



Leading-Edge Cluster

Making machines intelligent.

The Technology-Network: *Intelligent Technical Systems OstWestfalenLippe . Germany*

it's owl

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Publication information

Publisher:
it's OWL Clustermanagement GmbH
Persons responsible: Dr Roman Dumitrescu,
Günter Korder, Herbert Weber
Concept and implementation:
Wolfgang Marquardt
Editing: Wolfgang Marquardt,
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Image credits: DMG Mori Seiki (title image),
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Printed by: Print Vertriebs GmbH
April 2016



Image source: DMG MORI SEIKI

Machines are getting smarter

The Leading-Edge Cluster it's OWL develops solutions to meet the challenges of the 21st century. With intelligent technical systems, we provide the impetus for competitiveness in Germany as a production area – and pave the way for the fourth industrial revolution.

Globalisation, demographic change and scarcity of resources are changing our way of life and working conditions and place high demands on the innovative strength of the domestic industry. In the technology network it's OWL – short for Intelligent Technical Systems OstWestfalenLippe – we are developing innovative products and services

for the markets of tomorrow. Global market leaders and “hidden champions” from the mechanical engineering, electrical and electronics industries and the field of automotive suppliers are working closely with top research institutions. Because innovation is successful when market pull and technology push come together.

In 46 projects with a total value of around 100 million euros, we develop intelligent products and production systems. The spectrum ranges from automation and drive solutions, machinery, machines, vehicles and household appliances, to networked production units and smart grids.

The systems rely on the symbiosis of informatics and engineering sciences. They adapt to the environment and the needs of users; they conserve resources, are intuitive to use and are reliable.

Having won the Leading-Edge Cluster Competition conducted by the Federal Ministry of Education and Research (BMBF), it's OWL is one of 15 Leading-Edge Clusters for German high-tech expertise. With it's OWL, we know that we can build on the competitiveness of our corporate strengths and its leading position on international markets. This leads to growth and employment in OstWestfalenLippe and helps to make the region more attractive to professionals and executives. And we also provide the impetus for the development of Germany as a centre of innovation and production.

In this brochure, we will introduce the technology concept, the projects and the partners and would like to give you an idea of it's OWL's performance and impact. We are an open network and invite you to be involved. Our technology platform and the experience of the cluster partners could also benefit your company. □



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Global market leader and cutting-edge research

The collaboration of business and science gives it's OWL a unique profile in the field of intelligent technical systems.

According to a study by the Stockholm School of Economics, OstWestfalenLippe is among the strongest production locations in Europe, and marked by a high concentration of employment, capacity for innovation and export quota. In January 2014, the German Federal Ministry of Economics and Technol-

ogy named OWL as one of the TOP 5 most innovative and efficient regions in Germany. The region has 400 companies in mechanical engineering, the electrical and electronics industry and the automotive supply industry, employing over 80,000 individuals and generating annual revenue of 17 billion euros. it's

OWL's core is made up of family-run businesses and a wide range of medium-sized firms. These include numerous global market and technology leaders – strong brands such as Benteler, Claas, DMG Mori Seiki, Hella, Miele and Wincor Nixdorf, but also many hidden champions. Beckhoff, Harting, KEB, Lenze, Phoenix Contact, Wago and Weidmüller set global standards in industrial electronics, and hold 75% of the global market share for connector technology.

The region's universities are known for cutting-edge interdisciplinary research in the fields of self-optimisation, cognition and industrial automation. With the Cognitive Interaction Technology Center of Excellence (CITEC), three collaborative research centres, over 20 research institutes and numerous working groups, the region has around 1,000 scientists working on the solutions of tomorrow.

With the Fraunhofer Research Institution for Mechatronic Systems Design in Paderborn and the Fraunhofer Industrial Automation application centre in Lemgo, new non-university institutions have been launched. The universities offer excellent practical training in "MINT" subjects (mathematics, IT, natural sciences and technology) for more than 15,000 students. □

The technology network it's OWL in figures

24 core companies with innovation projects*

- Revenue: 11.8 billion euros
- Percentage of R&D employees: 14.7%
- R&D investment as a percentage of turnover: 8.4%
- Export quota: 56%
- 230 production sites and 782 branches worldwide

6 universities and 18 research institutes

- External funding: 100 million euros per year
- Investment in research infrastructure (2006 to 2012): approx. 300 million euros

More than 100 associated companies and 30 economy-oriented institutions



*The figures refer to revenue and employees for the 24 core companies in OWL in 2012.



New research centres provide perfect conditions for cutting-edge applied research in collaboration with businesses all over OstWestfalenLippe: Zukunftsmeile Fürstenallee Paderborn, Research Building "Interactive Intelligent Systems" of Bielefeld University, Centrum Industrial It (CIIT) Lemgo and Bielefeld University Campus

Technology concept

The combination of engineering and computer science opens up new perspectives.

Intelligent technical systems

- interact with and autonomously adapt to their environment (**adaptive**);
- cope with unexpected situations in an ever-changing environment that were not considered by the developer (**robust**);
- use knowledge gained through experience to anticipate the effects of different factors (**predictive**);
- take into account different users' behaviour (**user friendly**).

Subsystems form the basis of an intelligent technical system and consist of four units: the underlying mechanical system, sensor technology, actuator technology and information processing technology. Automation solutions, drives and energy accumulators are examples of subsystems.

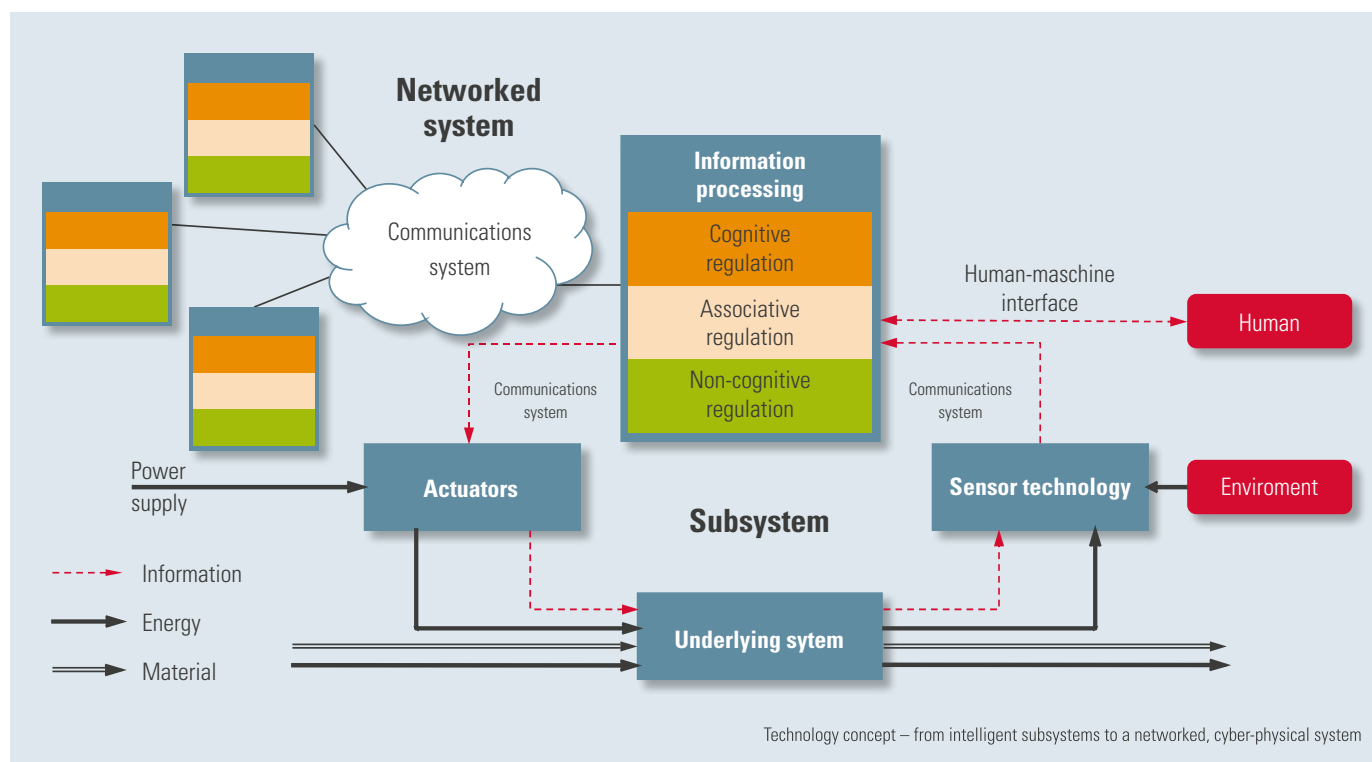
Several subsystems work together in a **system**, for instance a machine, a vehicle or a household appliance. In **networked systems** – such as production facilities, industrial laundries, electric vehicles and intelligent electrical grids – systems communicate with each other.

The key to their intelligence is in the way they **process information**. it's OWL projects develop solutions for this.

Effects

Thanks to intelligent technical systems:

- products and production systems develop new functionalities and become easier to use;
- development, installation, servicing and durability are improved;
- reliability, safety and availability are enhanced;
- resources such as energy and materials are used efficiently;
- individualised and adaptable production processes are made possible. □



Projects

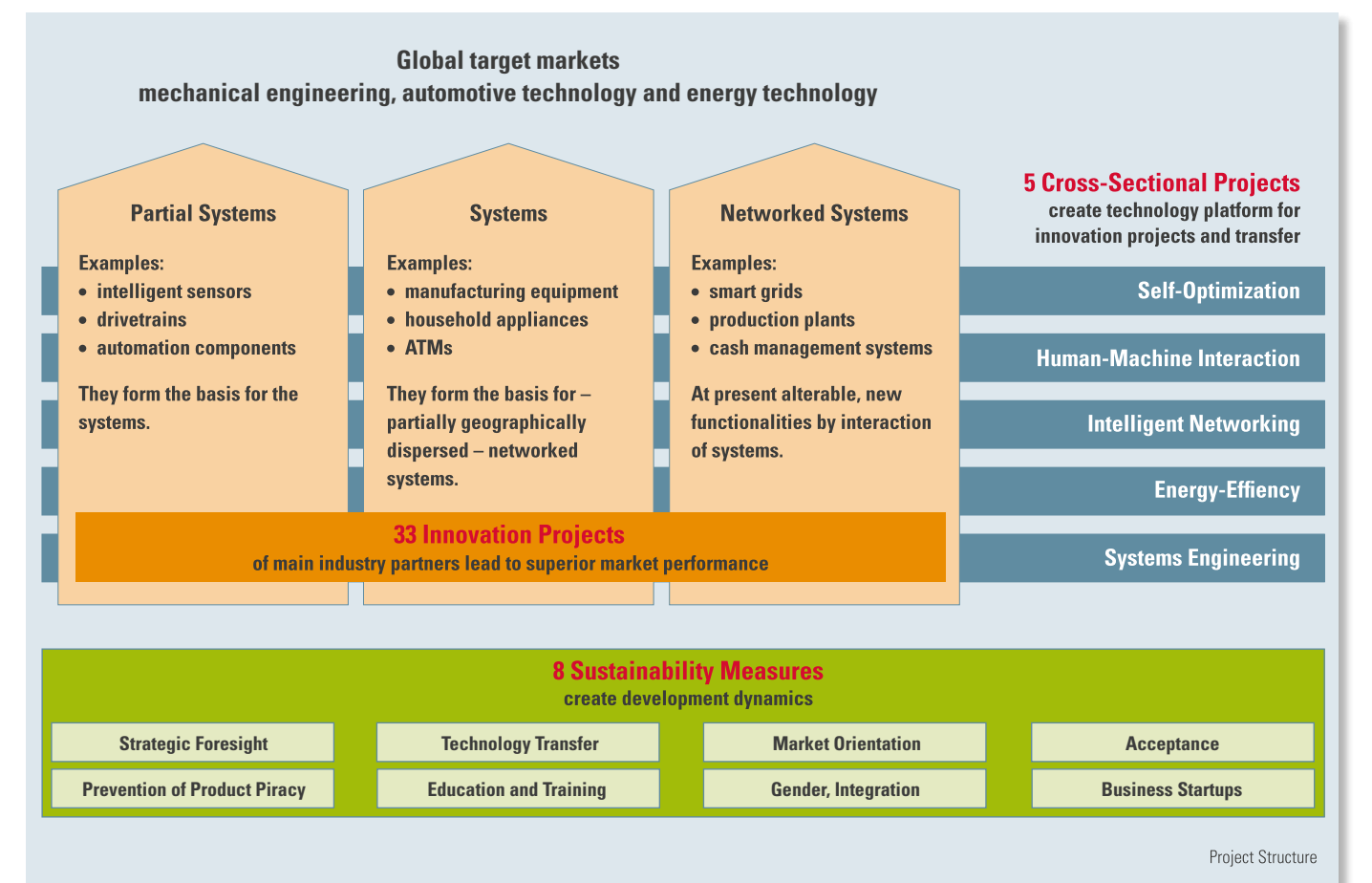
Business and research institutions are working together to create new market-ready products, technologies and applications in 33 innovation projects.

The basis for these is provided by applied research results from five cross-sectional projects conducted in the universities.

The various skills of a number of universities have also been consolidated. This technology platform serves as the basis for dissemination, with experience exchange programmes and transfer projects making the technologies and methods developed by the cluster available to small and medium-sized enterprises in particular.

Along with seven other sustainability initiatives, the transfer ensures that development does not lose momentum after funding has expired, and also increases the competitiveness of the companies involved. □

Cutting-edge applied research and entrepreneurial development expertise have been combined through 46 projects.



Advantages

- Optimised and situation-dependent behaviour during operation
- Improved resource efficiency
- Robustness with regard to operating errors
- Reduced startup
- Ensured reliability using predictive machine behaviour

Service portfolio

- Introductory “standard of performance of self-optimisation methods” seminar
- Application-specific analysis of the technical and economic benefits of self-optimisation
- Technology roadmapping from the status quo to intelligent machines
- Innovative control concepts
- Implementing powerful machine learning methods and mathematical optimisation
- Strategies to increase reliability through self-optimisation

Project partners

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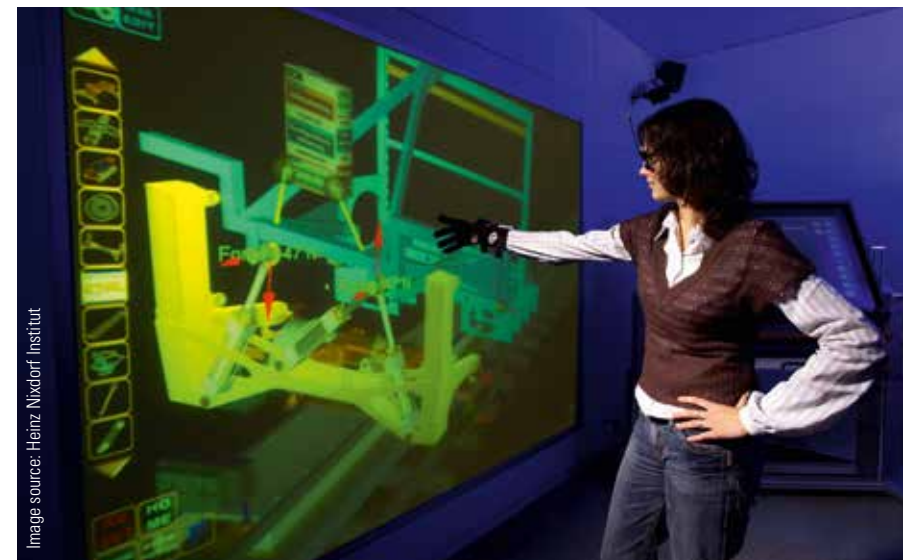
A machine that thinks for itself, learns and adapts

Cross-sectional project: Self-optimization

The foreseeable development of information and communication technology will enable mechatronic systems with inherent partial intelligence. This creates self-optimising systems that can react autonomously and flexibly to changing environmental conditions. For example, self-optimizing energy management systems in electric vehicles can distribute the available energy based on the current operating situation (e.g. cost of power, infrastructure) and with consideration toward conflicting objectives (such as maximising performance versus maximising range). Using self-optimization, companies can develop more efficient products and production systems and thereby sustainably increase usability.

The aim of the project is to create a set of tools for integrating self-optimization into the mechanical engineering systems of tomorrow. Companies will be supported in developing and operating adaptive, robust and predictive products and production systems.

To that end, self-optimization methods and processes, such as machine learning and cognition, intelligent control and regulation concepts and methods for increasing reliability, are compiled in a user-oriented manner and made available to the developers in the companies. They are displayed in a knowledge database for real-world access. ■



Intelligent machines understand people

Cross-sectional project: Human-machine interaction

The increasing complexity of intelligent technical systems presents ever greater demands on natural, intuitive operation without limiting the functionality of machinery and devices. There is still enormous potential for development in the field of human-machine interaction (HMI), such as intuitive user interfaces that can be controlled by gestures, touch, voice or eye movements. HMI processes allow the controls, cognitive demands and emotional quality of experience to be perfectly tailored to the user. Virtual and augmented reality help to develop intelligent technical systems efficiently and interactively, for example during design reviews. Faced with an ageing workforce and a lack of highly qualified specialists, it has become increasingly important to use assistive technology such as interactive robotics to keep workers working in the company for longer whilst carrying out high-quality work that creates value.

The aim of the project is to develop innovative methods and processes that can be used to create intuitive user interfaces for intelligent technical systems. This provides companies with support in integrating HMI technology into their products and the mechanical engineering systems of tomorrow and also in increasing their user-friendliness.

To that end, HMI methods and processes in the form of solution models are made available in an HMI toolkit. Examples include voice interaction, gesture control, tactile sensor technology, eye tracking, virtual and augmented reality and interactive robotics. Furthermore, guidelines and evaluation methods for applications are developed in areas such as ergonomics, behavioural measurement and the cognitive load on users. The results are established in a HMI transfer lab. ■

Advantages

- Improved usability of intelligent technical systems
- Greater efficiency and better quality when developing intelligent products
- Support for production unit configuration, servicing and maintenance
- Working conditions are optimised, particularly for older employees
- Intuitive and interactive robotics for safe human-machine cooperation

Service portfolio

- Consulting and training
- Supporting companies in evaluating their human-machine interfaces
- Providing methodology toolkits, tools and application guidelines for safe, intuitive HMI
- Needs-based selection and combination of developed HMI methods and tools
- Providing services and infrastructure for carrying out virtual design reviews for intelligent technical systems
- HMI transfer lab as a hub for demonstrating, documenting and transferring tools and methods

Project partners

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Advantages

- Simplified commissioning, (re)configuration and monitoring of devices, machinery and equipment
- Demand-driven maintenance
- Economical and reliable operation
- Reduced workloads for operating personnel

Service portfolio

- Introductory seminar
- Consulting services in the field of networking and sensor and information fusion systems
- Requirements analysis, technology selection and support during the introductory phase
- Concept development and evaluation for existing and planned devices, machinery and equipment
- Continuous systems analysis and evaluation using simulation and rapid prototyping
- Support when developing hardware and software solutions in the field of communications systems and sensors
- Detecting the “state of health” of devices, machinery and equipment using distributed sensors

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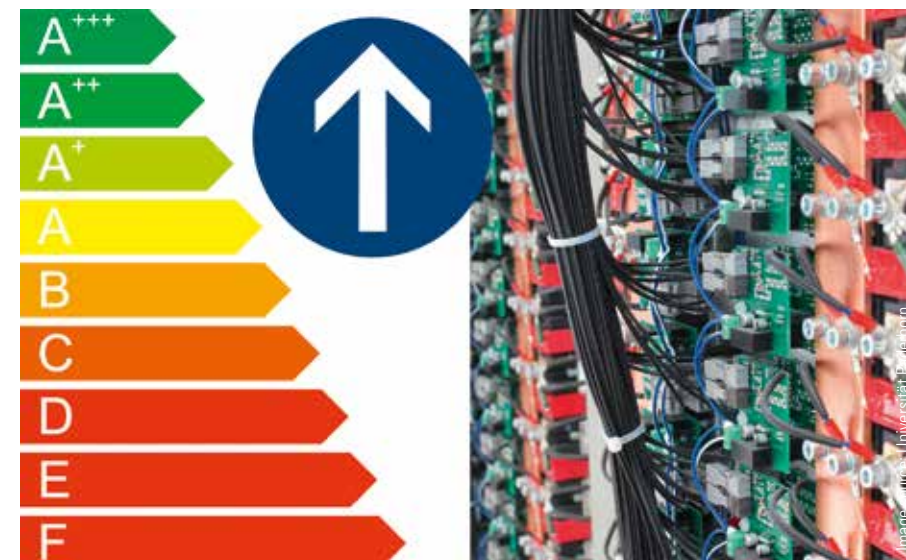
Plug-and-play

Cross-sectional project: Intelligent networking

Dynamic networking and coordination is a key feature in intelligent technical systems. For this to occur, the systems need to communicate with each other. Today's products and production systems cannot automatically react to changes within their environment and communicate with new systems. When new components are connected to a production unit, for instance, the entire system must be manually reconfigured, which involves considerable effort. Things could work differently, however – as demonstrated by USB sticks, which autonomously deploy as a new component when connected to a computer (plug-and-play). The intention is to also make this functionality available to devices, machinery and production units. To do so, individual components must autonomously analyse their own status and environment. Intelligent networking enables autonomous interaction between components.

The aim of the project is to develop plug-and-play functionalities for intelligent devices, machinery and production units by devising hardware and software components and making them available on a modular platform. The requirements that must be considered above all here are interaction between different components, reliability, and the capacity for integration into resource-efficient devices.

This is accomplished by developing reference architecture to support various interaction scenarios in dynamic and cooperative networks. In addition to this, reusable coordination patterns for networking, mechanisms for self-configuration and processes for information compression are developed and compiled in an implementation platform. □



Lower energy consumption, higher performance

Cross-sectional project: Energy efficiency

In light of rising energy costs, limited resources and ongoing climate change, energy efficiency is becoming increasingly important for industrial products and production systems. In order to remain competitive, machinery and devices must be developed and run in an energy-efficient manner. This can be facilitated by using innovative technologies to improve the energy efficiency of the components involved. Another approach is to optimise process management so as to reduce the total energy needed to carry out a particular task.

The aim of the project is to develop solutions for efficient and demand-based energy transformation, control and distribution in the production industry. The primary focus here is on energy transformation, energy management, electrical supplies, improving the efficiency of software and hardware components, and heating/cooling.

To that end, design processes that increase the efficiency of the energy used are developed for power electronics in devices and equipment. Efficient energy management in production units is facilitated by designing a methodology for optimised control of energy consumers, generators and storage systems as well as the necessary automation technology. Industrial electrical grids can be put to optimum use thanks to the provision of calculation methods that allow voltage drops, line outages and circuit feedback to be taken into account even in planning stages. In addition to this, concepts are developed to evaluate and improve the resource efficiency of hardware and software components. □

Advantages

- Lower energy consumption for products and production systems
- Increased energy efficiency
- Industrial networks are designed optimally
- Limited resources are used in a sustainable manner
- Contribution towards environmental protection thanks to lower CO₂ emissions

Service portfolio

- Design environment for power electronics
- Measurement of power semiconductors
- Developing guidelines for power pulse-controlled converters and harmonic filters
- Behavioural modelling of equipment
- Library of methods for optimal design and operating strategies
- Library of models of network users and networks
- Optimising the resource efficiency of information processing systems
- Catalogue of methods for heat management

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Advantages

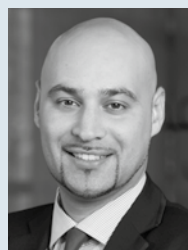
- Reduced time to market
- Improved development performance
- Improved collaboration thanks to a unified understanding of the system
- Production system taken into consideration at an early stage
- Transparency with regard to change processes
- Improved system integration expertise

Service portfolio

- Introductory seminars
- Modelling and analysis of products, machinery and equipment
- Support in requirements management and development management using integrated system modelling
- Modularisation for reusing existing solutions efficiently
- Early simulations to ensure that the system has the properties specified
- Recording and optimising the development process

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Intelligent products – intelligent development!

Cross-sectional project: Systems engineering

The benefit of intelligent technical systems stems from interaction between different components and technologies. This places high demands on the product development process, such as requiring a comprehensive understanding of the system and consideration of the full product life cycle. To that end, all disciplines must be oriented towards an overarching design approach called systems engineering (SE). As yet, however, this field offers only individual solutions. This leads to long development times, frequent adjustments, subsequent changes and poor quality in product development.

The aim of the project is to develop a set of tools that can be used as part of interdisciplinary work to devise intelligent products and production systems. Among other things, the set of tools consists of a method and modelling language for interdisciplinary descriptions of the entire system in the form of a system model. This creates a uniform understanding of the system and is the basis for design work in the relevant disciplines.

On that basis, methods are developed to ensure the compatibility of different models throughout the product creation process. Model-based synthesis and analysis methods – error tree and risk analysis, for example – ensure that the system has the specified properties. Using guides, tools and well-founded practical knowledge, the holistic methodology provides companies with practical support. □

Innovation projects

Business and research institutes are working together to create intelligent market-ready products, technologies and applications in 33 innovation projects.

In the innovation project, subsystems, systems and networked systems are developed.

- **Subsystems:** Automation solutions, drives, operator interfaces and chargers
- **Systems:** Production methods, dealing with hazardous materials and vehicle headlights
- **Networked systems:** Production facilities, virtual production planning, industrial laundries, intralogistics for warehouses, networked currency circuits and agricultural machinery as well as energy management systems in electric vehicles, small-scale power plants and smart grids

Sustainable production through intelligent automation technology

Scientific Automation platform

Machinery and equipment must be developed and run in an energy-efficient manner. Wear, production faults, energy consumption and harmful emissions are challenges for sustainable production. Integrating information and communications technology as well as engineering knowledge from a range of disciplines into automation technology (Scientific Automation) offers great potential for optimisation which, for example, can be exploited using self-optimisation methods, machine learning and image processing.

The aim of the project is to create a Scientific Automation platform for developing and operating machinery and equipment. Reusable solution elements are provided in the form of hardware and software, such as software modules or intelligent bus terminals. This should allow production units to autonomously anticipate wear, reduce emissions and immissions, optimise energy consumption and avoid production faults. This can reduce waste, throughput times and harmful emissions and increase the service life of tools as well as the sustainability of equipment. □



Image source: Beckhoff

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Increasing the efficiency of standard machine tools

Extremely fast automation

In light of increasing competitiveness and scarcer resources, the requirements placed on the productivity, reliability and efficiency of machine tools – e.g. assembly and manufacturing systems for the furniture industry – are also rising. In order to increase them, process parameters such as the tool position or rotational speed must be adjusted extremely precisely and synchronised in real-time. Up until now, automation technology was only able to guarantee these functions for small applications. This has not been possible for complex machinery and systems due to machine control systems having insufficient computing capacity to be able to process the required volume of data. Condition monitoring and self-optimisation methods could not be integrated into existing automation technology until now. This has led to downtime, manual readjustments and waste.

The aim of the research project is to develop hardware and software solutions that can bring about intelligent, powerful control systems for machine tools. The productivity, reliability and efficiency of the machinery will therefore increase, without any increase in automation costs. □



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Intelligent charging for longer drives

Self-adjusting chargers for electric vehicles

In view of rising fuel costs and ongoing climate change, the development of electric vehicles is pressing ahead. Their efficiency and cost benefits are currently not yet adequate in comparison to vehicles with combustion engines. A key component in electric vehicles is the battery charger. To reduce the vehicle's energy consumption, the intelligence of the charger must increase and its volume and weight must be reduced. At the same time, guaranteed reliability is important when dealing with all operational states and environmental conditions.

The aim of the project is to develop a compact, intelligent charger for electric vehicles, which minimises energy loss autonomously and adapts to different environmental conditions. This offers significant improvements in charger performance and efficiency as well as in the range of electric vehicles. □

Energy supply in the smallest space

Extremely compact chargers for electric vehicles

In light of limited resources, electric vehicles can make it possible to achieve a sustainable and efficient form of mobility. The vehicle charger has an important function in electric vehicles. It transforms the alternating current supplied by charging stations into direct current, and adapts the voltage level to the vehicle's battery. The present relatively high weight and overall installed size of the charger have a negative effect on the energy consumption of electric vehicles and reduce their range and efficiency.

The aim of the research project is to develop a powerful and compact charger for electric vehicles. Optimising the flow of electricity will increase the efficiency of the energy as well as reduce the volume and weight of the device significantly. This will increase the range and thus also the efficiency of electric vehicles. Moreover, part of the project involves developing a model-based design process, making it possible to individually assemble the components of a charger for different vehicles. Furthermore, the design process can help to simplify the development and integration of chargers. □



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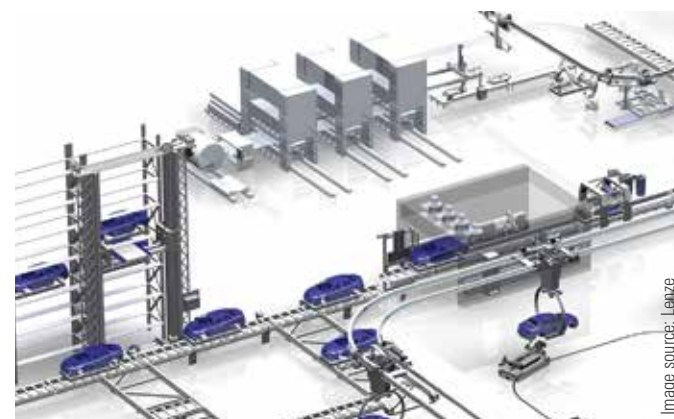
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High-tech on the rotor

Electric motor with rotating drive-train technology

The majority of production machines in automotive manufacturing are driven by alternating current electric motors, which convert electricity into mechanical energy. The variable production speeds require the use of converters, which switch between the motor and the power supply network, and make it possible to carry out a speed control adjustment. The use of the currently available converters causes voltage distortions in the power supply network, which could interfere with other connected devices. The converter, which is mounted on the motor, also requires additional installation space. In addition, when braking the machine, the energy that is released cannot be fed back into the power supply network. This aspect reduces the efficiency of production machinery and increases electricity consumption.

The aim of the project is to develop an innovative alternating current electric motor that is compact and energy efficient, and only produces very low interference. The return to the classic design concept will make it possible in the future for electric motors to autonomously adapt their revolution speed to individual needs. □



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Manufacturing different products with flexible machinery

Automation for adaptable production technology

Due to short product lifecycles, flexible batch sizes and greater consideration of overall running costs, machinery and equipment must be constructed increasingly quickly, adapted more and more frequently, and developed with an appropriate foresight. Currently, flexible machinery concepts can only be adapted to new manufacturing conditions as far as they were defined and anticipated when the machinery was designed. Considerable retooling and setup work is required if the necessary adjustments exceed the built-in capabilities of the machinery.

The aim of the project is to develop intelligent automation technology components for machinery and equipment, such as control systems, operating devices and field instruments. It also includes the development of intelligent design and operating software. The components and software will feature self-optimisation functions. This makes production machinery easier to plan, commission and adapt, thereby achieving a significant reduction in operating costs. □

Decentralised automation for adaptable production

Innovative automation devices through industrial IT

The increasing complexity and diversity of products make it highly challenging to design and run production units. These must be capable of manufacturing a wide variety of different products with features that were often unknown when the equipment was developed. The central automation systems currently in use allow only a limited degree of flexibility in automation, requiring frequent machinery conversions at great effort and cost. Decentralised automation systems make customised, modular production possible, but currently still result in significant engineering costs.

The aim of the project is to reduce engineering costs when carrying out automation functions based on distributed field devices. At the same time, this will make it possible for the automation system to optimise resources autonomously. Production process versatility and flexibility will increase without any additional cost. □

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Automation for different network standards

Adaptive coupling for industrial automation networks

Automation components in machinery and equipment communicate over networks, similarly to computers. As a result of changes in automation technology, there are now a great many established network standards designed to meet different information exchange requirements. Therefore, components that are identical in their function must be developed independently for different standards. This increases the development work required, delaying the launch and increasing the number of product variations. For equipment and component manufacturers, this results in a lot of work and additional costs over the equipment's entire life cycle.

The aim of the project is to develop intelligent automation components that can be used for different network standards and which adapt to production conditions autonomously. The effort and cost of automation can therefore be reduced throughout the machinery or equipment life cycle. The number of product versions and development times for new components is reduced. □

Small chip – big effect

Innovative hardware and software architectures through industrial IT

To be able to remain competitive, manufacturing companies need adaptable and cost-effective automation solutions that are suitable for short product life cycles and small batch sizes. Innovative electronic automation components provide the basis for cost reduction and adaptability, which will be enhanced by "system-on-chip" modules in the future. These are microchips that can be rapidly configured using software commands or external electrical circuits. However, so far there has not been any suitable automation hardware and software architecture for these modules.

The aim of the project is to develop flexible hardware and software solutions for automation machinery and systems on the basis of these microchips, which make it possible to carry out automation functions that are optimised for the application, such as condition monitoring and security. This will increase the adaptability of production processes, while at the same time reducing the degree of effort involved in engineering, commissioning and retooling machinery and systems. □

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Interactive self-service machines

Intelligent user interfaces for self-service terminals

Self-service terminals are becoming more and more prevalent in everyday life, and provide comprehensive services in the fields of information, administration and payment. Increasing mobility and a faster pace of life are heightening the demand for services to be flexibly accessible. Therefore, self-service terminals such as cash machines and ticket vending machines must be available around the clock and must be able to complete transactions quickly. At the same time, customers expect self-service machines to be easy to use and to allow interaction via mobile communications devices such as smartphones and tablet PCs.

The aim of the project is to develop software and hardware that allow mobile devices and self-service terminals to be connected easily, efficiently and securely. This will make it possible to operate the terminals via mobile devices in order to minimise the machinery hardware. Usability, flexibility and availability will all improve. □

Sustainable electric mobility

Intelligent heat transfer for efficient electric vehicles

Electric vehicles guarantee personal mobility without depending on fossil fuels, and have low CO₂ emissions. However, their efficiency is far behind that of vehicles with an internal combustion engine; this can be clearly seen, for example, by their limited range. One reason behind this is the limited capacity of energy accumulators, the efficiency of which depends to a great degree on the temperature level. In addition, energy consumption is higher for the vehicle's standard thermal management. On the other hand, there is a significant amount of heat loss during several process sequences – such as motor operation – which, up to now, has been transferred to the environment via the cooling system, which wastes energy. This dissipated heat can be used for targeted, needs-based temperature control, e.g. for the storage battery.

The aim of the research project is to develop a self-regulating thermal management system for electric vehicles. It is intended that the system be able to adjust itself adequately and appropriately to changes in surplus or required heat, and to sustainably increase the performance and efficiency of electric vehicles. □

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Energy-efficient drilling in furniture production

Self-optimising drive for drilling wooden parts

Wooden parts for furniture production are machined. Holes are currently drilled using machinery with drill heads that consist of several drive shafts called drill spindles. Until now, these have been inflexible, maintenance-heavy and high in energy consumption. This is because all spindles are always driven simultaneously, even if a drilling process requires only certain individual spindles. The spindles must also be constantly readjusted for different parts. Drilling may therefore affect the productivity of furniture production as a whole.

The aim of the project is to develop self-optimising drives for drilling processes that allow every single drill spindle to be used individually and adapted to the wooden part that is being processed. This will result in more accurate and higher-quality drilling whilst significantly reducing energy consumption and the cost of adjusting the drilling spindles. This will lay the groundwork for the productivity of woodworking machinery to be doubled. □

Efficient and safe harvesting

Environment detection system for harvesting machinery

Harvesting machines have to work in a continuously changing environment. Different conditions, such as the density of the crop being harvested and ground properties, require individual adjustments to machinery settings. Moreover, the driver faces the risk of collision due to the restricted view. Not only does this lead to machinery damage and consequently to expensive downtime, but it also constitutes a hazard to people. Automatic environment detection can optimise machine settings and ensure the safety of the working area.

The aim of the project is to develop a networked sensor system to electronically detect the environment of harvesting machinery. This should enable them to adapt their operation optimally to field conditions. This will increase the efficiency and safety of agricultural machinery – with equal or improved harvest quality. Damage to people and machinery will be minimised and downtime reduced. □

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Safely storing and monitoring hazardous materials

Intelligent early warning system for hazardous material storage areas

Companies that store and handle hazardous materials such as flammable and poisonous chemicals must deal with risks to the environment and to people. At present, automated monitoring of hazardous material storage areas is unreliable and complex. As a result, damage such as liquid spills cannot be detected until they have already occurred. This is often the case when manually drawing substances. There is a lack of solutions for detecting and preventing faults in hazardous material storage areas in advance.

The aim of the project is to develop a hazardous material storage area that ensures safe operational states. An early warning system uses sensors to detect hazards early on and networks them intelligently. Countermeasures to limit damage are then initiated automatically. Furthermore, an intelligent drawing terminal will be developed that allows hazardous liquids to be measured safely. As a result, usability and safety in handling with hazardous materials will be increased as well as avoiding hazards to employees and the environment. □

More marketability at the push of a button

Intelligent machine tools for individualised production

Manufacturing companies face great challenges as the result of increasing demand for tailor-made products. Machinery and systems, such as machine tools, must be able to carry out manufacturing processes flexibly and use resources efficiently. At the same time, they need to ensure the quality of the product and ease of operation. Up to now, machine tools have mostly required manual adjustment when being converted to manufacture a different product. Moreover, errors such as variations in product quality are not able to be recognised and rectified during the manufacturing process. This results in machine downtime and production waste.

The aim of the project is to develop an intelligent machine tool that is capable of autonomously adjusting the machine set-up for different machining processes, and checking the quality of the finished workpiece. This will achieve an increase in the flexibility of machine tools in the future, without reducing the reliability of the machining process or the quality of the product. As the result of the automatic adjustments, efficiency is expected to increase by around 20%. □



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Self-learning welding robot

Intelligent processing of large parts with high tolerances

Robotic technology is used in many industrial production processes to speed up processing and minimise costs. At present, welding robots must be "taught"; this means that the movement sequences are learned or programmed in advance. These processes require welding machines to be highly accurate in their positioning, which often cannot be guaranteed – particularly when working on large parts with high tolerances, such as steel girders for the construction industry. As a result, the only way to ensure the necessary quality involves additional work – either manual rectification or readjustments to the equipment.

The aim of the project is to develop an intelligent welding robot that can reliably process large parts with high tolerances. Using innovative detection and control technology, the robot should be able to check the individual properties of the part and adjust the position of the robotic arm accordingly. This makes it possible for large parts to be processed automatically with a high degree of precision, eliminating the need for manual rectification or readjustments to the welding machine. □



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Improved road safety through optimum lighting

Actuator-based systems for self-aligning intelligent headlamp technology

Participating in traffic poses a potential risk for drivers, especially at night: Driving at night is particularly hazardous; in 2011, 40% of all road deaths took place at dusk and during the night, despite the fact that roads are used far less when it is dark. The reasons for this sometimes include incorrectly adjusted headlamps. This applies for 40% of all cars and commercial vehicles in Germany. Headlamps that are angled too high dazzle other road users; if angled too low, the range of the beam is drastically reduced. Both can have a negative effect on the driver's ability to recognise objects, potentially resulting in too slow a response to hazards.

The aim of the project is to develop an intelligent headlamp system that analyses the data collected about the environment and the condition of the vehicle and makes autonomous mechanical adjustments to ensure optimum headlamp alignment. This will help to increase road safety and the driver is free to concentrate fully on the traffic. □



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Better performance in electronics

Intelligent copper bonding

Current and voltage are controlled in machinery and vehicles by power semiconductor modules. Among other things, the electrical contacts in the module are made from aluminium wires that are referred to as bonds. Copper provides greater conductivity, strength and durability compared to aluminium. However, it is more difficult to process and more sensitive to fluctuations in production conditions. As a result, copper bonds currently cannot be produced with the required degree of reliability.

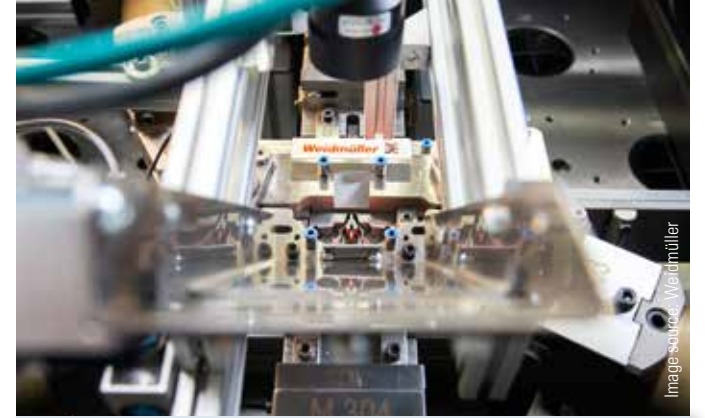
The aim of the project is to manufacture reliable copper bonds whereby the bonding machine autonomously adapts to the respective production conditions and material variations. This makes power semiconductor modules more powerful, efficient, compact and durable. □

Efficient and reliable forming processes

Self-correcting manufacturing of electrical connectors and furniture guide rails

Due to increasing customer demands, products must incorporate more and more functions. This has resulted in high demands being placed on the individual components and how they interact. Manufacturers are therefore faced with the challenge of having to ensure the high quality and precision of the very small parts that they often produce in high quantities. There is great potential for optimisation in forming processes such as press-bending electrical connectors or roll forming furniture guide rails. This can be achieved by using production machinery that autonomously identifies discrepancies in the manufacturing process and materials, and corrects itself accordingly.

The aim of the project is to incorporate self-optimisation technology into forming processes. This will improve the productivity of the machinery and will reduce setup and tooling times as well as reducing the amount of waste without compromising process reliability. □

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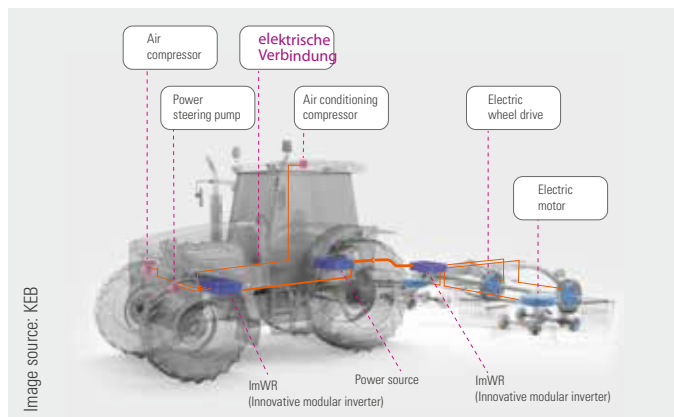
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Innovative drive solutions

Electrification of ancillary units in commercial vehicles

Up to now, ancillary units in commercial vehicles – such as air-conditioning compressors, ventilators and hydraulic pumps – have been driven by the internal combustion engine. The capacity available to drive these ancillary units is tied to the rotational speed of the internal combustion engine and cannot be controlled according to need. It is therefore necessary to design the ancillary units so that they will continue to work even if the engine speed is low. This results in an increase in the weight and size of the ancillary units. Both aspects impact the efficient operation of commercial vehicles, which also has a negative effect on fuel consumption. Therefore, the electrification of ancillary unit drives promises great potential.

The aim of the project is to develop a modular electric drive system for ancillary units in commercial vehicles. This will increase the efficiency of the drives for ancillary units in vehicles, fuel consumption will decrease and the size and weight of the units will be reduced. Savings in resources of up to 40% are expected. □

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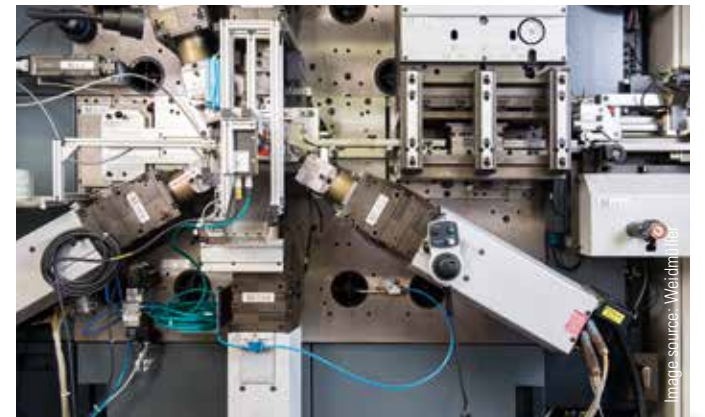
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Optimised forming processes

Self-correcting manufacturing in connector and automation technology

Electrical contacts are the core components of electronic connector and automation technology, such as plugs in controls and switching devices. Since they are responsible for operating machinery and equipment reliably, high demands are placed on the precision of the small metal parts. These metal parts are produced by forming processes that are very sensitive to changes in the operating conditions, such as material properties or temperature. To ensure quality and to keep waste to a minimum, an elaborate setup of production machinery is necessary. Processes are called for that enable machine settings to be automatically readjusted when material properties of the raw material change.

The project aims to develop control strategies, sensors and actuators for self-correcting forming processes in the field of electronic connector and automation technology. In the future, production machines should autonomously adapt to changing operating conditions. This will optimise the quality, reliability and efficiency of the forming process. □

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Image source: Kemper

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Kneading machines that feel the dough

Intelligent kneading process

Machines for producing dough currently use a kneading bowl and a dough hook to work the ingredients. To ensure that these are properly mixed for the best quality, the state of the dough has to be constantly checked manually. Kneading machines therefore cannot be operated without the expertise of trained bakers. There is a particular shortage of these in developing countries due to the increasing demand for baked goods. To make the kneading process more efficient and the machines easier to use, it must be possible for the kneading process to autonomously adapt to the changing state of the dough, which requires expert knowledge to be integrated in the machine.

The aim of the project is to redesign the kneading hook and to optimise the kneading process with intelligent control. To do so, it is necessary to create the mechanical and technical conditions for the machine to feel and knead the dough like a baker. This will make it possible to produce different types of dough with optimal quality whilst using resources efficiently. By simplifying the kneading machines, they can be operated even by personnel without baking expertise. □

Perfect harvests

Intelligent adaptation and networking of agricultural machinery

Much of the world's agricultural machinery is used for only a short period of the year. Combine harvesters, for example, are used for just 25 days each year in some regions. It is therefore necessary to bring in an optimum harvest quickly and efficiently. To do so, the conditions of each field, such as crop ripeness or soil conditions must be taken into consideration. At the same time, individual processes such as harvesting, transport and storage must be optimally coordinated. Until now, this has been a predominantly manual process based on experience.

The aim of the project is to develop software that allows different agricultural machinery to independently adapt to the current harvesting conditions and to intelligently link individual processes and participants. This increases the efficiency of agricultural machinery. Resources are used more efficiently, the quality of the harvest is improved and the burden on machine operators is relieved. □



Image source: CLAAS

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Image source: AEG

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Small-scale power plants for a reliable electrical supply

Developing a micro-grid for businesses

The energy revolution poses major challenges for Germany. A reliable, sustainable and affordable energy supply is required. This is particularly important for companies that consume the majority of Germany's electricity. A decentralised power supply contributes significantly towards this. Small-scale power plants within the micro-grids make it possible to use energy efficiently, particularly domestic sources such as solar, hydro, wind and gas power. They are located in the immediate vicinity of consumers and are connected to the central electrical grid using innovative power storage systems that, in contrast to traditional renewable energy network links, noticeably reduce the load on the grid.

The aim of the project is to develop a demonstration micro-grid supplying energy for industrial companies. The model power plant links energy sources and energy storage components via intelligent power controllers. These can control current and voltage flexibly and provide predictive energy management. This allows companies to use variable environmental conditions to produce energy and to ensure an effective and efficient energy supply. □

Intelligent planning – optimum utilisation of machinery

Virtual machine tools for production planning

Due to a high software ratio and the combination of different technologies, machinery is becoming increasingly complex. Therefore, operating plans and software programs have to be prepared prior to use them. Using digital simulations, different production processes can be tested in advance and the production planning can be considerably simplified.

The aim of the project is to develop a service platform that uses virtual machine tools to digitise production planning. Attention is focused on virtual machine configuration, intelligent order distribution and integrating expert knowledge into the machine. This accelerates production processes, increases the efficiency of machinery and simplifies operations, resulting in 30% savings in costs and resources. □



Image source: DMG MORI SEIKI

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Optimal refining of foodstuffs

Intelligent separator

Very high requirements are placed on the quality of a product during industrial manufacturing of foodstuffs such as dairy products or pharmaceutical products. To this end, raw products are refined in a multi-phase process. Amongst other processes, this is achieved using centrifuges – known as separators – which separate the substances from the product using centrifugal force. Optimal operating conditions, such as temperature and the composition of the raw products, are needed to guarantee reliable separation. However, these conditions often do not exist as the centrifuge is tied into a production process that is subject to fluctuation. To optimise work procedures, it is necessary to have extensive knowledge of the machinery and processes, which is very often only available to a limited degree. Both aspects lead to lower efficiency and yield losses.

The aim of the project is to develop a virtual system model for designing hardware and software solutions for intelligent centrifuges. This allows separators to autonomously adapt to changing conditions. The reliability and the efficiency of the separation process will increase. □

Manufacturing with the modular design principle

Flexible assembly with integrated interactive robotics

The requirements regarding the flexibility of manufacturing processes are continuously increasing. Amongst other things, this can be attributed to customers' demand for tailor-made products in smaller batch sizes. It is already possible for customers to create customised products – for example industrial plug connectors – over the Internet by choosing from a variety of components. In the future, manufacturing tasks should be automatically extrapolated and implemented for customer orders with any batch size, even as little as 1. It will therefore be possible to reduce warehouse stocks and shorten delivery times. To that end, it must be possible for individual manufacturing steps – such as screwing together, assembling and checking – to be planned, parameterised and easily combined according to the specific order.

The aim of the project is to develop hardware and software solutions that make production lines modular, in order to facilitate automatic manufacturing of customer-specific products. This will make it possible to manufacture individual products quickly and efficiently, without affecting process reliability. The intention is to reduce commissioning and retooling of production systems by 25%. □



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Intelligent automation to enable flexible manufacturing

Flexible assembly through self-optimising components

To remain competitive, manufacturing companies increasingly need to automate. At the same time, customer demand for customised products in small quantities is rising. It is therefore necessary for companies to make their manufacturing processes more flexible. This requires intelligent automation solutions that allow machinery to manufacture different products without the need for time-consuming manual changeovers.

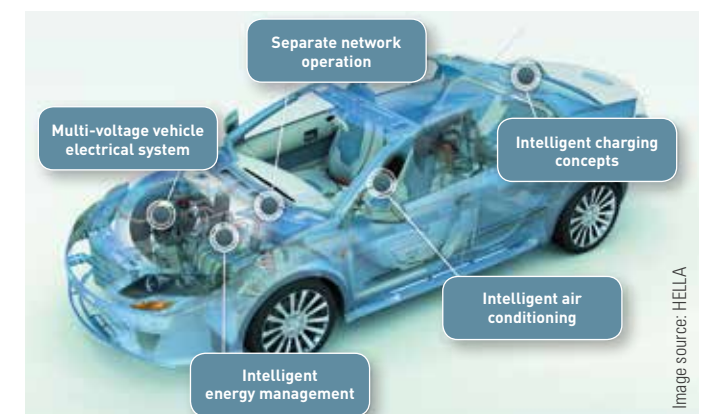
The aim of the project is to develop intelligent automation components that can adapt to different manufacturing processes efficiently in terms of their technology and functionality. This requires human-machine interaction and machine learning methods to be integrated into automation technology as well as using the latest technology for intelligent networking. This will significantly improve the flexibility, user-friendliness and cost-effectiveness of production without compromising quality and process reliability. □

Driving further without sacrificing comfort

Increasing the range of electric and hybrid vehicles

Electric and hybrid vehicles with a low carbon footprint offer the guarantee of mobility, while being largely independent of fossil fuels. However their efficiency currently still lags far behind that of vehicles with an internal combustion engine. A major reason for this is the limited storage density offered by the batteries that are currently available. In addition to the drive and lighting, they also need to power the air conditioning system in the passenger compartment. To meet the high expectations of users with regard to range, comfort and handling, the efficiency of vehicle components, such as energy transformers or control units, must be increased.

In addition to developing heating and cooling strategies, the aim of the project is to develop innovative transformer concepts, vehicle electrical systems and intelligent energy management. This will improve the energy efficiency and the range of these vehicles without sacrificing driver comfort. This will help to increase the use of electric vehicles and protect against climate change. □



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The green laundry

Resource-efficient, self-optimising industrial laundry

Due to the scarce resources and increasing competitive pressure, industrial laundries need to save water, energy and detergents and have to work more efficiently. Currently, industrial laundry machinery for sorting, washing, spinning and drying is set up individually and independently with values based on user experience. There are no approaches that take a holistic view of the laundry as a whole. This means there is great potential for improvement. Hygiene requirements are also playing an increasingly important role, for example the handling of soiled laundry and the need for hygiene certificates for the cleaned laundry.

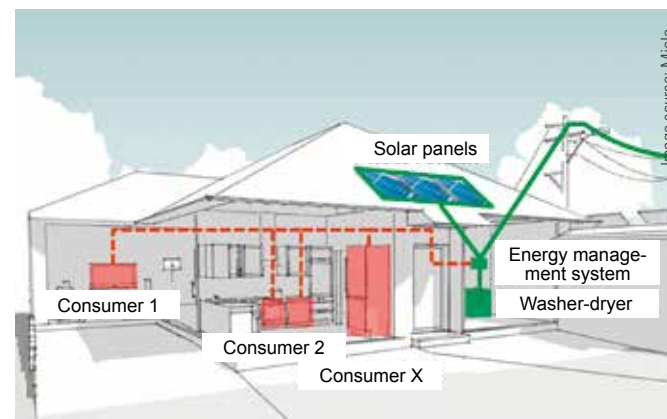
The aim of the project is to improve the interaction between machinery and processes in industrial laundries by using self-optimisation methods and intelligent gripper robots. This will increase the productivity of laundries and will reduce consumption of resources such as energy, water and detergent by around 50%. This will also help personnel to avoid harmful exposure to soiled laundry as well as ensuring that hygiene requirements are complied with. □

Intelligent household appliances for intelligent electrical grids

Energy management in smart grids

The electrical supply in Germany is currently provided by a few high-capacity power stations that adapt their electrical production to fluctuations in consumption throughout the day. However, due to the growing proportion of renewable sources, energy production is becoming increasingly difficult to control, potentially resulting in electrical surpluses or shortages. In the future, demand will therefore need to adapt to the fluctuating supply. This will be made possible in the future by smart grids, which network energy generators and consumers and allow supply and demand to be synchronized. However, there is a lack of household appliances that respond to the dynamic conditions in smart grids.

The aim of the project is to develop flexible household appliances that autonomously adapt their processes in response to fluctuations in the availability and price of electricity. An additional development is an innovative energy management system for private households. This reduces energy consumption and costs while enhancing the convenience for customers. □



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Saving energy in warehouses

Intelligent drive and control technology for energy-efficient intralogistics

Due to the globalisation of trade and the rise in internet sales, there is a growing need for effective and efficient logistics processes. To ensure a smooth flow of goods, warehouses use fully automated storage and distribution systems. These intralogistics services are carried out using a large number of control systems with electrical drives. In the past, businesses have given little consideration to their energy consumption as the energy savings often do not make the investment in new drives financially worthwhile. However, energy consumption is increasingly becoming a major cost factor in light of rising energy costs and the increasing complexity of intralogistics.

The aim of the project is to develop an intelligent modular system for efficient drive solutions, making it possible to provide the optimal solution for every warehouse drive process. Intelligent load management is also designed. This makes it possible to considerably reduce energy consumption in warehouses and to use the power supply grid to optimum capacity without compromising quality or cost-effectiveness. □

Secure and efficient banknote handling

Networked systems for automated currency circuits

The number of banknotes worldwide is constantly increasing; even in the digital age, nine out of ten transactions are paid in cash. However, banknote circulation (e.g. through ATMs) is expensive, as mechanical sorting and authentication processes are easily prone to error. Soiled, damaged and counterfeit banknotes are often not detected and lead to breakdowns, which require maintenance work to the ATM and in a branch. The banknotes must also be examined manually before they are delivered to the machine. A further problem is that the machines are vulnerable to manipulation, resulting in unauthorised access.

The aim of the project is to develop hardware that avoids errors when automatically sorting and authenticating banknotes. It also involves developing software to quickly detect and prevent attempts to manipulate ATMs. The efficiency and quality of cash handling are improved, ATM breakdowns are avoided and security against unauthorised access is improved. □



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Sustainability initiatives

Eight sustainability initiatives ensure that development does not lose momentum once funding has expired, and that companies remain competitive.



Image source: HELLA

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We bring the market to the laboratory!

MarketLab: Aligning technological advantages to customers' needs

New technology is not enough to guarantee market success. The customer is crucial here; innovations must meet their needs and offer more value than existing solutions. It is therefore necessary to take into account customer preferences during product development. There is however a lack of methods for predicting purchase decisions when products do not yet exist. In addition, purchasing decisions are often made jointly by several people. Many companies do not give adequate consideration to this.

The aim of the project is to develop a methodology that makes it possible to survey customer preferences and purchasing decisions for new solutions that do not yet exist in reality: the MarketLab. This will give companies practical assistance to align technological advantages to the customers' needs and to make adjustments as early as the product development stage. Investment in low-demand technologies is thus avoided. □

Always a step ahead

Forecasting: Thinking ahead and successfully shaping the future

In order to identify and exploit future potential for success at an early stage, companies must anticipate developments in markets and technologies. Such activities are known as forecasting. Many companies do not yet use forecasting systematically, but instead rely on updating established innovative concepts and a high level of responsiveness. However, in light of dynamic technological and market developments as well as the increasing complexity of products and production systems, this is not sufficient. Companies need an idea of their customers' needs, product features, the technology's potential and changes in the markets.

The aim of the product is to develop a set of tools with content such as factors of influence for it's OWL's target markets. In addition, methods such as scenario techniques and trend analyses for the needs of intelligent technical systems are being developed and made available. This enables companies to draw the necessary conclusions for future business, product and technology strategies effectively and efficiently. □

No chance for imitators

Protection against product piracy

Product counterfeiting causes considerable damage to businesses. 2011 saw the seizure of more than 103 million counterfeit products, which were responsible for over 1.1 trillion euro of economic damage – and these figures are set to increase. The technology network it's OWL is particularly involved in developing intelligent products that are likely to have considerable market potential, making them highly attractive to product counterfeiters. It is vitally important for original manufacturers to protect their products from the start if they wish to survive. Existing protective mechanisms are not equipped for this as yet, as the intelligent products are very complex and integrate a number of new features.

The aim of the project is to develop a process to identify potential threats and a database of protective mechanisms, such as hidden markings and "additive" manufacturing processes. In this way, companies can integrate suitable protective measures as early as the product development stage to effectively prevent counterfeiting. □



Image source: Alterlatier (Image source: Alterlatier)

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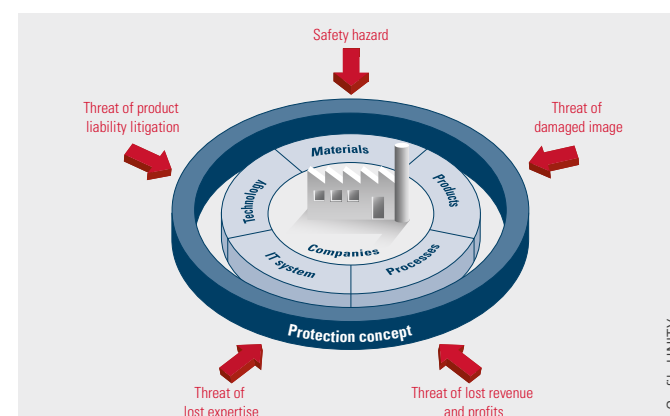


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Image source: OWL GmbH

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Ergonomic and socially responsible shaping of Industry 4.0

Ensuring technology acceptability

Successful innovation processes in industrial companies do not only come down to technical progress. It is also crucial to take into consideration the viewpoints of the various employee groups (socially responsible technology design) and, in particular, those of the future users (ergonomic technology design). This also applies to Industry 4.0: The designing of human-machine interfaces and changes to working environments and organisations will only be accepted if the employees directly involved in the planning and implementation of these projects.

The aim of the research project is to develop recommendations and consultancy programs for ergonomic and socially responsible innovation and technology design. Businesses are thus able to involve their employees and future users in the development and introduction of intelligent technical systems at an early stage. This also ensures that new technologies and operational change processes are borne by all those involved, and technical innovations are tailored to the needs and requirements of future users. □

Getting specialists ready for the future

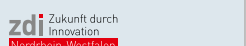
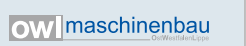
Education drive

Products and production systems are becoming more and more complex. The research projects carried out by it's OWL are therefore developing new technologies and methods. For these to be used in companies, specialists must be trained in using them. Older engineers and young professionals in particular are key target groups. Demographic change and skills shortages have made it necessary to raise awareness among students and professionals from other regions about job opportunities in OstWestfalenLippe.

The aim of the project is to develop new further education programmes and tools to train specialists and motivate them to pursue a career in the region. These include a summer school for graduates and young professionals, technical requirements and a staff development programme for experienced professional engineers. This contributes towards ensuring specialists in OWL. □



Image source: DWG MOBI SEKI

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Image source: shutterstock

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Startup companies

Sustainable startup companies from innovative ideas

Successful company startups increase the innovative strength and competitiveness of a region. The Leading-Edge Cluster projects create new technologies, methods and products with attractive business potential. In order to convert these into successful company startups, systematic identification of ideas, sensitisation of potential founders as well as extensive qualification, consultation and management are required. However, the existing infrastructure of the startup network in OWL, made up of universities, chambers of commerce and business development institutions, is not yet orientated towards this. New offers need to be created tailor-made for high-tech startups and their special requirements. They have to cover the entire value chain of the startup company.

The goal of the project is to convert the promising ideas into concrete business startups. As a result, new technologies, methods and products from the project will be disseminated on a broad basis. The competitiveness and strength of innovation in the region will increase and new workplaces will be created. □

Internationalisation

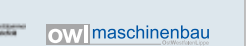
Regionally networked, globally successful

The Leading-Edge Cluster is creating a unique technology platform for intelligent technical systems, which companies can use to increase the reliability, resource efficiency and user-friendliness of their products and production systems. On a national level, the activities and skills of the Leading-Edge Cluster are already arousing high interest in the business and science worlds. However, they have not yet achieved sufficient visibility at an international level. Moreover, the cluster partners are only partially active internationally, but recognise great opportunities to strengthen their market position and performance there. The main goal of the cluster strategy is defined as taking a leading position among global competitors in the area of intelligent technical systems. In order to achieve this goal, the internationalisation and image profile of it's OWL must be expanded.

The goal of the project is to develop activities and offers to increase the profile of the cluster in the international business and science worlds. Cluster partners will receive contacts to new cooperation partners and access to new markets. □



Image source: Image source:la

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Advantages

- Easy access for SMEs to current research knowledge
- New technologies introduced into companies
- Increased reliability, resource efficiency and usability
- Cooperation and sharing of experience between business and science
- Training in the use of new technology

Service portfolio

- Information events, experience exchange groups, workshops and transfer projects for introducing new technologies
- Consulting on transfer projects and other service offerings from the Leading-Edge Cluster
- Liaising contact with project partners (businesses and universities)

Examples of transfer projects

- Analysing potential for self-optimisation
- Regulating and controlling machinery intelligently
- Evaluating user interfaces
- Simplified process for commissioning and reconfiguring equipment
- Operating strategies for efficient energy management
- Optimising requirements management and development management

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transfer



We bring new technologies to your company

Sustainability initiative: Technology transfer

The new technologies and methods developed in the five cross-sectional projects (see pages 8–12) make it possible for companies to increase the reliability, resource efficiency and user-friendliness of their machines, systems and devices. The focus is on the fields of self-optimisation, human-machine interaction, intelligent networking, energy efficiency and systems engineering. Small and medium-sized companies (SMEs) in particular can benefit from the innovative transfer concept of this unique technology platform. By means of transfer projects in cooperation with a research centre, they can gain access to methods, tools, software modules and prototype solutions. As the research partner is funded by the Federal Ministry of Education and Research (BMBF), the company only bears its own expenses.

Information events and knowledge-sharing groups offer companies the opportunity to learn about the potential of the technology platform. In-depth workshops help to provide training in using the technology. Interested companies can get personalised advice from the project partners. Together, needs for action and possible solutions are identified and suitable research partners are contacted. □

Cluster partners Successful together

In 'it's OWL e.V.', companies, universities, research institutes and other partners pool their interests.

Companies**Universities & research institutes****Transfer partners****Sponsor members**

Approximately 100 associate members – particularly small and medium-sized enterprises – use the service range of the Leading-Edge Cluster to network and to make their businesses fit for Industry 4.0.

Interested companies, scientific institutions and commercial organisations are welcome to get involved with the Leading-Edge Cluster and join the association. For more information on the association (charter, membership fee regulations and membership declaration) as well as other partners, please go to www.its-owl.com/technology-network/partners/

What people are saying

According to Wikipedia, “the BMBF Leading-Edge Cluster ‘it’s OWL’ is currently the largest project in Industry 4.0”.

Decision-makers and experts expect a major boost for Germany as a centre for industry.



Prof. Dr. Johanna Wanka,
Federal Ministry of Education and Research

“In the Leading-Edge Cluster Competition, the scientific and commercial fields work closely together to translate research results into practice as quickly as possible. The 15 Leading-Edge Clusters are therefore an important part of the High-Tech Strategy, which combines the federal government’s research and innovation strategies. The Leading-Edge Cluster it’s OWL hopes to connect engineering and IT more strongly to Industry 4.0. I wish all of those involved every success in this important strategic initiative.”



Garrelt Duin,
Minister for Economics, Energy, Industry and Commerce in the state of North Rhine-Westphalia

“Mechanical engineering and the electrical and electronics industries are particularly important for North Rhine-Westphalia as an industrial centre. This is no different in the Ostwestfalen-Lippe region, where they are an important focus for innovation, added value and employment. Linking them with information and communications technology leads to intelligent technical systems. In this sense, the cluster it’s OWL is providing outstanding support for businesses to shape the markets of tomorrow.”



Svenja Schulze,
Minister for Innovation, Science and Research in the state of North Rhine-Westphalia

“Whether it’s climate change or dwindling resources, major societal challenges require the commercial, scientific and research communities to work closely together with a focus on people. it’s OWL is an excellent example of this and a great asset to the scientific community in OWL and NRW!”



Dr. Klaus Mittelbach,
Executive board chairman, ZVEI – Zentralverband Elektrotechnik- und Elektronikindustrie e.V.

“In today’s internet economy, speed has become a crucial competitive factor. Fortunately, the Leading-Edge Cluster it’s OWL has picked up this tempo and is already working on concrete solutions for Industry 4.0 – in other words, for automation technology – with support from strong medium-sized enterprises.”



The award of “Outstanding Location in the Land of Ideas” emphasises the role of it’s OWL as a pioneer and a model for other regions.



Prof. Michael ten Hompel,
Clusterboard Chairman EffizienzCluster LogistikRuhr

“Today’s logistics process about a million times more data than in the mid-nineties. At the same time, the complexity and dynamics of logistics networks and systems are increasing exponentially. In both Leading-Edge Clusters of North-Rhine Westphalia, decentralisation and self-organisation will be the key principles for solving the challenges of tomorrow. We look forward to a joint future in the Internet of Things and Services.”



Wolf D. Meier-Scheuven,
Spokesman for Produktion.NRW, managing partner at Boge Kompressoren

“North Rhine-Westphalia is one of the strongest mechanical engineering areas in Germany. The projects conducted by it’s OWL are developing innovative solutions to make this industry more competitive. By working together as part of Produktion.NRW, we will harness these technologies for use by companies throughout North Rhine-Westphalia.”



Franz Loogen,
CEO, e-mobil BW GmbH

“By developing intelligent technical systems and components, the clusters it’s OWL and Electric Mobility South-West are helping to shape future mobility solutions in a significant way. Both Leading-Edge Clusters are supporting the federal government’s High-Tech Strategy by creating the ideal climate for specific developing specific innovations.”



Sevda Kayhan Yilmaz,
Board member, Turkish Machinery Promotion Group

“The Turkish Machinery Promotion Group represents 8,000 machinery manufacturers. Our partnership with the German Leading-Edge Cluster it’s OWL will provide us with access to top-level research and strengthen our international supplier network.”



Prof. Dr. Otthein Herzog,
Artificial Intelligence, University of Bremen

“Germany is still internationally competitive, but intelligent technical systems for production and logistics must be researched and developed to ensure that the German industry remains in the lead in the future. The excellent interaction between research and industry in the Leading-Edge Cluster it’s OWL will make a crucial contribution to achieving the goal of Industry 4.0!”



Dr. Harri Kulmala,
CEO Finnish Metals and Engineering Competence Cluster

“The technological expertise of it’s OWL and FIMECC complements each other well. Our collaboration in building an Added-Value Manufacturing Knowledge and Innovation Community will get Europe ready for Industry 4.0 – and will of course also strengthen the companies in Germany and Finland. And exchange programmes for researchers and young scientists will create new impetus for science and teaching.”



Distinction

The European Cluster Excellence Initiative has awarded it’s OWL a Gold Label for its cluster management. This quality label is an independent, voluntary benchmark of excellent cluster management and recognised throughout Europe.

www.cluster-analysis.org

Cluster profile

Global market leader and cutting-edge research

In the fields of mechanical engineering, the electrical and electronics industry and automotive suppliers, OstWestfalenLippe is one of the strongest economic locations in Europe. The high degree of vitality of these industries in OstWestfalenLippe can be clearly demonstrated. The companies in the cluster employ around 86,000 people in the technology field of in-

telligent technical systems, achieving an annual turnover of about 20 billion EUR. The core of the cluster is composed of family-run businesses and a wide range of medium-sized firms.

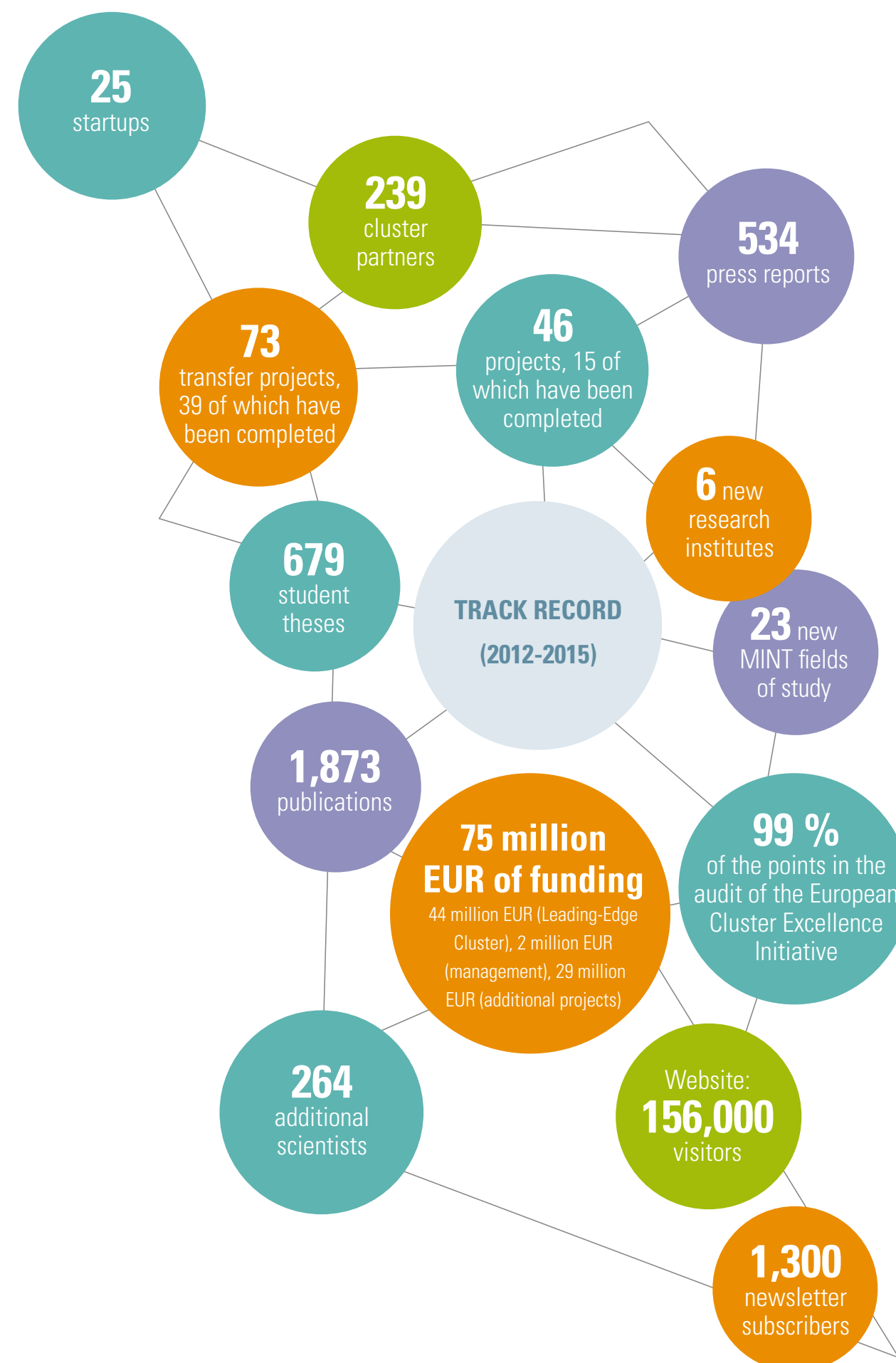
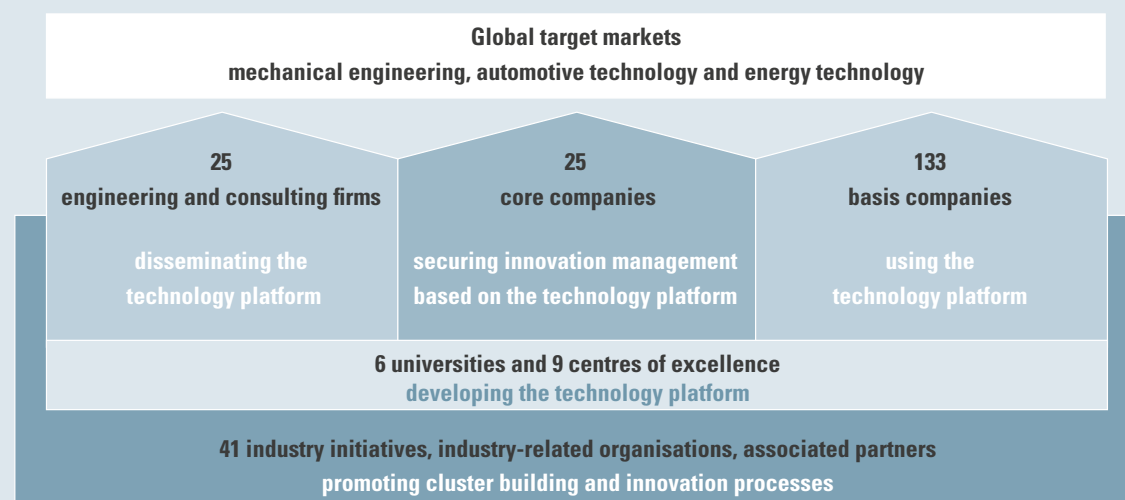
In terms of industry expertise, the companies complement themselves in the cluster excellently along

the innovation chain (Figure 1). The cluster has numerous market and technology world leaders, which include both strong brands and hidden champions. For electrical connection technology, for example, a world market share of about 75% is achieved through cluster companies.

The technological competence of the cluster results from the symbiosis of computer science and engineering. The focus is on the innovation leap from the current state of the art in the fields of mechatronics and automation technology to systems with inherent partial intelligence. The necessary technologies are incorporated into the technology platform of the cluster, which is essentially developed by the universities and research institutes as part of the cross-section projects. On this basis, the companies are developing intelligent technical systems for their specific markets along the entire innovation chain.

The overall strategic goal of the cluster is the top position in the field of intelligent technical systems in the global competition. Measurable strategic objectives by mid-2017 involve securing 80,000 jobs in the region, 10,000 new jobs, 50 start-ups, five new research institutes, 500 additional scientists and four new relevant study courses. The performance measurement is to be conducted annually, based on quantitative indicators. The results achieved as of 2015 have already been considerable. □

Cluster partners and their roles along the innovation chain



Cluster management

it's OWL at a glance

Founded in 2012, it's OWL e.V. now has 148 members (as of February 2016). Particularly due to the successful technology transfer to SME, the interest in membership in the association has increased significantly. In 2015, 39 companies joined the association.

The Board of Directors and therefore the supervisory body of the cluster management is the Cluster

Board. This was re-elected at the annual general meeting in early 2016 and currently includes 20 high-ranking personalities. The Chairman and his deputies were confirmed.

The Scientific Advisory Board, comprising four internationally renowned experts, advises the Cluster Board with regard to strategy and technology. For

example, the council initiated the „On the Road to Industry 4.0“ series of brochures.

The association is the sole shareholder of it's OWL Clustermanagement GmbH. The budget in 2015 was 872,000 EUR. The Board consists of three persons, each of whom oversees a particular functional area.

1 | Strategy, FuE: This area is the responsibility for the development of the cluster strategy and the overall technological concept. Dr.-Ing. Roman Dumitrescu is the authorised contact person of the cluster and is responsible for communication with the Federal Ministry of Education and Research, the project sponsors and the technical community.

2 | Operations: The focus of this range is on all essential operational management tasks as well as the communication with the cluster partners. This also includes networking at national and international levels. The division is lead by Günter Korder, the main point of contact at national and EU level.

3 | Marketing: This area promotes cluster identity-awareness (cluster image). Herbert Weber heads this area as well as the regional development corporation OstWestfalenLippe GmbH at the same time. Substantial synergies result from the joint coordination of the location marketing. □



The cluster management team promotes the development of intelligent technical systems.



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Beckhoff Automation GmbH & Co. KG
(Vice Chairman)



Roland Bent

Member of the Executive Board
Marketing and Development
Phoenix Contact GmbH & Co. KG



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Business Area Equipment
GEA Westfalia Separator
Group GmbH



Thomas Böck

Member of the Group Executive Board
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CLAAS KGaA mbH



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Board Member
Heinz Nixdorf Institute
(Chairman)



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President / General Partner
Senior Vice President Future and New
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Harting KGaA



Dr. Oliver Hermann

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District of Paderborn



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Bielefeld University



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Executive Director Technology
Miele & Cie. KG
(Vice Chairman)



Prof. Dr. Wilhelm Schäfer *

President
Paderborn University



Prof. Dr. Ingeborg Schramm-Wölk *

President
University of Applied Sciences Bielefeld



Herbert Sommer

Chairman of the Shareholders'
Meeting of
OstWestfalenLippe GmbH



Karl-Heinz Stiller

Chairman of the Supervisory Board
Wincor Nixdorf AG
(retired)



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Board Member OWL
Mechanical Engineering e.V.
Managing Director
MIT GmbH & Co. KG



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Council of Detmold



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Member of the Executive Board
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Artificial Intelligence,
University of Bremen



Prof. Dr. Edgar Körner

Honda Research Institute
Europe GmbH



Prof. Dr.-Ing. Dr. h.c. Manfred Nagl

Software Engineering
RWTH Aachen



Prof. Dr. Ir. Fred J.A.M. van Houten

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