Quantum ELSPI

STATUS: Reviewing…

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TITLE: Quantum ELSPI: ethical, legal, social and policy implications of quantum technology.

SUBMISSIONS PERIOD: 1 September 2021 until 15 February 2022.

SYNOPSIS: Anticipating spectacular advancements in real-world quantum driven products and services, the time is ripe for governments, academia and the market to prepare regulatory and business strategies that balance their societal impact. This topical collection seeks to provide informed suggestions on how to maximize benefits and mitigate risks of applied quantum technology. It intends to deliver insights and actionable recommendations on how and when to address identified opportunities and challenges, which can then be refined into plausible, evidence-based policy decisions by stakeholders across the world.

In this special edition of Digital Society, we aim for scholars to reflect on the multifaceted questions associated with Quantum ELSPI. In addition to learning from history and connecting quantum to other big picture trends, quantum should be treated as something completely unique and unprecedented. We especially welcome cross-disciplinary contributions that look beyond research silos and integrate law, economic theory, ethics, sociology, philosophy of science, quantum information science, and sustainable innovation policy, and that consider how to improve ELSPI stratagems for quantum technology. We encourage authors to be pioneers in this complex, and at times counterintuitive field.

Questions and topics that could be addressed by contributions in the topical collection are not restricted to, but could include the following:

- Potential strategies for industries facing disruption such as the cybersecurity industry and financial institutions. What role could antitrust law, intellectual property, prizes, fines, funding, taxes, lifelong learning and labor mobility play while incentivizing innovation?
- How can we utilize Quantum ELSPI to reverse the long-standing trend towards greater income inequality?
- How can a combination of antitrust rules and intellectual property (IP) laws safeguard a properly functioning market based on principles of fair trade and competition? How can winner take all effects and a quantum divide be prevented? What role should patents, trade secrets, copyrights and trademarks on quantum software and hardware play to foster sustainable innovation? How can equal access to quantum technology, including quantum computing and the imminent quantum internet be encouraged? Should access to essential quantum technologies be democratized? By which methods?
- A description of positive externalities, spillovers and innovation rent caused by a thriving quantum ecosystem. With a focus on application areas such as quantum computing & simulation, quantum sensing & metrology, quantum cryptology, quantum chemistry and quantum communication/internet.
- Should creations and inventions generated by quantum-AI synergies be public domain, or should we develop different modalities of property for such machine-made things? Should (quantum-)information be monopolized?

- How should dual use applications be managed? How do we balance freedom with control? What role could a Quantum Treaty or Declaration play to make our world a safer place?
- The creation of a list of quantum-specific themes, goals, benefits and risks that need to be addressed by universal, overarching principles of responsible quantum design and application, including (1) a list of use cases, (2) a case study (e.g., Defense, Cybersecurity, Mobile, Health, Energy, Climate Change) and (3) a definition of hi-risk quantum-systems. Is there anything new under the sun that justifies this research field? What exactly makes it so special?
- How can policy makers learn from history and adjacent fields like biotechnology, nano-ethics, nuclear and artificial intelligence (AI) when regulating exponential innovation and ensuring equal access to quantum computing and the quantum internet? What role could technology management roadmapping strategies play? To what extent does governing digitization driven by classical computing paradigms (binary digits) differ from governing quantum computing (qubits)?
- How should we construct a differentiated horizontal-vertical legal-ethical framework via a vis benefits and risks for quantum technology, which is both culturally sensitive and harmonized at the international level?
- Would developing a Trustworthy, Responsible Quantum concept, similar to EU Trustworthy AI, be useful? What would be its strengths and limits? Would a risk-based approach (responsibility, liability) based on the pyramid of criticality taxonomy used for AI be useful in whole or in part in the context of quantum? In which cases should self-regulation, best practices and codes of conduct be flanked by directives and (agile) regulations or (flexible) federal and state level laws? What role could legal sandboxes play to incentivise innovation?
- What could be the future impact of applied principles of quantum mechanics on culture, democracy and human rights such as privacy, freedom of expression and freedom of thought?
- It is not inconceivable that the development and uptake of transnational quantum principles will run along the lines of democratic and authoritarian tech governance models. Against that background, how can we embed cultural norms, liberal values, democratic principles, human rights and fundamental freedoms in globally accepted interoperability standards (such as ISO/IEC), benchmarks and certification (such as a CE-marking) for quantum technologies, including quantum-machine learning hybrids?
- How can we implement ethically aligned design into our quantum systems architecture and infrastructure? Should quantum infused systems, products and services be subject to monitoring and validation during their lifecycle? How can quantum technology impact assessments, audited by multidisciplinary teams, help achieving these goals?

AUTHOR INSTRUCTIONS: Papers submitted to the topical collection should not exceed 8000 words in total (excluding references).

Timeline for the topical collection:

- Deadline for submitted contributions: **February 15, 2022**
- First round of reviews completed: **April 1, 2022**
- Deadline for revisions: **June 1, 2022**

Submitted papers will be peer reviewed following the journal's standard, and accepted papers will be published online on a rolling basis. Please blind submissions for peer review prior to submission and chose **Quantum ELSPI** in the drop-down menu on the **Digital Society** submission page.