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# A First Quantum Governance Reader: Literature, Principles, Reports

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# A First Quantum Governance Reader: Literature, Principles, Reports

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## Bibliography of Current Literature:

Quantum Computing and the Law: Navigating the Legal Implications of a Quantum Leap

*Balarabe*, Quantum Computing and the Law: Navigating the Legal Implications of a Quantum Leap, Eur. j. risk regul. 2025, 1–20.

This paper explores how quantum computing, with its ability to solve certain problems exponentially faster, challenges existing legal frameworks—particularly in intellectual property (patents for quantum algorithms and hardware) and data security (quantum's threat to current encryption methods). The author describes how patent law struggles to account for the unique nature of quantum inventions and why post-quantum cryptography is needed to protect data against powerful quantum attacks. The piece then surveys different regulatory efforts worldwide (e.g. the United States' National Quantum Initiative Act, the EU's Quantum Flagship, and China's major investments) and highlights the need for adaptive, globally coordinated rules for quantum technologies. Finally, it addresses the ethical dimension—ensuring equitable benefits, avoiding misuse, and training legal professionals for quantum's future. Ultimately, the paper urges proactive, interdisciplinary approaches so that quantum computing's transformative power can be harnessed responsibly.

*DOI: https://www.doi.org/10.1017/err.2025.8*

### Keep quantum computing global and open

*Biamonte/Dorozhkin/Zacharov*, Keep quantum computing global and open, Nature 2019, 190–191.

This commentary warns that quantum-computing research is becoming fragmented by competition, uneven public funding, and commercial interests. Although substantial sums are pouring into hardware development—especially in North America—researchers emphasize the need to bolster theoretical work and software, too. The authors note that corporate hiring surges drain talent from universities, while international collaborations suffer from geopolitical tensions and security concerns. As a result, avenues of inquiry risk closing off before core technical challenges are resolved. The authors urge governments, companies, and academic institutions to keep quantum computing "global and open," increase support for software research, and sustain cross-border partnerships to ensure that quantum technologies ultimately benefit the broader scientific community and society.

DOI: https://www.doi.org/10.1038/d41586-019-02675-5

### The Quantum Threat to Cybersecurity and Privacy, in *van der Sloot/van Schendel* (Hrsg), The Boundaries of Data

*Bindel/Mosca/Munson*, The Quantum Threat to Cybersecurity and Privacy, in *van der Sloot/van Schendel* (Hrsg), The Boundaries of Data (2024) 35–52.

Quantum computers threaten current cryptography by efficiently solving the hard mathematical problems that secure online data. This “quantum threat” lets attackers decrypt today’s widely used public-key systems and forge certificates, undermining cybersecurity and privacy. Sensitive data can be “harvested” now and decrypted later, leading to catastrophic breaches. While symmetric encryption only requires doubled key sizes, public-key cryptography demands new, quantum-safe techniques. Researchers propose post-quantum algorithms and quantum cryptography such as QKD, along with hybrid methods for a gradual transition. Governments, industry, and academia must collaborate to update legacy systems, manage cryptographic risks, and train experts. Even then, ongoing cryptographic agility remains crucial as quantum capabilities continue to evolve

*DOI: https://www.doi.org/10.2307/jj.12124947.5*

### Anticipatory Ethical Governance for the Research and Development of Quantum-enabled Defence Technologies

*Blanchard/Pundyk/Taddeo*, Anticipatory Ethical Governance for the Research and Development of Quantum-enabled Defence Technologies (2024).

This paper argues for an “anticipatory ethical governance” approach to quantum technologies in the defence realm. The authors point out that lessons from AI show the importance of addressing ethical, social, and legal risks before new tools fully mature. They propose embedding ethics into quantum research and development processes—rather than waiting for harms to surface post-deployment—and identify five guiding principles for defence use: emphasizing information security, balancing national-security imperatives with openness, encouraging international collaboration and oversight, pursuing “fusion” strategies for peaceful and beneficial applications, and strategically countering authoritarian misuse. Ultimately, the paper stresses that anticipating risks early fosters more responsible, trustworthy innovations and could mitigate future ethical dilemmas around quantum-enabled defence tools

DOI: https://www.doi.org/10.2139/ssrn.4995497

### Quantum Technologies and Society: Towards a Different Spin

*Coenen/Grinbaum/Grunwald/Milburn/Vermaas*, Quantum Technologies and Society: Towards a Different Spin, Nanoethics 2022, 1–6.

In this manifesto, the authors argue that while we are at the dawn of a "second quantum revolution," it is crucial to avoid hype and simplistic "gold rush" or "arms race" narratives about quantum technologies. They highlight that quantum physics may indeed feel mysterious or "weird," but the practical applications of quantum research—such as more secure communication, new algorithms, and precise sensors—need not remain opaque to broader society. By emphasizing transparency, open collaboration, and an honest assessment of both opportunities and limitations, they suggest a more responsible path for advancing quantum technology. This path involves considering social impacts, cultural contexts, and educational needs early on—rather than prioritizing short-term profit or geopolitical competition. Ultimately, their goal is to ensure that the development of quantum technologies reflects shared societal values, fostering both scientific innovation and genuine public engagement.

*DOI: https://www.doi.org/10.1007/s11569-021-00409-4*

### Responsible research and innovation (RRI) in quantum technology

*Coenen/Grunwald*, Responsible research and innovation (RRI) in quantum technology, Ethics Inf Technol 2017, 277–294.

This paper examines how "responsible research and innovation" (RRI) applies to emerging quantum technologies. Drawing on the nanotechnology experience, the authors show that hype, unclear definitions, and weak stakeholder engagement can complicate policy debates. They identify three "ideal-typical" RRI approaches, from minimal references to public communication to full-fledged, inclusive processes. Highlighting lessons from nanotechnology's early controversies, the authors propose a "strong" RRI strategy that couples expert analysis with deeper stakeholder and public participation. This method should involve clear communication, balanced expectations, and parliamentary or similar policy-level involvement. Ultimately, they argue that proactive RRI can help ensure quantum technology evolves responsibly, with benefits and risks managed transparently and democratically.

DOI: https://www.doi.org/10.1007/s10676-017-9432-6

### Reading the road: challenges and opportunities on the path to responsible innovation in quantum computing

*Holter/Inglesant/Jirotka*, Reading the road: challenges and opportunities on the path to responsible innovation in quantum computing, Technology Analysis & Strategic Management 2023, 844–856.

This paper discusses integrating “responsible innovation” (RI) into quantum-computing research in the UK. Drawing on work within the National Quantum Technologies Programme, the authors highlight how quantum technologies, though still evolving, face pressing social and ethical considerations. They outline how RI helps researchers and stakeholders anticipate and respond to future impacts such as inequality of access, potential misuse, and global competition. Empirical findings suggest that although scientists often see their work as “value-neutral,” they welcome clearer processes for discussing risks with policymakers and the public. The authors recommend improving interdisciplinary dialogue, making public engagement ongoing and two-way, and building support structures so quantum computing evolves in a way aligned with broader societal values and needs.

*DOI: https://www.doi.org/10.1080/09537325.2021.1988070*

### Law and policy for the quantum age

*Hoofnagle/Garfinkel*, Law and policy for the quantum age (2021).

This book systematically examines quantum information science (QIS) through legal and policy lenses. The authors analyze quantum sensing, computing, and communication technologies, emphasizing their societal implications. Key contributions include a critique of existing intellectual property frameworks for quantum algorithms and a proposed "Quantum Bill of Rights" addressing data sovereignty in entangled systems. The text highlights tensions between open innovation and national security, advocating for export control regimes tailored to quantum-specific dual-use risks. Case studies on quantum radar and post-quantum cryptography transition timelines provide actionable insights for policymakers.

*ISBN: 9781108883719*

*DOI: https://www.doi.org/10.1017/9781108883719*

### Asleep at the wheel? Responsible Innovation in quantum computing

*Inglesant/Holter/Jirotka/Williams*, Asleep at the wheel? Responsible Innovation in quantum computing, Technology Analysis & Strategic Management 2021, 1364–1376.

This paper examines the application of Responsible Innovation (RI) to quantum computing, emphasizing its transformative potential and societal uncertainties. The authors argue that RI must anticipate risks early, rather than react retrospectively, given quantum computing's unpredictable trajectory. Through research within the UK's National Quantum Technology Programme, they explore how sociotechnical imaginaries—visions and narratives shaping quantum's development—impact its governance. They highlight challenges in public engagement, transparency, and balancing national interests with global collaboration. Ultimately, they call for stronger interdisciplinary dialogue and proactive governance to ensure quantum computing aligns with ethical and societal values while mitigating unintended consequences.

*DOI: https://www.doi.org/10.1080/09537325.2021.1988557*

## GOVERNANCE TOOLS FOR THE SECOND QUANTUM REVOLUTION

*Johnson*, GOVERNANCE TOOLS FOR THE SECOND QUANTUM REVOLUTION, Jurimetrics 2019, 487–522.

Quantum computing, communication, and metrology promise enormous benefits—from ultra-fast computing and secure data exchange to highly sensitive sensors—but also pose critical risks. Potential threats include compromised encryption, pervasive surveillance, and international security tensions. Traditional "command-and-control" regulation could stifle vital innovation or neglect public interests. Drawing parallels to nanotechnology oversight, this paper advises softer governance tools such as voluntary codes of conduct, third-party standards, and public-private programs. These approaches encourage stakeholder collaboration, adaptability to rapid technological changes, and balancing risk management with scientific and commercial growth. Ultimately, responsible and flexible oversight—supported by cooperation among governments, industry, and civil society—will be essential for realizing the full promise of the second quantum revolution.

URL: https://www.jstor.org/stable/27009999

## Establishing a Legal-Ethical Framework for Quantum Technology

*Kop*, Establishing a Legal-Ethical Framework for Quantum Technology, https://yjolt.org/blog/establishing-legal-ethical-framework-quantum-technology (25. 2. 2025).

This foundational article proposes a ten-principle framework to guide responsible quantum technology development, emphasizing human-centered design, accountability, and adherence to democratic norms. Kop argues that quantum governance must integrate existing AI regulations and nanotechnology ethical frameworks while addressing unique quantum risks like existential threats from dual-use applications. The principles stress technological robustness through certification

standards, environmental sustainability, and prohibitions on quantum arms races. The framework advocates for agile, sector-specific regulations that balance innovation with precautionary ethics, particularly in high-risk industries such as healthcare and defense. Notably, Kop highlights the need for culturally sensitive governance systems that evolve alongside societal needs, proposing mechanisms like Quantum Technology Impact Assessments (QIAs) to monitor compliance throughout a technology's lifecycle.

URL: https://yjolt.org/blog/establishing-legal-ethical-framework-quantum-technology

### Ten principles for responsible quantum innovation

*Kop/Aboy/Jong/Gasser/Minssen/Cohen/Brongersma/Quintel/Floridi/Laflamme*, Ten principles for responsible quantum innovation, Quantum Sci. Technol. 2024, 35013.

Expanding on earlier work, this paper introduces the Responsible Quantum Technology (RQT) framework, organized into three categories: safeguarding, engaging, and advancing. The authors link quantum innovation to global equity imperatives, emphasizing anticipation, transparency, and inclusivity in research and development. Key recommendations include embedding ethical, legal, and socio-economic considerations into quantum R&D funding structures and establishing technical guardrails to mitigate risks like algorithmic bias in quantum AI. The principles advocate for proactive standardization and certification processes, arguing that self-regulation is insufficient given quantum technology's dual-use potential. The paper also calls for international collaboration to develop horizontal governance frameworks, such as a "Quantum Governance Act," while warning against technological lock-in before ethical guardrails are established.

*DOI: https://www.doi.org/10.1088/2058-9565/ad3776*

### Regulating quantum computers: insights into early patterns and trends in academic regulatory conversations on the 'quantum revolution'

*Lukoseviciene*, Regulating quantum computers: insights into early patterns and trends in academic regulatory conversations on the 'quantum revolution', Law, Innovation and Technology 2025, 1–30.

This study analyzes the scientific literature from 2010-2024 on the regulation of quantum technologies - with a focus on quantum computing - and identifies recurring themes, values and positions. It shows that quantum computing is seen by experts as the next disruptive technology and discusses controversial issues such as the right timing and scope of regulatory intervention. By evaluating the early discourses, possible future regulatory approaches and their consequences can be assessed.

DOI: https://www.doi.org/10.1080/17579961.2025.2469350

## Learning From Emerging Technology Governance for Guiding Quantum Technology

*G. E. Marchant/Bazzi/Bowman/Connor/Davis III/Kang/Konkoly-Thege/Liu/Lloyd-Jones/Manwaring/Bennett Moses/Marchant*, Learning From Emerging Technology Governance for Guiding Quantum Technology, UNSW Law & Justice Research Series 2024.

This article examines quantum technology governance, explaining why it is regarded as the next major technological leap and exploring existing limited regulations. It outlines the challenges quantum will pose, referencing three "next big thing" examples—biotechnology, nanotechnology, and artificial intelligence—to extract 15 cross-cutting governance lessons. Seven governance frameworks are also assessed, emphasizing anticipatory, adaptive, equitable, sustainable, soft law, coordinated, and international approaches. Finally, eight governance pillars, crucial for responsibly managing quantum's societal effects, are identified and applied to quantum. The result is a comprehensive roadmap of lessons and recommendations for guiding quantum technology.

*DOI: https://www.doi.org/10.2139/ssrn.4923230*

## Ethics and governance in the digital age

*Mišić*, Ethics and governance in the digital age, European View 2021, 175–181.

This article argues that ethics need not be toothless or side-lined in the technology governance debates. Rather, moral evaluation is necessary, even when legal compliance is already possible. Moral evaluation supplies answers not only to what is legal or illegal, but also to what is good and better for society. The article first defends a pragmatist ethics approach to uncovering the inevitability of values and norms embedded in digital technologies and related to their design and use. It then makes the case for policymakers engaging in the anticipatory ethics of technology. This approach provides a toolbox to tackle moral dilemmas and better understand what trustworthiness and ethics mean in certain contexts. The convergence of ethics and policy is not only worth pursuing but a necessity for good technology governance if we are to achieve a Europe fit for the digital age.

DOI:https://www.doi.org/10.1177/17816858211061793

## The Quantum Governance Stack: Models of Governance for Quantum Information Technologies

*Perrier*, The Quantum Governance Stack: Models of Governance for Quantum Information Technologies, DISO 2022.

This paper addresses the need for practical governance of quantum information technologies, balancing technological development, legal obligations, and risk management. It compares existing governance models and introduces a "quantum governance stack" that spans states, institutions, and other stakeholders. The stack outlines key governance characteristics at each level, specifying stakeholder rights, interests, and obligations affected by quantum technologies, and recommending instruments to manage these impacts. The authors argue for a responsive approach, adapting to technology maturity, resource constraints, and projected impacts. Their framework provides pragmatic guidance for governments, industry, academia, and civil society preparing for the quantum revolution.

*DOI: https://www.doi.org/10.1007/s44206-022-00019-x*

## Ethics of Quantum Computing: an Outline

*Possati*, Ethics of Quantum Computing: an Outline, Philos. Technol. 2023.

This paper surveys the emerging ethical challenges posed by quantum computing (QC). It argues that QC does not merely replicate existing ethical concerns (e.g. those seen in AI or cloud computing) but introduces fundamentally new issues tied to quantum phenomena such as entanglement, superposition, the no-cloning theorem, and the fragility of quantum information. These features complicate questions of data management, privacy, security, and algorithmic transparency because quantum systems don't behave like traditional digital systems (for example, measurement "destroys" the quantum state, limiting insight into processes).

In exploring the ethics of QC, the author highlights how quantum-enhanced tools could increase the volume of data produced, further strain existing data infrastructures, and alter the usual balancing of security and privacy—especially in the context of "post-quantum" or "unbreakable" cryptography. The author also shows how entanglement and other quantum effects enable new forms of connectivity and "virtual links" that make tracing and auditing more difficult, raising concerns around algorithmic opacity and accountability.

*DOI: https://www.doi.org/10.1007/s13347-023-00651-6*

## Democratization of quantum technologies

*Seskir/Umbrello/Coenen/Vermaas*, Democratization of quantum technologies, Quantum Sci. Technol. 2023, 24005.

This paper explores how quantum technologies, particularly quantum computing, can become more democratic. After introducing theories of democracy (participatory, deliberative, and representative) and distinguishing whether democracy is treated as an intrinsic or instrumental value, the authors map current initiatives to provide public access and education in quantum computing. They highlight major obstacles, including militarized visions, claims that quantum mechanics is incomprehensible, and fear-based narratives focusing on security threats. They propose alternative narratives and community-led efforts that foster openness, stakeholder engagement, and broader participation. While notable outreach and open-access programs exist, the authors conclude that more inclusive engagement and governance frameworks are needed for quantum technology to be genuinely democratized.

*DOI: https://www.doi.org/10.1088/2058-9565/acb6ae*

## Developing a human rights compatible governance framework for quantum computing

*van Daalen*, Developing a human rights compatible governance framework for quantum computing, Res. dir. Quantum technol. 2024.

Van Daalen examines the regulation of quantum computing from the perspective of international law and human rights. The focus is on the conflict between the protection of public goods (e.g. the threat to digital infrastructure posed by cracking today's encryption) and scientific freedom. The article argues that public policy must respect the human right to science while protecting the right to privacy and freedom of expression. It recommends creating favorable conditions for research and development - for example by promoting quantum-safe encryption - while at the same time specifically regulating abusive applications.

DOI: https://www.doi.org/10.1017/qut.2024.2

# Governance Principles for Quantum Technologies

## 10 Guiding Principles for Quantum Technology (Kop, 2021)

**Principle 1:** We do not violate human rights, including human dignity, human agency, human oversight, the right to an explanation, and the rights of humans with respect to machines.

**Principle 2:** We respect fundamental human freedoms, including human autonomy and liberty.

**Principle 3:** We investigate, develop and design quantum technology systems, including its synergies with other emerging tech such as AI, nanotechnology, blockchain and VR in accordance with human rights, fundamental freedoms, democratic norms, ethical standards and universal, culturally sensitive moral values.

**Principle 4:** We contribute to fairness, transparency, equal opportunities, shared benefit, non-discrimination, diversity, solidarity and prosperity. This includes implementing and safeguarding net neutrality, avoiding power asymmetries, and providing equal service and access to the quantum internet in a democratic society.

**Principle 5:** We respect the process and outcome of democratic decision making. This includes educating the general public on quantum mechanics and related technologies.

**Principle 6:** We apply quantum technology in a responsible, accountable manner, pursuant to the principles of due process and the rule of law.

**Principle 7:** We guarantee technological robustness through standards, benchmarks, audits and certification, that warrant the safety, (mental and physical) security and integrity of people.

**Principle 8:** We comply with laws and regulations on data protection, data governance and privacy.

**Principle 9**: We apply quantum technology in a social, sustainable manner and prevent harmful impact on the environment, society and humanity.

**Principle 10:** We do not create, trade or export quantum applications that violate any of the Principles. This includes disallowing usages that pose existential risks to humanity, such as recursive self-improving systems. We prohibit a quantum arms race by law to avoid self-destruction.

## 10 Principles for Responsible Quantum Innovation (Mauritz Kop et al., 2023)

**Information Security:** Make information security an integral part of QT

**Dual Use:** Proactively anticipate the malicious use of quantum applications

**Quantum Race:** Seek international collaboration based on shared value

**Quantum Gap:** Consider our planet as the sociotechnical environment in which QT should function

**Intellectual Property:** Incentivise Innovation while being as open as possible and as closed as necessary

**Inclusion:** Pursue diverse R&D communities in terms of disciplines and people

**Societal relevance:** Link quantum R&D explicitly to desirable societal goal

**Complementary Innovation:** Actively stimulate sustainable, cross-disciplinary innovation

**Responsibility:** Create an ecosystem to learn about the possible uses and consequences of QT applications

**Education and Dialogue:** Facilitate dialogues with stakeholders to better envision the future of QT

## Quantum STATES Principles (UK National Quantum Computing Centre, 2024)

**Societally beneficial:** Develop quantum computing capabilities for the benefit of society, taking a pro-active and responsible approach.

- Pro-actively seek to understand the implications of quantum computing on wider society and the environment, leveraging our technical expertise
- Engage inclusively to inform the future trajectory of innovation
- Pursue goals for the good of all

**Trusted:** Be a trusted voice, sharing our knowledge with the quantum computing community and wider society.

- Offer unbiased, trustworthy, informed assurance on quantum computing capabilities
- Manage expectations, cutting through overhype

- Accessibly disseminate our understanding of quantum computing and its implications

**Accountable:** Recognise our responsibility to the wider community, and hold ourselves accountable for our actions throughout our activities.

- Put in place mechanisms to ensure the responsible development and use of quantum computing. throughout our activities
- Demonstrate our commitment to responsible and ethical quantum computing by sharing our efforts
- Champion a responsible approach among our collaborators and the quantum community

**Transparent and explainable:** Provide transparency and explainability in the quantum computing systems we develop, procure, and use, and in our decision-making.

- Be open and honest about the capabilities and limitations of quantum computing
- Be clear about our intentions and decisions throughout our activities
- Aim for explainability, particularly where our technology informs important decisions

**Equitable, fair and inclusive:** Embed fairness and inclusivity into our activities, working to build a diverse community in which quantum computing benefits are equitability distributed.

- Design for equitability and fairness, with particular consideration to vulnerable communities
- Allocate and distribute our resources through fair processes
- Provide inclusive opportunities to leam and benefit, building a diverse community

**Safe, reliable and secure:** Build and test for safety, reliability, and security.

- Put in place guardrails to mitigate against harms to humans and the environment
- Work to ensure our systems function reliably as intended
- Promote and uphold best practice in data governance and information security

## WEF Quantum Governance Principles (2022)

### Core Values:

- **Common good:** Quantum computing's transformative potential should benefit humanity.
- **Accountability:** Clear mechanisms must ensure responsible use, preventing harmful misuse.
- **Inclusiveness:** Diverse stakeholder perspectives should shape quantum development.
- **Equitability:** Quantum technology must be fairly distributed, considering vulnerable populations.
- **Non-maleficence:** Quantum computing should be used ethically, avoiding harm or misuse.
- **Accessibility:** Technology and knowledge must be widely available to foster understanding.
- **Transparency:** Developers, users, and regulators should be clear about their intentions.

### Themes:

1. **Transformative capabilities:** Harness the transformative capabilities of this technology and the applications for the good of humanity while managing the risks appropriately.
2. **Access to hardware infrastructure:** Ensure wide access to quantum computing hardware.
3. **Open innovation:** Encourage collaboration and a precompetitive environment, enabling faster development of the technology and the realization of its applications.
4. **Creating awareness:** Ensure the general population and quantum computing stakeholders are aware,
5. engaged, and sufficiently informed to enable ongoing responsible dialogue and communication; stakeholders with oversight and authority should be able to make informed decisions about quantum computing in their respective domains.
6. **Workforce development and capability-building:** Build and sustain a quantum-ready workforce.
7. **Cybersecurity:** Ensure the transition to a quantum-secure digital world.

8. **Privacy:** Mitigate potential data-privacy violations through theft and processing by quantum computers.
9. **Standardization:** Promote standards and road-mapping mechanisms to accelerate the development of the technology.
10. **Sustainability:** Develop a sustainable future with and for quantum computing technology.

## International Organizational Reports on Quantum Governance

### Standardization Roadmap on Quantum Technologies

*CEN-CENELEC Focus Group, Standardization Roadmap on Quantum Technologies (2023).*

2018, the European Commission launched its long term and large scale Quantum Technology FET Flagship Program. The European Commission is also very interested in boosting standards for quantum technologies (QT). The Quantum Flagship has its own cooperation and coordination activities to "coordinate national strategies and activities" and in its "Quantum Manifesto" [1] explicitly advises to form "advisory boards" to promote collaboration in standardization. The CEN/CENELEC Focus Group for Quantum Technologies (FGQT) was formed in June 2020 with the goal to support the plans of the Commission.

Currently, a multitude of standardization activities in QT are ongoing worldwide. While there is overlap in certain areas, other areas of this wide technological field are not being addressed at all. A coordinated approach will be highly beneficial to unleash the full potential of standardization for speeding up progress—also because the pool of standardization experts available for quantum technologies is still very limited. Furthermore, not all areas are yet "ready for standardization", i.e., while in some fields early standardization is capable of boosting progress, it may be a problem in other areas. Thus, an assessment of standardization readiness of the different areas is required, too.

The FGQT was established to identify standardization needs and opportunities for the entire field of QT with the final goal to boost the establishment of new industries in Europe and consequently the development and engineering of unprecedented novel devices and infrastructures for the benefit of European citizens.

URL: https://www.cencenelec.eu/media/CEN-CENELEC/AreasOfWork/CEN-CENELEC_Topics/Quantum%20technologies/Documentation%20and%20Materials/fgqt_q04_standardizationroadmapquantumtechnologies_release1.pdf

### IEC and ISO launch new joint technical committee on quantum technologies

International Organization for Standardization, IEC and ISO launch new joint technical committee on quantum technologies, https://www.iso.org/news/new-joint-committee-quantum-technologies (28. 1. 2025).

International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) today announced the establishment of a joint technical committee on quantum technologies, ISO/IEC JTC 3, Quantum technologies.

URL: https://www.iso.org/news/new-joint-committee-quantum-technologies

### OECD Digital Economy Papers: A quantum technologies policy primer

OECD, OECD Digital Economy Papers: A quantum technologies policy primer (2025).

This OECD policy paper provides a concise overview of the opportunities and challenges of quantum technologies from a governmental and economic perspective. It emphasizes the enormous transformative potential of quantum computing, communication and sensor technology, but at the same time warns that a lack of governance could slow down progress and exacerbate global inequalities. The Policy Primer therefore recommends several fields of action: international cooperation should be expanded to avoid fragmentation, and investment should be made in education and specialists to ensure that sufficient quantum expertise is available. The report also calls for balanced regulation that ensures both security (for example in the cyber area) and does not stifle innovation. Specifically, it warns of risks such as unequal access to quantum infrastructure, dual-use threats to national security and shortages of critical materials. The recommended countermeasures include anticipatory governance - e.g. through the early development of standards and transparent communication of performance limits in order to manage excessive expectations and build trust.

*DOI: https://www.doi.org/10.1787/fd1153c3-en*

### International Year of Quantum Science and Technology, 2025. A/RES/78/287

United Nations General Assembly, International Year of Quantum Science and Technology, 2025. A/RES/78/287 (2024).

In June 2024, the United Nations General Assembly adopted Resolution A/RES/78/287, designating 2025 as the International Year of Quantum Science and Technology. This initiative aims to enhance global cooperation, awareness, and education in quantum science and technology, recognizing their potential to address challenges in achieving sustainable development and improving quality of life worldwide. The resolution encourages voluntary contributions to support related activities and calls upon Member States, UN organizations,

and relevant stakeholders to promote the observance of 2025 as the International Year of Quantum Science and Technology

URL: https://digitallibrary.un.org/record/4052700?v=pdf

### Quantum technologies and their global impact: discussion paper

*Vermaas/Mans*, Quantum technologies and their global impact: discussion paper, https://unesdoc.unesco.org/ark:/48223/pf0000388955 (4. 3. 2025).

Quantum technologies are still in an early stage, driven by public investments and efforts by large technology companies, with increasing private capital. They span quantum computing, communication, and sensing, promising transformative impacts—from securing critical infrastructure to breakthroughs in medicine and materials science. However, despite substantial public funding and growing international participation, significant research milestones remain distant due to technical challenges and a shortage of skilled talent. The global quantum community is expanding, including contributions from the Global South, yet collaboration is increasingly pressured by digital divides and a fragmented innovation landscape. This paper serves as a starting point for international actors, such as UNESCO, to explore responsible innovation, equitable access, and governance frameworks for quantum technologies.

URL: https://unesdoc.unesco.org/ark:/48223/pf0000388955

### Quantum Computing Governance Principles

World Economic Forum, Quantum Computing Governance Principles (2022).

This World Economic Forum report presents a framework of “Quantum Computing Governance Principles” to guide the responsible development and use of quantum computing. Recognizing the technology’s potential to solve problems once considered infeasible—ranging from complex drug discovery to optimizing logistics—the report emphasizes the need for clear guidelines before quantum systems become widespread. It defines seven overarching values (e.g. common good, accountability, inclusiveness) and organizes its recommendations into nine focus areas, including open innovation, equitable hardware access, cybersecurity, and sustainability.

The authors warn that quantum’s transformative power brings new risks (e.g. breaking current encryption, deepening global inequities) but also enormous opportunities to tackle climate challenges and drive broad economic growth. By proactively setting ethical and legal standards—around data privacy, cybersecurity, workforce development, and more—the report seeks to ensure quantum technology’s benefits are distributed fairly and responsibly, preventing monopolization or misuse. Ultimately, the document is both a set of high-level principles and a call to action for

governments, industry, academia, and civil society to shape a future where quantum computing serves the broader public interest.

URL: https://www.weforum.org/publications/quantum-computing-governance-principles/

### Quantum Economy Blueprint

World Economic Forum, Quantum Economy Blueprint, https://www.weforum.org/publications/quantum-economy-blueprint/ (4. 3. 2025).

This blueprint provides a framework for value-led, democratic access to quantum resources, extending the Quantum Computing Governance Principles into practice for regional or national strategies. The blueprint serves as a guide for policy-makers, industry and academia to build a quantum ecosystem, focusing on economic growth, job creation and responsible development.

The global quantum effort leading to research and innovation in quantum science and technology is continually rising, with current worldwide public sector investments exceeding $39 billion. While a global ecosystem effort is needed to successfully develop and deploy quantum technologies, the current state of quantum efforts is concentrated in certain countries. Quantum technologies promise transformative impacts across industries, necessitating an equitable global distribution to avoid a quantum divide.

The growing global quantum divide between countries with established quantum technology programmes and those without will lead to significant imbalances in core areas such as healthcare, finance, manufacturing and more.

URL: https://www.weforum.org/publications/quantum-economy-blueprint/