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LIVEWORX

A NEW ERA IN PRODUCT LIFECYCLE INNOVATION

SESSION ID: PL1111B

DIGITAL PRODUCT TRACEABILITY IN AUTOMOTIVE

SPEAKER(s): **Rainer Eidloth**
SVP Engineering IT & Digitalization
SCHAEFFLER AG

Helmut Huprich
VP Engineering Applications
SCHAEFFLER AG

16.05.2023

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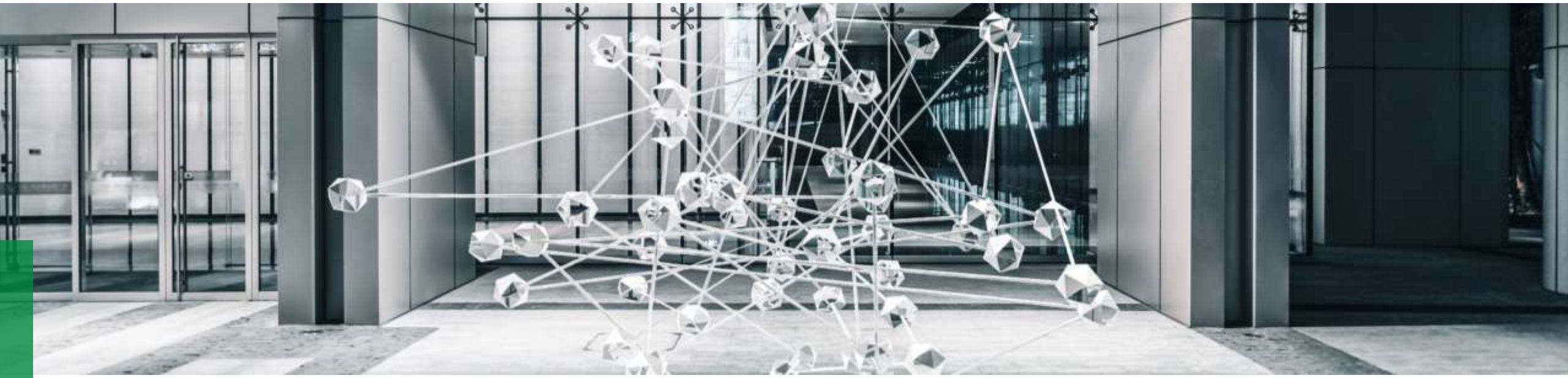

Digital Product Traceability in Automotive

Rainer Eidloth and Helmut Huprich
May 16th, 2023

We are Schaeffler – A world-leading technology business

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As a **leading global supplier to the automotive and industrial sectors,** the Schaeffler Group has been driving forward groundbreaking inventions and developments in the fields of motion and mobility for over 75 years. With **innovative technologies, products, and services** for electric mobility, CO_2-efficient drives, chassis solutions, Industry 4.0, digitalization, and renewable energies, the company is a reliable partner for **making motion and mobility more efficient, intelligent, and sustainable** – over the entire life cycle.

Schaeffler facts and figures – One of the world's largest family-owned companies

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As of December 31, 2022 | [1] Before special items

Pioneering work undertaken in motion and mobility – Our Key Topics

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Innovation

We work to bring about the technologies of the future and, in doing so, create the basis for our innovations to make tomorrow's worldwide mobility even better than it is today. One thing we know for sure is that mobility means progress.

Sustainability

The fight against climate change requires forward-looking technologies that promote the switch to renewable energies. The Schaeffler Group develops innovative product solutions for the demands of the future.

Digitalization

There is no escaping the digitalization trend in today’s world. This is literally happening everywhere. State-of-the-art information technologies offer a host of potential. The increasing merging of the real and digital worlds opens up opportunities for Schaeffler and its customers along the entire value-added chain.

Schaeffler products facilitate and shape mobility – Our customer sectors

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Two-wheelers

Cars & Light Commercial Vehicles

Truck & Bus

Off-road

Rail

Aerospace

Raw Materials

Industrial Automation

Power Transmission

Wind

Our three divisions at a glance

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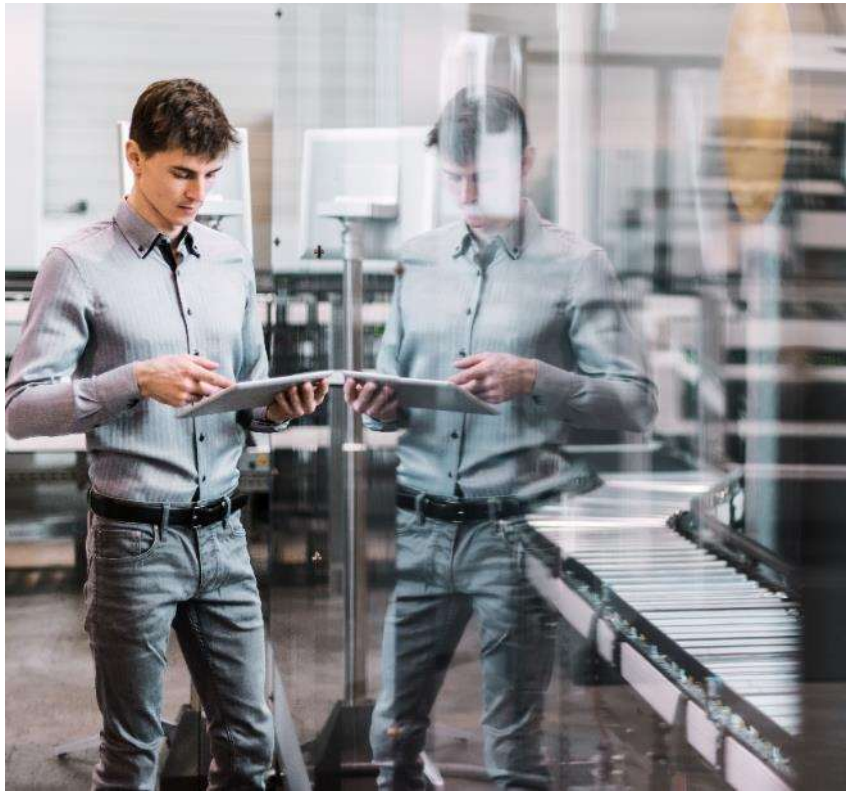
Automotive Technologies

Groundbreaking solutions for every drive concept

Automotive Aftermarket

Customized solutions for the automotive aftermarket



Industrial

Products and solutions for the industry of the future

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Four focus areas for digital solutions across our business

1 Digital for bottom-line excellence

Digital **Workplace**

- White- and Blue-Collar Workplace & Collaboration
- Specialized Workplaces for dedicated functions

Cyber-physical **Equipment**

- Smart Factories
- Smart Warehouses
- Machinery & Robotics
- Test Rigs

Digital **Value Chain**

- Direct Processes (R&D, Operations, Sales, etc.)
- Indirect Processes (HR, Finance)
- End-to-End Process Integration
- Online customer engagement Platforms
- eCommerce Platforms

Digitalization **for** Schaeffler

2 Digital for top-line growth

Smart **Product**

- Embedded Software
- Embedded Sensors & Actuators
- Connectivity
- MRO-Services (Condition Monitoring, etc.)
- Industry 4.0 services
- Mobility services

Digitalization **by** Schaeffler

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Innovations derived from system understanding

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Need for Change

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What challenges do our engineers face today in product development?

What do we believe that R&D users will need in the future?

How can we ensure that our organization delivers what the developers need?

Schaeffler is facing major challenges in Product Development

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New Product & Service Portfolio
- Strong system competencies
- Analytics and AI capabilities in combination with IoT for services

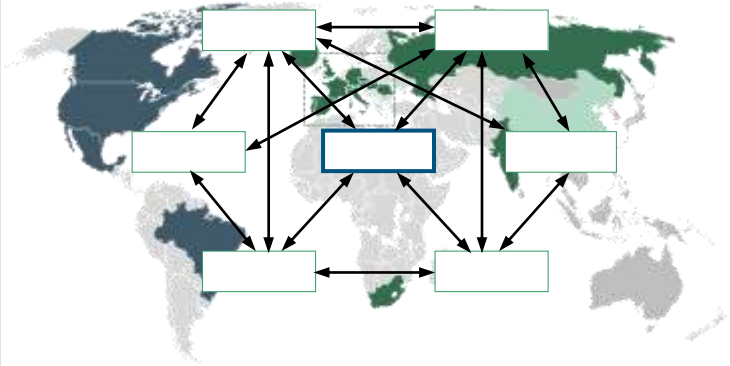
Growing product complexity and risks
- Entire life cycle focus
- Growing software and E/E content

Globalization and Protectionism
- Complex supplier structures continue
- Partnerships lead the way

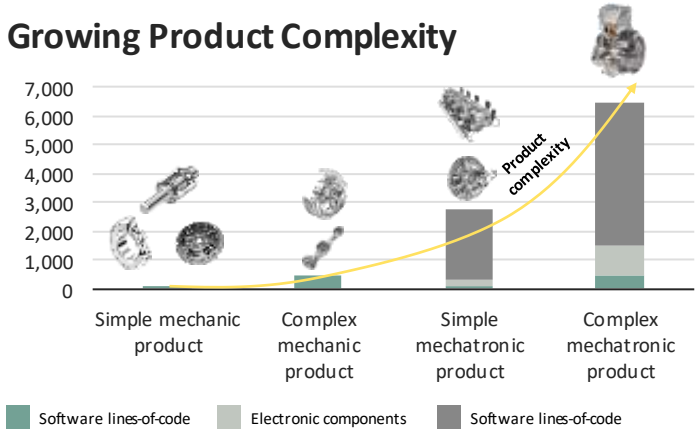
Compliance & Sustainability
- Material compliance and CO_2 footprint
- End to end traceability is must have

New Product & Service Portfolio

Globalization & Protectionism



Growing Product Complexity



Compliance & Sustainability

(e.g. Legislation, Environment, A-SPICE, FuSa)

Manage complexity in challenging projects

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Challenges

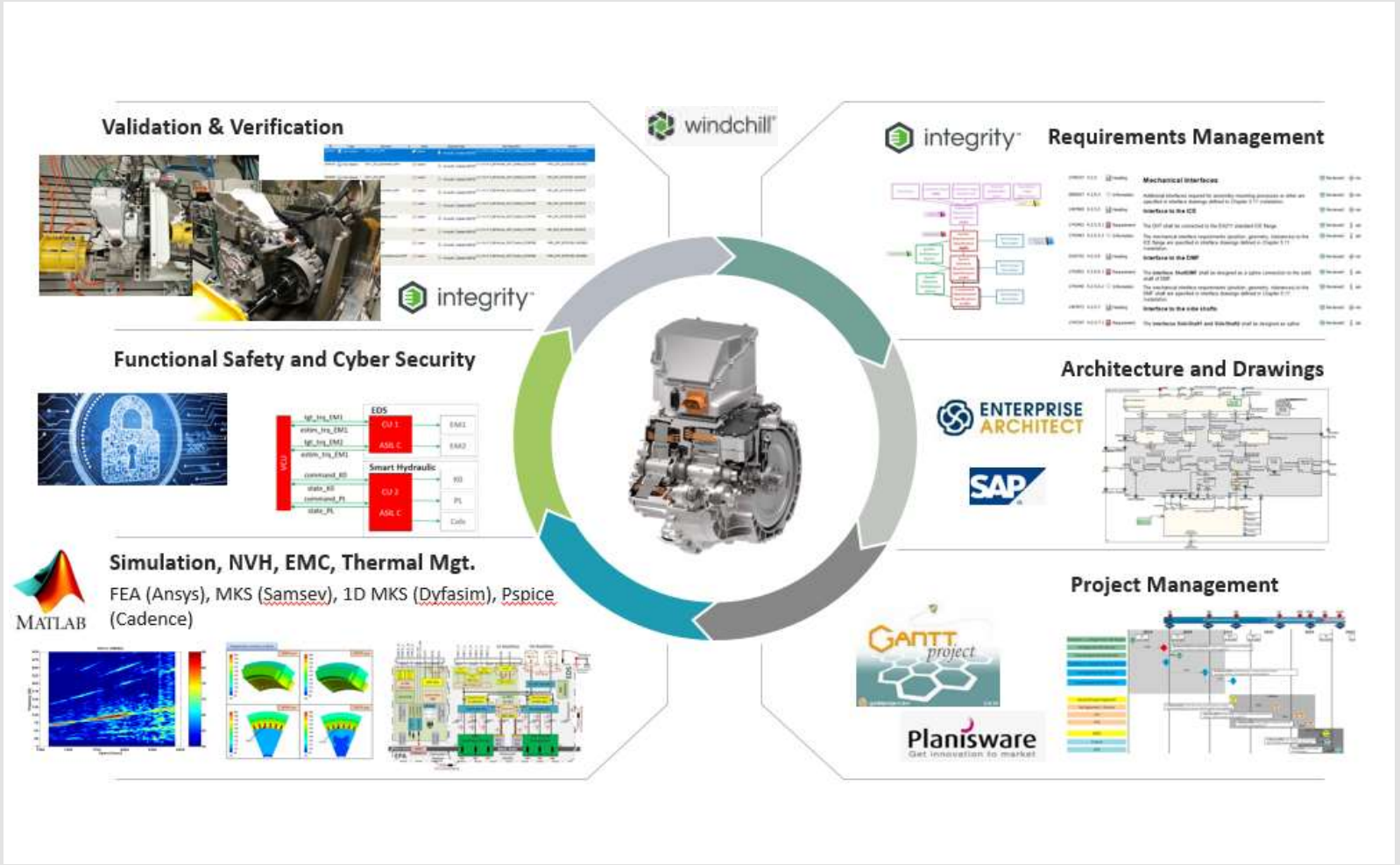
- Consistency between Project Management, Engineering and Realization
- Barrier-free cross functional Change & Configuration Management
- Transparent Reporting/KPIs
- Traceability between changes

> 7.000 customer requirements

> 300 components

> 300 team member

In cross discipline collaboration



Today Working Environment – Example *Systems Engineer*

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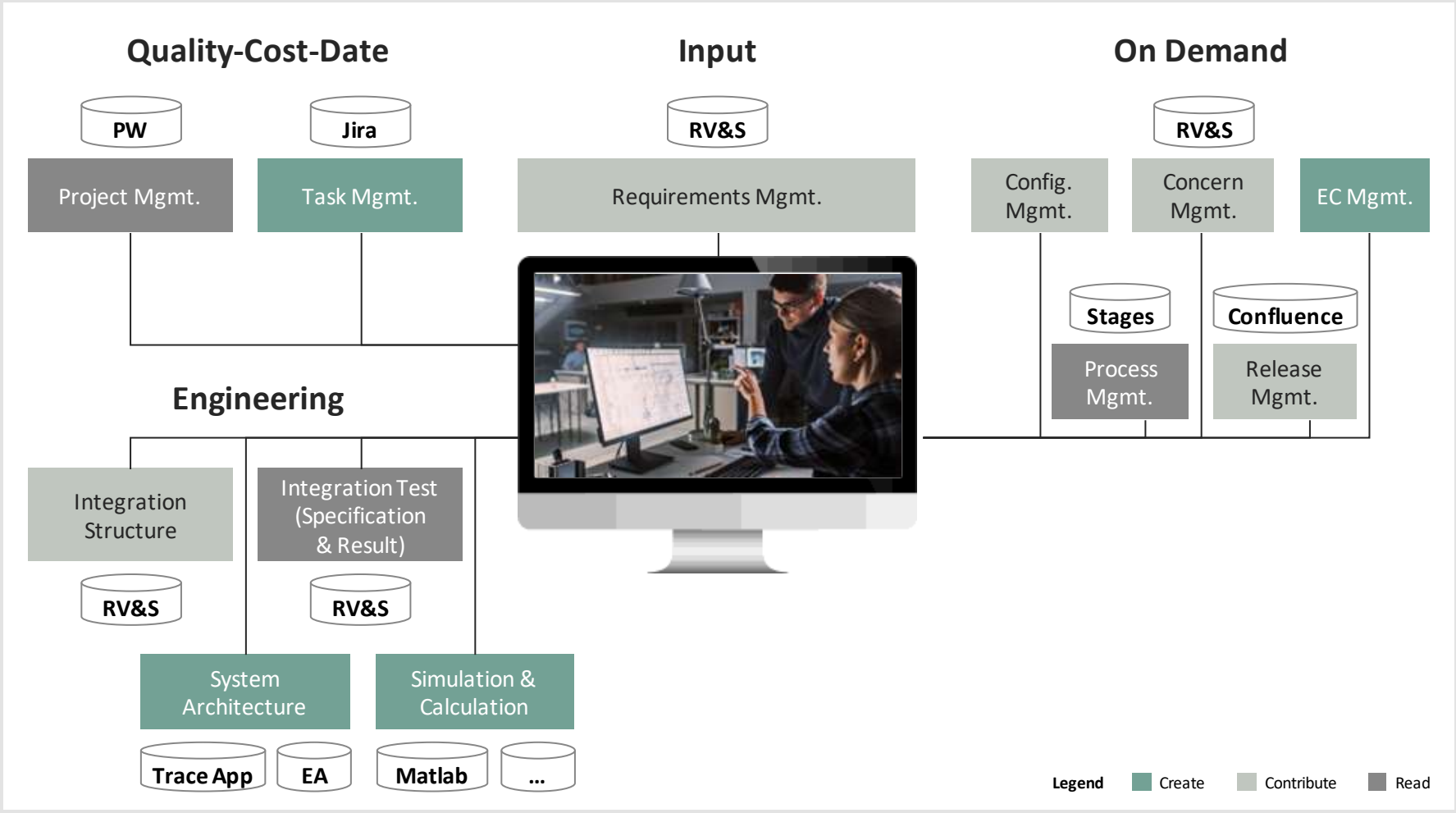

Potential for improvement

- **Increasing complexity** and missing transparency
- **Missing automation** of functionality within IT-solutions
- **Manual interfaces** between engineering areas
- Ensure **compliance with** all relevant **standards**
- **Necessary qualification** of several solutions

Workplace with an integrated user interface – Mockup for *Systems Engineer*

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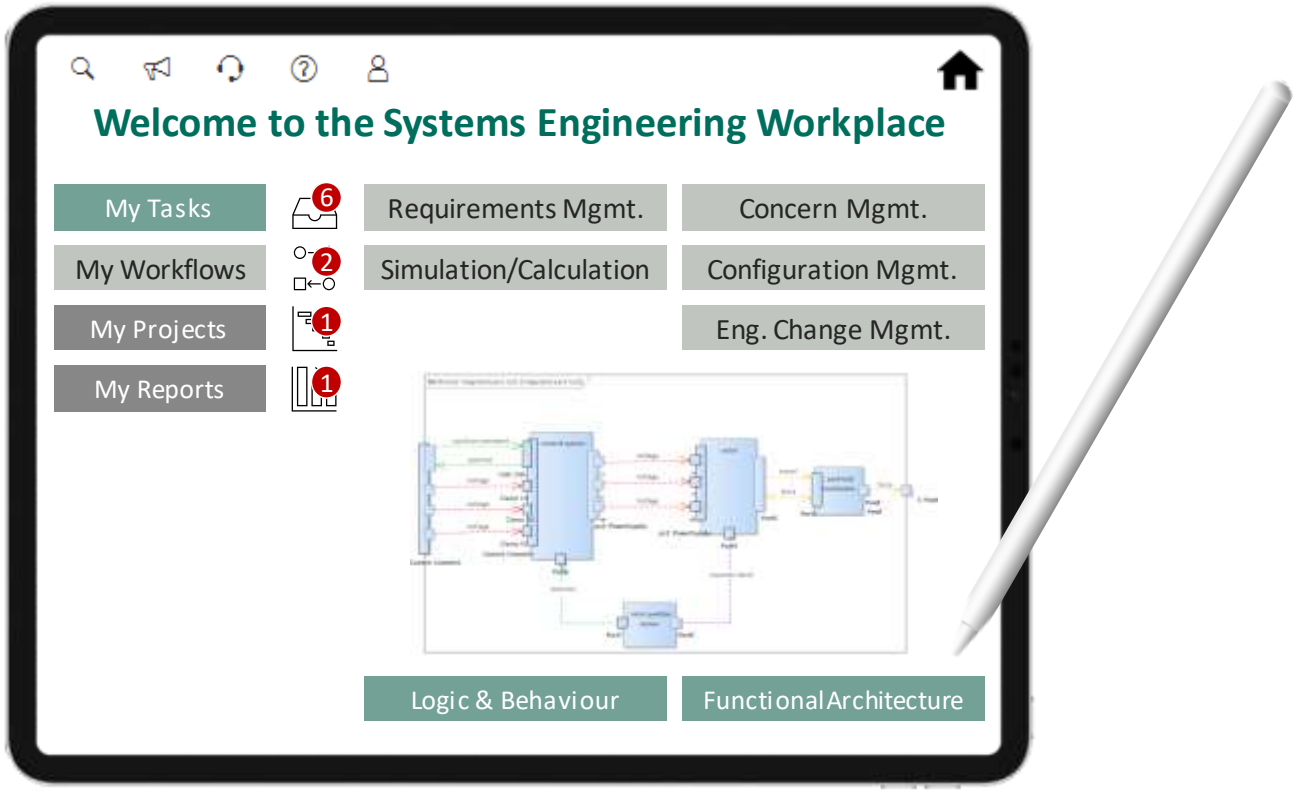

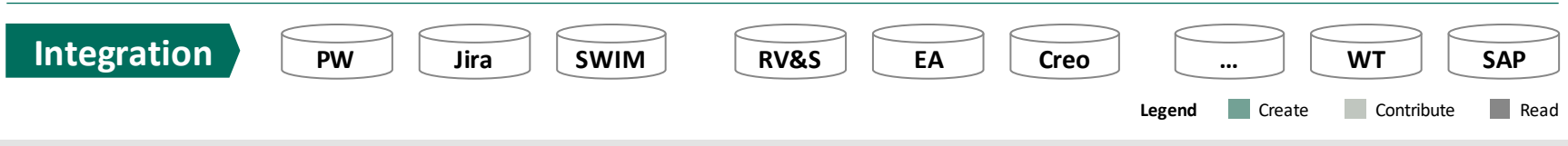

Workplaces

- Are a single point of access/entry
- Ensure context driven information and traceability
- Offer a uniform user interface
- Are modular and flexible, based on R&D roles

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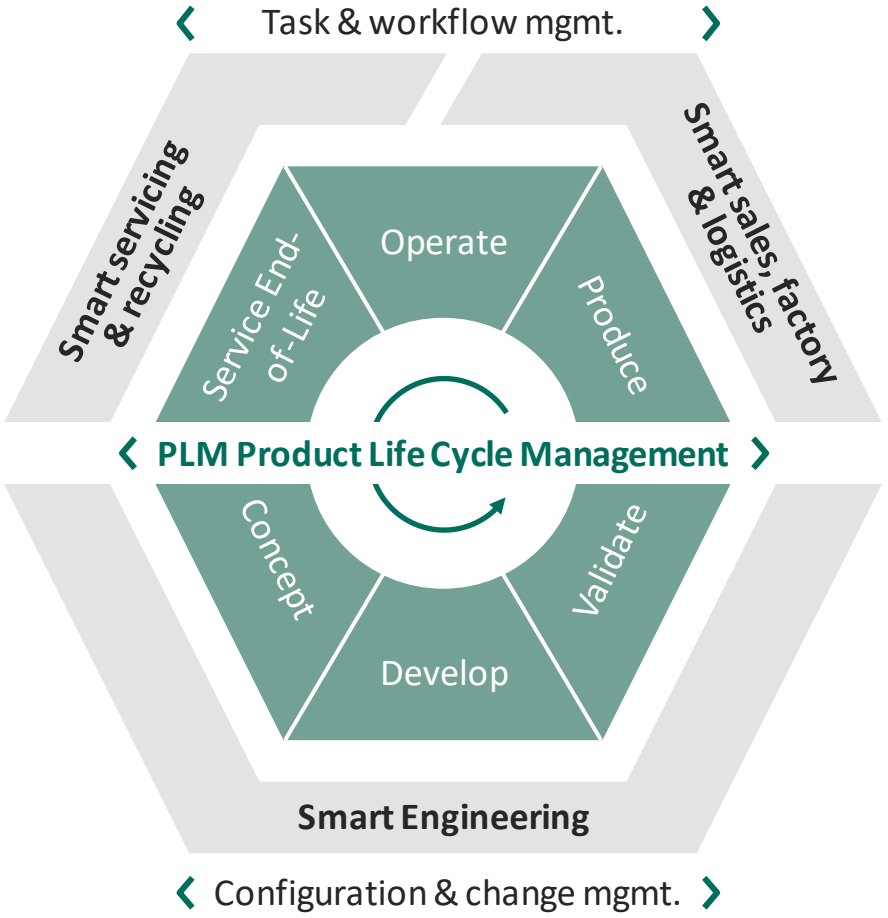
Smart Engineering as foundation for the closed loop life cycle is our focus

Digital sales & services based on new business models

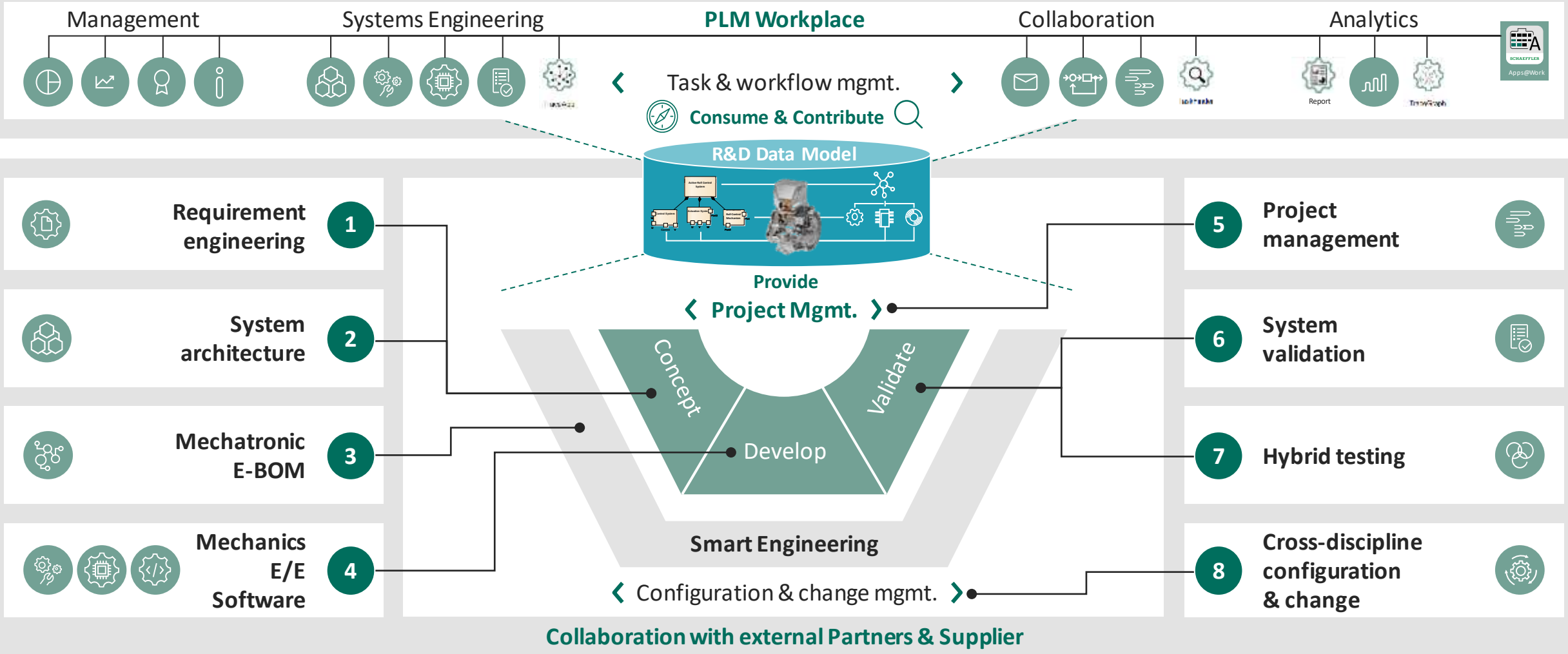
(Model-based) Multidisciplinary product, production and service engineering



Customer & supply chain integration | Industry 4.0 innovations

Virtual/physical verification/ validation and integration

Big Picture: Cross-Discipline Collaboration and Traceability



The simplified approach of PLM-Workplace to support MBSE

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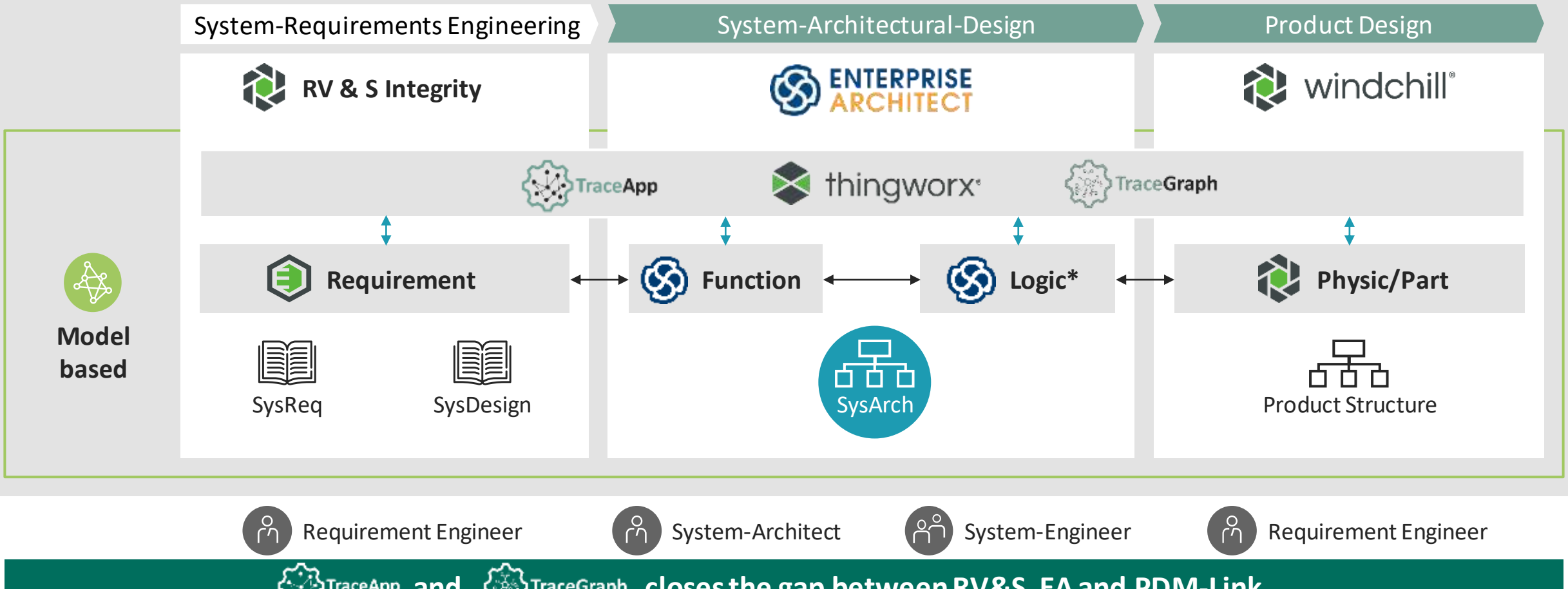

MBSE = Model-Based Systems Engineering | PLM = Product Lifecycle Management | Logic* = Physical Technical Architecture ⟷ System Trace bidirectional ⟷ Information exchange

TraceApp and TraceGraph in use by the Pilot “Steer by Wire”

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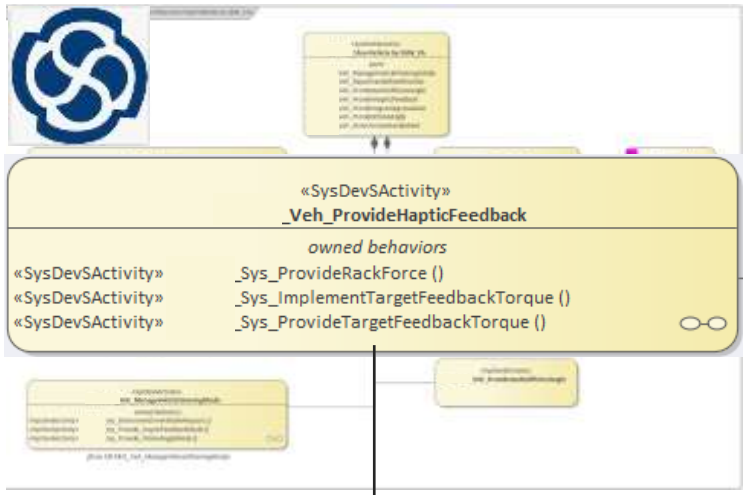

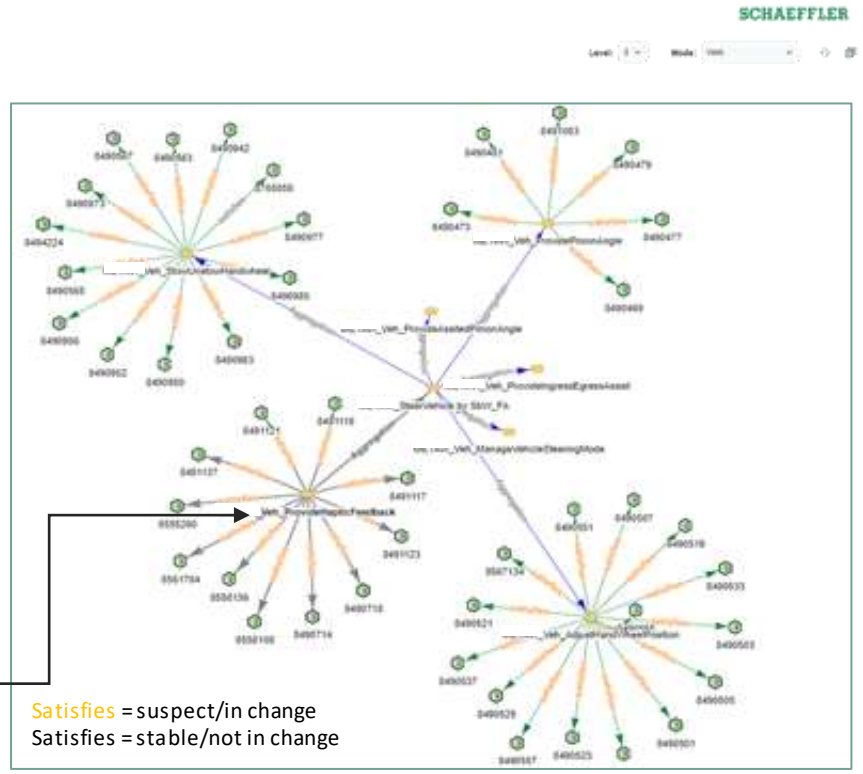

TraceApp and TraceGraph makes it easy to understand relations between architecture and requirements across tool boundaries. Impact and changes can be analysed including side effects.

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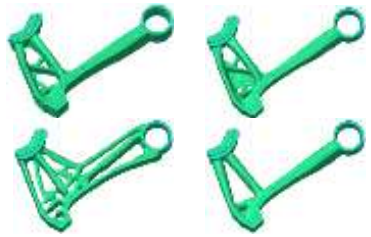
Generative Design (GTO/GDX)

1 Digital for bottom-line excellence

Project **Information**

- Introduce **Generative Design** (GD) into Schaeffler CAD environment
- Duration one year
- Cooperation with **University Bayreuth**
- Supported by ptc

PTC **Tools**



- Generative Topology Optimization (GTO)
- Generative Design Extension (GDX SAAS)

Generative Design

Project **Status**

- Focus **Additive Manufacturing**
- 18 Use Cases in Scope
- Guideline in work
- 3 Months left

2 Key Findings today

Findings **GTO & GDX**

- **Flow of forces** clearly visible
- GD enables **new design solutions** & methodologies
- GDX – very **fast calculation of many variants**
- Up to **43% save of mass (Sustainability)**

Explore Augmented Reality @ Schaeffler

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1 Augmented Reality @ Schaeffler

Project **Information**

- Make Augmented Reality available at Schaeffler
- Starting point: Learning & Documentation
- Supported by

ptc

PTC **Tools**

creo · vuforia · thingworx · vuforia studio

- Vuforia Expert Capture (VUFEC)
- Vuforia Studio
- ThingWorx
- Creo AR

Generative Design

Project **Status**

- Focus on **Remote Design Review**
- Further use cases in elaboration
- VUFEC and Creo AR in use

2 Key Findings today

Findings **Vuforia Expert Capture**

- SaaS beneficial in the maintenance context
- Cost reductions (onboarding, travel time, …)
- New ways of learning & collaboration
- Increase of quality

Agile Organization & Product oriented Structure

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Workplaces

PM | SE | SW | EE | ME | VV | PLM | ...

Applications

Cross Domain

- Eng. Change Mgmt.
- Config. Mgmt.
- Concern Mgmt.
- Order Mgmt.
- Obsolesc. Mgmt.
- Project Mgmt.
- Task Mgmt.
- Agile Methods
- E/E Design
- ME Design
- Req. Mgmt.
- Req. Mgmt.
- Simulation
- Embedded SW Dev.
- PDM
- AR & VR
- System Architecture
- Techn. Calculation
- Test Mgmt.

Integration Framework

- Reference Methods
- Eng. Data Mgmt.
- Proc. & Meth. Integr.
- IT Framework
- Authorization Mgmt.
- API Mgmt.
- R&D Architecture
- UI/UX

IT Product Management

- Business Engage-ment
- Portfolio Mgmt.
- Financial Mgmt.
- IT Process Controls
- Contract Mgmt.
- Eng. Data Exchange
- Operating Figures
- Demand Mgmt.
- Smart Standards

Guiding principles

- **Workplaces** are configured from different **Features** on a role-specific basis
- The **Integration Framework** ensures:
  - Features are mapping the process
  - Access to data in different IT systems
  - The connectivity of the IT tools is guaranteed
  - The user interface is consistent and intuitive
- **IT Product Management** ensures
  - KPI driven cost control
  - Efficient management of licenses
  - Value-based demand/ portfolio management

Take Aways

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1

With **fully integrated Engineering Solutions**, we are able **to run mechatronic business**

2

Process-awareness and **user centricity** is essential for **accepted Engineering Applications**

3

Holistic data model across all functions is mandatory for **intelligent functionalities and automation**

4

To be future proof Engineering Solutions must be easily **adaptable to new business models** or organizational changes

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We pioneer motion

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THANK YOU

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