

# TECHNOLOGIE PLATTFORMEN UND SOFTWARE

## - für digital vernetzte Produkte & Dienstleistungen

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# VERNETZUNG BEHERRSCHEN – DAS DIGITALE ABBILD ALS ORIENTIERUNG

(1) VERSTEHEN



Digital Product Definition



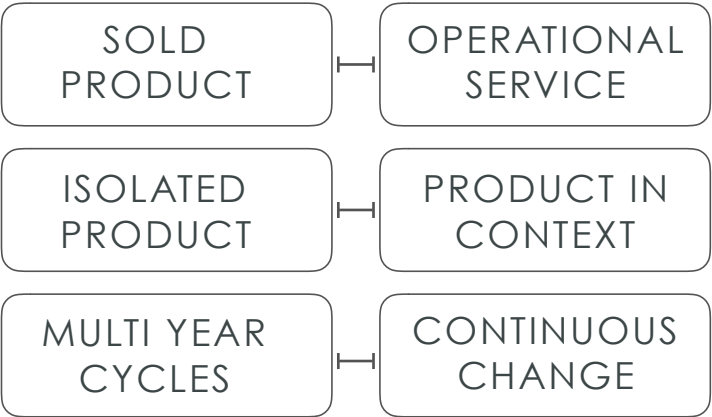
Real-World Product Data



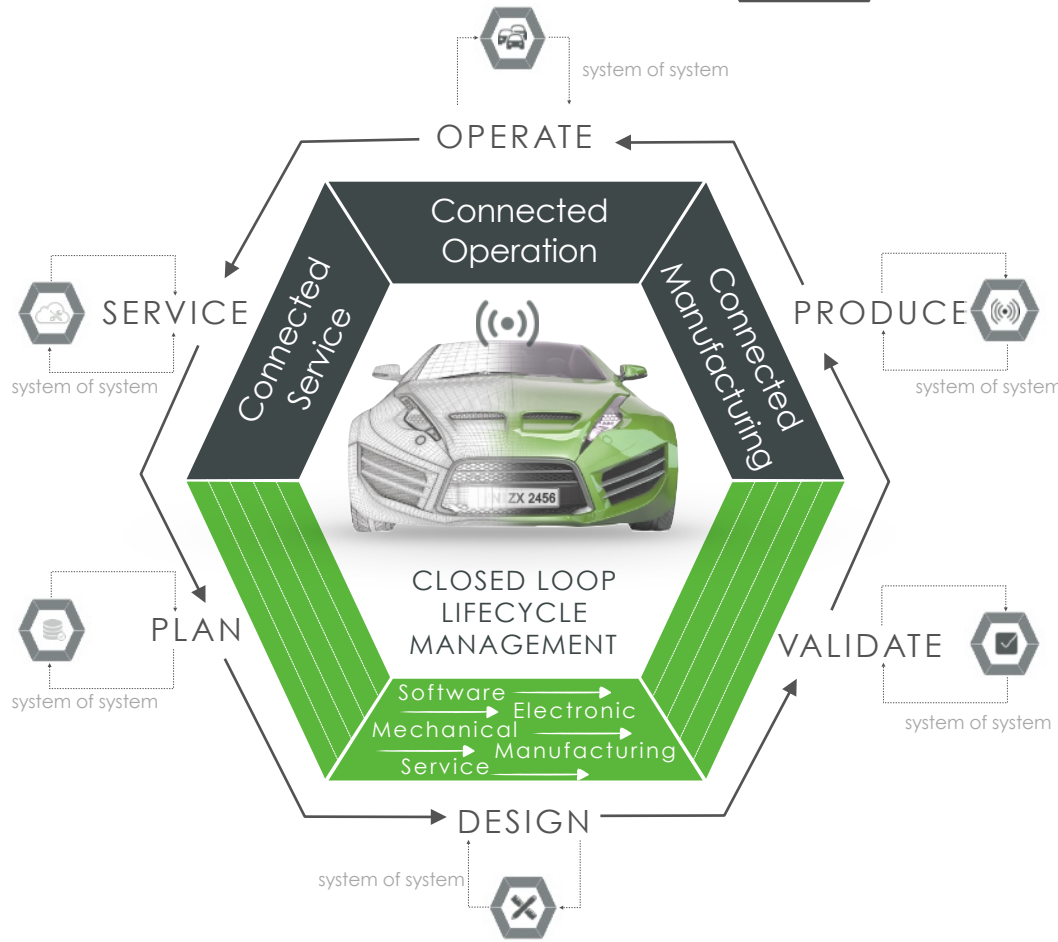
Creating smart, connected products



Leveraging smart, connected products



(2) BEHERRSCHEN







# WHO IS PTC?

*6,000 employees*

*\$1.3B software company*

*28,000 active customers*

*Headquartered in Boston, MA*

*Rich heritage in 3D modelling*

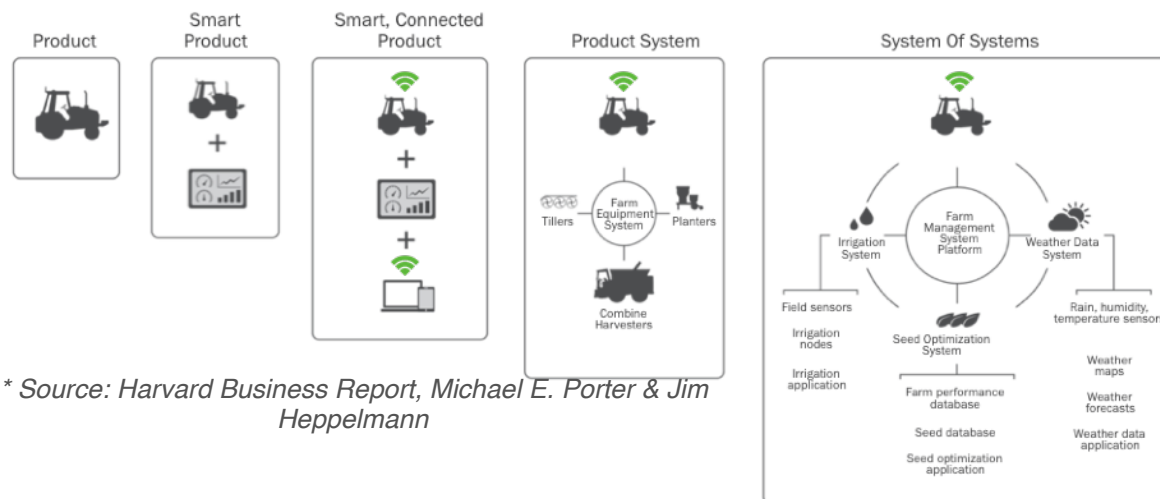
*Leader in CAD, PLM, SLM, ALM & IoT*

*Matriculated partner Aachen industry campus*



## THINGS ARE CHANGING

COMPLEXITY



\* Source: Harvard Business Report, Michael E. Porter & Jim Heppelmann

*“The changing nature of products is disrupting value chains, forcing companies to rethink and retool nearly everything they do internally.”*

## SOLUTIONS

CAD | **creo®**

PLM | **windchill®**

ALM | **integrity™**

SLM | **servigistics®**



Engineering



Manufacturing



Service



# COMPANIES ARE CHANGING



*“The changing nature of products is disrupting value chains, forcing companies to rethink and retool nearly everything they do internally.”*

## SOLUTIONS

CAD



PLM



ALM



SLM



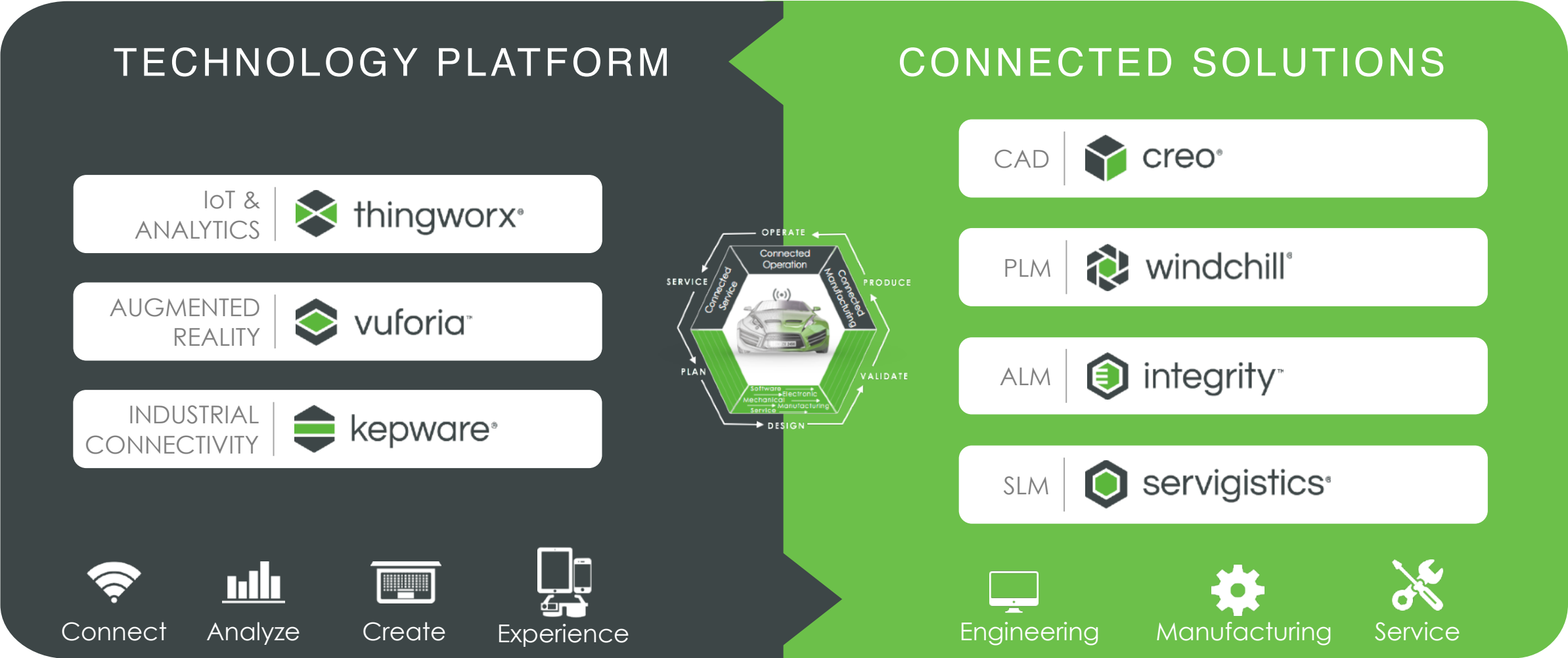
Engineering



Manufacturing



Service



# LIVING CLOSED LOOP INDUSTRY PRACTICES

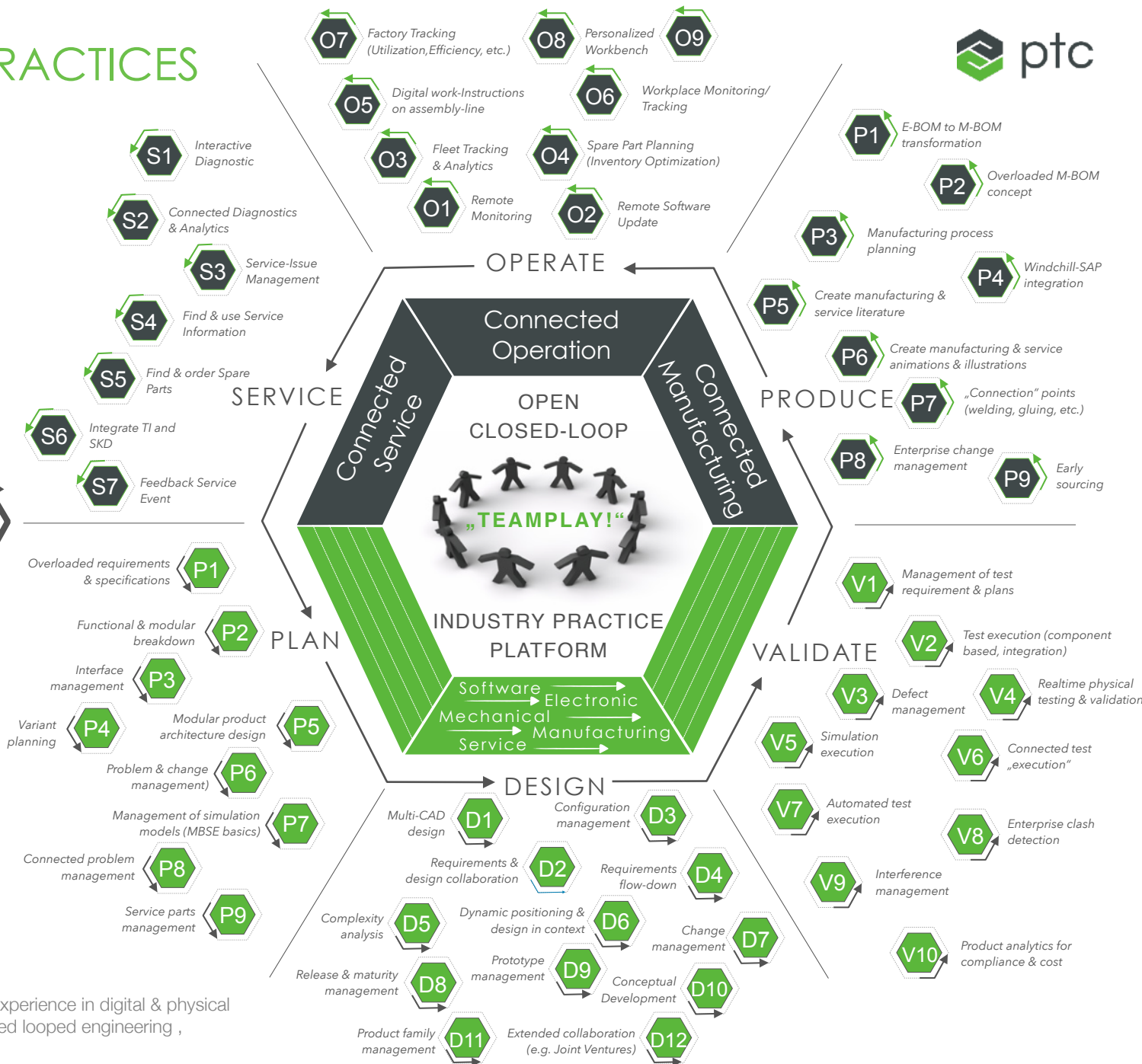
## Embedded in the industry

„located at the Aachen University Industry Campus, with a rich partner network of industry & research clusters, the E 4.0 TC enables the establishment of a close interaction between practice, research & education.“



Digital transformation experience center

A European PTC reference visit center to offer first-hand experience in digital & physical business transformation & industry practices, around closed looped engineering , manufacturing, service & operation.



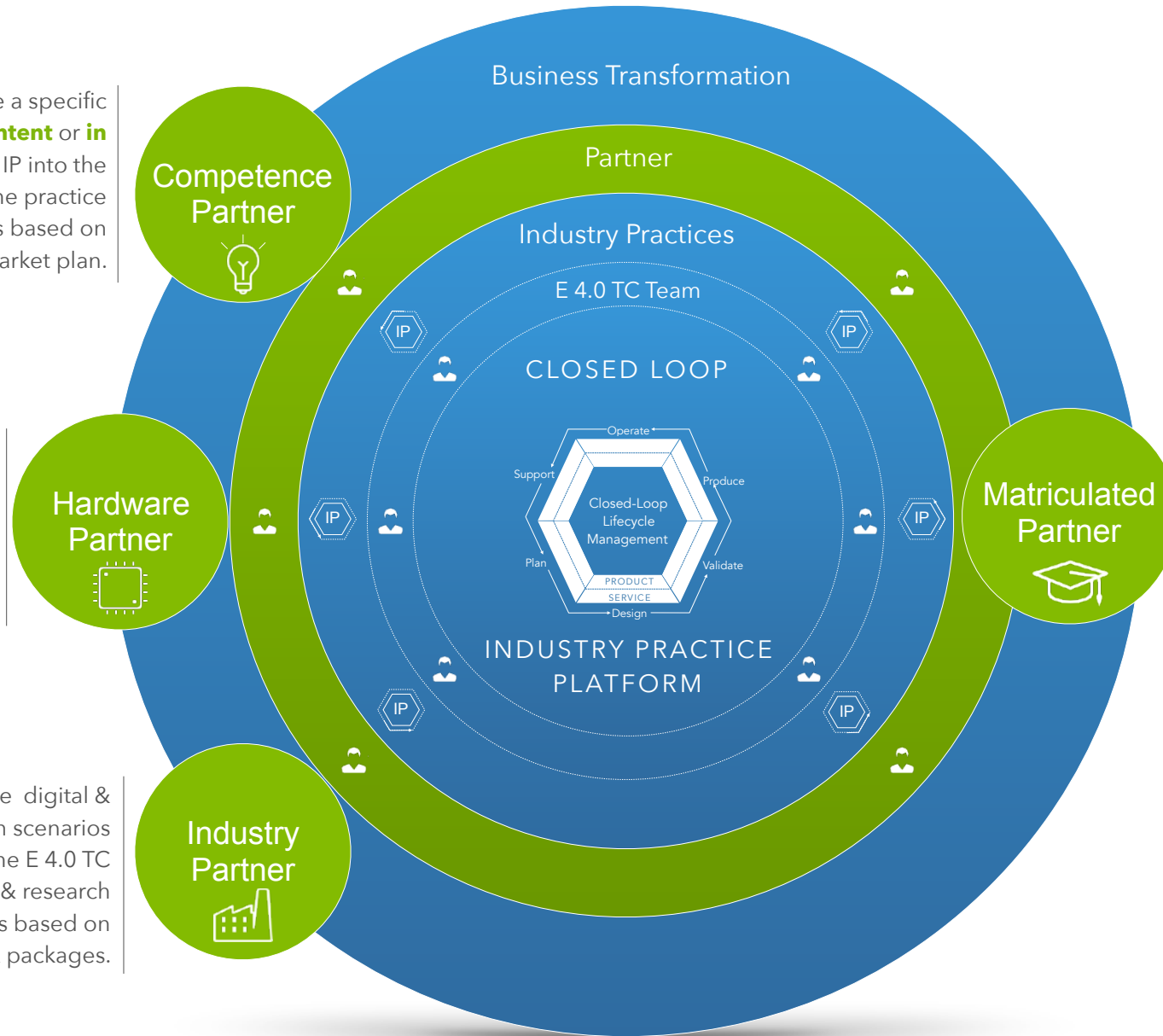


# E 4.0 TC - THE INTEGRATION & EXTENSION OF A OF PARTNER NETWORK

**Competence partner** provide a specific competence area, either **in content** or **in market access**. CP can integrate IP into the platform and/or benefit from the practice platform. Cooperation agreement is based on aligned go to market plan.

**Hardware partner** provide & integrate value added hardware assets & competence. HP benefit from the practice platform & infrastructure. Cooperation agreement is based on aligned go to market plan.

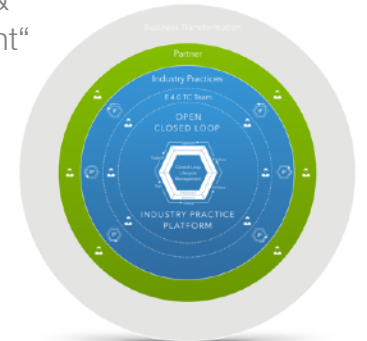
**Industry partner** develop and validate digital & physical business transformation scenarios utilizing the openness of the E 4.0 TC infrastructure, platform and industry & research expertise. Corporation agreement is based on specific project targets / work packages.



„**Develop** with partner a road map for digital & physical business **transformation** scenarios utilizing a rich industry & research expertise.“

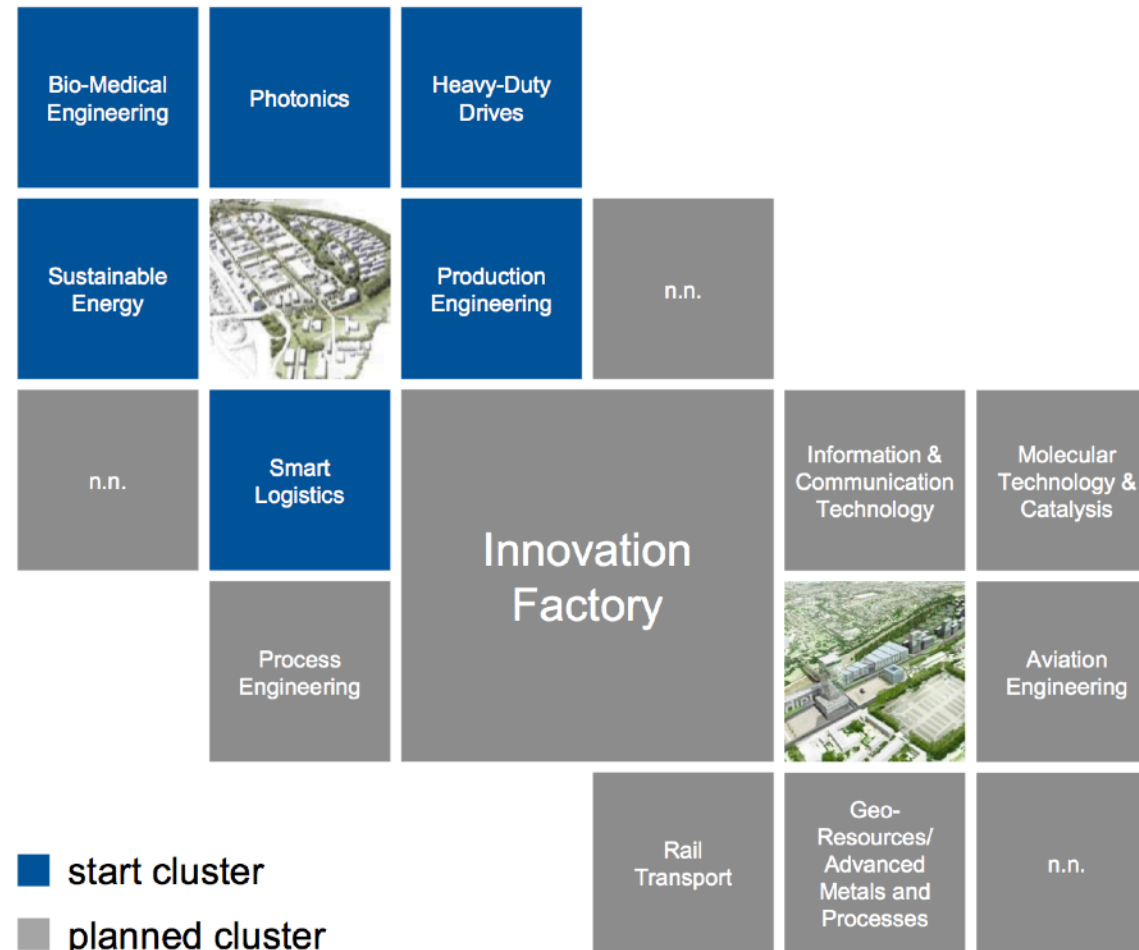


„**Partner** can utilize the open industry practice platform to **integrate**, develop & validate practices into a closed loop approach & environment“

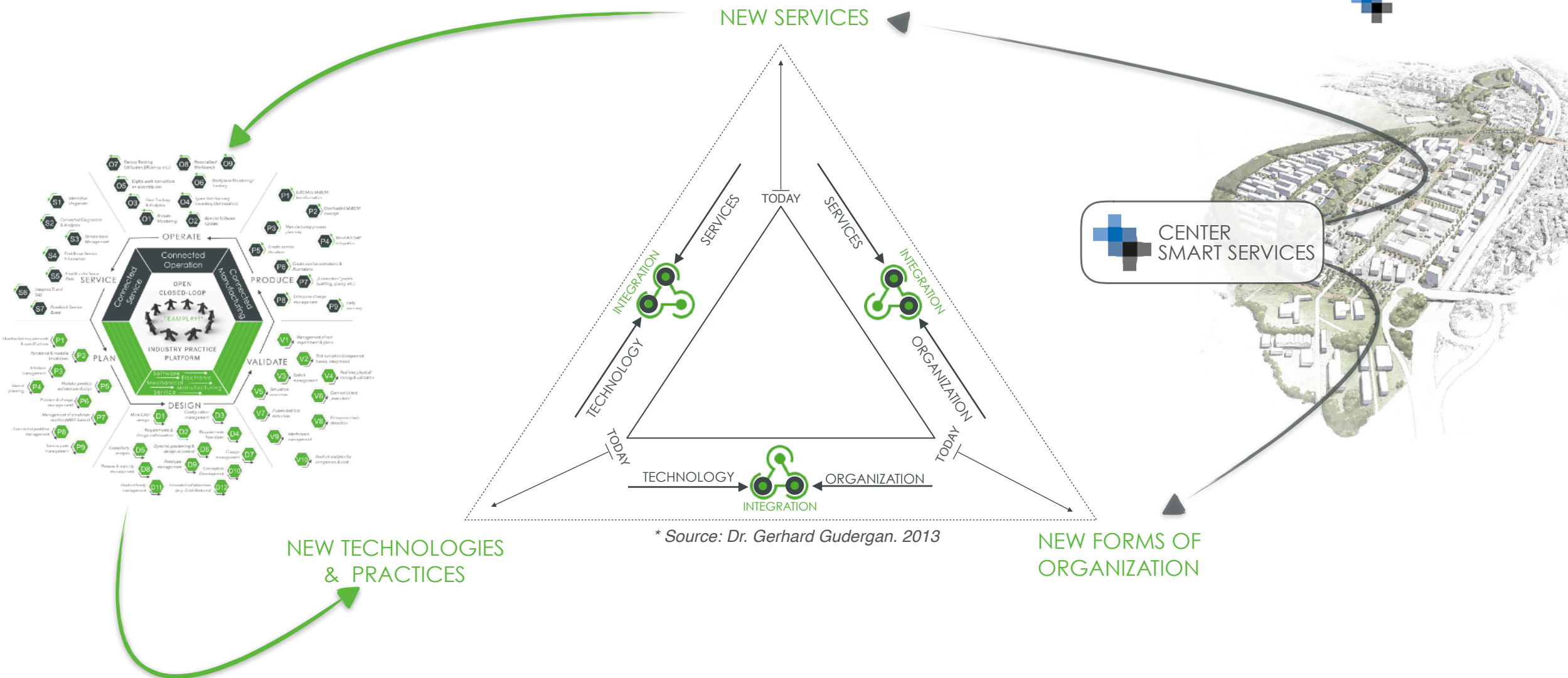




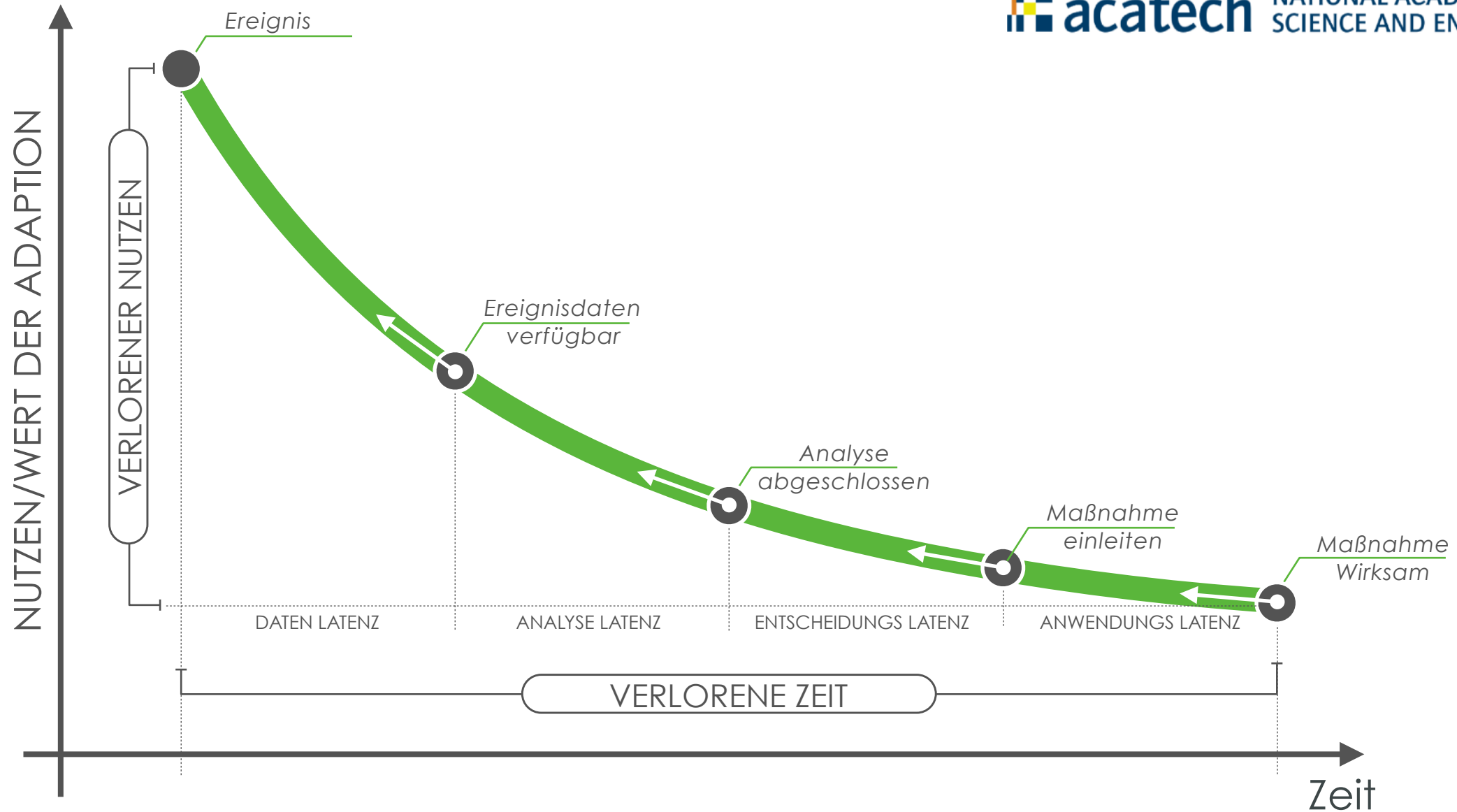
## The focus: 19 research clusters in close proximity to the relevant institutes

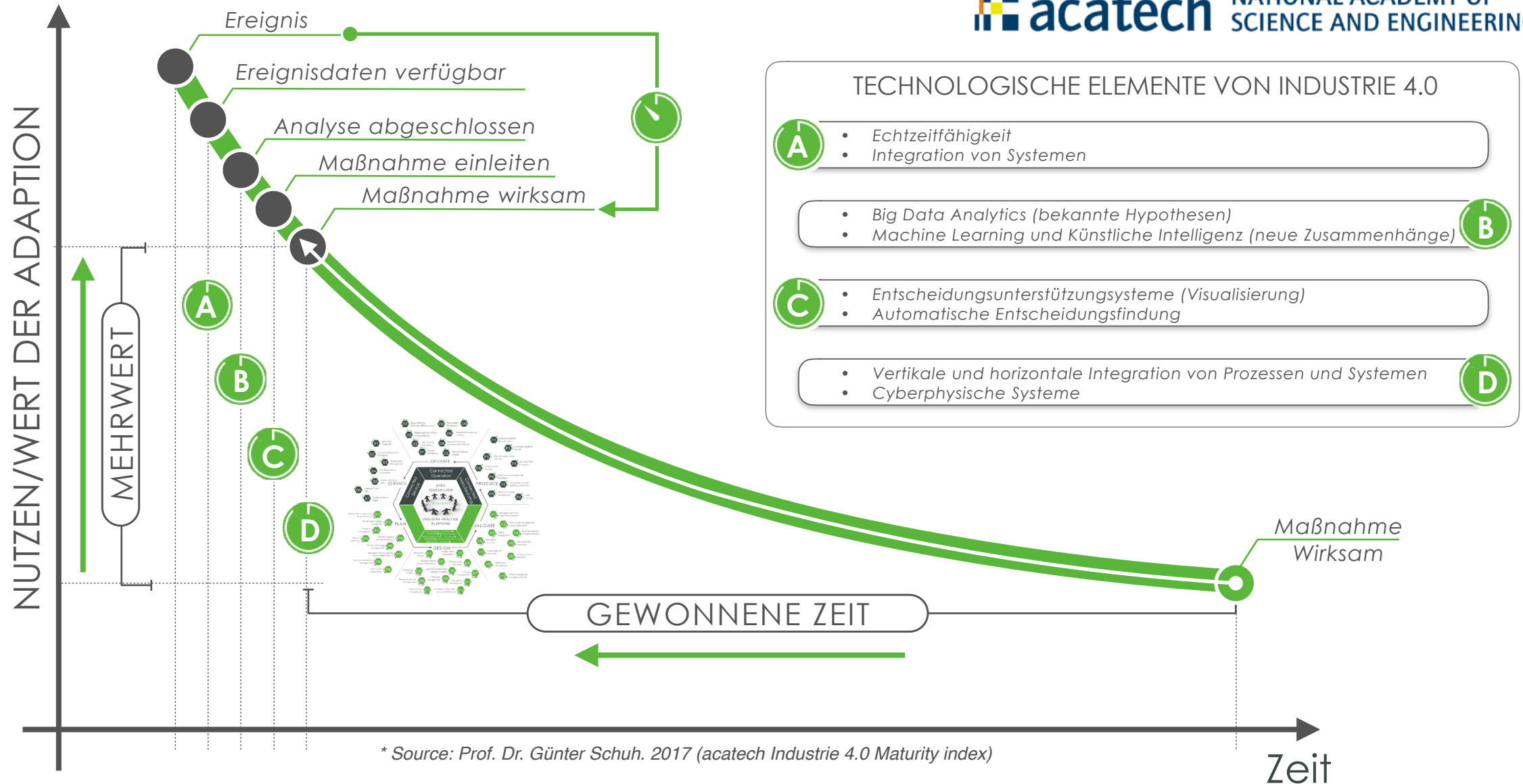


# DIGITAL TRANSFORMATION – 3 DESIGN DIMENSIONS

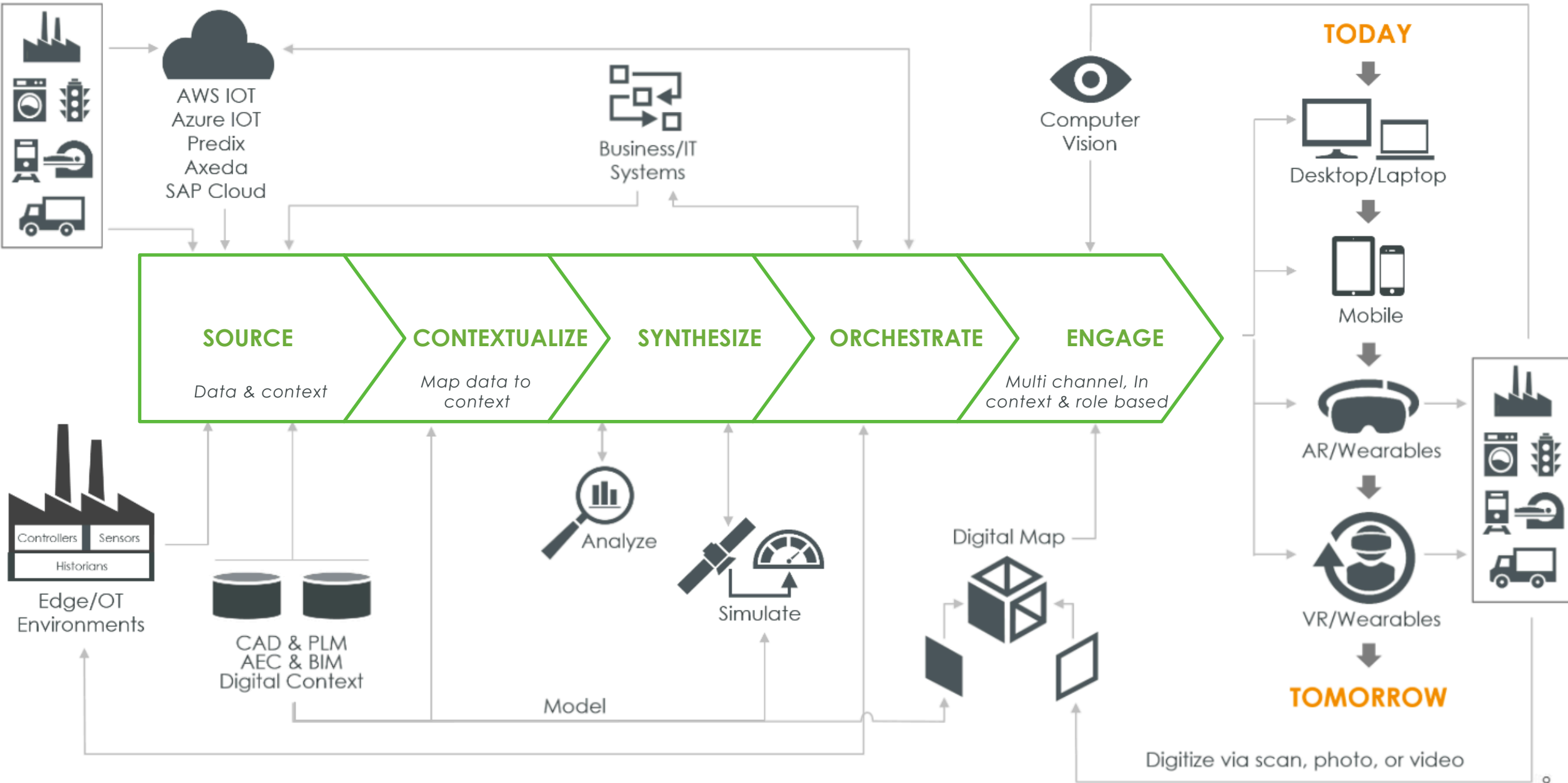








# PHYSICAL & DIGITAL ORCHESTRATION



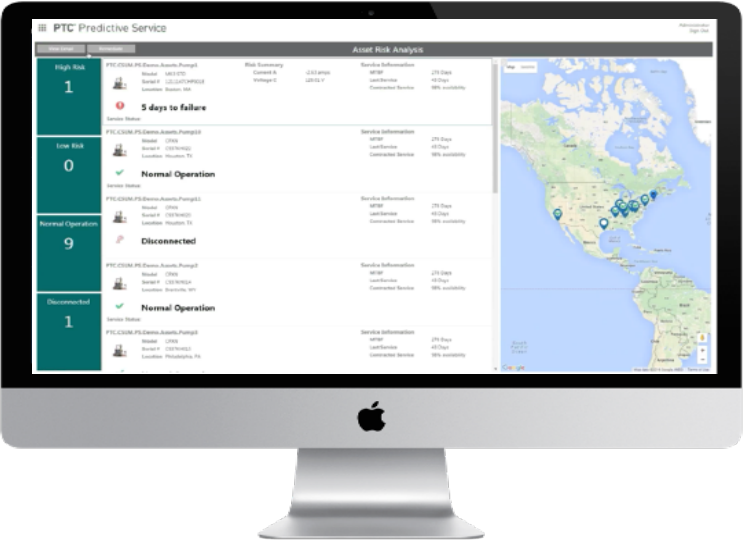


# CLOSED LOOP EXAMPLES



## PREDICTIVE SERVICE

Monitor conditions & performance,  
predict & prevent failure

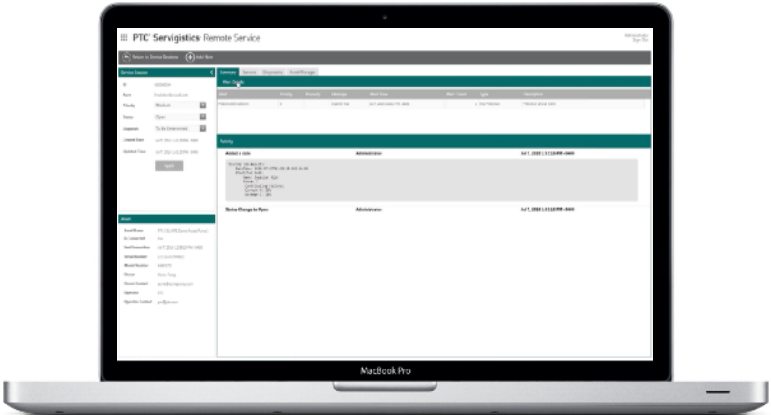


## ANOMALY DETECTION & MACHINE LEARNING



learn & understand conditions and detect  
anomalies tied to prediction

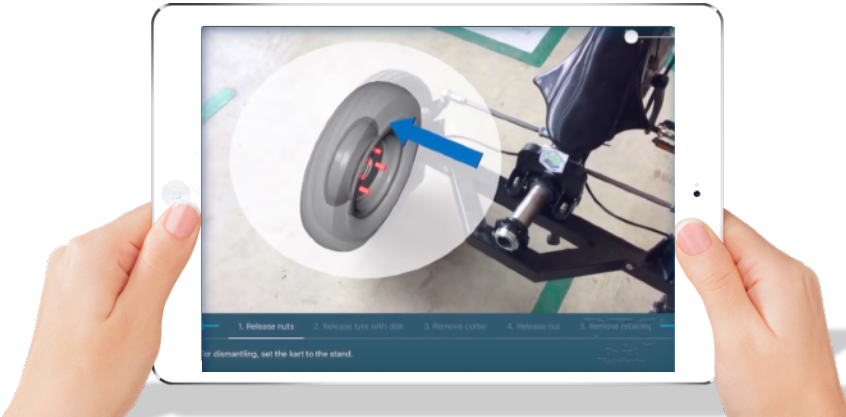
## REMOTE SERVICE



Remote service connected to knowledge  
management for resolution options

## CLOSED LOOP MAINTENANCE APP

Simple app to cover fleet management, remote  
service & augmented maintenance, integrated into  
closed loop



## CONNECTED FIELD SERVICE



Manage integrated service request,  
populated with connected details

# CLOSED LOOP EXAMPLES



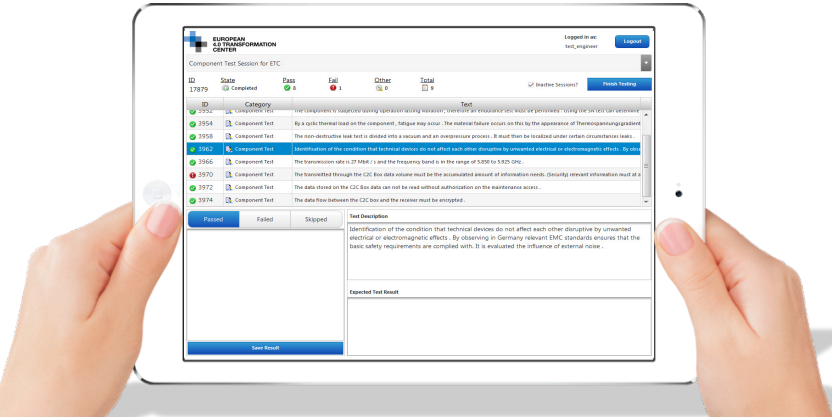
## DIGITAL TWIN IN SOFTWARE DEVELOPMENT & SIMULATION



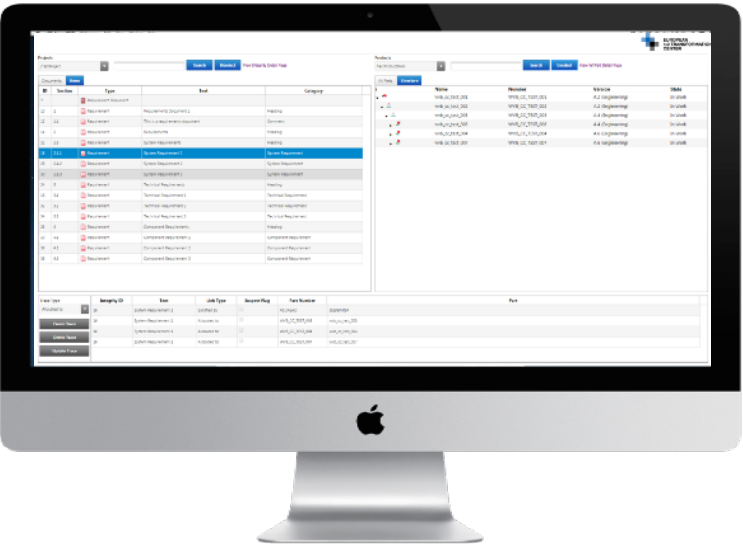
Understanding, building & aligning complex MBSE simulation with real physical behavior

## CONNECTED TEST APPLICATION

Simple online test management application

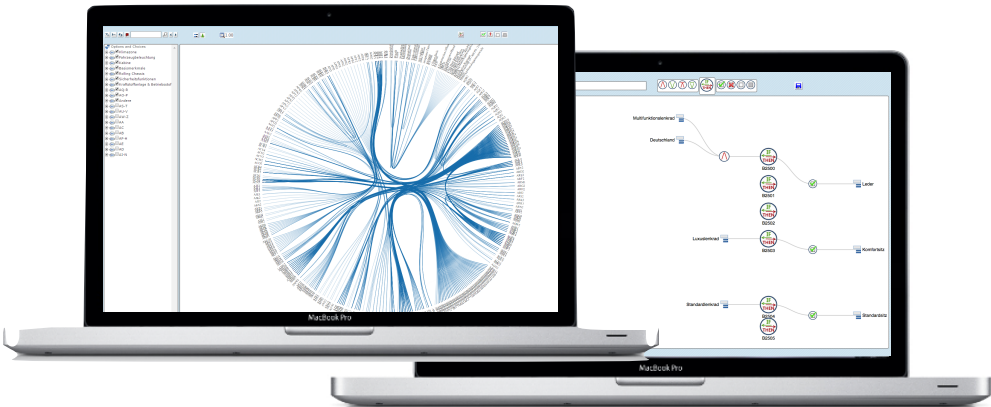


## CONNECTED TRACEABILITY



Understanding and building complex traces between product structure, requirements & functions across systems

## COMPLEXITY MANAGER



Understanding and building complex expressions & rules graphically

## SWARM- DATA FOR OEM SERIES CARS

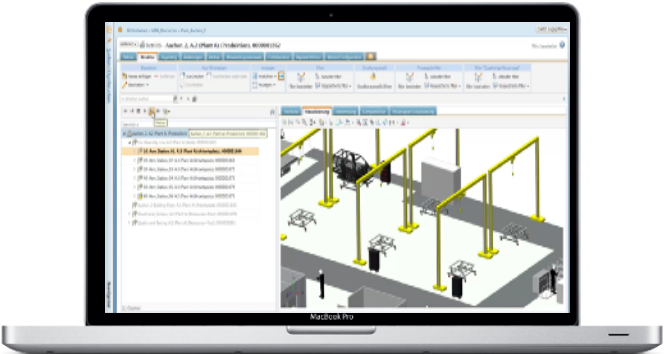
Understanding 300.000 vehicle in real time usage



# CLOSED LOOP EXAMPLES



## INTEGRATED MANUFACTURING PROCESS PLANNING



Manage factory processes, resources,  
mfg. illustration & visualization

## CONNECTED CAR & FLEET MANAGEMENT



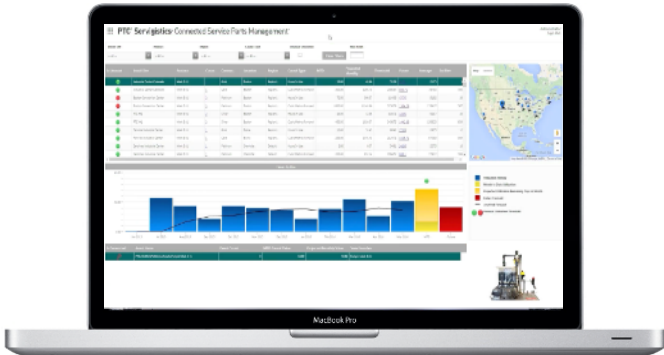
fleet monitoring, remote & secure  
software update

## ASSET & FACTORY ENERGY MANAGEMENT



Manage factory assets energy utilization,  
analytics & smart alerts

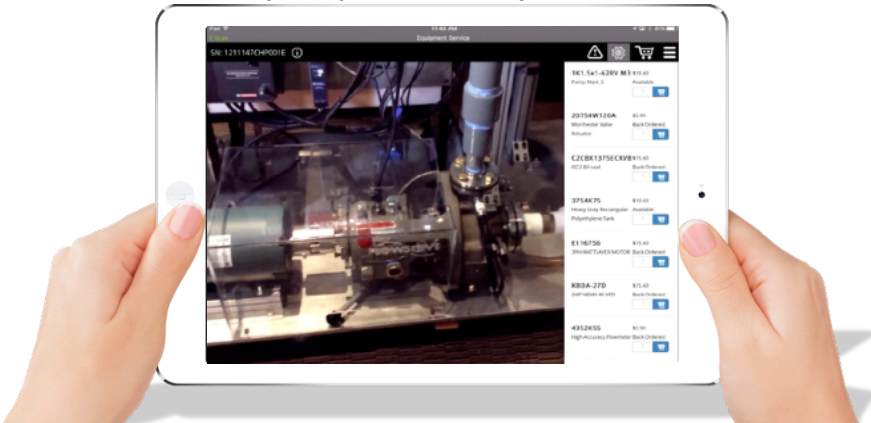
## CONNECTED SERVICE PARTS MANAGEMENT



real time utilization data to to manage  
accurate future forecast for service parts  
inventory

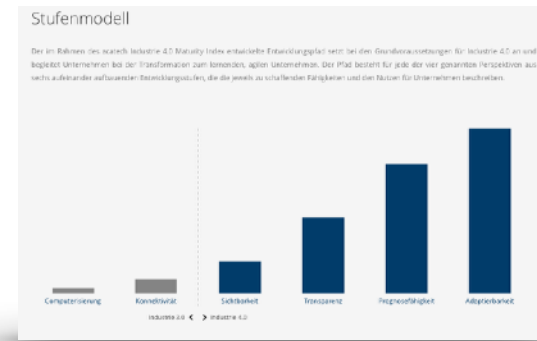
## FIELD SERVICE APP

Augmented reality & integrated  
spare parts order system





# DER WEG ZU EINEM AGILEN UNTERNEHMEN



**3,50**  
**RESSOURCEN**

Ressourcen beschreibt die physischen und nicht-physischen Produktionsfaktoren wie Maschinen oder Personal. In einer Industrie 4.0 Umgebung können physische Ressourcen als smarte Objekte mit dezentraler Intelligenz aufgefasst werden. Entscheidend sind dabei die Fähigkeiten der smarten Objekte sowie die Interaktion mit der Umgebung.

**3,75**  
**INFORMATIONSSYSTEME**

Informationssysteme umfasst alle Systeme zur Bereitstellung, Verarbeitung, Speicherung und Übertragung von Daten und Informationen. Dies umfasst die Datenwertschöpfung, um aus Rohdaten hochwertiges Wissen zu erzeugen, und den Integrationsgrad der einzelnen IT-Systeme.

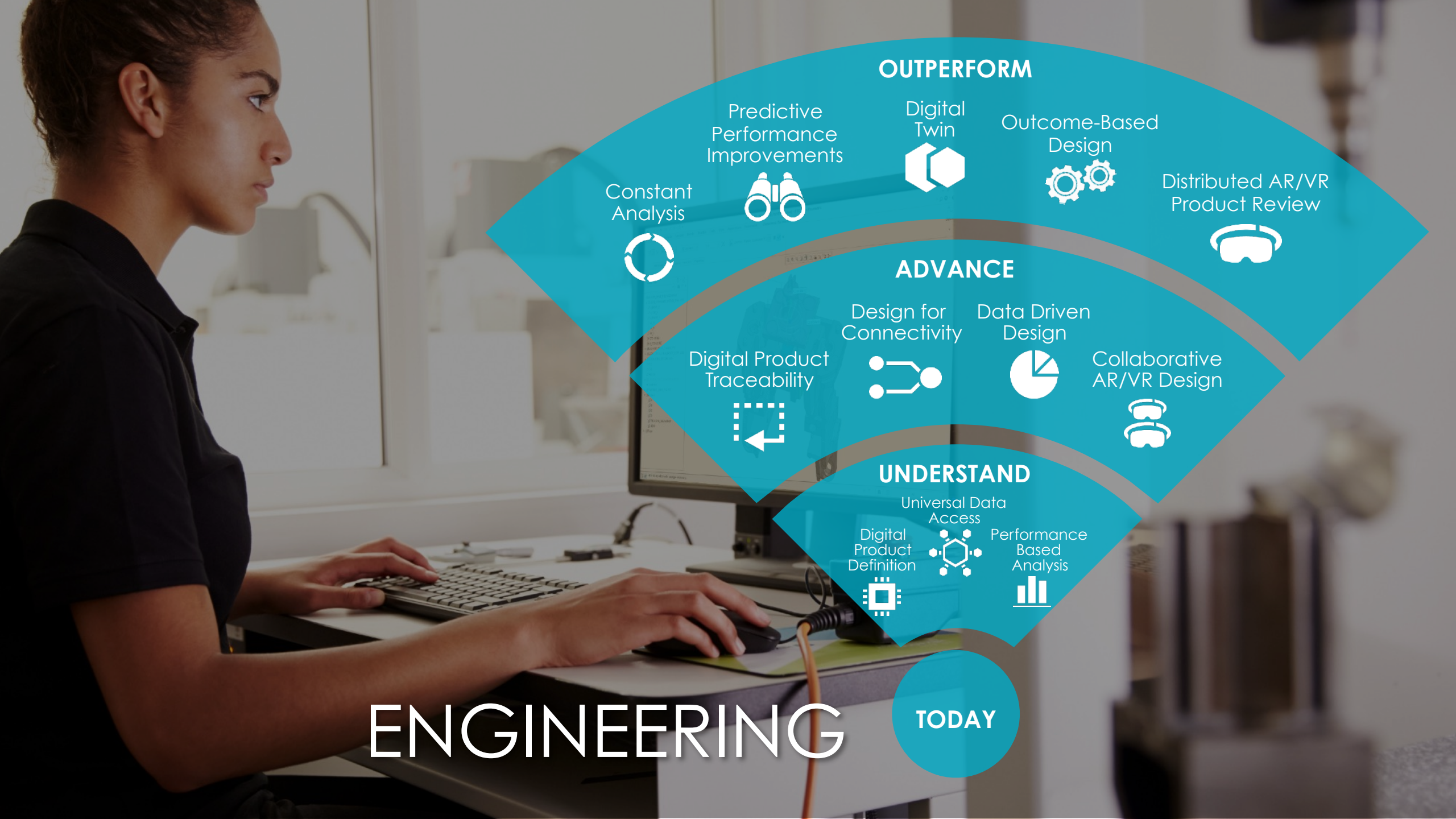
**1,28**  
**ORGANISATIONSSTRUKTUR**

Organisation beschreibt die Unternehmensstruktur, die Anpassungsfähigkeit und die Regularien. Neben der internen Unternehmensorganisation ist der Austausch mit externen Partnern im Rahmen eines Wertschöpfungsnetzwerks notwendig.

**3,00**  
**KULTUR**

Kultur umfasst das normative Management, die Unternehmenskultur, die Unternehmenszugehörigkeit und den Einfluss auf die Unternehmensentwicklung.

\* Source: Prof. Dr. Günter Schuh. 2017 (acatech Industrie 4.0 Maturity index)



## OUTPERFORM

Constant  
Analysis



Predictive  
Performance  
Improvements



Digital  
Twin



Outcome-Based  
Design



Distributed AR/VR  
Product Review



## ADVANCE

Digital Product  
Traceability



Design for  
Connectivity



Data Driven  
Design



Collaborative  
AR/VR Design



## UNDERSTAND

Universal Data  
Access



Digital  
Product  
Definition



Performance  
Based  
Analysis



# ENGINEERING

TODAY



# SERVICE

TODAY

## OUTPERFORM

Digital  
Twin



Product as  
a Service



New Revenue  
Streams



Constant  
Analytics



More Profitable  
Contracts



## ADVANCE

Optimized  
Technician  
Workforce



Proactive &  
Predictive  
Maintenance



Remote  
Service



Optimized  
Inventory



## UNDERSTAND

Service  
Visibility



Real-Time  
Product  
Data

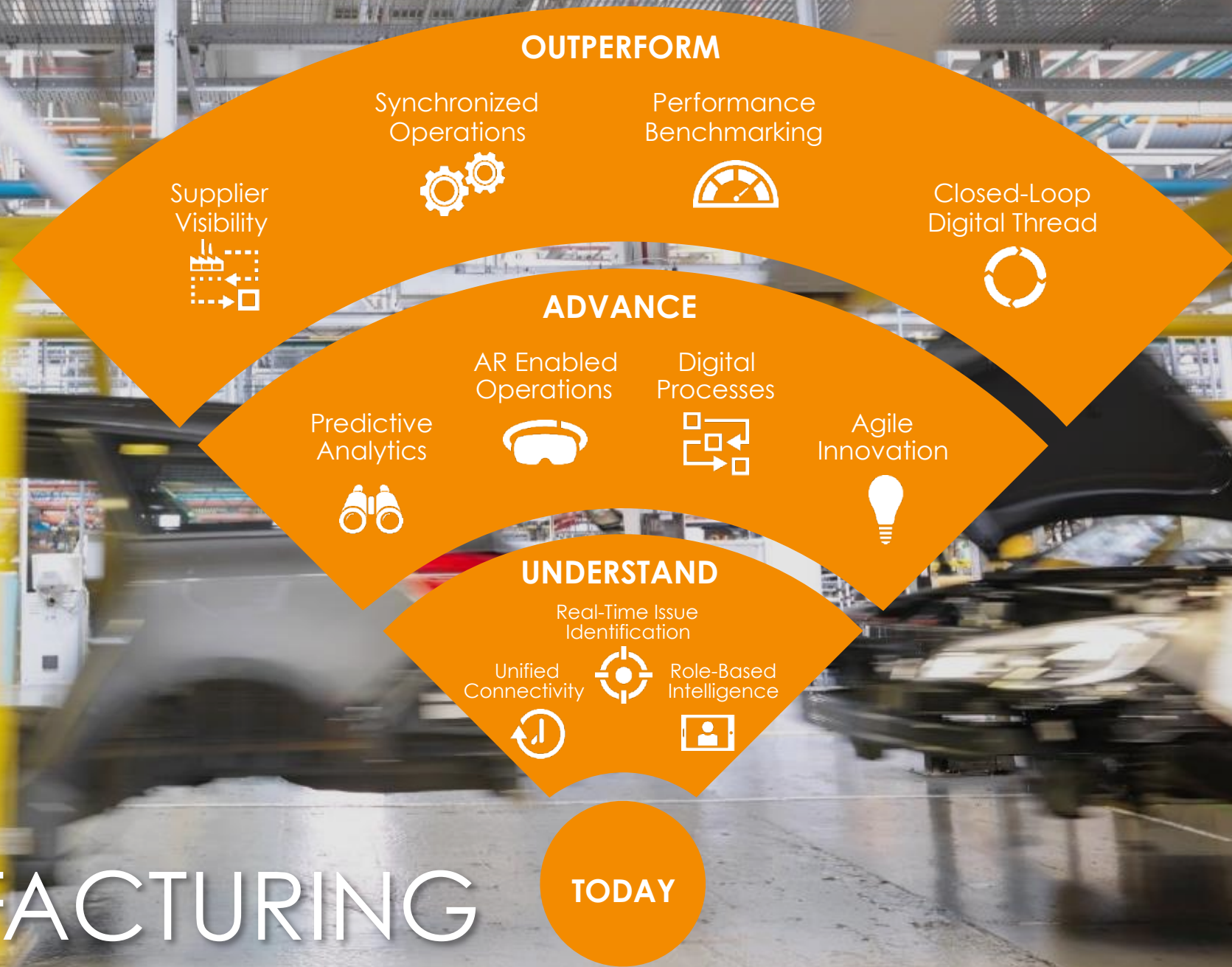


Digital  
Service  
Content





# MANUFACTURING





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VIELEN DANK

Markus Hannen  
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