

## Actors

A number of important research institution, technology cluster and industry actors are working to help make Germany's INDUSTRIE 4.0 and SMART SERVICE WORLD vision a reality. We look at just a few of the actors helping make INDUSTRIE 4.0 a reality.

### Industry-Science Research Alliance

Initiated by the Federal Ministry of Education and Research (BMBF) in 2006, the Industry-Research Alliance is an advisory group which brings together leading representatives from science and industry to accompany the High-Tech Strategy of interministerial innovation policy initiatives.

In January 2011, INDUSTRIE 4.0 was initiated as a "Future Project" of the German Federal Government by the Communication Promoters Group of the Industry-Science Research Alliance. The Industry-Science Research Alliance, in partnership with acatech (National Academy of Science and Engineering), established the INDUSTRIE 4.0 Working Group co-chaired by Dr. Siegfried Dais (Robert Bosch GmbH) and Professor Henning Kagermann (acatech president and spokesperson of the Promoters Group).

The Communication Promoters Group of the Industry-Science Research Alliance (Prof. Dr. Henning Kagermann, acatech; Prof. Dr. Wolfgang Wahlster, German Research Center for Artificial Intelligence - DFKI; and Dr. Johannes Helbig, Deutsche Post AG) in cooperation with acatech published the "Securing the future of German manufacturing industry: Recommendations for implementing the strategic initiative INDUSTRIE 4.0 - Final report of the INDUSTRIE 4.0 Working Group" report supported by the BMBF in April 2013.

#### Related Link:

- [Forschungsunion \(German only\)](#) ▶



Logo acatech | © acatech – Deutsche Akademie der Technikwissenschaften e.V.

acatech - the National Academy of Science and Engineering - represents the interests of the German scientific and technological communities, at home and abroad. It is autonomous, independent and a non-profit organiza-

tion. As a working academy, acatech supports policy-makers and society, providing qualified technical evaluations and forward looking recommendations. Moreover, acatech is determined to support knowledge transfer between science and industry, and encourage the next generation of engineers.

acatech works to promote sustainable growth through innovation. Its work focuses on four core areas.

**Scientific recommendations:** acatech advises policy-makers and the public on future technology issues based on best-in-breed research.

**Transfer of expertise:** acatech provides a platform for exchanging excellence between the sciences and business.

**Promotion of young scientists and engineers:** acatech is involved in the promotion of young scientists and engineers.

**A voice for science and engineering:** acatech represents the interests of scientists and engineers at national and international levels.

**Releated Link:**

- [acatech](#) ▶



Logo German Research Center for Artificial Intelligence GmbH | © 2015 DFKI - Alle Rechte vorbehalten

The German Research Center for Artificial Intelligence (DFKI) was founded in 1988 and has research facilities in Kaiserslautern, Saarbrücken, Bremen and a project office in Berlin. In the field of innovative commercial software technology using Artificial Intelligence, DFKI is the leading research center in Germany.

Based on application oriented basic research DFKI develops product functions, prototypes and patentable solutions in the field of information and communication technology. Research and development projects are conducted in fourteen research departments and research groups, ten competence centers and five living labs. Funding is received from government agencies like the European Union, the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Economics and Technology (BMWi), the German Federal States and the German Research Foundation (DFG) as well as from cooperation with industrial partners.

Apart from the state governments of Rhineland-Palatinate, Saarland and Bremen, numerous renowned German and international high-tech companies are represented on the DFKI supervisory board. The DFKI model of a non-profit public-private partnership (ppp) is nationally and internationally considered a blueprint for corporate structure in the field of top-level research.

DFKI is actively involved in numerous organizations representing and continuously advancing Germany as an excellent location for cutting-edge research and technology. Far beyond the country's borders

DFKI enjoys an excellent reputation for its academic training of young scientists. At present, 413 highly qualified researchers and 272 graduate students from more than 60 countries are contributing to more than 232 DFKI research projects. Over the years, more than 60 staff members have been appointed professors at universities in Germany and abroad.

DFKI is on the forefront of INDUSTRIE 4.0 research. The SmartFactory Living Lab performs operation and testing of the latest technologies in process engineering and piece goods under industrial conditions. The project "RES-COM" examines the vision of an automatized conservation of resources through highly interconnected and integrated sensor-actuator systems. "SmartF-IT" is looking at cyber-physical IT systems to master complexity of a new generation of multi-adaptive factories due to the intensive use of high-networked sensors and actuators, overcoming traditional production hierarchies of central control towards decentralized self-organization. Both projects are funded by the Federal Ministry of Education and Research establishing Germany as one of the leading pioneers in the field of the Internet of Things.

#### **Related Links:**

- [DFKI](#) ▶
- [DFKI/facebook](#) ▶
- [SmartF-IT Project](#) ▶
- [Res-Com](#) ▶

## **Fraunhofer-Gesellschaft**



Logo Fraunhofer | © Fraunhofer-Gesellschaft

Research of practical utility lies at the heart of all activities pursued by the Fraunhofer-Gesellschaft. Founded in 1949, the research organization undertakes applied research that drives economic development and serves the wider benefit of society. Its services are solicited by customers and contractual partners in industry, the service sector and public administration.

At present, the Fraunhofer-Gesellschaft maintains 66 institutes and independent research units. The majority of the more than 22,000 staff are qualified scientists and engineers, who work with an annual research budget of 1.9 billion euros. Of this sum, more than 1.6 billion euros is generated through contract research. More than 70

percent of the Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly financed research projects. Almost 30 percent is contributed by the German federal and Länder governments in the form of base funding, enabling the institutes to work ahead on solutions to problems that will not become acutely relevant to industry and society until five or ten years from now.

Affiliated international research centers and representative offices provide contact with the regions of greatest importance to present and future scientific progress and economic development.

With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, the Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process. Applied research has a knock-on effect that extends beyond the direct benefits perceived by the customer: Through their research and development work, the Fraunhofer Institutes help to reinforce the competitive strength of the economy in their local region, and throughout Germany and Europe. They do so by promoting innovation, strengthening the technological base, improving the acceptance of new technologies, and helping to train the urgently needed future generation of scientists and engineers.

As an employer, the Fraunhofer-Gesellschaft offers its staff the opportunity to develop the professional and personal skills that will allow them to take up positions of responsibility within their institute, at universities, in industry and in society. Students who choose to work on projects at the Fraunhofer Institutes have excellent prospects of starting and developing a career in industry by virtue of the practical training and experience they have acquired.

The Fraunhofer-Gesellschaft is a recognized non-profit organization that takes its name from Joseph von Fraunhofer (1787–1826), the illustrious Munich researcher, inventor and entrepreneur.

#### **Related Link:**

- [Fraunhofer Institute](#) ▶

#### **it's OWL**



Logo its owl | © it's OWL Clustermanagement GmbH

In February 2012 the German Federal Ministry of Education and Research (BMBF) announced the "it's OWL" (Intelligent Technical Systems OstWestfalen Lippe) high-tech strategy as one of the winners of its Leading-Edge Cluster Competition.

it's OWL is a science and industry technology network which intends to set international standards in the field of intelligent technical systems. The cluster is helping pave the way to the fourth industrial revolution and makes a significant contribution to the competitiveness of manufacturing and production in Germany.

Tomorrow's technological systems will be intelligent and connected. This applies to the products of mechanical engineering sector and related industries such as the automotive industry, electrical engineering and medical as well as their corresponding production systems. Intelligent technological systems arise from the interplay of engineering and information technology. They interact with their environment and adapt to it autonomously. They also deal with unexpected situations in a dynamic environment and are able to anticipate the future effects of different influences thanks to experiential knowledge. Moreover, they also adapt to individual user behavior.

Within the It's OWL technology network, 174 companies – including world leaders such as Beckhoff, Claas, Gildemeister, Harting, Lenze, Miele, Phoenix Contract, WAGO, Weidmüller, and Wincor Nixdorf - and research institutions are carrying out pioneering work in this area.

Intelligent products and production systems are being developed in 46 projects: from automation and drive solutions for machinery, automatons, vehicles and household devices to networked production facilities. Examples include self-correcting manufacturing processes, digitalization of work planning, energy efficient intralogistics for warehouses, resource efficient large laundry as well as energy management in smart grids.

The development, deployment, maintenance and life cycle management of products, machines and systems will be improved by it's OWL technologies and products. Their reliability, resource efficiency, and user friendliness will also be optimized, with individualized and adaptable production processes becoming a reality.

**Related Link:**

- [it's OWL \(German only\) ▶](#)

## **Platform INDUSTRIE 4.0**

The Platform INDUSTRIE 4.0 is a joint initiative of the industry organizations BITKOM (Federal Association for Information Technology, Telecommunications and New Media), VDMA (German Engineering Federation), and ZVEI (Electrical and Electronic Manufacturers' Association) and acts as a central point of contact for companies, employee representatives, politics and science in matters INDUSTRIE 4.0 related.

Officially launched at the Hannover Messe in April 2013, Platform INDUSTRIE 4.0 will continue the work of the Federal Government's "Future Project INDUSTRIE 4.0" in order to strengthen Germany as an industry location. The main objective of the platform is the development of technologies, standards, business and organizational models and their practical implementation. The three industry organizations believe that INDUSTRIE 4.0 is significant importance to the continued competitiveness of German industry.

The central office of the platform organizes and coordinates all Platform INDUSTRIE 4.0 activities, informs on the progress made by the cooperation and serves as a main point of contact for business, politics and the media.

The platform has set up four working groups (consisting members of the BITKOM, VDMA and ZVEI industry associations) to facilitate dialogue at project, cluster, national, state and regional levels.

These are:

- Working Group 1 – Strategy and Framework
- Working Group 2 – Reference Architecture, Standardization and Norms
- Working Group 3 – Research and Innovation
- Working Group 4 – Networked Systems Security

#### Related Link:

- [Platform Industrie 4.0](#) ▶

## SmartFactoryKL



Logo smart Factory KL | © Technologie-Initiative SmartFactoryKL e.V.

The SmartFactoryKL technology initiative, located at the German Research Center for Artificial Intelligence (DFKI) in Kaiserslautern, is the first European vendor independent demonstration factory for the industrial application of state-of-the-art information and communication technologies.

The venture has the purpose of supporting the development, application and propagation of innovative automation technologies in different sectors as well as providing a basis for their extensive usage in science and industry.

Founded in 2005, the SmartFactoryKL initiative is a successful example of public-private-partnership; being a cooperative venture between vendors and users (manufacturers) of modern automation technologies as well as representatives of public interests. The common projects range from fundamental work on basic technologies to the development of marketable products. Members, sponsors and promoters create a living partnership in order to realize the vision of a future industrial landscape with modern and innovative means.

SmartFactoryKL works as a pioneer for the technology transfer of key aspects of INDUSTRIE 4.0 into practice. By operating several modular pilot plants, both state-of-the-art technologies and cutting-edge research results can be implemented and evaluated. Within these plants, the key aspects of INDUSTRIE 4.0 are demonstrated in an intuitive and accessible way.

The central research and demonstration platform of the SmartFactoryKL is its hybrid demonstration plant which can produce a customized product (soap bottles) in the batch size 1 to customer specification. Terms of requirements, structure and complexity of the laboratory system with industrial production in practice is absolutely comparable. Functional electrical components (i.e. controllers, sensors, actuators) from different vendors are flexibly networked. Communication systems operate wirelessly, both within the system as well as for overall control levels.

The mobile production line showcases the flexible production of an exemplary product whose components (i.e. case cover, case base, printed circuit board) are handled, mechanically machined, and assembled. The product is able to control its own production process as it has all of the necessary information available in its digital prod-

uct memory stored on an RFID tag. The process is not controlled by a standard programmable logic controller (PLC), but by a service-oriented, decentralized control system consisting of distributed microcontrollers communicating using Internet standards. Human workers are supported with innovative mobile device and augmented reality-based assistance systems.



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