Future in flux? Global issues and national strategies for responsible quantum technology development

27-28 November 2023 | Virtual event

If the 20th century witnessed a revolution in physics with the emergence of quantum mechanics, our 21st century increasingly stands to be shaped by the technological mastery of its effects. Across the globe, a race has begun to achieve quantum supremacy in computing, develop sensing capabilities of unparalleled precision, and create ultra-secure communication systems that could pave the way to the teleportation of information. This quantum revolution stands to open new frontiers in science and could help solve some of the world's most intricate problems. From the breaking of current encryption systems to the deepening of technological divides and the emergence of diverging standards, it is not without risks.

International cooperation on research and policy will be important to harness the potential of quantum technologies and mitigating those risks. Modern interpretations of quantum mechanics teach us that our world is intrinsically relational and we can use those lessons for innovation policy and the development of quantum technologies themselves. Strong interconnections and a culture of exchange have long been recognised as paramount to the success of some of the world's leading innovation ecosystems. In a world in flux, pushing forward technological frontiers will require no less.

The OECD Global Forum on Technology event *'Future in flux? Global issues and national strategies for responsible quantum technology development'* will bring together leading technology and policy experts to discuss the state of quantum technologies, highlight their promises and pitfalls, and consider the role of public policies in advancing their responsible development.

Taking place over two-days, the event will be composed of welcoming remarks and keynote addresses, high-level panel discussions on quantum computing and collective safety in a post-quantum world, and four collaborative breakout sessions that will assess recent trends in quantum technologies and explore their policy implications. The breakout sessions will be organized along parallel tracks, with two collaborative breakout sessions. The first track focuses on technological advances in quantum communication and quantum sensing. The second track explores some policy building blocks of emerging technologies, with exchanges on national plans and strategies for frontier technologies and the global skills gap, with the domain of quantum technologies as an example.

Participation in the event is by invitation only and will take remotely on a dedicated online platform (Inwink). Please contact gftech@oecd.org for any questions.

Draft agenda

Monday 27 November 2023

Plenary sessions (13:00-14:30)

13:00 – 13:05 CET

Welcoming remarks

- **Ulrik Vestergaard Knudsen**, Deputy Secretary-General, OECD

13:05 – 13:15 CET

Keynote address – The second quantum revolution: A brief explainer

Quantum technologies promise revolutionary advances, yet the science behind them remains perplexing even to experts. This short session will provide a high-level overview of the ongoing second quantum revolution, which leverages quantum physics effects for practical applications. Using simple terms, it will serve as a primer for the discussions to follow.

- **Jim Al-Khalili**, Distinguished Chair, Professor of Physics, Professor of Public Engagement in Science, Centre Director, University of Surrey

13:15 – 13:25 CET

Keynote address – Quantum Connections: Fostering Global Collaboration through Israel's National Quantum Initiative

- **Aviv Zeevi**, Vice-President, Technological Infrastructure Division, Israel Innovation Authority

Panel discussion – Quantum computing: From hype to advantage

13:25 – 14:30 CET

Quantum computing draws substantial interest, yet also generates significant hype, making it difficult for non-experts to separate the wheat from the chaff. In this session, panellists will take an honest look at the state of play and highlight the promises of quantum computing, as well as the challenges that remain to be overcome to achieve full-fledged quantum computers. In doing so, they will explore whether quantum supremacy remains a distant prospect and discuss whether new approaches, such as hybrid quantum computing systems, the growing embrace of modularity, and the rise of quantum-as-a-service, already pave the way to a quantum advantage.

Moderator: **Josep Maria Martorell**, Associate Director, Barcelona Supercomputing Center, Spain

Speakers:

- **Jungsang Kim**, Chief Technology Officer, IonQ; Distinguished Professor of Electrical and Computer Engineering, Duke University; United States
- **Sabrina Maniscalco**, Co-founder and CEO, Algorithmiq Ltd; Vice Director of the Finnish Centre of Excellence for Quantum Technologies, Finland

- **Heike Riel**, IBM Fellow, Head of Science & Technology and Lead of IBM Research Quantum Europe, IBM Research, Switzerland
- **Itamar Sivan**, CEO, Quantum Machines, Israel

Moderated Q&A

Interval (14:30 – 14:45)

Parallel breakout sessions (14:45 – 16:00)

From QKD to quantum teleportation: Towards a quantum internet?

In this breakout session, participants will discuss the advent of ultra-secure networks thanks to cryptography via the Quantum Key Distribution (QKD) method and assess the extent to which continued innovation may help scale this technology and address its enduring limitations. Discussions will ultimately seek to identify some of the key policy challenges in the field of quantum communication and explore the prospects of the so-called "quantum internet", which promises to harness quantum entanglement to connect quantum devices and effectively teleport information.

Chair: Eleni Diamanti, CNRS Research Director, LIP6 laboratory of Sorbonne University

Opening perspectives:

- **Katsuyuki Hanai**, Business Unit Manager, ICT Solutions Division, Toshiba Digital Solutions Corporation; Chair, Subcommittee on Quantum Cryptography and Quantum Communications, Q-STAR Japan
- **Jaewan Kim**, Distinguished Professor in Quantum Computation & Information, Korea Institute for Advanced Study, Korea
- **Veronica Fernandez Marmol**, Tenured Scientist, Spanish National Research Council, Spain
- **Urbasi Sinha**, Head, Quantum Information and Computing laboratory, Raman Research Institute, India

Skills & inclusiveness: The building blocks of our technological future?

This breakout session will discuss the shortage of skills that has come to represent a major and global roadblock to the quantum revolution and other emerging technologies. Participants will be invited to share their perspectives and policy recommendations for upskilling workers and enabling them to benefit from advancements in quantum technologies. The session will further highlight the need to encourage participation from diverse geographies to address divides and achieve an inclusive technological future.

Chair: Araceli Venegas-Gomez, Founder and CEO, QURECA; Co-organiser, Quantum Latino

Opening perspectives:

- **John Goold**, Director, Trinity Quantum Alliance, Ireland
- **Abhilash Mishra,** Director, Kevin Xu Initiative on Science, Technology and Global Development, University of Chicago; Founder, EquiTech Futures, United States
- **Karina Robinson**, Senior Advisor, Multiverse Computing; Co-Founder, The Inclusion Initiative at the London School of Economics, United Kingdom
- **Brazilian representative** (Name TBD)

Tuesday 28 November 2023

Plenary sessions (13:00-13:30)

13:00 – 13:20 CET

Flash talks – A future in flux: Towards a quantum leap in responsible technology development

This series of flash talks, from a philosopher specialising in the societal impacts of quantum technologies, a technologist striving to address important problems using these technologies, and the head of responsible innovation of a leading national research centre, will shed light on the need to combine ambition, purpose, and inclusiveness to drive forward responsible quantum technology development.

Speakers:

- **Justine Lacey**, Director, Responsible Innovation Future Science Platform, CSIRO, Australia
- **Pieter Vermaas**, Associate Professor, Philosophy Department, Delft University of Technology; Ethics Research Lead, Quantum Delta NL, Netherlands

13:20 – 13:30 CET

Keynote address – Shaping vibrant innovation ecosystems: Insights from the technological edge

Recognised as the leading architect of the world-renowned Israeli innovation ecosystem, Professor Kandel will share important insights and lessons from experience on the shaping of a vibrant innovation ecosystem supportive of cutting-edge technology developments.

- **Eugene Kandel**, Co-Chair and Founder, Startup Nation Policy Institute (SNPI), Israel

Parallel breakout sessions (13:30 – 14:30)

Sensing potential: An overlooked revolution in measurement?	Shaping technological leadership: Charting national plans for emerging technologies
Quantum sensing technologies appear to receive comparatively little public attention, despite advancing at a rapid pace. In this breakout session, participants will highlight their substantial potential in various domains, such as the medical field, and discuss how policy-makers can support their responsible development and deployment. The session will thereby seek to explore whether technological advances in quantum sensing	In this breakout session, participants will discuss national strategies in quantum and other emerging technologies. The Chair will open the discussions by sharing expert insights on how to shape national plans and strategies on emerging technologies, before inviting participants to share best practices, identify solutions to common pitfalls, and ultimately learn from one

warrant greater policy attention to harness their benefits, while mitigating their risks.

Chair: Jan W. Thomsen, Chair, Danish Quantum Community; Head of Department, Niels Bohr Institute; Member, NATO Advisory Group on Emerging and Disruptive Technologies, Denmark

Opening perspectives:

- **Kai Bongs**, Director, Institute for Quantum Technologies, German Aerospace Centre
- **Volkmar Denner**, Former CEO, Robert Bosch GmbH; Spokesman for economics, QuantumBW, Germany
- **Tracey Forrest**, Programme Director, Transformative Quantum Technologies, University of Waterloo, Canada
- **Liron Stern**, Principal Investigator, Quantum Sensors Lab, Hebrew University, Israel

another in pursuing values-based approaches to technology development.

Chair: Neil Abroug, Head of the French National Quantum Strategy, France

Opening perspectives:

- **Reena Dayal**, Founder and CEO, Quantum Ecosystems and Technology Council of India; Member, Steering Committee, IEEE Quantum Initiative
- **Masahiro Horibe**, Deputy Director, Global Research and Development Center for Business by Quantum AI Technology, National Institute of Industrial Science and Technology, Japan
- **Phil Kaye**, Programme Director, Applied Quantum Computing Challenge program, National Research Council of Canada
- **Roger McKinlay**, Innovate UK Challenge Director for Quantum Technologies, United Kingdom

Interval (14:30 – 14:45)

Plenary session (14:45-16:00)

Panel discussion – Towards a quantum-safe future: Joining forces to advance scientific progress and responsible technology development

14:45 – 15:55 CET

This plenary session will delve into the security implications of post-quantum cryptography and discuss how to ensure collective safety in the post-quantum era. It will provide an opportunity to emphasize the critical need to modernise standards and protocols in cryptography, and explore how global cooperation, knowledge exchanges, and multi-stakeholder partnerships can help advance scientific progress, foster responsible quantum technology development, and pave the way to a quantum-safe future for all.

Moderator: Thierry Botter, Executive Director, European Quantum Industry Consortium

Speakers:

- **Michael Kasper,** CEO of Fraunhofer Singapore and Executive Manager of the Centre for Applied and Integrated Security; Co-coordinator, National Quantum-Safe Network (NQSN), Singapore

- **Vikram Sharma**, Founder and CEO, QuintessenceLab, Australia
- **Corey Stambaugh**, Chief of Staff of the Physical Measurement Laboratory, National Institute of Standards and Technology, United States
- **Kate Weber**, Head of Governance, Google Quantum AI

Moderated Q&A

15:55 – 16:00 CET

Concluding remarks

- **Jerry Sheehan**, Director of the Science, Technology, and Innovation Directorate, OECD