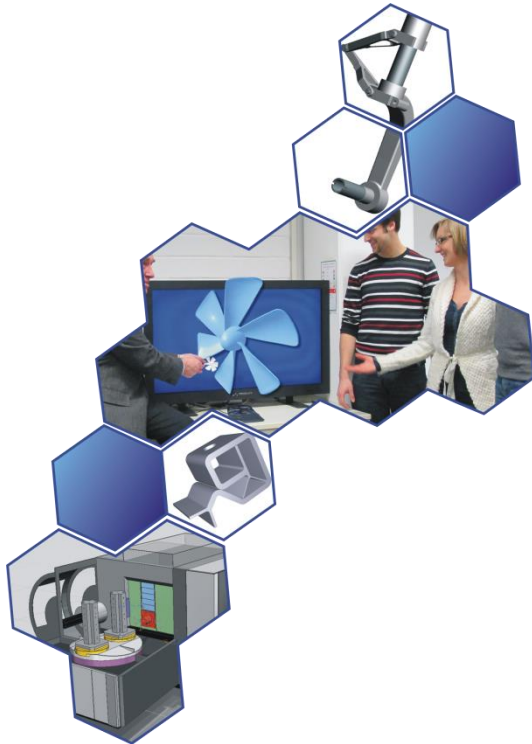


"Sustainable Research Strategies for Smart Production Technologies"



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1. Introduction

2. Industrie 4.0 Organization and Research Strategy

3. Strategic Approaches

- **Memorandum for a More Agile and Flexible Innovation System**
- **Strategic Research Fields**

4. Digital Transformation

5. Conclusion



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Development of information and communication technology (1)

Hypertext hyperlinked documents

 (1995)

  (1985,1997,1998)

  (1995)  (1994)

World Wide Web

Web

1995

Multimedia hyperlinked media

 (1998)

 (1999)

Java, UML, XML

Web 1.0

2000

Socialmedia (1) networking people

 (2004)

 (2005)

 (2006)

Web Services

Web 2.0

2005



Source: Dr. Dais, Bosch

Development of information and communication technology (2)

**Socialmedia (2)
networking
companies**



App technology

Web 3.0

2010

**Cyber-Physical Media
interconnected and
communicating systems**



**Industrie 4.0
component**

Web A.B

2015

**Future Media
Smart Networking**

5G

Artificial Intelligence

Machine Learning
Pattern Recognition
Smart Contracts
Engineering Smart Systems
Collaborative Roboting

Web X.Y

2020

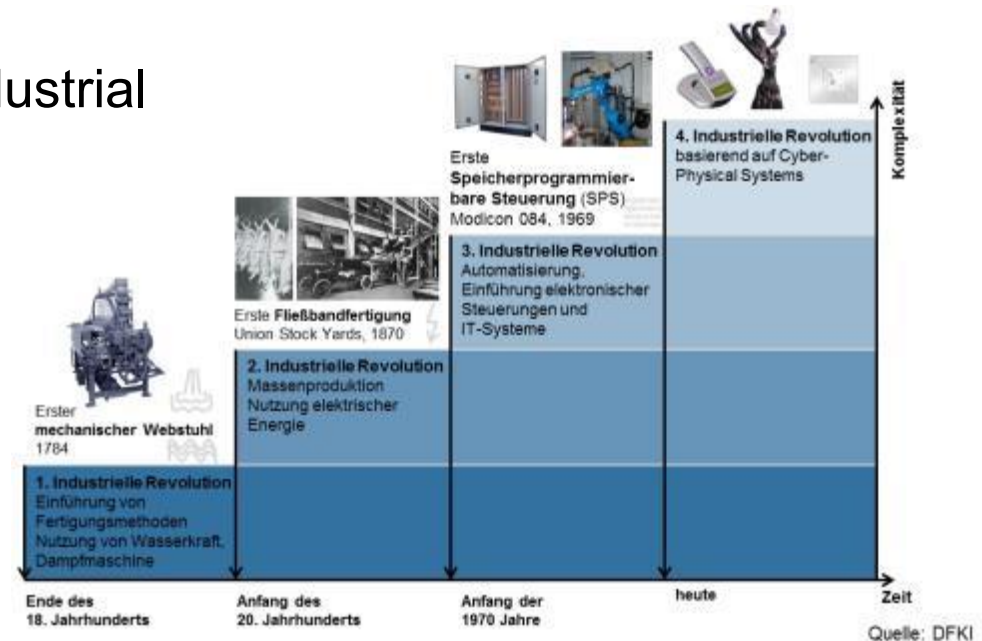
Industrie 4.0 – what does it mean?

The term Industrie 4.0 is a play on words consisting of 3 parts.

First “Industrie” indicates that this initiative is dedicated to industry.

Second, “.0” references the internet technology and intends to create the association with Web 1.0, Web 2.0, Web 3.0, Web ... technology.

Third, the “4” stands for the 4th industrial revolution and aims at reaching a new level of industrial value chains covering the whole product lifecycle.

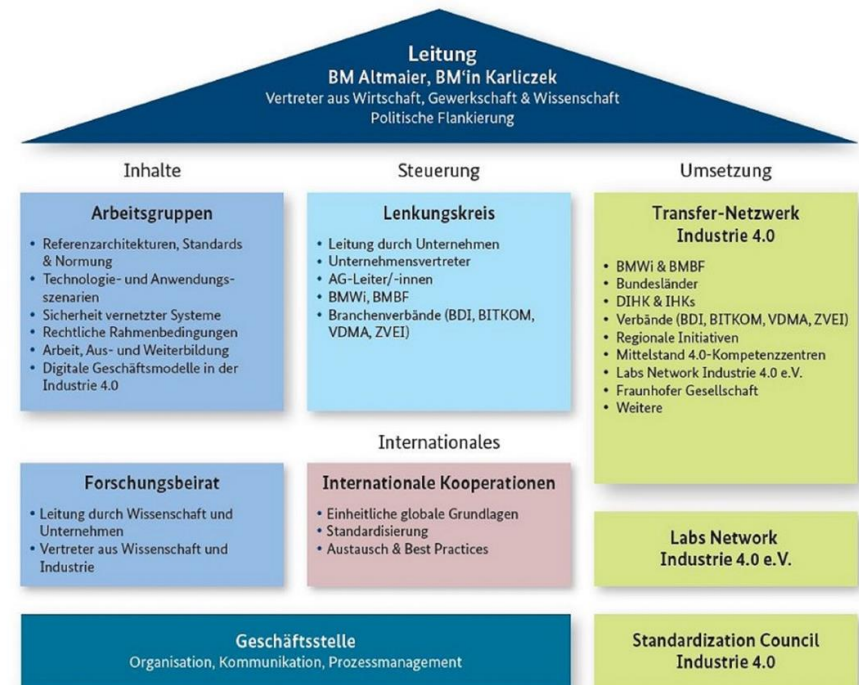


Industrie 4.0 – what does it mean?

Industrie 4.0 means the 4th industrial revolution and aims at new value chains covering the whole product lifecycle.

The technological approach is the use of so-called Cyber-Physical Systems, which comprise modern control systems containing embedded systems equipped with an internet address..

Applying this approach future products and production equipment are enabled to be logically interlinked and are able to communicate.



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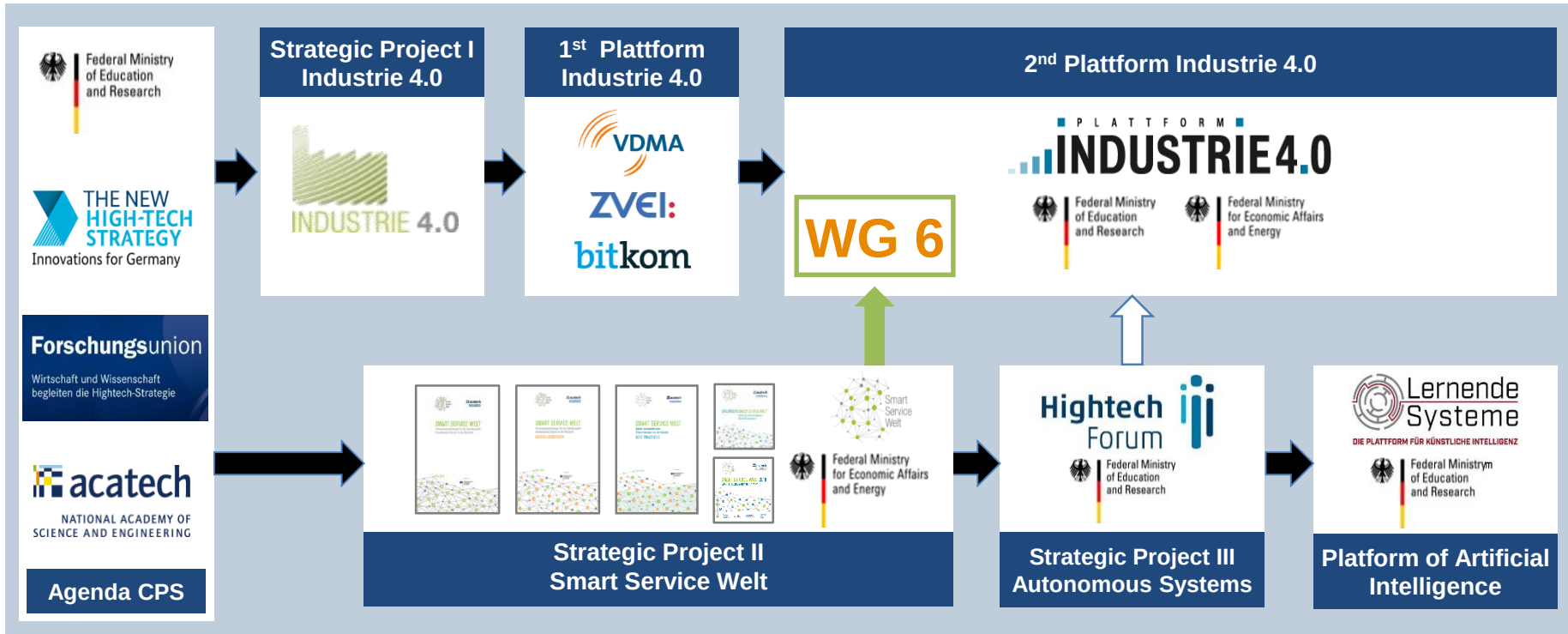
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Germany's Digital Journey

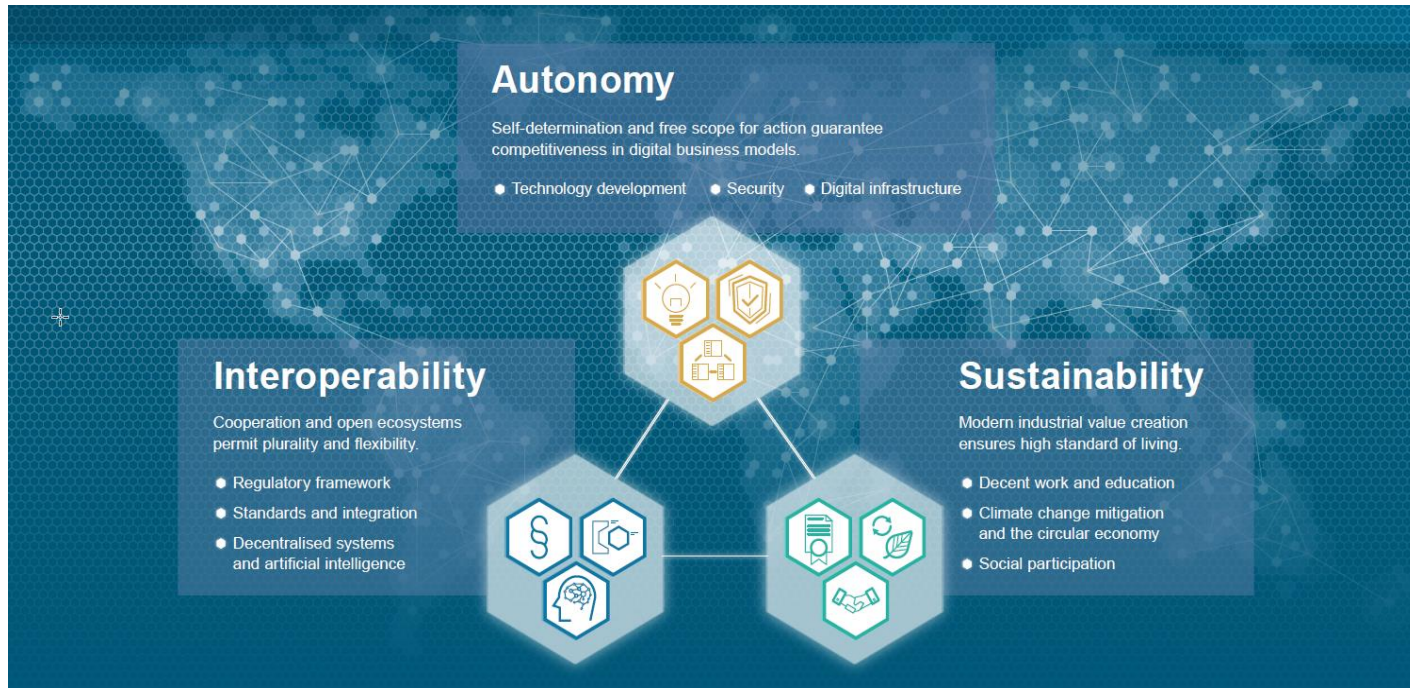


Source: acatech, Research Council Platform Industrie 4.0, 2019



2030 Vision for Industrie 4.0

Shaping Digital Ecosystems Globally



This way to the
publication.



Source: acatech, Plattform Industrie 4.0, 2019

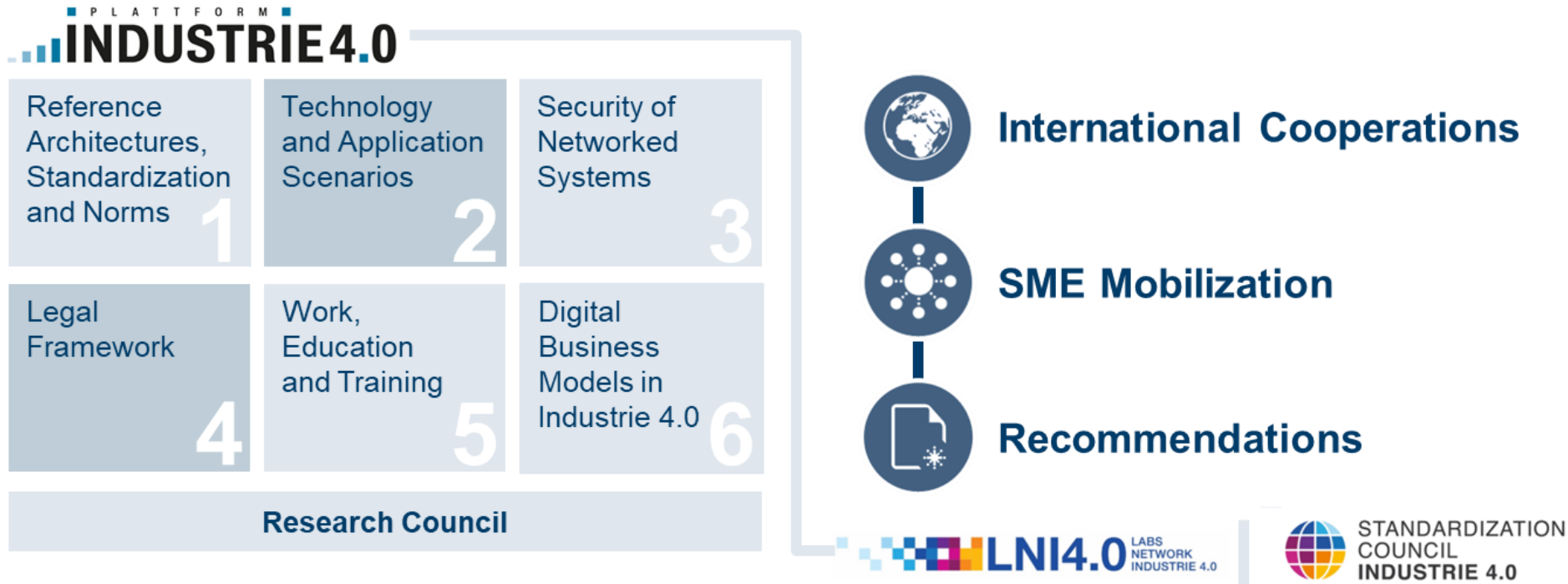
PLATTFORM
INDUSTRIE4.0
FORSCHUNGSBEIRAT



 **acatech**
NATIONAL ACADEMY OF
SCIENCE AND ENGINEERING

The Digital Transformation needs a Broad Foundation

Expanding the Scope of Plattform Industrie 4.0



Source: acatech, Research Council Plattform Industrie 4.0, 2019

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Research Council

Memorandum for a More Agile and Flexible Innovation System in Germany



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International competition, adaptation require the **further development** to the following aspects:

Speed

Flexibility

Agility

„Spaces“
New forms of
research
infrastructure



collaboration
with regard

New
Working
Methods

This way to the
publication.



Schneller zum Markterfolg

Memorandum des Forschungsbeirats der Plattform Industrie 4.0
für ein agileres und flexibleres Innovationssystem in Deutschland



acatech

NATIONAL ACADEMY OF
SCIENCE AND ENGINEERING



Source: acatech, Research Council Plattform Industrie 4.0, 2019

Research Council

Enhancing the implementation of Industrie 4.0 by tracking research and development requirements



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The Research Council continuously monitors **research and development requirements** in the following **key themes of Industrie 4.0**:

**Economical
and Value
Creation
Scenarios**

**Prospective
Technological
Trends**

**Methodologies
and Tools**

**Work and
Society**



“Thematic Fields of Industrie 4.0” will be published in October 2019.

Source: acatech, Research Council Platform Industrie 4.0, 2019



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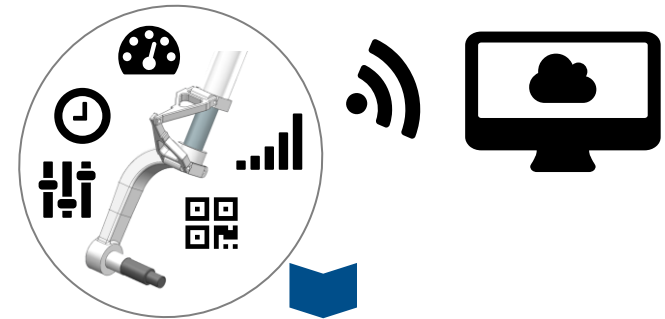


Approaches for smart systems

Improvement of the added value Based on functional integration



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



Cyber-physical systems support networking and communication

- Condition Monitoring
- Systems and Structural Health Monitoring
- Remote Diagnosis and Control
- Tracking and Tracing



Source: TU Darmstadt, ESE



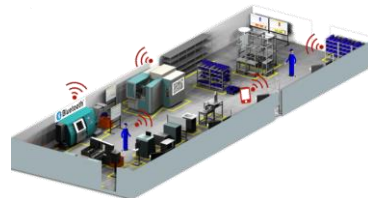
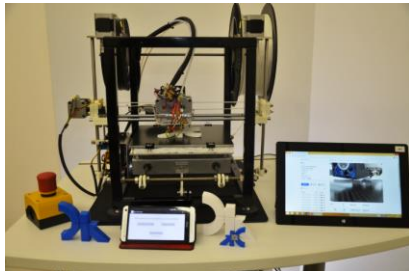
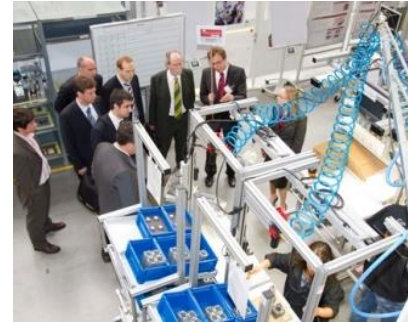
Strategy to Transfer Industrie 4.0 to Industry



Smart Factory



Source: TU Darmstadt
Center of Industrial Productivity



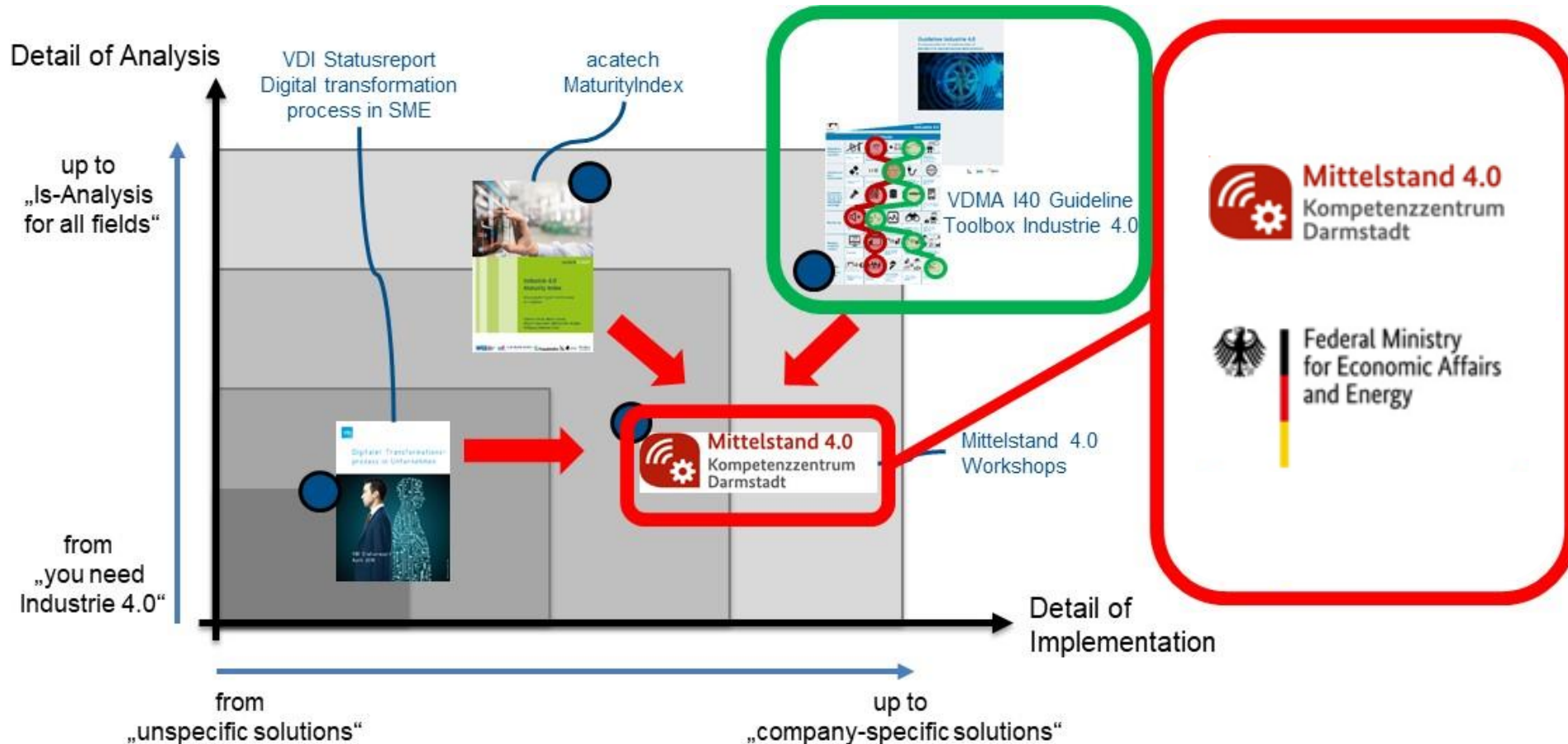
**Research and
Development
Labs**

**Demonstration
and Learning
Centers**

**Competence
and Transfer
Center**

**Prototyping
and Testbed
Centers**





OPC UA @ VDMA (Mechanical Engineering Industry)

OPC UA Companion Specification define the Semantics



OPC UA
Companion
Injection M
Machine



Interoperability by defining the meaning of
information



Overview of OPC UA in the VDMA organization units

- » Agricultural Machinery
- » Air Conditioning & Ventilation
- » Air Pollution Control
- » Automated Guided Vehicles
- » Battery Production
- » Building Control and Management
- » Building Materials
- » Ceramic Machinery
- » Cleaning Systems
- » Compressors, Compressed Air and Vacuum Technology
- » Construction Equipment
- » Continuous Conveyors
- » Cranes
- » Die & Mould
- » Drying Technology
- » Electrical Automation
- » Electronics, Micro & Nano Technologies

- » Engines
- » Engines & Systems
- » Fire Fighting Equipment
- » Fluid Power
- » Food Processing and Packaging Machinery
- » Foundry Machinery
- » Glass Machinery
- » Hydro Power Plants
- » Industrial Trucks
- » Integrated Assembly Solutions
- » Intralogistic Systems
- » Length Measurement Technology
- » Lifts & Escalators
- » Machine Tools and Manufacturing Systems
- » Machine Vision
- » Metallurgical Plants and Rolling Mills

- » Micro Technologies
- » Mining
- » Photovoltaic Equipment
- » Plastics & Rubber Machinery
- » Power Transmission Engineering
- » Precision Tools
- » Printing & Paper Technology
- » Process Plant & Equipment
- » Productronic
- » Pumps & Systems
- » Refrigeration & Heat Pump Technology
- » Robotics
- » Security Systems
- » Software & Digitalization
- » Surface Technology
- » Testing Technology
- » Textile Care, Fabric and Leather Technology

- » Textile Machinery
- » Thermal Power Plants
- » Thermo Process Technology
- » Valves
- » Waste Treatment & Recycling
- » Weighing Technology
- » Welding & Pressure Gas Equipment
- » Wind Power Plants
- » Woodworking Machinery

OPC UA CS released

Release Candidate

Joint Working Group with OPC Foundation

OPC UA CS in work

Aware of OPC UA

I am a robot
from KUKA.

I can move
products with
max 150 kg.

Source: VDMA



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The Digital Transformation is a key success factor for industry to gain increasing and sustainable competitiveness.

Industrie 4.0 as a key initiative of the German High-Tech strategy is supported by the German government and to be implemented by industry.

Key strategy of Industrie 4.0 is the creation of new innovation for smart systems such as smart products, smart production systems, smart logistics or smart grids based on the integration of internet based communication and embedded control software to ensure sustainability and environmental soundness.

Current situation:

Political level:	Strong awareness of the importance of Industrie 4.0
Industry:	Industry has started to organize and to implement Industrie 4.0
Society:	Increasing awareness of a changing working environment!

Digital Transformation based on Industrie 4.0 enables an agile and flexible innovation system and strengthens industrial competitiveness



Thank you very much for your attention!



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*I cannot say whether things will get
better if we change;
what I can say is they must change if
they are to get better.*

Georg Christoph Lichtenberg (1742-1799)
German scientist, author and philosopher

Source: TU Darmstadt / kh-architekten