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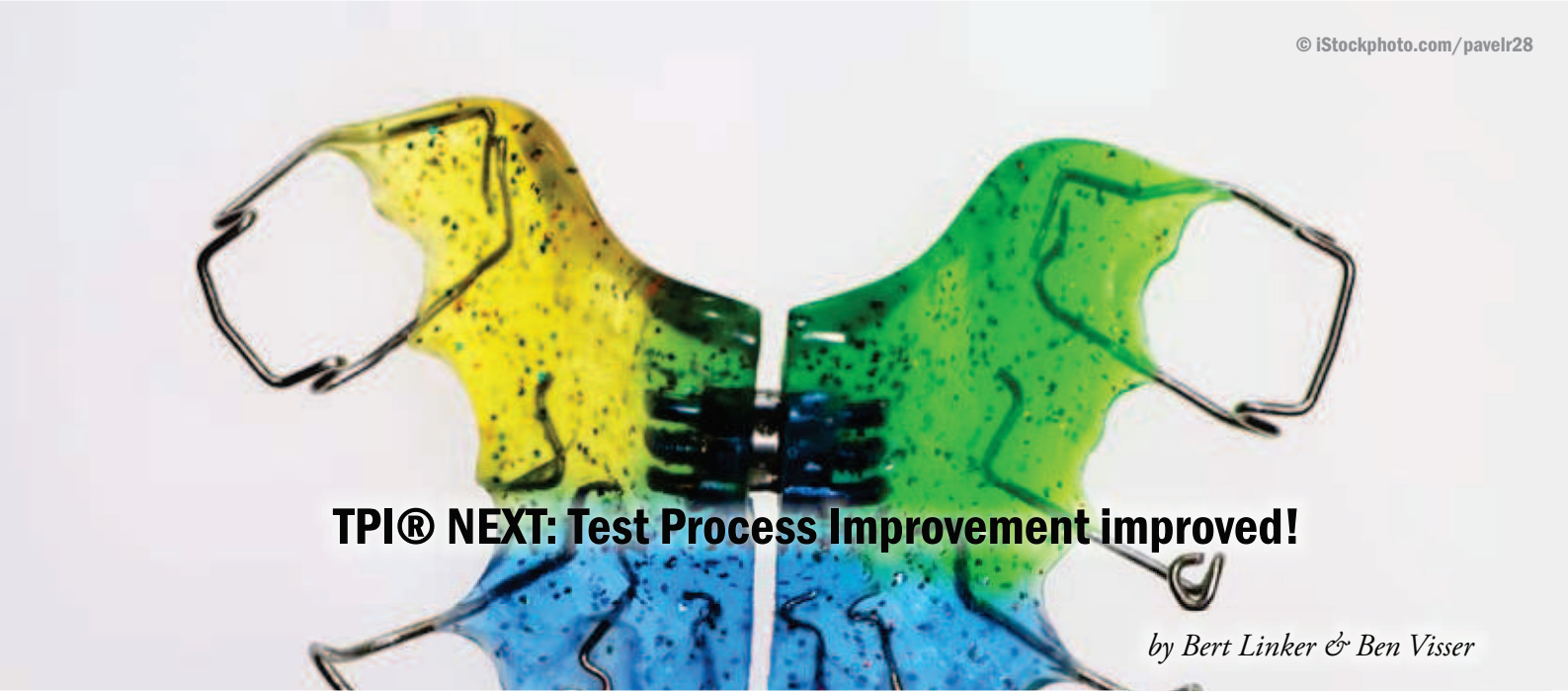


TPI® NEXT: Test Process Improvement improved!

by Bert Linker & Ben Visser

Since its launch in 1998, Sogeti's Test Process Improvement® has offered logical and practical steps to enhance test efficiency and effectiveness, and moreover, to instil a belief in achieving a permanent improvement cycle.

But, as in most things in life, there is always room for improvement. In over a decade of use, our customers, colleagues and Sogeti's own testing consultants have gathered a huge amount of experience and best practices in applying TPI 'in the field'. This experience, coupled with a changing IT environment and technology developments, has been the driver for a completely updated version of the model.

Developed by Sogeti TPI experts from several countries, with support from other colleagues and the active involvement of customers worldwide, the result is TPI® NEXT: Test Process Improvement has itself been improved. It is a powerful next step in the evolution of test process improvement, as it takes as its starting point the close alignment with business drivers, while leveraging the strengths of the original model.

The TPI® NEXT model – an overview

The TPI NEXT model is used to analyze the current situation of a test process, showing its relative strengths and weaknesses; the model also provides a roadmap for reaching specific business, IT or test goals.

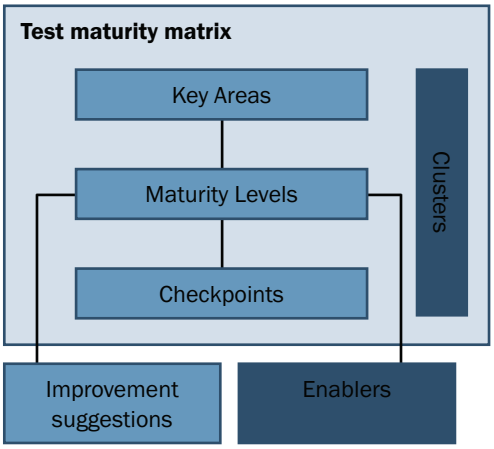


Figure 1. The key elements of the Business Driven TPI model

We kept the strengths

Clarifying the Key Areas

Each test process can be divided into a combination of coherent aspects called Key Areas. Integral to the original model, we have made some changes to the Key Areas - TPI NEXT identifies 16 – and the most important changes are explained here:

- We combined 'Life-cycle model' and 'Test process management', since they showed a great deal of similarity;
- The goal of TPI NEXT is to achieve a certain result from optimizing a test process. The scope of the test process improvement may cover all or any of the evaluation and test activities within the Software Development Life Cycle (SDLC). Because the scope or focus of TPI NEXT cannot be a Key Area as well, the Key Areas 'Evaluation' and 'Low-level testing' have been removed;
- The original Key Area 'Commitment and motivation' addressed two distinct success criteria for any test process. We believed commitment of stakeholders to be so essential for the success of test projects that we created a completely the new Key Area 'Stakeholder commitment'. Motivation has been integrated within the Key Area 'Tester professionalism';
- We found that the position of testing within an organization and the way test resources, products and services are provided for projects have changed. We have addressed these issues as a new separate Key Area 'Test organization'.

In more detail: a retrospective view of the original model

The original TPI® model looked at the test process from different points of view, for example the use of test automation, test specification techniques and reporting. These are called Key Areas. Examination of each Key Area leads to a classification of the test process at certain Levels of Maturity. The ascending levels improve in terms of time (faster), money (cheaper) and/or quality (better). For example, for the Key Area 'Reporting' defined Levels A through to D.

Key Areas and Levels are not equally important for the performance of the complete test process, and dependencies exist between the different Key Areas and Levels. Therefore they are all mutually linked in a Test Maturity Matrix.

To ensure that the classification of Levels is done objectively, Checkpoints (being requirements) are assigned to each Level. If a test process passes all the checkpoints at a certain level, then the process is classified at that level.

In addition to mapping the current situation of the test process, Key Areas and Levels can also be used to define the required situation and intermediate steps to get there. Improvement suggestions provide additional support and guidance to reach a certain level.

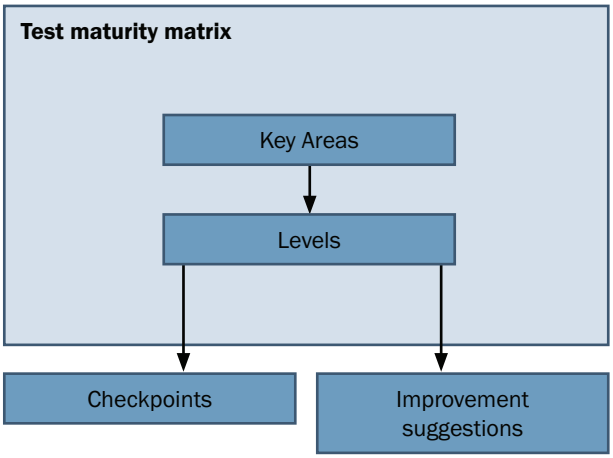


Figure 2. The elements of the original TPI model

Maturity levels have been redefined

As each Key Area can have a different level of maturity, it is the combination of the Key Areas which defines the maturity of the test process as a whole. TPI NEXT has 4 Maturity Levels for each Key Area, characterizing the test maturity:

- Initial: *Ad hoc* activities
- Controlled: Doing the right things
- Efficient: Doing things the right way
- Optimizing: Continuously adapting to ever-changing circumstances.

Compared with the original model, visualizing the maturity of the test process is now much clearer. With the original model, the levels (A to D) could be spread across the levels Controlled, Efficient and Optimizing. In TPI NEXT, all Key Areas comprise the 4 Maturity Levels.

Example: Statements per maturity level for Key Area 'Test process management'

Managing the test process maximizes the execution of the test assignment within the required time, costs and results.

- Controlled: Proactive management of the test process enables the fulfilment of the test assignment
- Efficient: Managing the test process with clear authorizations makes instant adjustments possible, to keep the test project on track
- Optimizing: Lessons learned on test process management advance the effectiveness and efficiency of steering test projects to their required end result.

All Checkpoints have been reassessed

Expectations for each of the Key Areas are defined by Checkpoints for each maturity level (except for the 'Initial' level). A Checkpoint is an objective statement that can be confirmed by a simple 'yes' or 'no'. TPI NEXT contains 157 Checkpoints across the 16 Key Areas and 3 main Maturity Levels.

Example: A Checkpoint for Key Area 'Test process management' at the Controlled level

At the start of the test project, a test plan is created. The test plan includes at least the test assignment, the test scope, the test planning, roles and responsibilities.

Improvement suggestions have been updated

For each Maturity Level per Key Area, we have provided Improvement suggestions, which describe hints and tips for reaching a specific Maturity Level. Checkpoints that have not been met should definitely be looked at to reach the Maturity Level, but while Checkpoints describe what needs to be reached, it is Improvement suggestions that describe how this can be done.

Example: An Improvement suggestion for Key Area 'Test process management' at the Controlled level

Search for appropriate test activities in available test methods in order to break them down over the separate phases.

The Maturity Matrix has been improved

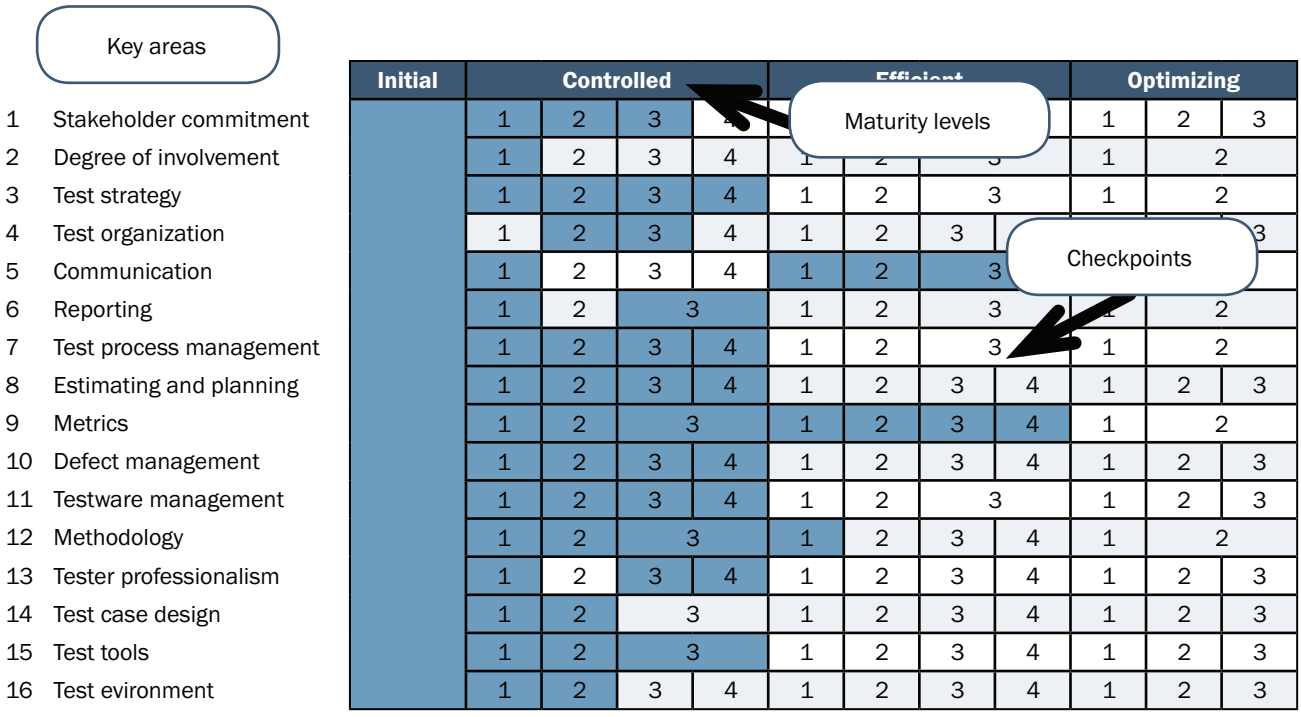


Figure 3. An example of a 'current' situation displayed in the Test Maturity Matrix

The Test Maturity Matrix provides a clear overview of all Key Areas, together with their respective maturities. The Matrix lists all 16 Key Areas in the horizontal rows, and the Maturity Levels (Initial, Controlled, Efficient and Optimizing) in the columns. The Checkpoints for each Key Area are displayed in order. Figure 3 shows that the Checkpoints in the matrix are not visualized to a standard 'width'. Please note that this does not indicate relative complexity or 'size' of that Checkpoint.

We added new features

- Enablers

Our testing experience has led us to realize more than ever that a test process cannot be seen as a stand-alone process, but is very closely related to other processes within the SDLC. In TPI NEXT we have introduced Enablers, which show where the test process and other processes within the software development life cycle can benefit from their respective best practices. An Enabler can both strengthen and accelerate the improvement process for testing and also stimulate the other SDLC processes to adopt similar measures to improve their maturity.

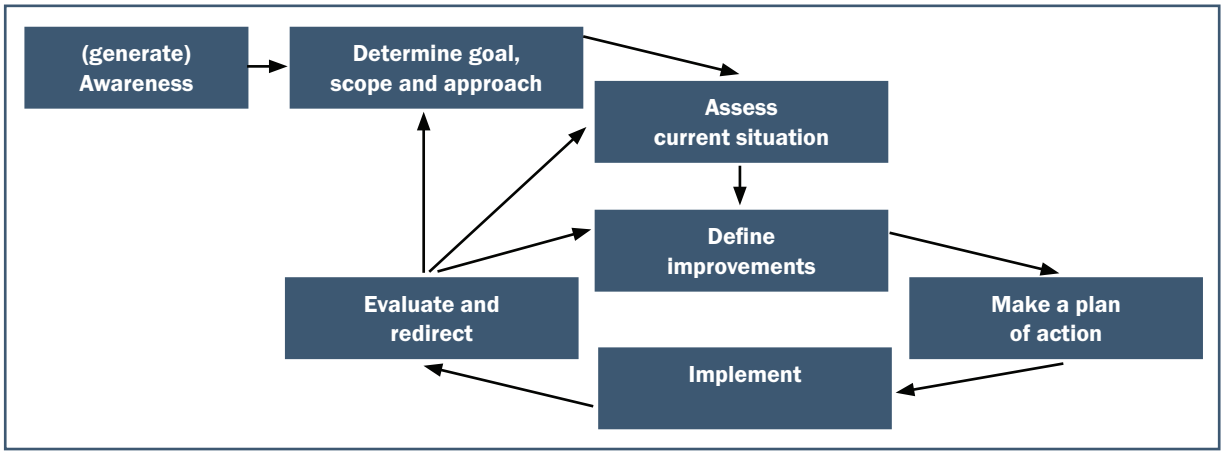
- Clusters

One of the strong points of the original model was the possibility of step-by-step improvement; the steps consisted of reaching a Maturity Level for specific Key Areas. The new TPI NEXT model also enables a stepwise improvement, from Initial, Controlled or Efficient levels through to fully Optimizing. However, the main difference is that now each step is indicated by Clusters of Checkpoints. We defined a Cluster as a group of Checkpoints from multiple Key Areas that may contain mutual relationships and that function as one improvement step.

TPI NEXT can be both process-driven and business-driven

To achieve a higher level of test process maturity, it is obviously necessary to implement improvement measures that not only depend on understanding the current state of maturity, but also on the improvement goals to be reached. To support the improvement process, the business-driven TPI model provides a step-by-step approach, in which each step is described in a Cluster as described above. The composition of the Clusters can vary according to the range of improvement goals.

Depending on which specific business driver is selected (or in some situations, which improvement drivers from within the test process itself), the Key Areas will be rearranged into different categories of priority. This will result in different improvement measures and activities.



Process-driven TPI NEXT: improving the full breadth of testing

For straightforward improvement, we have created a base clustering, illustrated in Figure 4. The improvement of the test process is regarded as a general improvement process, in which no one single business driver is predominant. To try and reach the Controlled level in one step would be, in our experience, usually a leap too far!

What is more, to make any improvement process successful, you need to celebrate successes on a regular basis. Although there's no one way to accomplish this, some ways are better than others, and we provide proven suggestions to help. It all starts with applying some generally acknowledged best test practices: think before you start, involve the appropriate people in this thinking, and monitor the actions agreed. Checkpoints addressing these first basic best practices together make up Cluster A.

Next, pay more and more attention to the details involved in managing the test process and the actual test activities. The Checkpoints for this next step are grouped together in Cluster B. Clusters C, D and E rep-

		Initial	Controlled				Efficient				Optimizing			
1	Stakeholder commitment		A	B	B	C	F	H	H		K	M	M	
2	Degree of involvement		A	B	C	E	H	H	J		L	L		
3	Test strategy		A	A	B	E	F	F	H		K	L		
4	Test organization		A	D	D	E	I	I	J	J	K	L	L	
5	Communication		B	C	C	D	F	F	J		M	M		
6	Reporting		A	C	C		F	G	G		K	K		
7	Test process management		A	A	B	B	G	H	J		K	M		
8	Estimating and planning		B	B	C	C	G	H	I	I	K	L	L	
9	Metrics		C	C	D		G	H	H	I	K	K		
10	Defect management		A	A	B	D	F	F	H	J	K	L	L	
11	Testware management		B	B	D	E	I	I	J		L	L	L	
12	Methodology		C	D	E		F	H	J	J	M	M		
13	Tester professionalism		D	D	E	E	G	G	I	I	K	K	M	
14	Test case design		A	A	E		F	I	I	J	K	K	M	
15	Test tools		E	E	E		F	G	G	I	L	M	M	
16	Test evironment		C	D	D	E	G	H	J	J	L	M	M	

Figure 4. The view of base Clusters in the Test Maturity Matrix (with Cluster A highlighted)

resent further consecutive steps, until you can truly say: "We're doing the right things" – i.e. the test process can be categorized as Controlled. Likewise, moving from Controlled to Efficient Maturity Levels, and from Efficient to Optimizing, can be achieved through relatively small steps, as shown in Figure 4.

In more detail: backward compatibility

Over the past decade, many organizations have used the original TPI model. Although the business-driven TPI model is different in some aspects, it is still possible to use the results of former (original) TPI assessments and improvement processes together with the new business-driven TPI.
If the base information from an original TPI assessment is still available, you can use this data to produce a new business-driven TPI matrix. Even if only the original TPI Maturity matrix is available, you can use a conversion table that translates the value of original TPI Checkpoints to the value of the new associated business-driven TPI Checkpoints. A tool to enable this conversion is provided through the TPI NEXT website (www.tpinext.com).

Business-driven TPI NEXT: improvement with a specific goal in mind

Not all test improvement initiatives are directed at achieving better test processes in general. Probably most address a specific business or IT objective. To accomplish such a specific goal, following the base clustering might not be the best way to proceed. In this situation, some Checkpoints can be safely put on hold, while others are best realized at an earlier stage. In other words, the content of the Clusters should be adjusted to reflect the specific needs of the desired improvement.

To create Clusters for a specific business driver, a 6-step approach is provided. The first task is to define which Key Areas are most relevant to the required business driver focus (e.g. cost, time, quality as business drivers). You then need to determine how this influences the distribution of the Checkpoints across the Clusters. The 6 steps are described below:

1. Identify the business driver

An important part of this step is to describe how to measure progress against the driver. If the business driver is well formulated, it can serve as the basis for reporting. It can also prevent future disappointments, since discussions on how to measure often reveal implicit expectations by the business.

In more detail: Business drivers

A business driver is a management directive, usually directly derived from the organization's vision and/or business strategy, which wants specific outcomes of the organization at an operational level. A business driver is a reason, motivator or challenge for test process improvement, commonly indicated as (a combination of) cost, time, quality and risk.

2. Translate the business driver into an IT goal

This is especially helpful since test process improvement is not always initiated within a business department. Often the IT department recognizes the need for improvement and acts accordingly. This step makes it possible to engage in a business-driven TPI NEXT program initiated by the IT department.

3. Identify the most (and least) important Key Areas for the IT goal

It is important that although some general considerations are valid, industry and even company-specific circumstances play a highly decisive part in establishing the relative importance and prioritization of Key Areas.

4. Shift Checkpoints to an adjacent Cluster in line with the Key Area's importance

Checkpoints of Key Areas considered to be the most important are shifted to 'earlier' Clusters (Checkpoints in Cluster M move 'back' to L, L moves to K, etc.). Checkpoints of Key Areas considered to be least important are shifted to 'later' Clusters (Checkpoints in Cluster A to B, B to C, etc.).

5. Take into account the dependencies between Checkpoints

The base clustering constitutes a logical and coherent way to gradually fulfil Checkpoints and to reach a certain Maturity Level. By shifting Checkpoints to other Clusters, some of this logic might become invalidated or compromized.

For example, the first Checkpoints at the Controlled level of Key Area 'Stakeholder commitment' ("The principal stakeholder is defined") and 'Test strategy' ("The principal stakeholder agrees with the documented Test strategy") are both part of Cluster A (see Figure 4). Obviously, Checkpoint "The principal stakeholder is defined" must always be in the same Cluster or an earlier one than "The principal stakeholder agrees with the documented Test strategy".

6. Balance the Clusters

The primary goal of Clusters is to provide convenient, well-organized sets of coherent Checkpoints. If, after re-arranging the Checkpoints, Clusters become too big, too small or in any way unbalanced, feel free to improve the Cluster arrangement by moving a limited number of Checkpoints.

In more detail: TPI NEXT adjusted to a specific environment

The same principle can be followed to create Clusters that are attuned to specific IT environments and situations, such as Agile development methods, software maintenance, development testing and organizations with multiple test processes.

TPI NEXT can also be used to cut test costs

Not unsurprisingly, we have found that a common business driver is to "Provide a good return on (IT-enabled) business investments". This business driver translates into the IT goal "Improve IT's cost efficiency", which for testing means "Reduce the cost of testing". Our example below describes how to adjust the cluster arrangement to accommodate this driver.

The essential 5 Key Areas for cost-cutting

We believe that the following 5 Key Areas are the most effective in reducing the costs of the test process and therefore these have increased priority:

- **Test strategy**; establishing a test strategy, based on a product risk analysis, helps the principal stakeholder to decide which test items have the highest priority and the required test coverage. Rather than testing everything equally thoroughly, the test depth can be reduced for identified system parts and quality characteristics that have a relatively low product risk.
- **Test tools**; the use of test tools can significantly reduce the costs of testing. Automated test execution is much cheaper than manual test execution, but the use of specialist test tools facilitates more efficient test, defect and testware management (configuration management). Without specific tools, this is hard to accomplish, especially in larger development and test teams.
- **Defect management**; proper defect management contributes to solving defects as efficiently as possible, especially if developers too have sufficient access to the same tools as testers. More advanced defect management employs measures to avoid defects, for example in root cause analysis.
- **Test organization**; many organizations rationalize their business activities by concentrating on projects that will generate profits immediately, while keeping the line organization (viewed as a cost centre) at a minimum. However, projects are constrained if they cannot take advantage of economies of scale. Significant cost sav-

ings can be realized by acquiring and maintaining scarce resources, like skilled test specialists, test environments, and test tools within the line organization, and then providing them as a service to other projects as required.

- **Degree of involvement**; many problems in the development process manifest themselves in the test process; typically project costs at the testing phase appear to run out of control. By involving testing earlier in the development process and allowing testing to influence the development project, many of these problems can be avoided. Sufficient involvement early in the project also results in defects being found sooner, resulting in lower fixed costs and less uncertainty about project rework.

Conversely, the following 4 Key Areas are usually considered to be least effective in contributing to test cost reduction:

- Reporting; while reporting is important for monitoring costs and managing the test process in a cost-effective way, basic reporting will suffice. Improving reporting in itself does not contribute to saving test costs.
- Metrics; as with reporting, basic metrics are necessary to provide support for saving costs. But while more intense use of metrics provides more detailed control of test process management, it does not contribute to cost reduction itself.
- Stakeholder commitment; testing certainly benefits from strong stakeholder commitment in many ways, but saving costs for testing is not really one of them.
- Test environment; the management of test environments and test data can cost a lot of money and often there is a strong desire to reduce these costs. In this case, effort should be spent on improving test environment management.

Impact of prioritizing Key Areas on the Clusters

Figure 5 below provides a visual presentation of the Clusters. The Key Areas have been prioritized into High, Neutal and Low (H, N & L).

		H	N	L	Initial	Controlled				Efficient				Optimizing		
1	Stakeholder commitment			x		B	C	C	D	G	I	I		L	M	M
2	Degree of involvement	x				A	A	B	D	G	G	I		K	K	
3	Test strategy	x				A	A	A	D	E	E	G		J	K	
4	Test organization	x				A	C	C	D	H	H	I	I	J	K	K
5	Communication		x			B	C	C	D	F	F	J		M	M	
6	Reporting			x		B	D	D		G	H	H		L	L	
7	Test process management		x			A	A	B	B	G	H	J		K	M	
8	Estimating and planning		x			B	B	C	C	G	H	I	I	K	L	L
9	Metrics			x		D	D	E		H	I	I	J	L	L	
10	Defect management	x				A	A	A	C	E	E	G	I	J	K	K
11	Testware management		x			B	B	D	E	I	I	J		L	L	L
12	Methodology		x			C	D	E		F	H	J	J	M	M	
13	Tester professionalism		x			D	D	E	E	G	G	I	I	K	K	M
14	Test case design		x			A	A	E		F	I	I	J	K	K	M
15	Test tools	x				D	D	D		E	F	F	H	K	L	L
16	Test evironment			x		D	E	E	F	H	I	K	K	M	M	M

Figure 5. Categorized Key Areas for 'Test cost reduction' as the business driver

After re-arranging the Checkpoints, the Key Area 'Stakeholder commitment' has no more Checkpoints in Cluster A. Two dependencies have now been compromized: '1.C.1' cannot be part of a Cluster later than '3.C.1', so '1.C.1' moves from Cluster B back to Cluster A, and '1.E.1' cannot be part of a Cluster later than '3.E.1' and so moves back from Cluster G to Cluster E.

The Cluster arrangement for Test cost reduction has now changed and is represented in Figure 6:

		H	N	L	Initial	Controlled				Efficient				Optimizing		
1	Stakeholder commitment			x		A	C	C	D	E	I	I		L	M	M
2	Degree of involvement	x				A	A	B	D	G	G	I		K	K	
3	Test strategy	x				A	A	A	D	E	E	G		J	K	
4	Test organization	x				A	C	C	D	H	H	I	I	J	K	K
5	Communication		x			B	C	C	D	F	F	J		M	M	
6	Reporting			x		B	D	D		G	H	H		L	L	
7	Test process management		x			A	A	B	B	G	H	J		K	M	
8	Estimating and planning		x			B	B	C	C	G	H	I	I	K	L	L
9	Metrics			x		D	D	E		H	I	I	J	L	L	
10	Defect management	x				A	A	A	C	E	E	G	I	J	K	K
11	Testware management		x			B	B	D	E	I	I	J		L	L	L
12	Methodology		x			C	D	E		F	H	J	J	M	M	
13	Tester professionalism		x			D	D	E	E	G	G	I	I	K	K	M
14	Test case design		x			A	A	E		F	I	I	J	K	K	M
15	Test tools	x				D	D	D		E	F	F	H	K	L	L
16	Test evironment			x		D	E	E	F	H	I	K	K	M	M	M

Figure 6. Final Cluster re-arrangement for the business driver 'Test cost reduction'

In this revised situation, Cluster A contains 14 Checkpoints, Cluster B has 9 Checkpoints, etc. Other Clusters have Checkpoints from different levels of maturity: For example, Cluster E has 8 from the Controlled level and 6 from the Efficient level. This is caused by the fact that a further step in improvement (in our cost-driven example, reducing the cost of the test process) may also require Checkpoints from other levels of maturity.

Cluster D contains many Checkpoints, as do Clusters I and K; Cluster F on the other hand contains just a few Checkpoints. Depending on the specific situation in the assessed organization or project, you should consider shifting Checkpoints so that the number of Checkpoints per Cluster is more evenly spread.

Conclusion

Business dynamics and drivers change over time and from entity to entity, but TPI NEXT is highly flexible and adaptable, and can work independently or in sync with other test methodologies, including of course Sogeti's own TMap.

By putting the business drivers at the heart of the new model, we have seen very clear benefits; a clear improvement path understood and endorsed by the business, optimization of test processes in line with the most important business drivers, and a better understanding of the correlation between testing and adjacent software development processes. We believe that our enhancements make TPI®NEXT an indispensable step-by-step guide to improving your organization's testing processes.

More information on TPI NEXT can be found at www.tpinext.com. Copies of TPI®NEXT are now available from specialist publisher UTN at www.utn.nl or contact Sogeti at tpi@sogeti.nl.

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Biography

Bert Linker has over 12 years testing experience, in the Netherlands and other countries, as test consultant, test manager and senior trainer of test topics and methodologies. He has gained his knowledge and experience from numerous test assignments in both traditional as well as RUP environments. He is one of the initiators and co-authors of Sogeti's latest publication TPI® NEXT.

Ben Visser is a highly experienced test manager and test consultant. In a career of over 15 years as a tester, he has fulfilled a wide range of test functions, from programmer of automated scripts, to test manager of a large international program. He has worked in traditional waterfall development as a change manager responsible for test and acceptance environments, as well as model-based testing. Based on this extensive experience, he co-authored Sogeti's TMap NEXT® Business Driven Test Management (Nov 08) and more recently TPI® NEXT.