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ADDITIONAL LINKS
What are the ingredients that contribute decisively to the success of a company or business sector? The key to success are »soft location factors« such as local networks, the ability to share experiences with other companies in the region, straightforward contact with fellow enterprises, personal dialogue on ideas and visions as well as short distances.

This is where the Bavarian cluster policy kicks in. With 17 established clusters in key technologies and traditional sectors we strengthen cooperation among companies, universities and research institutions in Bavaria. The clusters’ secret to success is simple and effective: work within the clusters is undertaken by cluster members, for cluster members, and for the common benefit of all stakeholders, under the supervision of a professional cluster management. In this way, all cooperating companies and research institutions benefit from the services and project initiatives offered by the clusters.

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Bavarian State Minister of Economic Affairs, Regional Development and Energy

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OBJECTIVES
STRUCTURE
BENEFITS
FACTS & FIGURES
The path to innovation and growth

As part of its cluster policy, the Bavarian State Government supports the establishment of state-wide platforms in high tech industries and traditional key sectors of the Bavarian economy. The central task of the cluster platforms is to interlink enterprises, i.e. to network companies and research institutes. The objectives of the cluster platforms are

- to strengthen the entire value chains from research to the end product in Bavaria,
- to promote competitiveness through cooperations,
- to convert research results into new products and services and
- to ultimately increase the overall innovation dynamics in Bavaria.

The clusters' recipe for success

The cluster policy exploits the context which in the meantime has been confirmed by numerous international studies: The competitiveness of companies is very significantly influenced by local factors – in spite of globalization. A dense industry network of well-known companies, renowned technology forges, specialized suppliers, excellent universities and colleges, focused research institutes, as well as highly qualified specialists, forms an agglomerated innovation potential, concentrated at one location. Clusters build on these unbeatable advantages of geographic proximity and promote them through their daily work: The close interlinking of industry and science in a sector or in a field of technology allows innovative ideas to fall on fertile soil, thrive in an optimal environment, and mature in a favorable climate.
Efficient structures

The term „cluster“ at this point in time is used quite loosely in common parlance. The Bavarian cluster policy is characterized by the following structures:

17 competence fields

Since 2006, cluster platforms have been set up and extended in significant competence fields. Currently there are 17 cluster platforms. The emphasis is on technology-oriented and industry-oriented innovation clusters. The thematic variety is an indication of the diversity of the Bavarian economy, and hence the diversity of the cluster initiative. Consequently, the cluster policy has established itself as an effective instrument for high tech industries, and also for important traditional sectors of the Bavarian economy.

Cluster offices

Each cluster platform has a professional cluster management team. Competence and commitment are wholly central to the success of the cluster work. Since 2006, the cluster platforms have established themselves as statewide hubs for information, communication, coordination, knowledge, transfer, and innovation in their respective industry or field of technology. In every cluster platform volunteer cluster spokespersons provide support in strategic alignment and control: Cluster spokespersons are outstanding personalities from industry and science who bring their know-how, personal network of relationships, and prestige to the cluster work. In dialog with the cluster management teams and cluster spokespersons, advisory boards and working groups identify topics that provide the enterprises with a significant added value and give each cluster a clear competence profile. Quite often new cooperations and specific research and development projects emerge from such topics. Thus technology transfer succeeds, and in this manner companies for which R&D previously had not been a factor are brought together with knowledge holders.

The professionalism of the Bavarian cluster offices is also manifested in the fact that all won the Bronze, Silver or Gold Label of the European Cluster Excellence Initiative, awarded by the European Union, for their cluster management achievements.

Active overarching networks

Cluster teams strengthen their respective network of enterprises and research institutes throughout Bavaria:

- The cluster policy places special emphasis on networking the Bavarian small and medium-size enterprises (SMEs) – unlike large companies, smaller companies often lack the possibilities of finding suitable cooperation partners, or even the possibilities of implementing innovations in the day-to-day business on their own.
- The cluster teams bring companies of all sizes together along the respective value chain. The more lead companies, competent suppliers, and well-versed service providers that participate, the better a cluster functions. Another advantage is the fact that, thanks to the neutral cluster teams, companies come together, who otherwise are in direct competition with each other.
- Bavarian universities and research institutes are also an existential component of the clusters: They come into the clusters, and with their knowledge, their research laboratories, as well the know-how of their scientists, researchers and application-oriented problem solvers, they significantly enhance the capabilities of the clusters.
- The cluster teams expressly integrate all relevant enterprises and research institutes throughout all Bavaria. The cluster policy extends to all regions of Bavaria, since the entrepreneurial, as well as the scientific excellence in Bavaria is found in the urban centers and also in the rural areas.
Overview of the 17 cluster platforms of the Cluster Initiative Bavaria, organized in the five central megatrends.

- I&C [in the BAVARIAN DIGITALIZATION CENTER]
- POWER ELECTRONICS
- SENSOR TECHNOLOGY
- MECHATRONICS & AUTOMATION

- ENERGY TECHNOLOGY
- ENVIRONMENTAL TECHNOLOGY
- MEDICAL TECHNOLOGY

- BIO-TECHNOLOGY
- FOOD

- CHEMISTRY
- FORESTRY AND WOOD
- NANO-TECHNOLOGY

- FOOD
- NEW MATERIALS
- MAI CARBON

- AEROSPACE
- AUTOMOTIVE
- RAIL TECHNOLOGY

- DIGITALIZATION
- ENERGY
- HEALTH
- MATERIALS
- MOBILITY
Activities

Cluster teams are active on multiple levels with their networking efforts:

- They organize the dialog between cluster players, develop key topics, and present a wide variety of industry-specific events, such as conferences, workshops, meetings or matching activities. Thus many new business contacts come about and the right partners find each other.

- Cluster teams support their members in word and deed, they provide information and reports on market trends, research findings, technologies, and funding opportunities.

- They coordinate the acquisition of national and international financial assistance.

- They initiate and accompany national and international research and development projects.

- They facilitate contacts to national and international networks, organize joint trade fair stands, and establish access to foreign markets.

More innovation, more growth:
Clusters create added value for companies

With these multilayer cluster team activities, cluster players experience concrete support and a genuine added value. Targeted information and effective networking with other companies in the same value chain, initiation and intensification of contacts to other enterprise representatives, as well as sustainable integration of university and non-university research competence, creates new impetus, additional partnerships, new cooperations, and innovation projects, which otherwise would not have been initiated because know-how, resources or capacities are lacking. Thus innovations occur, with which the companies develop new business areas, expand into new markets, and create new jobs. Focused networking contributes to a sustainable increase in competitiveness and the innovative strength of the individual participating companies. Companies in clusters are more innovative, more dynamic, and they grow faster.

Thus the effective cluster policy also promotes all of Bavaria as an industrial location!
The cluster teams are working very successfully and have developed a widespread impact in the Bavarian economy. A look at the key indicators makes clear just how important and right the cluster policy is for Bavaria (status: December 2017):

- With more than 11,000 individual events – ranging from major conferences to thematically highly specialized working groups for a small expert audience – the clusters have reached more than 606,000 participants.

- Through countless individual discussions with cluster players, the clusters have been able to initiate more than 1,600 projects with 10,700 project participants.

- In this process the clusters have acquired more than €253 million of federal financial assistance and more than €41 million of EU funding for their member companies.

Moreover, the clusters also perform general industry-promoting tasks for the Bavarian State Government, e.g. in the area of foreign trade and delegation trips.

Bavaria – successful in the Leading-Edge Cluster Competition sponsored by the Federal Ministry of Education and Research

The capacity of the Bavarian clusters is also manifested in their successful showing in the competitions sponsored by the Federal Ministry of Education and Research.

- In the Ministry’s competition between 2015 and 2017, which was devoted to »Internationalization of Leading-Edge Clusters, Future Projects and Comparable Networks«, five clusters were able to successfully outperform their competitors: Cluster BioM (biotechnology), Power Electronics, Mechatronics & Automation, Medical Valley (medical technology), as well as the Leading-Edge Cluster MAI Carbon. With this competition the Federal Ministry of Education and Research promotes international networking through development of internationalization concepts and their implementation in projects with worldwide partners, each with funding of up to €4 million over five years. The winners extend existing contacts to international cooperations and desire to realize innovation leaps in joint research projects.

- The Leading-Edge Cluster Competition was one of the largest relevant subsidy programs worldwide. Between 2007 and 2012 in a total of three funding rounds, 15 national clusters were each subsidized with €40 million for five years. The Federal Ministry of Education and Research subsidized the top performing clusters in which companies and scientific institutes of a region work together to convert key technologies into an internationally visible market position. At the time, as winners of this competition, three Bavarian clusters were able to obtain total funding in the amount of €120 million for innovation and topics that are relevant for the future in Bavaria: Munich Biotech Cluster m4 (therapeutics and diagnostic devices for personal medicine), Medical Valley European Metropolitan region Nuremberg (Center of Excellence for Medical Technology), and MAI Carbon (carbon fiber reinforced plastics in the tri-city area Munich, Augsburg, Ingolstadt).
Performance spectrum of the clusters in the Cluster Initiative Bavaria

**OVERVIEW**

- **NETWORKING EVENTS**
  A wide variety of formats for specific topics

- **SUPPORTING SERVICES**
  Specialized and custom-tailored

- **CONTINUING EDUCATION AND TRAINING COURSES**
  Informative, highly topical, and practice-oriented

- **RESEARCH AND DEVELOPMENT PROJECTS**
  for product and process innovations

- **ACCESS TO FUNDING**
  EU, Germany, and Bavaria

- **ACCESS TO FOREIGN MARKETS**
  Delegation trips and joint trade fair stands
CLUSTER PLATFORMS
CLUSTER AEROSPACE

Excellence in aerospace and space applications

Bavaria is one of the most prestigious aerospace locations in Europe. Approximately 38,000 employees generate a turnover of more than €10 billion a year. Bavaria stands for total system capacity and covers the complete value chain in the civil as well as military aerospace segments – from research and development to production and extending to service and support.

The enterprise landscape ranges from small innovative suppliers to multinational groups; with 18 Bavarian research institutes and universities, the research infrastructure is optimally formed.

Objectives and focus areas

Aerospace applications are important growth and innovation engines for the Bavarian economy. bavAIRia e.V. headquartered in Oberpfaffenhofen has extended its cluster management with over 280 members since it was founded in 2006. The predominant objective is to increase international competitiveness of the industry in Bavaria. Prioritized action fields are technology transfer, marketing/international visibility, supply chain management, in the training and further education of specialists, as well as internationalization. Various event formats are offered, such as working groups, seminars, business breakfasts devoted to current topics, for example, digitalization, 3D print or project management, and export control.

Current key topics for the aviation forums are:
- Unmanned Aircraft Systems (UAS)
- Supply chain management
- Initiatives for innovation and cooperation

Key topics for the space flight forums are:
- Copernicus (Global Monitoring for Environment and Security)
- SatNav applications (e.g. in the areas of tourism, traffic, air pollution control, environment and health, agriculture and forestry)
- Legal issues and financing issues

Moreover, international projects are executed with partners from Bavarian industry and research institutes. The cluster has an extensive network of contacts to companies, research institutes, ministries, and government agencies in Germany and abroad which is used to support its internationalization.
EXAMPLE 1

Supply Chain Excellence Initiative

The structural change in the aviation supplier industry is driven by the aircraft manufacturers. This brings opportunities but also risks for the supplier landscape, which is primarily characterized by small and medium-sized enterprises. Direct OEM/Tier1 orders will only be awarded if specific criteria are fulfilled.

To support these companies, bavAIRia together with all German partner clusters, established the »Supply Chain Excellence« Initiative and extended it to what has now become a nationwide initiative with all industry associations. The objective of the initiative is to further increase global competitiveness in Bavaria and in Germany. In this regard, Supply Chain Excellence means active development of stable and agile supply chains along all value creation stages.

EXAMPLE 2

UAS

The field of »Unmanned Aircraft Systems (UAS)« is one of the most dynamic areas of the aviation industry in terms of new, future-oriented developments and technological progress. The Bavarian Aviation Strategy 2030 further substantiates this, since UAS has now been listed as one of five key technologies 2030. bavAIRia is actively engaged in UAS, a topic with future relevance, and has established the »UAS Forum« with a constantly growing number of participants. Essential objectives include promotion of the acceptance of UAS and minimization of existing development impediments: Thus, for example, bavAIRia has initiated and shaped a dialog for defining a clear, nationwide body of rules for the use of UAS. The first German testing center was opened in 2015.

EXAMPLE 3

myEOrganics – satellite technology for certification of sustainable agriculture

In the EU-EMMIA project, myEOrganics, a demonstrator was successfully developed that supports certification of sustainable agriculture. Information from high-resolution satellite images, GNSS, and farm management systems combined with mobile end devices, to provide the certifier a service that offers an orientation aid for the actual location, a decision-making aid in selecting the fields for the audit, as well as documentation possibilities for audit farm visits. bavAIRia coordinates the activity; Bavarian partners were Vista GmbH and PC-Agrar. As certifier, ECOCERT defined and evaluated the app. Usability in other regions was likewise investigated.
The Automotive Cluster intensifies the collaboration of companies and research institutes. The objectives are to further enhance the innovative performance of the Bavarian automotive industry.

The service offering includes scouting trends & technologies, finding cooperation partners, organizing technology platforms, as well as cluster meetings at the facilities of companies and research institutes, moderation of working groups, as well as initiation and management of cooperative projects. Furthermore, the cluster as driving force gets involved in activities of Bayern Innovativ GmbH that extend across industries and across technologies.

The cluster takes up topics with relevance for the future; deals intensively with these topics on project level, and supports its players with access to funding programs. In this regard, key regions, national and international, are brought together on all levels of the value chain. The networking of small and medium-sized enterprises (SMEs), with vehicle manufacturers and system suppliers, as well as scientific institutions, is one of the essential aspects.

The cluster is comprised of more than 730 companies and institutes from the automotive sector and from all competence fields relevant for the automobile.

Objectives

- To strengthen regional value creation
- Identification of future technologies
- In-depth study of relevant topic areas
- Intensification of the networking of cluster players
- Promotion of open innovation in small and medium-sized businesses
- Strengthening the activities in the topic area of electromobility

Platforms

In addition to networking, platforms are used to identify important topics and to «consolidate» technological issues.

The cluster is a first-hand source for information concerning trends, technologies, and markets. In addition, the cluster organizes workshops and working groups that have a trust-building effect and establish the basis for future cooperation. In this regard cluster management acts as a neutral moderator.
The Conference on Future Automotive Technology (CoFAT) provides comprehensive answers to the question of the future of electromobility. Further reduction of CO₂ limits, containment of the fine dust particles in cities, the prospect of a battery price of €100/kWh, and electric vehicle ranges of more than 300 km will accelerate electromobility. CoFAT accompanies this change and, among other things, offers SMEs the possibility of obtaining information on trends and technologies and making valuable contacts.

More than 400 participants, as well as the strong support of science (Technical University of Munich (TUM)) and industry (including BMW, AUDI, and IAV), make this conference a central cluster platform for all aspects of the electric vehicle.

The company HS Systemtechnik – cluster partner from the beginning – with 40 employees is active in the area of sheet metal, shaping and bending technology. In addition to the new business segment, motion control elements, the company focuses on shielded housings for the automotive, aviation, and electronic industries.

HS Systemtechnik has years of experience in the focus area of electromobility and is working on new battery housings and connection technology for high voltage cables. In this regard, the owner, Christian Melzer, relies on networking in the cluster: »On the cluster platform we regularly obtain information on the state of the technologies and get valuable contacts to automotive manufacturers and suppliers, for example most recently to Volkswagen and to Draxlmaier. This offering is a great benefit to us as a medium-sized company.«

On a Supplier Innovation Day companies have the opportunity to exclusively present their technologies to engineers and purchasers of the hosting OEM or TIER1. In 2016 Renault/Nissan invited cluster partner companies to Paris for the second time.

At least, development itself is also based upon further development of tools and models. This is precisely where companies of the cluster offer the most advantages. Another objective of a Supplier Innovation Day is for suppliers to make the right contacts. Renault/Nissan specified the topics for which the companies could present new approaches: Connected mobility, autonomous driving, smart materials, and electromobility. A total of 37 companies presented their technologies and services there.
The German rail industry generates annual revenues of approx. €10 billion and thus holds a world market share of approx. 15 percent. Some of the largest and most significant German rail transport suppliers are domiciled in Bavaria. The industry structure in Bavaria is characterized by global players, such as Siemens AG Division Mobility, Knorr-Bremse SFS GmbH, and a number of innovation-focused, highly specialized SMEs. The largest European rail enterprise, Deutsche Bahn AG, has established its central development center, DB Systemtechnik GmbH, in Bavaria.

Objectives, tasks, and focus areas of the cluster

The Cluster bundles the competencies of strong regional railway technology partners along the value chain, and thus strengthens the global competitive position of these railway technology partners. Innovative projects are initiated in four steering committees. From within the steering committees a number of project groups have been formed for specific project development.

The topic focus areas of the four steering committees are:
- Infrastructure and energy
- Operation and maintenance
- Train control and protection
- Vehicles

For further exchange of current developments, multiregional events, such as the »Forum Railway Technology Bavaria«, are organized by the Cluster Railway Technology.

The Cluster Railway Technology is managed by CNA e.V. In addition to the Cluster Railway Technology, CNA also coordinates Bavarian logistics initiatives on behalf of the Bavarian State Ministry of Housing, Building and Transport. CNA’s objectives are to strengthen and further develop the competitive position of the transport and logistics sector along the value chain.
The successful innovation, the »Hybrid shunting locomotive« from the Cluster Railway Technology came about in collaboration between ALSTOM Deutschland AG and Deutsche Bahn AG. Through use of hybrid propulsion technology, it was possible to develop a new, environmentally-friendly and energy-efficient generation of shunting locomotives that consume 50% less fuel, have 70% fewer emissions, and offer annual cost savings ranging from €40,000 to €60,000 per locomotive. An eight-year practical trial has been underway since 2016 in the Model Region Franconia, at the locations Würzburg and Nuremberg. This is where five H3 shunting locomotives with hybrid technology are in service. The goal is series production of the technology. The Model Region Franconia for innovative rail propulsion systems was founded in 2012 with the involvement of the cluster.

Due to the great success for the joint-exhibitors and the network in past years, since 2008 the Cluster Railway Technology joint trade fair stand at Innotrans, the world’s largest trade fair for the promotion of rail, is again a fixed component of the annual planning. The members are enthusiastic about this opportunity of presentation. Large companies demonstrate their participation in the network, and SMEs can have their own trade fair presence in an attractive environment at a reasonable cost. Innotrans, the leading international trade fair for rail technology, additionally offers an outstanding opportunity for driving name recognition of the Cluster Railway Technology beyond the borders of Bavaria.

For collaboration on the European level, since 2010, the Cluster Railway Technology has come together with eleven European rail technology innovation clusters with the objectives of exploiting synergy effects, learning from best practice examples, and further extending the network. Overall, the competitive ability of the regions should be increased and collaboration on the European level should be supported. Participants in the ERCI network come from nine European countries: Belgium, Germany, England, France, Italy, Austria, Poland, Sweden, and Spain. Like the Cluster Railway Technology, all partner networks are innovation-driven and pursue the goal of networking industry representatives from industry and science, and thus initiate innovative projects.
With more than 210 companies active in the area of biotechnology, and nearly 150 additional companies from the pharmaceutical sector, as well as clinical research and development, Bavaria takes a leading position in medical and biopharmaceutical biotechnology in Germany.

The Biotechnology Cluster bundles the strengths of the locations Munich/Martinsried, Regensburg, and Northern Bavaria (Würzburg, Erlangen, Bayreuth), and actively integrates institutes from other Bavarian regions in the Bavaria-wide network.

The focus of the cluster’s work is the identification and incubation of research projects that can be commercialized. Active technology and product scouting is conducted by local partners at academic institutions. BioM offers advice and a comprehensive support program for company founders. A special Bavaria-wide funding program can be offered for project validation of promising ideas.

Over the past 20 years a knowledge-based, highly innovative industry has developed. Its international importance is expressed through a global network of cooperation partners. In the extremely protracted, high-risk, and expensive product development cycles for new medications, Bavaria has been able to establish itself as a location for early identification and validation of suitable drug candidates. In addition to a number of successful SMEs with specific products or technology offerings, one of Europe’s largest research and production facilities for biopharmaceuticals (Roche Diagnostics) is located south of Munich in Penzberg. The complete value chain, from research to pre-clinical and clinical development, and extending to production, is a particular characteristic of this industry, which is firmly rooted in Bavaria. In addition, pharmaceutical biotechnology is linked with industrial biotechnology in many ways, for example, through continuously updated production procedures and close cooperation with technical universities.

A second essential topic of the network is the international presentation of technologies and know-how of Bavarian companies and scientific institutions at various fairs in other European countries, the U.S., Asia, Australia and others.
The Munich Biotech Cluster as a national Leading-Edge Cluster »m4 – personalized medicine and targeted therapies« is the name of the cooperation program that the Federal Ministry of Education and Research funded with €40 million from 2010 to 2015. With additional funds, – including €40 million from industry – a total of approx. €100 million was invested in the expansion of the site and strategic further development to become an internationally recognized »Competence Center for Personalized Medicine«. More than 60 cooperation projects involving biotechnology SMEs, most of them together with academic research groups, have resulted in improving innovative active ingredients and optimizing the execution of clinical trials. Thus one of the »Lighthouse Projects«, a clinical trial of MorphoSys (see example 2) conducted jointly with the University Clinic of the Technical University of Munich could be executed with great success.

MorphoSys AG – the antibody specialists MorphoSys, a biotechnology company founded in the early 1990s is domiciled in Planegg near Munich; today it is one of the world’s leading specialists in the area of human antibodies.

Thanks to the technology for producing antibodies developed in-house, the major entrepreneurial success is based for the most part on the area of »Partnered Discovery«, where the top-20 pharmaceutical groups use the expertise of MorphoSys in the development of new medications. In the second business area, which the company is increasingly extending, MorphoSys is involved in first researching therapeutic antibodies on its own, which are then further developed together with pharmaceutical partners. Currently more than 100(!) new antibody medications based on the MorphoSys technology are being researched and developed.

IBB Netzwerk GmbH – industrial biotechnology in Bavaria IBB Netzwerk GmbH is a network and service organization in the area of industrial biotechnology and sustainable bio-economy. The IBB network bundles the competencies of more than 100 members from large-scale industry, SMEs, universities, non-university research institutes, as well as industry associations. The members manufacture bio-polymers, special chemicals/basic chemicals, dyes, lubricants/adhesives, cleaning agents, as well as bio-fuels. Among other things, residual substances and excess CO₂ are also used as raw materials.

Since the »founding« of the network and of the GmbH in 2008, IBB has been able to successfully implement systematic promotion of industrial biotechnology in Bavaria.
CHEMISTRY CLUSTER

Bavaria's engine for chemical innovation

The Chemistry Cluster Bavaria (CCB) is an established network of companies and research institutes of the Bavarian chemical industry. Covering global players, a strong SME base, and modern research institutes, the cluster members cover the entire performance spectrum of chemical suppliers. Since its foundation in 2006, the CCB supports its members in all aspects of chemical innovations ranging from the support of R&D activities to the identification of new markets.

Tasks and objectives

As part of the Bavarian State Government’s Cluster Initiative, the CCB acts as an engine for innovation. It directly connects the players of the German chemical industry and thus strengthens Germany’s position as a leading industrial high-tech location. The CCB promotes product and process innovations for new, cross-industry markets with a focus on value creation for its members. The cluster supports its members in the acquisition of funding, coordination of R&D initiatives and collaborations, and determination of new sales markets. By supporting the close collaboration between large and small companies, universities, and research institutes synergies, joint efforts and perspectives are generated which will be able to tackle arising global challenges.

Value Creation Partnership – Chemical Industry

Within the initiative »Value Creation Partnership – Chemical Industry« sales and innovation requirements from various industries, such as aerospace, ship construction, oil and gas production or the consumer goods sector, are determined and coordinated with cluster members throughout Europe. Each year the Value Creation Partnership – Chemical Industry produces a variety of new industrial applications; thus sales of cluster members are verifiably and measurably increased.

Cooperation and networks

The CCB lives from the high level of activity of its members and close cooperation with regional and international networks and partners. Regular events, such as the yearly »Network Day« or the »The Chemical Industry meets ...« workshop series, in which members gain deep insight into the development processes of key industrial customers. By advising the members regarding their own technology inquiries, new industrial partnerships are initiated and novel markets are accessed.
Under the motto »The Chemical Industry Meets ...« the CCB has fostered the initiation of collaboration of cluster members with companies around the world. In 2015 it was possible to execute the successful workshop concept in Chile for the first time. Through mediation of the cluster, six member companies were able to discuss specific projects with top management representatives of the Chilean National Petroleum Company ENAP. In Santiago de Chile, member companies were able to get an idea of the extensive production facilities on-site, introduce innovative products and technology solutions from their repertoire, and establish new contacts, joint innovation projects and cooperations.

The CCB established an innovative bridge between the chemical and the shipping industry. Within the Value Creation Partnership – Chemical Industry, players from both technological areas evaluated confidentially technological product requirements and subsequently, through feasibility studies, adapted existing products to the needs of the users. Participating cluster members included ECKART GmbH, a member of the Altana Group. The company is a leading expert in the production of effect pigments for optical and functional applications in paints and printing ink market and offers innovative products for other functional applications. With support of the cluster, the profound know-how and expertise of the company could be applied for a specific product adaptation for the shipping industry, whose market potential could be exploited by the ECKART GmbH for the first time.

The joint »Contact Center for Research and Industrial Cooperations – ConTec« of the CCB and the University of Bayreuth organized a »Thinktank Microplastics« at the University of Bayreuth aiming to establish a stakeholder dialogue regarding current knowledge-gaps and potential activities concerning microplastic contaminations in the environment. Participants ranged from industrial representatives over material and environmental scientists to interest organization and associations of the chemical industry. Currently, several joint projects are in preparation. ConTec intensively supports the project partners in the acquisition of third-party funding and proposal preparation.
With formation and extension of cluster structures, collaboration of companies with each other and with science should be intensified and thus industry competence should be further developed. The central approach of the Cluster Energy Technology is further intensification of the existing network structure throughout Bavaria and it extends to links with the national and international environment.

In this regard the essential aspect is to reach the appropriate companies and institutes and there generate awareness and interest for networks and clusters with employees on all management levels.

The cluster has a large offering of professional support: Through an extensive knowledge base on the Internet, fast access to the latest studies, and at presentations given by experts from science and industry, companies obtain in-depth insight into current and future trends, technologies, and markets in the area of energy technology.

There are many ways that participating companies can benefit from their involvement with the cluster. Whether through papers presented to a qualified audience, or participation in joint trade fair stands or the accompanying technical exhibitions at events, and via the Internet portal of the Cluster Energy Technology – this is where companies can demonstrate their entrepreneurial competence and technical competence.

With the partner package, the cluster offers companies and scientific institutions a special service offering for all aspects of innovation in the field of energy technology.

Focus areas

Energy efficiency
- Buildings
- Cogeneration
- Industrial processes

Energy storage
- Electrochemical energy storage
- Chemical energy storage
- Functional storage
- Heat accumulators

Overall energy consideration
- Energy system analysis
- Supply safety
- System services
- Sector coupling
The project "Energy System Analysis Bavaria" investigates various aspects of the energy transition in Bavaria. In the second project phase (2014 to 2016) the emphasis was on modeling the entire German electrical energy supply system; three models, Optimization, Simulation, Electrical Grid, were each developed at a chair (organization) of the Friedrich Alexander University Erlangen-Nuremberg (FAU). In the concluding report the boundary conditions considered, the models, as well as the results of various scenario calculations up to 2023 without nuclear power generation, will be described.

www.bayern-innovativ.de/cluster-energietechnik/systemanalyse_bayern

In December 2014 representatives of the Federal Government and industry associations signed the agreement concerning introduction of energy-efficient networks. The Bavarian Energy Efficiency Network Initiative (BEEN-i) supports development of energy efficient networks in Bavaria. A Network Coordination Point Bavaria (NCCP) organized for the cluster takes over the coordination of the initiative; it is supported by a standing working group consisting of representatives of the participating organizations (industry associations, chambers, and the Bavarian Ministry of Economic Affairs and Media, Energy and Technology). The objective of the Network Coordination Point Bavaria is a sustainable marketplace for energy efficient networks in Bavaria. By August 2016, 17 such networks had already been established. Thus Bavaria leads in the German comparison.

http://been-i.de/

The portal provides information concerning essential components of the energy transition in brief articles. Well-known authors from the surroundings of the cluster present the current state of technology and its perspectives for the future from the vantage point of industry and science. The focus is on the "energy transition", in particular central and distributed power generation including cogeneration, conventional and renewable, storage, distribution and transport of electrical power, as well as important topic areas in conjunction with the "heat transition". Reporting is also offered concerning gas networks, R&D, as well as demonstration of proven technologies and new technologies that have not yet established themselves on the market.

www.bayern-innovativ.de/cluster-energietechnik/energieumstieg
The agriculture and food sector in Bavaria, with sales of approximately €100 billion and over 700,000 jobs, is one of the most labor-intensive industries. Traditions, combined with ultramodern manufacturing procedures and innovative, effective systems for quality assurance and traceability, guarantee a leading position for the Bavarian food industry in Europe.

With the objective of increasing the competitive ability and innovation capacity of Bavaria as a relevant location for the food industry, the Cluster Food works on central social content, such as quality of food products, sustainability, and enjoyment. The cluster is involved in topics with relevance for the future, such as digitalization in production and retail, as well as with regional and traditional food products from Bavaria.

Small and medium-sized companies, in particular, often reach their limits or are subject to personnel bottlenecks when the task at hand is finding innovative, problem-solving approaches for their specific needs. The Cluster Food supports these companies with new project ideas and innovative measures, project management, professional execution, and marketing.

As the network’s central platform the cluster brings the players in the nutrition and food sector together: agriculture, the skilled food trades, the producing food business, science and research, retail, service providers, and consumers. The Cluster Food also has a strong network on the international level that is committed to the concerns and requirements of companies in the agri-food industry. Presence at international trade fairs, trips abroad, or contact mediation to enterprises in other countries – the Cluster Food finds the right contact person. Likewise, the cluster forwards inquiries from abroad to competent partners in Bavaria.
Qualification

With its qualification offerings that are unique in Germany the cluster closes gaps in the training and continuing education available in the food industry. Those who are looking for technical knowledge concerning the complex subject area of cheese, can hardly avoid continuing education courses for the cheese sommelier qualification. The content of the 15-day continuing education course ranges from cheese production, typology, and cheese curing to sensor systems. The seasoning sommelier course provides qualifications for professions, such as baker, butcher, or chef, for whom seasonings are important, but for whom there are no specialized training courses. The qualification series is in demand, and not only in the trades. Product developers from the food production sector also appreciate the expert knowledge that is imparted. In the future the cluster will extend the qualification area and bundle the varied offerings under one roof.

Pre-harvest monitoring

Among other things, cluster activities are designed to build up and strengthen regional value chains. Quality assurance and traceability of Bavarian food products are significant aspects in this regard.

Pre-harvest monitoring for wheat is a successful example of the cluster work. Investigations are conducted before harvest to determine whether a fungus has infested ears in the wheat’s flowering stage, which could impair quality. Mills and retail associations are informed of the results, so that only the best wheat goes into the production of food products. Since crop protection at the right time can reduce the risk, it is important to observe factors such as weather and growth stage. Currently work is underway to enable even more precise forecasts through satellite-supported information.

Innovation series »Ennovation«

The cluster’s innovation series strengthens the innovative capacity of the Bavarian food industry. The primary target group is made up of small and medium-sized companies. The knowledge and know-how of the universities, colleges, and research institutes are organized in a practical manner appropriate for the target groups, and thus knowledge transfer into production and manufacturing is enabled. Ennovation takes up current, industry-overarching, as well as industry-specific topics. For example, at the Meat Forum, the kickoff event of the Ennovation Series, experts from a variety of research institutes imparted new possibilities of salt-reduced and fat-reduced sausage production, as well as technical knowledge concerning sensors and food pairing, to participants.
With annual sales of €37 billion, a labor force of 196,000, and 22,500 businesses, the forestry, wood and paper sector is a key industry in Bavaria. In recent years the cluster was able to achieve a significant increase in revenue, particularly in the areas »wood in the construction industry«, furniture manufacturing, and the sawmill industry. In national and international comparisons, strengths include the extensive timber reserves and timber growth, the efficient businesses, the outstanding level of training of the workforce, as well as acknowledged teaching, research, and certification institutions.

Due to the number and variety of industry players networking is of particular importance. Among other things, the value chain includes the forestry industry, the wood processing industry, the predominantly internationally active pulp and paper industry, the wood craftsmanship sector, as well as the wood energy sector.

New impetus through product and process innovations, as well as a cross-sector image initiative, should contribute to sustainably strengthening a lead industry of the rural area. The significance of, and appreciation for the renewable raw material, wood, particularly in the construction industry, will continue to increase in coming years, in light of the energy transition and climate protection efforts.

Current work focus areas

- Initiation of new networks, as well as extension of existing networks between science and industry along the forestry-wood-paper value chain
- Establishment of systematic innovation management for the industry
- Technology transfer and cooperation in the research and development area, e.g. Hardwood Innovation Alliance
- Support and professionalization of Bavarian regional initiatives
- Management of expert panels, e.g. on forward-looking topic »building with wood«
- Coordination of the image initiative »proHolz Bayern (proWood Bavaria)«, in which all sub-industries of the forestry, wood, and paper sector work together
- Support of the forestry multipliers in communication under the »mein-Wald (My Forest)« brand
- Public relations/trade fair participation/presentations/contact talks
The »Research Compass Timber Construction« offers a platform for businesses and users that provides information, networking, and inspiration. The objective is the increased collaboration of research and practice. For the first time, the cluster service maps the research landscape for the German-speaking countries. In addition, the user will find an overview of projects that have been completed and projects that are still running. The service is aimed at all timber construction players, such as businesses, institutes, research facilities, architects, engineers, specialized planners, and project developers. The project was funded by the Federal Ministry for Economic Affairs and Energy in the program »go-cluster – excellently networked!« and it was included in the brochure »Selected Cluster Successes«. This service will be regularly updated and extended.

EXAMPLE 1

Hardwood Innovation Alliance

The »Hardwood Innovation Alliance« brings together companies throughout Germany along the forestry and wood value chain, their suppliers, as well as partners from science and research. The objectives of the network are, through joint and coordinated activities

- to analyze the existing obstacles in the substance recovery of domestic hardwoods,
- to identify optimization potential,
- to develop new products and technologies, and
- to introduce them on the market.

Currently the focus is on beech glued laminate timber with several R&D projects. Measures for marketing hardwood construction products round out the field of activity. The network was funded as part of the Central Innovation Program SME through the Federal Ministry for Economic Affairs and Energy.

EXAMPLE 2

Research Compass

EXAMPLE 3

Cluster study

First place in growth and employment: Nowhere else in Germany is the forestry and wood industry booming like it is in Bavaria. This is the central finding of the cluster study Forestry, Wood, and Paper 2015. In the study financed by the Bavarian Ministry of Agriculture and Forestry, important key indicators concerning the economic situation and development of the industry were summarized. Significant megatopics, such as climate and demographic change, energy transition, and resource efficiency were discussed. It was shown that the economically successful cluster can make a significant contribution to climate protection and development of the rural area. On the basis of the industry dialog the »Action Program Timber Construction« and the »Agenda Forest and Wood 2030« were formulated as a target and action concept.

www.clusterstudie-bayern.de
Throughout Europe and internationally the Free State of Bavaria leads the way in the field of information and communication technology (I&C) with more than 300,000 employees in more than 20,000 companies. As basic technologies, software and microelectronics determine the innovation capacity in virtually all application areas. More than half of industrial production, most modern services, and 80% of exports depend on the use of I&C.

Special opportunities for growth are opening up in the future for I&C companies, particularly in the convergence areas to and between other industry and economy sectors, as well as in the ever-increasing internationalization of this area. The I&C cluster, BICCnet, particularly focuses on these industries, it actively and intensively networks I&C companies, universities, colleges, as well as non-university research institutes, and thus promotes the transfer of knowledge.

To implement such networking in a manner that is as effective and optimal as possible, the BICCnet has been integrated as a strategic unit in the Bavarian Digitalization Center since 2016. This ensures a fruitful and beneficial exchange between cluster and the Bavarian Digitalization Center, above all in the areas of internationalization, cooperation support, and knowledge transfer.

In this context the Bavarian Digitalization Center offers six platforms for the topics digital production, network mobility, cybersecurity, digital health/medicine, digitalization in the energy sector and in the education/science/culture areas that work closely together with the cluster.

Focus areas

- Supporting I&C companies with positioning in the international context
- Knowledge transfer from research to industry to strengthen the innovation capacity of the companies
- Cooperation support
- Trend scouting
**SmartCityTech**

The city of the future needs intelligence through highly networked embedded systems: Such systems gather information concerning the environment and, for example, optimally regulate traffic flows and energy flows. Four regions in Europe lead the way for embedded systems; these regions are networked in a EU project and offer innovative solutions for smart cities. BICCnet is part of this for Bavaria. Results:

- Selection of interesting markets for Bavarian companies
- Alignment of Smart City innovation workshops with international participants. Thus, for example, Garching introduced a representative from Buenos Aires; the political leadership there is looking for (technical) solutions for these challenges.
- Establishment of the »Interest Group Bavaria Smart City« with regular network events

[www.smartcitytech.eu](http://www.smartcitytech.eu)  
[www.clines-project.eu](http://www.clines-project.eu)

**SMIC**

As part of the I&C project Smart Microgrid Information and Control (SMIC) in Haunstetten the network loads of the Augsburg municipal utilities (Stadtwerke) were systematically analyzed in order to regulate them more efficiently, and thus further extend the high level of supply security and grid stability. The objectives are to better forecast energy flows and to integrate more renewable energies and thus save the maximum amount CO₂. To apply the solutions to other suppliers, the project utilizes existing IT and software systems and does not set up any parallel structures.

A total of six industrial and research partners are working together. BICCnet has been centrally integrated as a supporting partner, starting from the project idea to establishment of the consortium, assisting with the project proposal, and project accompaniment.

[www.smartgrid-smic.de](http://www.smartgrid-smic.de)

**Fit for smart grid**

The energy grid of the future will mediate intelligently between the producer side and consumer side – on the producer side, particularly, injection will fluctuate through the extension of renewable energies.

In the cooperation network, Fit for Smart Grid, established as part of the Central Innovation Program SME, 11 companies and one Fraunhofer Institute came together to accompany grid operators, energy producers, and municipalities in the setup/extension of an intelligent network along the value creation process for a smart microgrid. BICCnet was part of the consortium as network manager. Results:

- Integrated energy solutions for buildings and heating networks
- On-demand provision of energy in the microgrid through virtual power plants and energy storage

[www.fit-for-smart-grid.de](http://www.fit-for-smart-grid.de)
The role of power electronics is the conversion of one form of electrical energy into another form needed for a specific application as efficiently as possible, as well as the control of the power flow. Thus it is a key technology for growth industries in the areas of mechanical engineering, electrical engineering, and the automotive sector. Approximately 545 companies and institutes with roughly 110,000 jobs in Bavaria are directly involved in research and development, production, sales, and services in the field of power electronics.

The Cluster Power Electronics within the ECPE e.V. organizes specialist events, initiates and accompanies cooperation and research projects, sponsors joint trade fair participation, and executes qualification measures, as well as recruitment measures for secondary education students, teachers, and university students.

Focus areas
- Power semiconductor devices (Si, SiC, GaN)
- Passive devices (inductors, capacitors, substrates)
- Circuit and control concepts
- Packaging and interconnection technology, new materials
- System integration, miniaturization
- Thermal management, reliability, and EMC
- Development tools, design, and simulation
- Test and measurement techniques
- Production technologies, Industry 4.0

Key applications
- Intelligent power supplies with extended functionalities
- Energy-efficient systems, power management
- Electrical drives (industrial drives, railway traction)
- Automation technology and robotics
- Electromobility
- Grid integration of renewable energies
- Electrical transmission and distributed networks (smart grids with storage integration)
**EXAMPLE 1**

**Cluster events: seminars and training courses**

Every year in approx. 50 events, such as training courses, seminars, joint trade fair stands, and expert talks, the cluster offers the opportunity for companies and research institutes to present their innovative solution approaches for current power electronics issues and for employees of companies and research institutes to obtain qualifications in different areas of power electronics.

Topics include: power electronics devices, switching concepts, current sensors, thermal management, drivers and protective circuits, control technology, EMC, packaging and interconnection technology, design and simulation tools, testing technology.

**EXAMPLE 2**

**Research project Distribution Grid 2020**

The cluster supports its players through initiation, concept, and accompaniment of research and application projects in collaboration with companies and research institutes.

In the funding project, »Distribution Grid 2020«, innovative equipment for integration of regenerative energies in distribution grids is developed and tested: for example, intelligent, controllable inverters, multi-function linear regulators with extended functionalities for reactive power control, fault compensation and balancing, and forecast-guided power storage, and powerline communication in the direct vicinity of the power electronics.

Since the cluster was established in 2006, funding of approx. €33 million for 35 projects representing a total volume of €57 million, has been obtained.

**EXAMPLE 3**

**Cluster internationalization – cooperation with Japan**

Through its embedding in the European Research Network ECPE, the Cluster Power Electronics has been active internationally ever since it was founded. Cluster events are regularly attended by participants and presenters from throughout the entire German speaking area.

In the course of the internationalization measure sponsored by the Federal Ministry of Education and Research, the cluster has been strengthening cooperation with Japan since early 2016. The two innovation regions are working on the new generation of wide bandgap power semiconductors, an effort that should be leveraged with coordinated strategies and joint projects. Bilateral meetings and workshops not only broaden the technical exchange, they also broaden cultural understanding.
LEADING-EDGE CLUSTER MAI CARBON

MAI Carbon – bundled competence for CFRP applications

The Leading-Edge Cluster MAI Carbon of the Carbon Composites e.V. (CCeV) in the city triangle Munich, Augsburg and Ingolstadt pursues the objective of implementing CFRP technology on an industrial scale for different user sectors in Germany. To achieve this goal, springboard innovations throughout the complete component life cycle are required, i.e. starting from fiber and matrix material, through the manufacture of components and product systems, to conclusive recycling concepts.

The founding partners of MAI Carbon are Audi, BMW, Premium Aerotec, Airbus Helicopters, Voith and SGL Carbon, as well as the Chamber of Commerce and Industry Swabia, the Chair of Carbon Composites of the Technical University Munich, and the Carbon Composites e.V.

Currently more than 100 partners in this Leading-Edge Cluster initiative – which are also members of CCeV – bundle their knowledge to further extend the technology leadership for the use of CFRP components in mass production, and to make Germany the world leader in the area of fiber composite technology. The intensive collaboration of well-known major companies and technology leaders of the application industries, aerospace, machinery and plant engineering, as well as fiber manufacturers and manufacturers of semi-finished products, makes the Leading-Edge Cluster MAI Carbon unique.

The concentration of all relevant companies and institutions along the value chain of future materials with carbon fiber reinforcement is a noteworthy and unique selling proposition in the tri-cities area of Munich, Augsburg and Ingolstadt (MAI). Thus an ideal basis is available to leverage carbon composites material technology in various industries, such as the automotive industry, the aerospace industry, but also in the mechanical engineering industry. The prerequisite in this regard is a networked and concerted procedure coordinated by the Leading-Edge Cluster MAI Carbon.

Leading-Edge Cluster as engine for the region

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EXAMPLE 1

Within the framework of the cluster, over 35 R&D projects have already been initiated, all of which contribute to developing the series production capacity of carbon composites. Important target values in this regard include cost reduction and avoidance of waste during production. The project MAI Skelett made rapid progress. Based on the chassis cowl of the BMW i3 a new design was developed and investigated. The results: with at least the same performance of the current component, it was possible to reduce cycle time to 75 seconds; manufacturing costs decreased by more than 60%. Thus, using a real component the project proves that development potential can be leveraged and that use of CFRP is also technically and financially possible in large-scale production.

EXAMPLE 2

The seventeenth European Conference on Composite Materials (ECCM17) was organized by the Leading-Edge Cluster MAI Carbon and the Chair of Carbon Composites of the Technical University Munich, under the patronage of the European Society for Composite Materials (ESCM) in June 2016. ECCM is Europe’s leading biennial conference on composite materials and attracts internationally renowned scientists and engineers to experience the latest research findings in their respective areas of expertise.

Approximately 900 presentations, held in up to 16 rooms simultaneously, were delivered at the four-day conference in Munich. In addition there was an exhibition and poster show. Furthermore it was possible to visit industrial companies and scientific institutes in and around Munich. For MAI Carbon ECCM17 with 1,300 participants was one of the highlights of the cluster’s work.

EXAMPLE 3

The special exhibition »Hard material: carbon – the material of the future« presented the carbon material from its origin to the state of current processing, in the Deutsches Museum in Munich from May 2014 to July 2015, and then until May 2016 in the Museum’s Bonn branch. In the Center for New Technologies in Munich, the exhibition showed on 300 m² which methods are employed to process carbon fibers and in which areas carbon is already being used. Objects in which the material can be used provided a glimpse into the future (e.g. Ariane booster housing, see photo). The exhibition was organized by the Leading-Edge Cluster MAI Carbon.

Along with the special exhibition a permanent facility was opened in the Children’s World, where the youngest visitors could become acquainted with the material.
As an interdisciplinary area of knowledge, mechatronics has sustainably shaped modern mechanical engineering and the adjacent industry groups through integration of IT in electromechanical systems. Thus mechatronics forms the basis for most of the ideas of industry 4.0. In Bavaria this applies to industrial key sectors with approximately 50% of all industry employees. Leading research institutes, such as the German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt (DLR)), several Fraunhofer Institutes, and many specialized university chairs with their scientific competence make an essential contribution to innovative industrial mechatronic applications.

The cluster has established itself as a communication platform for mechatronics & automation in Bavaria with intensive participation of companies and scientific institutions. Through its commitment in the International Mechatronics Forum, among others, the cluster has gained high recognition on national and international scale. In cooperation with its members and partners, to date more than 50 research and transfer projects have been completed, e.g. in the machinery and plant engineering industry, electrical and electronics industry, medical technology industry, drive technology and environmental technology, as well as the aerospace industry. Thus, the cluster provides valuable and highly reliable support in the conception, development, production, operation and service of mechatronic and automation systems. In addition, its very own mechatronikakademie provides an opportunity for professional and academic specialists to obtain adequate qualification and receive continuous professional training.

Focus areas
- Digitalization and Industry 4.0
- Manufacturing automation and robotics
- Mechatronic drive technology
- Production systems and processes
- Machines and data security
- Diagnostics and quality assurance

In the non-profit association of the same name, the Cluster Mechatronik & Automation e.V. as of 2016 comprises approximately 200 companies, universities and extramural research and development institutions.

The members form an alliance to support the common promotion of cooperation in research and development as well as the particular exchange of experience and knowledge in the application of mechatronic principles, components, assemblies, machines and equipment. With an overview of their members’ expertise, competence, capacities and interests, cluster management coordinates the initiation of bilateral cooperation and entire value creation networks and provides platforms for exchange and qualifications that are in line with their members’ demand.
EXAMPLE 1
Procurement network for electronic components
Small and medium-sized contract manufacturers of electronic components (EMS service providers) in Eastern Bavaria have come together under guidance of a cluster manager in the cluster project ProdNET, in order to procure frequently required electronic components in larger quantities and thus achieve more favorable conditions. The cluster started the procurement network in 2013; today several millions of Euros in material worth is moved by the network. Each of the participating companies since then has saved tens of thousands of euros, which they have invested in innovative growth. One entrepreneur confirms: »In the first half year, we saved over €70,000. We could invest half of this sum in the development of new markets and the other half in the creation of sustainable jobs.«

EXAMPLE 2
Product development in the cluster network
»What started as an internal innovation project at electron Systeme has, through collaboration in the cluster, developed into an innovative product that revolutionizes SMT manufacturing and enables Industry 4.0« enthuses Wolfgang Peter, CEO of optical control. Initially the company had developed an X-ray camera together with Fraunhofer IIS that records a very large image surface at an extremely high resolution. With the competencies of additional cluster companies in the machine tool industry (apra-norm) and electronic design (UG Systems), as well as partners for pilot series tests (Zollner Elektronik, Siemens Healthcare), the component counter OC-SCAN® CCX was further developed, and thanks to optimized software, automatic parameterization, and compact design, it now serves the requirements for Industry 4.0 application.

EXAMPLE 3
Settlement support – ISHIGAKI Europe GmbH
For many years the cluster has maintained close ties with Japanese companies. What began as a Japanese-funded cooperation project including economic development agencies and companies from the Japanese prefecture of Saitama with mutual B2B matching and delegation visits resulted in the settlement of the company ISHIGAKI in the Business Support Center Nuremberg Fürth for Excellence. Simultaneously, the cluster and the Japanese consortium maintain an education and exchange partnership that benefits companies on both sides. In addition to Invest-in-Bavaria and regional players, cluster management supports internationally active manufacturers of filter presses in evaluating the market situation, arranges corporate visits for a selection of potential suppliers, final assembly partners and service partners in Germany and Europe, and offers a suitable network for cooperation.
With wide sales of approximately €250 billion and annual growth rates of 6 to 8%, medical technology is one of the key industries of the future. With more than 1000 innovative companies and approximately 80,000 highly qualified employees Bavaria takes on a leading role in Germany and Europe. Businesses in Bavaria generate approximately one third of German production. As a matter of fact, more than 3% of worldwide medical technology comes from Bavaria. This can also be expressed in sales figures: With sales of approximately €9.5 billion in 2015, Bavaria is equivalent to countries such as France and Italy.

This technical medical competence is supplemented through a top-class medical-clinical infrastructure with approximately 400 approved acute care hospitals, 55,500 physicians, 10,800 dentists, 285 care or rehabilitation facilities, 47 spas and health resorts.

The focused cooperations and application-oriented networking of technologies and physicians are essential pillars for innovation. This is the background, against which the Bavarian Ministry of Economic Affairs, Regional Development and Energy promotes the medical technology cluster platform. Joint sponsors of this cluster are two well-established, very successful organizations in Bavaria:

The Forum MedTech Pharma e.V. the largest interdisciplinary network in Bavaria, Germany, and Europe in the area of medical technology and the healthcare industry with 600 members, includes more than 10,000 customers from 4000 companies in approximately 1500 institutes and clinics from a total of 31 countries.

The Medical Valley European Metropolitan region Nuremberg (EMN) is a leading international cluster in the area of medical technology. Functioning as a cluster management organization since 2007, Medical Valley EMN e.V. is an amalgamation of currently 185 members from industry, science, healthcare, networks and politics. The central tasks of cluster management are further development, coordination and marketing of the cluster.

**Focus areas**

Over the next few years, in particular world-class research and development projects will be stimulated and implemented. In this regard, among other things, successful event formats, such as the Mt Connect/MedTech Summit Conference will be expanded, expert groups will be initiated in application areas, such as medical robotics, idea competitions will be organized, and companies will be supported in the acquisition of funding.
EXAMPLE 1

BayMed

The Bavarian Medical Technology Cluster actively supports implementation of ideas and innovative products through acquisition of funding, for example, within the framework of the Bavarian research program »Medical Technology« (BayMED), through which a funding volume of up to €2 million per year is made available. In 2016 it was possible to start the first five projects, for example:

- terraplasma GmbH and the Regensburg University Clinic are working together on development of a portable, battery-operated plasma device for use in domestic care and in-patient care of wound patients.
- Nuviant GmbH, together with the Erlangen University Clinic, is developing a minimally invasive, wireless neuro-stimulation system for treatment of an interactive bladder.

EXAMPLE 2

Conference

Starting in 2017 a new autonomous industry trade fair will be established for the medical technology industry in Nuremberg. The basis is the new cooperation of NürnbergMesse with the Forum MedTech Pharma. The foundation is the »MedTech Summit«, established by Forum MedTech, a conference at which Medical Valley and other clusters from Germany and other countries are integrated. In addition to the trade fair, parallel conference sessions, as well as interactive network offerings, are provided. Thus, B2B partnering and other connecting events will be offered. The interactive structure of the new event concept opens up a variety of opportunities for networking, not only in the area of research and development cooperations, but also in the area of market strategies, such as project financing and joint ventures.

EXAMPLE 3

Expert group

The newly established expert groups for important technology or application topics promote origination of project ideas and formation of new project consortia. Thus within the framework of the Care Innovations Expert Group it was possible to implement an initial project devoted to interface management between clinic and care facility. Analysis and optimization of resident transfers between two Nuremberg facilities was the center of focus in this regard. Experts discussed possible solution approaches, e.g. for optimized data acquisition management and dissemination of information. The extent to which the results can also be applied to other homes and clinics, and how the use of technology can help overcome interface problems, will be discussed and worked out in a subsequent step.
The forecasted billion euro market for nanotechnology has become a reality. There is virtually no segment of the economy that does not benefit from nanotechnology: Information and communication, production, energy, transport industry, health, construction, among others. As a key technology of the 21st century, nanotechnology is one of the most crucial innovation drivers worldwide and offers new products or product solutions, as well as totally new approaches.

Bavaria is a leading location for nanotechnology in Europe. This is where the Cluster Nanotechnology is domiciled and promotes an efficient networking of industry, science, politics, and theory, as well as transfer of knowledge and technology between players from science and industry, for the innovation process. For implementation of such innovations, first and foremost medium-sized companies are of central significance. Consequently, cluster work also focuses on small and medium-sized companies and on stimulation and realization of specific research, development and innovation projects. Originating from its strong roots in Bavaria, the cluster is also active on the national and international level with its networks and projects.

Focus areas

Focus areas of cluster tasks are the core areas of the specific implementation of the potential offered by nanotechnology. The central components of cluster work include introduction of innovative process technologies, cost-effective integration in existing production processes, technology-oriented project management, customer-oriented innovation management, and exploitation of interdisciplinary synergies.

Core competencies

- Initiation, support, and coordination of projects, extending to complete project management
- Execution of customer-specific innovation workshops
- Initiation and management of nanotechnology networks
- Promotion of cooperation between research and development institutes and users in industry
- Support for project proposals
- Support of application-oriented research
- International research marketing
- Organization of seminars, workshops, and trade fair participation
- Knowledge procurement and knowledge maintenance
- Open discussion of opportunities and risks
EXAMPLE 1

Founding of the European Center for Dispersion Technologies (EZD)

Dispersing is of vital significance for subsequent industrial treatment of basic materials in the area of process technology. Consequently, through nanotechnology the foundational activities for the EZD were initiated and executed in Selb together with the Kunststoffzentrum SKZ (German Plastic Center). Through funding provided by the Bavarian Ministry of Economic Affairs, Regional Development and Energy, it was possible to form the European Center for Dispersion Technologies. Here a competent team with outstanding experimental equipment has been established, the team is specialized in production and characterization of micro-scale and nanoscale dispersions. The EZD offers development services for the industry. The EZD and the Cluster Nanotechnology work closely together in the nanoInk network and in many R&D&I projects.

EXAMPLE 2

Network NanoCarbon – communication platform on the international level

The Network NanoCarbon was founded five years ago, also in order to continue a portion of the activities of the Inno.CNT innovation alliance. Since then, it has developed into a platform known throughout the world for the latest developments and application possibilities of nanocarbon materials. The annual expert conference organized by the Cluster Nanotechnology and the Network NanoCarbon is now established as an important communication and exchange platform for the nanocarbon community.

»In the network to success«: Together in projects and workshops, partners further develop nanocarbon materials such as carbon nanotubes (CNTs), carbon nanohorns (CNHs), and carbon graphenes into new products and close the value chains in the various application areas.

EXAMPLE 3

Forging new paths with innovation workshops

Assessing nanotechnologies and successfully implementing them in marketable products, are important tasks in the innovation and product development process. A functioning innovation process in the enterprise integrates as many players in the process as possible, and thus contributes to minimizing product development and product processing risks and avoiding high expenditures of time and costs in the development phase. It is precisely at this point that the cluster comes in with its innovation workshops. It brings all players together at one table to take a 360° view of the innovation potential of an enterprise. Many new product ideas and services have already come about on the basis of workshops adapted individually to the special needs and desires of the customer.
Bavaria is one of the international leaders in the field of "New Materials". With its broad-based research landscape, highly innovative technology and process companies as well as a strong user industry, it has the best prerequisites to play the leading role in the future.

The Cluster New Materials is the Bavarian-wide information, communication and cooperation platform. The Cluster New Materials is managed by the Bayern Innovativ GmbH and brings together players from science and industry - interdisciplinary and across technologies and industries.

The creation of transparency with regard to material competencies - especially from Bavaria - and marketing of innovations with new materials is one of the Cluster’s core competence.

This is done within the field of the cluster’s core topics:
- Additive manufacturing
- Lightweight and multi material design
- Resource efficiency and sustainability

The Cluster New Materials is covering almost all material classes, from polymers and composites to light metal materials, functionalized surfaces, textiles as well as technical ceramics and glass.

The portfolio of project activities and services are differentiated and consistently developed towards the needs of the Bavarian companies and institutions. Close collaboration with regional networks and initiatives is an essential pillar for the cluster network.
EXAMPLE 1

Opportunities of additive manufacturing

Tooth crowns, glasses, sneakers, even whole car parts: There are many ideas, what could be printed in future. Some of the developers already use 3D printing in serial production. The cluster is increasingly dedicating its focus on solutions for the medical sector, mechanical engineering, aviation and the automotive industry. The cluster offers small and medium-sized companies an overview of the potentials of this new production technology as well as exchange with experts. It carries out a technology scouting, examines the needs and competencies of Bavarian companies, and selectively networks companies to keep ahead Bavaria’s strong position in additive manufacturing. With long-term partners such as Audi, Areva, KSB, Siemens or MTU and research institutes the topics were defined and first working groups already established.

EXAMPLE 2

Plastic solutions for antimicrobial packaging

Meat is a fast deteriorating food. Pathogenic micro-organisms can endanger consumers but antimicrobial packaging can keep meat fresh much longer. Thus, the companies Verpa Folie and RF Plast, together with Ansbach University of Applied Sciences – all partners of the regional Cluster network »k-messwerk« – developed antimicrobially effective foil bags together with sticks to package fresh meat. The combination of film and injection molding technology together with the measuring methods provides innovative solutions for the use of antimicrobial plastics in the food sector. The cluster supported the partners to realise this project idea within the ZIM funding programme, a funding programme for small and medium-sized enterprises (SMEs) with business operations in Germany.

EXAMPLE 3

Closed-loop material cycles

One of the goals of the ZIM network »WiProNa - We Produce Sustainability«, managed by the Cluster New Materials, is to anchor sustainability in the entire process and product cycle of companies. The network comprises 24 partners from science and industry and aims to identify solutions to close the loop of material cycles.

For this approach it is decisive to develop and to implement closed-loop materials as well as new technologies for generation, qualification and use of recyclates. The project is covering the whole process chain - product development, production, return logistics, recycling and re-use. Currently, the project is focussing on polymers, composite materials and technical textiles, where so far recycling is not realised either technically or economically.
Sensors are considered as a universal cross-sectional technology for the most significant innovation suppliers. Sensors are the sensory organs of modern industry and are used in many different ways. Consequently, sensors also constitute the key technology in Industry 4.0, the world of intelligent products, and networked production. Sales of this industry, which is characterized by SMEs, have increased by more than 70% in the past 10 years. German sensor manufacturers dominate the world market, and in the comparison with other German states Bavaria takes the leading role in this area. Pronounced sensor competence at universities and research institutes as well as highly specialized industry trade fairs round out the profile of Bavaria as a leading location for sensor technology.

Cluster management anticipates economic, technological, and demographic changes in its role as future scout, it identifies megatrends as well as developments in the industry, and offers numerous exchange possibilities for industry, science, and politics. Initiation of cooperation projects, acquisition of funding as well as active participation in implementing innovation projects are among the core competencies of SPS. To supplement the extensive offering of qualification opportunities, SPS also supports members as partners, consultants, and a driving force for strategy development and enterprise alignment. Sensorik-Bayern GmbH, as a wholly-owned subsidiary of SPS, additionally offers access to high tech expertise.

Focus areas
- Automotive
- Life sciences
- Automation and mechatronics
- Environmental technology
- ICT, safety and security

Strategische Partnerschaft Sensorik e.V. (SPS)/Cluster Sensor Technology has been officially responsible for cluster management of the sensor technology competence field in Bavaria since 2006. On behalf of Bavaria, SPS bundles interests, experience, and know-how of companies, universities, and research institutes. With more than 70 member companies and institutes as well as 200 partners, SPS has established itself as a strong cross-industry network. In this regard, members of the network reflect the classic strengths of Bavaria and the strengths of these future technologies. Sensor technology network focuses on jointly strengthening the innovation power and future capability of Bavarian companies and institutions.
Sensors with their very diverse fields of implementation constitute the technological backbone of the high tech world and are a trailblazing key technology. A specific and continuous (ongoing) qualification of the labor force is of inestimable value in sustainably promoting the capacity for innovation. SPS offers its members and partners a broad spectrum of seminar series, workshops, and certificate training courses with high practical reference. To implement innovation strategies in the company and participate in triggering new developments is what »innovation managers with IHK certificate« learn in the eponymous two-year training course. The five-day seminar series »Business Administration for Developers« imparts business administration basics to sensor experts as an extension of their technological know-how.

For 10 years SPS has been promoting research and development and sensor technology through consultation, networking, and the bringing together of players’ know-how as well as acquisition of funding for new cooperation projects. Thus, in the network numerous ideas have been implemented in products and services. One current example is the project »assemblies with embedded microsensor systems for intelligent manufacturing of industrial electronics (PCB 4.0)«. For flexible and high-performance data acquisition in Industry 4.0 sensors must be compactly integrated in workpieces and equipment. The project team takes on the major technical challenge of manufacturing miniaturized radio sensor nodes and integrating them in production processes. Sensorik-Bayern GmbH, the wholly owned subsidiary of SPS, is part of the project team.

The organizational and strategic further development of high tech enterprises is firmly in focus of the project »(Mit-)Arbeitswelt 4.0«. SMEs get prepared for »Work World 4.0« with a new qualification concept. Issues associated with the increasing digitalization of work are the subject of company-overarching entrepreneurial workshops, as well as company-internal intervention, and are organized in several modules (data security, communications, coordination, interaction responsibility, life balance, values & leadership). The project team does not consider single effects. The cluster management rather assists the six participating companies as an accompanying consultant for the entire spectrum of organizational changes.
Climate change, worldwide urbanization, and extension of renewable energies result in strong growth in the global demand for environmental technologies. In terms of environmental technology, Bavaria has a first-class position with over 2000 companies. For the most part, SMEs offer products and services from planning, development and engineering, and extending to plant construction and modernization, on the international environmental market.

More than 100 research institutes round out this profile. The objective of the cluster is to support Bavarian enterprises in developing and manufacturing marketable products. The focus is on networking of companies and research, development of pilot projects, and provision of information for specific target groups. Through technical events and conferences the cluster disseminates information concerning technology-specific developments and cross-sectional topics, such as innovation, financing, and internationalization. In its working groups for the topics of wastewater heat utilization, distributed wastewater treatment, and energy from waste, specialists come together on a regular basis to fundamentally drive the topic forward and develop projects. Moreover, the team of the Bavarian Environment Cluster also provides an extensive consulting and service offering.

Focus areas

The Environmental Technology Cluster Bavaria is a network of Bavarian industry, science, government agencies, politics, municipalities, and municipal operations. In this regard the following topics are of particular interest:

- Waste and recycling
- Alternative energy production, particularly energy from waste and biomass
- Air pollution control
- Resource efficiency, material flow management
- Water and waste water treatment
EXAMPLE 1

iDetec – competence center for innovative landfill technology

In Germany, the landfilling of untreated waste has been banned since 2005. Nevertheless, landfills remain an indispensable part of the waste industry. Due to the lack of recycling possibilities, landfills are still the only option for the disposal of various types of waste. With the iDetec competence center for innovative landfill technology the cluster offers companies, government agencies, and research institutes a platform for exchanging information and for initiation of joint projects. iDetec covers the entire area of landfill technology and in the alliance develops solutions and site-specific, made-to-measure concepts. What began in 2012 as a funding project is a strong network today. iDetec has already executed ten free-of-charge landfill audits and has organized two workshops for landfill operators.

EXAMPLE 2

Environmental technology »made in Bavaria« – for international markets

The demand for environmental technologies is increasing worldwide, and at the same time more and more Bavarian companies are doing business internationally. The Environmental Technology Cluster Bavaria supports its members in developing new markets. The current focus is on countries such as China, Canada, Iran, or Chile, which offer a lot of potential for the products and services of cluster members. »Through a cluster delegation trip to Chile we were able to make important contacts and ultimately won the order for a water management project. The events and travel sponsored by the Environmental Technology Cluster are always outstanding in their organization«, confirms Christian Biothe, Branch Manager of HPC AG in Harburg.

Are you interested in international markets? Contact us!

EXAMPLE 3

Lighthouse of the Environmental Technology Cluster – flagship environmental technology projects

Each year the Environmental Technology Cluster confers the Lighthouse Project Award on particularly outstanding environmental technologies with signal effect. A Lighthouse Project identifies development directions and is an attestation of entrepreneurial courage and visionary thinking. Project sponsors from Bavaria can compete with a specific project, procedure, concept, a plant or development that has already been successfully implemented and is working profitably. Award-winning projects benefit from the marketing through the network of the Environmental Technology Cluster – e.g. at trade fairs and events through advertising materials created especially for the project, and through publications in the industry press. At this point in time nine successful projects have already been honored with the award.
ADDITIONAL LINKS
Bavarian Research and Innovation Agency

The Bavarian Research and Innovation Agency is a joint initiative of the Bavarian Ministry of Economic Affairs and the Bavarian Ministry of Science. With the synergistic interaction of five partners in the Bavarian Research and Innovation Agency, the Bavarian State Government pursues three strategic objectives:

- More efficient and more transparent shaping of the overall system of technology transfer in Bavaria
- Extension of qualified funding consultation in promoting technology, to activate a higher implementation potential of innovations in Bavarian companies, in particular in the SMEs.
- Increased acquisition of EU funding, primarily through universities, as well as SMEs, particularly by forming consortia from science and industry.

[www.forschung-innovation-bayern.de](http://www.forschung-innovation-bayern.de)

Bayern Innovativ GmbH

Bayern Innovativ GmbH is Bavaria’s organisation for innovation, technology and knowledge transfer. It supports players from industry and science in all stages of the value chain by providing customised services to boost innovation dynamics. In this regard, Bayern Innovativ operates at the interfaces of various industries and technologies. The goal being to build an ecosystem of dynamic networks to accelerate the innovation process. In addition to the organisation’s own clusters – namely Energy Technology, Automotive and New Materials – the activities focus on cross-clustering with other Bavarian clusters and networking with key players in Bavaria’s innovation landscape.

[www.bayern-innovativ.de](http://www.bayern-innovativ.de)
The Bavarian Research Foundation

The Bavarian Research Foundation was founded in 1990. With the Bavarian Research Foundation the Bavarian State Government has established an institution that strengthens and promotes Bavaria’s impact in the worldwide competition of research and technology. This occurs on a clear basis: Profits from industry investments of the Free State of Bavaria are directly fed back into the economy via research.

The primary goal is to promote strategically important, application-driven research and seminal projects precisely at the point where special successes can be expected through the intensive cooperation of science and industry.

-> www.forschungsstiftung.de

Bayern International

The Bayern International website includes an extensive database of events for the promotion of foreign trade with references to events in Germany and abroad that are organized by Bayern International, Bavarian ministries, chambers, and industry associations.

Bayern International’s work particularly focuses on the Bavarian trade fair participation program, delegation trips, and delegation visits, entrepreneur trips, Bayern – Fit for Partnership (the international further education program) and the Bavarian Company Database. In addition, on the website there are numerous links to national and international partners, who are pleased to advise and support Bavarian companies in their international endeavors.

-> www.bayern-international.de
Company Database »Key Technologies in Bavaria«

With the company database »Key Technologies in Bavaria« companies can find potential business partners and cooperations in Germany and abroad. »Key Technologies in Bavaria«, provided by Bayern International, contains extensive information on Bavarian companies, institutions from the fields of research, technology transfer and network management, as well as relevant authorities and industry associations. The online database is available in two languages, free of charge and always up to date.

www.keytobavaria.com

Invest in Bavaria

Invest in Bavaria is the Business Promotion Agency of the Free State of Bavaria. Since 1999 Invest in Bavaria has supported German and foreign companies in establishing or expanding a location in Bavaria.

Invest in Bavaria compiles specific information, helps to find the optimal location in Bavaria, and mediates the contacts that are required for project realization: for instance, contacts to government agencies and industry associations, as well as to important local networks.

The services offered by Invest in Bavaria are free of charge, naturally all inquiries are treated confidentially.

www.invest-in-bavaria.com
Cluster competitions sponsored by the Federal Ministry of Education and Research

In accordance with the principle »Strengthening Strengths« the Federal Ministry of Education and Research supports top-performing clusters on their way to inclusion in the group of Leading-Edge Clusters with Leading-Edge Cluster Competitions. As part of the competition, which was launched in 2007 to strengthen Leading-Edge Clusters and is open to all research topics, cluster partners should develop a common strategy and plan projects for implementation of this common strategy.

The competition »Internationalization of Leading-Edge Clusters, Future Projects, and Comparable Networks« aims at enabling (leading-edge) clusters to extend existing international cooperation and realize innovation breakthroughs in joint research projects.

www.spitzencluster.de

Funding database of the Federal Ministry for Economic Affairs and Energy

With the funding database of the Federal Ministry for Economic Affairs and Energy on the Internet the Federal Government provides a complete and current overview of the subsidy programs offered by the Federal Government, the States, and the European Union.

www.foerderdatenbank.de

Clusterplattform Deutschland

As an initiative of the Federal Ministry for Economic Affairs and Energy and the Federal Ministry of Education and Research, the Clusterplattform Deutschland website includes an overview of cluster promotion measures and initiatives on the national, state, and European level. A map of Germany shows the German Leading-Edge Clusters and the most efficient cluster management organizations in the »go-cluster« program sponsored by the Federal Ministry for Economic Affairs and Energy.

www.clusterplattform.de
BAYERN|DIREKT is your direct line to the Bavarian State Government.

Via telephone number +49 89 12 22 20 or via email at direkt@bayern.de you can obtain information material and brochures, information concerning current topics and Internet sources, as well as references to government agencies, responsible entities, and contact persons in the Bavarian State Government.

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