



Canada's National Quantum Strategy Survey

Executive Summary

Prepared for Innovation, Science and Economic Development Canada (ISED)

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Executive summary

A. Background and objectives

Quantum science, an emerging field at the forefront of research and innovation, holds immense potential to revolutionize various industries. From developing life-saving drugs to creating next-generation batteries, quantum technologies are set to reshape how we design and develop many things. Canadian scientists and entrepreneurs are poised to capitalize on these opportunities and become leaders in this fast-growing field.

The National Quantum Strategy (NQS) is an initiative to bolster Canada's quantum sector and ensure its prominent position among global frontrunners. The NQS revolves around three key pillars: research, talent and commercialization. Through strategic investments and targeted support, the NQS endeavours to achieve key missions in quantum computing hardware and software, communications and sensors.

Launched on January 13, 2023, the NQS aims to catalyse the growth of Canada's quantum sector and solidify its leadership in this transformative field. Specifically, the NQS seeks to amplify Canada's existing strength in quantum research, foster growth of quantum technologies and establish Canada as a global leader. To fulfil its responsibilities and ensure the effectiveness of the strategy, the NQS Secretariat has committed to addressing data gaps and tracking progress. The NQS Secretariat hired Nanos Research to conduct a quantitative survey, targeting two key groups: Canadian businesses operating in the quantum field and academics specializing in quantum. The primary objective of this research is to gain deeper insights into the Canadian quantum ecosystem.

Objectives

- Filling identified data gaps and tracking key performance indicators;
- Assessing critical aspects of the quantum ecosystem, such as inter-sector collaboration, quantum products and service adoption, the evolving quantum job market and quantum community awareness of NQS programming; and,
- Providing a more comprehensive and data-driven understanding of the quantum landscape in Canada.

B. Methodology

The survey was conducted online and was deployed to a list provided by ISED and a total of 112 individuals participated. The sample included 66 individuals in businesses/non-profits in the quantum sector (46 unique businesses) and 46 academics (23 unique universities/institutes) in the quantum sector. For business/not-for-profits, only one response per organization was included. The survey had a response rate of 26%.

The survey consisted of two streams: Stream 1: Industry/Non-profits and Stream 2: Academics. The questionnaire consisted of separate modules for each stream with questions asked that are relevant to each, as well as several core questions which were the same for both streams.

The fieldwork was conducted between February 21st and March 1st, 2024. Details on the rate of participation can be found in Appendix A, and the questionnaire is provided in Appendix B.

C. Contract value

The contract value was \$73,746.31 (HST included).

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PWGSC contract number: CW2343345

Original contract date: 2024-12-27

For more information, contact ISED at publicopinionresearch-recherchesurlopinionpublique@ised-isde.gc.ca

D. Political neutrality statement and contact information

I hereby certify, as a Representative of Nanos Research, that the deliverables fully comply with the Government of Canada political neutrality requirements outlined in the Government of Canada's Policy on Communications and Federal Identity and Directive on the Management of Communications. Specifically, the deliverables do not include information on electoral voting intentions, political party preferences, party standings with the electorate, or ratings of the performance of a political party or its leaders.



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E. Key findings

The survey consisted of two streams: Stream 1: Industry/Non-profits and Stream 2: Academics. The following key findings and report contain findings from the two streams, and it is noted throughout which stream the findings relate to.

Research and collaborations

Industry and academic respondents most often report they or their organization conducts research and development related to all of the quantum areas, in roughly similar proportions. Quantum sensors was identified as an area of R&D for 48% of academics; and 39% of industry respondents, quantum communications and cryptography by 44% each of academics and industry respondents, and quantum computing hardware (41% of academics; and 46% of industry respondents) and quantum materials (37%).

Almost all industry (95%) and academic (96%) respondents report collaboration with other players in the ecosystem. Academic respondents most often report collaborating with universities and colleges in Canada the most (87%), followed by universities and colleges in other countries (78%), companies located in Canada (67%), and Canadian research institutes (61%). Only four percent of academics report they do not collaborate with any of these entities. Similarly, industry respondents most often report collaborating with universities and colleges in Canada (85%), as well as companies located in Canada (77%), companies located outside of Canada (71%) and Canadian federal government laboratories (64%). Just five percent of industry respondents report their organization does not collaborate with any of these entities.

Both industry and academic respondents rate collaborations with universities and colleges in Canada as important (academics: mean score of 8.5 out of 10; industry: mean score of 7.9), however, industry respondents also rate companies inside (mean of 8.2) and outside of Canada (mean of 8.1) as most important. Academics are more likely to think collaborations with universities and colleges outside of Canada is important (mean of 7.9) than industry respondents (mean of 6.1).

In terms of the main benefits to these collaborations, both academic and industry respondents often mention innovation, advancing knowledge and the sharing of new ideas as the primary benefits (35% of academics; 37% of industry respondents). Additionally, both groups mention that the main output from these collaborations has been ongoing research collaboration or just ongoing collaboration (93% of academics; 79% of industry respondents).

Talent

Fifty-seven per cent of academic respondents report their department has tried to hire a new faculty member in quantum in the past six months, while more than two in three industry/non-profit respondents report their organization has tried to fill positions in the last six months for which a quantum science and technology background is important (69%). Industry respondents report the search took place primarily within Canada (89%), followed by the US (44%) or Europe (40%) and close to eight in ten say their organization is likely (61%) or somewhat likely (18%) to hire candidates in the next six months.

Sixty-one per cent of industry respondents report their organization found qualified Canadian candidates that met their needs (61%), and 64% report their organization filled some (42%) or all (22%) of the positions they were hiring for. Industry respondents said the most effective recruiting tools were social media (including LinkedIn) (64%), job posting websites (i.e., monster.ca, Indeed) (38%) and a recruiting agency (27%).

When industry respondents were asked what the biggest barriers are to hiring for their organization, top responses included a lack of qualified candidates (36%), candidate expectations (i.e., salary and benefits) (27%) and immigration barriers (22%). Industry respondents feel the biggest shortages of qualified candidates in the sector are in quantum computing hardware (49%), quantum communications and cryptography (47%), quantum software (46%) and quantum sensors (44%).

Industry respondents noted women were the top reported underrepresented group present in their organization's workforce (86%), followed by racialized persons (72%) and the 2SLGBTQIA+ community (49%). The biggest challenges to have a diverse workforce included: few diverse candidates available to fill jobs and a lack of qualified candidates in a field that is already not diverse (43%), and that skills and talent are more important (19%).

Nine in ten academic respondents say they are likely (80%) or somewhat likely (11%) to remain in Canada in the next five years to pursue their research and say funding opportunities (mean score of 8.9 out of 10) and quality of life (mean of 8.8) are the top factors that are most important when choosing where to conduct their research. Similarly, a majority of industry respondents say their company or organization is likely (71%) or somewhat likely (14%) to remain in Canada for the next five years.

Regarding underrepresented groups included in the workforce of their academic department, respondents most often report that women are represented in their department (58%), followed by racialized persons (42%), 2SLGBTQIA+ community members (33%), and persons with disabilities (22%), while 27% report none of these groups are represented.

In terms of the main challenges related to hiring a more diverse workforce, the top response for both industry and academics is that there are few diverse candidates available to fill jobs and a lack of applications (43% of industry respondents; 41% of academics).

Commercialization of research

Over half (55%) of the respondents in both industry and academic streams report they have filed a patent related to quantum technology. Additionally, more than three in four industry and academic respondents report they have engaged potential end users of their product and/or service within the past year (78%), with industry respondents more likely to report having done this (88%) than academic respondents (64%).

When asked about the level of interest potential end users have in adopting quantum technologies, nearly all industry and academic respondents say end users are interested (63%) or somewhat interested (34%), but they are less likely to say end users are comfortable (20%) or somewhat comfortable (49%) with adopting quantum products or services.

Examining barriers to end users adopting quantum solutions, industry respondents most often said that use cases are still being proven and not adopted widely yet (21%), it is too early for adoption, and their work or

technology is not ready yet (20%) and that there is a lack of knowledge and understanding of the technology by end users (20%). When academics were asked about barriers preventing the commercialization of their research, a similar sentiment was shared, as they also often said that it is too early and the work or technology is not ready yet (27%), followed by not being interested in commercializing it (18%).

Awareness and use of federal programs

Overall, both industry and academic respondents rate themselves as knowledgeable (71%, score of 7-10) of how federal programming can support quantum research and development (mean of 7.4 out of 10).

Survey respondents indicated a high level of awareness of many federal quantum related programs supporting commercialization, for example, a majority of industry and academic respondents report having heard of the NRC Industrial Research Assistance Program (IRAP) (87%), followed by the NRC Challenge Program (84%) and the Innovation for Defence Excellence and Security (IDEaS)(81%). Industry and academic respondents who had heard of these programs were most likely to report having applied for and received funding from IRAP (37%), Innovative Solutions Canada (ISC) (36%) and Regional Development Agency funding (30%). Industry and academic respondents noted that the application or approval process for these federal programs supporting commercialization are too long or complex (20%) and there are too many requirements, and they should be relaxed (10%).

In terms of federal programs that support research, both industry and academic respondents were most likely to report having heard of the NSERC Alliance Quantum federal program (87%), while two in three report they have heard of the Canadian Institute for Advanced Research (67%) and just over one in ten report awareness of the Bank of Canada PIVOT program (12%). One in three of industry and academic respondents who have heard of the NSERC Alliance Quantum program report they applied for and received funding (32%; 21% report they have applied, and the decision is pending), while two in ten say the same for the Canadian Institute for Advanced Research (20%). When asked for comments on their engagements with these federal programs, industry and academic respondents mentioned the Alliance program doesn't fund companies or the private sector (24%) and nine percent said CIFAR doesn't have open calls for funding, and it is invitation only.

For federal programs that support talent, nearly all industry and academic respondents reported having heard of the Mitacs program (98%), while more than three in four had heard of NSERC Create (77%). More than half of industry and academic respondents who have heard of Mitacs report they have applied for and received funding (59%), while three in ten have received funding from NSERC Create (31%; 11% report they applied but did not receive funding). One in four industry and academic respondents each commented that the federal programs supporting talents are good programs and they have applied successfully (25%), that the programs are difficult to apply for or have too many requirements (25%), that the programs don't apply to industry and they must go through academia to apply (25%).

Views on the National Quantum Strategy (NQS)

Nearly all industry and academic respondents (98%) reported being aware of that Canada released its National Quantum Strategy (NQS) in January 2023, with close to one in two of those aware of the strategy, saying they are satisfied with the three main aspects of the NQS: making Canada a world leader in the continued development, deployment and use of quantum computing hardware and software (54% satisfied, score of 7-10), ensuring the privacy and cyber security of Canadians in a quantum enabled world, through a national secure quantum communications network and a post-quantum cryptography initiative (51% satisfied) and enabling the government and key industries to be developers and early adopters of new quantum technologies (47% satisfied).

Over two in three industry and academic respondents who have heard of the NQS agree (22%) or somewhat agree (47%) that the NQS missions create clear priorities for quantum in Canada, while one in four somewhat disagree (16%) or disagree (10%). When asked why they have that opinion (either positive or negative), industry and academic respondents mentioned the objectives being very broad (26%), not enough funding or issues with funding (13%) and the implementation being slow or having issues with implementation (12%).

A majority of industry and academic respondents aware of the NQS (86%) report they have received information from the Federal Government concerning events related to the NQS, including workshops, roundtables and missions.