

# QUANTUM

FALL 2024

## BUILDING A QUANTUM-READY WORKFORCE

A Roadmap for  
Colorado and the  
Mountain West Region

**EXECUTIVE SUMMARY**

access the [full report here](#).

# Acknowledgments

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# Ecosystem Signatories

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Boulder Valley School District  
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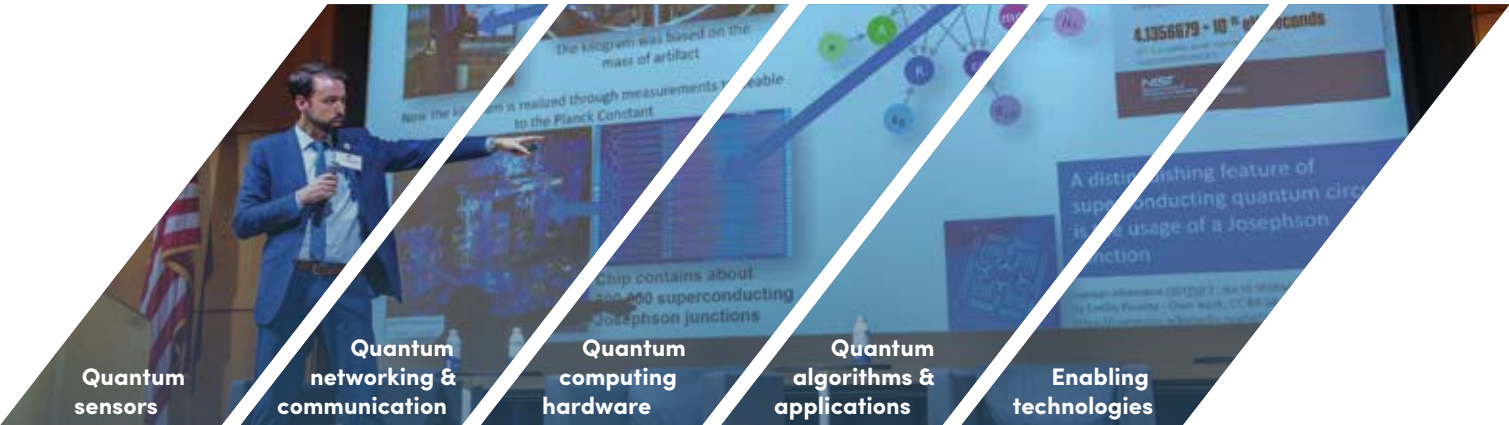
# Executive Summary

Recent national efforts established to bolster United States’ leadership in Quantum Information, Science, and Technology (QIST) include the [National Quantum Initiative Act<sup>1</sup> \(NQI\)](#), the formation of the Quantum Economic Development Consortium (QED-C), and a multitude of federal funding opportunities. Growing in national prominence, Colorado and the Mountain West region represent a significant area of opportunity for QIST based on the region’s vibrant technology ecosystem, research and educational institutions, national labs, industry investments, and progressive workforce development policies and programs.

Colorado’s leadership in the quantum industry led to its 2023 designation and 2024 funding for the Elevate Quantum Initiative as an Economic Development Administration Regional Technology and Innovation Hub. The region, including New Mexico and Wyoming partners, will soon have access to over \$120 million in federal, state, private sector, and non-profit funding for quantum programs, infrastructure, and capacity building. To further support this opportunity and accelerate its success, the Colorado Office of Economic Development and International Trade generously funded a 2023 effort managed by the University of Colorado’s CUbit initiative to convene cross-ecosystem, regional stakeholders to develop a “roadmap” for Colorado and the Mountain West to build a quantum-ready workforce.

The roadmap effort included the (1) recruitment of a cross-ecosystem team to represent the region’s industry, government, and skill-building institutions, (2) creation of the 2023 Quantum Workforce Development Forum where over 200 QIST industry, government, and skill building experts convened to educate, align, and provide a common vision to support QIST, (3) development of a vision document including emerging themes to guide a subsequent roadmap, (4) alignment and easily-understood definitions of QIST market segments and skills required, (5) identification of the region’s current state workforce development strengths and gaps, and (6) creation of the roadmap with accompanying workforce recommendations for the next 3-5 years.

The QIST market includes five segments, each with its own relative maturity and density in the region:



/ OCTOBER 2023 QUANTUM WORKFORCE DEVELOPMENT CONVENING

## Strengths and Gaps

The Colorado ecosystem has well-established programs for training a quantum-ready workforce at multiple institutions of higher education, and partnerships across the region are riding the tailwinds of the recent Elevate Quantum effort. Despite the recent percolation of programs and increased attention on Colorado’s quantum assets, a more comprehensive focus on workforce development is essential, building on and aligning with the strategies proposed by Elevate Quantum. Perhaps one of the most critical opportunities to grow the QIST workforce is by removing barriers in communicating with the broader community about opportunities QIST will [offer<sup>2</sup>](#).

The scarcity of U.S. programs with experiential quantum training labs further limits workforce preparation in this rapidly evolving field frequently focused on improving quantum hardware and useful quantum systems.



QIST workforce strengths are highlighted by skill domain area, using a schema that relatively ranks the **evidence** of skill building programs that are unique to the region and not typically represented in other geographies, and the **density** of said programs which represents relative scale and prominence in the region.





The rapid emergence of the quantum industry necessitates the development of a well-prepared workforce to sustain and drive forward innovation in Colorado and the Mountain West region. The recommendations below outline a strategic approach focused on alignment, skill building, and assessment, with the ultimate goal of building a robust, quantum-ready workforce.

## Recommendations

**Alignment:** To build a cohesive regional strategy, it is vital to establish measurable industry and workforce metrics, commission a comprehensive “State of Colorado’s Quantum Industry” report, and actively support the Elevate Quantum Workforce Collaborative (EQWC). These steps will ensure alignment across stakeholders and enable effective monitoring of progress, thus providing a data-driven foundation for future initiatives.

### Skill Building:

-  **QUANTUM EXPERT:** For those who will lead in quantum research and development, it is crucial to regularly convene regional higher education quantum program leaders. These leaders should collaborate to increase awareness of existing programs, share resources, and identify opportunities to bolster partnerships between institutions. Additionally, leveraging institutional strengths to address regional gaps—such as expanding access to specialized lab experiences and offering foundational quantum courses across institutions—will enrich and diversify the quantum talent pool.
-  **QUANTUM PROFICIENT:** Building proficiency in quantum technology requires significant investment in industry-informed pathways and experiential training programs. Establishing a statewide quantum sector partnership, aligned with the national Next Generation Sector Partnership Community of Practice, will ensure that training tracks with industry needs. Creating quantum-adjacent pathways, particularly in biotechnology, aerospace, semiconductors, and IT/computer science, will connect existing regional industries to quantum technology. Furthermore, expanding hands-on experiences at two-year and four-year institutions and enhancing quantum internship programs will create a robust pipeline of talent, increasing the likelihood of retaining skilled graduates within the region.

QUANTUM SKILL DOMAIN / EVIDENCE / DENSITY		
EXPERT PROFICIENT CONVERSANT AWARE		HIGH
		HIGH
		MEDIUM
		LOW





**QUANTUM CONVERSANT:** For professionals who may not specialize in quantum technology but need to be conversant, integrating quantum-related content into existing statewide platforms and initiatives is essential. Developing a quantum career and technical education pathway under the Colorado Department of Education's standards will promote visibility and accessibility of quantum education. Scaling quantum-specific and adjacent programs through the Colorado Community College System and leveraging apprenticeship intermediaries, such as CareerWise and Apprenticeship Colorado, will expand opportunities further to reach non-traditional learners and industries to engage with quantum technologies.



**QUANTUM AWARE:** At the most basic level, creating quantum awareness among educators and the general public is critical. Implementing a "Teaching the Teachers" program by deploying resources from national initiatives like the National Q-12 Education Partnership will equip K-12 educators with the tools to introduce quantum concepts. Launching experiential programs to inspire K-12 learners to engage in broader STEM and quantum experiences is essential. Additionally, launching a broad quantum literacy campaign will raise public understanding of quantum technology, ensuring that all community members, including government and business professionals, are informed and able to engage with the quantum economy. This inclusive approach will help to democratize access to quantum education and opportunities.

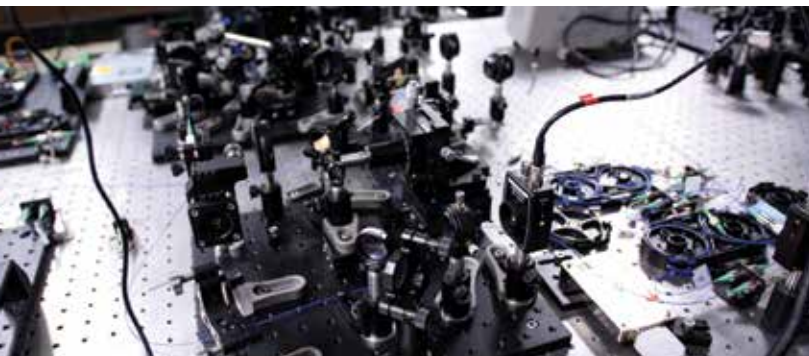
#### Assessment:

Given the early stage of quantum industry development, adopting an agile assessment strategy is imperative. This approach should blend quantitative analysis with qualitative insights, drawing from learner experiences and industry feedback to continuously refine workforce development programs. Regular assessment involving all stakeholders, including learners, will ensure that programs remain adaptive and aligned with the rapidly evolving demands of the quantum industry.

By fostering strategic alignment, investing in targeted skill building, and maintaining rigorous assessment practices, the region can cultivate a diverse and capable quantum workforce that drives future innovation.

My hesitation to pursue a quantum job is that I think quantum is a very specific field that most people know very well, and that those people have much more education than I do"

/ QUANTUM LEARNER PERSPECTIVE



/ QUANTUM OFTEN REQUIRES FAMILIARITY WITH OPTICS AND PHOTONICS PRINCIPLES



/ QUANTUM WORK IS A GROUP EFFORT

#### Study Scope

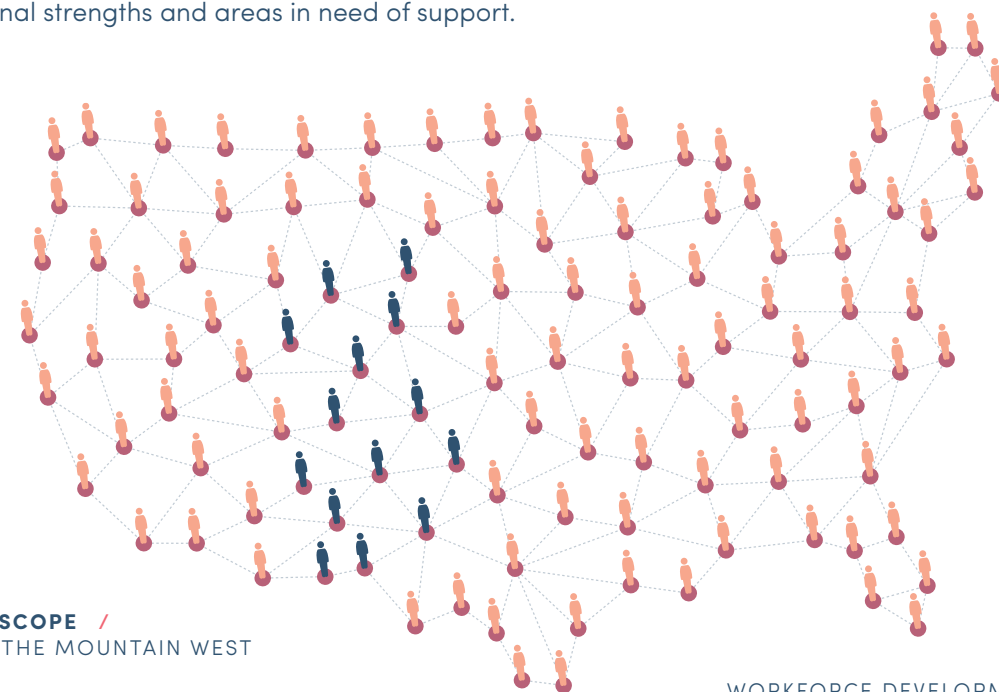
This report provides both a snapshot of current resources available for QIST education and workforce training and recommendations for how **Colorado and the Mountain West** can create and deploy additional resources both to support existing workforce demands and to meet growing, future demands. A three- to five-year outlook centers on the Colorado ecosystem with New Mexico and Wyoming included as complementary stakeholders. It is intended to be used by policymakers, industry leaders, educators, and the public.

#### Gaining the Industry Perspective

Engaging with the quantum industry is essential for gaining a well-rounded perspective on workforce demands and the future of the sector. Industry workshops were a key tool in understanding the specific skills and expertise required by quantum companies, offering direct insights from business leaders. Local quantum companies opened their doors for guided tours, giving core team members a first-hand look at the operational needs of the quantum sector. Additionally, participation in industry panel discussions and regional workforce conferences facilitated deeper discussions about talent gaps and workforce preparation. Collaboration through statewide institutional ideation sessions further helped in brainstorming solutions for building a robust quantum workforce. Lastly these activities were conducted in parallel during the development of the "Elevate Quantum INCLUDE" proposal, aimed at promoting inclusivity in quantum workforce development.

#### Tapping Surveys and Published Reports

A literature review tapped into a wealth of data from surveys and published reports. The Quantum Economic Development Consortium (QED-C) has been particularly instrumental, offering detailed reports that highlight trends, workforce challenges, and growth potential within the industry. Published academic works provided a broader context on the current state of the quantum sector, discussing technological advancements and commercialization efforts. Where available, regional data on the quantum workforce offered more localized insights, allowing for targeted analysis of regional strengths and areas in need of support.



GEOGRAPHICAL SCOPE /  
COLORADO AND THE MOUNTAIN WEST



The background is a dark blue field filled with a pattern of binary code (0s and 1s) and various geometric shapes like triangles and squares, all in different colors (red, green, blue, yellow). The top of the image features two large, overlapping triangular shapes with vibrant, multi-colored streaks of light, resembling a digital or quantum aesthetic. A large white triangle is positioned on the left side, pointing towards the center.

access the [full report here.](#)

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