15504 standard was designed to be enhanced by the development of specific process reference models (PRMs) and process assessment models (PAMs) [1]. Specific models are now available. The best known is automotive SPICE®, developed by the user group in coordination with the automotive domain. Additional parts published as technical reports provide an exemplar system life cycle process assessment model (Part 6) and serve to assess organizational maturity (Part 7).

There are two major assessment methods in the test business market: TPI®/TMAP® and TMMi®. There are also various schemes for training test professionals such as ISTQB, which is recognized as a de facto standard at least in Germany. The ISTQB education scheme implies an own process model that is used, say, for organizing the test from a test management perspective. Because of this our team decided to judge the ISTQB approach as a topic for evaluation and a potential source for test processes. The first question to answer was: Does one or more of these models comply with ISO/IEC 15504 Part 2, and if not, what should a compliant model be like?

The conformity requirements of ISO/IEC 15504-2

The PAM must specify

- The selected PRM(s)
- The selected processes taken from the PRM and
- Capability levels taken from the measurement framework.

The model must also describe the mapping between it and

- the process reference model
- the measurement framework

As long as a model for assessing tests follows this structure, conformity with ISO/IEC 15504 Part 2 is assured. The Test SPICE approach is designed to fulfil these essential preconditions.

The test process models currently available

With ISTQB®, TPI®/TMAP® and TMMi® three major models are available in the market. But do these models fulfil the requirements of ISO/IEC 15504-2?

ISTQB

The International Software Testing Qualifications Board (ISTQB) provides a set of syllabi for the qualification of test people (e.g. foundation level, advanced level: functional tester or test manager and expert level certified test process improver). [2] [3] [4] [5] Even though we knew that the ISTQB does not claim to provide a process reference model, the team decided to include the model in the evaluation. The ISTQB syllabus provides a fundamental test process: planning and control; analysis and design; implementation and execution; evaluating exit criteria and reporting; test closure activities. It also contains a glossary [8] [9]. The description of processes is heterogeneous. Sometimes a process is described with its purpose, but no explicit description of outcomes is available. Based on this the fundamental ISTQB test process does not meet the conformity requirements of ISO/IEC 15504 Part 2. Our team nevertheless considered the content of this model to be a useful input.

TPI®/TMAP®

TPI®/TMAP® is the test process assessment and improvement method of the testing service provider SOGETI. The assessment is based on a questionnaire that covers the

needs of software testing. The approach uses a two-step maturity model. Each check point can be fulfilled to up to four levels (A–D) that require fulfilment of different aspects of the check point. These levels are mapped to three general maturity levels (controlled, efficient, optimizing). The model does not provide for mapping to the capability levels and process attributes of ISO/IEC 15504 [7] [10] (This result is based on the first version of TPI®. Since the development of this paper a new version has been published. It could be that analysis of this version will lead to a different conclusion). Result: TPI®/TMAP® (first version) does not meet the conformity requirements of ISO/IEC 15504-2.

(see Fig. 1)

TMM(SM)/TMMi®

TMM(SM) was initially developed by the Illinois Institute of Technology and is now maintained as TMMi® by the TMMi Foundation. The aim of this initiative was to use the CMM®/CMMI® approach for test process assessment and improvement. The current published model is based on the graduated CMMi® approach, with processes directly linked to maturity levels. In contrast to CMMI®, TMMi® currently has no continuous representation [6]. A continuous approach enables the tester to define the capability level of each process and to deliver a capability profile. Unlike a model that only provides a graduated representation, continuous representation may fulfil the conformity requirements of ISO/IEC 15504-2. Result: TMMi® also fails to meet the compliance requirements of ISO/IEC 15504-2.

(see Fig. 2)

The new Test SPICE approach

The aim of the Test SPICE approach is to deliver a PRM and a PAM that both meet the conformity requirements of ISO/IEC 15504-2 and cover the processes required to effectively and efficiently assure the quality of software products.

Key Area	Reached TPI Matrix												
	0	Controlled				Efficient				Optimizing			
1 - Test Strategy		A					B				C		D
2 - Life Cycle Model		A			B								
3 - Moment of Involvement			A				B				C		D
4 - Estimating and Planning				A							B		
5 - Test Design Techniques		A		B						C			
6 - Static Test Techniques					A		B						
7 - Metrics						A			B			C	D
8 - Test Automation				A				B			C		
9 - Test Environment				A				B					C
10 - Office and Laboratory Environment				A									
11 - Commitment and Motivation		A				B						C	
12 - Test Functions and Training				A			B			C			
13 - Scope of Methodology					A		B				C		D
14 - Communication			A		B							C	
15 - Reporting		A			B		C					D	
16 - Defect Management		A				B		C					
17 - Testware Management			A			B				C			
18 - Test Process Management		A		B								C	
19 - Evaluation			A				B			C			
20 - Low-Level Testing					A		B		C				
21 - Integration				A			B				C		

Fig.1: The improvement strategy table of TPI® (example Automotive TPI®)

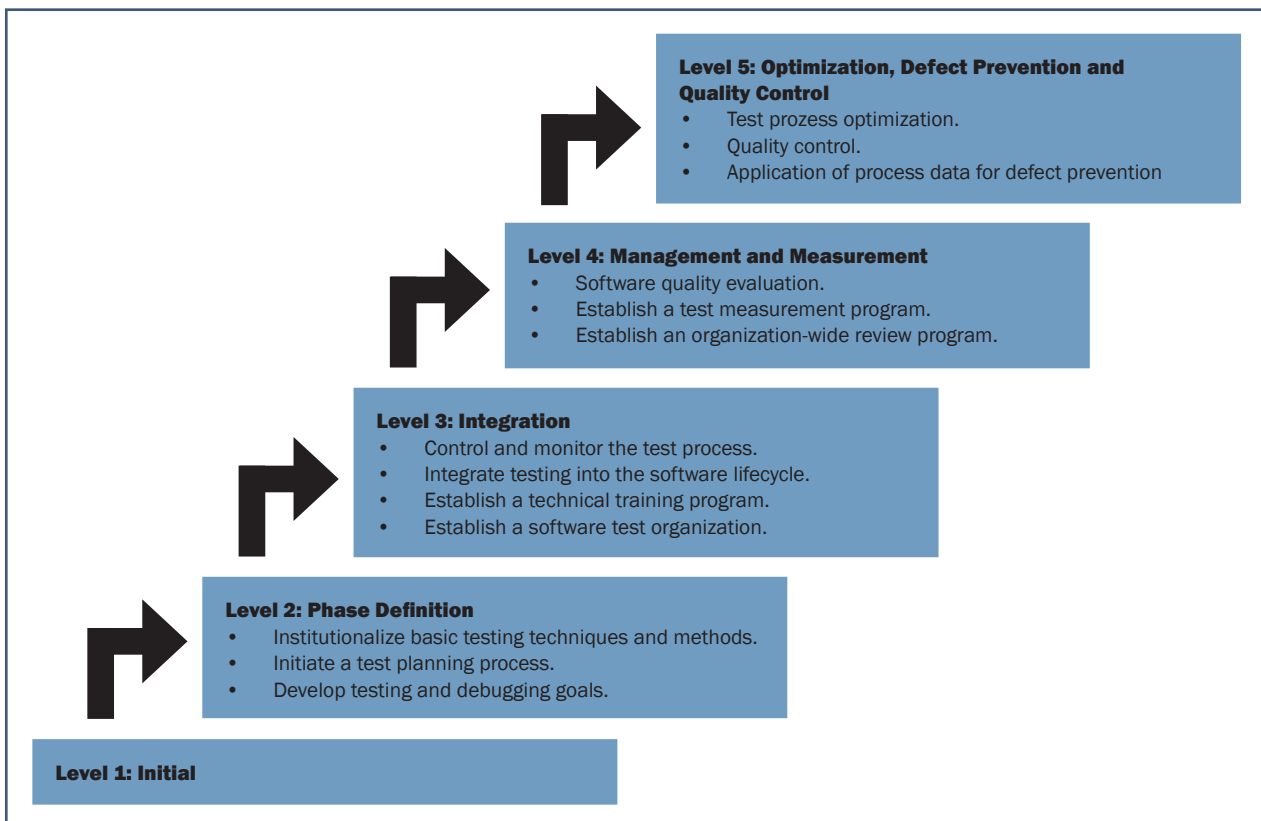


Fig.2: The maturity levels and processes of TMMi®

Quelle: "Developing a Testing Maturity Model, Part II" Ilene Burnstein, Taratip Suwannasart, C.R. Carlson Illinois Institute of Technology

The basis: ISO/IEC 15504-5

Test SPICE was developed with ISO/IEC 15504-5 as its starting point. This model is structured in process categories, process groups and processes. A well-known and practice-proven structure, it is used for the Test SPICE model. The main difference is that the processes themselves are designed to meet the requirements for setting up efficient testing.

For readers who are not familiar with ISO/IEC 15504-5 here is a short overview of the ISO/IEC 15504-5 process model.

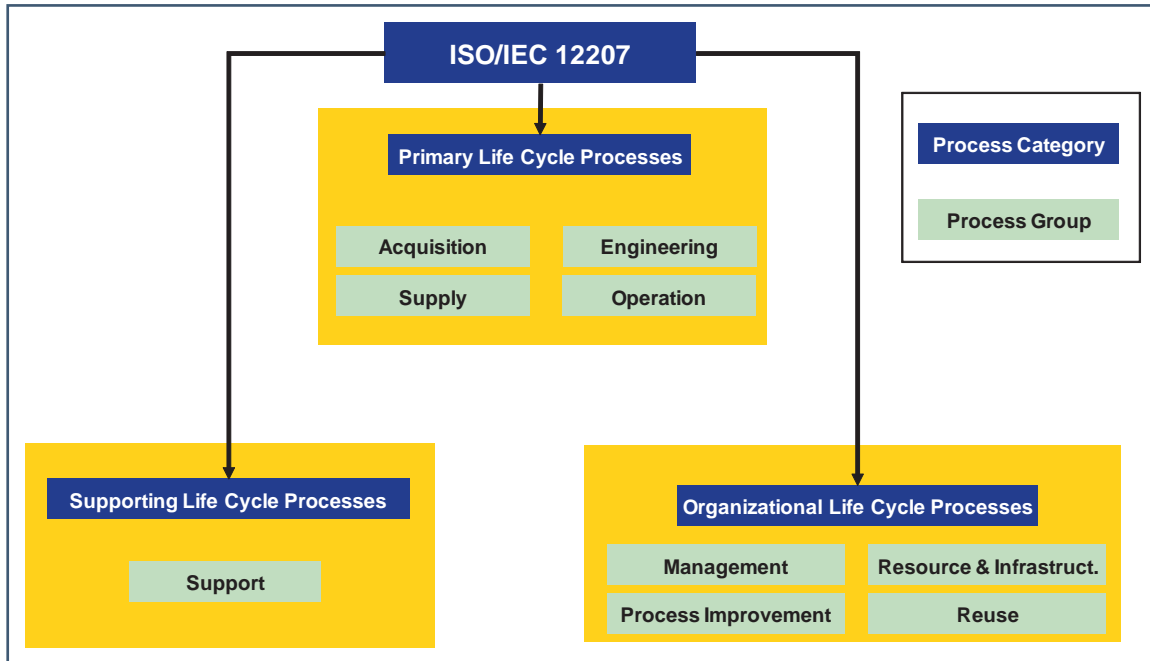


Fig. 3: First we see the overall structure of this model, its process categories and its process groups.

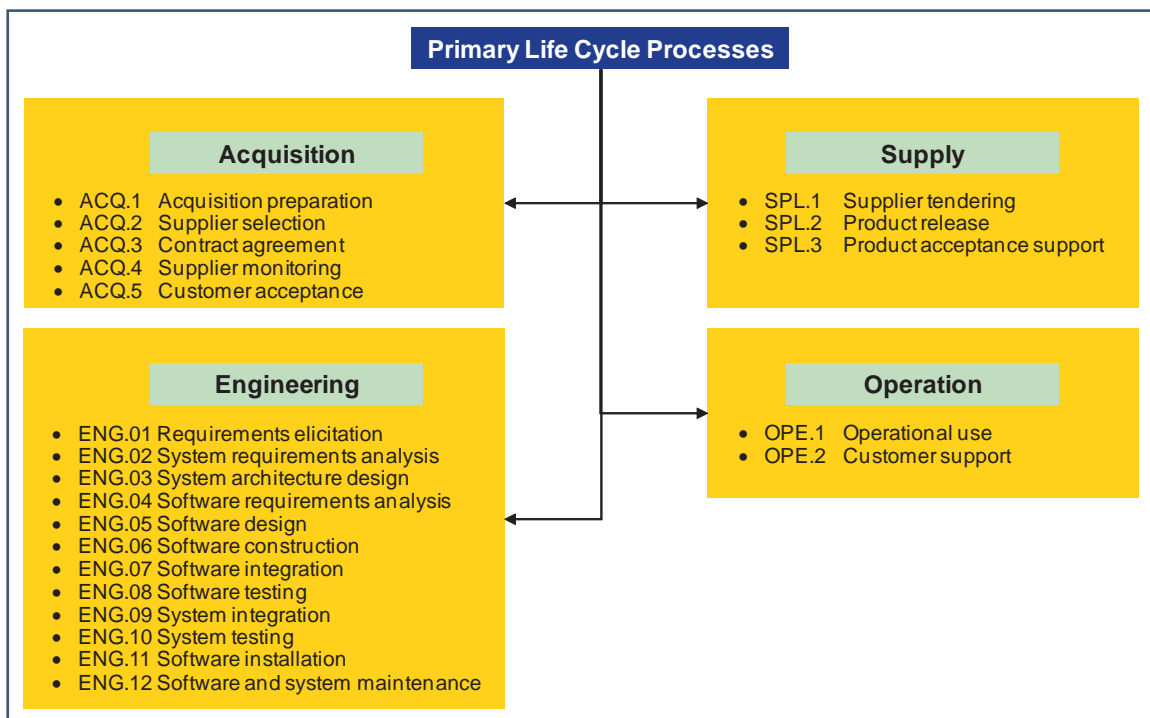


Fig. 4: Next we see the primary life cycle processes of ISO/IEC 15504-5:

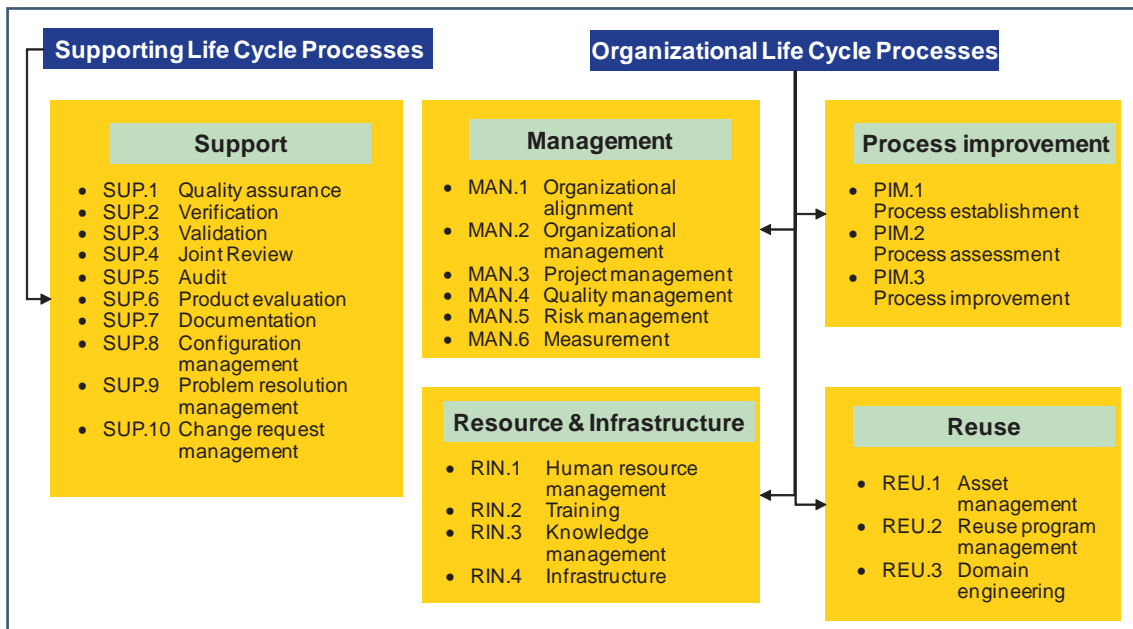


Fig. 5: And finally we see the supporting and organizational life cycle processes:

Looking at the Test SPICE model we see that it has a similar structure to ISO/IEC 15504-5 To transform the original model, four methods were used:

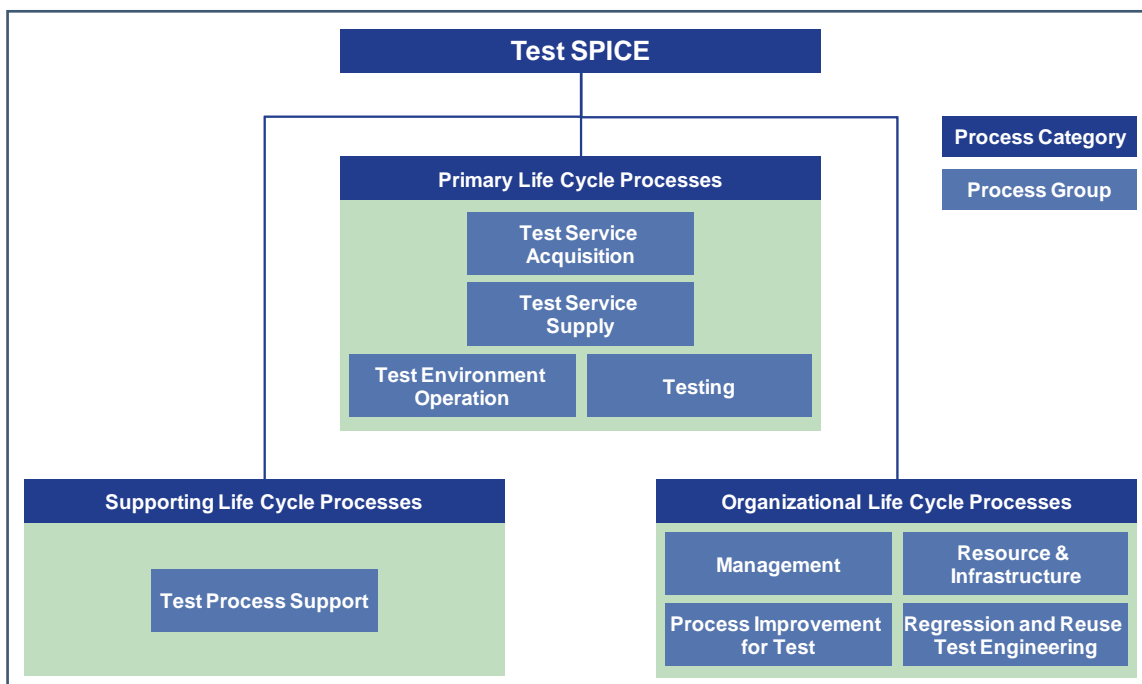


Fig. 6: The overall structure of Test SPICE

- Do nothing: If the content and focus of a process is the same for the testing the process is transferred 1:1 from ISO/IEC 15504 V to Test SPICE. Example: Project Management
- Replace: Where the content and focus of process is changed the process from the original model is replaced by a process reflecting the specific needs for testing. Example: Domain Engineering was replaced by Regression Test Management
- Rename: If the focus of a process or process group is changed to the testing area the name was changed to reflect this. Example: Support was renamed Test Process Support
- Insert: If specific topics for testing are missing they are added by inserting a new process. Example: Test planning

The process categories were used as defined in ISO 15504.5 and not changed.

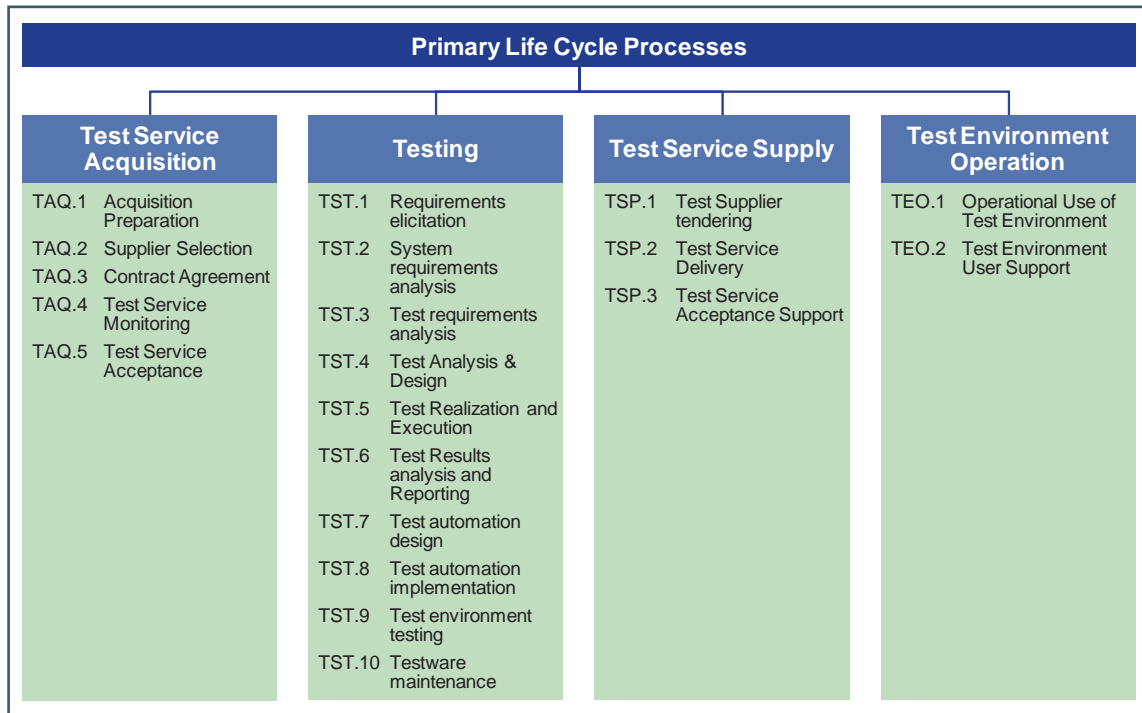


Fig. 7: The primary life cycle processes of Test SPICE

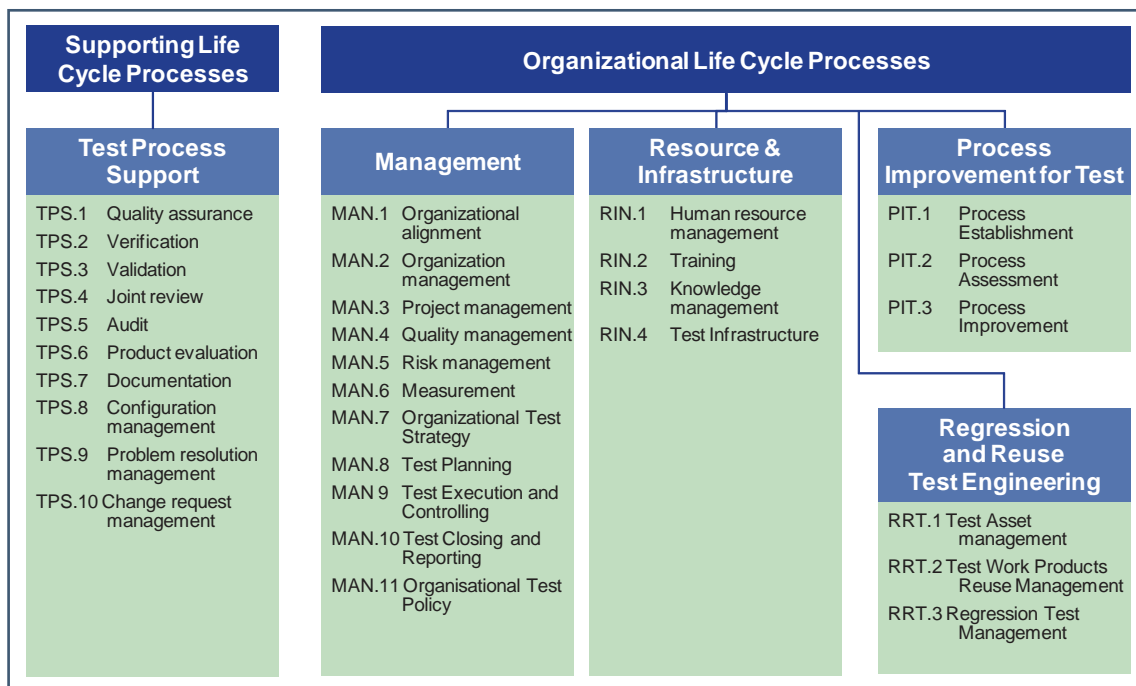


Fig. 8: The supporting and organizational life cycle processes of Test SPICE

The new model at a glance

The following figures show the overall content structure of the model:

This approach delivers some benefits. The structure of content and, based on this, usage is very easy for people experienced in assessments and process engineering based on the standard. The requirements content and indicators can be found and used as already used by the original standard. The second advantage is that Test SPICE is an amendment that focusses on an area of special interest (well suited for test organizations) but it can be easily integrated in a complete approach to stabilize and improve the process capability.

Mapping from ISO/IEC 15504-5 to Test SPICE

The following mappings show the original content of ISO/IEC 15504-5 to Test SPICE:

Mapping by Process Groups

ISO/IEC 15504-5	Test SPICE
Acquisition	Test Service Acquisition
Supply	Test Service Supply
Operation	Test Environment Operation
Engineering	Test
Support	Test Process Support
Management	Management
Resource and Infrastructure	Resource and Infrastructure
Process Improvement	Process Improvement for Test
Reuse	Regression and Reuse Test Engineering

Mapping by Processes for the Acquisition Process Group

ISO/IEC 15504-5: Acquisition	Test SPICE: Test Service Acquisition (TAQ)
Acquisition preparation	TAQ.1 Acquisition Preparation
Supplier selection	TAQ.2 Supplier Selection
Contract agreement	TAQ.3 Contract Agreement
Supplier monitoring	TAQ.4 Test Service Monitoring
Customer acceptance	TAQ.5 Test Service Acceptance

Mapping by Processes for the Supply Process Group

ISO/IEC 15504-5: Supply	Test SPICE: Test Service Supply (TSP)
Supplier tendering	TSP.1 Test Supplier Tendering
Product release	TSP.2 Test Service Delivery
Product acceptance support	TSP.3 Test Service Acceptance Support

Mapping by Process for the Operation Process Group

ISO/IEC 15504-5: Operation	Test SPICE: Test Environment Operation (TEO)
Operational use	TEO.1 Operational Use of Test Environment
Customer support	TEO.2 Test Environment User Support

Mapping by Process for the Engineering Process Group

ISO/IEC 15504-5: Engineering	Test SPICE: Test (TST)
Requirements elicitation	TST.1 Requirements elicitation
System requirements analysis	TST.2 System requirements analysis
System architecture design	TST.3 Test requirements analysis
Software requirements analysis	TST.4 Test analysis and design
Software design	TST.5 Test realization and execution
Software construction	TST.6 Test results analysis and reporting
Software integration	TST.7 Test automation design

ISO/IEC 15504-5: Engineering	Test SPICE: Test (TST)
Software testing	TST.8 Test automation implementation
System integration	TST.9 Test environment testing
System testing	TST.10 Testware maintenance
Software installation	
Software and system maintenance	

As the charts show, this is not a mapping in the sense that you can compare processes 1:1, but it helps you to understand the comparison between software engineering and software testing. Therefore both models use requirements elicitation as a starting point because requirements are crucial for software engineers and for software testers. For the same reason, both models contain a maintenance process.

Mapping by Process for the Management Process Group

ISO/IEC 15504-5: Management	Test SPICE: Management (MAN)
Organizational alignment	MAN.1 Organizational alignment
Organizational management	MAN.2 Organization management
Project management	MAN.3 Project management
Quality management	MAN.4 Quality management
Risk management	MAN.5 Risk management
Measurement	MAN.6 Measurement
	MAN.11 Organizational test strategy
	MAN.12 Test planning
	MAN.13 Test execution and controlling
	MAN.14 Test closing and reporting
	MAN.15 Organisational test policy

The design of this process group reflects that on the one hand there are standard processes in the management area and on the other hand there are specific processes to manage the test in the organization and in the projects. In contrast to ISTQB, Organizational Test Strategy and Organizational Test Policy are taken as processes (ISTQB: Work Products). Behind this more formal reason the design of the process group reflects the typical problems faced by test teams:

- Poor project estimation
- Poor time planning
- Abuse of planned test time as an undeclared time buffer for development activities
- Unrealistic goals
- Blaming the test team for slowing down the project speed.

The design of the process group makes it possible to look at the test management as well as at the project management to see not only the symptom (test is late) but also if the symptom is caused by the test management or by the project management.

Mapping by Processes for the Resource & Infrastructure Process Group

ISO/IEC 15504-5: Resource & Infrastructure	Test SPICE: Resource & Infrastructure (RIN)
Human resource management	RIN.1 Human resource management
Training	RIN.2 Training
Knowledge management	RIN.3 Knowledge management
Infrastructure	RIN.11 Test Infrastructure

In Test SPICE “Infrastructure” was changed to “Test Infrastructure” and was given a new ID to this process to make sure that assessors are looking for the right evidences.

Mapping by Processes for the Reuse Process Group

ISO/IEC 15504-5: Reuse	Test SPICE: Regression and Reuse Test Engineering (RRT)
Asset management	RRT.1 Test Asset Management
Reuse program management	RRT.2 Test Work Products Reuse Management
Domain engineering	RRT.3 Regression Test Management

Mapping by Processes for the Process Improvement Process Group

ISO/IEC 15504-5: Process Improvement	Test SPICE: Process Improvement for Test (PIT)
Process establishment	PIT.1 Process Establishment for Test
Process assessment	PIT.2 Process Assessment for Test
Process improvement	PIT.3 Process Improvement for Test

This group and the processes were renamed to ensure that only evidence relevant to the improvement of the test process is taken into account during an assessment.

Benefits of Test SPICE

Test SPICE is designed for all organizations which currently use a SPICE model that is documented in ISO/IEC 15504 or is currently driven from organizations outside the ISO, such as Automotive, Banking, Enterprise or Medi Spice, as well as for organizations that currently do not use a process assessment model.

Organizations that are already familiar with a SPICE model benefit from the coherent look and feel of the process reference model, the measurement framework and the assessment process. This makes it easy to integrate the assessment of software or system processes. These organizations will save money by using the Test SPICE model to add to their current SPICE assessments the assessment of specific test processes.

Organizations that are not familiar with SPICE or other process assessment models are provided with a complete process assessment model that covers all aspects of test process assessment.

Conclusion

If we consider ISO/IEC 15504 as an open standard for process assessment and improvement especially for the IT industry, then this open standard should also be applied to test processes. The first version of this model shows that this is achievable. As a benefit for the IT industry there is no longer a need to translate the results of proprietary models to the ISO/IEC 15504 measurement framework, thereby saving money for training (one measurement framework fits all), data collection and analysis.



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Biography

Monique Blaschke is a junior consultant at SQS Software Quality Systems AG. After studying she spent two two years with a leading telecommunication company as a technical project manager in different test projects for mobile communications before joining SQS in October 2008. Apart from another test project for a telecommunications distributor, her major project has been participation in the development of the test assessment approach Test SPICE.

Michael Philipp is a senior consultant at SQS Software Quality Systems AG. He has a broad experience of software quality management, software testing and process improvement, having been with SQS since 1998. He is particularly characterized by experience in international projects (testing, improvement, IT life cycle), conducting assessments (ISO 15504) and as a trainer for the SQS training program.

Tomas Schweigert is a principal consultant at SQS Software Quality Systems AG. He has a long experience of software quality management, software testing and process improvement (PI), having been with SQS since 1991. His special interest is the analysis of projects in crisis situations. Tomas Schweigert is now a SPICE principal assessor (INTACS scheme). His current research topics are the SPI Manager qualification and the Test SPICE test assessment approach.