

# *SmartFactory*<sup>KL</sup>

## *Pioneer of Industrie 4.0*

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Welcome to the future of  
industrial production

*smartFactory*<sup>KL</sup><sup>®</sup>

## *“The future must be simple.”*

In 1991, Mark Weiser described the vision of a future world with the term of “Ubiquitous Computing”. Since then, many aspects of this vision described have become reality: Our mobile phones are powerful multimedia systems, our cars are wheeled computer systems, and our houses are intelligent living environments. All of these advances need to be transformed into new products in intensively competitive markets in cycles shorter than ever before.

Nowadays, the resulting requirements on design, construction and operation of our factories are the crucial factor for success. In the past, we often increased complexity of the structures and control systems, culminating in rigid and monolithic production systems. The future, nevertheless, has to be simple, not only regarding the organization, but also the planning and technology!

It is our task to develop technologies which enable an acceleration of planning and construction to make rapid product changes during the operation possible and to reduce the development effort. To meet these challenges, we also need to use the intelligent technologies of our everyday life.

Regarding the industrial use, there are still many questions to be answered. The available technologies might be acceptable for the user, but do not fulfil the requirements for industrial applications with their high safety standards.

Therefore, the **SmartFactory<sup>KL</sup>** technology initiative was founded by industrial and academic partners in order to develop a demonstration and research platform for innovative factory technologies. Many solutions are developed, tested and evaluated in numerous projects.

If you have any questions or comments, please contact us.



**Prof. Dr. Dr. h.c. Detlef Zühlke**

Chairman of the Board of the Technologie-Initiative SmartFactory KL e.V.



*“Industrie 4.0 has been a familiar buzzword for many years – but, more than ever, we are now observing the introduction of specific ideas and concepts into production facilities around the world.*

*SmartFactory<sup>KL</sup> has been performing pioneering work in this field since 2005.”*



↑ The unique, manufacturer-independent Industrie 4.0 system was presented for the first time in 2014. The growing consortium completed the fourth version already.



↑ At **SmartFactory<sup>KL</sup>**, various network partners jointly develop pilot systems.

↑ A standardized transport system conveys the intelligent work-piece over multiple modules.

## *Researching, developing, realizing together.*

**SmartFactory<sup>KL</sup>** is a manufacturer-independent demonstration and research platform and unique in the world. Here, innovative information and communications technologies and their application are tested and developed in a realistic, industrial production environment. We aim to integrate sophisticated information technologies into factory automation.

The devices and applications of consumer electronics are already part of everyday life, e.g., tablet PCs, smartphones, navigation devices and wireless communication systems, will enrich the traditional working methods in industry and open the way for more flexible and efficient concepts in the future factory operation.

The Technologie-Initiative SmartFactory KL e.V. was founded in 2005 as a non-profit association to establish a network of industrial and research partners which initiate and implement together research and development projects ranging from base technologies to the development of marketable products.

From the beginning, **SmartFactory<sup>KL</sup>** has been cooperating intensively with the **German Research Centre for Artificial Intelligence (DFKI)**. This successful cooperation guarantees the access to leading German research in the field of innovative software technologies.

The initiative is supported by the active participation of its members and the financial and material contributions of its supporters and sponsors. The members, supporters and sponsors create a lively partnership to realize the vision of the factory of the future with modern and innovative ideas.

We invite you to become a part of our network.



***Our guiding vision:  
to create the factory of tomorrow.***

Manufacturing companies, in particular medium-sized enterprises, represent the backbone of the German economy. They secure jobs and prosperity by their capacity to respond to changed requirements of the market and by their innovativeness at the production location Germany.

The mega-trends towards customer specific products and shorter delivery times, together with a rapidly growing cost and efficiency pressure, are responsible for a significantly increased competition on the global market. Innovation leads in the mechanical engineering sector ensure the German competitiveness.

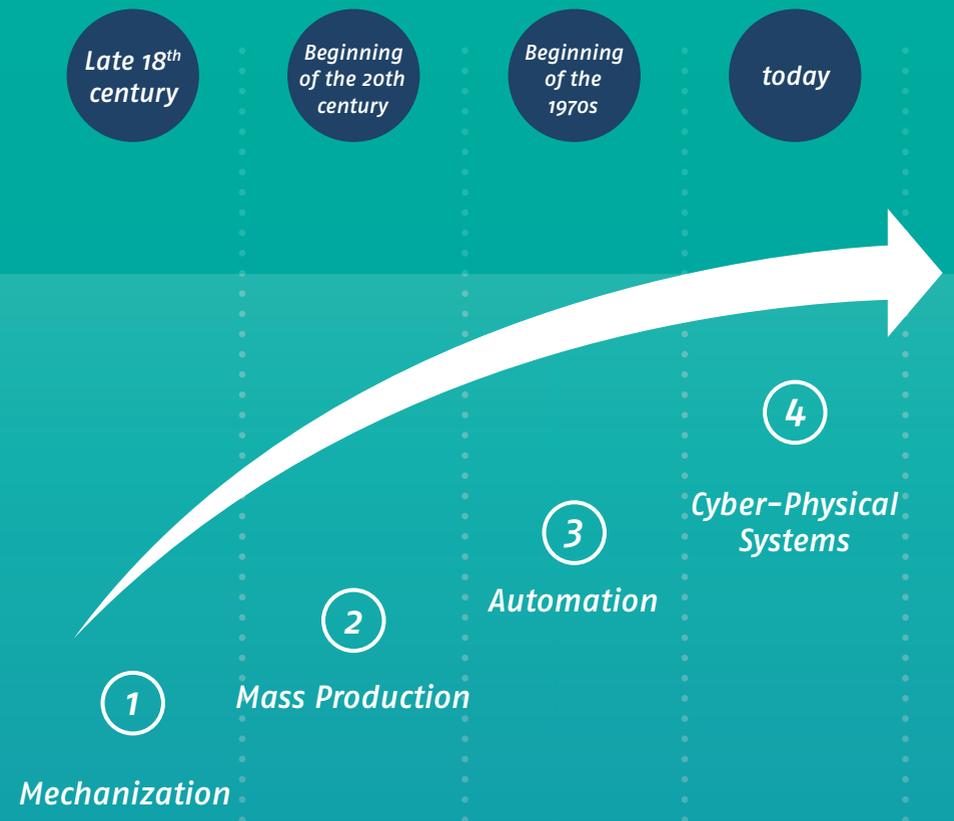
For this purpose, the replacement of the traditional, hierarchical structures of today's automation-technical systems is required.

The use of **Cyber Physical Systems** enables the transfer of the technologies of the Internet of Things to the factory: Products are able to control their own manufacturing process and take over their own quality control. Rigid factory lines turn into modular, efficient systems while conserving resources. Humans will be supported by intelligent training and assistance systems.

In **SmartFactory<sup>KL</sup>**, researchers and practitioners are working together to pave German industry the way for the 4th Industrial Revolution.

**SmartFactory<sup>KL</sup>** is the best example for a successful Public Private Partnership in which the transfer of visionary research results into industrial practice has succeeded.

## Stages of the Industrial Revolution



## *Working with you to implement the smart factory of tomorrow.*

Cooperation is the key to success: **SmartFactory**<sup>KL</sup> produces no finished “Industrie 4.0” solution for sale. In keeping with our philosophy, we are solving the challenges of the future in cooperation with partners and other interested parties.

This implies our ability to check the readiness of companies to accept Industrie 4.0 and accompany them through all development stages right up to implementation.



↑ The interdisciplinary team at **SmartFactory**<sup>KL</sup> is composed of experts in the fields of mechanical, electrical, industrial and software engineering as well as marketing.

### › *Researching together*

**SmartFactory**<sup>KL</sup> coordinates the joint research and development activities for all of the members. We identify research interests, check possibilities for supporting the projects through subsidies at national and international level, and form competent consortia. For the implementation of research and development projects, we rely on experienced and highly qualified employees.

Our members can also produce studies and thesis works in the context of **SmartFactory**<sup>KL</sup>, where a motivated pool of student and graduate staff with interdisciplinary training in the relevant courses of study are able and willing to provide assistance.

### › *Developing together*

At **SmartFactory**<sup>KL</sup>, members work together in various working groups on different topics. The group members discuss and jointly determine the development efforts, trends, visions, and ideas to be further developed and planned so, in the next step, they can be implemented in the demonstration facility. Research teams at **SmartFactory**<sup>KL</sup> act as moderators and promote the exchange among partners.



↑ Working at eye level is a central element of our activities.



↑ Developing and testing: the **SmartFactory<sup>KL</sup>** demonstrators are a testbed for new technologies.

### › Testing together

Within a network of industrial companies and research institutes **SmartFactory<sup>KL</sup>** has created a manufacturer-independent, realistic research and demonstration environment. The platform serves as a testbed for new technologies, control architectures and components: Plant equipment and control elements from various suppliers can be integrated, tested, and further developed within this framework of prototypes and pilot projects.

### › Implementing together

**SmartFactory<sup>KL</sup>** supports members and customers in all phases of a consulting project: From the identification and assessment of possible applications to the design and embedding of individual Industrie 4.0 solutions in existing production processes. Services also include technical coordination of your Industrie 4.0 projects and the development of migration strategies for follow on activities.

In this way, we transfer the results obtained from application-oriented research projects to industrial operating practices.



↑ We transfer the results of research projects into industrial practice.

### › Communicating together

**SmartFactory<sup>KL</sup>** organizes information events interactive workshops on practical research questions and subjects for its members and customers. Thought provoking topics are discussed and passed on to our partner institutions. We encourage public awareness of the topics we are developing through our participation in activities such as trade show exhibits, conference contributions, professional publications and public relations work. We also communicate research and development results within the network and beyond.

**SmartFactory<sup>KL</sup>** is also a powerful voice heard in the direction of government and professional associations. We initiate and support standardization efforts at both national and international levels in cooperation with the relevant committees and boards. By preparing and providing the first publicly accessible standards, we supply the stimuli needed by industry and plant engineers to begin their implementations of the Industrie 4.0 concepts in specific products and as a new business model.

*Many members,  
one common goal:*

*We want to get ahead of the competition.*

The realization of Industrie 4.0 demands ideas and collaboration, as well as the eagerness to experiment and willingness to learn. Numerous renowned companies and institutions have recognized this and support us as members. Together in a strong network, we gather important experience, develop practical solutions – and play a key role in shaping the future of the intelligent factory.

We invite you to become a partner of our strong network.

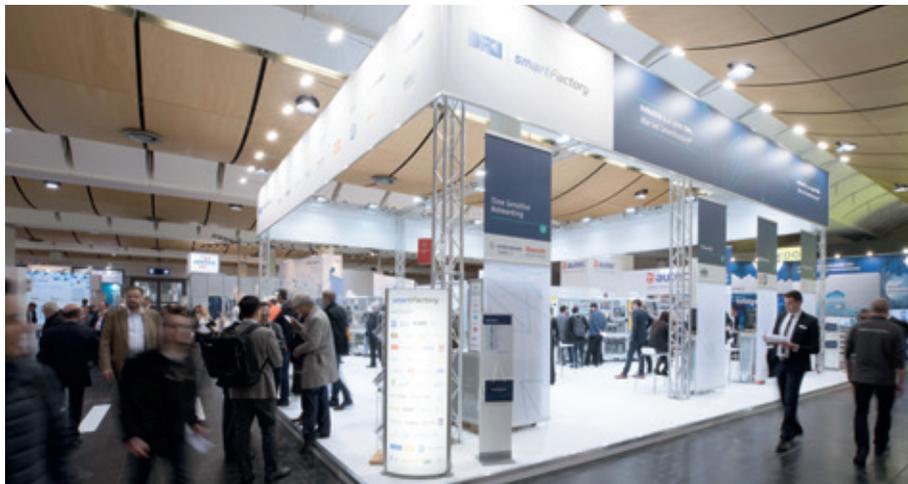




[www.dfki.de/web/research/ifs/index\\_html](http://www.dfki.de/web/research/ifs/index_html)

DFKI's **Innovative Factory Systems (IFS)** department focuses on developments in the field of Artificial Intelligence (AI) in the areas of ubiquitous computing, smart objects and service-oriented architectures and their integration in manufacturing plants and production engineering systems.

In the context of research and industry projects, the main interest when developing model-based, context-adaptive, human-machine interfaces (HMI) is always on the utility to the user.



↑ The close cooperation of DFKI, **SmartFactory**<sup>KL</sup> and industrial partners is the key to our success.

The primary research topics are presented below:

#### › **Automation**

- Modularization concepts for production systems and infrastructures as well as software engineering based on the principles of decentralized architectures
- IT systems along the production life-cycle
- Real time communications (Industrial Ethernet, TSN, ...) and management of data and services in the age of edge-computing

#### › **Human-Technology Systems**

- Knowledge management in production environments (semantic structures across the entire value chain and production life cycle)
- Development of context sensitive human-machine interfaces (HMI) in a variety of application fields (for example, mobile maintenance support, monitoring of control terminals & machines, design of manual workstations)
- Development of concepts for the use and practical evaluation of innovative technologies and devices (for example, manual workstations, operator assistance) in production environments

#### › **Digital Production Processes**

- Design and evaluation of technical concepts for Industrie 4.0 applications (for example, digitization of lean production, modular IT architectures for assembly lines, and data models for vertical integration from PLC to IT system level)
- Development of migration approaches and selection of technologies for retrofitting existing production facilities (for example, retrofitting with cyber-physical systems and technologies for Big Data)
- Systems engineering for adaptable, CPS-based production systems (for example, multidisciplinary engineering)

This cutting edge research is transferred to the **SmartFactory**<sup>KL</sup> for implementation in collaboration with industry partners and the results are ultimately marketed as finished products.



[www.kompetenzzentrum-kaiserslautern.digital](http://www.kompetenzzentrum-kaiserslautern.digital) (German only)

In 2016, **SmartFactory<sup>KL</sup>** initiative together with other regional competence partners was recognized as a Competence Center for SME 4.0 in Kaiserslautern by the German Federal Ministry for Economic Affairs and Energy (BMWi).

We support companies from the states of Rhineland-Palatinate and Saarland as well as from neighboring regions in tackling the challenges of digitalization. The aim of the federal high-tech initiative "Digital SMEs" is to inform small and medium sized enterprises about the importance of Industrie 4.0.



↑ The team at the SME 4.0 Competence Center Kaiserslautern consists of a pool of experts dedicated to digitalization and the concepts of Industrie 4.0.

The priority of support is on the digitalization of SMEs:



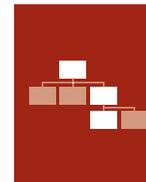
**Intelligent Systems** – Facilitating networking and communication  
Digitalization depends on data. We answer your questions about data collection, data exchange between systems, and assess their practical application for your business.

Networking | System Development | Digital Descriptions |  
Interdisciplinary Views | Data Security



**Information technologies** – The Foundation  
Digitalization requires a suitable IT infrastructure. We assist you in the selection and use of appropriate hardware and software.

IT Infrastructure | Cloud Computing | Big Data |  
Programming Languages | Web Technologies



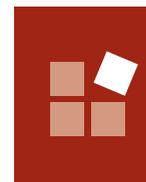
**Strategy & Organization** – Industrie 4.0 affects every business sector:  
Improve collaboration and benefit from the networks and joint ventures that give your business a competitive advantage.

Innovation Management | Corporate Culture | Employee Organization |  
Business Processes | Networks



**Production** – Ideas and technical developments  
Flexibility and efficiency in production methods are necessary to meet the demanding customer requirements and the growing complexity of product options. We provide all-round assistance for your production plants and factory floors.

Process automation | Human-Machine Interaction |  
Flexible Manufacturing | Self-Directed Products | Cyber-Physical Systems



**Products and Services** – Taking new approaches  
Digitalization is enabling new products and services and resulting in a need for new business models. We advise and provide the impulse to try out a new business model for the future.

Customization | New Business Models | Data as Product | Service-based Products



**People** – Advanced Education and Training  
Employees are the foundation for success, but digitalization is changing the work environment. We assist executives and employees to fully apply their knowledge and skills in this new world.

Data Protection | Training | Leadership | Work Organization

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The Technologie-Initiative SmartFactory KL e.V. (**SmartFactory<sup>KL</sup>**) is a non-profit association registered in the register of associations for Kaiserslautern.

Association registration number: VR 2458 Kai

Sales tax identification number: DE249965612

### **Executive Board**

Prof. Dr. Dr. h.c. Detlef Zühlke (Chairman of the Board)

Andreas Huhmann, HARTING AG & Co. KG

Dr. Thomas Bürger, Bosch Rexroth AG

Klaus Stark, Pilz GmbH & Co. KG

### **Geschäftsführung**

Rüdiger Dabelow, DFKI GmbH

### **Source for images**

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Stay informed  
about **SmartFactory<sup>KL</sup>**  
– with our Newsletter.

[www.smartfactory.de](http://www.smartfactory.de)