Cross-industry innovation: Quantum Computing

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Diverse business opportunities

- Bavaria is home to many major corporates who heavily invest in technology. There are also numerous technology suppliers to the Quantum Science and Technology (QST) sector based here, including companies in areas such as photonics, semiconductors, cryogenics, testing and control technology. Bavaria's strong and diverse industrial and technological base is thus tailor-made to facilitate cross-industry innovation and close collaboration between research and business in the emerging quantum computing and technology industry. The key initiatives are:
  - Munich Quantum Valley (MQV) is at the heart of the emerging Bavarian QST innovation ecosystem, with universities in Augsburg, Würzburg, Erlangen and Regensburg acting as additional hubs. MQV will not only build Bavaria's first quantum computer but also set up a quantum technology park where business will collaborate closely with research.
  - MCQST, the Munich Center for Quantum Science and Technology, is a cluster of more than 450 scientists and principal researchers. It is building a world-class QST foundation for addressing scientific and technological questions. The initiative combines the academic strengths of the Technical University of Munich (TUM) and Ludwig Maximilians University (LMU), with the research capabilities of the Max Planck Institute of Quantum Optics and the Walter Meissner Institute.
  - TUM Venture Lab Quantum is the center for quantum technology innovation at Technical University Munich. They support the translation of world-class research in quantum theory and quantum technologies into scalable business ventures.

Effective networks

- The Quantum Business Network is transforming the European quantum community into a strong quantum industry. QBN connects people and organizations from academia, industry and politics and provides members with opportunities for collaboration and knowledge transfer to drive growth and technological advancement.
- PushQuantum is a Munich-based student club. They offer real-world focused education in quantum tech for students from all disciplines. It's the place to develop a career in quantum tech. PushQuantum offers educational resources and assessment opportunities with a heavy focus on real world scenarios and a vibrant community of like-minded talents.
- Bavarian Quantum Computing eXchange brings together leading experts, organizations and companies in quantum computing and supercomputing from Bavaria and around the world. It seeks to foster collaboration in research and development to establish quantum computing as a critical asset to supercomputing, science and society.
- BayQS the Bavarian Competence Center for Quantum Security and Data Science was founded in Munich to research the practical use of quantum computing in industry and to develop secure, reliable and efficient quantum computing software.

Access to talent

- Alongside Bavarian universities' strength in QST research, they place is a key focus on training future quantum scientists. Shortly, they will also organize and run vocational tuition programs that offer applied training to young specialists. Examples include:
  - Munich: since fall 2020 Munich's leading universities LMU and TUM jointly run a new QST master degree course that ensures premium-quality education in the field. In conjunction with the doctoral programs „Exploring Quantum Matter" of the Bavarian Elite Network and the „International Max Planck Research School for Quantum Science and Technology", Munich has one of the most comprehensive QST university education programs worldwide.
  - University of Würzburg: the physical foundations of quantum matter and the application of topological concepts for the realization of future quantum bits are investigated in the Cluster of Excellence „Complexity and Topology in Quantum Matter" and at the „Center for Topological Insulators".
  - University Erlangen/Nuremberg: the focus is on optical quantum communication, as well as hybrid and many-body quantum systems. In addition, research is conducted on the characterization of many-body systems and quantum-assisted machine learning. A new lighthouse project - Quantum Measurement and Control for the Enablement of Quantum Computing and Quantum Sensing (QuMeCo) - will combine physics and electrical engineering in new ways in the field of light and matter.
  - The Augsburg and Regensburg: research is carried out on correlated quantum materials, some of which are already connected to the Munich universities via collaborative projects.
  - Deggendorf Institute of Technology (DIT): as one of the first universities in Germany, DIT offers a Master's degree in Quantum Computing.
  - UniBw M (University of the German Armed Forces Munich): The MuQuaNet project will develop and operate a quantum-safe communications network with UniBw M as its core. It will also be available to other research institutions, government agencies and military services.

Glocal perspectives

- Bavaria's Quantum Initiative not only includes academia, research and industry throughout the state, but also draws on strong ties with global partners. Major players such as IBM, Microsoft and Quantinuum are working on the topic at their Bavarian R&D centers. Moreover, a growing number of international start-ups are setting up operational bases here to become part of this dynamic ecosystem.
- The Leibniz Supercomputing Center (LRZ) has been selected as one of 6 hosting sites for European quantum computers by the European High Performance Computing Joint Undertaking (EuroHPC JU). The decision of the EuroHPC JU strengthens the concept of the project „European Quantum Computing for Exascale-HPC" (Euro-Q-Exa).