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... What Matters Most

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Transparent Testing = Insight in Testing

Patrick Duisters
Improve Quality Services BV
Laan van Diepenvoorde,
Netherlands.

Patrick Duisters has worked with in quality and testing in the ICT industry for over 10 years. Patrick has extensive experience in software testing of both administrative and technical systems. He now works as a test consultant, test architect and test process auditor at Improve Quality Services.

In these complex systems the functionality as well as the integrated behavior must be verified and validated. Especially during an escalating incident humans have to take important decisions under stress conditions. Typically under these conditions humans make errors and panic could occur which makes the situation even harder to manage. That's why reliable and trouble-free systems are needed. More in general during the many projects in my experience typical deliverables of a test project were created. Test plans, test specifications and test reports are often available. But are these documents aligned and do they give the expected information, or are they made because they should be made 'by the book'?

The basic picture

The fundament for a structured and substantiated test process consists of the following 3 steps depicted in figure 1.

It is all about risk. Risks caused by of failures of the (software) system. Risk can be e.g. the financial consequences of repair, reputational damage or even worse: harm. The first important step therefore is the identification and analysis of the risk. This can be done by performing a Product Risk Analysis (PRA).

Risk can be mitigated by testing, showing that failures will not occur. The test approach should be derived from the results of this PRA and serves as the basis for the test approach.

In succession the deployment of the test approach will have consequences for the required effort and resources needed and thus also for the required budget. At the end it is a business decision how much they want to spend to mitigate the risk (e.g. by more or less testing) or accept the future consequences such as costs of failures.

When a substantial budget is spend on testing the business wants to have insight in the testing process spending their money, so a transparent test process is preferred.

In more detail…

Figure 1: The basic picture: 3 steps

Let's zoom in to see what may be expected from a transparent test process. It will be described based on figure 2.

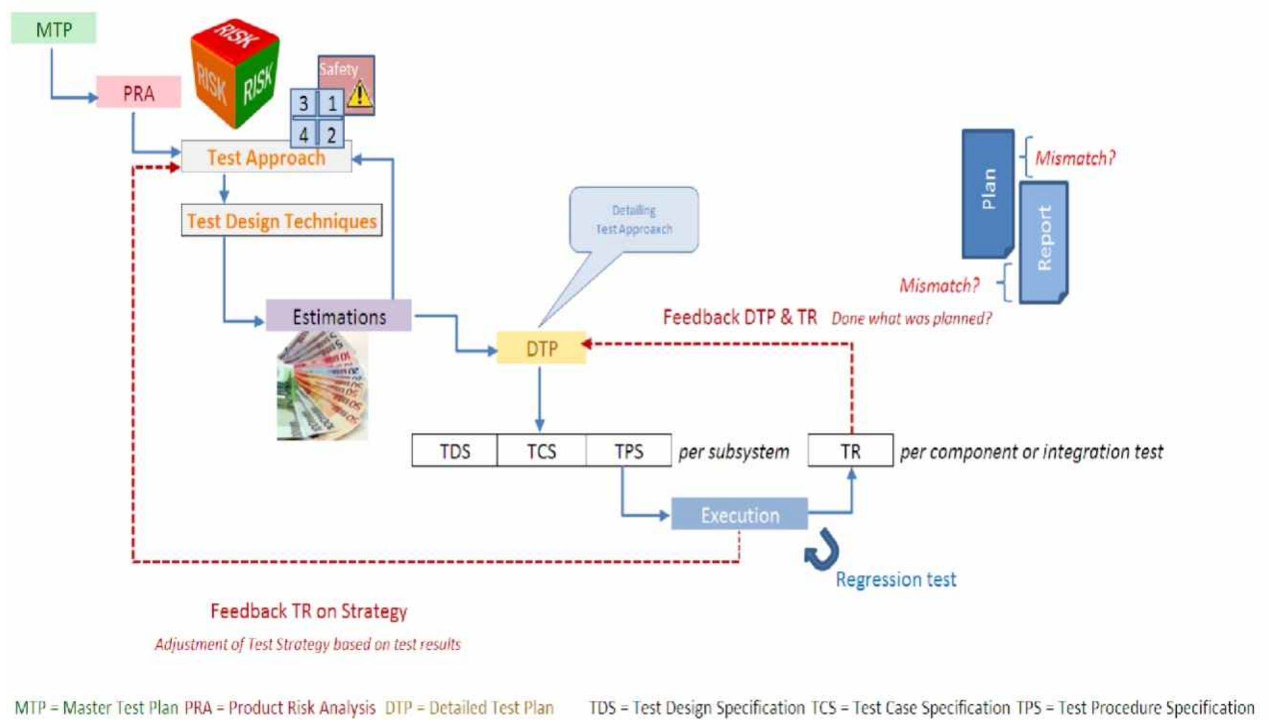

Figure 2: Transparent Test Process in more detail

Master Test Plan

As already stated most projects do create a Master Test Plan (MTP), or even sub system- or level test plans. But these plans typically try to cover everything and most often are not based on a test strategy. Even less projects have a test approach based on a PRA. As testing everything is impossible one has to make decisions on what, how and when to test. The PRA is a good basis for these decisions and the deployment should be described in the (master) test plan.

Product Risk Analysis

Based on experiences the PRISMA® methodology serves as good basis for executing the PRA. During the PRSIMA® process test items are identified as well as factors influencing the likelihood and impact of (software) system failures. Stakeholders with different viewpoints are involved in scoring the test items with regard to the likelihood and impact factors to quantify the risks. When all scores are gathered and the differences are discussed and agreed upon, the PRA results in a Risk Matrix with 4 quadrants as depicted in figure 3. When safety risks arise an extra 'safety quadrant'' can be applicable. It's obvious that test items related to safety, or with a high likelihood and high impact (quadrant 1), have to be tested thoroughly and with the highest priority. Test items with a low likelihood and low impact (quadrant 4) can be tested less thorough with a lower priority or even might be skipped. In figure 3 a risk matrix is shown including an example of commonly suitable test design techniques. Suitability of these test design techniques is also depending on the environment (see also Test Approach).

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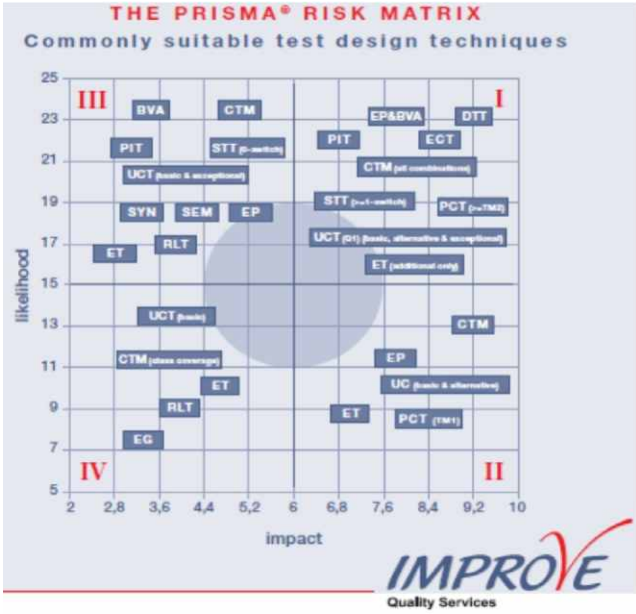

Figure 3: Product Risk Matrix with commonly suitable test design techniques

Test Approach

Based on the Risk Matrix a test approach should be derived to mitigate risk. Suitable test design techniques can be selected from the wide range of available test design techniques and depending on their characteristics. Many projects find this very difficult because there is not 'one size fits all' distribution of test design techniques over the matrix. Techniques might be complementary to each other or aim at different kinds of defects. That is one of the reasons why test training is important. During test training test design techniques are explained, practiced, and their characteristics are discussed, for example during ISTQB courses.

Another difficulty is that test design techniques are dependent on the (system) environment. State Transition Testing for example is likely to be applied on state machines, often used in technical systems, where Process Cycle Testing is likely to be applied to work flow management systems in administrative environments.

Test Design Techniques

When the suitable test design techniques have been selected more details are known and thus more reliable estimates can be made. Of course these estimates may not fit into the available time or budget. Now management can decide whether more risk is acceptable and as a result less testing is performed. These decisions are now based on product risk and not on coincidence. The test approach may then be adjusted alongside the estimations and the expectations on what is tested.

When the estimations are agreed upon a detailed test plan can be made, e.g. for a test type or a test level. In this test plan the overall test approach should be applied and where applicable the test approach should be further detailed.

Test Design & Test Specifications

Many organizations and projects create test specifications. Often these test specifications are combined Test Case Specifications (TCS) and Test Procedure Specifications (TPS). Quite often the deployment of the test design techniques is missing!

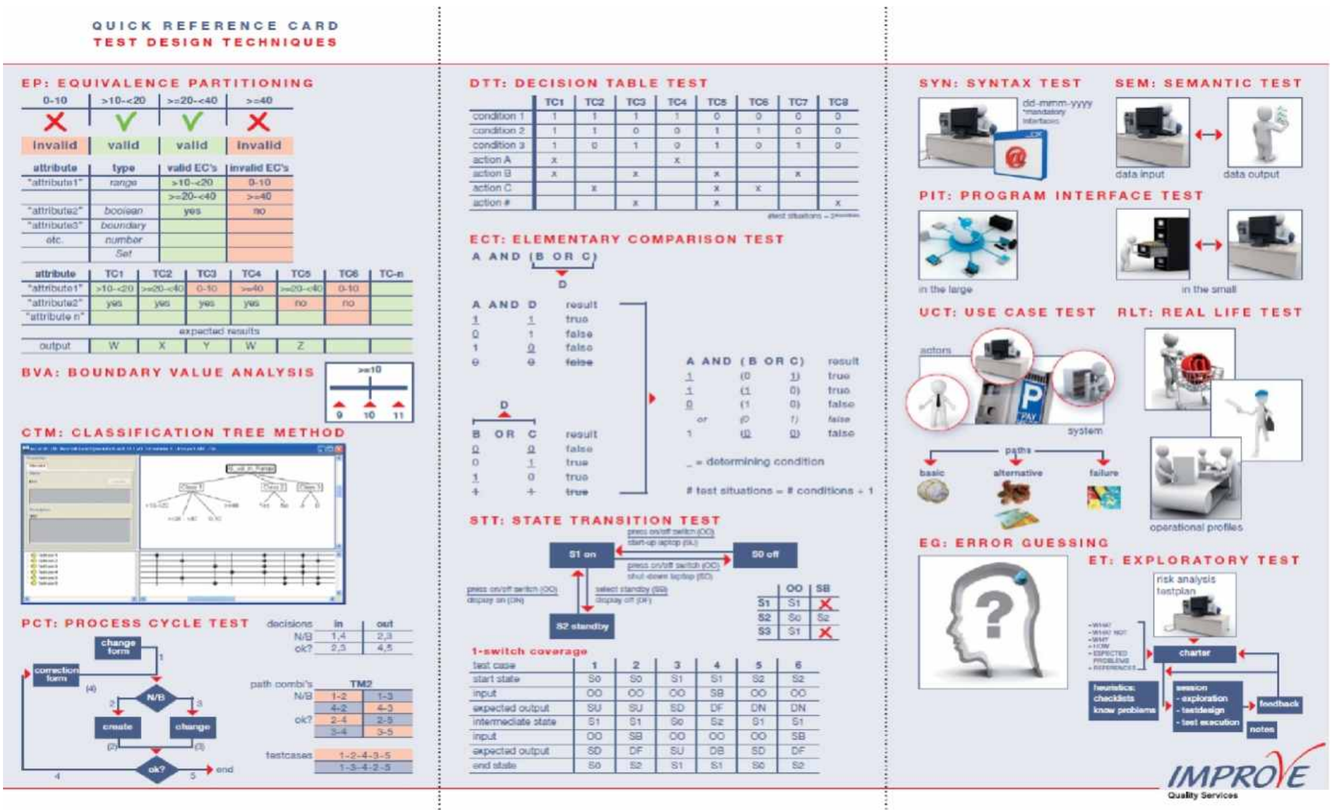

Figure 4: Example Quick Reference Card Test Design Techniques

Test Design Specifications (TDS) are not created. Test cases are derived without test design, but based on intuition or as we say in the Netherlands: using our "farmer's common sense". Usually this is quite a good basis but as we need traceability or proof e.g. for later maintenance or for regulatory bodies it is not sufficient. The combination of test design techniques plus intuition is stronger. A test design techniques Quick Reference Card may be very useful to support deployment of test design techniques. Such a quick reference card as in figure 4 depicts the expected appearances of test design techniques and also supports common understanding of applied test design techniques.

Test Report

Tests should of course be executed based on the test procedure specifications and according to test plan and planning with respect to priorities which can also be derived from the PRA and the test approach. And of course results should be captured in a test report (TR). As testing is now performed for risk mitigation test reporting can and should also be risk based. When the test cases belonging to a test item are executed and the results are known one has insight in mitigated and residual risk.

This provides more information then numbers of test cases, and is a very good basis for the business to decide to go live or not. Based on the test execution there are two interesting feedback loops in this process:

- Test report vs. test plan,
- Test execution vs. test approach.

Let's look at these feedback loops in more detail.

Feedback Loops

When a project is large and the time between test plan and test report is long there might be shift in focus our attention. It happens that the items mentioned in the test plan are not reported in the final test report. Somehow one or more test items got lost underway!

It's easy to check if all test items identified in the MTP or DTP are also reported in the test report or, when missing, at least a good rationale is available in the test report.

During test execution it is likely that defects are found. If there are major defects in areas where, according to the PRA, only minor defects are expected it is highly recommended to re-evaluate the test approach. Maybe a more thorough test approach is now more suitable for this test item. A shift in risk quadrants or applied test design techniques should be considered and recorded.

TMMi, TPI, cGMP and others…

What about the models? Of course depending on the project environments, the applicable standards or regulations there are specific models or regulatory requirements applicable for the test process.

But after many projects and audits of different kinds, the picture above shows the core process that fits TMap Next® and TPI, ISTQB, and TMMi. It even is a good basis for the 'current Good Manufacturing Practice' as required by regulatory bodies like FDA.

Conclusion

Organizations, environments and projects differ. But when the elements described above are deployed and proof of that can be shown, an auditor can get insight and confidence about a well founded and solid test process.

Risks, test approach, execution, reporting and residual risks get transparent. It provides a good basis for management to make decisions on when to stop testing and what risks remain at moment of release.

PRISMA® and ISTQB provide good support in determining the test approach and applying test design techniques.

Finally, it is expected that the influence of regulatory bodies and their need in insight will increase over time. Not only in tunnels or in the medical domain but also in other domains. This core process may therefore become more and more valuable to you and others as well. Because of that the lessons learned are shared in this article!