

Industrie 4.0 – From Vision To Reality

January, 2015

Content



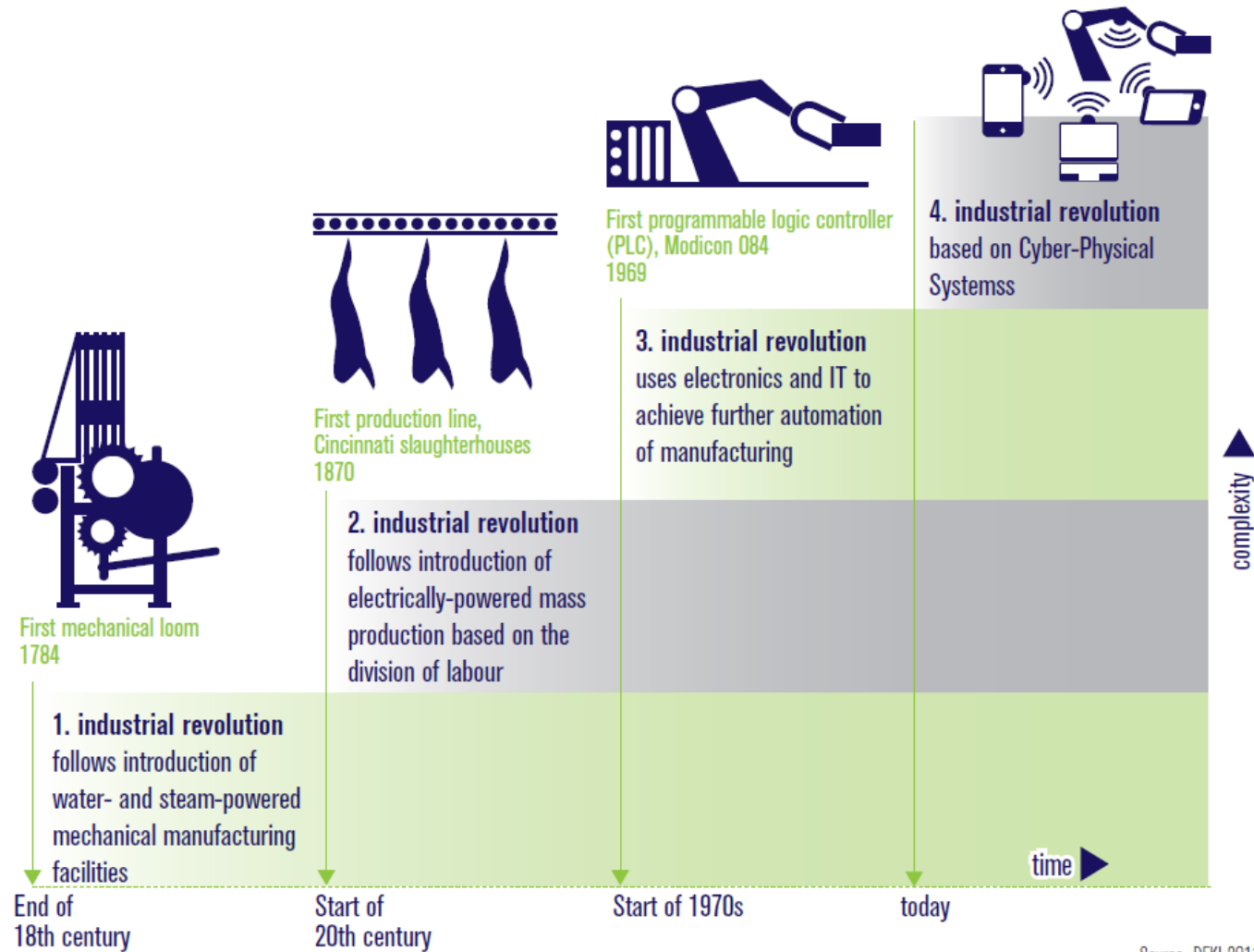
- **Short History – State-of-Play**
- **Why Industrie 4.0?**
- **Industrie 4.0 and enterprises: benefits, drivers, barriers**
- **Activities of the VDMA Forum I4.0**
- **Political dimension**

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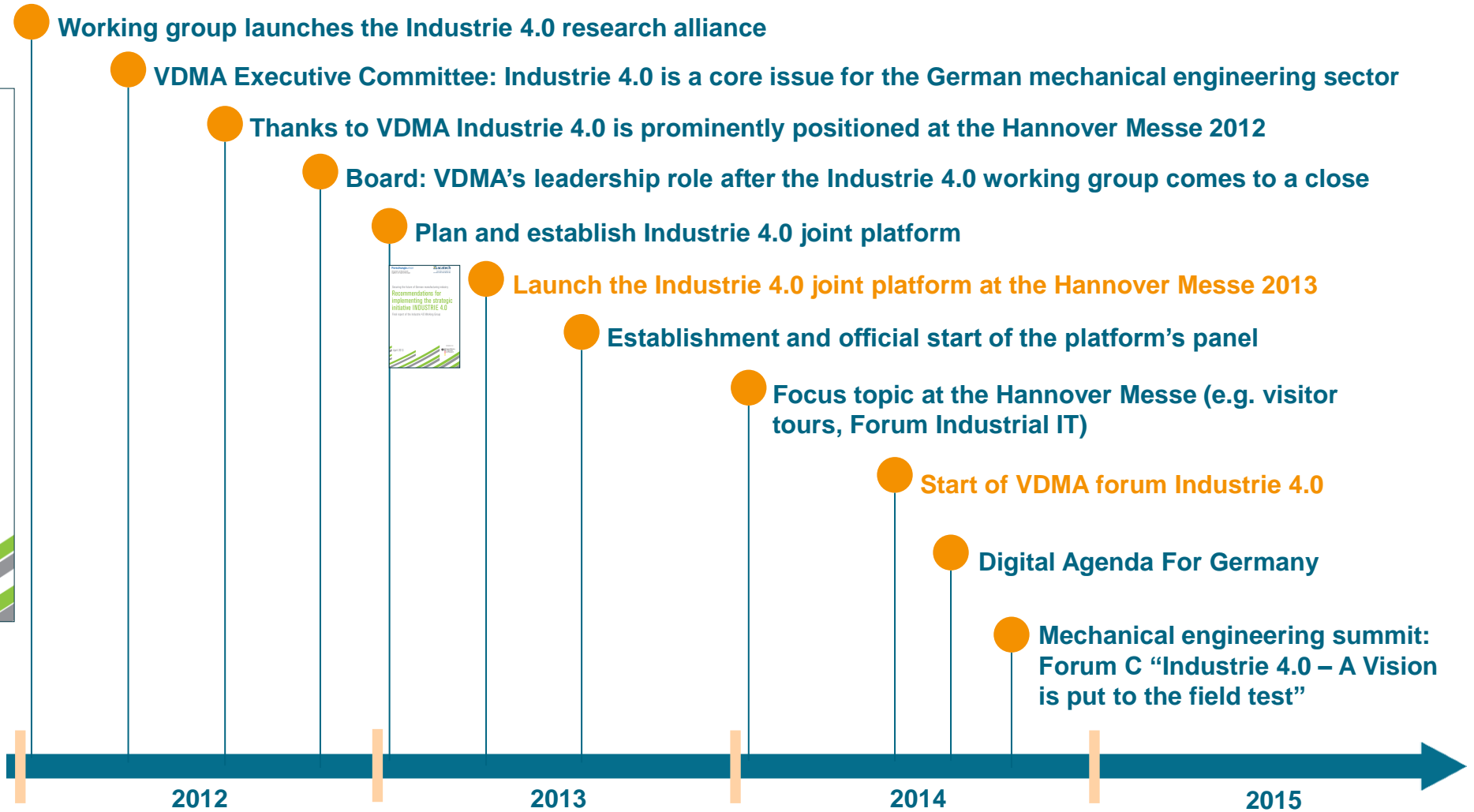
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From 1.0 to 4.0



Source: DFKI 2011

Industrie 4.0 is quickly gaining momentum



Platform I4.0 and context



Spitzencluster
45 Projekte

ZP Internetbasierte Dienste
für die Wirtschaft, 5 AG'n

BDI/BDA-AK „Zukunft der
Industrie“ - AG'n Legal
Foresighting, Zukunft der
Arbeit ?

VDI VDE VDI/VDE-Gesellschaft
Mess- und Automatisierungstechnik
FA 7.20 „CPS“, FA 7.21 „I40“



Horizon 2020, JTI ECSEL,
PPP Factories of the Future

Plattform

AK I40

Fraunhofer IA0:
Innovations-
netzwerk

PRODUKTIONS
ARBEIT 4.0

Nationaler IT Gipfel

Bundesministerium
für Bildung
und Forschung

... und viele weitere ...

Bundesministerium
für Wirtschaft
und Technologie

14 Projekte

Smart Data

Industrie 4.0 in a hype cycle

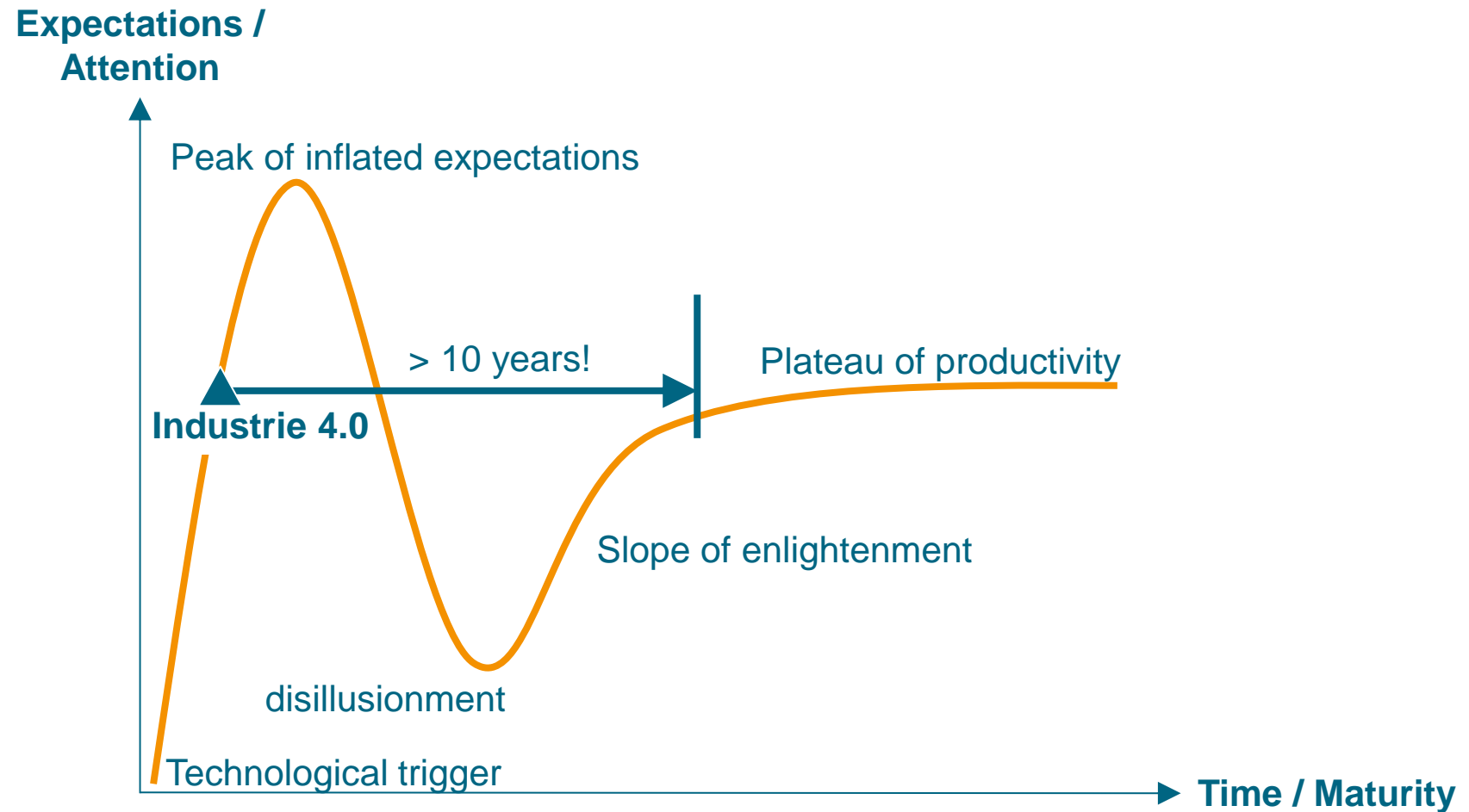


Figure based on Gartner Research 2012

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Industry 4.0: Challenges



- global markets are demanding more flexibility and productivity
- resource consumption has to be minimised.
- progress in in communication, sensor and production technologies opens new sustainable and competitive ways of innovation, production and consumption.
- **More and faster information will optimise resource use, shorten lead times, increase productivity and allow the automatised production of small series and customised products.**

What is Industrie 4.0?

- **Digitalisation and increased integration**
 - » The horizontal value chain and
 - » The vertical connectivity of a company
- **Autonomous**, self-organising production units
- Intelligent products actively support the production process
- Creation of new (digital) business models

- Industrie 4.0 provides the **framework** or rather the **vision**
- The path to Industrie 4.0 is an evolutionary process, which will unfold at different speeds

Definition of Industrie 4.0



Definition Industry 4.0 (Source: Steering Committee of the Plattform Industrie 4.0)

The term “Industrie 4.0” refers to the fourth industrial revolution, a phenomenon that marks a quantum leap in organisation and management of the entire value chain throughout product life cycles. Such life cycles are oriented towards increasingly individual customer requirements. They span from the original idea over product order, development and manufacturing up to delivery to the end customer and ultimately recycling. Product life cycles also include all services associated.

Real-time availability of all relevant information provided by networking all parts of the value chain as well as the ability to derive the optimal value stream at any time, is the basis of Industrie 4.0. By networking humans, objects and systems, value-networks involving several different enterprises arise, which are dynamic, self-organising and real-time optimised. Such value-networks can be optimised with respect to many different criteria, such as cost, availability or resource consumption.

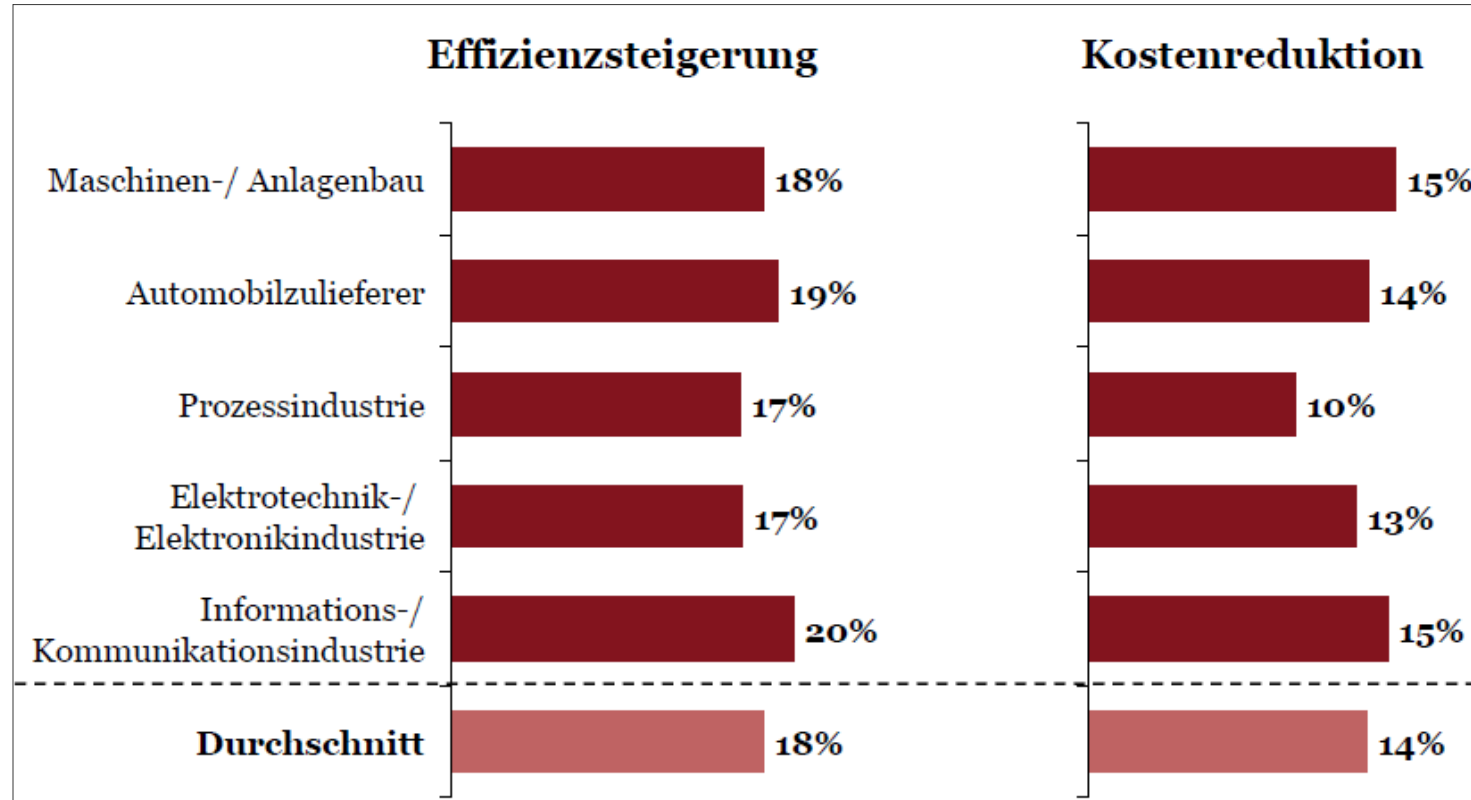
Source: Steering Committee of the platform Industrie 4.0

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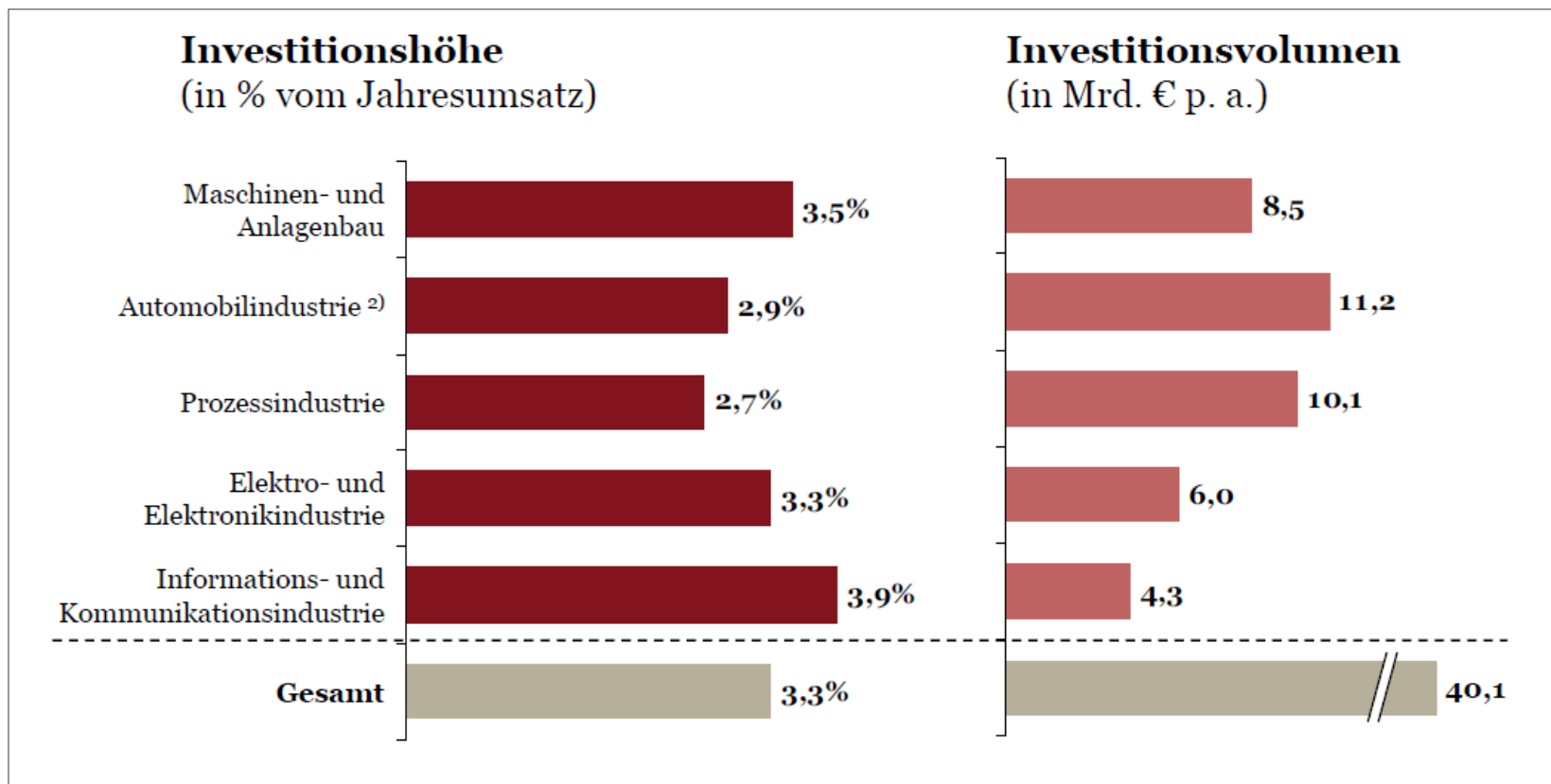
Potential: Productivity



Enterprises in Germany expect an increase in productivity of more than 18% by 2020.

Source: PWC (2014): Industrie 4.0 – die Vierte Industrielle Revolution

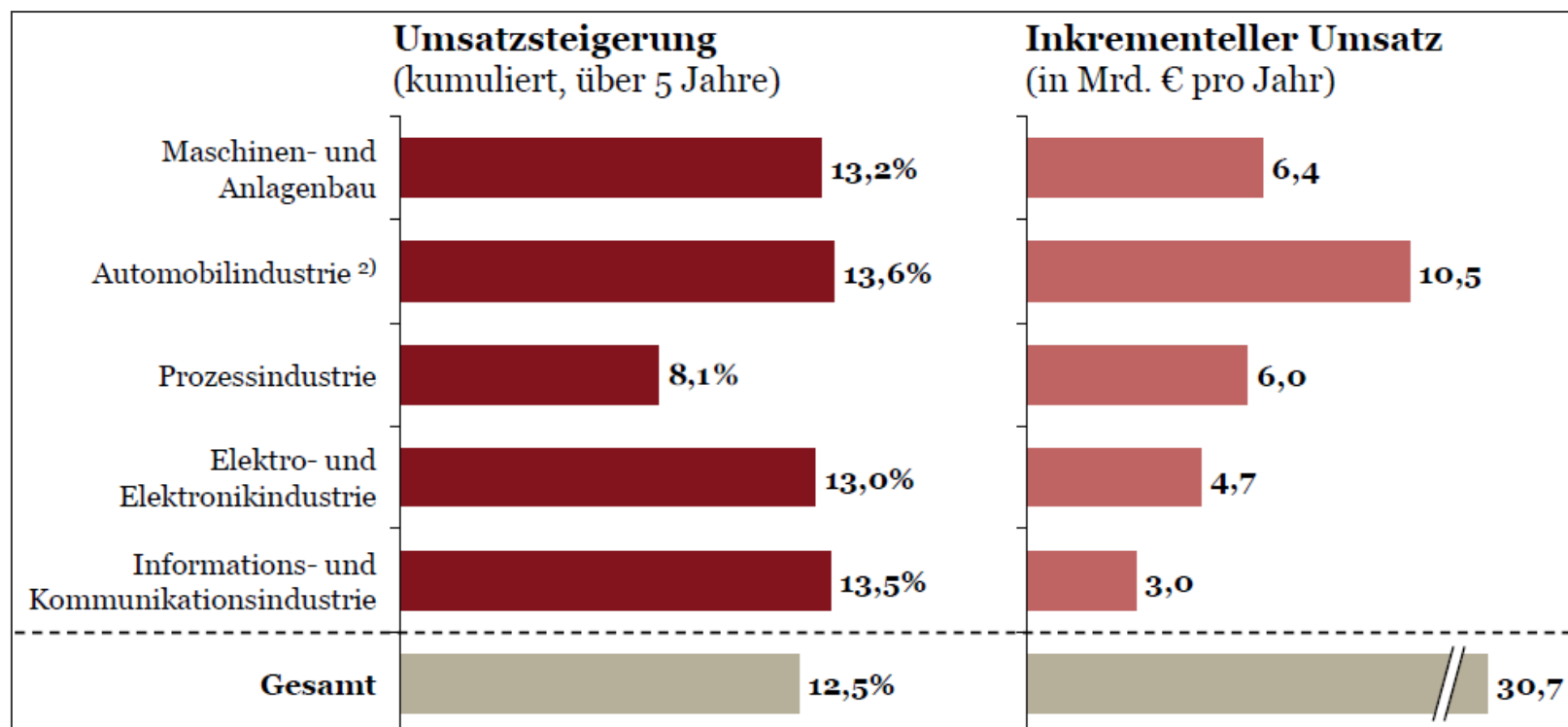
Investments in Industrie 4.0



The related investments in equipment are estimated to reach around 40 billion Euro p.a. – which might constitute the urgently needed investment stimulus for the European economy.

Source: PWC (2014): Industrie 4.0 – die Vierte Industrielle Revolution

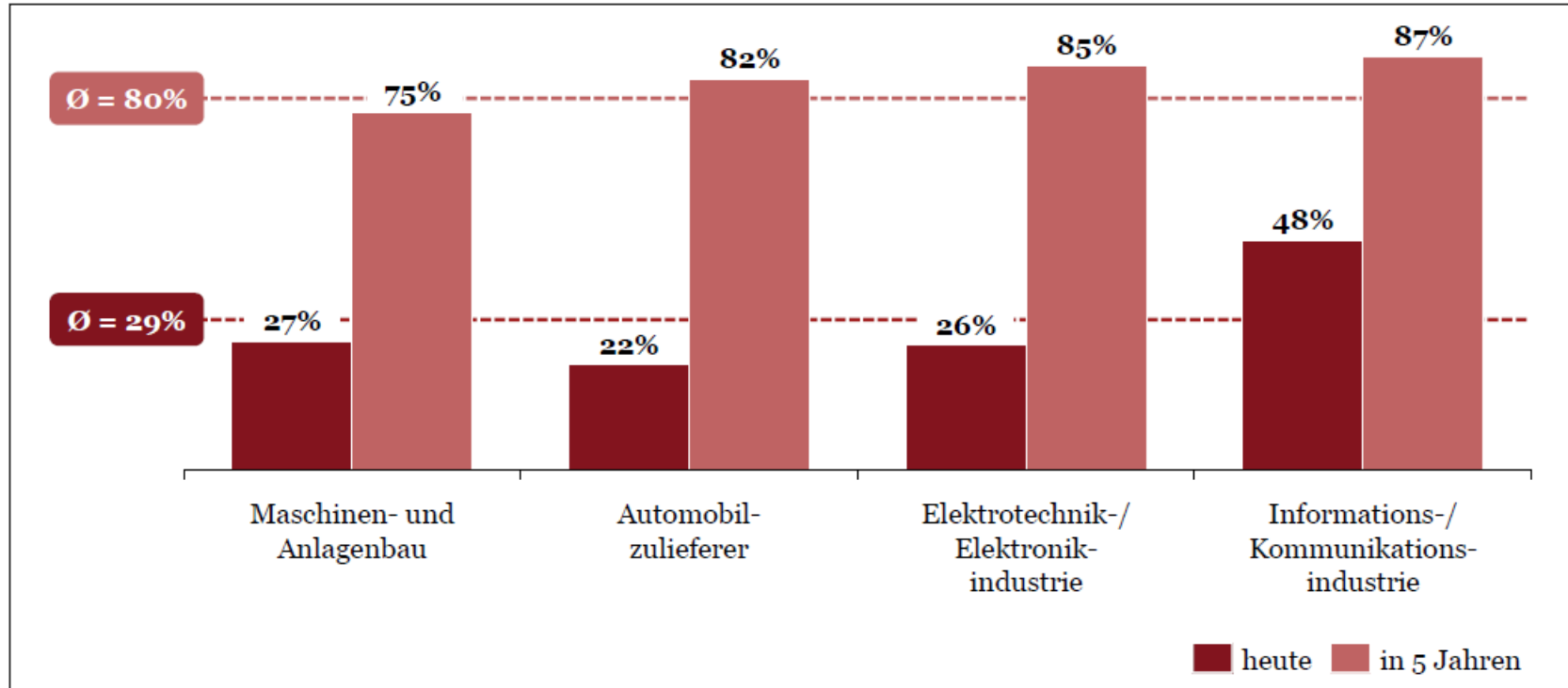
More business through digital portfolio of product/services



Industry 4.0 could increase turnover by 12 % in 5 years.

Source: PWC (2014): Industrie 4.0 – die Vierte Industrielle Revolution

Digitalisation of value chains



By 2020, 80% of value chains will be mostly digitalised.

Source: PWC (2014): Industrie 4.0 – die Vierte Industrielle Revolution

I4.0: relevant for business objectives

Meeting delivery deadlines

- » Most Important objective for 2/3 of companies
- » Customer satisfaction

Throughput

- » High Efficiency
- » Short time between delivery and invoicing
- » Cash-Flow optimisation

Cost

- » Keeping low Work in Process (WIP)
- » Ideal level of capacity use

Humans still in the centre – same legal framework



- The autonomous reaction of production scenarios takes place in a defined and controlled framework – humans are still in the driving seat.
- Machines and Components won't have power of procurement!
- Property rights are still valid
- Legal framework for contracts remains valid



Barriers to overcome



- broad acceptance in industry which can only be achieved when the solutions are reliable, economically viable and if the **know-how- is well protected**.
- The integration of value chains requires communication between companies, factories and machines. This integration will happen on an unprecedented level and will cross not only factory walls, but also sectorial borders, management hierarchies and life-cycle phases. The essential basis for this are common **standards**.
- The development and deployment of Industrie 4.0 is not only a challenge for industry. The **framework conditions** have to be established between industry, society and policy makers – on a national, European and international level.

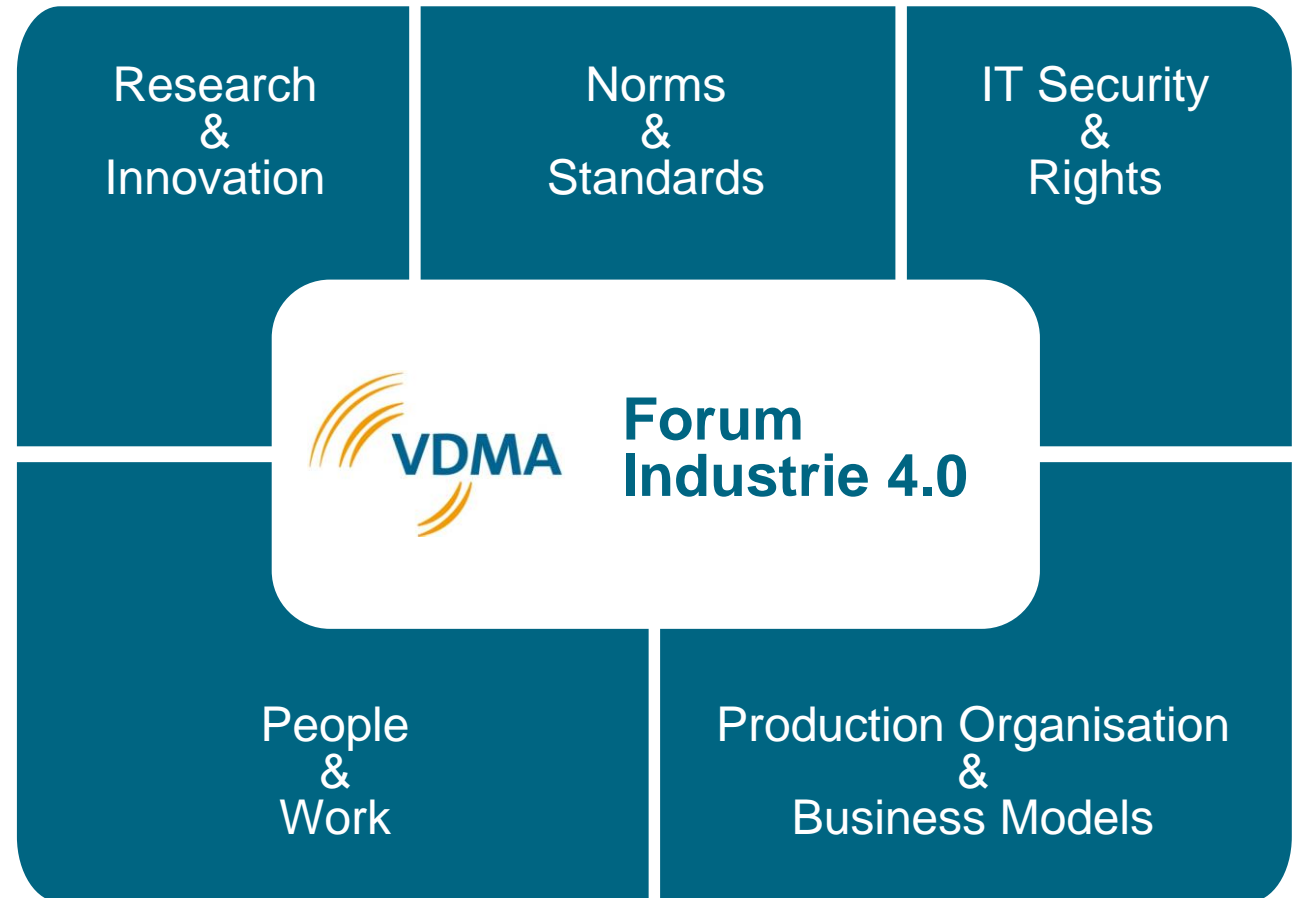
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Forum Industrie 4.0 - Spheres of action



Industrie 4.0

Die vierte industrielle Revolution

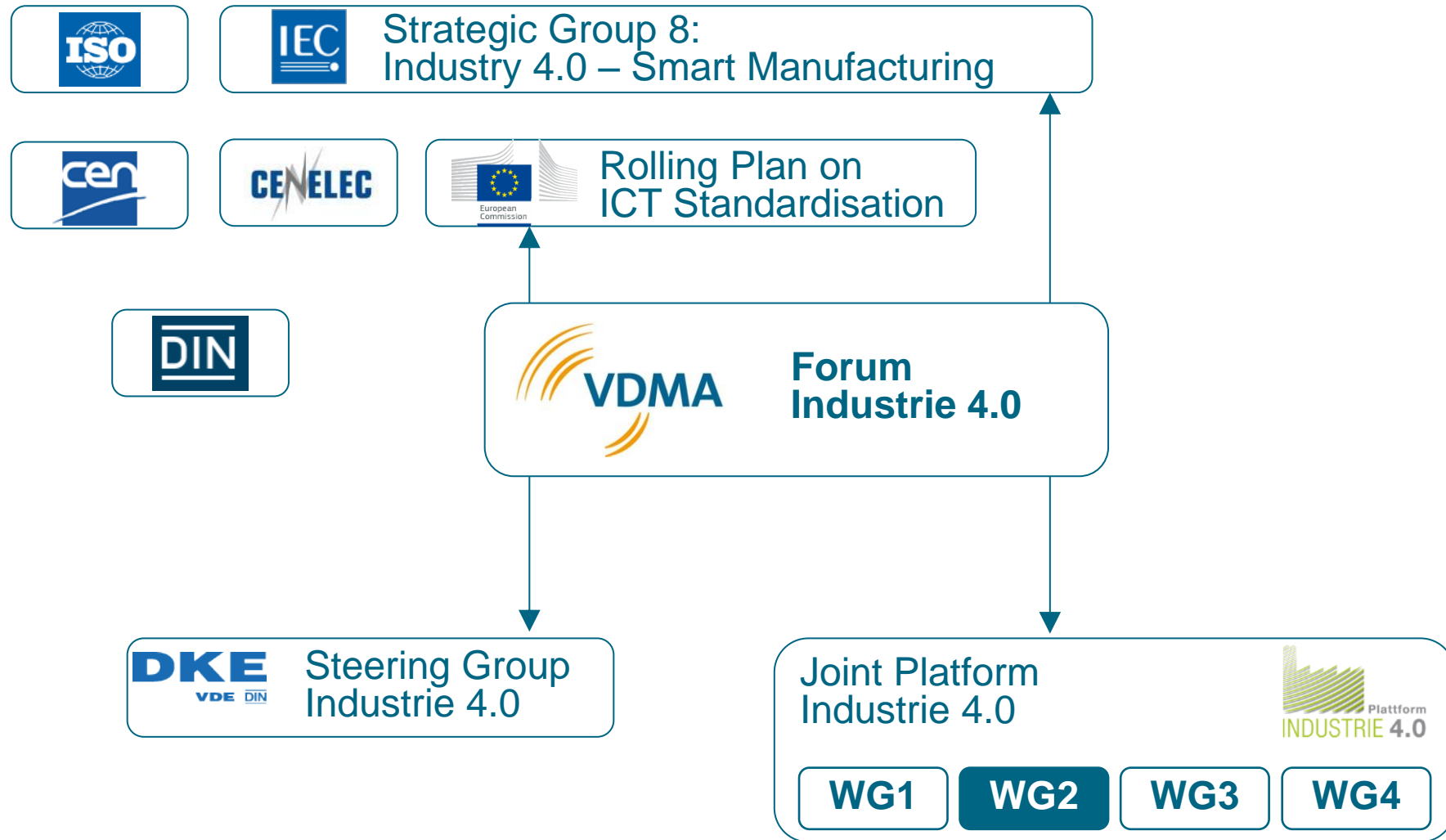
The fourth industrial revolution



Forum Industrie 4.0 Goals

- Further develop the vision of Industrie 4.0 into **implementable recommendations**
 - » Taking into account the perspective of users and providers
 - » Documenting the requirements of the machine and plant engineering sector
- Build up a **network** to share experience
- **Transfer** research results into the practical workplace
- **Represent the interests** of the mechanical engineering sector vis-a-vis politics, science, standardisation bodies and other sectors
- **PR work** to communicate the opportunities, challenges and implementation possibilities

Norms and standards



Research and Innovation Goals and measures

Organisation of pre-competitive research

Transfer of research results into the practical workplace

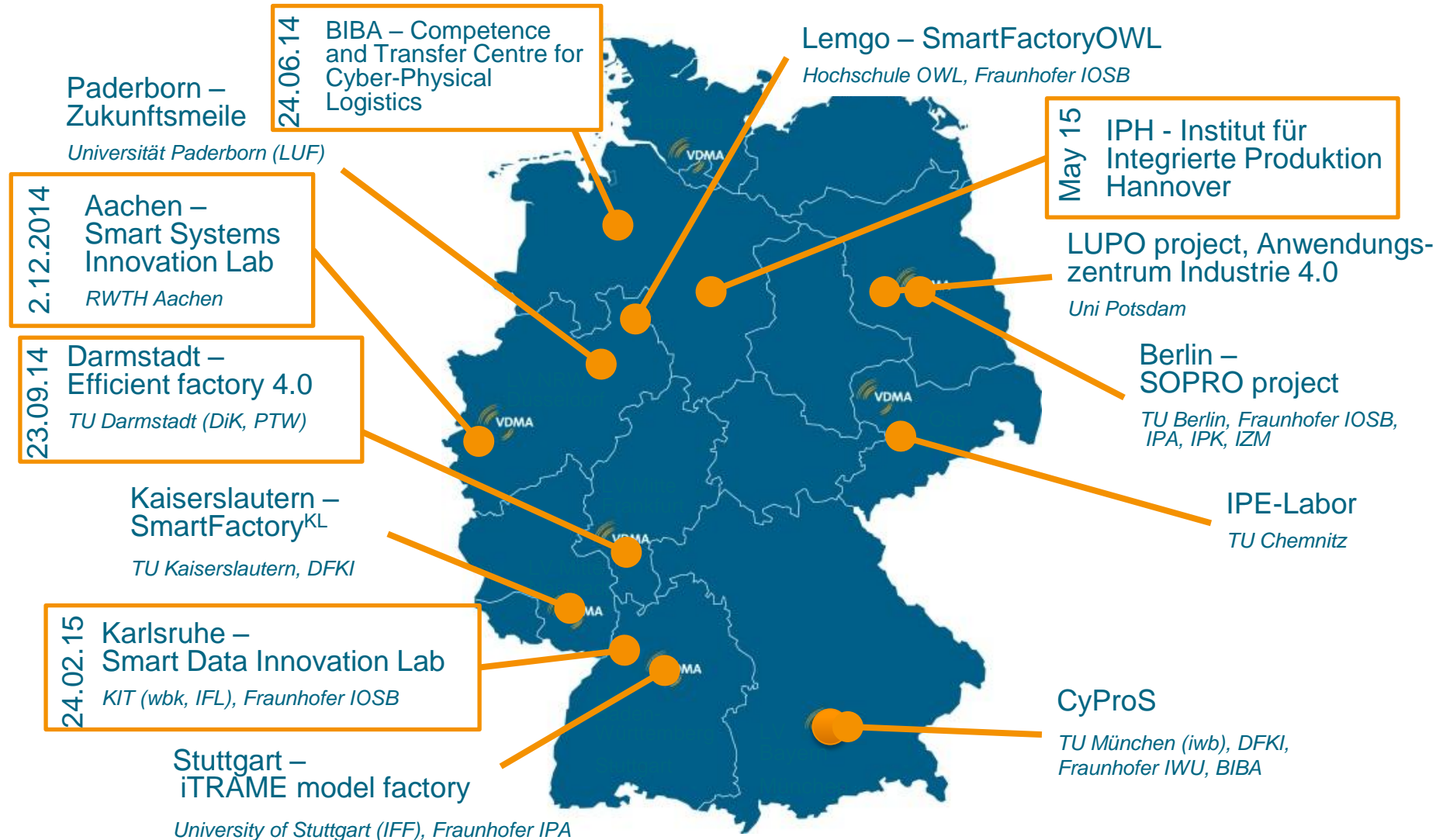
Connecting industry and science

Lab Tour I4.0 with regional associations

- » Visit to learning factories and I4.0 projects in Germany



Lab Tour I40 learning factories and I40 projects in Germany



Lab Tour I40 BIBA in Bremen, 24 June 2014

Visit to the Competence and Transfer Centre for Cyber-Physical Logistics at BIBA, the Bremen Institute for Production und Logistics

More than 40 participants

Focus: Technology demonstrator “Factory of self-organising products”

Use of autonomously-controlled methods in logistics

- » Products make, swap and interpret information



Lab Tour I40 TU Darmstadt, 23 Sept 2014

Visit to the “Efficient Factory 4.0”

- » Special field: Data processing in design (DiK)
- » The Institute of Production Management, Technology and Machine Tools (PTW)

Goal of the project: Analyse, develop and implement ICT technologies for creating a resource-efficient learning factory

Is based on the existing process learning factory CiP

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Industrie 4.0 is a hot topic in Germany

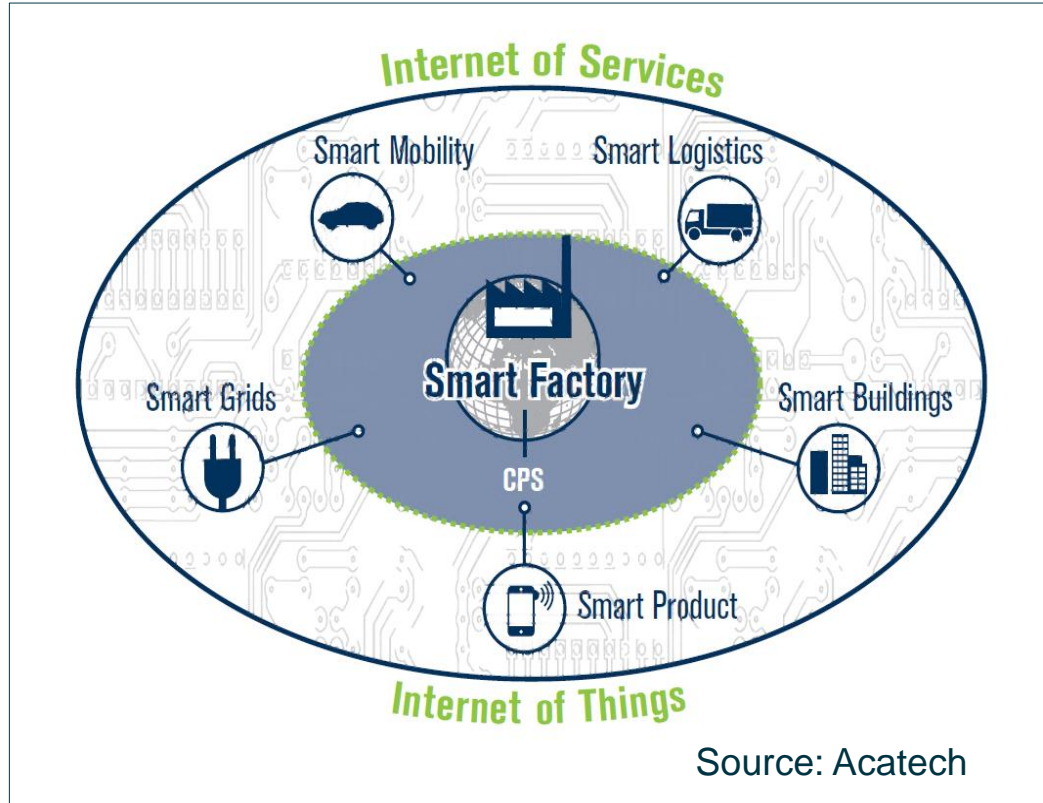


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Industrie 4.0 is not alone



Role of mechanical engineering



- As the provider of cyber-physical production systems and intelligent machine components the Mechanical Engineering sector is in the center of this digital change.
- The machines and components provided by equipment suppliers will be the main new sources of data for the digital integration.
- **Digital manufacturing and Industrie 4.0 is a new dimension going beyond the current way of digitalisation: It connects the virtual and the physical world and takes places mostly in a B2B-environment.**

Framework conditions



- **Data security:** New rules for a new and connected industry in order to protect business and process knowledge and to ensure clear rules for the ownership of data.
- **Excellent communication infrastructure** with industry-level performance in terms of reliability, speed and volume.
- **Research & Innovation** funding to support the digital transition, in particular SMEs and Midcaps
- **Standards and reference architectures are essential.** In general, the standardisation system should remain a voluntary consensus-driven, bottom-up activity, carried out by and for the interested parties.
- The framework conditions have to be set in Europe and global!



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