

Industrie 4.0 in Germany: Framework and Government Initiatives

Germany's Approach to tomorrow's Manufacturing

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Taipei, 30 May 2016
IDB Computex



„Trademark“ Industrie 4.0 – Hannover Messe 2011



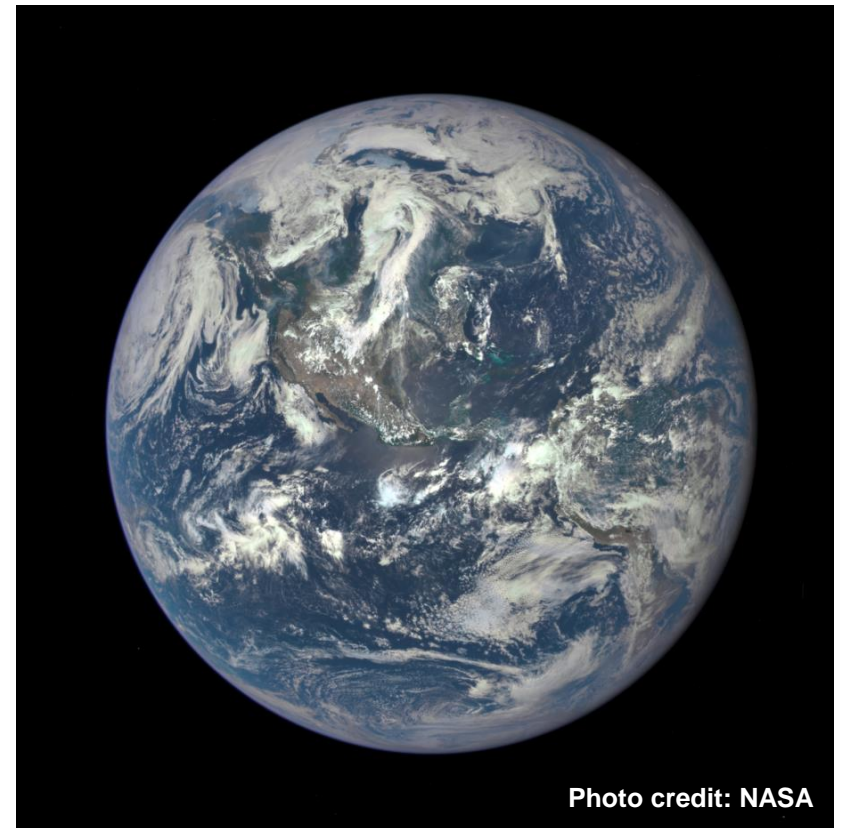
Agenda

1. **Implementation in Germany**
2. Framework Development & Government Initiatives
3. Research of Excellence
4. Outlook

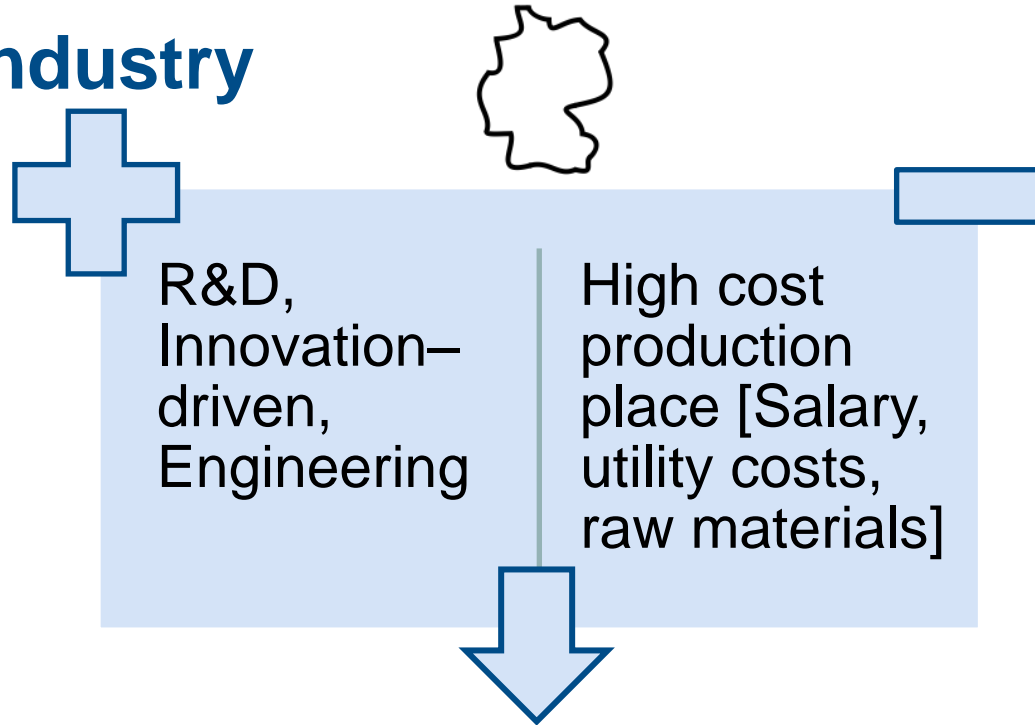


Global Trends

- ▶ Globalization
- ▶ Climate Change
- ▶ Demographic Change
- ▶ Urbanization
- ▶ Digital Transformation



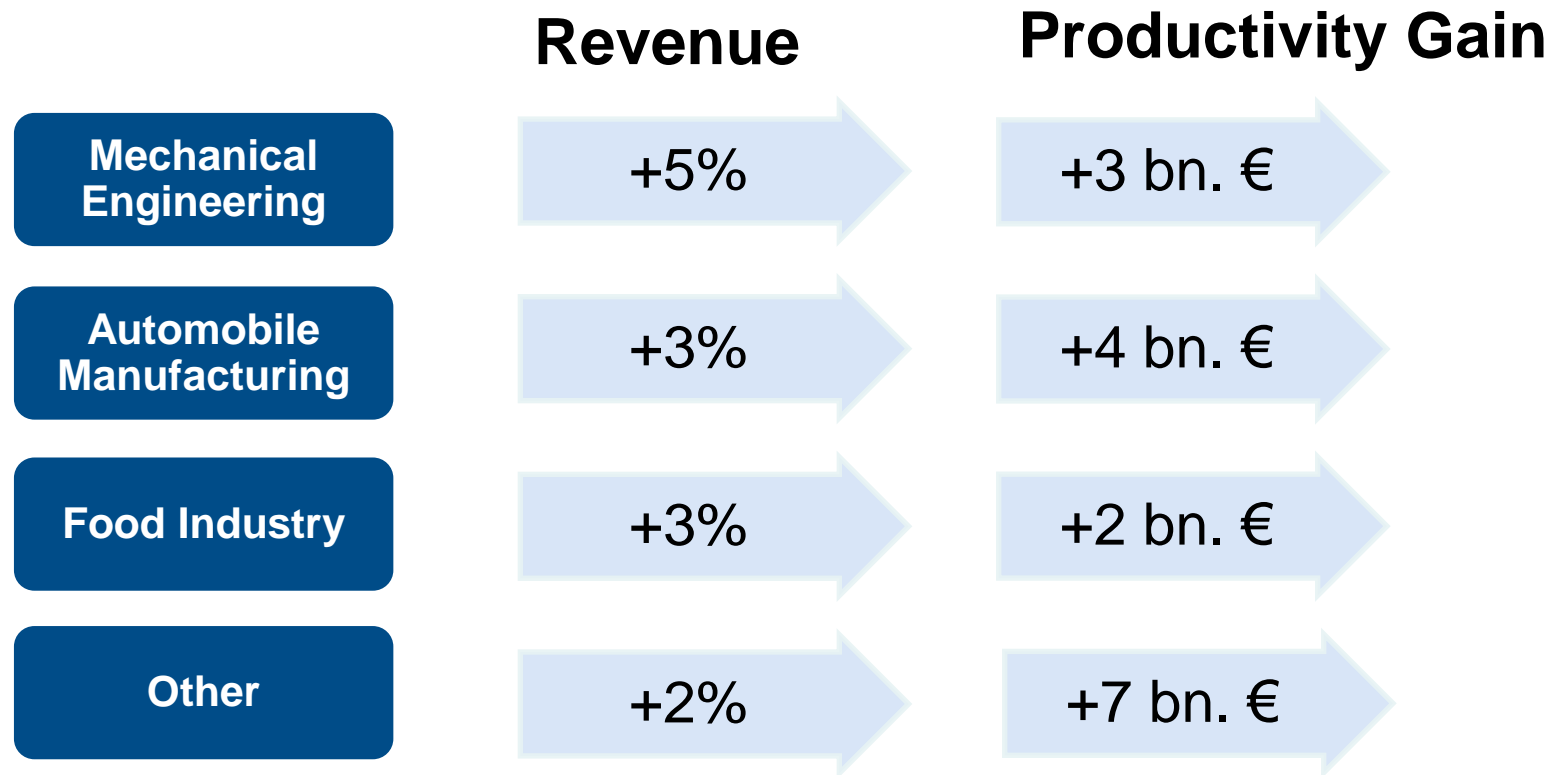
German Industry



Upgrade & increase production quality and productivity

- Digitalize the industry
- Combine technologies: Engineering + Big Data
- Establish a new way of production
- HR, R&D: Create new research fields & job opportunities

Economic benefits of Industrie 4.0 in Germany – Increase per year (2014)



Source: Student und Maier

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„Trademark“ Industrie 4.0

► 2011:

- Mentioned for the first time at the Hannover Messe



► 2016:

- Focus Topic

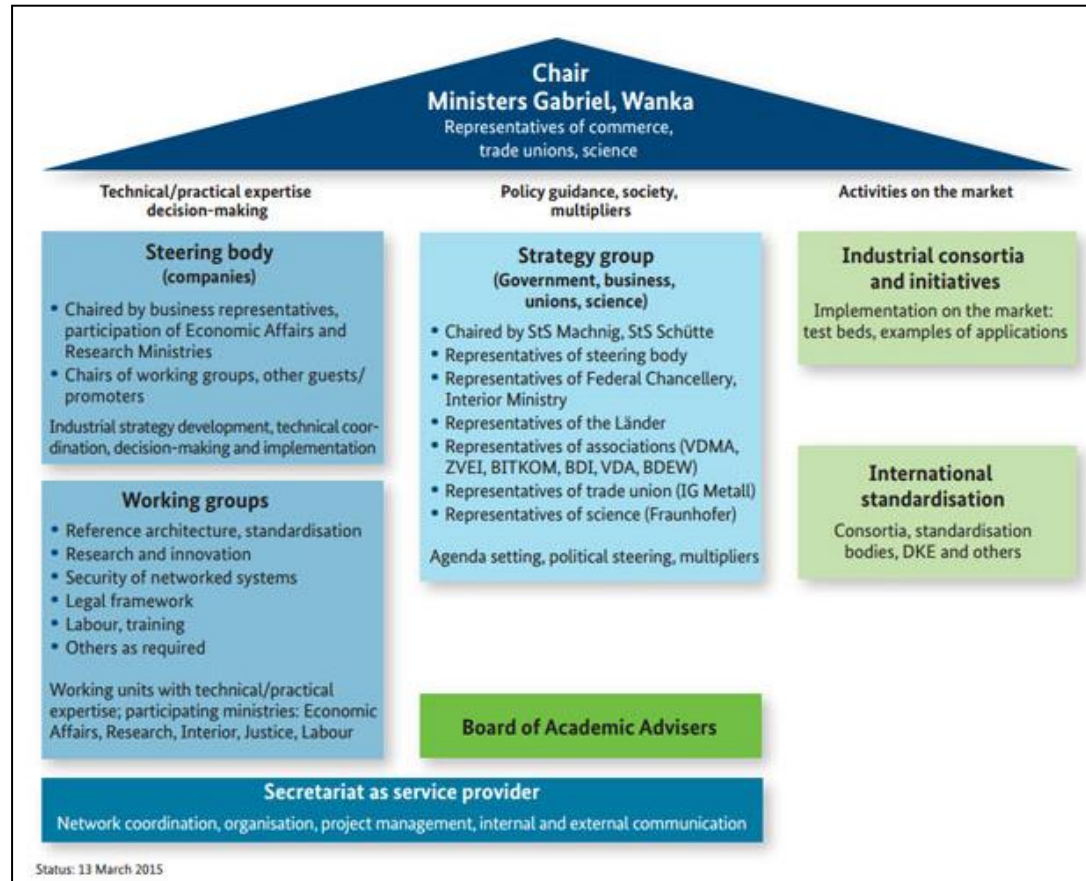


INDUSTRIE 4.0

Get ready for the connected Industry

Radical change awaits us, in which entire operating flows will be transformed. Flexibility and individualized production and logistics are prerequisites for remaining competitive.

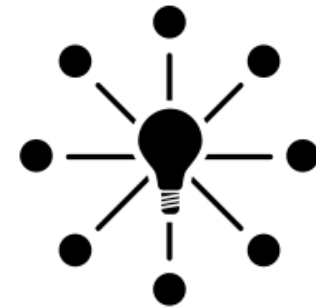
„Industrie 4.0“ Plattform



Source: Ministry for Economic Affairs and Energy/Fraunhofer IAO

„Industrie 4.0“ Plattform

- ▶ Joint initiative of BITKOM (Federal Association for Information, Technology, Telecommunications and New Media)
 - ▶ Central alliance for the coordination of the digital structural transition in German industry
 - ▶ Coordination & exchange of ideas
- ▶ Central point of contact for:
 - ▶ Companies
 - ▶ Employee representatives
 - ▶ Politics
 - ▶ Science



„Industrie 4.0“ Plattform

- ▶ The platform unites all of the stakeholders in Industrie 4.0
- ▶ National & international hub supporting German companies, - particularly SMEs - in implementing Industrie 4.0
- ▶ Practical examples from businesses nationwide, concrete recommendations for action and testbeds



„Industrie 4.0“ Plattform



Federal Ministry
for Economic Affairs
and Energy

Federal Ministry
of Education
and Research

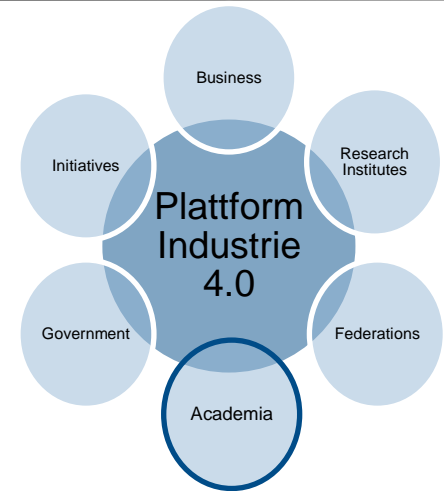


- ▶ Federal Ministry for Economic Affairs and Energy
- ▶ Federal Ministry of Education and Research
 - ▶ Industry-Science Research Alliance
 - ▶ 120 Mio. € government subsidies
 - ▶ Federal platform to create a referral architecture for Industrie 4.0
 - ▶ „High-Tech“-strategy
 - ▶ „Entwicklung 4.0“-program to qualify workers
 - ▶ „Autonomik für Industrie 4.0“: autonomous robots handling complex tasks
 - ▶ Smart Service World: value-creation across compartment and department boundaries

„Industrie 4.0“ Plattform

► Universities:

- TU Darmstadt
- KIT, WBK
- TU München
- Universität Oldenburg
- Universität Paderborn
- Jacobs University Bremen
- RWTH Aachen, WZL



„Industrie 4.0“ Plattform

► Federations:

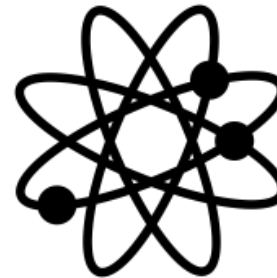
- ZVEI
- VDMA
- BITKOM
- BDEW
- BDI
- DGB
- IG Metall



„Industrie 4.0“ Plattform

► Research Institutes:

- Fraunhofer IAO
- Fraunhofer-Institut IPA
- BIBA
- DFKI



„Industrie 4.0“ Plattform

► Business:

- Robert Bosch GmbH
- WITTENSTEIN AG
- Siemens AG
- SAP AG
- Bosch Software Innovations
- ThyssenKrupp AG
- Deutsche Telekom AG
- BMW AG
- Deutsche Post DHL AG
- TRUMPF Werkzeugmaschinen



- Software AG
- Infineon Technologies AG
- Hewlett-Packard GmbH
- Daimler AG
- Festo AG & Co. KG
- ABB Ltd
- Giesecke & Devrient GmbH
- Scheer Group



„Industrie 4.0“ Plattform

- ▶ Initiatives:
 - ▶ acatech



„Industrie 4.0“ Plattform

- ▶ 5 Working Groups with representatives from business, science, associations, trade unions and federal ministries:
 - ▶ Reference architectures, standards and norms
 - ▶ Research and innovation
 - ▶ Security of networked systems
 - ▶ Legal framework
 - ▶ Work, education and training








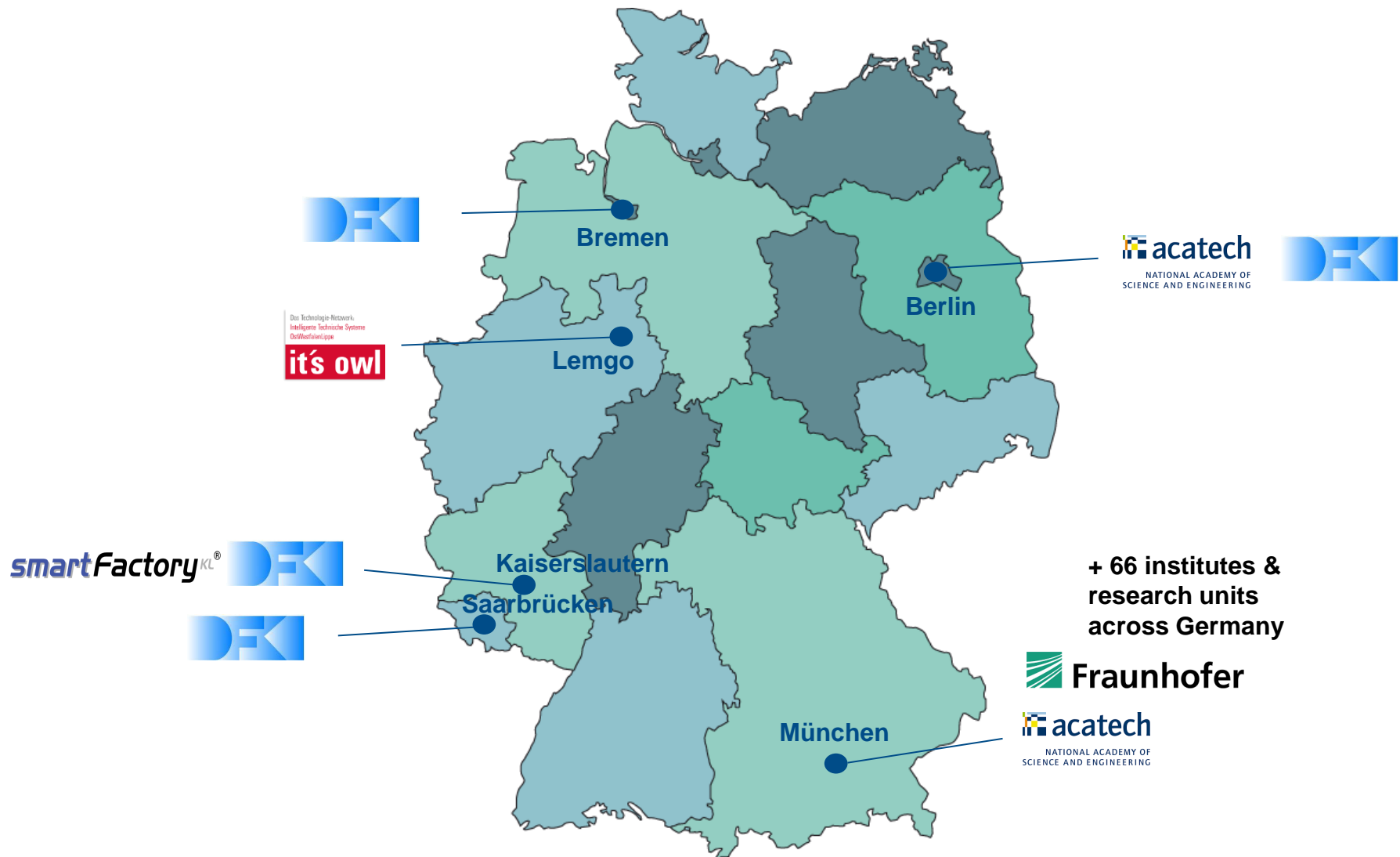
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Research of Excellence

	 <small>NATIONAL ACADEMY OF SCIENCE AND ENGINEERING</small>	 <small>Deutsches Forschungszentrum für Künstliche Intelligenz GmbH</small>			<small>Das Technologie-Netzwerk: Intelligente Technische Systeme OstWestfalenLippe</small> 
Foundation	2011	1988	2005	1949	2012
Role in Germany's Industrie 4.0 project	Supporting policy-makers and society by providing qualified technical evaluations & recommendations, transfer of information & research results between science & industry	Worked on initial concept, cooperation with policy-makers on projects of real societal importance, operating „smart factory“	Implementation and evaluation of state-of-the-art technologies and latest research results, operation of modular pilot plants, development of marketable products	Involved in shaping the project, working on lead project of highly flexible, self-organized capacity management, developing new applications and business models	Developing Industrie 4.0 solutions, industrial automation, human-machine cooperation and self-optimizing production systems (self-x capabilities)



Research of Excellence - Funding

- ▶ Funding received from governmental agencies + industrial partners



- ▶ Autonomous independent & non-profit organisation



Research of Excellence – Educating the next generation

- ▶ Promotion of young scientists and engineers



- ▶ Helping to train needed future generation of scientists and engineers



- ▶ Academic training of young scientist – at present, 413 highly qualified researchers & 272 graduate students contribute to research projects



Research of Excellence



Deutsches
Forschungszentrum
für Künstliche
Intelligenz GmbH



- ▶ Development of product functions, prototypes and patentable solutions in the field of information and communication technology

Research of Excellence *smartFactory*^{KL}[®]



- Plant can already produce a soap bottle to customer specification
- Product has all necessary information in RFID tag and controls its own production

Research of Excellence

- Pioneer projects for different industries



Das Technologie-Netzwerk:
Intelligente Technische Systeme
OstWestfalenLippe

it's owl



Research of Excellence

- ▶ Textile Industry:
- ▶ Cyber Physical Production Systems
- ▶ Innovations in management of resources
- ▶ Customer-oriented flexible value-creation chains



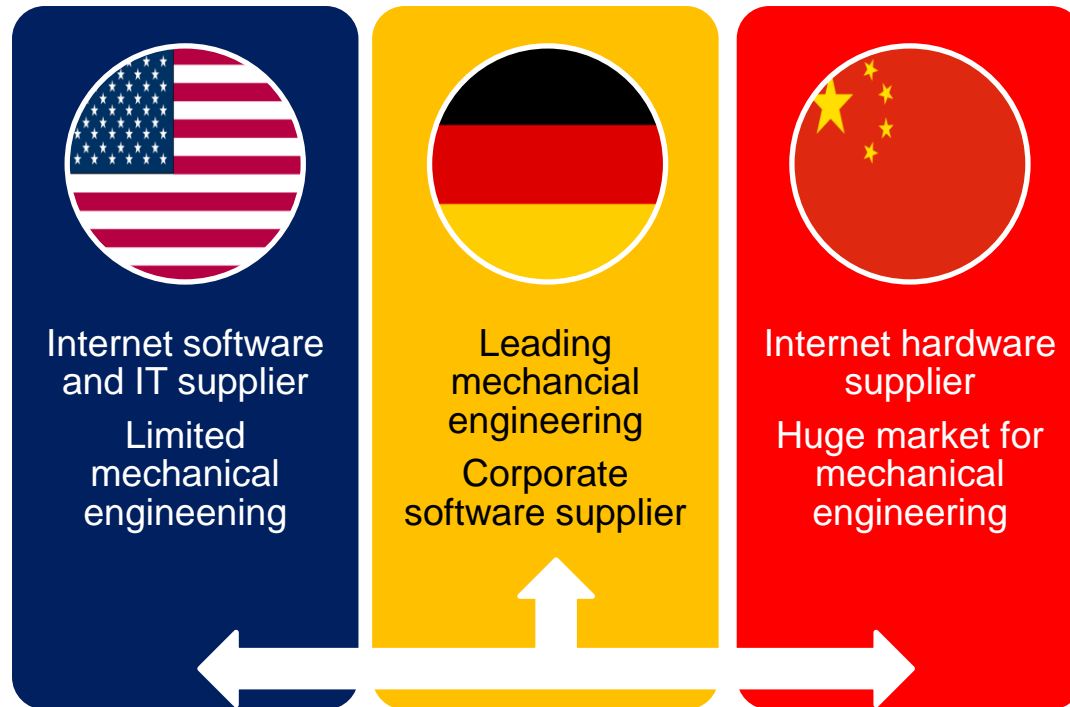
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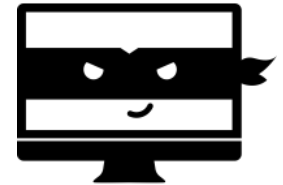


Considerations

- Standards are key!



Considerations



- ▶ Risks of digitalization
 - ▶ 1,1 Mio. Malware samples per day
 - ▶ *“We estimate that the likely annual cost to the global economy from cybercrime is more than \$400 billion.”*
– McAfee
 - ▶ Cybercrime is increasing
- ▶ Survey of the German Federal Office for Information Technology Security (BSI) in April 2016:
 - ▶ 30% of companies had IT-security issue
 - ▶ 60% of companies see cyber attacks as an intensified threat

Source: Cisco, McAfee, BSI

Review Hannover Messe 2016



**Industrie 4.0 arrived
on global Agenda**

Not longer a vision
but actual reality



Source: AA. Hannover Messe

Hannover Messe 2016 – Keynote



- ▶ Sustainable Industrial Value Creation
- ▶ Integration of renewable, decentralized and efficient energy supply



Source: Hannover Messe

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