

expoQA[®]26

MADRID 26th, 27th & 28th May

Lessons Learnt in Testing Safety Critical Systems



expoqa.eu

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About me (in a meaningful way?)

1. “human aspects of testing” vs. “technical aspects of testing”



2. “testing assures quality” vs. “build-in quality”



3. “AI will take our jobs” vs. “AI is just a tool”



My Definition of Testing

Testing for me, is the generic activity that allows the tester to discover information about a certain situation / product / project etc. with the aim to support the decision-making process.



The Aim for Today

- Get a glimpse how testing works in the railway industry (signaling)
- Share some lessons learnt from the past 15 years



The Railway Industry

Complex

Regulated

Long life cycle

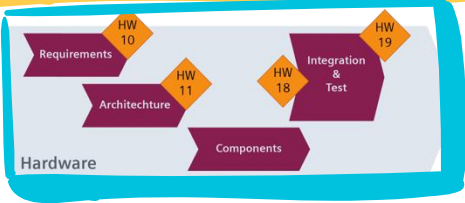
Safety-relevant

Customer



The Norms and Processes

- How to organize the activities
- What documents to create
- What test methods to use



The Systems (Interlocking)



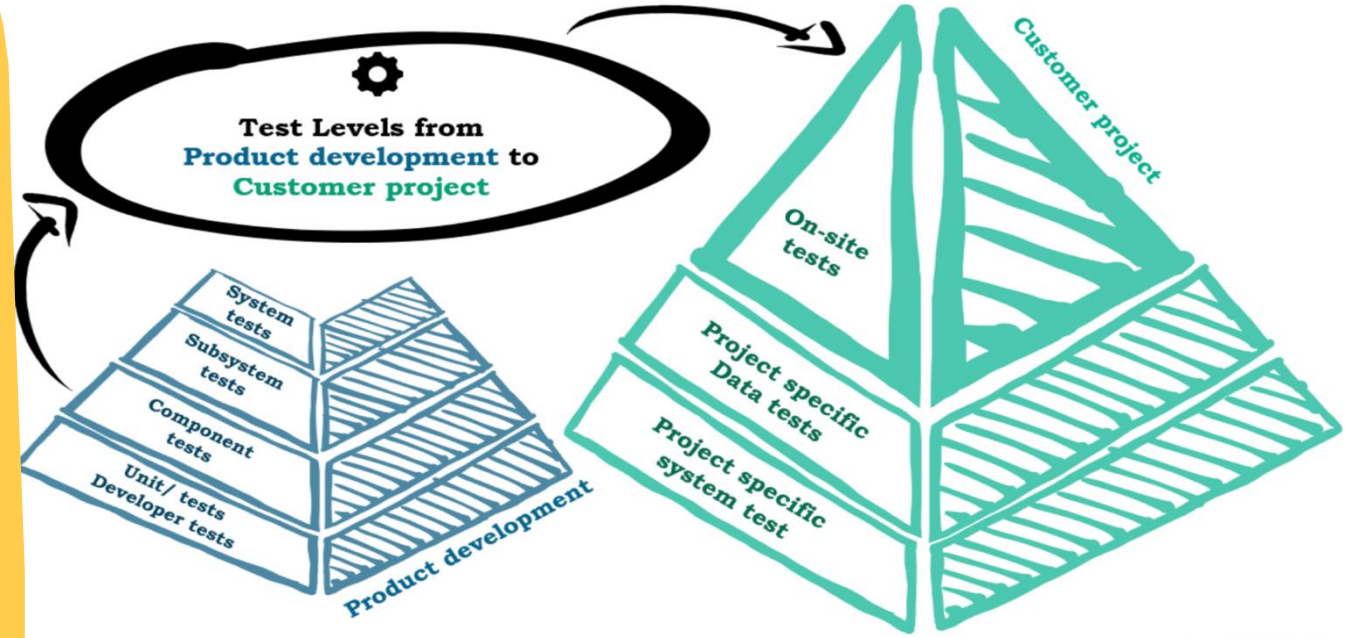
The Systems (Operation and Control)



The Systems (Train Control)



The Testing



1st Lesson – The Problem

- Good, experienced team
- Fast feedback loops
- Exploratory based approach

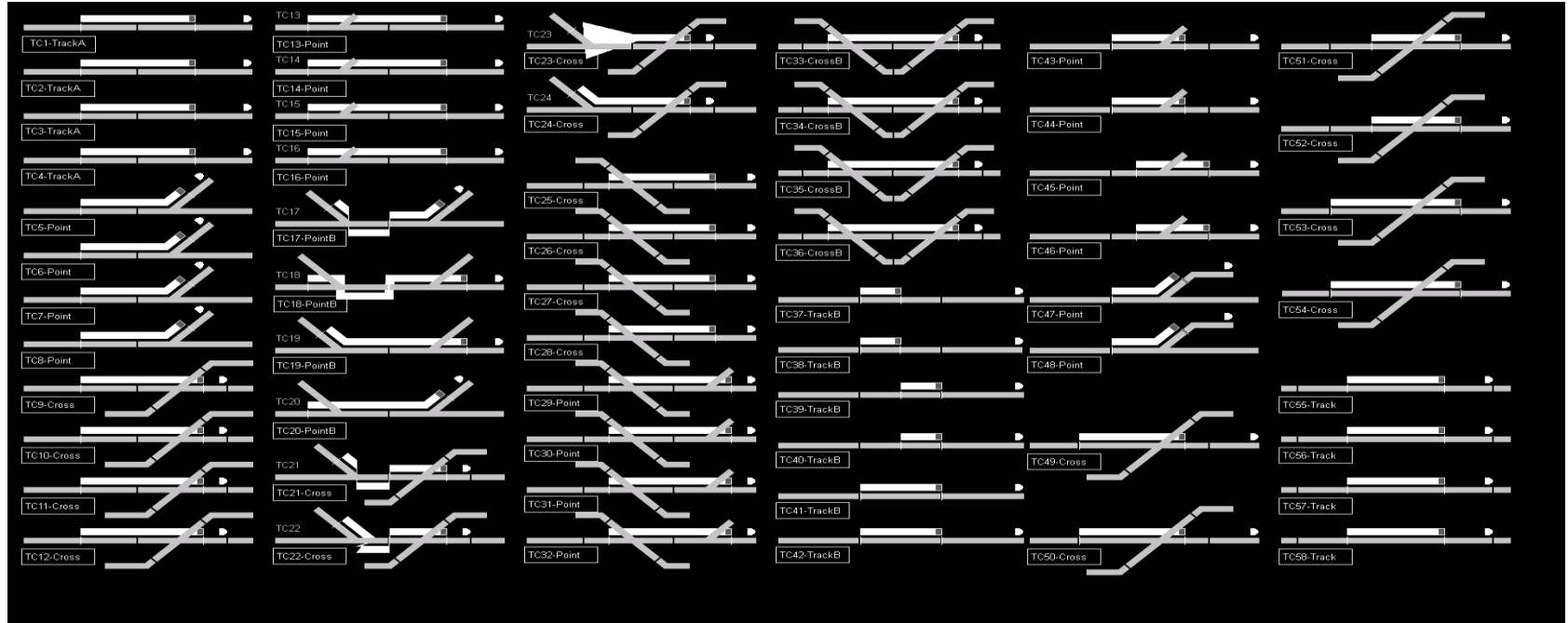


- Functionality as a “running gag”
- Testers complained
- A lot of iterations



1st Lesson – The Solution

- Understanding the actual problem
- Test case creation as “regression”



1st Lesson – The Learnings

1. “Good testing” is sometimes not enough!
2. Know the biases and limitations!

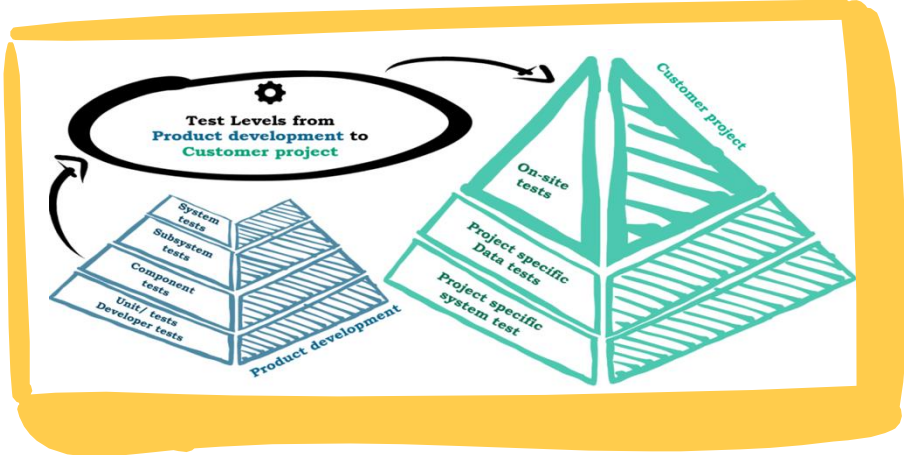


4. Understand how your output is used and how it generates value!

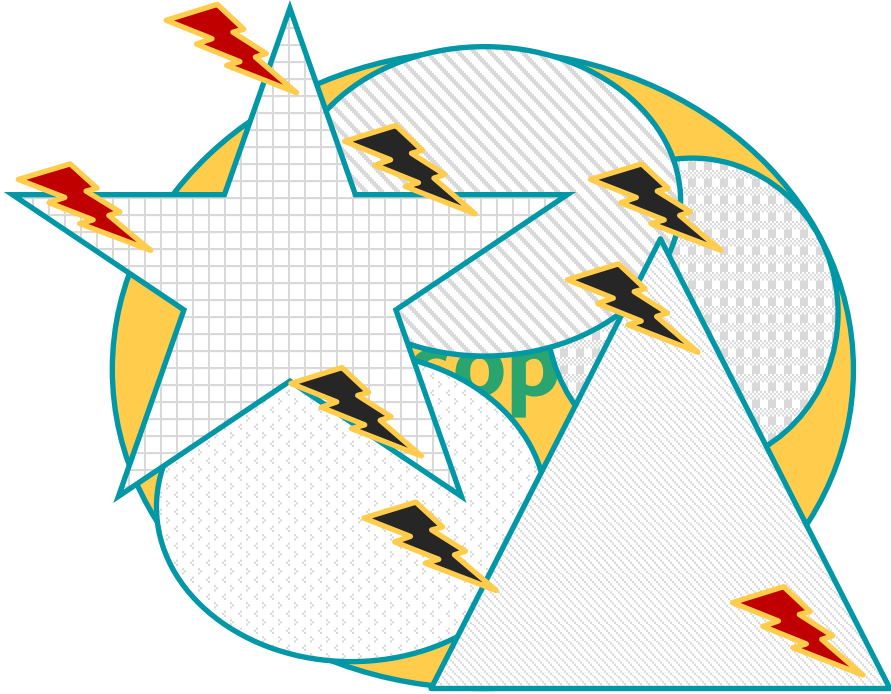
5. Act instead of complaining, using reframing as a tool!

Cognitive reframing is the process by which situations or thoughts are challenged and then changed.

2nd Lesson – The Problem



2nd Lesson – The Gap, the Overlay, the Extra



2nd Lesson – The Gap, the Overlay, the Extra

And now, what?

The Gap:
Address everything?

 **The Overlay:**
Eliminate all overlays?

 **The Extra:**
Eliminate all extras?



2nd Lesson – The Solution

“What is the risk?”

**Impact on human life
Material damage**

Availability/Reliability problems

**Lack of competitiveness
Financial loss**



2nd Lesson – The Learnings

1. The bigger picture is essential!
2. You must know what/how other instances test!
3. Serendipity plays a role, but luck is often “self-made”.

4. Use the risk-oriented gap analysis as a heuristic!

A heuristic is any approach to problem solving that employs a pragmatic method that is not necessarily optimized or perfected but is nevertheless “good enough”.

3rd Lesson – The Problem

Looking for excuses to:

- do things as always
- not optimize, challenge or adapt

We are doing “things” because...

... **“The Norm”!**

3rd Lesson – The Spirit of the Law

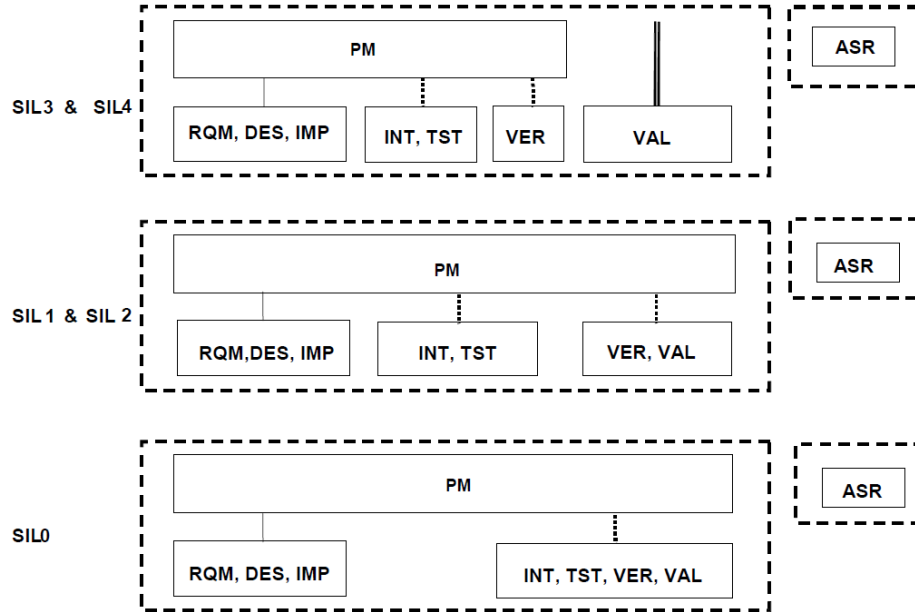
A framework
A checklist

Assurance of the four-eye principle

A minimum level of competency



3rd Lesson – Solution



However, the following options may apply:

- n) A person who is Validator may also perform the role of Verifier, but still maintaining independence from the Project Manager. In this case the Verifier's output documents shall be reviewed by another competent person with the same level of independence as the Validator. This organisational option shall be subject to Assessor's approval.
- o) A person who is Verifier may also perform the role of Integrator and Tester, in which case the role of Validator shall check the adequacy of the documented evidence from integration and testing with the specified verification objectives, hence maintaining two levels of checking within the project organisation.

However, the following options can apply:

- l) A person who is Verifier may also perform the role of Integrator and Tester, in which case the role of Validator shall include reviewing the Verifier's output documents hence maintaining two levels of checking within the project organisation.
- m) A person who is Validator may also perform the role of Verifier, Integrator and Tester. In this case the Verifier's output documents shall be reviewed by another competent person with the same level of independence as the Validator. This organisational option shall be subject to Assessor's approval.

However, the following alternatives can apply:

- i) Requirements Manager, Designer, Implementer, Integrator and Tester can be the same person.
- j) The Validator and Verifier can also be the same person;
- k) A person who is Verifier or Validator shall neither be Requirements Manager, Designer, nor Implementer.

3rd Lesson – The Learnings

1. Norms and processes are there to help not as a motivation for your work!
2. Watch out for checkbox compliance!

3. It is our duty to challenge them or to deviate from them if necessary!
4. Be ready to argument the deviations!

4th Lesson - Problem

Monitoring progress and quality

How far along are you with testing?

95% done

Are there any problems?

No

Thank you!

4th Lesson – Title vs. Role

Test Manager – “Minister of External Affairs“

Integrator – “The Scriptor“

Integration Lead – “Customer Interface“

Integrator – “The Bug Magnet“

Integrator – “The Diligent Bee“



4th Lesson – The Solution

Discover

Acknowledge

Accept
(or not)



4th Lesson – The Learnings

1. We might take different roles in different projects even if our job title never changes!

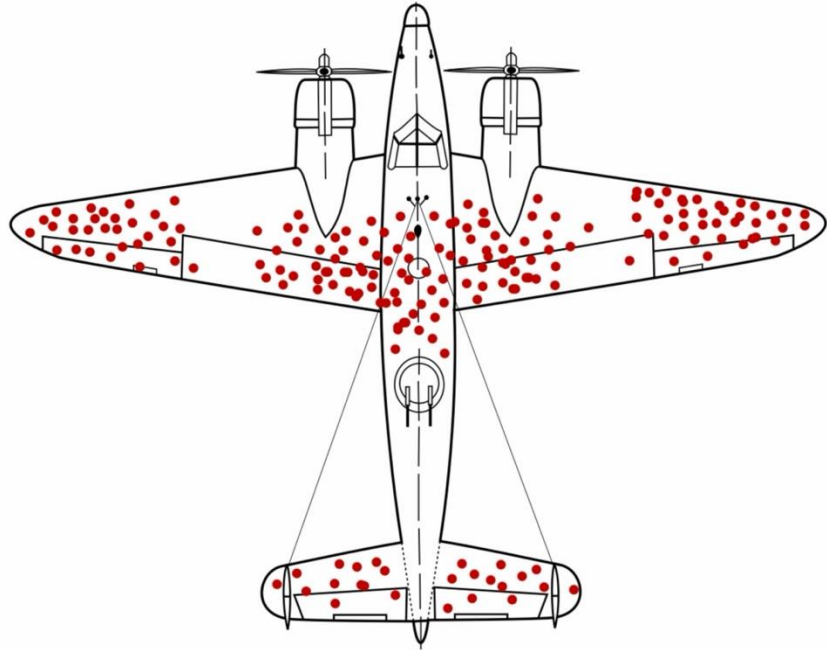
2. Understand how you can use your strengths in different project contexts!

3. Determine how these strengths generate value!

4. Reporting KPI's without a story is unhelpful and misleading!

Bonus Lesson – The Learnings

What am I not seeing?



Wrap-up

Identifying and handling limitations in complex environments

Risk-oriented gap analysis

Spirit vs. letter of the “law”

Difference between “title” and “role”

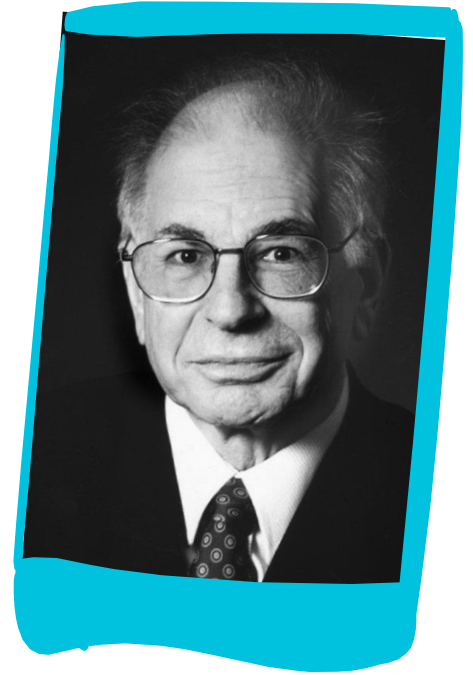
„Reframing“ as a powerful tool



Questions?

“We would all like to have a warning bell that rings loudly whenever we are about to make a serious error, but no such bell is available.”

Daniel Kahneman (Thinking fast and slow)



- <https://printerval.com/glass-of-water-optimist-pessimist-realist-etc-cool-and-funny-designs-p40687709?spid=3419738029>

- https://images.prodecom.mueller.de/_next/image?url=https%3A%2F%2Fstatic.prod.ecom.mueller.de%2Fproduct%2F5702017415932%2F5702017415932_1.jpg&w=2880&q=75

- Siemens Photo Archive (Digital Asset Management)

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Thank you for attending

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