

## **Organizations are increasing investment and exploration in quantum technologies with expectations of first commercial applications in 3-5 years**

*New research from Capgemini identifies 23% of organizations globally are currently working on or planning to use quantum technologies, moving from scientific research into real-world solutions*

**Paris, March 31, 2022 – New research published today by the [Capgemini Research Institute](#) reveals that almost a quarter (23%) of organizations are working (or planning to work) on leveraging quantum technologies, with expectations of at least one major commercial application within the next 3–5 years. Furthermore, 20% of organizations are expecting to increase investments in the technology in the next year.**

According to the research [Quantum technologies: How to prepare your organization for a quantum advantage now](#), China (43%) and the Netherlands (42%) have the largest share of companies working on or planning to work on quantum technologies, well ahead of Germany and the UK (each on 26%), versus 23% on average globally.

While the vast majority of the organizations working on quantum started more than 2 years ago, 28% of them stated that they had done so in the last two years. Overall, quantum technologies are beginning to move out of research environments and into real-world applications: among the organizations working on quantum, nearly 20% have reached implementation stage (experiments or proofs of concepts). A further 23% have identified relevant use cases and are preparing for implementation.

These companies intend to leverage the tech in a number of ways, from improving sustainability in operations, and discovery of new materials for battery manufacture, to securing information, through to medical sensors and mitigating harmful industrial gases. Financial services organizations are using quantum technologies for more accurate pricing of risky assets, optimizing portfolios for better returns, and detecting frauds. In addition, Life Sciences companies are attempting to shorten the drug-development cycle using quantum computing.

The Capgemini Research Institute conducted in-depth discussions with over 30 industry experts globally to distill how the top implementers are already using quantum technologies. Elham Kashefi, Professor of Quantum Computing at the School of Informatics, University of Edinburgh and Director of Research at Centre national de la recherche scientifique (CNRS), Sorbonne University and co-founder of VeriQloud Ltd, said: “*It can take another decade to build a fault-tolerant, universal quantum computer. However, we can still get real impactful applications on quantum devices in the near future provided we optimize and adapt Quantum algorithms for the emerging noisy hardware equipped with tailor made verification processes.*”

The report highlights that quantum technologies have reached different levels of maturity in terms of expected applications:

- **Quantum computing** has the highest potential of all quantum domains but it is also the least mature. The pace of development has accelerated, driven by investor interest, expanding use cases and technology breakthroughs. On average, a majority of organizations working on quantum believe



that the first commercial quantum computing applications are five years away;

- **Quantum communications** could address the new requirements of information security<sup>1</sup>, in particular to secure information exchange with external parties, protect critical infrastructure (IoT and cloud-enabled technologies) within the organization or secure cloud data centers. Quantum cryptographic solutions are already being implemented. However, 58% of organizations working on quantum are waiting for standards to emerge before prioritizing quantum-safe security;
- **Quantum sensors** are more niche but also more mature. As they become smaller, more energy-efficient and cheaper, sensors could play a transformative role across industries. Quantum sensors can accelerate precision of measurement, notably in the healthcare/diagnostics, defense, automotive, civil engineering, construction, oil/gas, space, and telecom sectors<sup>2</sup>.

Seven in ten organizations working on quantum agreed that due to long product development cycles in their businesses, they need to invest time now in building a base (the right skills, identifying problems/use cases, conducting lab experiments, or striking partnerships) and integrating quantum technologies into their processes. More than half (58%) of the organizations working on quantum stated that they had secured C-level support for quantum initiatives in the last year.

Pascal Brier, Chief Innovation Officer at Capgemini and member of the Group Executive Committee, said: *"Recent breakthroughs in quantum technologies seek to herald a new era for computing, sensors and cybersecurity within the next 5 years. Our research confirms that more and more organizations are getting educated about the technology and experimenting with real-life quantum technology applications. In the past two years, we've seen leaders emerge in the financial industry and a lot of traction in automotive, in particular. Getting ready today is critical to be able to capitalize on these new generation technologies when commercial applications become mainstream. It is why our [team of quantum technology experts across the globe](#) is focused on unlocking this potential for clients."*

Even as large-scale commercial applications are a few years away, the report advises that organizations can start preparing now for the quantum advantage – the ability to drive significantly higher performance than what is possible with the current state of technology. Once the use case is established, organizations can start experimentation with a small team of experts. Further, translating the most potent use cases to small-scale quantum experiments, striking long-term partnerships with technology providers, and developing a long-term strategy to scale up quantum talent will be crucial.

To read the full report, click here: <https://www.capgemini.com/research/quantum-technologies/>

## Methodology

In November–December 2021, Capgemini gathered input from 857 organizations asking whether they were working on or planning to use quantum technologies, and surveyed 200 executives working or planning to work on quantum technologies. It also supplemented the survey with more than 30 in-depth interviews of practitioners of quantum technology at large organizations, startups, academics working on quantum technology, VCs in the field, as well as communities around quantum technology.

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<sup>1</sup> Current security standards are based on factorization of large composite prime numbers, and are currently impossible to break with the available classical computing capacity. But these standards are increasingly vulnerable: by the end of this decade a sufficiently large quantum computer is expected to be able to break factorization-based algorithms

<sup>2</sup> These could be quantum gravimeters for prospecting or surveying land or water, quantum sensors for process control and safety, sensors and oscillators for GPS-free navigation, or magnetometers and sensors for biomedical imaging



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