Trends in Automotive Software Engineering

a Challenge for OEMs and Suppliers

10th Stages insights
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CEO Method Park
Agenda

- Trends in Automotive
  - Observation and Motivation
  - Trends in Automotive SW Engineering
  - Core Principles of ASPICE
  - More than 15 Years ASPICE
  - New Kids on the Block
- Summary
Trends in Automotive

- Battery electric vehicles (BEVs): 50%
- Connectivity and digitization: 49%
- Fuel cell electric vehicles (FCEVs): 47%
- Hybrid electric vehicles (HEVs): 44%
- Market growth in emerging markets: 43%
- Increasing use of platform strategies and standardization of modules: 40%
- Creating value out of big data (e.g., vehicle & customer data): 39%
- Mobility-as-a-service/Car sharing: 39%
- Autonomous and self-driving cars: 37%
- Downsizing of internal combustion engines (ICEs): 31%
- Rationalization of production in Western Europe: 31%

Source: KPMG’s Global Automotive Executive Survey 2017
Trends in Automotive

48% of consumers believe that drivers of vehicles are the sole owners of consumer data.

31% of executives believe OEMs are the natural owners of customer data.

85% agree that the digital ecosystem will generate higher revenues than the hardware of the car itself.

83% anticipate a major business model disruption over the next 5 years.

49% agree that premium OEMs are most trustworthy with zero-error tolerance.

Only 25% of consumers agree that newcomers from Silicon Valley are most trustworthy.

Source: KPMG’s Global Automotive Executive Survey 2017
Trends in Automotive

- Man-Machine-Interface
- BIG DATA
- ADAS
- Connected Car
- Autonomous Driving
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- **Observation and Motivation**

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Learning from Production

- Distributed Production
- Distributed but integrated Production
- Lean Production
- Process Optimization

Productivity

History of Software Development

- in order to solve more difficult and complex problems
- … move up one level of abstraction
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Increasing functionality
Interaction between ECUs
Increasing number of variants
Dependencies between features

Application Life Cycle Management
SW Development Processes
Product Line Engineering
AUTOSAR
Introduction of AUTOSAR needs defined Processes
Automotive SPICE® Level 3
Introduction of PLE needs a defined Process
Automotive SPICE® Level 3
ADAS
Autonomous Driving
Fail Safe Strategies
Safety Culture during Development

ISO26262 or a remake of it
Automotive SPICE® Level 3
Remote control (Internet of things)
Car2car communication
Connectivity
Big data

Security standard driven by automotive
Automotive SPICE® Level 3
Common terminology across company boarders
Distributed planning
Agreed work products
Monitoring concept

Automotive SPICE® Level 3
KPI for monitoring
Traditional vs. Agile

Traditional
- Plan driven
- Typical V-Model
- Trouble with changes
- Big Bang – Integrations

Agile Methods
- Value driven
- Welcome late changes
- Continuous integration
- Sprints with fixed timelines

Combination of Traditional & Agile Methods

Automotive SPICE® Level 3
State of the Art in SW Engineering

- Complexity
- Safety
- Agile
- Lean
- Supply Chain Management
- Tool Chain Management
- Continuous Integration
- Distributed Development
- Legal Regulations
- Misra
- Product Line Engineering

- AUTOSAR
- ISO26262 (++)
- Security Standard for Automotive
- Automotive SPICE® Level 3
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Core Principles of ASPICE

Level 1

- Bilateral traceability including Change Requests
- Consistency of traceability
- Evaluation of architectures and designs
- Strategies become plans

Level 2

- Objectives for improvements, planning, monitoring and adjusting
- Define and assign roles including skill needs and competencies
- Establish communication to involved parties
- Define and use templates and checklists
- Conduct Reviews
- Establish Configuration Management
Core Principles of ASPICE

Level 3

- Define a standard process including
  - tailoring guidelines
  - roles
  - infrastructure
  - measures for suitability and effectiveness

- Use the tailored standard process
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After more than 15 Years of ASPICE there is Harmonization across Company Boarders in:

- Common Terminology
- Common Practices
- Common Work Products
- Common Maturity

... supports distributed Development across Company Boarders

> Automotive SPICE® Level 3
... more than 15 Years of ASPICE

Quelle: intacs.info, Gate4SPICE Meeting 19.09.2012
**History.**

Milestones regarding SPICE®@BMW Group.

- **2002** BMW Group starts using SPICE-Assessments for supplier rating
- **2004** BMW Group published SPICE Level 3 in all processes of the HIS-Scope as goal for suppliers. Agreed improvement measures are mandatory for a nomination without achievement of the prescribed criteria.
- **2005** First release of Automotive SPICE®
- **2006** BMW Group performs assessments with Automotive SPICE® only
- **2007** 100th BMW Group SPICE-Assessment
- **2008** German translation of Automotive SPICE® and Assessment-Process published by VDA
- **2009** Mapping of CMMI® → Automotive SPICE® presented by VDA
A correlation between product maturity and SPICE capability at BMW Group.
Examples for goal-oriented product maturity.

- Good example for goal-oriented product maturity
  - 90% of all errors found 11 month before SOP
  - 50% of all errors found 16 month before SOP
  - Goal-oriented product maturity value: 58%

- Bad example for goal-oriented product maturity
  - 90% of all errors found 2 month before SOP
  - 50% of all errors found 8 month before SOP
  - Goal-oriented product maturity value: 25%

⇒ Difference in product maturity: 9 month!
Higher process capability increases product maturity.
Result of correlation.

- **Cluster 1:** Low process capability, late product maturity.
- **Cluster 2:** Transition phase, project management incomplete, product maturity differs.
- **Cluster 3:** High process capability, early product maturity.

Clear correlation between goal-oriented product maturity and process capability.
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New kids on the ASPICE block

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- Higher complexity asks for higher abstraction:
  - programming ➔ design ➔ processes
- ADAS, Security, Safety requires defined processes
- Automotive SPICE Level 3
  - Distributed Engineering needs Frame Works like AUTOSAR based on defined processes
- Transformation of Engineering based on Process Management

was build to support Automotive SPICE Level 3