Tackle the Challenge of Digital Transformation
- Quality Engineering und Skills

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25 years of experience

Quality assurance, development and processes

Scientific and industrial projects

Complex and safety critical domains e.g. healthcare and automotive

Researcher, Experimental Particle Physics

1999 – 2015: sepp.med gmbh
Department manager, leading consultant and business developer

2016 - 2017: ASQF e.V.
Director, managing expert and business developer

2018 - : GTB e.V.
Executive Director, managing expert and business developer

Founding member and former president of the German Testing Board e.V.
• Internet of Things, AI et al – A Phantom Menace?

• Tackling the Challenges - Quality Engineering and Skills

• Conclusion
IoT, AI et al challenging Software Quality...

Hardware intruding the System
Components, Variants and Interfaces

Paradigm Changes for Application Processes

Not a question of new Technologies

IoT scaling into a global AI?

Paradigm Changes for the System Lifecycle
… with volatile and changing Consumer and Business driven Requirements …
Long Operation Lifetime

Source: Quality Analysis with IoT-Testware, Axel Rennoch, Sascha Hackel meet the industry, Potsdam, May 17, 2018
… on a heterogenous HW and SW Platform …

Exploding # of Variants
Rising Demands for Interoperability, Architecture, ...
... and for QA
... with an increasing # of Smart Objects ...

The Internet of Everything
Intelligent Smart Objects connected to People, Processes, ... , Ethics
... dynamical and unpredictable Behaviour ...

Dynamical interacting Environments
Rising Dynamics
Frameworks like Services, Interfaces, ... will change over the System Lifecycles

Major Concerns - IT-Security (and Ethics)

- **Mirai botnet**, October 2016:
  - botnet using *insecure configured* IoT-devices
  - attack causes *blackout* and *disruption*
    (e.g. Amazon, Netflix, Twitter, Github)

- **Wannacry**, May 2017: cyber attack on steel mill in Germany, ...

- **KRACK** (Key Reinstallation Attack), October 2017:
  Replay attack on Wi-Fi Protected Access protocol (WPA2), ...

- **Spectre** and **Meltdown**, January 2018
  - **Spectre**: vulnerability that perform branch prediction in modern microprocessors
  - **Meltdown**: hardware vulnerability that allows to read all memory

Source: Quality Analysis with IoT-Testware, Axel Rennoch, Sascha Hackel
meet the industry, Potsdam, May 17, 2018
Künstliche Intelligenz erfindet eigene Verschlüsselung


Von Patrick Beuth

31. Oktober 2016, 16:21 Uhr / 177 Kommentare
Facebook musste AI abschalten, die „Geheimsprache“ entwickelt hat

Veröffentlicht am 28.07.2017 | Lesedauer: 2 Minuten
Von Philipp Nagels

Interoperability, Connectivity
Reliability
IT-Security, Ethics

WIR VERSTEHEN SCHON JETZT IM
ALLGEMEINEN NICHT, WIE KOMPlexE
AIS DENKEN, WEIL WIR IN IHREN
denkprozess NICHT WIRKlich
Hineinsehen können.

DHRUV BATRA,
Facebook AI Research (FAIR)

https://www.welt.de/kmpkt/article167102506/Facebook-musste-AI-abschalten-die-Geheimsprache entwickelt hat.html
Aus Microsofts nettem Chat-Teenie wurde in nur 24 Stunden eine Nazi-KI

… needs Paradigm Changes

Thesis:
Major paradigm changes will rapidly and significantly impact the ecosystem

<table>
<thead>
<tr>
<th>Missing comprehensive standards for methods, architecture and process</th>
<th>Missing skills and missing awareness</th>
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| • in order to integrate domains  
• in order to integrate lifecycle and business processes  
• in order to establish a common glossary | • in order to find (adequate) solutions  
• in order to apply proper prioritization  
• in order to look for a solution |
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Quality Engineering as Key Factor

Awareness of the right prioritization of **Quality Aspects** and awareness of their impact

An adequate **Architectural Framework** for smart objects reflecting the quality aspects

Knowledge of **Interdisciplinary Processes and Methods**, including automation, simulation and product certification

Comprehensive and adequate **Standards**

Still missing awareness of the basics
Constructive QE – Key Aspects

Product: Data oriented value chain

Product: Orchestration of improved or new application scenarios

Process: Agile development

Process: Continuous integration & delivery, DevOps

Process: High degree of automation

Process: Variant management

Process: Model based development and testing

Comprehensive Standards and interdisciplinary thinking are the key

Comprehensive cross-domain Architectural Framework for smart objects reflecting the quality aspects
Analytical QE – Key Aspects

Test objectives prioritized according to the quality aspects

Methods: Simulation and product certification

Essential test targets: IT security, interoperability and performance

Risk analysis

Missing awareness of the right prioritization of Quality Aspects and their impact on architecture and lifecycle

Test automation including test automation architecture

Test and monitoring spreads over the complete lifecycle

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Testautomation

Testautomation is done incidentially – isn’t it?
Quality Aspects – Change your Prioritization

Shift from pure localized functional quality aspects during development ...
... to activities covering the full lifecycle incl. operations and maintenance
Testing AI – A Paradigm Change

Deterministic Scenarios

Probabilistic Scenarios
(Condition Based)

Test oracles for AI systems are not easily available

Black Box par excellence
Testing AI – A Paradigm Change

Deterministic Scenario

Probabilistic Scenario

Environment specification

Start

Stop

A

B

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Testing AI – Ethics as Quality Characteristic

German Bundeswehr

Rules
1. Asimov’s Laws
2. Geneva Convention
3. Mission Objectives

Imperial Forces

Rules
1. Asimov’s Laws
3. Mission Objectives

Ethics → (functional) Behaviour) & Effectiveness → Quality
Testing AI – A Paradigm Change

Extended Quality Characteristics
• Complexity
• Scalability
• Continuous learning

Test Approaches reloaded
• Simulation
• Product Certification
Will AI change the Software Testing Process?

It definitely has the potential!

But we are right at the beginning of this journey.

Support process and test automation.

Adapt the process.
Can all Testing Activities be automated?

When?

- Test Analysis
  - Analyse Test Basis
  - Derive Test Conditions
  - In the Future AI can help!

- Test Design
  - Test Design Technique
  - Tool-Application
  - Model-Based Testing

- Test Execution
  - Capture&Reply
  - Structured Scripting
  - Data/Keyword-Driven
  - Behavior-Driven

- Test Evaluation
  - Test Coverage
  - Test Completion Criteria
  - Reporting
  - Trend Analysis
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Major Challenges
… and how GTB can help

Lack of Awareness
Lack of Standards
Lack of Skills
Unsettledness in Industry

Qualification Scheme

Provide basic Skills
Provide a de facto standard
Provide guidance

Provide a common glossary
Improve awareness
Reduce confusion and uncertainty
The ISTQB® Certified Tester

For a deeper and future proof insight into testing topics

Quelle: https://www.istqb.org/

08.10.2019
German Testing Board
Skills for Software Quality

GTB – national chapter of ISTQB®

ISTQB® Certified Tester – The #1 Scheme for Software Testing Skills

> 600,000 certificates worldwide

http://www.istqb.org/about-as/facts-figures.html
Conclusion

IoT, AI et al is not completely new, but …

| ... has enormous potential for new business processes | ... challenges the whole system lifecycle … | … requires comprehensive thinking, interdisciplinary processes and adequate methods |

… in order to manage these challenges we have to change our paradigms …

| … quality engineering instead of pure testing and proper prioritization of quality aspects | … (process and) test automation | … establish standards, methods and skills and a common glossary |
Thanks!
Questions ?!

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Vielen Dank für Ihre Aufmerksamkeit!