Does your business have a quantum strategy?

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According to Gartner, a leading research and advisory firm, the looming importance of developing a quantum technology plan for businesses cannot be overstated. Just as most organizations were caught off guard by the sudden market emergence of artificial intelligence (AI), companies need to learn from that experience and prepare for the inevitable advancements in quantum technology. The lessons learned from AI's rapid evolution highlight the importance of staying ahead of the curve and investing in research, development, and strategic planning for quantum computing. Businesses need to assess the potential impact of quantum technology on their industries and explore its possibilities for enhancing computational power, data analysis, and security. By proactively incorporating quantum technology into their long-term strategies, businesses can position themselves to harness its transformative capabilities and gain a competitive edge in the future.

"Quantum computing is complex and can't be turned on overnight. Starting early is the surest form of success for CIOs on their quantum journey," explains Chirag Dekate, VP Analyst at Gartner.

2023 – moving from Quantum Advantage to Quantum Economic Advantage

The mainstream discourse focuses on Quantum advantage which refers to the capability of quantum computers to solve computational problems faster than classical computers, even if the solutions obtained are not practically useful or relevant.

"A business achieves a quantum economic advantage when a quantum computer provides a commercially relevant solution, even if only moderately faster than a classical computer could, or when a quantum computer provides viable solutions that differ from what a classical computer yields." -- Francesco Bova, Avi Goldfarb, Roger Melko – MITSLOAN Management review, Spring 2023

Courtesy from DisitriQ

Quantum advantage aims to prove that quantum systems can outperform classical algorithms in specific domains. Quantum advantage is the stepping stone to the potential revolution in fields like cryptography, optimization, drug discovery, and materials science by significantly accelerating computations and unlocking new possibilities for solving complex problems.

Quantum economic advantage prioritizes the use of quantum computers to address real-world business challenges rather than solving purely academic problems, and highlight the computational superiority of quantum computing. While solutions derived from quantum economic advantage may differ from classical computing solutions, the additional perspective and knowledge gained can enhance the developed solution. Businesses are seeking to tackle complex and strategic challenges that cannot be practically solved by classical computing. They are primarily concerned with obtaining a powerful solution, regardless of its underlying technology, from classical, quantum, or hybrid computing.

Quantum technologies have been developed and deployed in limited use cases – however resolving strategic business challenges at scale via quantum computing so far has not been achieved. To that end, countries worldwide are making substantial strategic investments, amounting to billions of dollars, to secure an early lead as quantum

innovation pioneers, driven by the potentially transformative opportunities offered by quantum technologies. Concurrently, venture capital funding for early-stage quantum technology firms focused on commercial solutions is experiencing unprecedented growth.

> *"Pursuing a share of that value, in 2022 investors poured $2.35 billion into quantum technology start-ups, which include companies in quantum computing, communications, and sensing. The total edged out 2021's record for the highest annual level of quantum technology start-up investment. In fact, four of the biggest deals in the 2000s closed last year. -- McKinsey, April 24, 2023*

Nevertheless, McKinsey has identified critical obstacles impeding the rapid development of quantum solutions for real-world business problems. Foremost among these challenges are the exorbitant costs and limited availability of quantum computers and the sophisticated infrastructure necessary for supporting commercial research. Additionally, building the required digital infrastructure, encompassing quantum algorithms and hybrid software that leverage both quantum and classical computers, poses significant difficulties in terms of time, complexity, and expenses. Furthermore, acquiring access to quantum talent and managing the associated costs remain significant barriers, along with fostering collaboration between researchers to expedite problem-solving capabilities.

Consequently, businesses must take immediate action to secure an early position in the race for quantum economic advantage, as the risks of falling behind could have severe repercussions for their organizations. Thanks to DistriQ, companies all over the world can now address theses opportunities.

Courtesy from DisitriQ

Not all Quantum Innovation Zones or Hubs are created equal.

At DistriQ, the Quantum Innovation Zone in Sherbrooke, Quebec, Canada, we recognized the immense strategic potential of quantum technologies. However, they went beyond mere recognition and understood that to harness this potential, it was essential to establish a comprehensive framework that encompasses the entire innovation chain, spanning from academic ideation to commercial product development. DistriQ recognized the importance of not only identifying these unique stages but also establishing a supportive infrastructure to address the key challenges highlighted by McKinsey. By doing so, they empower quantum entrepreneurs with the necessary resources and capabilities to develop their solutions more effectively and efficiently. DistriQ's holistic approach ensures that innovation is not only nurtured but also supported throughout all stages of its evolution, fostering a thriving quantum ecosystem in which ideas can flourish and transform into impactful real-world solutions.

The result is a Quantum Innovation Zone unlike any other on the planet.

DistriQ distinguishes itself through its strategic approach to fulfilling its purpose. The key to ensuring the long-term success and growth of DistriQ lies in its focus on developing ground-breaking quantum solutions that directly address real business challenges, not the underlying quantum research and development – this aspect is diligently addressed by academia, providing a fundamental added value in training the next generation of highly qualified individuals. As these successes accumulate, a thriving community of quantum innovation companies will emerge, alongside an ecosystem of supporting organizations that cater to the increasing demands of the wider world. The critical factor for achieving this success is the establishment of an early strategic position, designed to meet the needs of key stakeholders and foster accelerated growth—a vision that DistriQ has precisely implemented.

Who are the constituents that comprise DistriQ, and what is the value proposition that unites them into a singular and strategic quantum force unlike any other on the planet?

Clients – Global companies

DistriQ's clientele are Global organizations, keenly seeking the strategic advantages offered by quantum solutions. Reflecting on the recent disruptions caused by the abrupt rise of AI, many of these organizations still navigate the ripple effects of being caught unprepared. In boardrooms across the globe, the looming specter of quantum technologies has thrust a critical question into the spotlight: how are these organizations preparing for the opportunities and risks inherent in this new quantum landscape?

Considering the challenges presented by McKinsey, how do these global organizations surmount the obstacles of accessibility, costs, and time delays in establishing a commercial quantum research center? How do they develop the necessary algorithms for quantum and hybrid computing, and find the scarce talent required to deliver on these endeavours?

DistriQ - Quantum Innovation Zone is on the verge of completing the world's first business focused quantum innovation centre, set to open its doors in early fall 2023. This ground-breaking facility spans an expansive 50,000 square feet and will stand as the most comprehensive and extensive commercially focused quantum innovation center. It will bring together the leading experts, and new quantum technology companies (partners) from around the world and boasts the most fully equipped shared commercial quantum development labs. This commercially oriented quantum center is just one of several planned quantum innovation centres in the Zone aimed at supporting the growing influx of quantum start-ups eager to leverage the infrastructure and collaboration opportunities provided by DistriQ.

Courtesy from DisitriQ

These centres are painstakingly designed to equip client and partner research teams with state-of-the-art quantum technologies and a digital infrastructure, within a collaborative work environment.

This setup not only accelerates the development of solutions being created by quantum start-ups, but also fosters collaborative initiatives and subgroups focused on resolving client challenges – providing strategic and lucrative quantum economic advantages to early moving clients.

Partners – quantum technology companies

As highlighted in this article, quantum start-up partners face the challenge of accessing expensive and hard-to-find commercial quantum research infrastructure. The quantum innovation centre, equipped with office spaces for teams, effectively addresses these challenges, and serves as a robust platform to expedite the development of innovative technologies through collaboration.

When start-ups collaborate to solve customer challenges, they cultivate profound relationships that fast-track problem-solving. These partnerships bridge the gap between different start-ups, resulting in comprehensive solutions that address customer needs more effectively. This synergy often leads to fresh product offerings and reveals unexplored market opportunities, contributing to an ever-evolving technological landscape.

Working directly with clients also affords start-ups a unique perspective. It allows them to shape and accelerate the development of new products based on valuable real-world feedback gathered through technology testing. The iterative process of testing, feedback, and refinement leads to offerings that are finely tuned to market needs.

From a financial perspective, revenue from collaborative projects demonstrates market viability. This can be a key factor in securing investment for start-ups, enabling them to expand their teams, and negotiate future venture investments with greater leverage.

Lastly, brand exposure is another key benefit of working with clients. By engaging in business challenges for Global 500 companies alongside peer partners, start-ups enhance their brand awareness. This not only instills

confidence in their capabilities but also bolsters the perceived viability of their technologies, attracting future clients and investors.

In sum, clients function as powerful catalysts for growth in the world of tech start-ups. Through collaboration, real-world testing, revenue generation, and brand exposure, they support and expedite the innovative journey of these ventures, shaping the technological landscape of the future.

DistriQ has already filled 80% of the space in its first quantum innovation centre, with agreements in place with several industry-leading quantum start-ups, including some from the international, such as Nord Quantique, PASQAL, Multiverse, 1Qbit, and Qbit Pharmaceuticals, among others. Plans for the next quantum centre are already underway.

DistriQ partners already active in Japan.

"A strategic investment that Fujitsu has made in 1QBit provides significant resources to accelerate its research and development efforts and drive quantum computing applications across various industries. Furthermore, 1QBit has enjoyed strategic partnerships with NTT's Basic Research Lab, renowned pioneer in quantum research, and its new PHI Lab initiative. These collaborations have harnessed the collective expertise to advance quantum computing and AI methods, algorithms, and hardware devices, unlocking new frontiers in advanced computing." --Dominic Marchand, Director of 1QBit Sherbrooke.

"Our partnership with Presidio Ventures, of Sumitomo Corporation, showcases the potential of partnerships with quantum companies in the Zone to foster the development of Proof-of-Business to potentially pursue Quantum Economic Advantage." --Philippe St-Jean, CEO and co-founder of Nord Quantique.

A World Class Quantum Ecosystem

DistriQ embodies the vision for a sustainable and progressive quantum ecosystem. It is not a single organization but a collective of various entities aiming to make an indelible impact on the planet's future through the power of quantum technology. Key elements of this diverse ecosystem include academic excellence, state-of-the-art R&D infrastructure, rich talent reserves, and a combination of private and public funding sources.

- At the heart of this ecosystem is the Institut quantique of Université de Sherbrooke, a global beacon for quantum talent. Built on strong international collaborations and concerted efforts in quantum materials, information, and engineering, this unique research center is perfectly poised to navigate the needs of the digital age. The researchers at the affiliated 3IT brings potent forces around superconducting device fabrication – focussing on key areas that promise substantial impacts: robotics, sustainable energy, health, digital transformation, and society.
- PINQ2 – Platform for Digital and Quantum Innovation of Quebec, is a non-profit organization created by the Université de Sherbrooke and the ministère de l'Économie, de l'Innovation et de l'Énergie du Québec (Ministry of Economy, Innovation and Energy of Quebec) in 2020. Its mission is to support organizations in accelerating their digital transformation, to enhance collaboration, and to simplify technology transfers between industries and research, in addition to training the talents of tomorrow. The PINQ² platform is based on conventional, hybrid and quantum digital solutions, and is accessible to all Quebec companies and to all academic networks and College Centres for the Transfer of Technology (CCTT).
- DistriQ actively fosters investment for quantum innovators. It provides critical early-stage support, attracting investment from diverse sources and enabling local investment partners' leverage. Notably,

"The Institut Quantique and Université de Sherbrooke research team, faculty, university community and dedicated staff represent over 300 people supporting the development of quantum technologies," said -- Vincent Aimez, Vice-Rector, development & Partnerships of Université de Sherbrooke.

the Quantum Studio offers pre-seed funding and a supportive structure for quantum entrepreneurs. Quantonation Ventures, with over €100m under management, and Investment Québec, committed to catalyzing Québec's economic development, further bolster the ecosystem.

- Beyond the quantum realm, the ecosystem encompasses an impressive R&D innovation chain. An example is C2MI, the crucial bridge between applied research and the swift commercialization of microelectronic components. C2MI aids both small and large companies in turning their concepts into reality, shortening the gap between academic research and industrial production.

"Investment Québec International can support Japanese companies who would like to establish a foreign direct investment in the Zone" Akira Yamaguchi, Director Japan, Foreign Direct Investment, Investment Québec International.

Don't wait for your competitor to establish an advanced position of Quantum Economic Advantage…

In today's rapidly evolving technological landscape, the urgency for business leaders to implement a quantum plan cannot be overstated. DistriQ sets a new standard for quantum ecosystems, offering a favourable environment for organizations seeking to resolve compelling business challenges and for quantum start-ups to establish a presence to accelerate their innovation.

In addition, Chénier La Salle, Délégué général of Québec at Tokyo and his team, can help you and any Japanese organisations to create partnerships and business opportunities with Québec's stakeholders.

<About the authors>

Richard St-Pierre – Richard has held multiple board memberships and CxO positions for over thirty years, during which time he has been at the forefront of technology transformations. Richard was awarded one of the Top 10 Innovators of 2017 by the American magazine BizBash. Recently, he directed the creation of C2 by assembling cohorts of influential minds resulting in more than $700 million in annual economic impact. During the COVID pandemic, Richard served as a Strategic Advisor for the Quebec Ministry of Health.

Mark M.J. Scott – Mark has a successful track record of developing marketing strategies in the tech industry. Early in his career he developed communication strategies and materials for the Canadian Space Agency (Microgravity Sciences and RADARSAT) and Rolls-Royce Aerospace. He led marketing strategies resulting in the growth of three successful tech companies: Zero Knowledge Systems, an early pioneer in B2B SaaS (acquired by AppDirect), OptoSecurity a defence and civil aviation security technology, (acquired by a division of Toyota Corp.); TrueContext, a B2B SaaS Low Code Application Platform, where he rapidly grew sales from $500K ARR to $30M+ ARR.

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