

Disentangling the Quantum Europe Strategy: From Innovation to Industry

Quantum computing promises to revolutionise sectors such as defence, pharmaceuticals, and finance, with implications that will be felt across Europe. While the European Commission has already taken steps to harness this new technology – such as through the €1 billion Quantum Technologies Flagship in 2018¹ – the rapid development of the field demands a more comprehensive approach.

In answer to this, the “Quantum Europe Strategy: Quantum Europe in a Changing World” was presented on 2 July 2025. The Strategy outlines the areas being targeted to maximise the potential of quantum technologies while addressing the barriers currently hindering progress.² This paper provides a brief overview of how quantum computing works, its real-world implications, and an analysis of the EU-level initiatives meant to support its developments as outlined in the Strategy.

Quantum Computing in a Nutshell

While the technical details of how quantum computers work are incredibly complex, a basic understanding of what sets them apart can help with understanding their unique value. Whereas traditional computers operate using bits – electrical signals in the states of either 0 or 1 – and process information in a linear fashion, quantum computing instead utilises qubits. These can exist in a state of superposition, wherein they represent a range of values between 0 and 1, and interact with each other through entanglement, enabling complex simultaneous calculations.

As a result, quantum computers can manage difficult calculations far more efficiently than traditional computers and can measure physical features with a degree of sensitivity that would never be possible before. To give a practical example, scientists wishing to study the behaviour of molecules with the most advanced computers of today need to simulate every possible permutation of behaviours, which causes even the best of machines to fail. With quantum computers, they could instead create algorithms that directly mimic how the molecules themselves work, thereby providing unprecedented insights in a fraction of the time.³

¹ “Quantum Technologies Flagship,” European Commission, 22 May 2025, <https://digital-strategy.ec.europa.eu/en/policies/quantum-technologies-flagship>.

² “Quantum Europe Strategy,” European Commission, 2 July 2025, <https://digital-strategy.ec.europa.eu/en/library/quantum-europe-strategy>.

³ “What is quantum computing?” IBM, 10 June 2025, <https://www.ibm.com/think/topics/quantum-computing>.

However, it is important to note that quantum computers are not intended to replace their traditional counterparts; they are not suited for efficiently storing data, and the complex nature of their problem-solving results in a range of answers that would not be suitable for simpler problems. As such, this technology is best used in combination with classic computing, allowing them to work in tandem to maximise the potential of both systems.

Applications Across Sectors

The possible applications of these advancements are extensive and stretch across many different sectors, with defence positioned to gain particularly significant advantages from quantum technologies. Secure quantum communication networks and encryption would provide a level of protection for sensitive data that current systems cannot match, ensuring information remains safe from interception even as computing power advances. Quantum gravimeter sensors capable of detecting minute variations in gravity or magnetic fields are able to reveal hidden threats underground or underwater, while advanced navigation systems can ensure precise positioning for military assets in situations where GPS is unavailable or unreliable. Quantum computing is set to revolutionise operational planning by optimising complex operations, such as rerouting supply chains in rapidly changing conditions or modelling new materials for equipment and vehicles, to give decision-makers faster insights and more reliable solutions. Together, these capabilities stand to not only strengthen Europe's strategic autonomy but also establish a decisive technological edge in the defence sector.

Beyond defence and security, the same advances have the potential to positively impact a wide range of civilian industries. Pharmaceuticals and chemical companies may make use of quantum computing to dramatically speed up the discovery of new drugs and substances by simulating molecular behaviour far more efficiently than traditional methods, while the energy sector stands to benefit from improved battery materials and superconductor designs. Quantum computing also has a synergistic relationship with artificial intelligence development, as AI model training can be accelerated through quantum computing while AI in turn can be used to identify and correct the errors inherent in quantum calculations. Financial services are expected to make use of secure quantum communication to protect transactions and harness quantum algorithms for faster, more accurate risk assessment. Finally, manufacturing and logistics operations can optimise their processes through quantum methods, thereby reducing costs while improving resilience, thus helping industries operate more efficiently and sustainably.

The Commission's Strategy: Five Pillars for Global Leadership

The Quantum Europe Strategy identifies five key areas of action to overcome current challenges and position the EU as a global leader in quantum technology. The first of these areas addresses the need for coordinated research and innovation among Member States, to ensure that quantum computing is used to its highest potential without being hindered by fragmented national efforts. The Commission proposes a “Quantum Europe Research and Innovation Initiative” to align Member States on a commonly agreed upon agenda, thereby avoiding overlaps and gaps while pooling their expertise. Additionally, existing funding programmes will be expanded upon to also cover quantum technologies, allowing for greater access to financing for quantum innovators.

Second, the Commission elaborates upon the infrastructure initiatives needed for the successful quantum advancement. Its plans for quantum computing infrastructure involve scaling up manufacturing from the current forms of quantum processors to full-scale machines capable of more advanced operations, expanding the amount of available quantum computers and simulators made primarily with EU products, and the establishment of an early market of suppliers to ensure that hardware needs can be met as the technology continues to progress. For quantum communications, the EU aims to develop a pan-European Quantum Internet by 2030 to support secure communication. Finally, the quantum sensor initiatives focus on deploying quantum gravimeters across the Member States and supporting research into quantum-enhanced imaging for medical procedures.

The third area involves strengthening the EU's quantum ecosystem by accelerating industrialisation, supporting market readiness, and attracting investments. To this end, the Commission intends to establish six pilot production lines for supporting the quantum chip manufacturing industry from the prototyping stage to market. The Commission also plans to set up a centralised network of quantum testbeds, which would allow smaller actors to have access to facilities for testing their quantum devices, something that would otherwise not be possible given the prohibitive complexity and cost of establishing such laboratories independently. Furthermore, the Strategy seeks to address funding gaps by encouraging private funding and setting up a fund for EU scaleups, while new Risk Assessment instruments will be established to ensure resilient supply chains.

The final two areas relate to dual-use technologies and fostering talent, respectively. For the former, the Commission aims to integrate quantum capabilities into the EU's space and defence strategies. This includes a cooperation agreement with the European Space Agency, a Quantum Sensing Space and Defence Technology Roadmap, and further initiatives to ensure that civilian quantum innovations with potential dual-use applications are properly implemented into the defence sector. In the final area, training, fellowships, and mobility programmes will be expanded upon to build a skilled quantum workforce, facilitating talent mobility between research, industry, and government roles across the EU.

To achieve the objectives of the Quantum Europe Strategy, the Commission will establish a “tailored technology lifecycle approach,” which will work to continuously integrate research, innovation, infrastructure, and early market development to accelerate the transition of scientific discoveries into real-world applications and market impact. This includes launching a Quantum Grand Challenge mechanism that will bring together industrial users and researchers to collaboratively develop innovative solutions in the field with the support of EU financing instruments. A structured framework for cooperation with Member States will ensure that efforts are coherent across national and EU-level programmes, while a high-level advisory board of scientists and technology experts will provide strategic guidance. Finally, though strategic autonomy is central to the Strategy, the EU shall also remain open to engaging with trusted third countries – particularly those who already have established bilateral partnerships with the EU, though the Commission also seeks to launch new cooperation initiatives – in joint research programmes and exchanges of expertise.

Conclusion

The EU is well placed to become a world leader in quantum technologies, but only if it can scale innovation into market-ready solutions. The Quantum Europe Strategy sets out the tools to make this possible – from shared infrastructure and stronger supply chains to defence partnerships and skills development – but consistent funding and strong governance will be necessary for its success. The ZPP urges the European Commission to maintain a strong line of communication with the industry stakeholders who will be the engine driving this technological revolution, to ensure that the EU-level policies accurately reflect the interests of those who stand to be the most affected by them.