A Realization Guideline for Industrie 4.0

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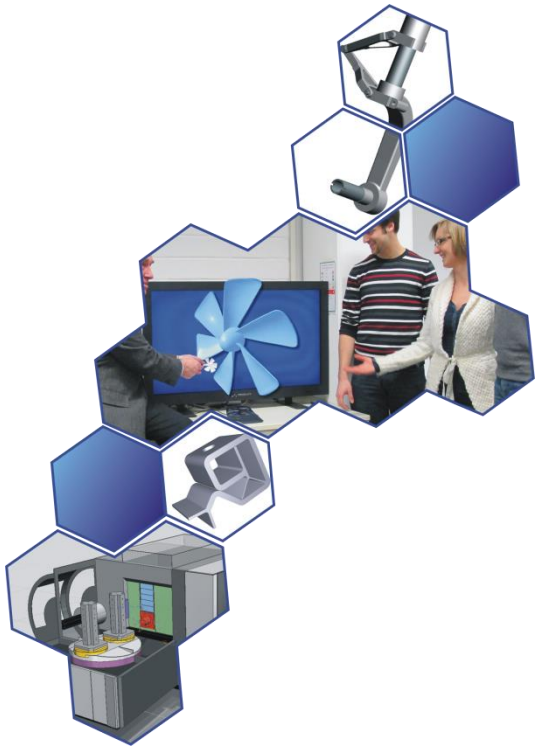

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A Realization Guideline for Industrie 4.0

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1. Introduction

2. Approaches for Implementation of Industrie 4.0

- Implementation Recommendation Plattform Industrie 4.0
- Sample Solutions
  - Efficient Factory 4.0
  - Competence Center Mittelstand 4.0

3. The VDMA Guideline

- Internal Competence Analysis – External Perception Analysis
- Toolbox Products
- Toolbox Production
- Strategic Orientation towards Industrie 4.0
- Business models

4. Summary

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Development of information and communication technology (1)

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Hypermedia hyperlinked documents

YAHOO! (1995)

NETSCAPE AOL (1985,1997,1998)

MOSAIC ebay (1995) amazon (1994)

Multimedia hyperlinked media

Google (1998)

Alibaba.com Global trade starts here.™ (1999)

Socialmedia (1) networking people

facebook (2004)

YouTube (2005)

twitter (2006)

World Wide Web

Java, UML, XML

Web Services

Web	Web 1.0	Web 2.0
1995	2000	2005

Source: Dr. Dais, Bosch

Development of information and communication technology (2)

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Socialmedia (2) networking companies

App technology

Web 3.0

2010

Cyber-Physical Media interconnected and communicating systems

PLATTFORM INDUSTRIE4.0

Plattform INDUSTRIE 4.0

Industrie 4.0 component

Web A.B

2015

Future Media

?

Web X.Y

2020

Approaches for smart systems

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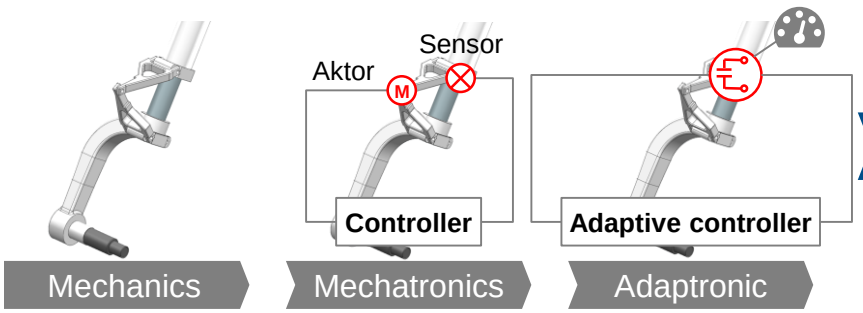
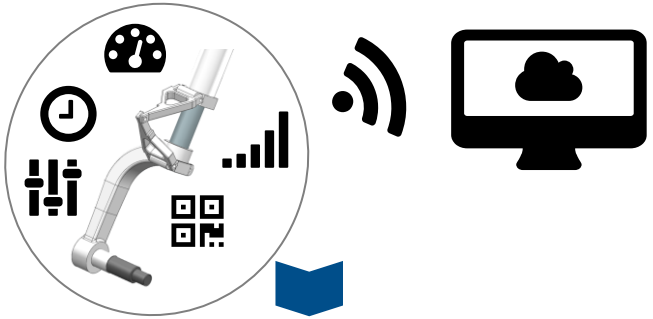
Improvement of the added value Based on functional integration



Further improvement of the added value based on cyber-physical systems



Networked and communicating systems

Smart Plant

Smart Factory

Source: TU Darmstadt, Effiziente Fabrik 4.0

Smart City

Source: TU Darmstadt

Smart Grid

Source: TU Darmstadt, ESE

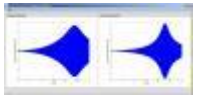
Smart Products

Smart Logistics

Smart Home

Cyber-physical systems support networking and communication

- Condition Monitoring



- Systems and Structural Health Monitoring

- Remote Diagnosis and Control

- Tracking and Tracing

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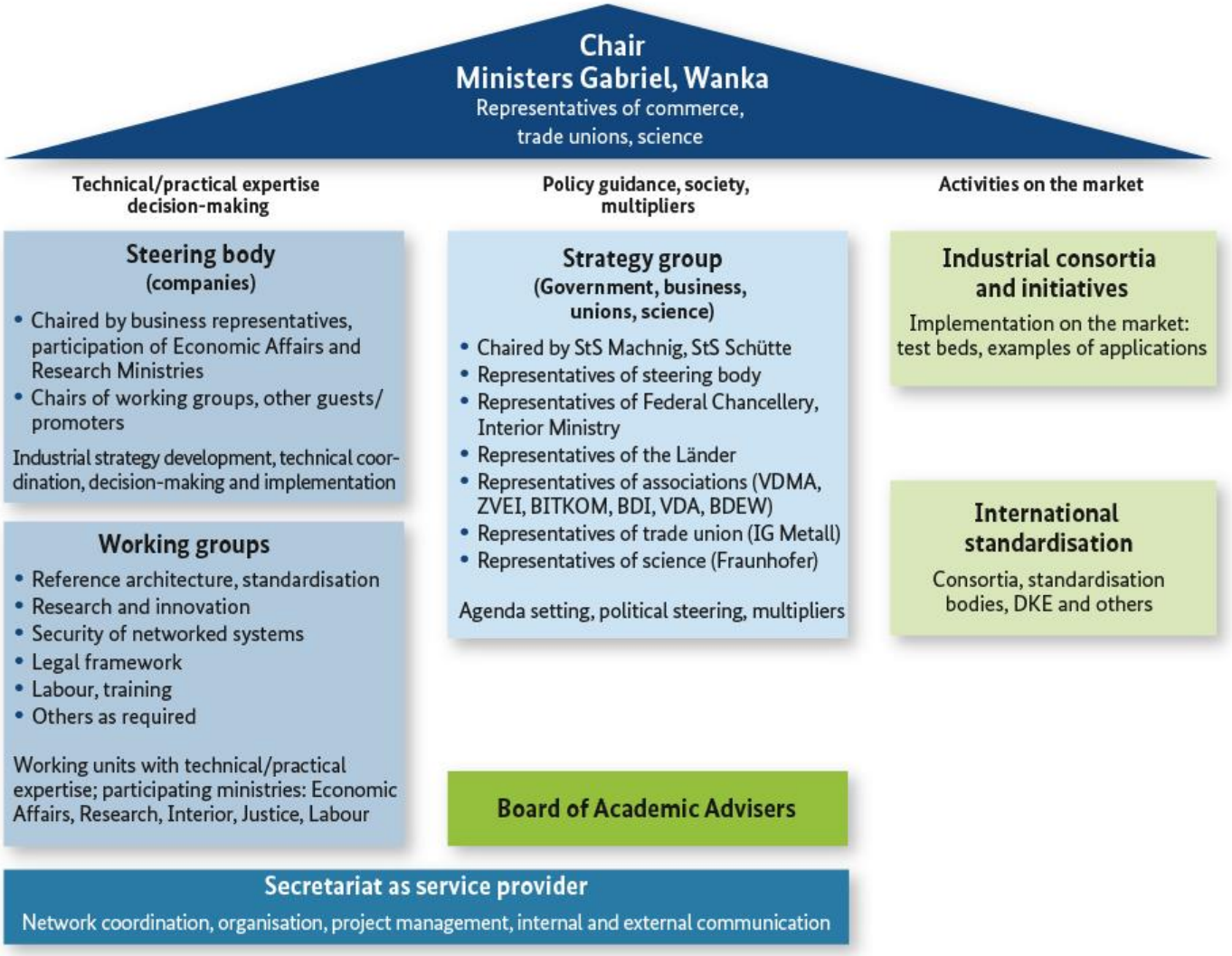
Plattform Industrie 4.0



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HIIG, IEB
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PLATTFORM INDUSTRIE4.0

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Implementation recommendations for Industrie 4.0 Effective: April 14, 2015

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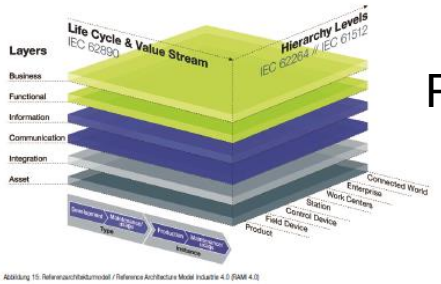
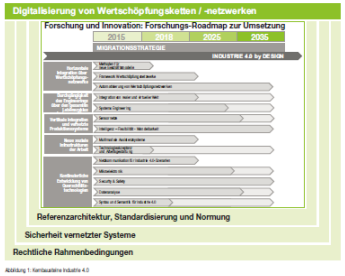
Industrie 4.0 component

Abbildung 23: Industrie 4.0-Komponente



RAMI 4.0



Research roadmap

Implementation recommendations for Industrie 4.0 Effective: April 14, 2015

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BITKOM VDMA ZVEI

Umsetzungsstrategie Industrie 4.0

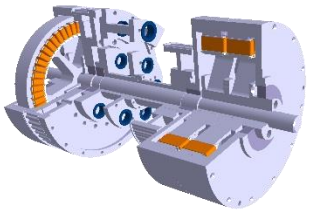
Ergebnisbericht der Plattform Industrie 4.0

April 2015

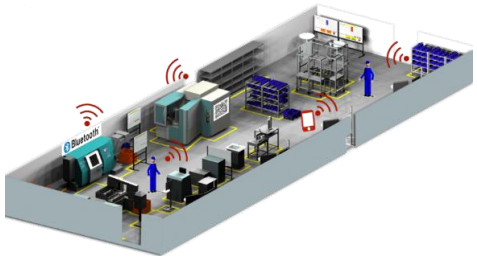
Added Value
Use Cases
Examples of execution

Business models

Products



Production



Model factory for Industrie 4.0
Unique selling point TU Darmstadt: Effiziente Fabrik 4.0

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- Build on existing, real production system

⇩

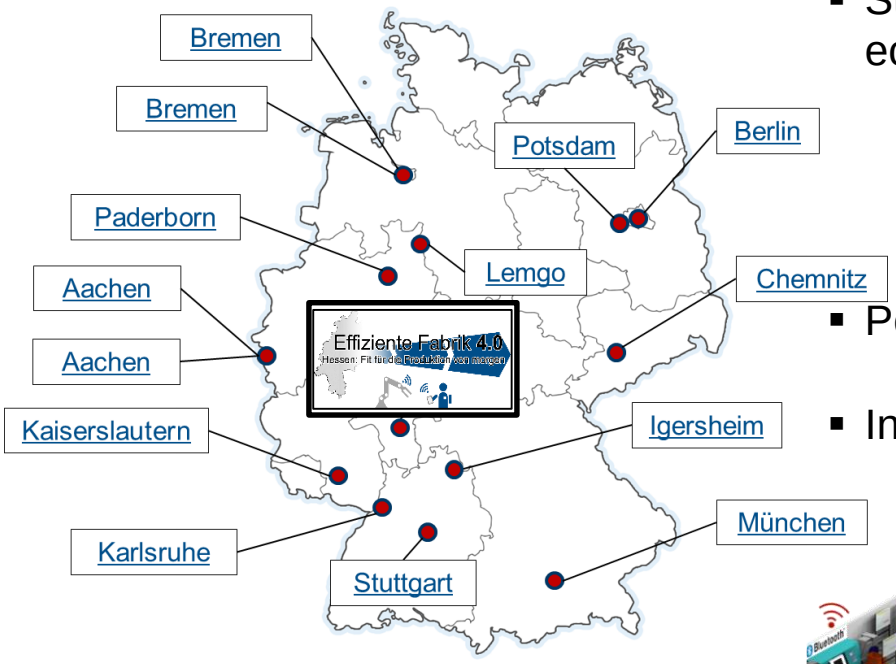
Brown instead of Green Field

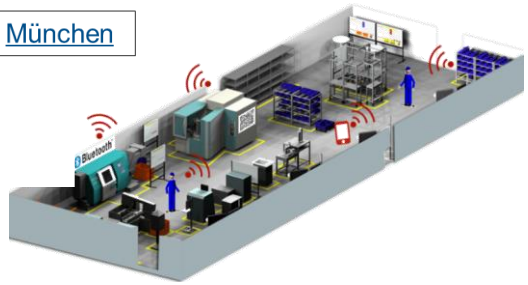
- Statistical system for the organizational and economic evaluation

⇩

Quantification of benefits via before/after comparison

- People are the focus
- Industrial use cases (application scenarios)





Project partners			
IG Metall Institution/ employee association	Heidelberger Druckmaschinen User Company	:em engineering methods AG Supplier/Software	TE Connectivity Supplier
Rittal GmbH User Company	Software AG Supplier/Software	Pepperl+Fuchs Supplier	Hottinger Baldwin Messtechnik Supplier
ESR Pollmeier Supplier	BR Automation Supplier/Software	Östling Supplier	Memex GmbH Supplier

Uses Cases – Efficient Factory 4.0

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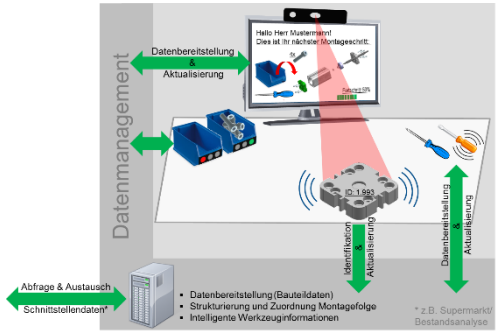
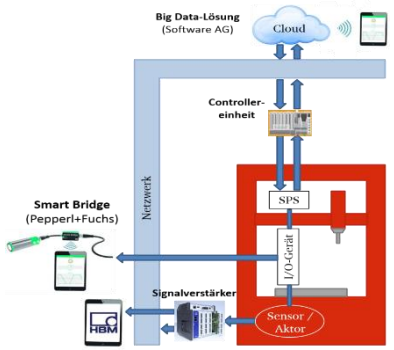


Use Case 4

- **Flexible intelligent worker assistance systems**



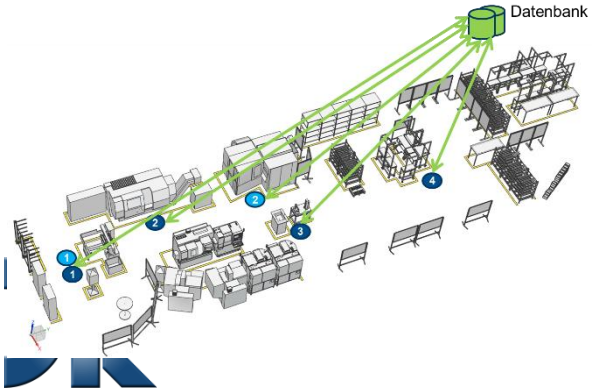
Use Case 1

- **Paperless and integrated quality assurance**

- Components as information carriers
- Unified data management

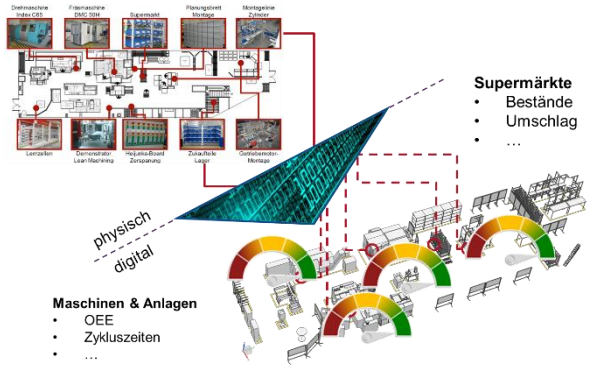
Use Case 3

- **Condition and energy monitoring**



Use Case 2

- **Digital value stream image**
- **Real-time capable production controlling**



Uses Cases – Efficient Factory 4.0

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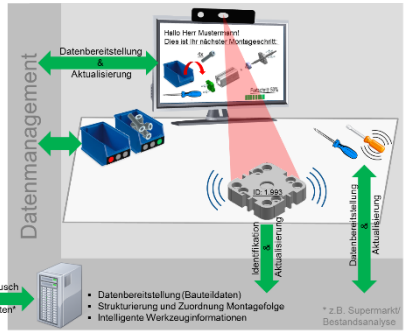
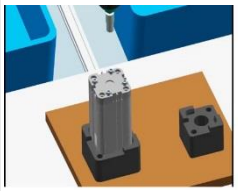
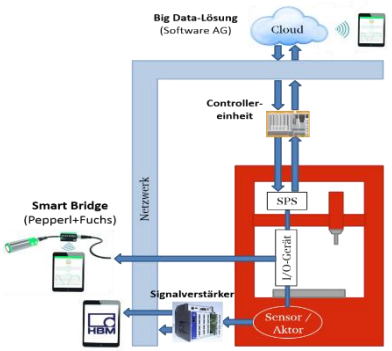
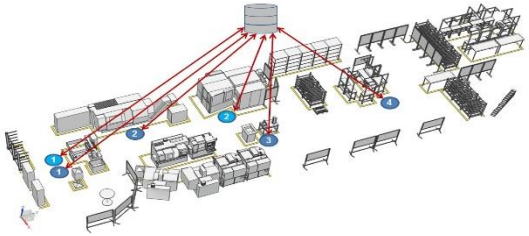


Use Case 4



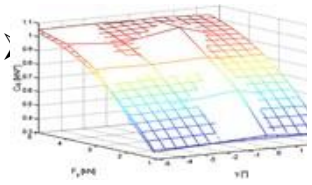


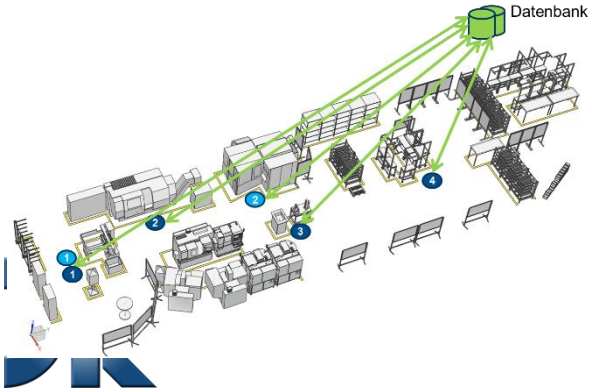
Use Case 1



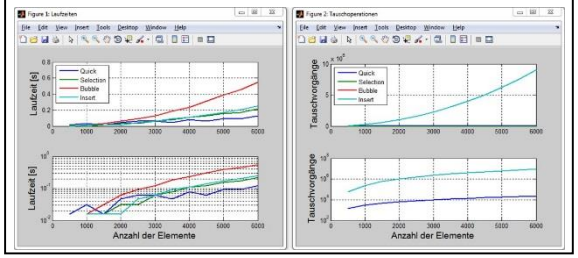
- Components as information carriers
- Unified data management

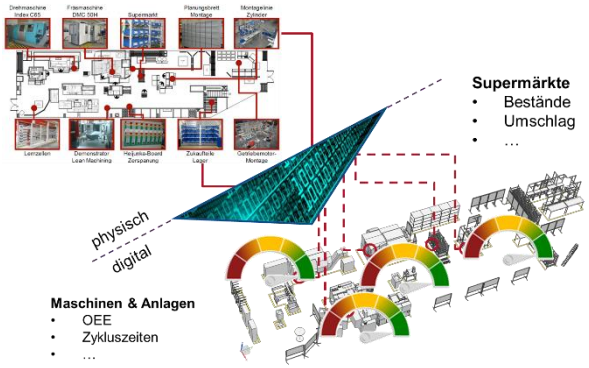
Use Case 3



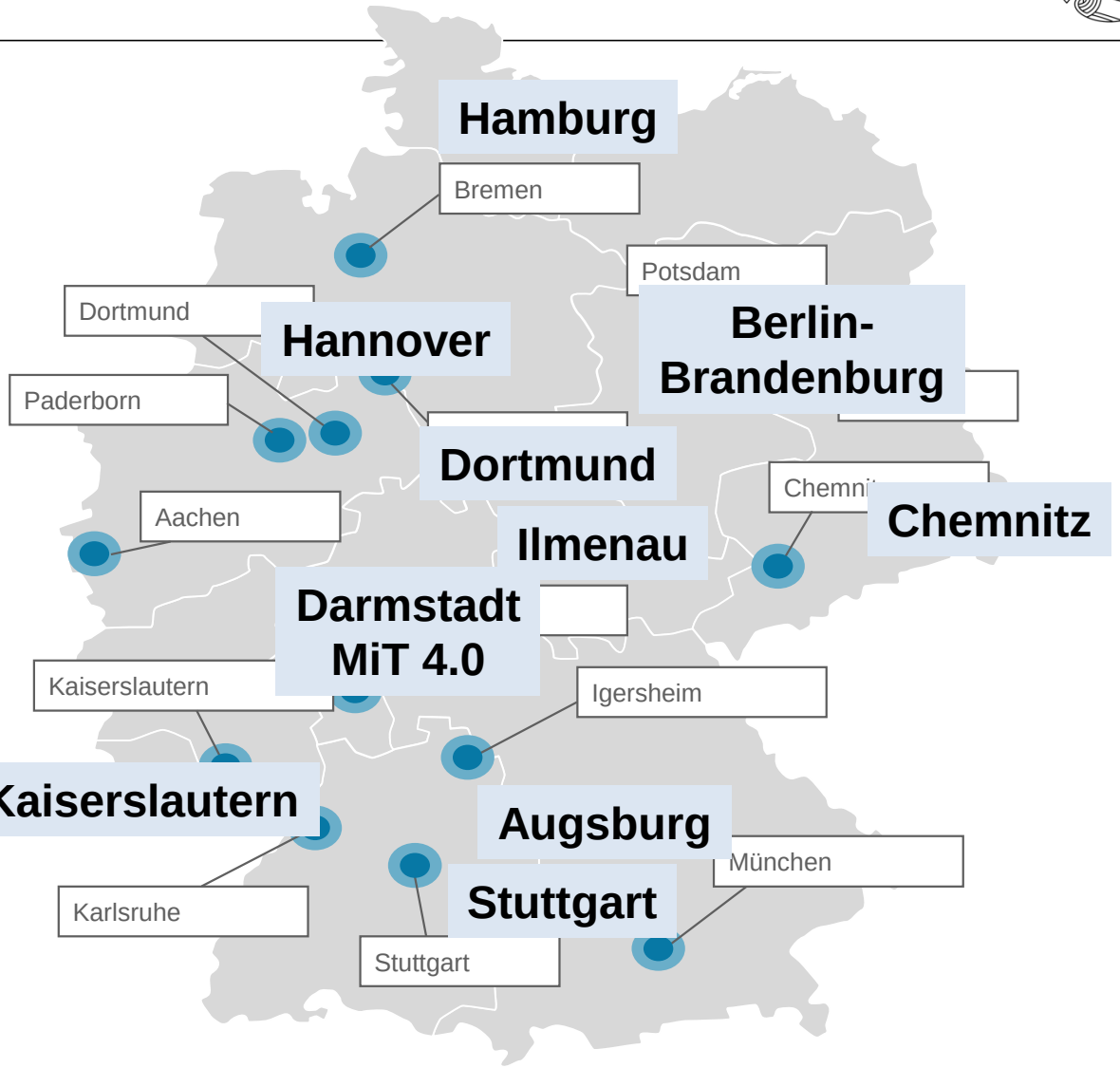


Use Case 2





Competence Centers Industrie 4.0 in Germany



Source: Wissenschaftlicher Beirat Industrie 4.0

SME Technology Center for Industrie 4.0 (MiT 4.0)

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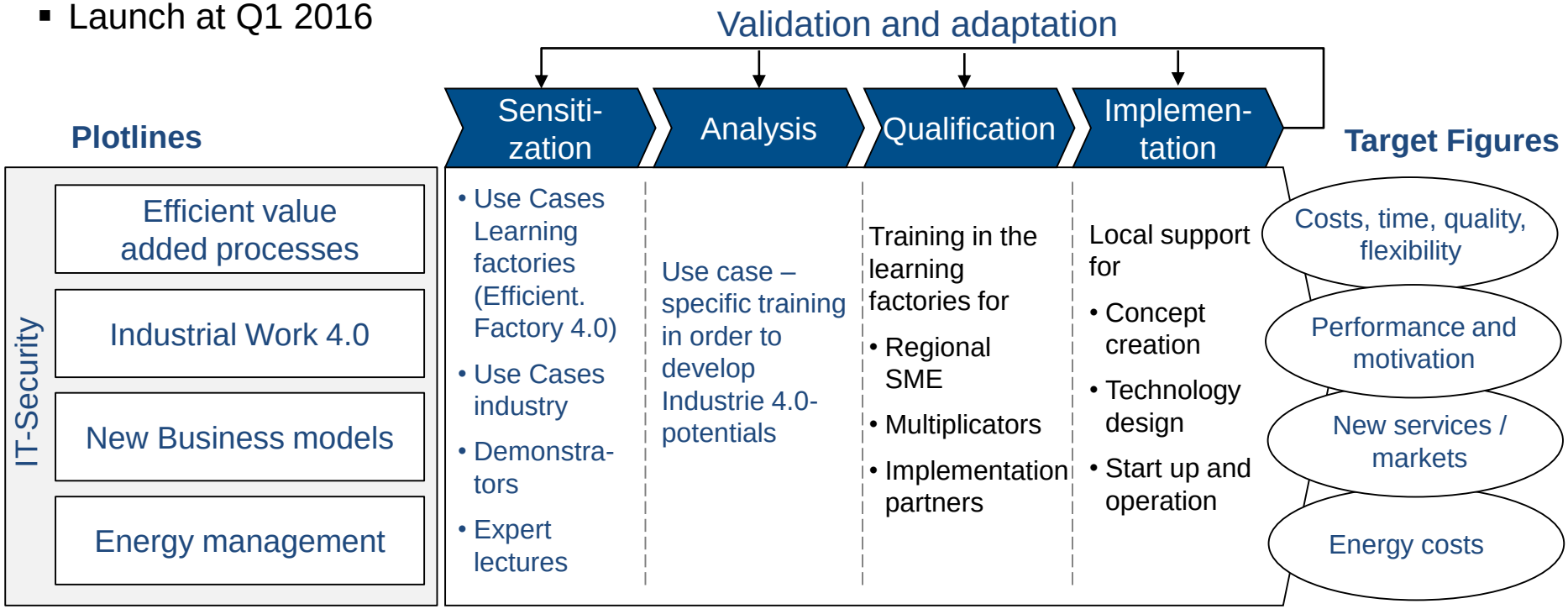
- The service portfolio includes a target group-oriented competence development. For this purpose, different plotlines and instruments for SME-friendly exchange in MiT 4.0 are defined.
- Launch at Q1 2016



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VDMA guideline Industrie 4.0

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Initial situation:

- 86% of German SMEs have recognized the potential of Industrie 4.0 (Source: Commerzbank AG)
- Visions of Industrie 4.0 are intangible and too general for the industry
- Way to realize Industrie 4.0 is unknown for the industry

Objectives:

- Break down the visions of Industrie 4.0 on realizable development stages for product ideas and production improvements
- Understanding Industrie 4.0 as a pioneer of new business models
- Sketch and support path to successful implementation

VDMA guideline Industrie 4.0: Toolbox Industrie 4.0

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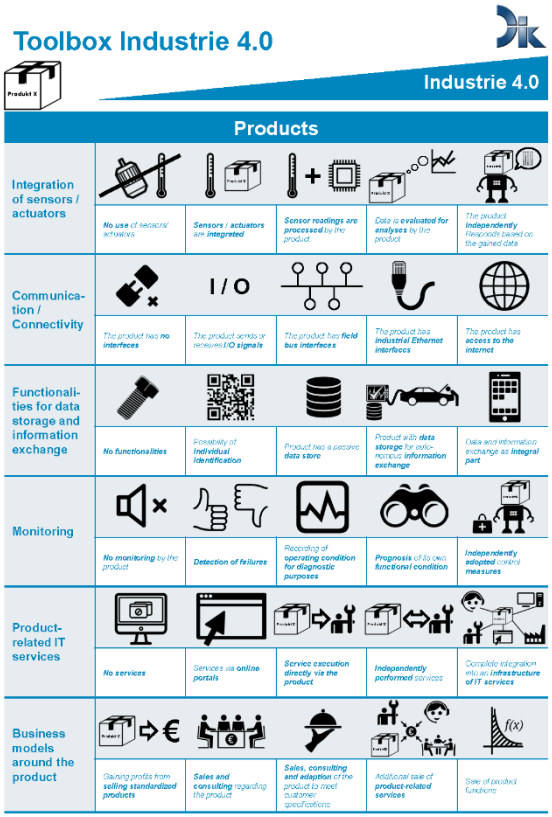
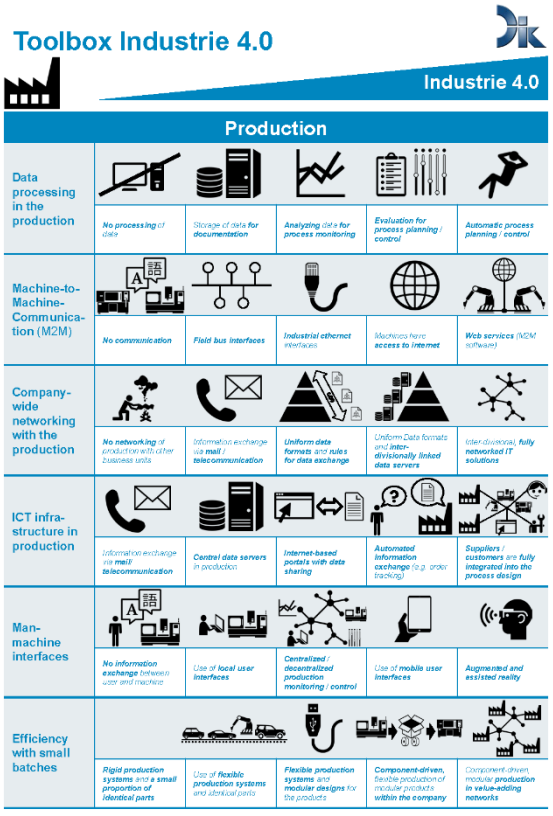
- The key element of the guideline Industrie 4.0 is the **Toolbox Industrie 4.0**
- The Toolbox Industrie 4.0 is used to analyze the company's competences and to generate strategies for approaching Industrie 4.0.





Source: Leitfaden Industrie 4.0 – Orientierungshilfe zur Einführung in den Mittelstand, VDMA

VDM guideline Industrie 4.0: Toolbox Industrie 4.0

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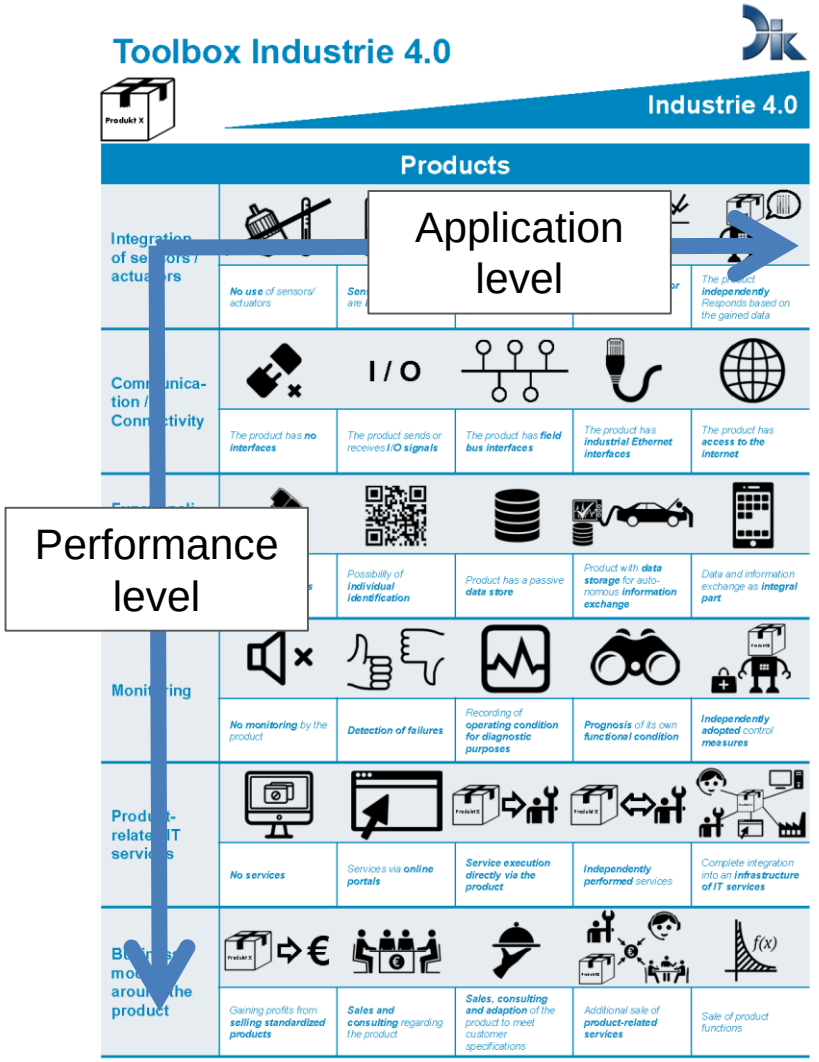
Structure of the toolbox:

- Application level:
  - Six application levels to identify themes for ideas in the field of Industrie 4.0.
  - The combination provides the functionality.
- Performance level:
  - Five technological, building on one another performance levels for positioning and strategy development.
  - The highest level represents the vision Industrie 4.0.



Source: Leitfaden Industrie 4.0 – Orientierungshilfe zur Einführung in den Mittelstand, VDMA

VDMA guideline Industrie 4.0: Toolbox Products

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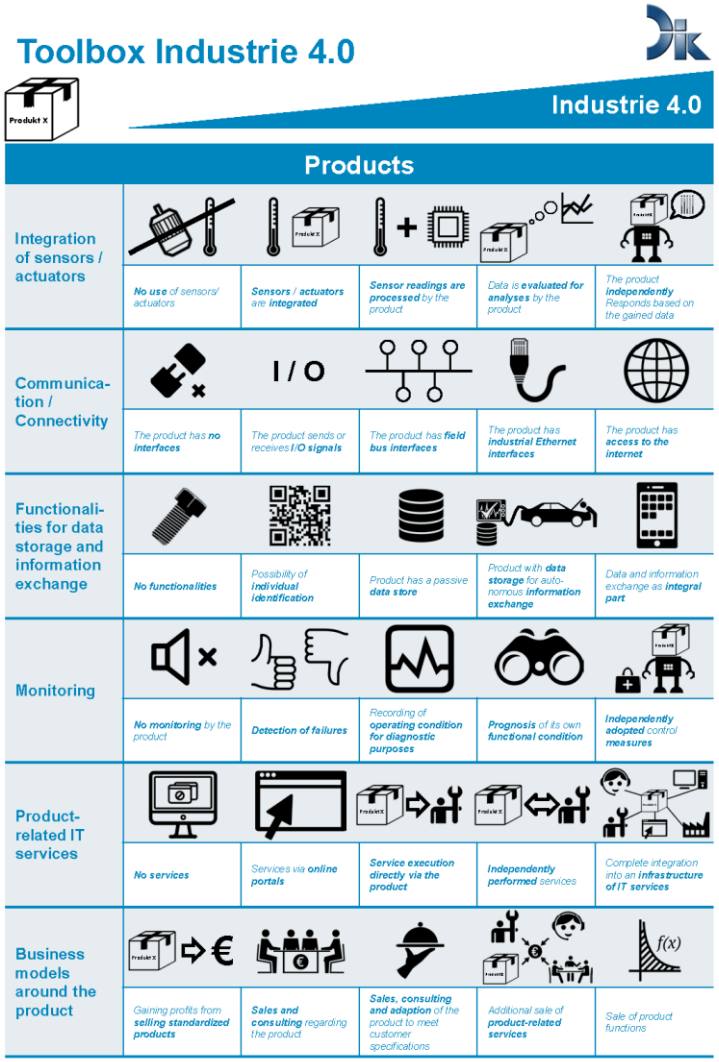
- Application levels:
  - Integration of sensors / actuators
  - Communication / Connectivity
  - Functionalities for data storage and exchange of information
  - Monitoring
  - Product-related IT services
  - Business models around the product



Source: Leitfaden Industrie 4.0 – Orientierungshilfe zur Einführung in den Mittelstand, VDMA

VDMA guideline Industrie 4.0: Toolbox Production

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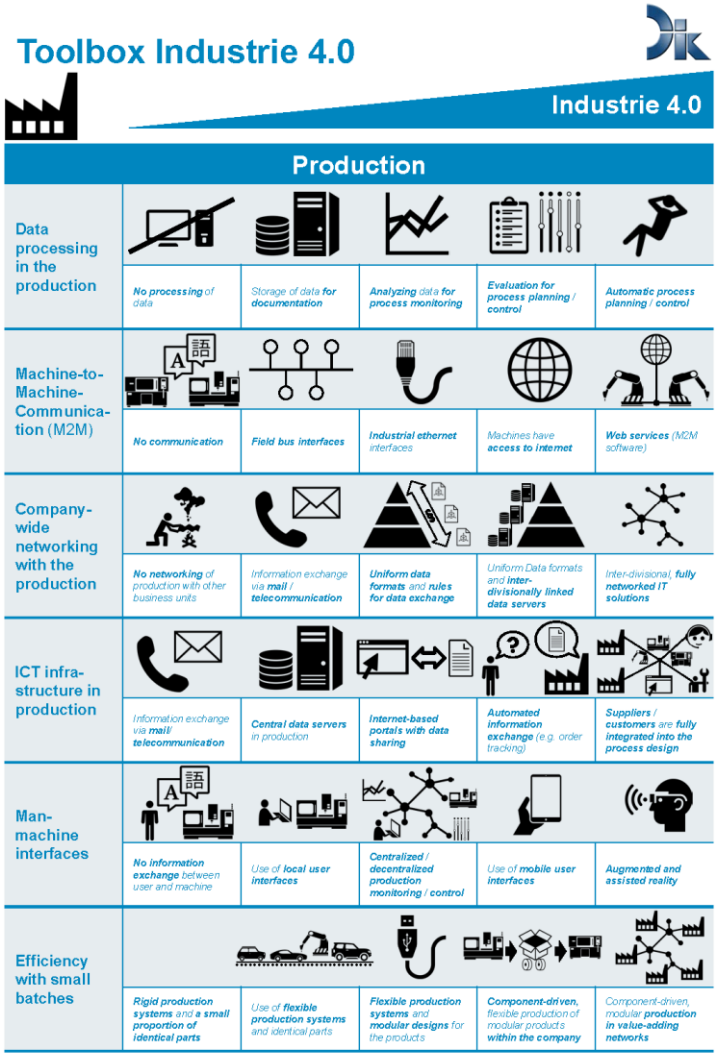
- Application levels:
  - Data processing in production
  - Machine-to-Machine- Communication (M2M)
  - Company-wide networking with the production
  - ICT infrastructure in production
  - Human Machine Interfaces
  - Efficiency for small batches



Source: Leitfaden Industrie 4.0 – Orientierungshilfe zur Einführung in den Mittelstand, VDMA

Generic Process Model

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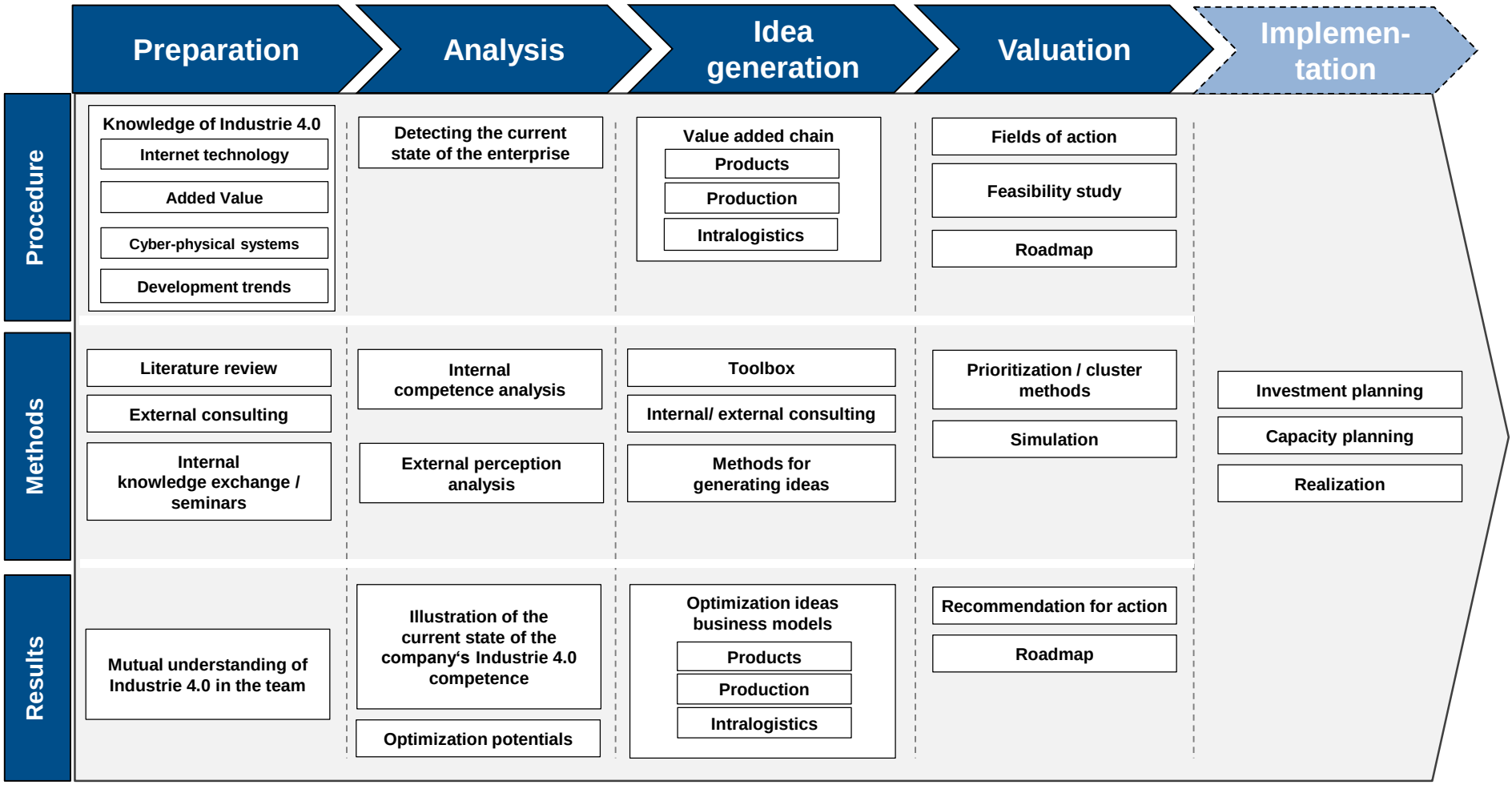

Internal Competence and External Perception Analysis

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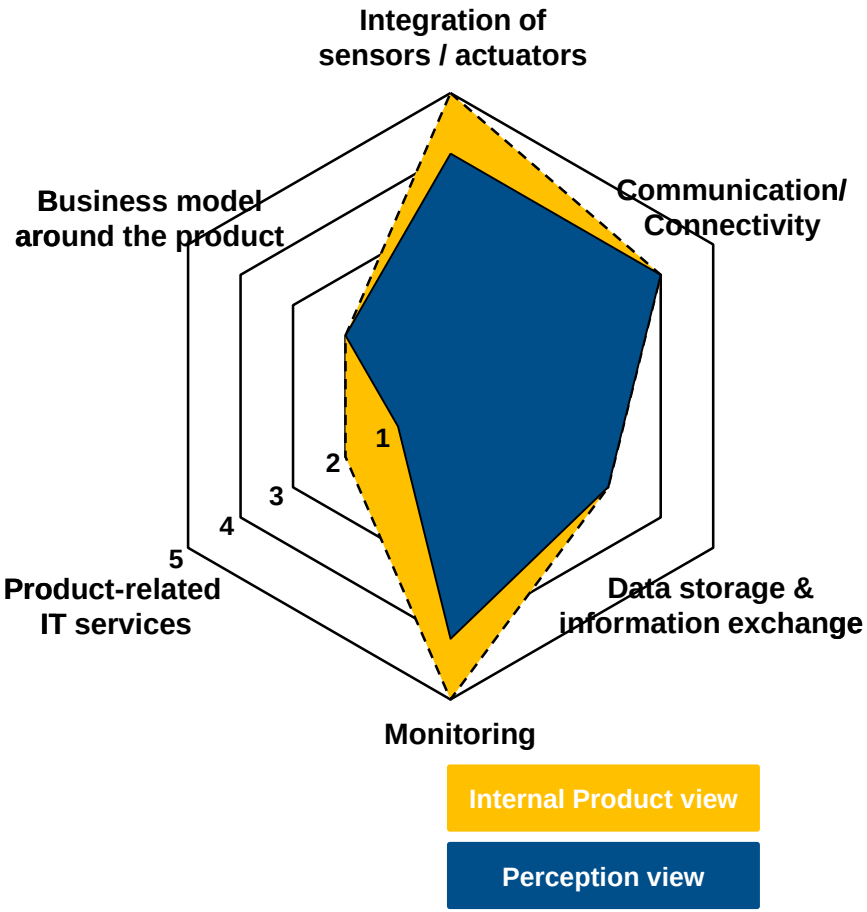
Objectives:

- Identification of already existing Industrie 4.0 competences
- External perception

Often competences for Industrie 4.0 approaches are already existing in the company

Procedure:

1. Classification into the stages of development of the Toolbox Industrie 4.0
2. Questionaire and Interviews of product and production experts
3. External Perception (through analysis of products presented in media)
4. Graphical representation as a radar chart



VDMA guideline Industrie 4.0: Results for products und production

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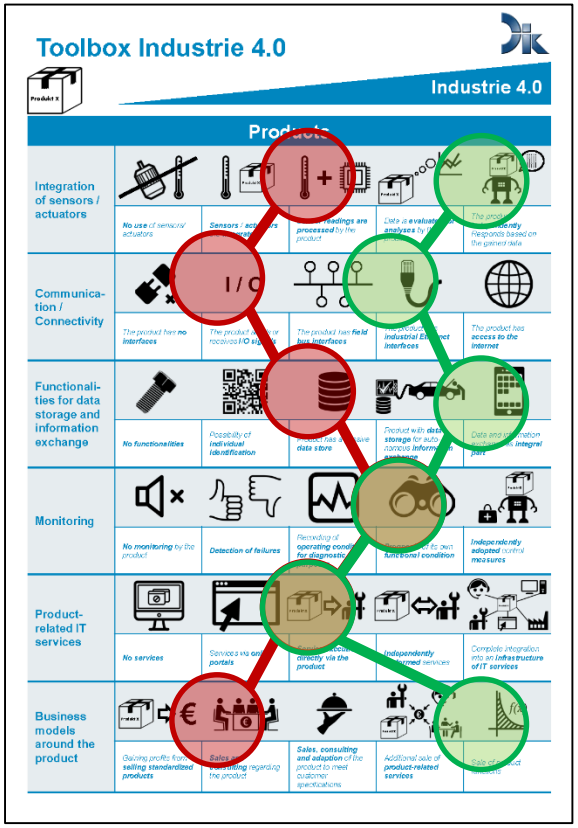
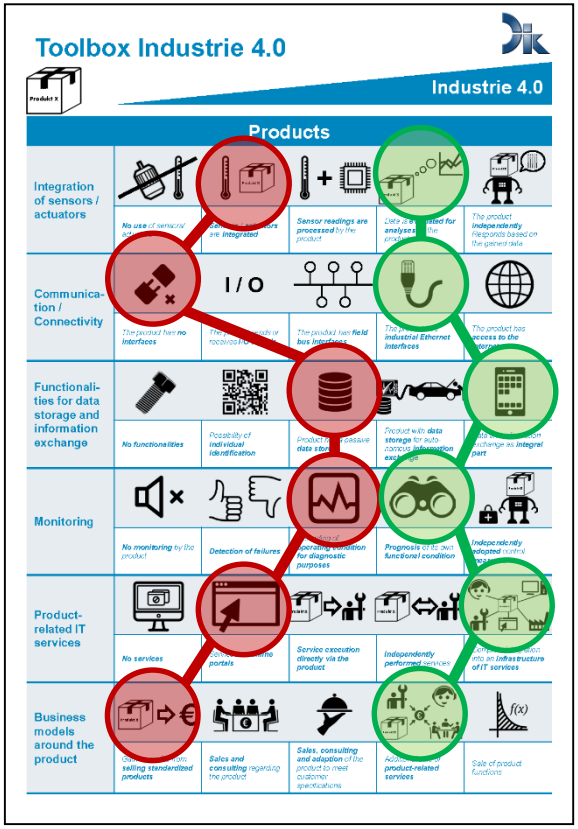
Procedure:

1. Classification with respect to performance levels of the Toolbox Industrie 4.0
2. Identification of the existing performance profile in the toolbox
3. Definition of the target profile in the toolbox





Source: Leitfaden Industrie 4.0 – Orientierungshilfe zur Einführung in den Mittelstand, VDMA

Definition of the target profile for the product portfolio

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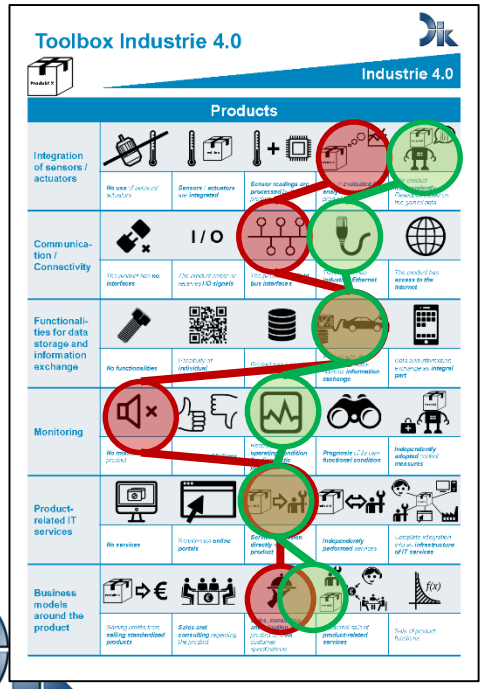
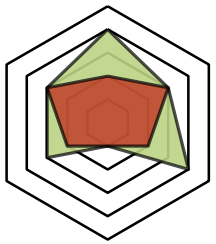
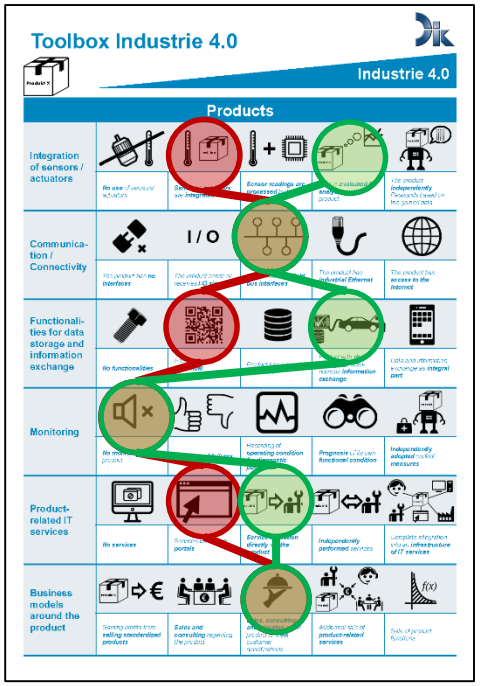
Product 1



Product 2





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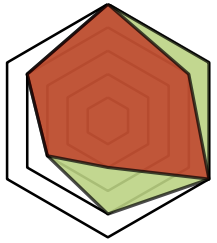
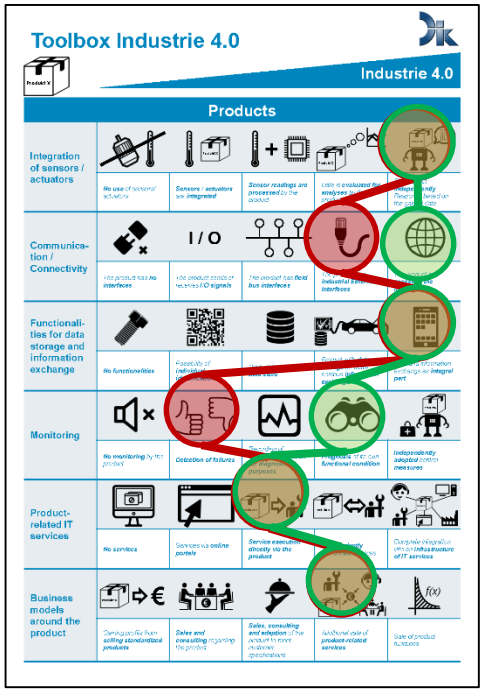
Product n





Definition of the target profile for the areas of production

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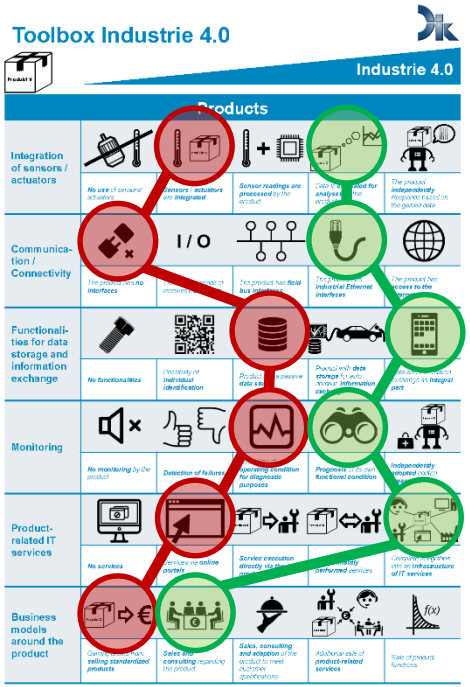
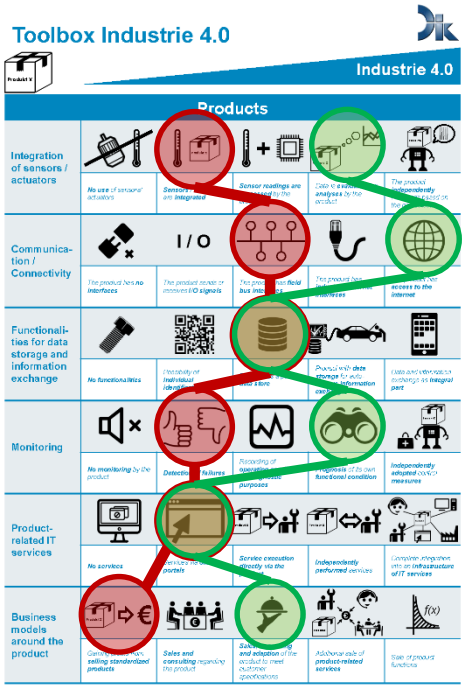
Production



Intralogistics



Production, products, business models: Industrie 4.0 development trends

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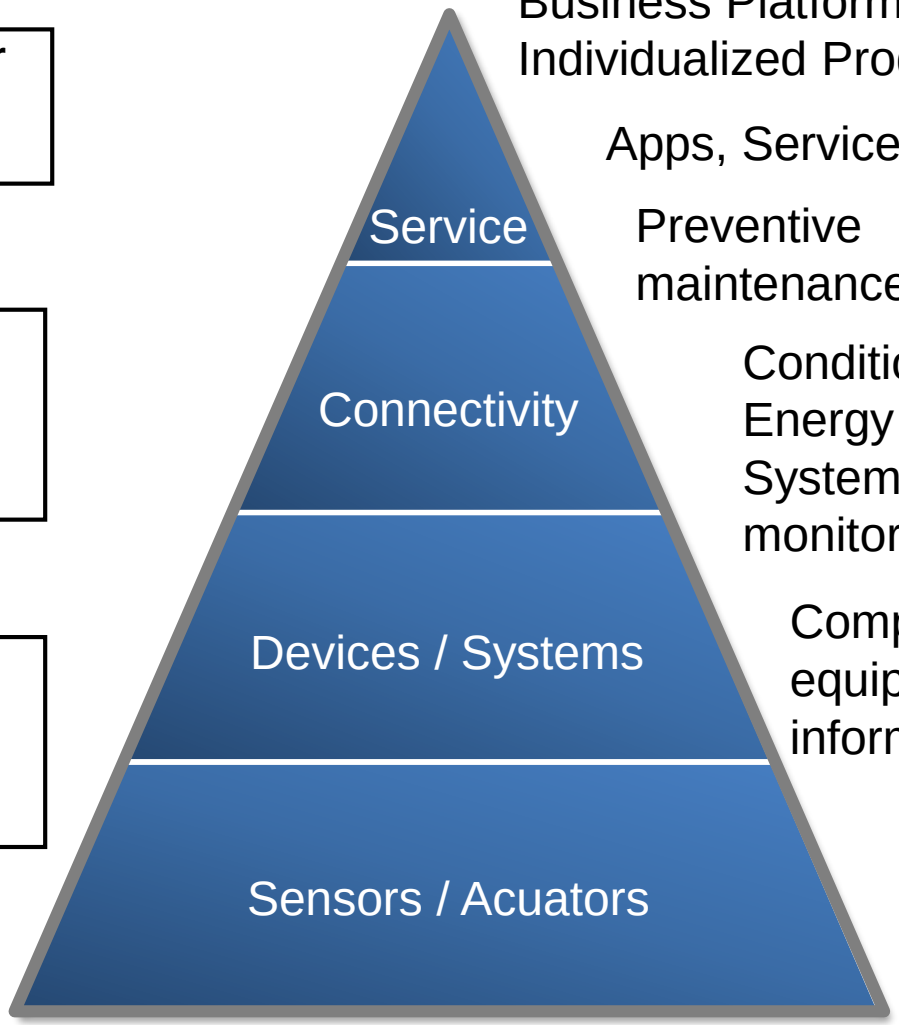
New approaches for internet-based business models

New level of organization and management of the value added chain

Interlinked and communicating systems



Business Platforms, B2B Marketplace
Individualized Products and Production,

Apps, Services instead of products

Preventive maintenance

Component tracking

Condition monitoring
Energy monitoring
System and structural monitoring

Components and equipment act as information carriers

Addressing
Localization
Identification

Bluetooth

RFID

Quelle: Lee

A Realization Guideline for Industrie 4.0

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1. Introduction
2. Approaches for Implementation of Industrie 4.0
   - Implementation Recommendation Plattform Industrie 4.0
   - Sample Solutions
     - Efficient Factory 4.0
     - Competence Center Mittelstand 4.0
3. The VDMA Guideline
   - Internal Competence Analysis – External Perception Analysis
   - Toolbox Products
   - Toolbox Production
   - Strategic Orientation towards Industrie 4.0
   - Business models
4. **Summary**

Summary

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- Industrie 4.0 provides new impulses for the development and application of cyber-physical systems on the way to the internet of things, of services and data.
- Industrie 4.0 still requires research and development initiatives, nevertheless applicable solutions are already visible.
- Impulses for the Industry:
  - Customization through customer and market interaction
  - New ICT infrastructures
  - Innovative business models through integrated product and service quality
- Current state of debate:
  - Politics: Politicians have recognized the importance of Industrie 4.0 at the federal level and the state level and became active (Plattform Industrie 4.0, IT summit, European initiatives)
  - Industry: The industry has organized itself through the platform industry 4.0
  - Society: Change of the working environment! Increasing digitization and computerization through Industrie 4.0 requires training and continuous qualification of employees

➢ ***Industrie 4.0 offers to companies a serious vision, that has to be evaluated and implemented company-specific.***

Thank you!

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