

AGILITY – BUILT-IN QUALITY @ BOSCH

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ROBERT BOSCH GMBH

Robert Bosch GmbH - Four business sectors

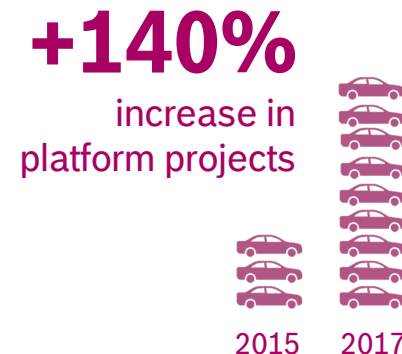
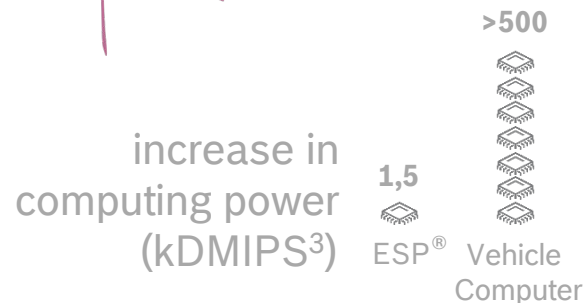
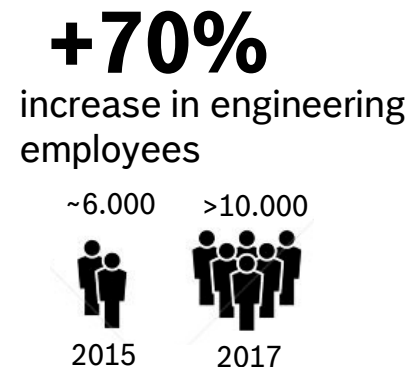
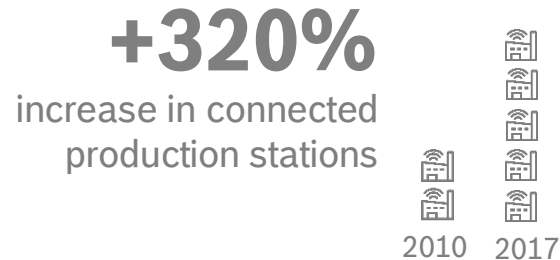
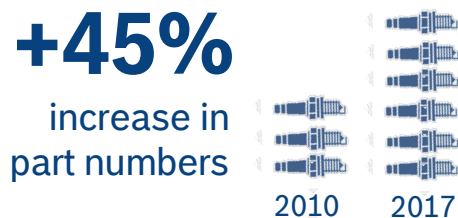
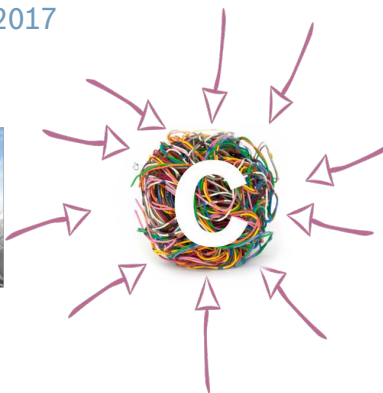
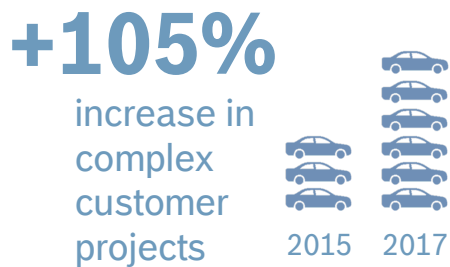
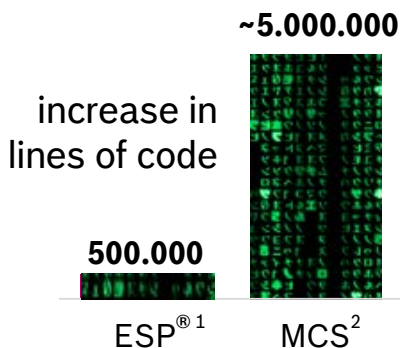
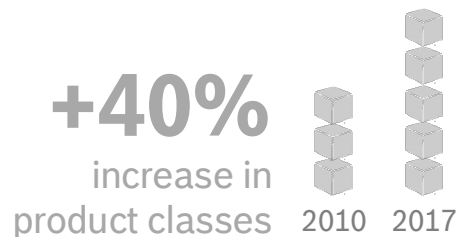
Key Figures 2017*



* Preliminary, rounded figures as of 12.17

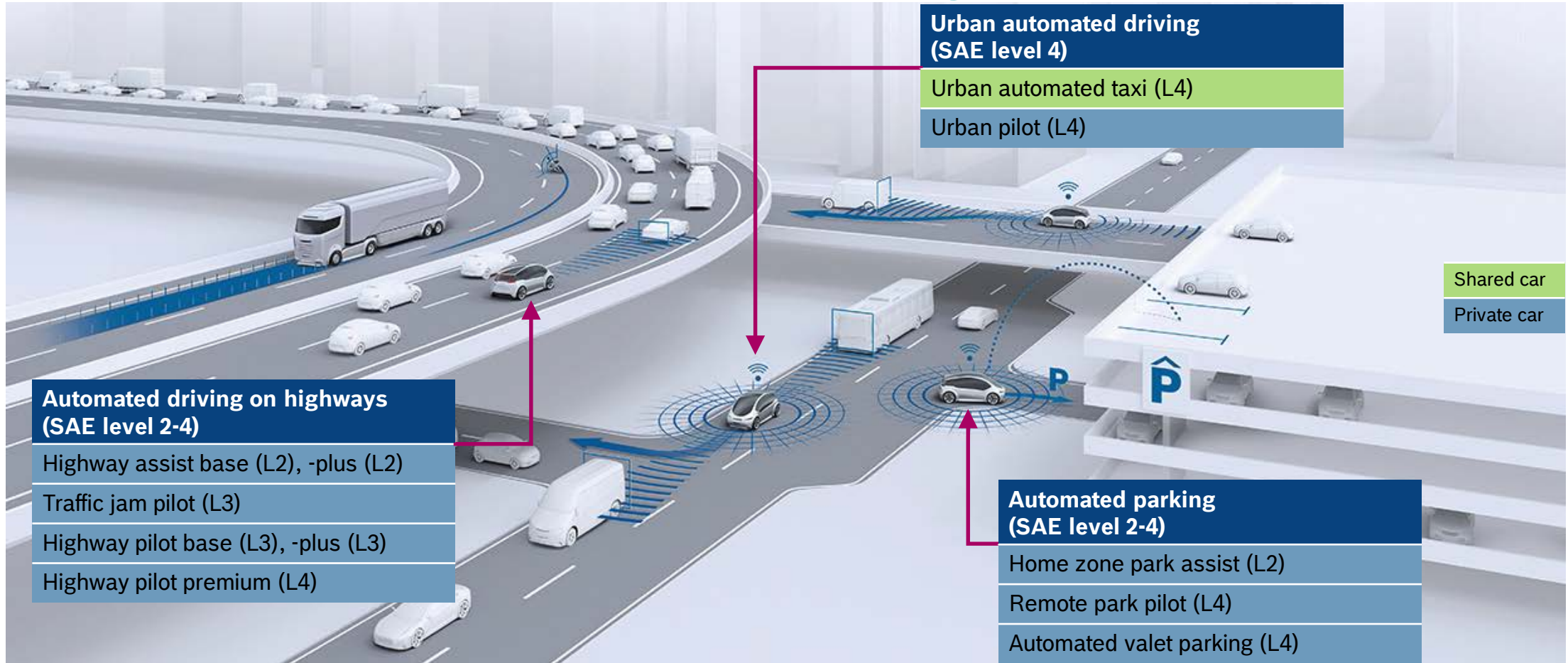
Dramatically increasing complexity

Example Division Chassis Systems Control




Chassis Systems Control

Driver Assistance and Automated Driving



Agility @ Bosch

What we mean when we refer to agility @ Bosch

A large fleet of sailboats is shown racing on a deep blue sea under a clear sky. The boats are white with various colored sails (white, yellow, blue, green). The water is choppy with whitecaps. The boats are leaning as they catch the wind. The text is overlaid on the right side of the image.

We **adapt** to changes and we **shape** them together –
continuously & rapidly, customer & user driven
and faster than market & competitors.

Master Complexity

Characteristics of agile organizations @ Bosch



Attitude

- ▶ **“We LEAD Bosch”** mindset across levels & functions
 - ▶ trust, courage, empowerment, and servant leadership for self-organization, fast adaptation, and failure tolerance
- ▶ **Empowered teams** at all levels
 - ▶ decisions at lowest possible level



Operational structure

- ▶ Flow-oriented work organization
 - ▶ **“pull and cadence”** methods (e.g., Scrum, Kanban), high-frequency customer interaction
 - ▶ prompt **removal of barriers** hindering the associates’ work flow
- ▶ Continuous, emergent transition into **self-optimizing system**
 - ▶ organization learns via improvement cycles



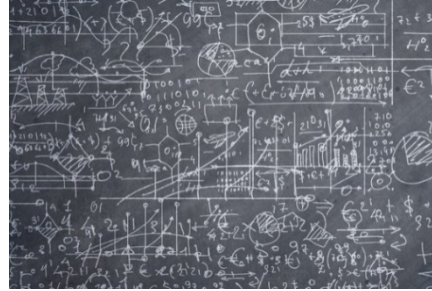
Organizational structure

- ▶ **User centricity** and **business value** oriented structure (according to strategy)
- ▶ **Agile leadership roles**
 - ▶ Product Owner, Agile Master, Empowered Team, Agile Entrepreneur
- ▶ **Similar** decision and control **structures** across levels
 - ▶ flat hierarchies and high local autonomy

Driver Assistance and Automated Driving

Agile Transformation - Mastering Growth & Complexity

- ▶ We are **growing**!
... faster than other areas of Bosch
... number of projects increases significantly
- ▶ **Complexity** is increasing
- ▶ Our **customers** asking for system solutions and for a single contact person
- ▶ Customer is becoming a **partner**
- ▶ Engineers are **distributed** over several projects, frequent task forces
- ▶ We use **different** approaches among product areas
- ▶ With our products and solutions we shape the future of **safe** and **autonomous driving**



Driver Assistance and Automated Driving

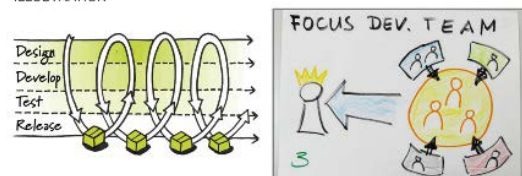
Five Strategic Directions



Strategic Direction

Frequent Value to the Customer

ILLUSTRATION



Focus on customer value and close customer collaboration

Strategic Direction

LET IT GROW

ILLUSTRATION



Start with pilots and make use of self-learning organization

Strategic Direction

TURN THE PYRAMID

ILLUSTRATION



Empowerment of teams & servant leadership

Strategic Direction

TEAR DOWN THE WALL

ILLUSTRATION



Collaboration across functional, organizat. and regional boundaries

Strategic Direction

CREATE PASSION

ILLUSTRATION



Strong involvement of associates and leaders

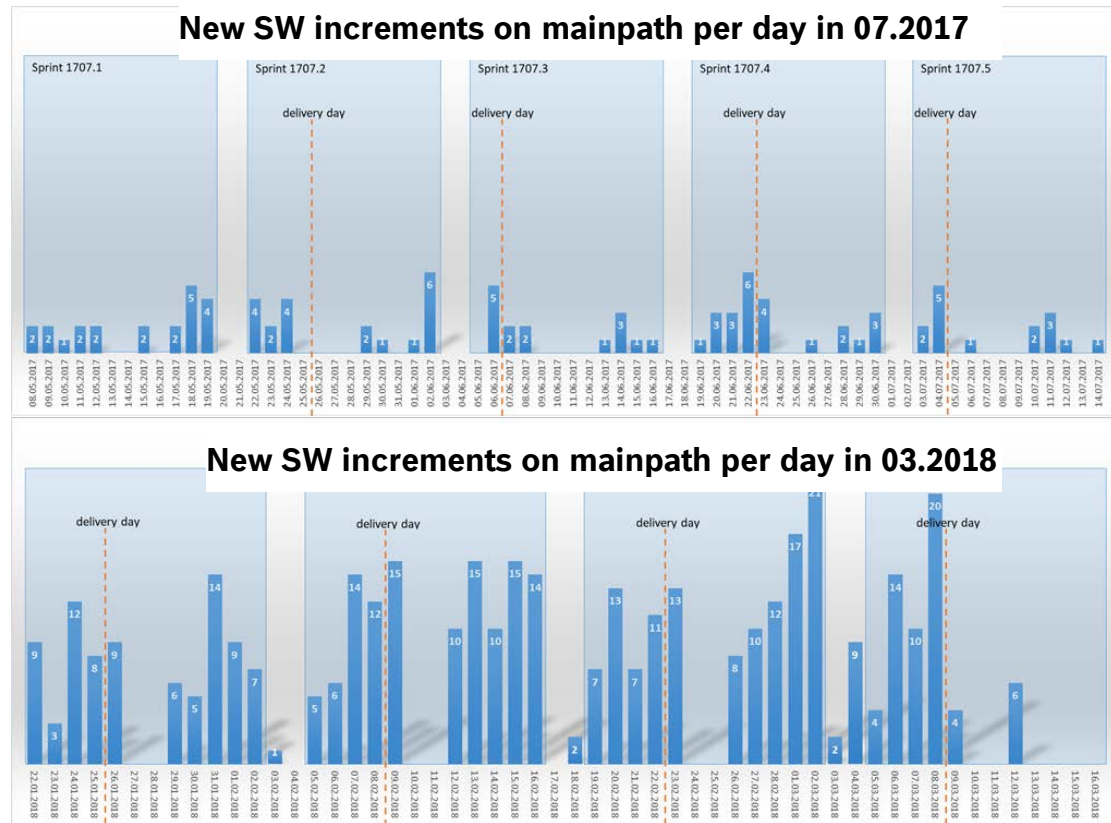
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Frequent Customer Value: Key Enabler Continuous Delivery



► Decoupled / parallel SW development

- ~2 successful integrations on mainpath p. day
- Release cadence unstable; peak of check-in's on final day of sprint ("Big bang")
- Large amount of unproductive check-in's
- Teams spend days for fixing integration problems



► Synchronized SW development

- ~10 successful integrations on mainpath p. day
- Release cadence stable and predictable
- High quality releases
- Overall *much less* time spent for integration

Comprehensive Continuous Integration & Testing has strong positive impact on effectiveness & efficiency: 5 x more daily integration's. Better distribution of integrations over time, no peak on final sprint day.

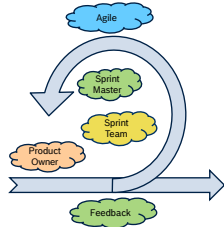
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Let it Grow - Agile Methods



SCRUM (SW & HW)

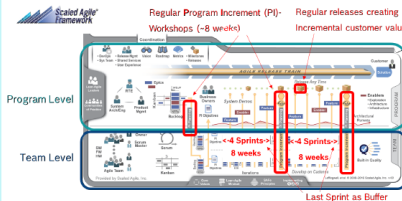
- A-Spice combined with agile methods
- Reduce batch size
- Early feedback
- Reduce rework



5 Teams supported by AS&P @ Radar HW

SAFe^{®1}

Method to synchronize several agile teams and programs



KANBAN



FLOW / LEAN

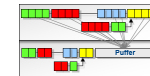
- Right approach for efficiency
- “80%” Goal with stable capacity

FLOW



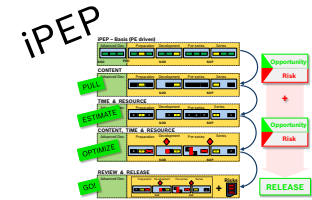
LEAN Teamboards

CCPM³



iPEP²

- “Just enough process”
- Tailoring to the project
- Active risk management



Project team: Pull your method

¹ SAFe = Scaled agile framework

² iPEP = Intelligent product engineering process

³ CCPM = Critical chain (multi) project management

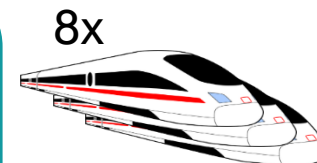
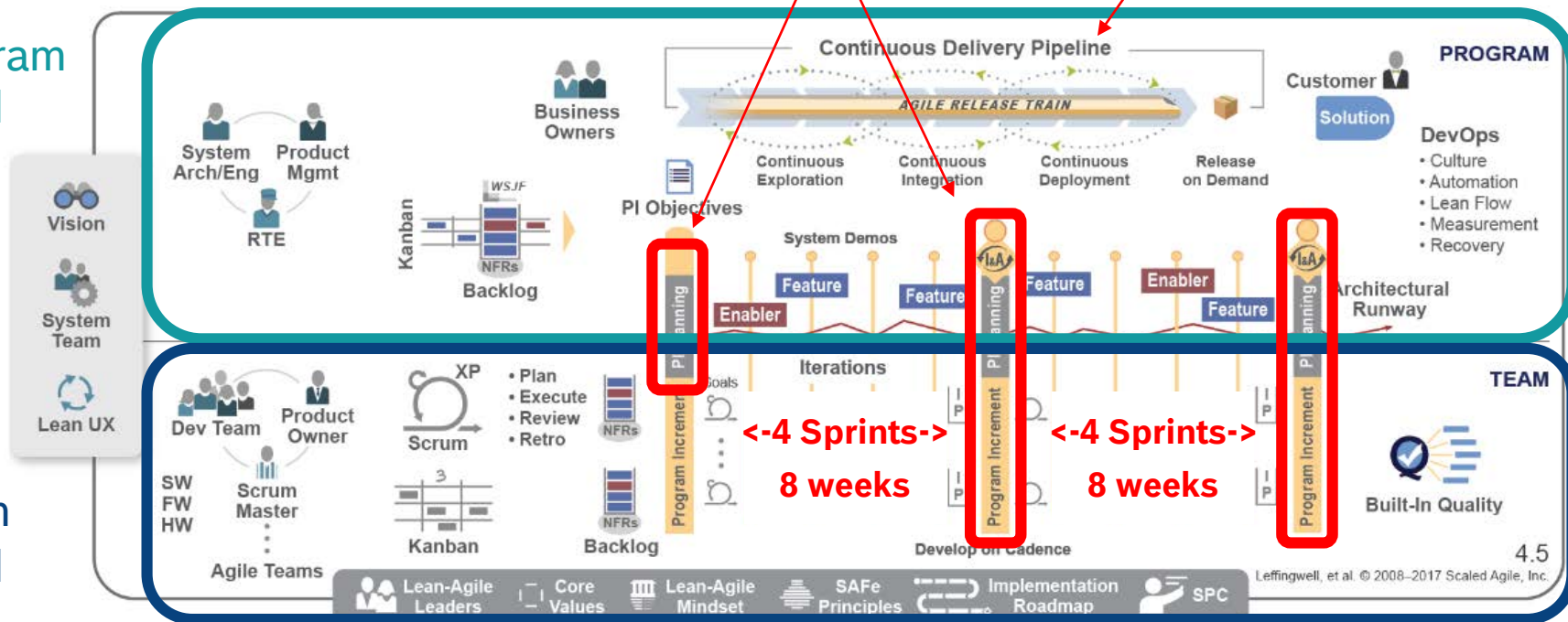
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Let it Grow – More than 900 Associates in SAFe® Concept



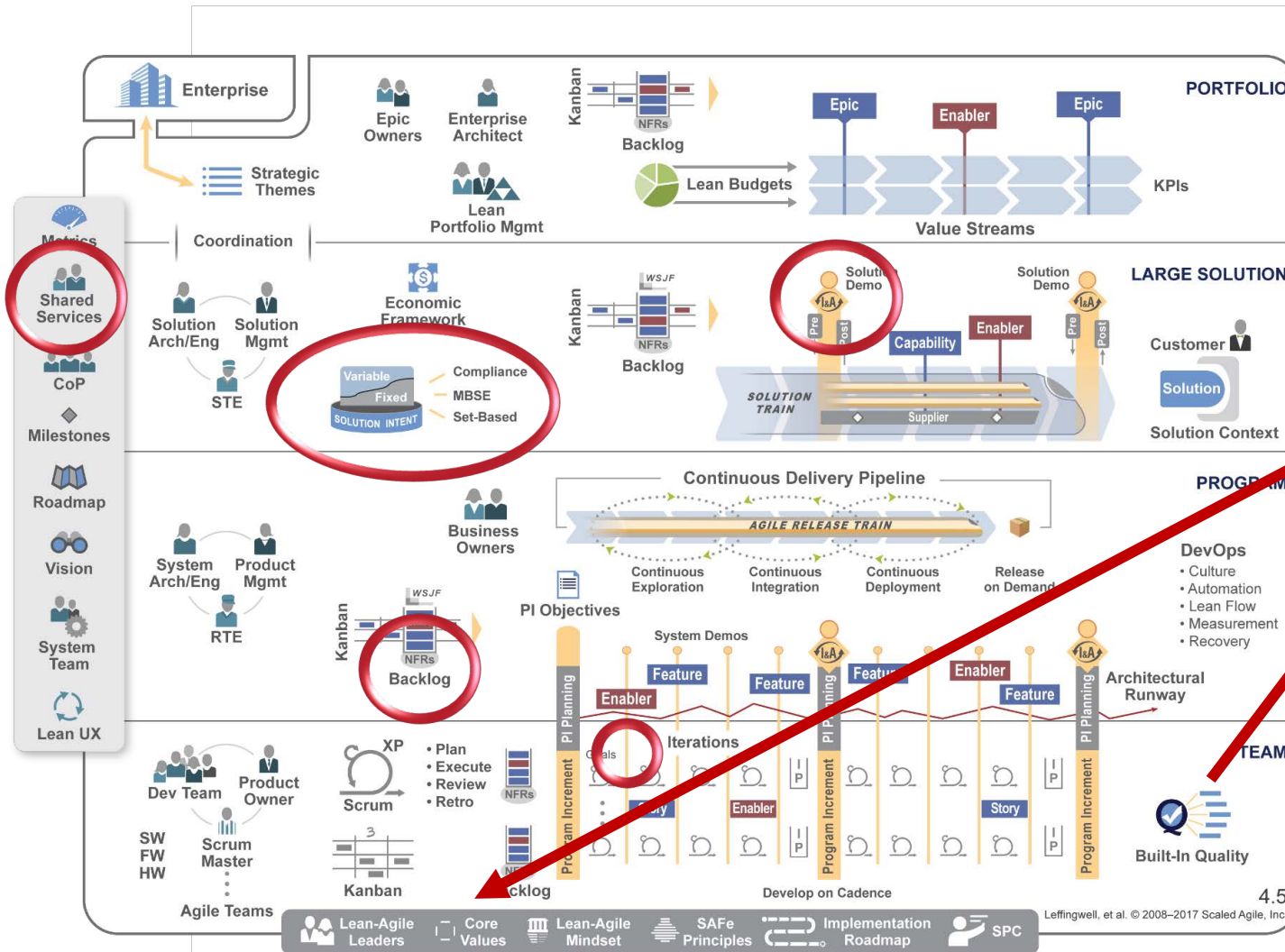
Program Level

Team Level



SAFe® framework w/ 8-week Program Increment (PI) is applied in most of our major platform programs. Release of shippable SW at end of each PI. SAFe® enables high transparency and empowered teams.

SAFe Framework - einige Qualitätsdimensionen



1. Built-In Quality
2. Program execution
3. Alignment
4. Transparency

Driver Assistance and Automated Driving

Turn the Pyramid – Agile Values & Principles



- ▶ We are uncovering better ways of developing software by doing it and helping others do it.
- ▶ Through this work we have come to **value**:
 - **Individuals and interactions** over processes and tools
 - **Working software** over comprehensive documentation
 - **Customer collaboration** over contract negotiation
 - **Responding to change** over following a plan
- ▶ That is, while **there is value in the items on the right**, we value the items on the left more.

*Kent Beck
Mike Beedle
Arie van Bennekum
Alistair Cockburn
Ward Cunningham
Martin Fowler*

*James Grenning
Jim Highsmith
Andrew Hunt
Ron Jeffries
Jon Kern
Brian Marick*

*Robert C. Martin
Steve Mellor
Ken Schwaber
Jeff Sutherland
Dave Thomas*

Source: <http://agilemanifesto.org/>

The agile values and principles have to be read carefully and implemented the right way.

Driver Assistance and Automated Driving

Turn the Pyramid – Agile Values & Principles



1. Our highest priority is to **satisfy the customer** through early and continuous delivery of valuable software.
2. Welcome **changing requirements**, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software **frequently**, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must **work together** daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and **trust them** to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is **face-to-face** conversation.
7. Working software is the primary **measure of progress**.
8. Agile processes promote **sustainable** development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to **technical excellence** and good design enhances agility.
10. **Simplicity**--the art of maximizing the amount of work not done--is essential.
11. The best architectures, requirements, and designs emerge from **self-organizing** teams.
12. At regular intervals, the team reflects on how to become more effective, then **tunes and adjusts** its behavior accordingly.

Source: <http://agilemanifesto.org/>

Technical excellence is one of the 12 key principles of agile (software) development.

Driver Assistance and Automated Driving

Turn the Pyramid – Agile Values & Principles



Driven by Purpose with Respect for Reality

- ▶ Focus on commercial needs without losing sight of technical feasibility
- ▶ Purpose driven adaption of methods, tools, principles
- ▶ Maintain sustainable pace
- ▶ Ensure required excellence in teams

Iteration & Adaptation

- ▶ Commitment to milestones & SOP with preference of iterative approach over detailed long term planning
- ▶ Openness that requirements might change at any time, considering effects & profitability
- ▶ Strive for continuous integration & testing

Entrepreneurial Thinking

- ▶ Focus on customer feedback & needs
- ▶ Employ the simplest solution that works (i.e. satisfies the market) but avoid technical debt
- ▶ Shippable increments and working products are the primary measure of progress

People & Interactions

- ▶ Servant & positive leadership
- ▶ Shift decision making to lowest adequate level
- ▶ Assembly of self-organizing and empowered teams and trust in their decisions
- ▶ Preference of co-located teams
- ▶ Work in a cross functional manner

**The agile principles have to be interpreted in each specific business context.
In this case for driver assistance and autonomous driving.**

Driver Assistance and Automated Driving

Turn the Pyramid – Agile Values & Principles



Driven by Purpose with Respect for Reality

- ▶ Focus on commercial needs without losing sight of technical feasibility
 - ▶ Purpose driven adaption of methods, tools, principles
 - ▶ Maintain sustainable pace
 - ▶ *Ensure required excellence in teams*
-
- ▶ Self-empowered teams can only commit if the required capability is given
 - ▶ Trust only in teams who have the competence to take relevant decisions
 - ▶ Excellent teams have the ability to take the right prioritization (soft-skills, experience)
 - ▶ Apply proven ratings of excellence in artifacts (EN ISO 9001, IATF 16949, IEC 61508 / ISO 26262, ISO/SAE AWI 21434 / J3061, ISO/IEC 15504 / Automotive SPICE, state of the art, thresholds for technical debt)

Our understanding of technical excellence (agile principle #9).

VDA AK “Agile Collaboration” Charter



► Motivation

- More agile forms of collaboration are required (due to disruptive digital business models, connectivity and networking with the internet of things, and capital-intensive competitors from other industries).
- For development of vehicle electronics and software, vehicle manufacturers and suppliers aim to jointly form a cross-organizational community of practice, the "Agile Automotive Community".
- Topic-specific working groups address key questions of cooperation (common body of knowledge).

► Objectives

- Enable **new development partnerships among future partners** in automotive.
- Develop new SW-specific solutions **with highest level of customer satisfaction and quality**.
- Consider **aspects of contract design** as well as cross-company (OEM / suppliers) agile development teams.

► Organization

- Open for contributions, built and maintained by users and practitioners from the automotive industry (OEM / suppliers).
- Protect the community results while at the same time make it generally accessible for contributors as well as interested parties.
- Organizes its work under the umbrella of the VDA – **in strict compliance with VDA's competition law guidelines**.

VDA AK “Agile Collaboration”

Collaboration Types and Quality Focus

Characteristics	Linked Collaboration	Aligned Collaboration	Combined Collaboration	Embedded Collaboration
Description of scope and objectives	OEM requests still by traditional requirement specifications	Supplier has responsibility for solution	Like teams within the same company	<i>Out of scope?</i> <i>(Extended workbench)</i>
Roles	<ul style="list-style-type: none"> • Chief Product Owner (OEM) • Product Owner / Proxy Product Owner • Agile Master (OEM, Tier) • Agile Teams (OEM, Tier) • Agile Entrepreneur (OEM, Tier) • Safety Product Owner (OEM, Tier) • Quality Product Owner (OEM, Tier) • Project manager (Tier, commercial issues) 	<ul style="list-style-type: none"> • Chief Product Owner (OEM) • Product Owner / Proxy Product Owner • Agile Master (OEM, Tier) • Agile Team (OEM, Tier) • Agile Entrepreneur (OEM, Tier) • Safety Product Owner (OEM, Tier) • Quality Product Owner (OEM, Tier) • Project manager (Tier, commercial issues) 	<ul style="list-style-type: none"> • (Chief Product Owner (OEM)) • Product Owner (OEM or Tier) • Agile Master • Agile Teams (shared) • Agile Entrepreneur (OEM, Tier) • Safety Product Owner • Quality Product Owner 	<ul style="list-style-type: none"> • (Chief Product Owner (OEM)) • Product Owner • Agile Master • Agile Teams • Agile Entrepreneur (OEM, Tier) • Safety Product Owner • Quality Product Owner
Artifacts	<ul style="list-style-type: none"> • supplier delivers ready-to-use SW packages • each party has its own backlog • deliveries of the defined scope 	<ul style="list-style-type: none"> • common product backlog • agreed iteration scope / deliverables 	<ul style="list-style-type: none"> • scope and deliverables for the iteration • tasks and test of the next iteration • common build, integration, source control 	
Ceremonies	<ul style="list-style-type: none"> • request early feedback from the OEM on deliveries in an mature system 	<ul style="list-style-type: none"> • common prioritization of tasks • common refinement of the backlog • intensive communication necessary 	<ul style="list-style-type: none"> • common planning and review ceremonies • commonly manage/ prioritize defects • common planning, review and retrospectives 	
Tools	<ul style="list-style-type: none"> • infrastructure to share information 	<ul style="list-style-type: none"> • shared ticket / defect tracking system 	<ul style="list-style-type: none"> • length of the iteration • manage all defects in a ticket system • common source CM, CI, validation system 	
Workflow	<ul style="list-style-type: none"> • asynchronous work of both parties • alignment on releases or milestone level • define a full change mgmt. process 	<ul style="list-style-type: none"> • aligned schedule for integration / test • aligned planning and review method 	<ul style="list-style-type: none"> • 	
Agreements	<ul style="list-style-type: none"> • technical OEM representatives must be available to clarify open questions 	<ul style="list-style-type: none"> • communication techniques • availability of stakeholders • deliverables can be tested completely • the maturity of deliverables is high • automated test coverage is high • short-term feedback on deliverables • defect removal with highest priority • fixed scope: supplier controls backlog 	<ul style="list-style-type: none"> • Time-and-Material contract • plan for the iteration has priority • impediments are openly communicated • IP parts are black box contributions • parts added as black box ready to use 	<ul style="list-style-type: none"> • OEM takes care that the milestone are met, the whole project management tasks are on his side • OEM defines the frequency of delivery, where delivery is the increment and its content

Quality is key – no matter which collaboration model

Blue: typical agile
Green: agile / classical
Black: typical classical (?)

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THANK YOU