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

San José, Sep. 13th 2016
From Industry 1.0 to Industry 4.0

First Industrial Revolution
through the introduction of mechanical production facilities with the help of water and steam power
First mechanical loom, 1784
1800

Second Industrial Revolution
through the introduction of a division of labor and mass production with the help of electrical energy
First assembly line
Cincinnati slaughterhouses, 1870
1900

Third Industrial Revolution
through the use of electronic and IT systems that further automate production
First programmable logic controller (PLC), Modicon 084, 1969
2000

Fourth Industrial Revolution
through the use of cyber-physical systems

Time

Degree of complexity

Source: DFKI (2011)
Is it really a revolution?

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

• 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
National Key Project: Industry 4.0

- 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

Expected economic effects through Industrie 4.0.

Market potential until 2025 (overall)
- Internet of Things: **29 tn Euro**
- Digital Intelligence: **7.2 tn Euro**
- Robotics: **4.8 tn Euro**
- Cloud Computing: **1.4 tn Euro**

Effects until 2030 (sector-specific, market potential is solely defined by additional investment needs)
- **90.8 bn Euro p. a., total: 1.35 tn Euro**

Leading market and leading provider

Possible effects until 2020 (overall)
- **153.5 bn Euro, +12.5 %**

- Process industry: +8.1 %, 30 bn
- Automotive: +13.6 %, 52.5 bn
- Engineering: +13.2 %, 32 bn
- Electronics: +13 %, 23.5 bn
- ICT: +13.5 %, 15 bn

Key future areas for exploiting market potential


Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de
National Key Project: Industry 4.0

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.


Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de
Public Measures

Establishing strong networks

Building a diverse and strong R&D portfolio

Nurturing young entrepreneurs

Strengthening Education and Training

Fostering International Cooperation
Public Measures

Establishing strong networks

Building a diverse and strong R&D portfolio

Nurturing young entrepreneurs

Strengthening Education and Training

Fostering International Cooperation
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

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

Scientific Advisory Committee

Secretariat as service provider
Network coordination, organisation, project management, internal and external communication

www.plattform-i40.de
Regional Competence Centers

- 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
Public Measures

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

Steffen Wischmann - Industry 4.0 in Germany
contact: wishmann@iit-berlin.de
Autonomics for Industry 4.0

• **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

Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de
**Examples**

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

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

www.reapp-projekt.de  
www.manuserv.de

Steffen Wischmann - Industry 4.0 in Germany  
contact: wischmann@iit-berlin.de
Examples

**SmartSite:**

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

**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.smartsite-project.de  www.fortiss.org/forschung/projekte/speedfactory

Steffen Wischmann - Industry 4.0 in Germany  contact: wischmann@iit-berlin.de
**Examples**

**InventAiRy:**
- Fully automated stock-tracking with drones

**FTF out of the box:**
- Semi-autonomous forklifts for intralogistics
- Intuitive control by speech and gestures
- Simple installation without the need for specific infrastructure
- Self-organizing adaptive systems

www.inventairy.de

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

Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de
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

Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de
Examples

InnoCyFer:

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

OPAK:

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

Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de
Examples

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

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

www.appsist.de

Steffen Wischmann - Industry 4.0 in Germany
go to: wischmann@iit-berlin.de
Task forces on cross sectoral issues

Legal Challenges

Standardization

IT security

The future of employment
Future of employment

- 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 than 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?

Steffen Wischmann - Autonomous systems in the context of Industry 4.0
contact: wischmann@iit-berlin.de
Industry 4.0 – Keys to success

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

Steffen Wischmann - Industry 4.0 in Germany
contact: wischmann@iit-berlin.de