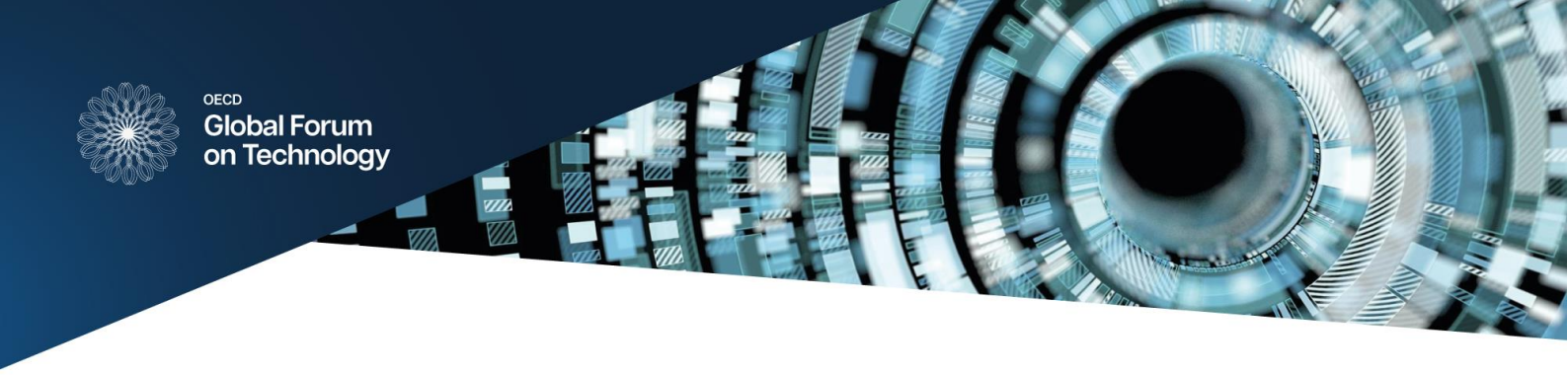
OECD
Global Forum
on Technology



Quantum Technologies Briefing Document

3 April 2024 | Global Forum on Technology (GFTech)

Understanding quantum technologies

Quantum information science blends the unique properties of quantum mechanics with information theory, paving the way for the development of quantum technologies that revolutionise how we acquire, process, and transmit information. Quantum technologies include quantum computers, sensors, and devices for quantum communication.

- **Quantum computing** uses quantum bits (qubits), which can represent and store information in a vast array of states beyond the binary 0 and 1 of classical bits. This enables complex calculations at speeds unattainable by traditional computers. Quantum computing requires control and readout systems for individual particles. These are still in their early stages of development and need breakthroughs in science and engineering to fulfil the potential that the technology offers.
- **Quantum sensors** detect physical quantities, such as magnetic fields, with unprecedented sensitivity to measure exceptionally subtle phenomena. Compared to computing, quantum sensing is a more mature technology, with applications like magnetic resonance imaging in medical diagnostics deployed for several years.
- **Quantum communication** uses particles like photons for encoding and sending data in quantum states to securely transmit information. While still in its early stages of development, practical implementations have been demonstrated with unique security features, showing promise for secure communication systems in the future.

The case for anticipatory governance and policy

Quantum technologies represent a paradigm shift with the potential to disrupt the ongoing digital transformation, introducing unprecedented economic and societal implications. These technologies give rise to a unique blend of challenges and opportunities for governments to navigate. On the one hand, these technologies promise groundbreaking capabilities in capturing, transmitting and processing information, paving the way for innovative commercial applications and significant contributions to Sustainable Development Goals (SDGs). On the other hand, the development and commercialisation of these dual-use technologies introduce complex challenges, including high-risk and costly public and private sector investments, uncertain access to value chains and skills, risks posed to digital security as well as dangers of misuse. The path to responsible quantum technologies requires international cooperation to align efforts towards values-based development and use.

Focus group on quantum technologies

Established in December 2023, the focus group brings together about 50 research, industry and policy experts from 25 countries to collect and contribute evidence that informs strategic dialogue and international cooperation on quantum technologies. It seeks to contribute insights and share good practices for the human-centric governance of these technologies, aiming to inform policy approaches.

The focus group has scoped the below sets of challenges and opportunities posed by quantum technologies and associated business models.

Opportunities and benefits to be unlocked	
Expected commercial applications	Contributions to the Sustainable Development Goals
Convergence with artificial intelligence and other digital technologies	Using the existing computing and networking ecosystem
Expected needs of quantum technology ecosystems	Successful experiences of science-industry collaboration
Metrics that enable benchmarking monitoring of technological capabilities	The role of international cooperation

Challenges and risks to anticipate and manage	
Limited and competitive access to a workforce with required skills and diversity of perspectives	Cryptographic and other digital security risks
Fragmented research cooperation and sharing	Limited access to value chains due to changing geopolitical contexts and strategic competition
The need for high-risk, high-reward investment in R&D	Ensuring access and inclusion to avoid deepening divides

Planned GFTech activities

1. Building an early foundation for policymakers to grasp the responsible development of quantum technologies, providing them with a comprehensive overview of opportunities and challenges.
2. Identifying and characterising national strategies and policies supporting quantum technologies, creating typologies and analysing key instruments to support quantum ecosystems, with the aim of highlighting learning opportunities and fostering international collaboration.
3. Exploring the role of publicly funded institutions and technology providers in helping the private sector prepare for quantum technologies, focusing on developing capabilities for readiness and resilience in digital economies.
4. Convening expert panels and workshops to foster multistakeholder dialogues, enhance the application and policy development of quantum technologies, and address areas requiring international cooperation like global measurement standards and equitable access.

For more information about GFTech visit

- GFTech Webpage
- About us video: What is the OECD Global Forum on Technology?
- GFTech Brochure

Contact info.gftech@oecd.org for questions