

## Bachelorarbeit / Masterarbeit

# The Emergence of a New Super Technology: What Quantum Computing Means for Organizations in the Future

*Searching for a specific item in a list of 1 trillion items with a search duration of 1 millisecond per item, takes 1 week in classical supercomputers - 1 second in quantum computers.*

This simple example indicates the high inherent power of quantum computing, which is based on the laws of quantum physics, such as quantum superposition or quantum entanglement. In contrast to quantum computers, classical supercomputers must analyze each combination in turn for problems with high combinatorial possibilities. As a result, they often do not have sufficient computing capacity to solve such problems efficiently. In real-world settings, such as calculating the optimal transportation route to save fuel costs, balancing the risks of investment portfolios, or simulating molecules interaction to better understand drug interactions, classical supercomputers often reach their limits. By exploiting the laws of quantum physics, quantum computers can create vast multidimensional spaces to represent these very large problems.

However, the resulting exponential growth in the computing speed of quantum computers also poses various challenges. The way quantum computers work is much more complex than in the known classical approaches. For example, quantum computers are currently often unable to provide unambiguous solutions. Given the potentials and the current challenges, the question arises which problems quantum computers can solve in the future. Consequently, this thesis aims to prepare the basics of quantum computing from an organizational perspective by conducting a structured literature review. Thereby, the current state of the art, opportunities, and challenges are to be elaborated in a structured manner.

The thesis can be written either in German or English (preferred).

### Empfohlene Einstiegsliteratur:

- Gyongyosi, L.; Imre, S. (2019): A Survey on quantum computing technology. In: Computer Science Review, 31, p. 51-71.
- National Academies of Sciences, Engineering, and Medicine (2019): Quantum computing: progress and prospects. In: National Academies Press.
- Mashatan, A., & Turetken, O. (2020): Preparing for the Information Security Threat from Quantum Computers. In: MIS Quarterly Executive, 19(2), p. 157-164.

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