

Center for Quantum Networks

NSF Engineering Research Center



Evaluation

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Y6 Evaluation Context and Purpose

Context: The Year 6 evaluation builds on five years of CQN infrastructure and learning documented under prior evaluation efforts, using those assets as a foundation for continuous improvement.

Focus: Align with Gen-4 ERC performance criteria while shifting from compliance-based reporting to learning-oriented evaluation using a developmental evaluation framework.

Purpose: Strengthen CQN's capacity as a learning organization that uses data for decision-making, sustainability, and societal impact.

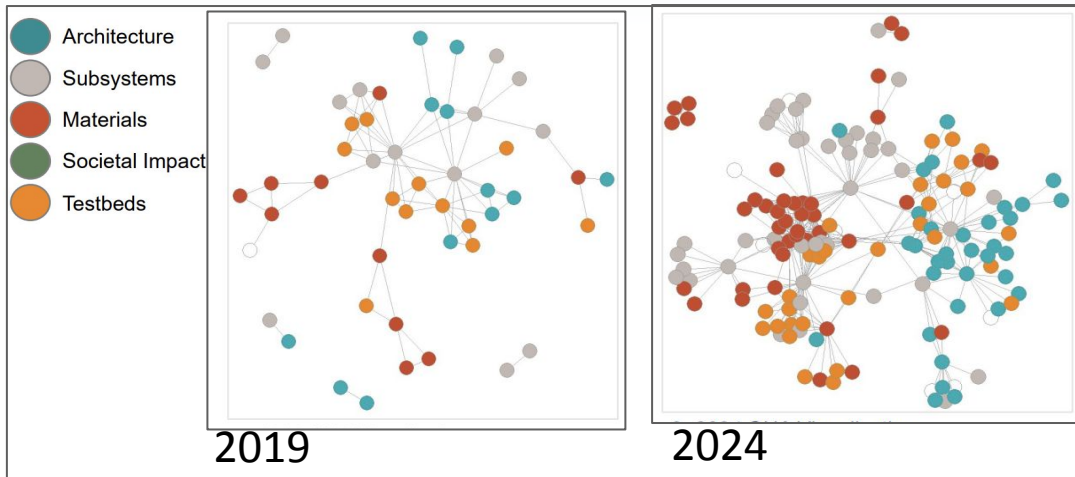
Findings: Integration and Vision (Y5)

Integration

- 154 members co-authored 239 publications across CQN
- 61% of projects involved three or more institutions
- ZALM working group a best practice for cross-thrust collaboration (Thrust 2 + 3)
- Integration between Thrusts 1–3 strong; Thrust 4 integration still developing

Vision and Leadership

- Clear and ambitious vision for the quantum internet recognized nationally
- 70–77% of members report receiving needed information from CQN
- All foundational components met or partially met objectives



“The Center achieves interdisciplinary collaboration as part of its foundation– that’s what makes it effective.” (Spring 2025 CQN member survey)

Opportunity: Enhance use of evaluation and feedback loops to connect strategic goals with real-time decision-making

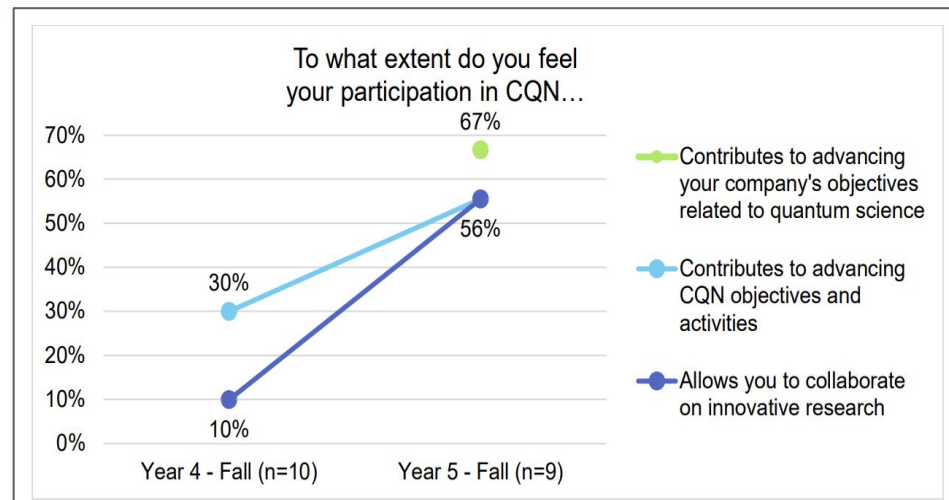
Findings: Workforce & Partnerships (Y5)

Engineering Workforce Development

- 55% improved professional skills, 57% improved research skills
- 86% rated mentoring as high quality
- 70% participated in ≥ 1 EWD activity
- 81% of Winter School participants sustained or increased interest in quantum
- SparCQS: 70% repeat visits; 100% teachers reported high student engagement

Innovation Ecosystem

- 19 industry partners retained (+1 new) | 13 patent applications filed
- 2 customized industry research projects completed
- Translational publications still emerging (*lagging indicator*)



Increase in perception of benefits from partners from 2024-2025

Opportunities: Strengthen industry integration in research and expand tracking of alumni and workforce outcomes.



Strategy

Developmental Evaluation

Informs and supports innovative and adaptive program development in complex environments or within interconnected and changing systems--exemplified by the interdisciplinary ERC model.

Patton, M. Q. (2011). Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use. Guilford Press.

Traditional Evaluation Process



Developmental Evaluation Process



Framework for Year 6-10

- Fully aligned with NSF Gen-4 Performance Criteria.
- Uses Developmental Evaluation to provide real-time learning and iterative feedback.
- Incorporates mixed-method data collection (surveys, interviews, bibliometrics, and network analysis).
- Emphasizes utilization, reflection, and continuous improvement across all foundational components.

Performance Criteria Section	Evaluation Question	Outcome Measures	Data Sources	Success Criteria
Transformational	To what extent is CQN's vision transforming the engineering community, scientific enterprise, and society?	Evidence of influence on the field (citations, recognition in national/global forums, policy engagement). Documented societal use cases (e.g., secure quantum communications, entanglement-enhanced sensing).	Renewal proposal milestones, publication metrics, external advisory board (EAB) input, industry/government stakeholder interviews.	CQN is recognized as enabling transformative applications and shaping the emerging field of quantum networks.
Leading Edge	How is CQN recognized as a leader in the field due to its cross-disciplinary, systems-level vision?	Leadership roles in national/international collaborations; visibility in high-impact journals; partnerships across academia, industry, and government.	Bibliometric analysis, NSF/ERC reports, industry advisory board (IAB) feedback, participant surveys.	CQN is acknowledged as a global leader in transdisciplinary quantum networking research and education.
Integration	How well does CQN integrate its four foundational components (CR, EWD, IE, EP) into a coherent vision?	Evidence of cross-pillar collaboration; shared goals across thrusts/testbeds; activities refined based on feedback.	Leadership interviews, annual reports, meeting notes, evaluation focus groups.	Demonstrated interdependencies between pillars; leaders articulate a clear, integrated strategy.
Societal Impact	How is CQN beginning to demonstrate societal impact (resilience, productivity, safety)?	Early technology translation outcomes (patents, startups, licensing, testbed partnerships). Evidence of workforce outcomes.	NSF reports, innovation ecosystem data, stakeholder workshops, REU/EWD/EP program tracking.	Demonstrated early societal impact, such as technology demonstrations with partners, impactful workforce development, and visible pathways to broader adoption.
Strategic plan	Strategic plan	Strategic plan	Strategic plan	Strategic plan
Performance Criteria Section	Evaluation Question	Outcome Measures	Data Sources	Success Criteria
Integrated Strategic Plan	How effectively does CQN integrate its four foundational components (CR, EWD, IE, EP) into a coherent and adaptive plan?	Evidence of refinement of goals across pillars; cross-pillar initiatives documented; alignment with NSF ERC requirements.	Annual reports, logic model, leadership interviews, EXCOM/leadership team meeting notes.	Strategic plan demonstrates evolving integration; feedback from NSF Site Visit Team (SVT) and advisory boards is incorporated.
Convergence	To what extent does the strategic plan foster deep, transdisciplinary collaboration toward societal impact?	Evidence of cross-disciplinary publications, collaborative projects, new frameworks or paradigms.	Bibliometric analysis, project milestone tracking, thrust leader interviews, publication networks.	Clear evidence of transdisciplinary collaboration leading to novel results that could not be achieved within disciplines alone.
Stakeholder Engagement	How effectively does CQN engage stakeholders in shaping its direction and activities?	Documented engagement of industry, government, and community partners; evidence of co-development of initiatives; evolving stakeholder relationships.	IAB meeting notes, stakeholder surveys, partnership agreements, workshop records.	Stakeholders are active participants in CQN's planning and decision-making; feedback loops shape center priorities.
Team Formation	How intentional and effective is CQN in forming a diverse, cross-institutional, interdisciplinary team?	Evidence of onboarding and integration of new team members; diversity in disciplines, institutions, and demographics; faculty/student perceptions of team effectiveness.	Demographic tracking, collaboration surveys, interviews with thrust and pillar leads, leadership retreat observations.	Team is cohesive, diverse, and well-integrated across partner institutions, with effective onboarding processes in place.



Learning Organization in Action

- Evaluation insights will inform leadership meetings, retreats, and advisory board discussions.
- Data will be used to identify **patterns, not just outcomes** in order to clarify the ways that CQN's systems enable or constrain progress.
- Evaluation findings will directly feed into:
 - Annual goal-setting and pillar plans
 - Cross-site integration efforts
 - Sustainability planning (post-NSF transition)



Next Steps: Evaluation Priorities (Y6)

- Embed evaluation within leadership decision-making (Evaluator as *Ex Officio* member of leadership team).
- Implement streamlined Workplace Excellence survey to broadly assess culture, communication, and collaboration.
- Launch CQN Alumni Tracking System to measure long-term workforce and translational outcomes.
- Map all data collection to Gen-4 criteria to ensure comparability and reduce reporting burden.
- Build evaluation capacity within CQN teams using existing tools where effective, refining and discarding others as needed



Closing Takeaways

- CQN is well positioned for its second phase: The foundation is strong, and learning systems are being built and will be used and strengthened through evaluation work.
- Year 6 evaluation will bridge assessment and action, supporting CQN's maturation as a learning, adaptive, and sustainable organization.
- CQN's evaluation approach will now prioritize using results to inform action in addition to documenting outcomes.