Trends in Automotive Software Engineering

a Challenge for OEMs and Suppliers

Stages insights
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Agenda

➢ Trends in Automotive

➢ Observation and Motivation

➢ Trends in Automotive SW Engineering

➢ Core Principles of ASPICE

➢ Summary
Trends in Automotive

- **Battery electric vehicles (BEVs)**: 50%
- **Connectivity and digitalization**: 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

- **Software Quality**: 48% of consumers believe that drivers of vehicles are the sole owners of consumer data.

- **Software Security**: 31% of executives believe OEMs are the natural owners of customer data.

- **Software Revenue**: 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.

- 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.

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

- Man-Machine-Interface
- BIG DATA
- ADAS
- Connected Car
- Autonomous Driving
Agenda

➢ Trends in Automotive

➢ **Observation and Motivation**

➢ Trends in Automotive SW Engineering

➢ Core Principles of ASPICE

➢ Summary
Observation and Motivation

New Business Models
New Suppliers
New Technologies
New Tooling

Biggest Transformation since we build cars

New Development Culture
New Standards
New Processes
Agenda

➢ Trends in Automotive

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➢ **Trends in Automotive SW Engineering**

➢ Core Principles of ASPICE

➢ Summary
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
Safety

- 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
Challenges in Automotive SW Engineering

- Complexity
- Safety
- Security
- Distributed Development
- Supply Chain Management
- Legal Regulations
- Agile
- Lean
- Continuous Integration
- Tool Chain Management
- Product Line Engineering
- Misra
- Automotive SPICE® Level 3
- AUTOSAR
- ISO26262 (++)
- Security Standard for Automotive
Agenda

➢ Trends in Automotive

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➢ Trends in Automotive SW Engineering

➢ Core Principles of ASPICE

➢ Summary
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
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
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Summary

➢ 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

Automotive SPICE Level 3

➔ Transformation of Engineering based on Process Management

stages was built to support Automotive SPICE Level 3
Summary

New Business Models
New Tooling
New Suppliers
New Technologies
New Standards
New Development Culture

Biggest Transformation
since we build cars

Not without Process Management