

**AUTOMOTIVE E/E DEVELOPMENT 2030**

# **SOFTWARE DRIVES**

A SURVEY REPORT BY  
HORST HIENTZ  
HANS-JÜRGEN KUGLER  
BONIFAZ MAAG  
DOMINIK STRUBE



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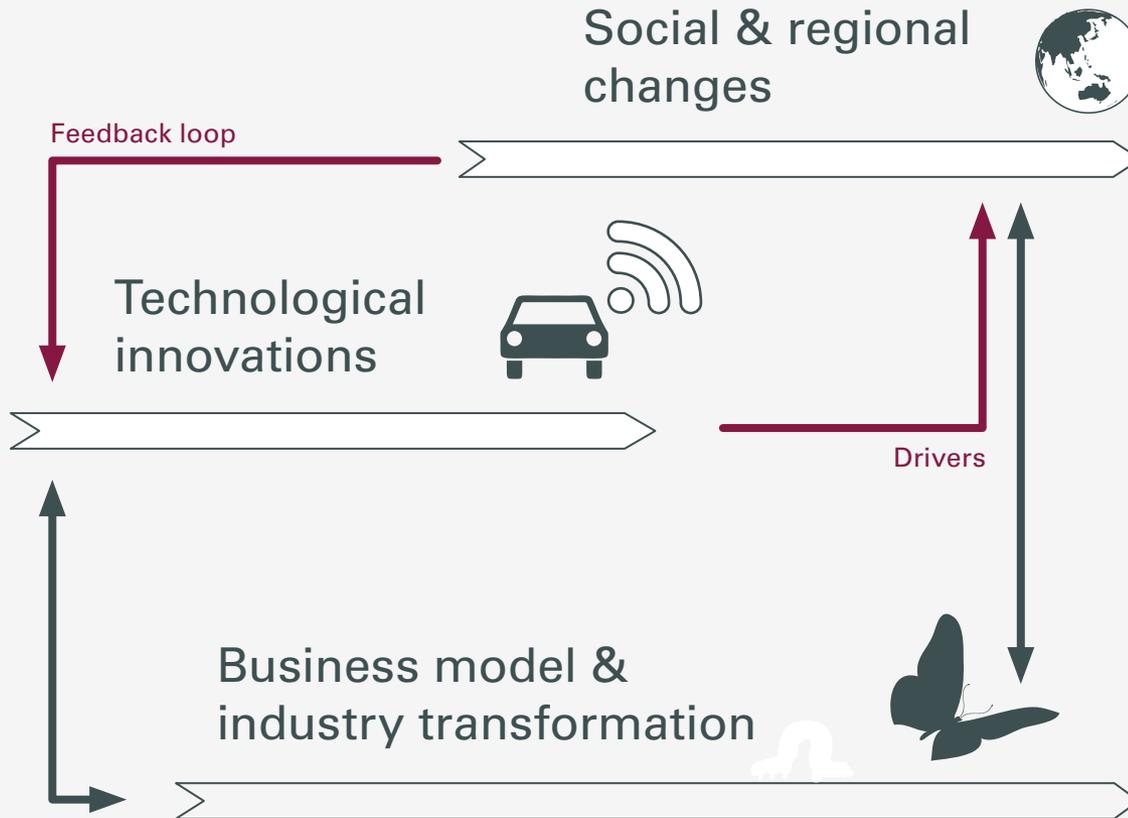
# Survey framework

- **Methodology**
  - Meta-analysis of relevant studies
  - Trend analysis of mobility & organizations
  - Worldwide expert interviews of E/E Executives and Managers – in Automotive and Non-Automotive
  - Broad survey – online questionnaire
- **Timeframe**
  - March 2014 until July 2015

In cooperation with  
**BMW Car IT**



# Technological innovations create business opportunities.



## Technological drivers

### Top selection

- Connectivity
- Automated Driving
- Alternative Drives

## Social drivers

### Top selection

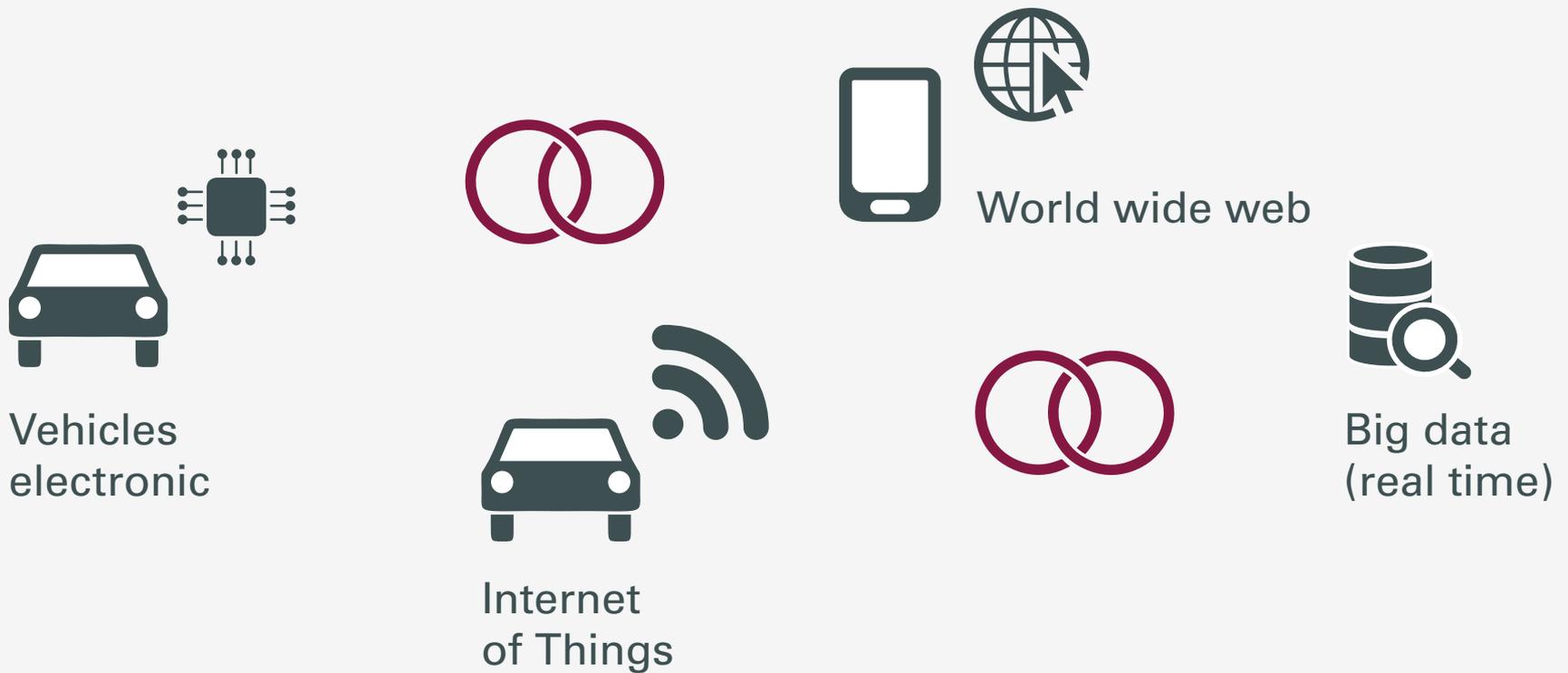
- Urbanization
- Social Networking
- Demographic Change

### Others

- Ecology
- Individualization and Personalization

# Connectivity converges IT and electronics first.

**Today:** Technological innovations



# The convergence enables the merger of industries.

## Transformations tomorrow: New emergent business models



# Six major factors will impact automotive E/E – (1 / 4)

## 1. Increasingly divergent customer needs will require both, greater flexibility and shorter response times.

- Segmented industry
- Various business models
- More niches and opportunities

Value creation networks are to be formed quickly



→ **Flexibility** is required by E/E R&D

Demands are to be identified, solutions are to be delivered quickly



→ **Speed** is required by E/E R&D

# Six major factors will impact automotive E/E – (2 / 4)

## 2. Both become more important, R&D and knowledge.

- Global R&D organizations
- Larger R&D organizations
- Diversity: risk taking, systems engineering, service orientation, embedded and IT, ...



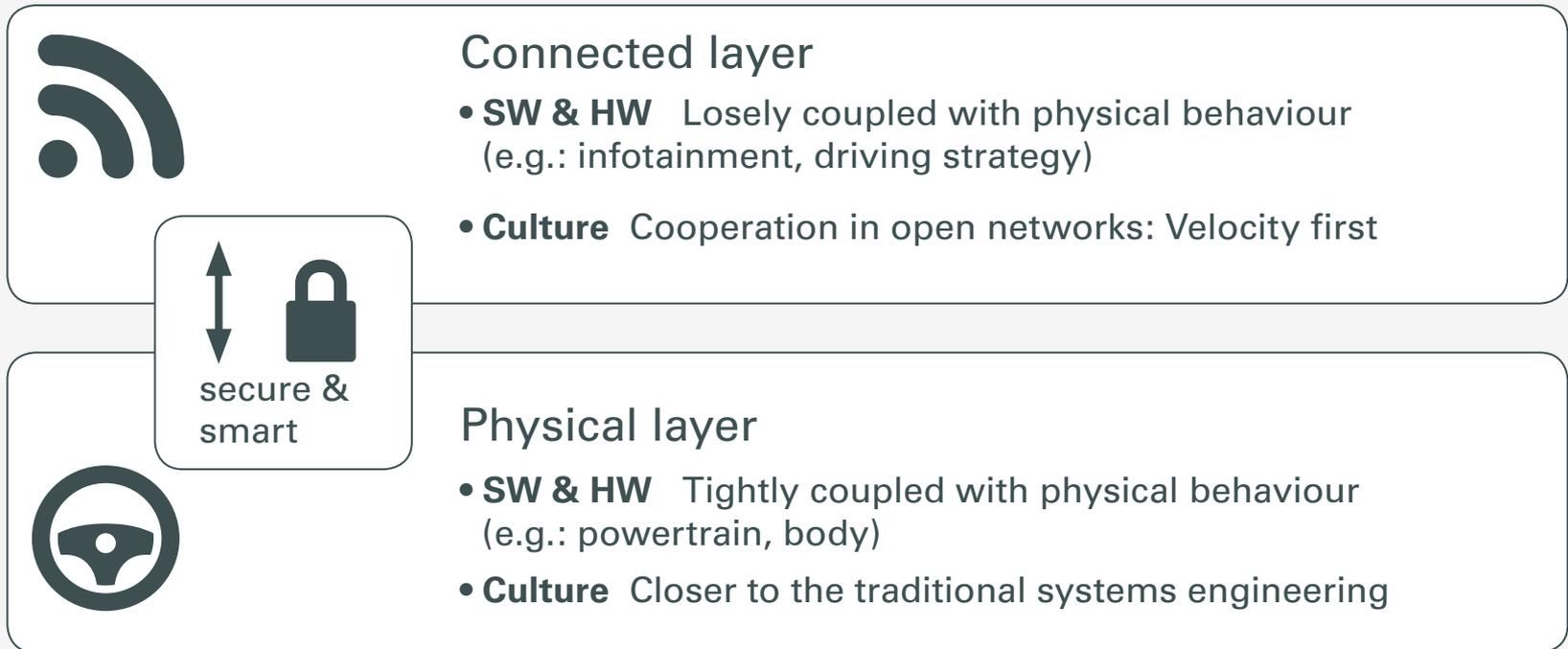
## 3. Services invention will become increasingly emergent.

- No delivery roadmap
- Co-creation in networks accross industry boundaries



# Six major factors will impact automotive E/E – (3 / 4)

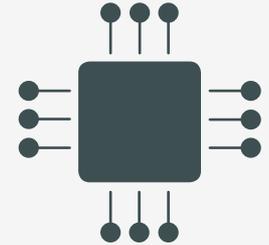
## 4. Vehicle electronic architectures will change radically.



# Six major factors will impact automotive E/E – (4 / 4)

## 5. Hardware will be standardized.

- First on the connected layer
- Headroom for software upgrades
- But still economies of scale from producing larger volumes

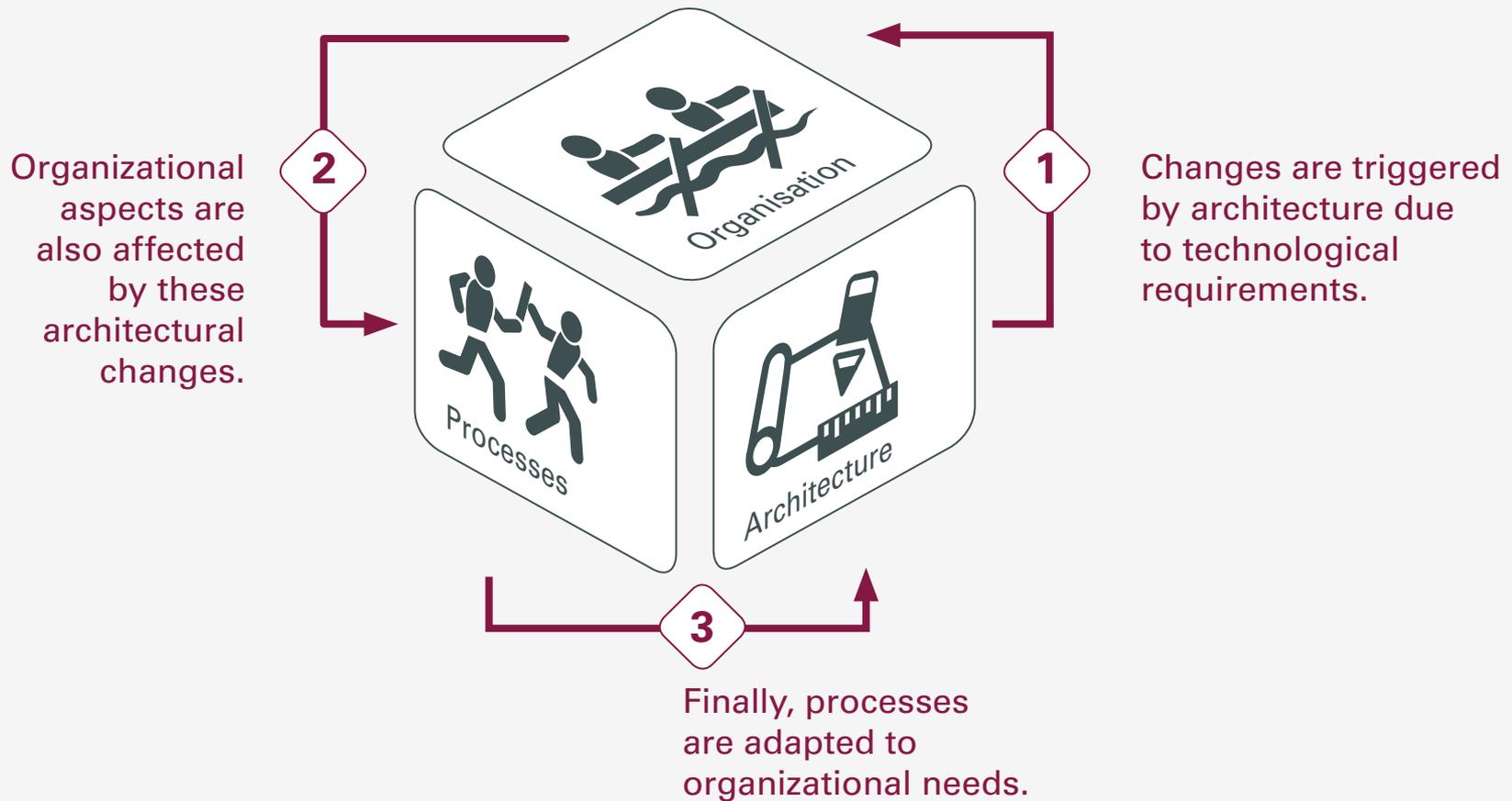


## 6. Move to a system of systems increases complexity.

- Specification is always incomplete
- Components need to be more robust and more versatile in terms of capacity
- Increasing need for validation, continuous validation
- More complex event capturing



# Architecture, organization & processes will change.



# Impact on architecture, organization & processes (1 / 3)

A	O	P	Challenge	Explanation
			Assuring vehicle functionality	<ul style="list-style-type: none"><li>○ Adaptive Algorithms</li><li>○ Processing extremely large volumes of data</li><li>○ Early high test coverage, continuous integration</li><li>○ Close cooperation in the value creation network</li><li>○ Increasing complexity: System of Systems</li></ul>
			Networked cooperation inside the company	<ul style="list-style-type: none"><li>○ Integrated teams with shared objectives</li><li>○ Developing domain competency</li><li>○ Local customer interface</li></ul>
			Cross-Company agility	<ul style="list-style-type: none"><li>○ Scaled co-operation</li><li>○ Collaborative management with decentralized responsibility</li><li>○ Shared repository</li></ul>
			Weaknesses detection early in the network	<ul style="list-style-type: none"><li>○ Continuous delivery and evaluation</li><li>○ Short change cycles</li></ul>

# Impact on architecture, organization & processes (2 / 3)

A	O	P	Challenge	Explanation
			Providing services, not functions	<ul style="list-style-type: none"><li>○ Merging IT and embedded software</li><li>○ Continuous user experience</li><li>○ Perpetual beta</li><li>○ Cross-functional engineering teams</li></ul>
			Continuous development	<ul style="list-style-type: none"><li>○ Flexible matrix / line organization</li><li>○ Dedicated maintenance teams</li></ul>
			Open source and inner source	<ul style="list-style-type: none"><li>○ Ensuring functional safety</li><li>○ Cross-functional collaboration</li></ul>
			Managers and knowledge workers	<ul style="list-style-type: none"><li>○ Empowerment rather than command &amp; control</li><li>○ Intercultural competence</li></ul>
			Velocity over efficiency	<ul style="list-style-type: none"><li>○ Developing both architectural layers</li><li>○ Speeding up throughput</li></ul>

# Impact on architecture, organization & processes (3 / 3)

A	O	P	Challenge	Explanation
			Security	<ul style="list-style-type: none"><li>○ Resilient organizational culture</li><li>○ Security over the lifecycle</li><li>○ Standardization and transparency</li></ul>
			Procurement	<ul style="list-style-type: none"><li>○ Providing hardware with capacity buffers / headroom</li></ul>
			New forms of organization	<ul style="list-style-type: none"><li>○ Cross-functional collaboration instead of incumbents' traditional department structures (body, electronics, interior, and powertrain)</li></ul>

# Impact on industry players

- **New industry entrants**

- **IT-Player:** face the customer and leverage from that.



- **Industry incumbents**

- **OEMs:** need increased flexibility, SOP becomes less important.
- **Tier-1:** Hardware depreciates, system and software are the future.
- **Tier-2:** Low cost manufacturing, particularly CE components.



# Impact on regions

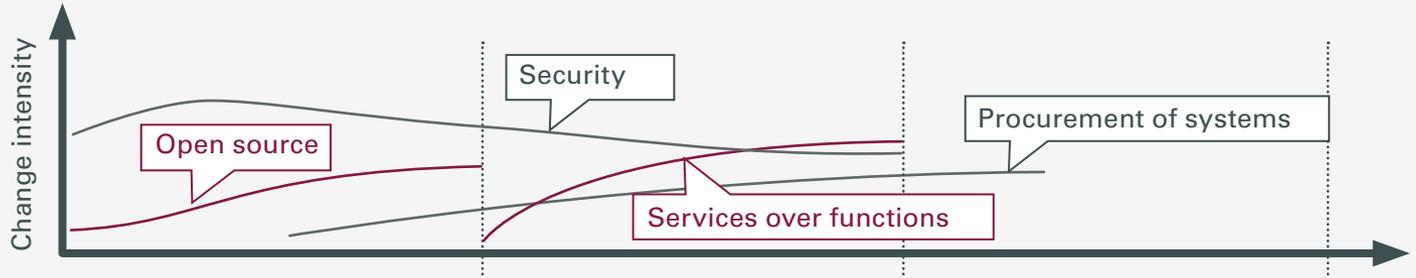
- **Regional shift**

- **North America:** In a good position for the future. Leading in LTE coverage, ultra innovative IT companies, and a well established automotive and system engineering background.
- **Europe:** Ourdays industry leader is, vice versa, lacking in terms of LTE coverage and IT start-up culture. Need to globalize R&D, too. Some are strong because of a high level of in-house SW competence.
- **Japan:** Can they cope with the required rate of change and can they establish the required software eco-system in time?
- **China:** The globe's biggest market is still growing. Will they catch up or be caught in the middle-income trap? Know-How will grow fast.
- **India:** Unpredictable; however, will probably increase its SE position.

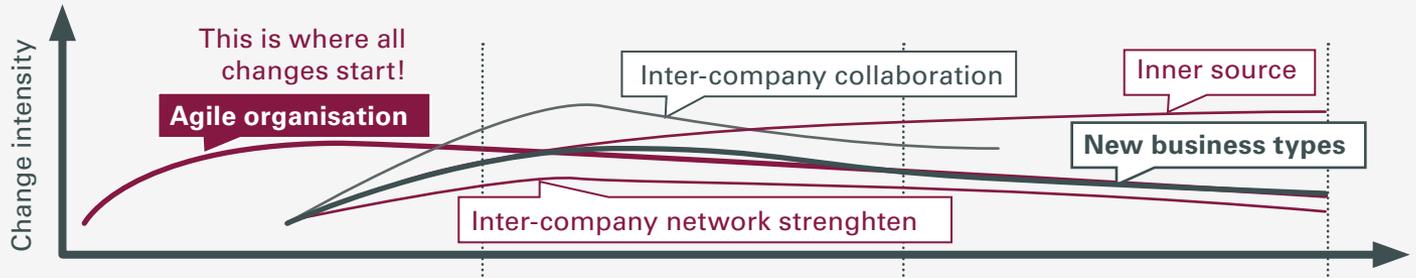
# Possible paths to the future



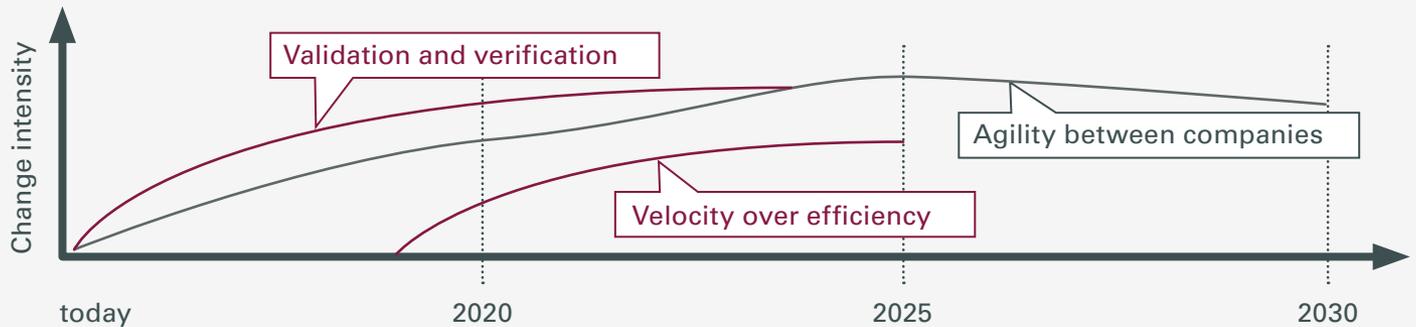
Architecture



Organisation



Processes

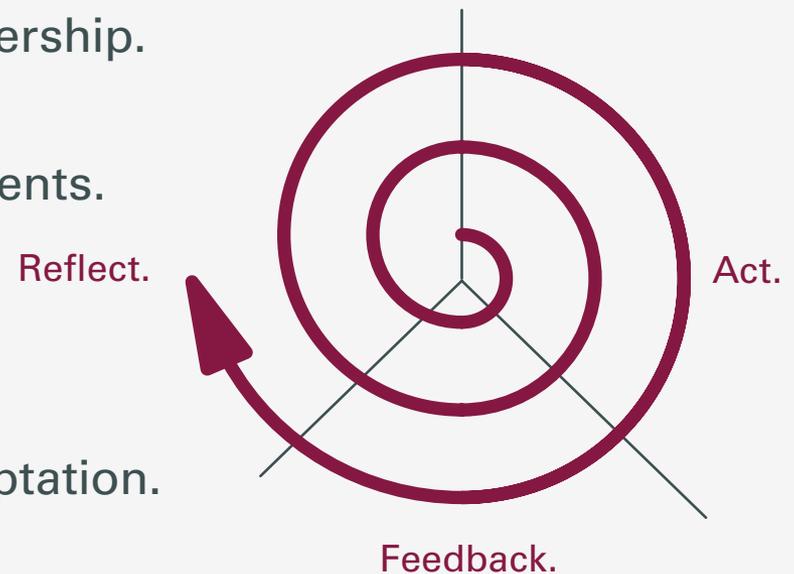


# All transformation starts with an agile organization.

## Characteristics of an agile organization

- They understand the system as a whole.
- They adapt a catalyst style of leadership.
- Their organization is based on continuous learning from experiments.
- They foster an open communication style.
- Their governance is based upon long-term business value and adaptation.
- Their members seek mastery in their respective skills.

<http://www.agilealliance.org>



# Reflection: All involved parties need to change.

## IT-Players

- will need to figure that cars are different: long lifetime, mechatronical complexity, and potentially life threatening.
- they already know how the future business models work.
- they are closer to the rules driving the future.



## Automotive industry

- needs to learn the new business models.
- needs to master the increasing complexity.
- needs to become more flexible.
- needs to change their cost-focused attitude.
- knows all about the critical issues of vehicles and mass production.
- tries to master the game changing issues with traditional solutions.



# Contact information

For comments, feedback and questions about this report, further information or requests for copies can be directed to

## **Dominik Strube**

*Project Manager Software Drives 2030*

dominik.strube@kuglermaag.com

+49 7154 1796 123

## **Editor**

Kugler Maag Cie GmbH  
Leibnizstr. 11  
70806 Kornwestheim

Phone +49 7154 1796 100  
information@kuglermaag.com

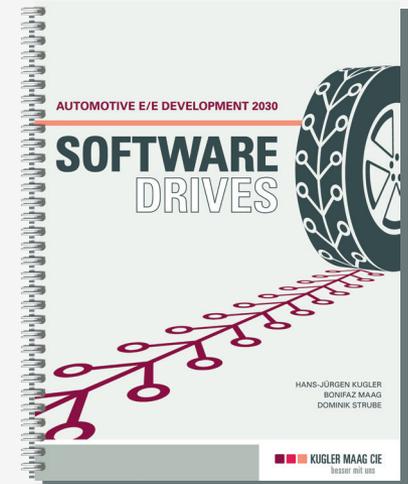
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Kugler Maag Cie North America Inc.  
Columbia Center No 387  
101 West Big Beaver, Suite 1447  
Troy, MI 48084

Phone +1 248 687 1210  
usa@kuglermaag.com



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