



SmartFactory^{KL}

Pioneer of Industrie 4.0

Welcome to the future of
industrial production

smartFactory^{KL}[®]

"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.

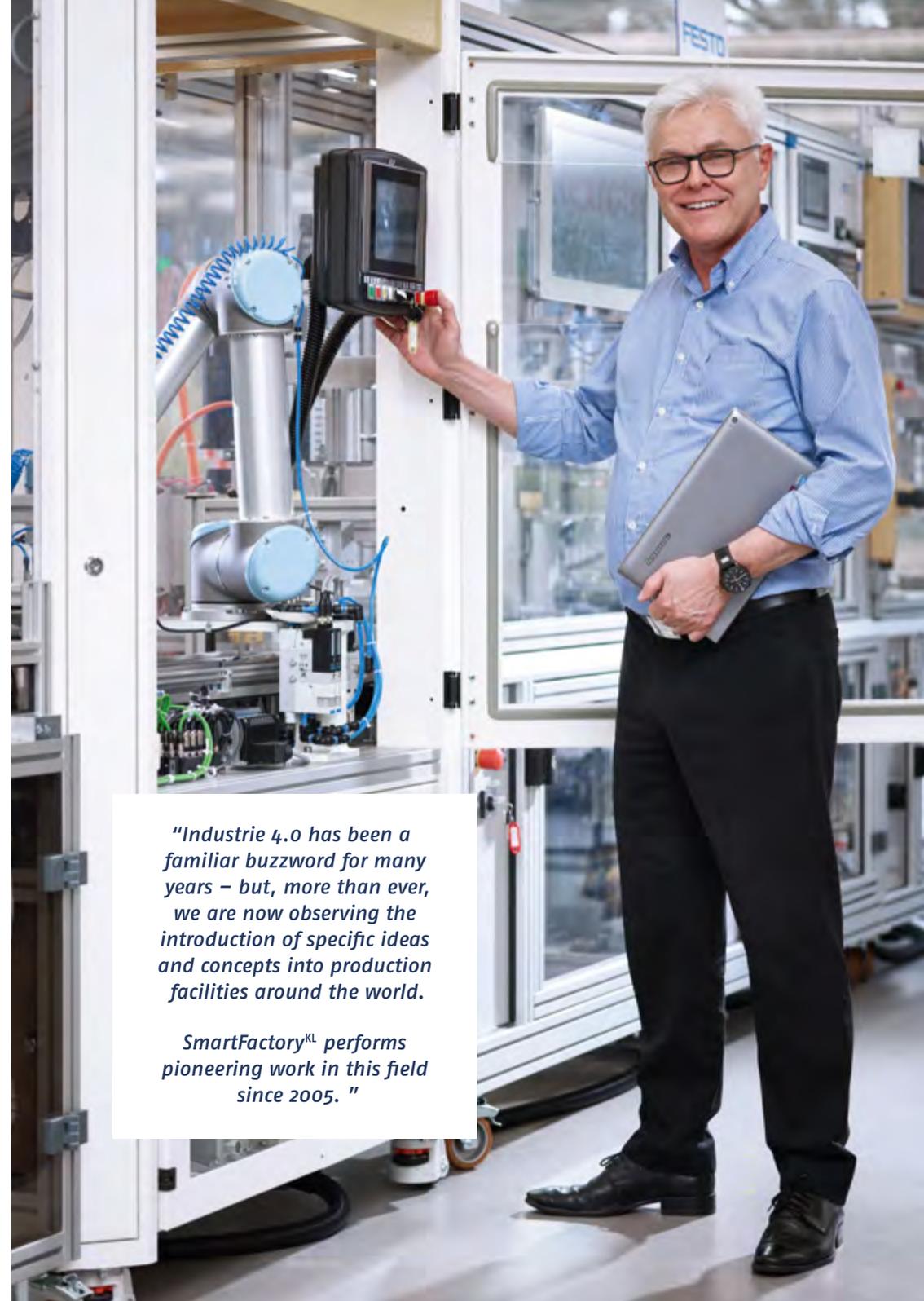
Therefore, the technology initiative **SmartFactory^{KL}** was founded by industrial and academic partners in order to develop a demonstration and research platform for innovative factory technologies. Many solutions are developed, tested and evaluated in numerous projects. This brochure is intended to present the working methods of **SmartFactory^{KL}** and to give information on its ideas and 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.
Scientific Director, Innovative Factory Systems (IFS) department at DFKI



"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^{KL} performs 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 third version already.



↑ At **SmartFactory^{KL}**, various network partners jointly research practical pilot systems.



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

Researching, developing, realizing together.

SmartFactory^{KL} is a manufacturer-independent demonstration and research platform and unique in Europe. 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.

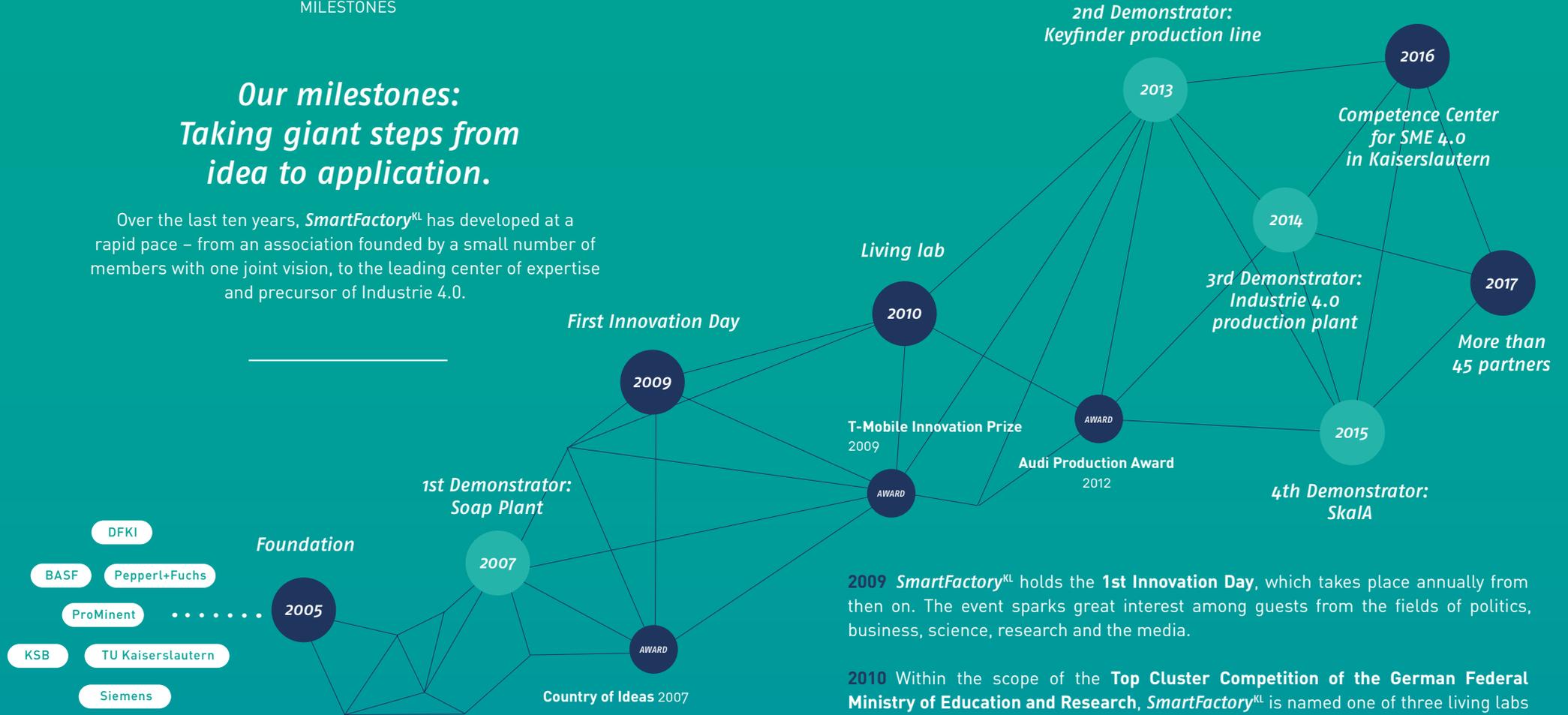
From the beginning, **SmartFactory^{KL}** has been cooperating intensively with the **German Research Centre for Artificial Intelligence (DFKI)**. This successful cooperation guarantees the access to leading German research in the field of innovative software technologies.

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 milestones: Taking giant steps from idea to application.

Over the last ten years, *SmartFactory*^{KL} has developed at a rapid pace – from an association founded by a small number of members with one joint vision, to the leading center of expertise and precursor of Industrie 4.0.



2005 BASF, the German Research Center for Artificial Intelligence (DFKI), KSB, Pepperl+Fuchs, ProMinent, the TU Kaiserslautern and Siemens found the Technologie-Initiative SmartFactory KL e.V. in Kaiserslautern.

2007 The first demonstration system is put into operation. The so-called **Soap Plant** gives a first taste of what an intelligent factory can look like in practice.

2009 *SmartFactory*^{KL} holds the **1st Innovation Day**, which takes place annually from then on. The event sparks great interest among guests from the fields of politics, business, science, research and the media.

2010 Within the scope of the **Top Cluster Competition of the German Federal Ministry of Education and Research**, *SmartFactory*^{KL} is named one of three living labs at the center of the development and evaluation of emerging software for the process and manufacturing industry.

2014 Together with ten industry partners the *SmartFactory*^{KL} presents the world's first manufacturer-independent Industrie 4.0 production plant at the **Hannover Messe**.

2016 *SmartFactory*^{KL}, together with other regional competence partners, is recognized as a Competence Center for SME 4.0 in Kaiserslautern by the German Federal Ministry for Economic Affairs and Energy (BMWi).

2017 By now, more than 45 members are working together to further develop the project *SmartFactory*^{KL}.

***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.

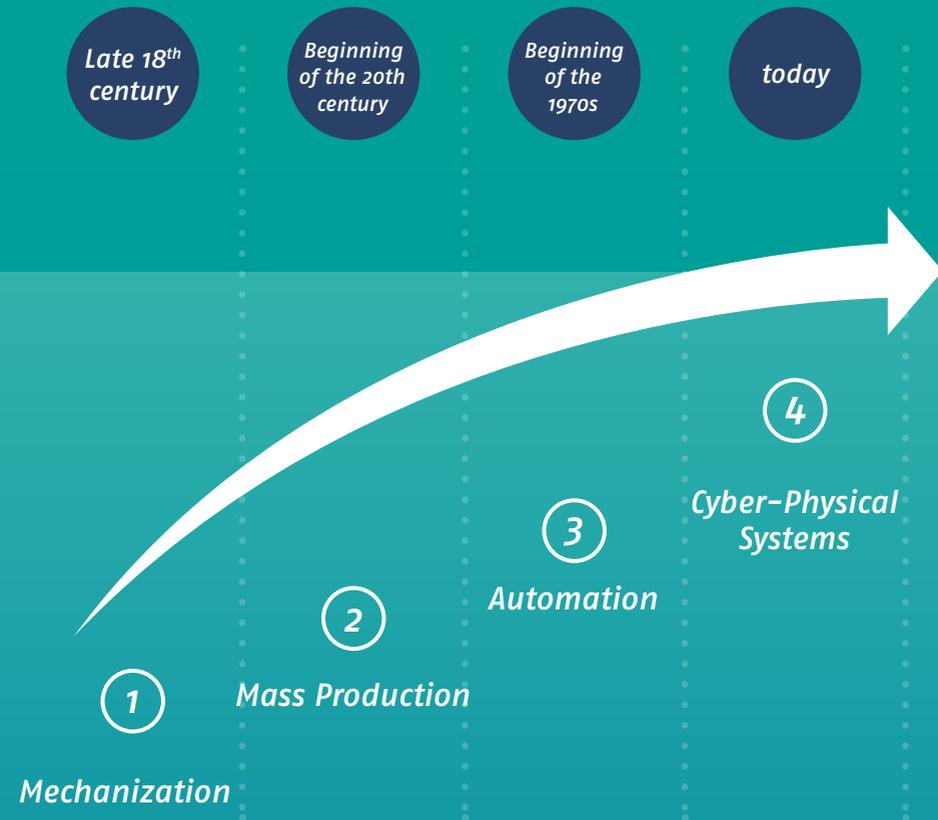
For this purpose, the replacement of the traditional, hierarchical structures of today's automation-technical systems is required.

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^{KL}**, researchers and practitioners are working together to pave German industry the way for the 4th Industrial Revolution.

SmartFactory^{KL} 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



*We support you –
from knowledge
to practical application.*

SmartFactory^{KL} is not producing a finished “Industrie 4.0” solution for sale. Instead, we are preparing the ground for the realization of the intelligent factory of the future. We check the readiness of companies for Industrie 4.0 and accompany them through all development stages up to implementation. We support our partners with a broad range of services.

Infrastructure

SmartFactory^{KL} is providing a manufacturer-independent, realistic research and demonstration plant within a network of industrial companies and research institutions. This platform acts as a testbed for new technologies, control architectures and components: Plant components and control elements of different manufacturers can be tested and developed within the scope of prototype tests and pilot projects.

Research

SmartFactory^{KL} coordinates collaborative research and development activities of its 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 can call on experienced and highly qualified employees. Our members can also write study and thesis works in the context of *SmartFactory*^{KL}, whereby a pool of motivated student employees with interdisciplinary training and graduates of the relevant courses of study is provided.

Transferring ideas to reality

SmartFactory^{KL} supports members and customers in every stage of consultancy projects: from identification and analysis of use cases, conception and appliance to the production processes up to the technical implementation and analysis of following-up activities. In this way, we help to transfer the results achieved in application-oriented research projects into industrial practice.

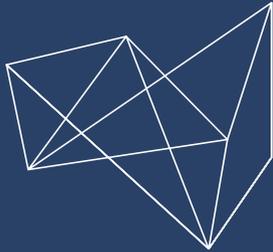
Standardization

Collaborating with relevant associations and bodies, *SmartFactory*^{KL} initiates and supports standardization projects at the national and international level. By drawing up the first publicly available standards, we are giving industry and plant engineers the opportunity to implement the ideas of Industrie 4.0 as a business model and to realize them in production today.

Information and communication

SmartFactory^{KL} organizes information events and workshops on current research topics and practical issues for its members and customers. New ideas are discussed and conveyed to the partner institutions. We promote the spread of the elaborated themes by means of publicity activities such as trade fair appearances, conference papers, scientific publications and press work. Results achieved in research and development are also communicated within the network and externally.

OUR PARTNERS



*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. These include small and medium-sized businesses and corporate groups, as well as research and education institutes, manufacturing companies and suppliers of plants and control systems. 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.



Visionary Technologies for the Factories of Tomorrow – Cutting-edge research in the field of Innovative Factory Systems

www.dfki.de/web/research/ifs

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.



↑ Presentation of the research project AmbiWise on the topic
“mobile, across locations knowledge management”

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^{KL}** for implementation in collaboration with industry partners and the results are ultimately marketed as finished products.



www.kompetenzzentrum-kaiserslautern.digital (German only)

In 2016, **SmartFactory^{KL}** 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). The Competence Center is part of the federal government's high-tech strategy "Digital SMEs – Strategies for the digital transformation of business processes" established to promote digitalization in small and medium-sized enterprises and skilled trades.



↑ Competence Center for SME 4.0 team in 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:



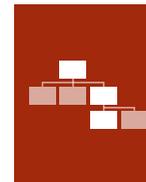
Intelligent Systems – Facilitating networking and communication
Digitalization depends on data. We answer your questions about data collection, data exchange between systems, and sensible assessment and use.

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



Information technologies –The Basics
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

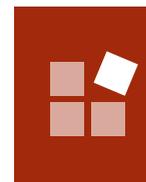


Strategy & Organization – Company orientation
Industrie 4.0 affects every business sector: Improve collaboration in your business and benefit from the competitive advantages of networks and joint ventures.

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



Production – Ideas and technical developments
Increasing customer requirements and the growing complexity of product options demand flexibility and efficiency in production methods. 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 – Accepting new approaches
Digitalization enables new products and services to satisfy individual customer requirements. We provide the impulse to try out new business models.

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 help executives and employees to fully apply their knowledge and skills.

Data Protection | Training | Leadership | Work Organization

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The **Technologie-Initiative SmartFactory KL e.V.** (*SmartFactory^{KL}*) is a non-profit association and registered in the Register of Associations of Kaiserslautern.

Executive Board

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Stay informed about **SmartFactory^{KL}** –
with our Newsletter.



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