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Industry 4.0 in Germany

Public measures and initiatives

Steffen Wischmann

Institute for Innovation and Technology
VDI/VDE Innovation + Technology GmbH
Steinplatz 1, 10623 Berlin
E-Mail: wischmann@iit-berlin.de

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From Industry 1.0 to Industry 4.0

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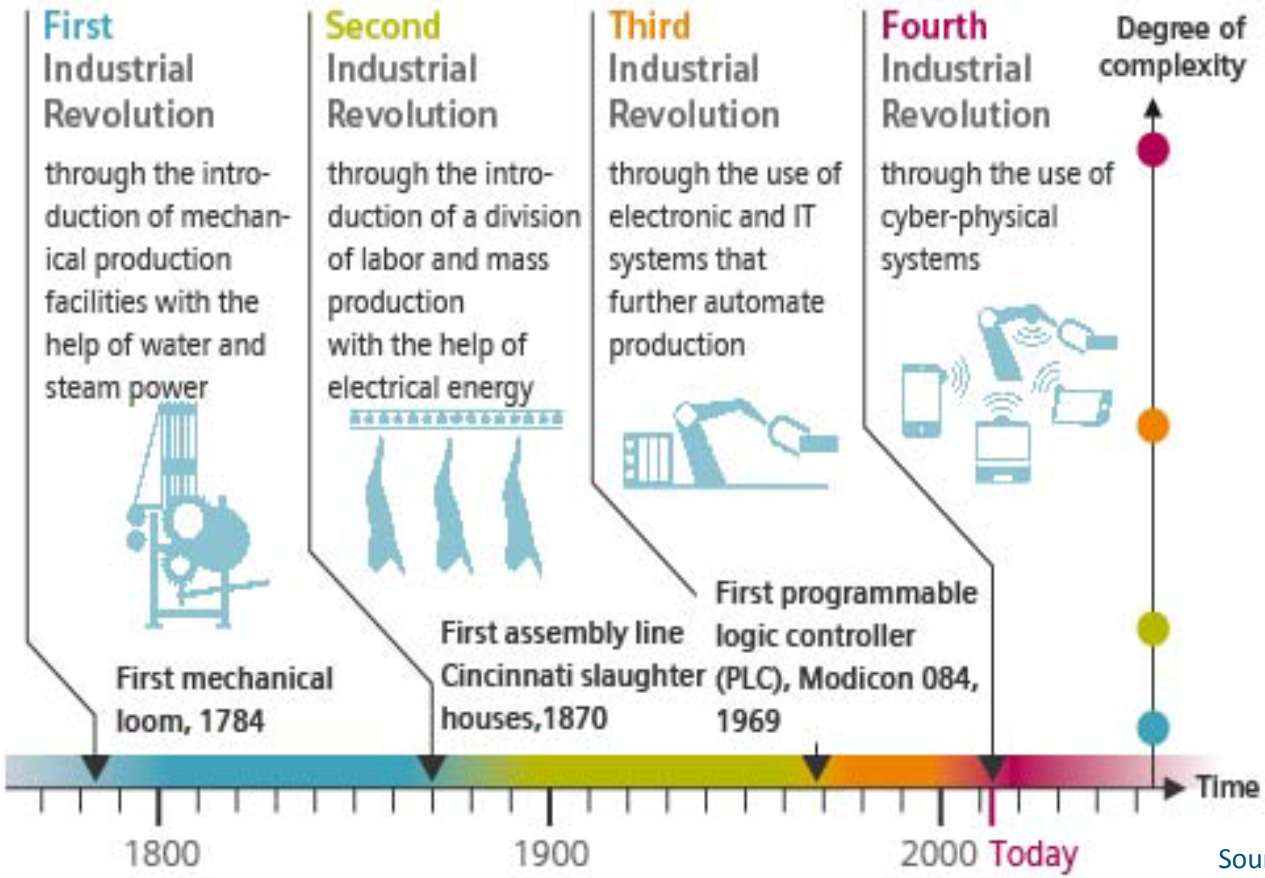

Source: DFKI (2011)

Is it really a revolution?

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The biggest taxi company
has no cars.

The most popular media proprietor
creates no content.

The most valuable retailer
has no goods.

The biggest accommodation provider
has no real estate.

The context of Industry 4.0
Challenges of Digital Change

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- Strong international competition (USA, Asia)
- Value chain networks, that cross borders between countries and companies
- New disruptive technologies mark a turning point
- Reclaiming and extending the controllability and strength of digital technology

Objective: Strengthening German and European companies to develop innovative solutions

contact: wischmann@iit-berlin.de

National Key Project: Industry 4.0

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Source: Abele, Eberhard/Reinhart, Gunther (2011): Zukunft der Produktion. Herausforderungen, Forschungsfelder, Chancen, Hanser, München.

- Production is the **backbone of German prosperity**
  - Direct jobs: 7.7 m.
  - Indirect jobs: 7.1 m.
- The **mega trend CPS** is of vital importance to answer the question how we are going to produce tomorrow:
  - Acceleration of production cycles
  - Increasing demand for individualized products
  - Penetration of new technologies (innovation at all interfaces)
  - Production that considers the shortage of resources (recycling, substitutional materials, personnel)
  - Production in a global world (control of global production networks with ICT)
- We need **adaptive, self-configuring** and **self-organising** production systems

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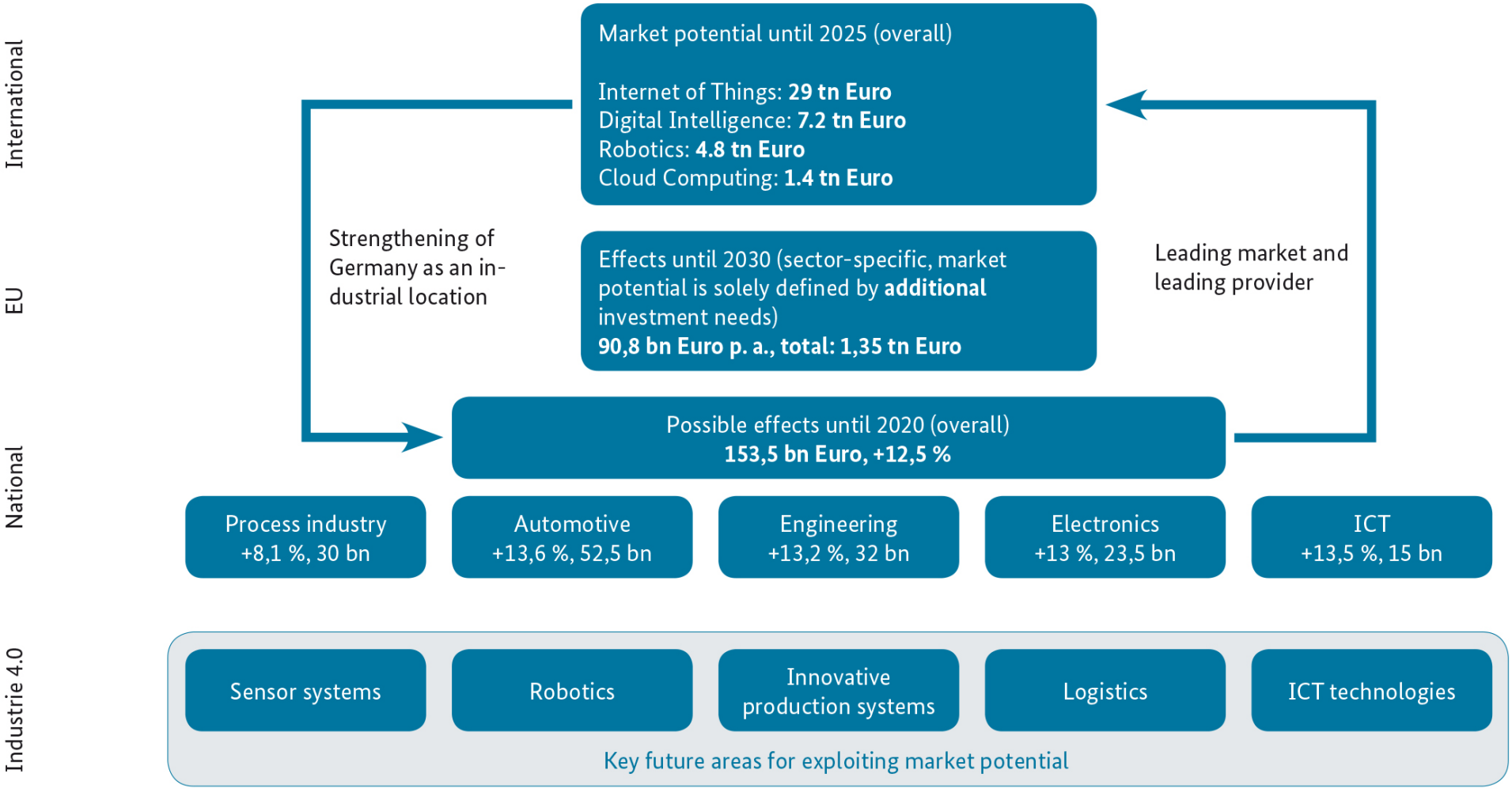
Expected economic effects through Industrie 4.0.



Source: iit 2015; the data is aggregated from BITKOM (2014), PwC (2014), Roland Berger (2014), McKinsey (2013)

National Key Project: Industry 4.0

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New High-Tech Strategy – Innovations for Germany

Establishing thematic priorities in research and innovation, addressing global challenges and thereby enhancing the quality of life for everyone.

Launched in 2006, updated every four years.

http://www.hightech-strategie.de/de/The-new-High-Tech-Strategy-390.php

Public Measures

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- Establishing strong networks
- Building a diverse and strong R&D portfolio
- Nurturing young entrepreneurs
- Strengthening Education and Training
- Fostering International Cooperation

Public Measures

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- **Establishing strong networks**
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Chair
Ministers Gabriel, Wanka
Representatives of commerce, trade unions, science

Technical/practical expertise decision-making

Steering body
(companies)

- Chaired by business representatives, participation of Economic Affairs and Research Ministries
- Chairs of working groups, other guests/ promoters

Industrial strategy development, technical coordination, decision-making and implementation

Working groups

- Reference architecture, standardisation
- Research and innovation
- Security of networked systems
- Legal framework
- Labour, training
- Others as required

Working units with technical/practical expertise; participating ministries: Economic Affairs, Research, Interior, Justice, Labour

Policy guidance, society, multipliers

Strategy group
(Government, business, unions, science)

- Chaired by StS Machnig, StS Schütte
- Representatives of steering body
- Representatives of Federal Chancellery, Interior Ministry
- Representatives of the Länder
- Representatives of associations (BDEW, BDI, BITKOM, DIHK, VDA, VDMA, ZVEI)
- Representatives of trade union (IG Metall)
- Representatives of science (Fraunhofer)

Agenda setting, political steering, multipliers

Scientific Advisory Committee

Activities on the market

Industrial consortia and initiatives
Implementation on the market: test beds, examples of applications

International standardisation
Consortia, standardisation bodies, DKE and others

Secretariat as service provider

Network coordination, organisation, project management, internal and external communication

Plattform Industry 4.0

www.plattform-i40.de

Regional Competence Centers

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- 16 competence centers distributed over Germany
- Regional consolidation of information and competence matching to support SME
- Broad impact by regional networks (organizations, associations, etc.) national cross-linking of all Centers
- Existing labs and testbeds adapt to SME needs
- Technological „deep dive“ and matching with competent partners
- Demand-driven dynamic project adjustment
- Mutual responsibility: SME does not pay for support but will not be funded

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Research Map Germany Industry 4.0

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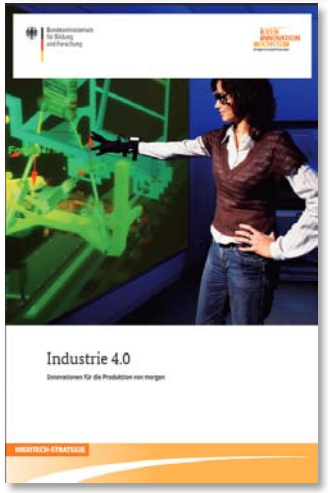
Initiatives by BMWi

- Autonomics for Industry 4.0 (19 collaborative projects)
- Smart Services (16 collaborative projects)
- Smart Data (13 collaborative projects)
- PAiCE: Platforms, Additive Manufacturing, Imaging, Communication, Engineering (13 collaborative projects)
- Large-scale collaborative projects (e.g., Cooperative Driving, 18 Mio. Euro funding)

Initiatives by BMBF

- National production research (17 projects)
- National ICT-research (8 projects)
- Human Technology Interaction (>200 projects)
- IT-Security for critical infrastructures (12 projects)
- it‘s OWL – excellence cluster: Intelligent Technical Systems Ostwestfalen-Lippe



Autonomics for Industry 4.0

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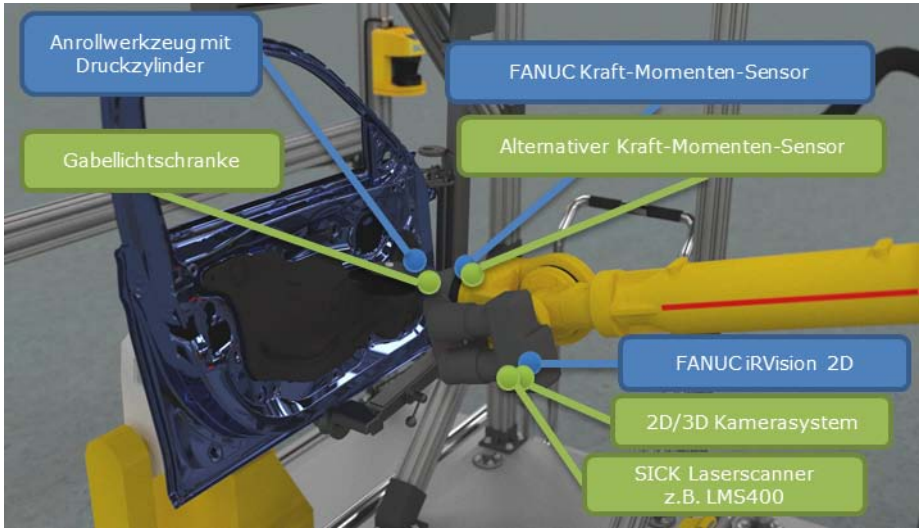
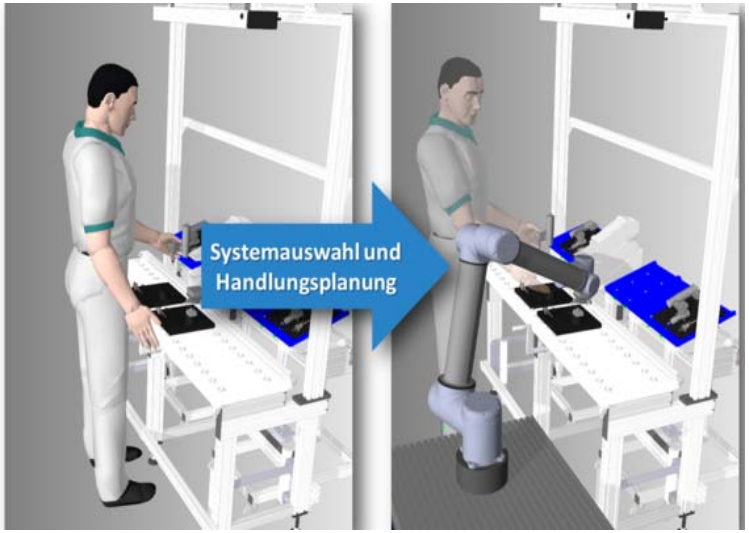
- **Measures:** 19 projects, 110 m€ costs, 55 m€ funding, 2014-2017; conferences, workshops, accompanying research on cross sectoral issues, trade fair appearances
- **Additionally:** Identifying new business models
- **Main Objective**: Foster highly flexible production infrastructures that enable disruptive products
  - Each project needs to address specific problems of end-users (especially SMEs)
- **Focal points**: working conditions (human-machine-interaction, safety & security), engineering models (i.e. decision making support schemes), logistics, robotics

more information: http://autonomik40.de/en

Examples





ReApp:

- Reusable, flexible robotic applications
- Substitutes and supports humans
- Industrial-ROS as communication model and interface

www.reapp-projekt.de

ManuServ:

- Identifying potential for automation in SMEs
- Intuitive platform for decision making about the introduction of robots

www.manuserv.de

Examples

SmartSite:

- Connected logistics for construction sites
- Autonomous rollers and pavers
- Autonomous coordination and documentation of the whole process

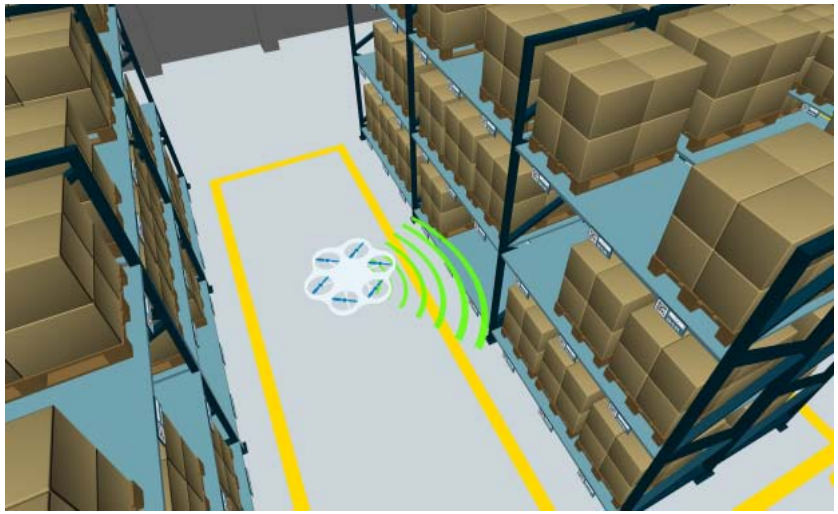
www.smartsite-project.de

SpeedFactory:

- Automated custom manufacturing of sports shoes and textiles (lot-size 1 production)
- By use of cooperative and autonomous robotics solutions
- Enabling profitable production in Germany

www.fortiss.org/forschung/projekte/speedfactory

Examples



InventAIRy:

- Fully automated stock-tracking with drones

www.inventairy.de

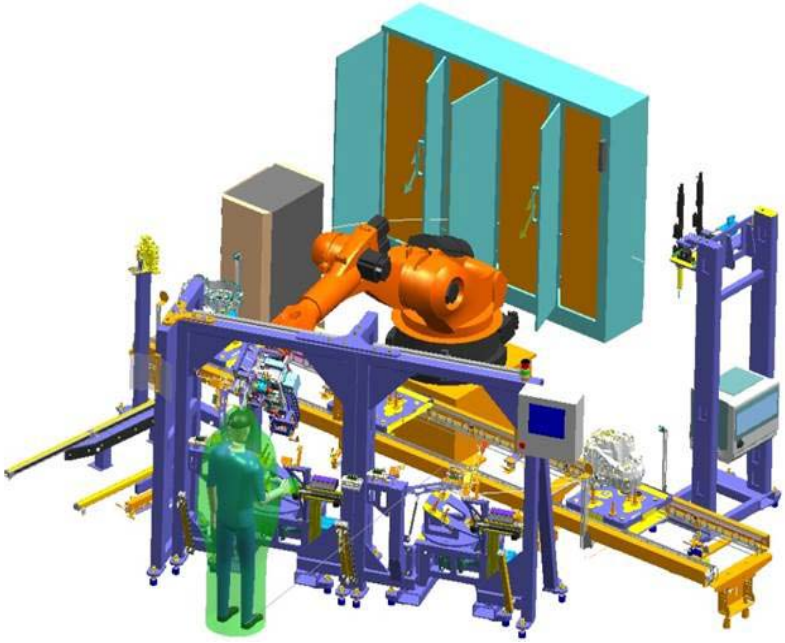
FTF out of the box:

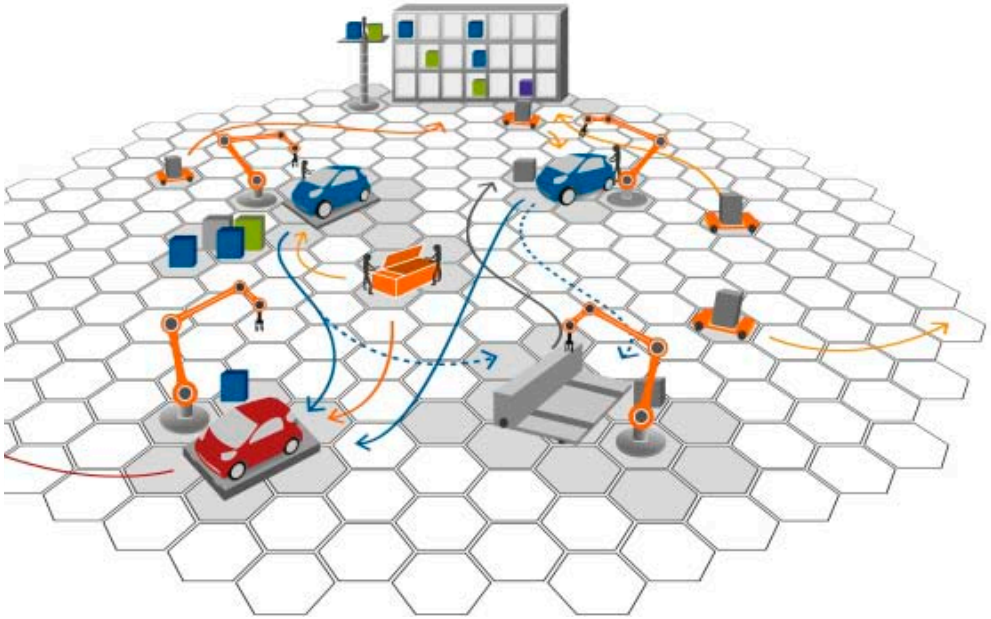
- Semi-autonomous forklifts for intralogistics
- Intuitive control by speech and gestures

www.ftf-out-of-the-box.de

- Simple installation without the need for specific infrastructure
- Self-organizing adaptive systems

Examples





INSA:

- Context-aware safety systems
- Complete sensory perception of employees (including competences and qualifications)
- Self-adapting safety systems

www.insa-projekt.de

SmartFace:

- Distributed control of production for the automotive industry
- Adapting manufacturing structures to the demands of small-series production

www.smartfactoryplanning.de

Examples

InnoCyFer:

- Bionic control of production systems for manufacturing customized products
- Open-Innovation processes integral part of the manufacturing

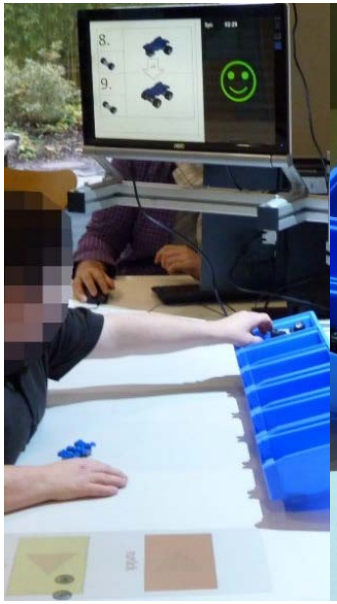
www.innocyfer.de

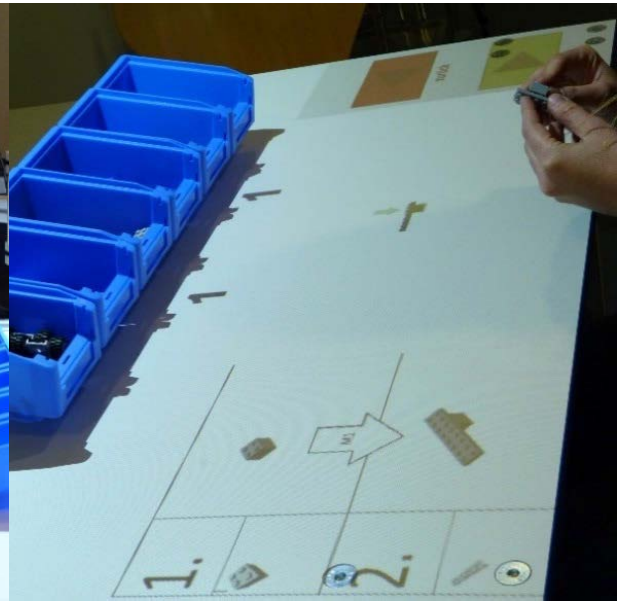
OPAK:

- 3D-supported engineering platform for intuitive planning, development and commissioning of production plants
- Plug-and-produce

www.opak-projekt.de

Examples





APPsist:

- Software-based assistance systems
- Adapts to the individual expertise and knowledge of the users

www.appsist.de

motionEAP:

- Assistance in production processes for cognitive impaired employees
- Fast introduction to new production workflows

www.motioneap.de

Task forces on cross sectoral issues

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Legal Challenges

Standardization

IT security

The future of employment

Future of employment

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- Smart machinery will work hand in hand with humans
- Resistance is not an option!
- Automation doesn't cause sustainable unemployment!
- Through digital technologies companies can, now more then ever before, organize working conditions to simultaneously foster economic growth and employee qualification and well-being

~~Will technology destroy our jobs~~?

How will technology change the way we work?

Industry 4.0 – Keys to success

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