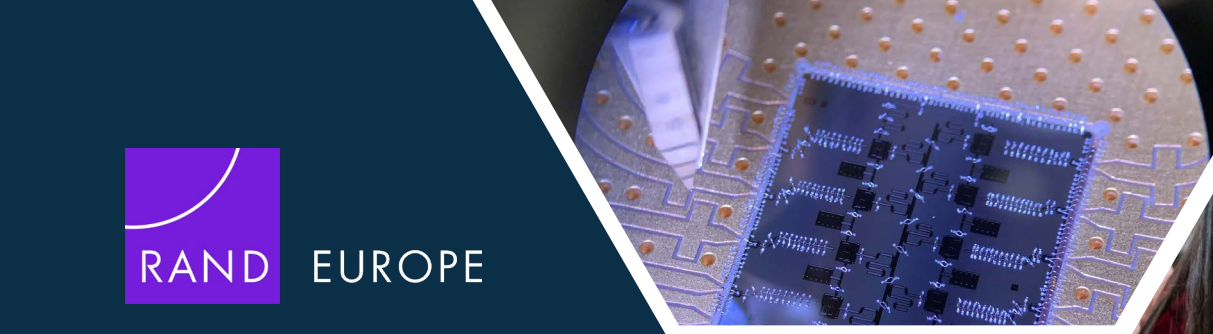
RAND EUROPE

Navigating skills and talent development for quantum technology

Current insights and future horizons

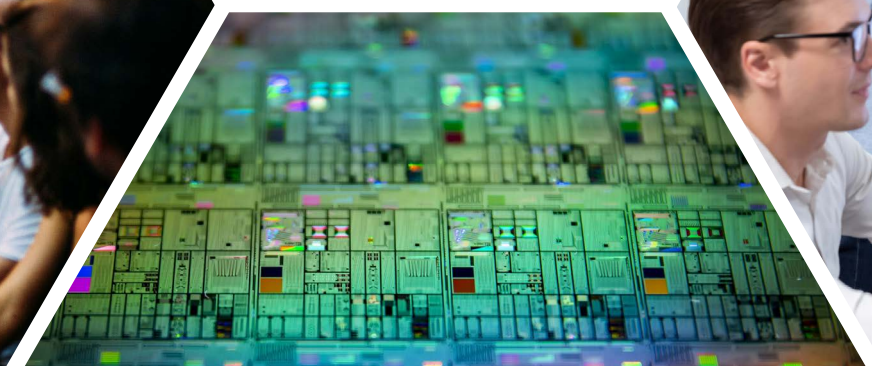
SUMMARY

Salil Gunashekar and
Teodora Chis









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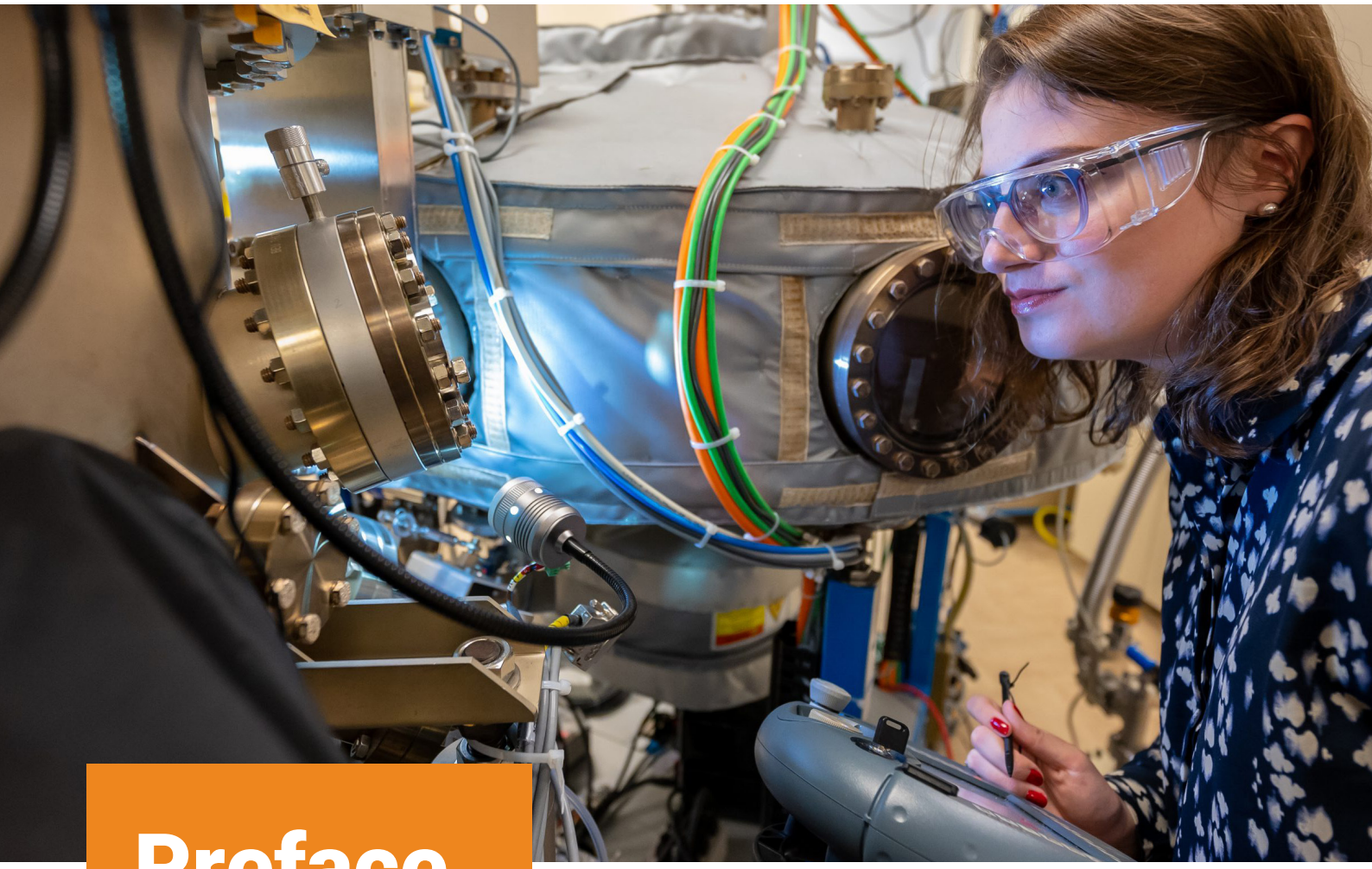


Preface

On 10 October 2024, RAND Europe and the Novo Nordisk Foundation co-hosted a roundtable discussion in Copenhagen to explore key aspects of the quantum technology ecosystem, given the rapid global advancements in cutting-edge research and innovation in the field. This was the second in a series of events aimed at bringing together thought leaders, researchers, industry experts and policymakers who are committed to helping responsibly shape the future of quantum technologies. The inaugural roundtable had taken place in London in November 2023, where discussions centred on ideas for promoting innovation while ensuring a safe and equitable future enabled by quantum technologies. The focus of this roundtable was on two critical issues that are likely to influence the direction of this rapidly progressing field: the development of skills and talent, and the strengthening of supply chains.

This short report provides a summary and overview of the discussions and insights from the skills and talent component of the roundtable. We find that the global quantum technology ecosystem is becoming increasingly diverse, integrating various expertise and disciplines, yet faces challenges to the availability and distribution of necessary skills. To build a sustainable talent pipeline, a coordinated, long-term approach involving enhanced educational programmes and multistakeholder collaboration was highlighted as essential to strategically improving quantum literacy and workforce readiness.

Drawing on the discussions, we propose a selection of policy considerations and associated enabling actions that stakeholders within the broader quantum technology ecosystem could take to address issues related to skills, talent and workforce development.

The policy considerations are organised into three clusters, each reflecting common themes: connecting, collaborating and community building; expanding and diversifying skills and perspectives; and approaching skills systems holistically with forward planning. Taken together, these policy considerations can be regarded as a set of cross-cutting principles intended to guide stakeholders in addressing challenges proactively and holistically, with the aim of developing a more resilient, equitable and future-ready quantum technology skills pipeline and workforce.

The analysis following the roundtable discussion reported here was internally funded by RAND Europe and has been peer-reviewed in accordance with RAND's quality assurance standards. This work is intended to inform the public good and should not be taken as a commercial endorsement of any product or service.

We extend our gratitude to the roundtable attendees for their participation and insightful contributions. Additionally, we wish to thank the quality assurance reviewers at RAND Europe, Hans Pung and Susan Guthrie, for their critical review of the report. Finally, we express our thanks to Jessica Plumridge and Georgina Melia for designing and laying out the report and Ruby Russell for her copyediting work.

RAND Europe is a not-for-profit research organisation that aims to improve policy and decision making in the public interest, through research and analysis. Our clients include European governments, institutions, non-governmental organisations and firms with a need for rigorous, independent, multidisciplinary analysis. This roundtable was delivered as part of RAND Europe's Frontiers of Technology Hub, where we pursue a proactive research agenda to anticipate and prepare stakeholders for emerging technologies and their impacts.

Novo Nordisk Foundation is a private, independent, philanthropic enterprise foundation. They provide grants and investment in the public sector for scientific, humanitarian, and social purposes. Their vision is to improve people's health and the sustainability of society and the planet. They have since 2019 been a key player in supporting and growing the Danish quantum ecosystem with grants, investments, partnerships and activities.

For more information about RAND Europe or this document, please contact:

Salil Gunashekar
Deputy Director and Senior Research Leader,
Science & Emerging Technology Research Group
RAND Europe
Eastbrook House, Shaftesbury Road
Cambridge CB2 8DR
United Kingdom
Email: sgunashe@randeurope.org

Teodora Chis
Senior Analyst,
Science & Emerging Technology Research Group
RAND Europe
Eastbrook House, Shaftesbury Road
Cambridge CB2 8DR
United Kingdom
Email: tchis@randeurope.org

Summary

In recent years, the capabilities of quantum technologies have advanced significantly, underscoring their potential applications across diverse fields, including the life sciences, finance, aerospace, defence, energy and telecommunications. In recognition of the centennial year of the development of quantum mechanics, the United Nations (UN) has designated 2025 as the International Year of Quantum Science and Technology, seeking to raise global awareness and understanding of quantum applications across various sectors. **Against this backdrop, on 10 October 2024, RAND Europe and the Novo Nordisk Foundation co-hosted a roundtable discussion in Copenhagen to explore key aspects of the quantum technology ecosystem, given the rapid global advancements in cutting-edge research and innovation in the field.** This was the second in a series of events aimed at bringing together thought leaders, researchers, industry experts and policymakers who are committed to helping responsibly shape the future of quantum technologies. The inaugural roundtable had taken place in London in November 2023, where discussions centred on ideas for promoting innovation while ensuring a safe and equitable future enabled by quantum technologies. The focus of this roundtable was on two critical issues that are likely to influence the direction of this rapidly progressing field: the development of skills and talent, and the strengthening of supply chains.

This report captures the perspectives and insights of participants at the roundtable, serving as a concise guide to inform and contribute to the broader stakeholder discourse on quantum technology skills

and talent, as policy on these key issues develops over the coming months.[1] **It is widely recognised that skills, talent and competencies are crucial to advancing economies in general; however, they are particularly vital to constructing resilient workforces and maintaining progress in advanced technology domains like quantum technology.** Alongside other structural factors such as funding, infrastructure, collaboration and oversight, skills development can be considered one of the essential enablers of the broader quantum technology ecosystem. We discussed that **the quantum technology ecosystem is facing a skills gap**, which stakeholders are actively striving to bridge. Ultimately, strategically investing in skills and talent development is essential to cultivating robust ecosystems capable of supporting the ongoing evolution and expected impact of quantum technologies.

Drawing on the roundtable discussions, we offer a selection of **high-level policy considerations** and associated **enabling actions** that stakeholders within the broader quantum technology ecosystem could take to address issues related to skills, talent and workforce development. Figure 1 provides a visual representation of the policy considerations. Taken together, these eight policy considerations can be regarded as a set of **cross-cutting principles** intended to guide stakeholders in addressing challenges proactively and holistically, with the aim of developing a more **resilient, equitable and future-ready quantum technology skills pipeline and workforce**. We organise the eight policy considerations into three colour-coded clusters, each reflecting common themes across the respective policy considerations.

We believe that these principles could underpin a future '**Quantum Technology Skills Charter**', articulating a **collective statement of intent, ambition and commitment among stakeholders** including public, private and third sector (including civil society) entities. This charter could facilitate focused, coordinated efforts and actions to proactively address the key challenges related to quantum technology skills and the broader workforce.

1 A forthcoming companion report will provide a summary of the discussions related to the supply chains component of the roundtable.

The main **cross-cutting themes** that emerged during the discussion are as follows:

The global quantum technology ecosystem is evolving to become increasingly heterogeneous, encompassing a range of expertise and disciplines.

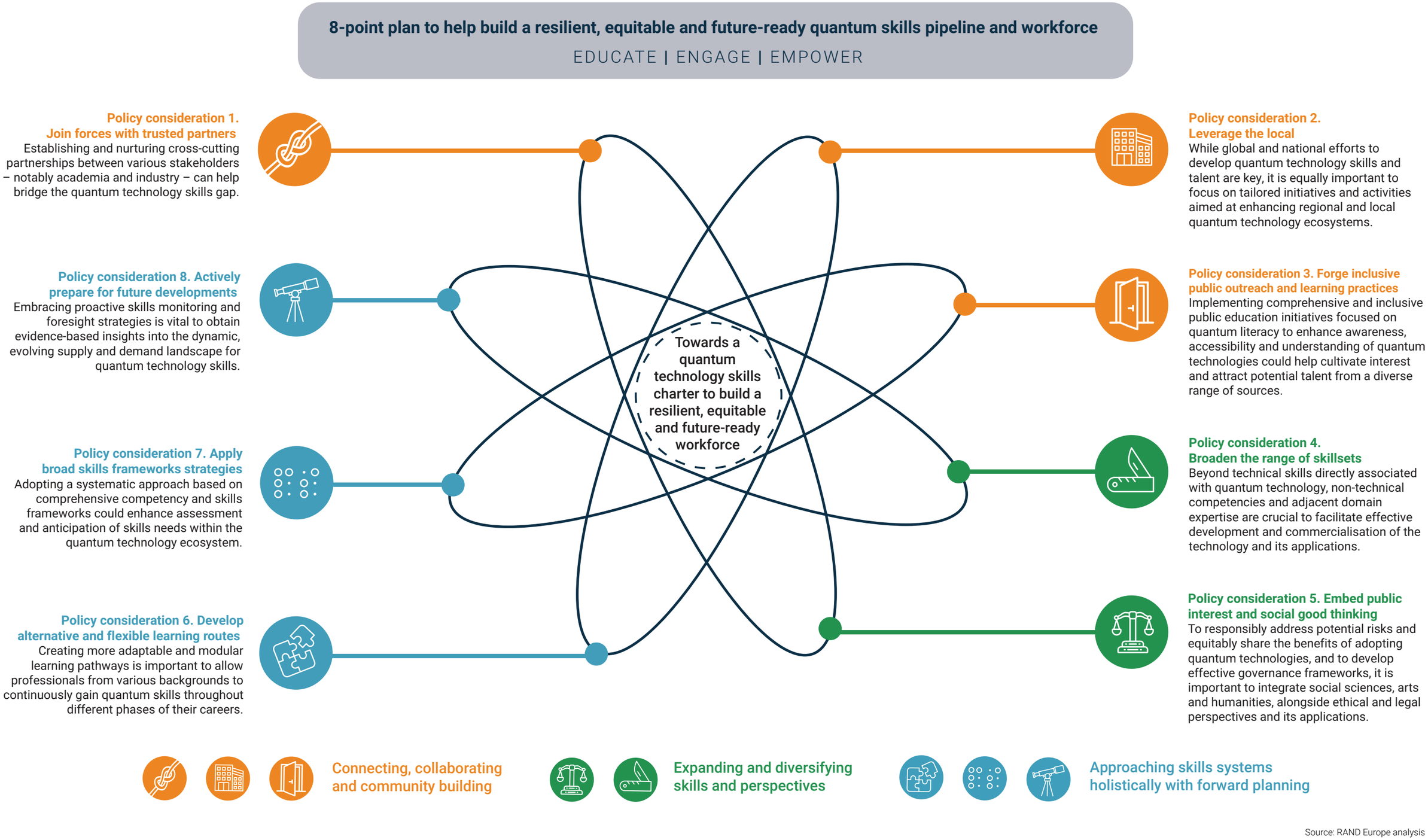
There are key challenges concerning the availability, types and distribution of skills pertinent to advancing the quantum technology ecosystem.

Universities worldwide are expanding quantum-related degree programmes and research opportunities, while industry players are also increasingly developing educational content and tools, collectively enhancing quantum literacy and workforce readiness.

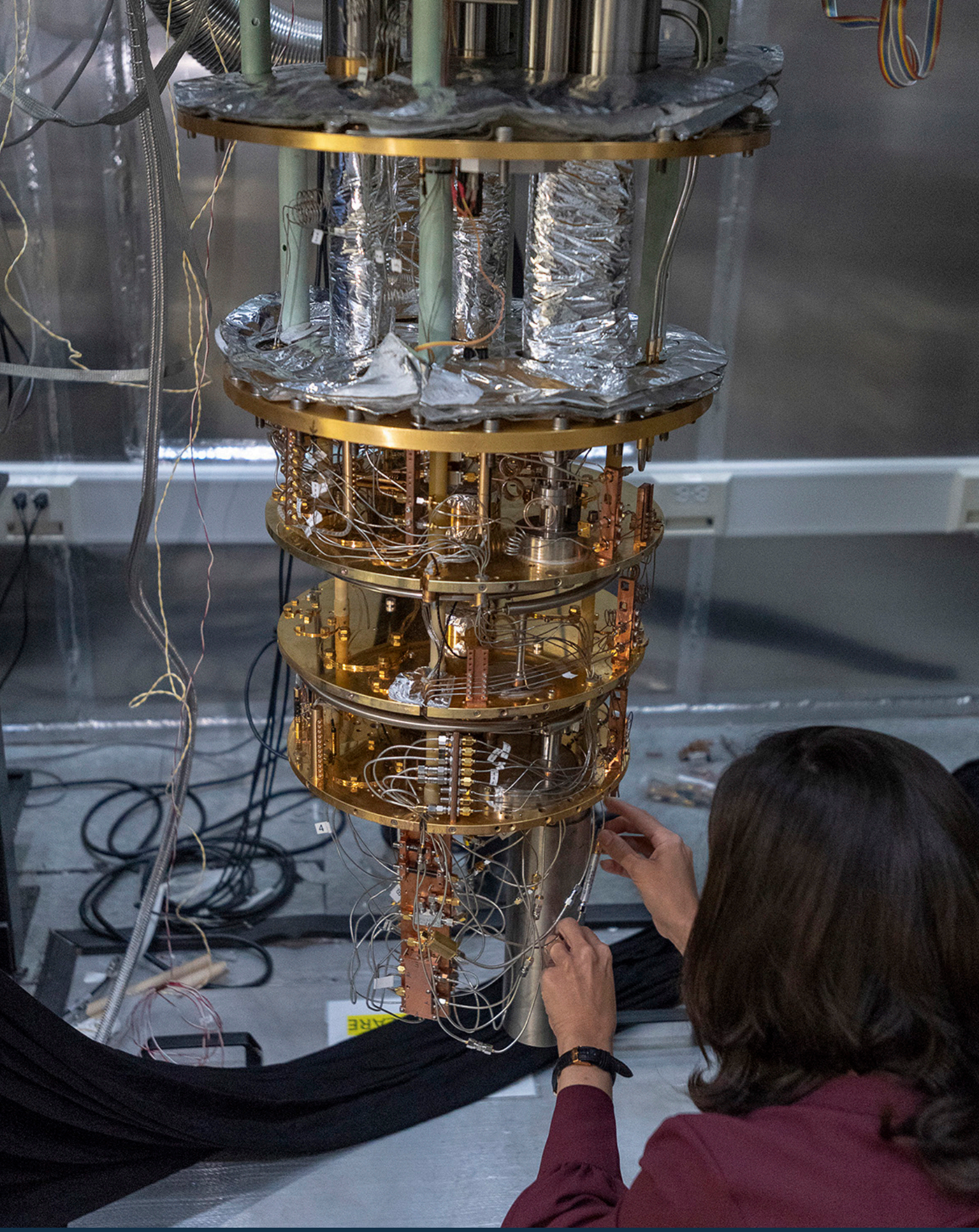
The development of a robust, sustainable quantum technology talent pipeline will require adopting a patient, long-term approach that targets different learning levels across the education and skills development journey.

Addressing the quantum technology workforce development challenge necessitates coordination, community building and common standards.

Figure 1: Eight policy considerations for stakeholders within the quantum technology ecosystem to address issues related to skills, talent and workforce development (note: policy considerations are organised into three colour-coded clusters, each reflecting common themes: connecting, collaborating and community building; expanding and diversifying skills and perspectives; and approaching skills systems holistically with forward planning)



Source: RAND Europe analysis



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