



# Cross-industry innovation: IoT & Industry 4.0



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## Diverse business opportunities

- › Over 25% of value added of Bavaria's GDP is accounted for by manufacturing. That's why IoT & Industry 4.0 are [key drivers](#) of future growth.
- › From improving production processes to creating new business models, business leaders in Bavaria know that tearing down silos and working with new partners is the only way to make the new industrial revolution a reality.
- › This creates enormous cross-industry innovation business potential for industrial service providers and start-ups from all over the world.

## Access to talent

Various universities and institutions are dedicated to developing new skills required for IoT & Industry 4.0, including quantum computing, additive manufacturing and robotics. The Bavarian government finances the expansion of faculties and infrastructure with a wide range of programmes, from high-end R&D to hands-on training. For example:

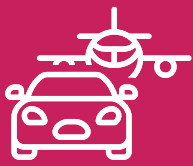
- › Most of Bavaria's leading universities – such as Julius-Maximilians University in Würzburg, the Technical University of Munich and the Ludwig-Maximilians University in Munich – are surrounded by rapidly growing ecosystems that not only help grow talent but also foster world-class R&D in areas relevant to IoT & Industry 4.0. In Munich, for example, the brand-new [Quantum Valley](#) is a collaboration of the Technical University of Munich, the Bavarian Academy of Sciences and Humanities, the Fraunhofer Gesellschaft, Ludwig-Maximilians University and the Max Planck Society. The Leibniz Supercomputing Centre is also housed next door.
- › The [Technical University in Weiden](#) offers a programme in Industry 4.0 Informatics. Bavarian corporations such as [BMW](#) offer a dual study programme that combines on-the-job training with a degree at the Technical University in Weiden.
- › Another example of cooperation is the [Technical University in Ingolstadt](#), which offers several study programmes focusing on IoT & Industry 4.0 combined with cutting-edge research on topics such as digital factories.

## Effective networks

- › Since 2006, [Bavaria's Cluster Initiative](#) has built themed networks that bring companies, researchers, government and independent experts together. Clusters include a multitude of technologies such as sensor technology, mechatronics, automation and new materials – all of them essential in driving collaborative Industry 4.0 projects.
- › Several regional networks focus on specific technologies to strengthen global competitiveness and cross-industry innovation among corporations and institutions within their respective regions. For example:
  - › Northern Bavarian [Automation Valley](#) – focuses on automation technology in Northern Bavaria.
  - › [Mechatronik Competence Network](#) – focuses on creating networks in Eastern Bavaria in close cooperation with nearby universities.
- › New themed networks focus on specific cross-industry innovation technologies in IoT & Industry 4.0, for example:
  - › [Additive Manufacturing Coordination Centre](#) brings together players in this field, reinforcing Bavaria's know-how and technology base.
  - › The [Digital Production & Engineering platform](#) within the Bavarian Digitisation Centre (Zentrum Digitalisierung Bayern) supports networking and best practice sharing within the field.

## Global perspectives

- › Bavaria is known as a favourite venue for global players in IoT & Industry 4.0 to meet and connect.
- › [Automatica](#), the world's leading trade fair for smart automation and robotics, has been a popular venue where global technology leaders gather in Munich for over 15 years.
- › Many international corporations such as Microsoft, IBM and Google have established major R&D hubs here taking advantage of the Bavarian ecosystem as a testbed for IoT & Industry 4.0 innovations.
- › While many Bavarian companies enjoy the benefits of being headquartered here – their business is still global. The export quota of goods manufactured in Bavaria is well over 50%.



# Cross-industry innovation: Mobility & Aerospace



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## Diverse business opportunities

- › Bavaria has been a leading international location for key mobility sectors for many decades. For example:
  - › [Automotive](#): With famous brands such as Audi and BMW as well as leading OEMs such as Brose, Dräxlmaier Group or Webasto, automotive accounts for approximately 30 % of revenues in the manufacturing sector.
  - › [Aerospace](#): Over €11 billion in revenues are generated annually in the manufacturing aerospace sector by around 450 companies. As such, Bavaria is one of the few regions worldwide where companies serve the whole aerospace value chain.
  - › [Railway Technology](#): The German rail industry generates annual revenues of approx. €12 billion and holds a significant share of the world market. Some of the most essential companies are located in Bavaria.
  - › [Logistics](#): Bavaria is centrally located between Western and Eastern Europe, its road network of 138.000 kilometers links many important logistic hubs – via water, road, rail and air alike. It is therefore an important location for logistics innovation.
- › Its diverse mobility landscape is also the key driver for cross-industry innovation in Bavaria. In fact, the state has become Europe's leading testbed for future mobility solutions, with many high profile projects such as [Hydrogen Centre Bavaria](#) in Nuremberg, Ingolstadt's [Urban Air Mobility Initiative](#) and the [Digital Motorway Testbed](#), attracting attention far beyond its borders. Disruptive start-ups such as [Lilium](#) and [TUM Hyperloop](#) are settling here as a result, likewise collaborative initiatives such as [IONITY](#), the first pan-European high power charging grid, a joint venture of Audi, BMW, Porsche, Ford, Volkswagen and Daimler.

## Access to talent

- › Bavaria has 30 world-class universities and universities of applied sciences with a total approximately 400.000 students – many of whom are enrolled in specialties relevant to the mobility sector.
- › A number of academic programmes specifically build the skills required for shaping the future of mobility. For example:
  - › University of Applied Sciences in Landshut: bachelor's degree in [Automotive Computer Science](#).
  - › [TUM Campus Straubing](#) for biotechnology and sustainability: special focus on clean tech, conducting specific research in the area of synthetic fuels, for example.
  - › Department of [Aerospace and Geodesy](#) at the Technical University of Munich: founded in 2018 with the vision of becoming the core of a "space valley" in the metropolitan region of Munich.
- › In addition, a well-established system of in-company education via vocational training and dual studies has evolved over the past several years with a focus on areas such as digitalisation or clean technology.

## Effective networks

- › Since 2006 the state-funded Cluster-Offensive Bayern promotes the formation of industry networks that drive cross-functional and cross-industry innovation. Three renowned clusters in [automotive](#), [aerospace](#) and [railway](#) today serve as high performance network-king and innovation platforms with international connections. The Cluster [MAI Carbon of Composites United](#) pursues the goal of implementing lightweight construction technologies on an industrial scale not just for the mobility sector. E-Mobility Cluster Regensburg focuses on technology for e-mobility including infrastructure. The [Cluster Mobility & Logistics](#) and the [Logistics Initiative Bavaria](#) are key innovation platforms for the logistics sector.
- › In addition, new platforms have been formed that harness the power of digital technology. For example, the [Digital Hub Mobility](#) is part of a nationwide hub initiative. It focuses on networking and pooling projects around big data, eMobility and autonomous driving. The focus of [MCube](#) and [EIT Urban Mobility](#) is on developing sustainable solutions for mobility in metropolitan regions.
- › In the same spirit, larger corporations have founded start-up programmes to cross-innovate with young founders and digital entrepreneurs. Among them are, for example, the [BMW Startup Garage](#), [co-pace](#) by Continental, [UNLIMITED X](#) by Rehau, the [Volkswagen Data Lab](#) or [MAN Impact Accelerator](#).
- › Two start-up centres are specifically focused on the aerospace industry: [ESA BIC Bavaria](#) is a business incubator for space technology while [brigkAIR](#) specializes in three-dimensional mobility and unmanned aerial vehicles.

## Glocal perspectives

- › From 2021 onwards, Munich will be hosting the [IAA Mobility trade show](#), welcoming fair attendees from all over the world. IAA Mobility is one of the world's most important trade shows in this sector with exhibitors from 39 countries (2019). Its relocation to Munich reflects not just the city's international clout as a location for the future of mobility but also its overall global perspective.
- › Not only the big players – such as Audi, Siemens, BMW, Airbus or MAN – but also Bavaria's hidden champions innovate cross-border. For example, [Goldhofer](#), based in Memmingen since 1705, is a world leader in vehicles for heavy-duty transport and special cargo haulage and exports more than 80 % of its production.
- › Innovative mobility companies are drawn to the region: for example, [Lyft](#), an on demand transportation company based in San Francisco, recently opened its first European office in Munich. [NIO](#), a Chinese electric car start-up based its global design office here.



# Cross-industry innovation: Fin- & InsurTech



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## Diverse business opportunities

- › Bavaria's [established strength](#) in the banking and insurance sector is the ideal breeding ground for cross-industry innovation in the Fin- & InsurTech sector:
  - › It is the leading location for the insurance sector in Germany, with approximately 60,000 employees.
  - › It is the second largest German banking center with 98,000 employees state wide, working for 263 cooperative banks, 74 savings banks and 51 private banks.
- › Fin- & InsurTech in Bavaria is all about combining the best of both worlds: almost all major banks and insurance companies are collaborating with new start-ups. In the same spirit, in contrast to the early days of FinTech, innovative young companies also opt for cooperation rather than competition to build their business.
- › In this ecosystem, many well known Fin- & InsurTech companies originated in Munich, including Scalable Capital (Personal Finance), treefin (Money Management), Check24 (Money Management), Interhyp (Mortgages), Ottonova (Health Insurance), IDnow (Enabling Processes and Technology)

## Access to talent

- › Bavaria is well known for its excellent universities and business schools: approximately 125,000 (figures winter 2019) young people are studying to graduate in business, law, IT, mathematics and other science programs.
- › In addition, the unique German vocational training and dual study programmes offer highly specialized on the job training combined with academic studies in banking and insurance.
- › A number of academic programs and institutions across Bavaria focus on developing talent specifically for the industry. For example,
  - › [Forum V](#) is a joint initiative of universities, corporates and associations in North Bavaria that promotes interdisciplinary education in the insurance sector.
  - › [MRIC Munich Risk and Insurance Center](#) aims to bundle expertise from LMU insurance scientists and their network to further enhance Munich's visibility as an important insurance research and teaching location.
  - › Blockchain is a key supporting technology for FinTech business models. A major underway at the following institutions: [Fraunhofer Blockchain Lab Bayreuth](#), [Fraunhofer AISEC Garching](#), [TUM Blockchain Research Cluster Munich](#).

## Effective networks

- › Whether you are a start-up, a corporate or an investor, Bavaria's larger cities are full of networking opportunities to establish relevant partnerships.
- › Since 2017, [DIA Digital Insurance Agenda](#) Munich has evolved into the leading 'must see' conference on InsurTech and insurance innovation worldwide.
- › A number of accelerator programs offer plenty of networking opportunities. Many of the major banks and insurance companies cooperate with these players. For example:
  - › [InsurTech Hub Munich](#) is a vibrant ecosystem of start-ups, corporate partners, investors and research institutions initiated by major insurance companies. Today, it is part of the nationwide digital hub initiative. International partners such as Da-ichi Life or Microsoft are also working with the initiative.
  - › [Plug&Play](#), a renowned Silicon Valley accelerator, runs accelerator programs out of Munich with a focus – among others – on InsurTech.

## Glocal perspectives

- › Bavarian banks and insurance companies have always been run with global markets in mind – and this has been the source of decades of successful growth for companies like Allianz or Munich Re. The same is true for new FinTech business models made in Bavaria.
- › All major players are also reaching out across borders. For example:
  - › [Allianz X](#), for example, is the digital investment unit of Allianz Group working to create a global ecosystem of strategically relevant new companies.
  - › Munich Re's partnership with Plug&Play is a great example of how global players capitalize the strengths of the local ecosystem to cross-innovate.
- › A global perspective is also driven by the venture capital and private equity scene: Bavaria is its most important German. 50 firms are headquartered in Munich – many other international and national firms have offices here as well.



# Cross-industry innovation: Artificial Intelligence (AI)



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## Diverse business opportunities

- › [AI thrives on Bavaria's industrial strength](#): Thanks to its strong and diverse manufacturing base, Bavaria is a hotbed for Industry 4.0 in Europe and hence for cross-industry innovation based on artificial intelligence.
- › On a global scale, Bavaria's competitive edge in AI is in embedded systems and industrial IoT applications. From mechanical engineering to pharmaceuticals to automotive – smart new applications and AI based services are highly sought after in all industry sectors.
- › Bavaria is also among Germany's most important regions in the services sector, major branches being insurance and financial services.
- › A new ecosystem of insurance and cross-industry partners, start-ups, investors, universities and research institutions has evolved over the last years with a clear focus on creating new AI-driven business models.
- › In 2020, Munich ranked first among German cities in terms of funding of AI with an average funding of EUR 27 million per company.

## Access to talent

- › The Hightech Agenda is also designed to massively expand the capacities for prepping world class AI talent at Bavarian universities and technical colleges. 100 new professorships will be created over the coming years.
- › Already today, the Munich School of Robotics and Machine Intelligence is a world class facility for research and education, which closely collaborates with other institutions such as Fraunhofer Institut on specific topics.
- › All Bavarian AI hubs – such as Würzburg, Erlangen or Nürnberg – are home to universities offering specific programmes on AI. In addition, universities and technical colleges in many other Bavarian cities [offer specialized programmes](#). For example, Aschaffenburg offers a programme on “Medical Engineering and Data Science”, the AI course at OTH Weiden allows for specialization on specific topics such as Smart Home and Smart Energy.

## Effective networks

- › The [Hightech Agenda](#) set the agenda for building a world class “AI-District” in Bavaria. The concept provides for a state-wide-network to connect and strengthen existing and new AI hotspots. The newly founded Bavarian AI Agency, will manage the network. An advisory board consisting of renowned experts from Bavaria and abroad will consult to ensure that the network will turn artificial intelligence into a major driving force for business success.
- › For example, Würzburg (Data Science), Ingolstadt (Mobility), Erlangen (Healthcare) and Nürnberg (flexible AI applications) act as hubs for specific topics. Munich's focus is on intelligent robotics with both the LMU and TU universities as well as independent research institutes building world class R&D facilities. In the same spirit, [appliedAI](#), a part of [UnternehmerTUM](#) is Germany's largest initiative for the application of AI technology, helping companies to tackle the operational challenges of AI transformation.
- › Institutions such as the [ADA Lovelace Center](#) for Analytics, Data and Applications in Nuremberg facilitate cross-industry innovation by bringing R&D and business together. Here, companies team up with leading national and international AI researchers to collaborate on specific projects.
- › Munich based [fortiss](#) center seeks to bridge the gap between research and real life applications. In 2019, a dedicated center for AI research was founded in [collaboration](#) with IBM Watson IoT Center.

## Glocal perspectives

- › The growing AI field in Bavaria is not just driven by investments from the Bavarian state and local investors but also international corporates, private investors and accelerators. The [Bavarian AI venture capital landscape](#) is highly dynamic.
- › Many global players are contributing to turning Bavaria into a global AI hotspot. For example, [IBM Watson's IoT headquarters](#) is located here and Munich is one of three locations of [Microsoft's IoT & AI Insider Lab](#).
- › Local research institutions and universities are well connected globally with partner institutions worldwide – major research projects operate across border.



# Cross-industry innovation: Health, MedTech & Life Sciences



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## Diverse business opportunities

- › R&D is the catalyst of any successful life science business – and the very reason why it thrives in Bavaria. The state is known around the world for promoting research at universities and non-academic institutions in various fields, including biotechnology, medical technology, digital health, pharmacy and pharmacology, nutritional science, food technology and environmental engineering.
- › Over the past two decades, connections between the world of science and business have been reinforced in Bavaria. In addition, digitalisation (and new disciplines such as bioinformatics in its wake) has been a driving force in creating a unique cross-industry innovation and entrepreneurship climate:
  - › For example, there are no less than 350 companies in the [biotechnology sector in Bavaria](#).
  - › [Medical technology](#) also thrives here. This sector has a total turnover of approx. €6.1 billion of which 93% is generated by small and medium-sized enterprises.
  - › In addition, the state is home to a significant number of world-class healthcare institutions and pharmaceutical, chemical and environmental technology companies. As a result, Bavaria enjoys a very diverse life science business landscape.

Get an overview of life sciences in Bavaria [here](#).

## Access to talent

- › Of the thirty universities and universities of applied sciences in Bavaria, most have faculties with world class R&D programmes in all major life science disciplines. For example:
  - › Ludwig Maximilian University (LMU) of Munich: The laboratory for [Artificial Intelligence in Medical Imaging](#) (AI-Med)
  - › Technical University of Munich (TUM): [Munich Institute of Biomedical Engineering](#)
  - › Julius-Maximilians University in Würzburg: Research priority area [Molecules, Cells and Organisms](#)
  - › University of Regensburg: R&D in the [Faculty of Medicine](#)
  - › University of Augsburg: Chair of [Embedded Intelligence for Health Care and Wellbeing](#)
  - › Friedrich-Alexander University in Erlangen-Nuremberg: [Chair of Digital Health](#)
  - › Ostbayerische Technische Hochschule Amberg Weiden: [Digital Healthcare Management](#), [Medical Technology](#) and [Physician Assistance](#)
  - › Hochschule Ansbach: [Industrial Biotechnology](#) and [Medical Engineering](#)
- › In addition, non-academic institutions are important R&D hubs for life science. For example:
  - › Max Planck Society is building a larger “life science campus” in Martinsried where a strong focus will be on Real Life Neuroscience.
  - › [Helmholtz Zentrum München](#) has R&D teams covering a broad range of topics such as genetics and epidemiology, diabetes, health and environment and stem cells.

## Effective networks

- › Since 2006, the state-funded Cluster-Offensive Bayern has promoted the formation of industry networks to promote cross-functional and cross-industry innovation. Three renowned clusters in life sciences today serve as high performance networking and innovation platforms with international connections:
  - › [BioM Biotech Cluster](#)
  - › [Food Cluster](#)
  - › [Forum MedTech Pharma for Medical Technology](#)
- › Regional networks such as [Medical Valley Nuremberg](#) facilitate collaboration in their respective locations, also forming cross-border partnerships.
- › In addition, new platforms have been formed over the past several years that harness the power of digital technology. For example, the [Digital Health Hub](#) in Nuremberg/Erlangen focuses on the digitalisation of the healthcare industry.
- › Most recently, the [H+ digital health programme](#) was created by InsurTech Hub Munich and the dmac – Medical Valley Digital Health Application Center. As a true cross-industry initiative it seeks to support teams developing digital health solutions.

## Global perspectives

- › All players in the Bavarian life science ecosystem collaborate with partners cross-border. As a consequence, many international companies in the sector are located here, for example: Amgen, Baxter, Novartis, GE Healthcare, Roche, Daiichi Sankyo.
- › There are also many cross-border projects, such as [Siemens Healthineers and Imito AG](#) (software developers from Zurich), who have developed an app solution „ImitoWound“ for the digital observation of wounds. Another example is Medigene AG (Martinsried) and Cytovant (Shanghai), who have entered into a [service agreement](#) to support the development of a manufacturing process for dendritic cell (DC) vaccines.
- › In the same spirit, Bavarian entrepreneurs innovate with a global perspective, with various “hidden champions” acting as world market leaders in their field. They include, for example, medical technology company Brainlab, a world market leader in soft- and hardware for in the fields of surgery, radiotherapy and medical image sharing. Martinsried based Morphosys is a leading player in the field of antibody technology. Bauer Comp is a global provider of breathing air compressor systems and Ireks is known worldwide for first-class baking ingredients with customers in over 90 countries.
- › Various institutions, such as [Bayern International](#), assist innovative companies in the life science sector to go global.