



A Roadmap for Quantum Maturity

Progressing your organization along the
five levels of quantum maturity

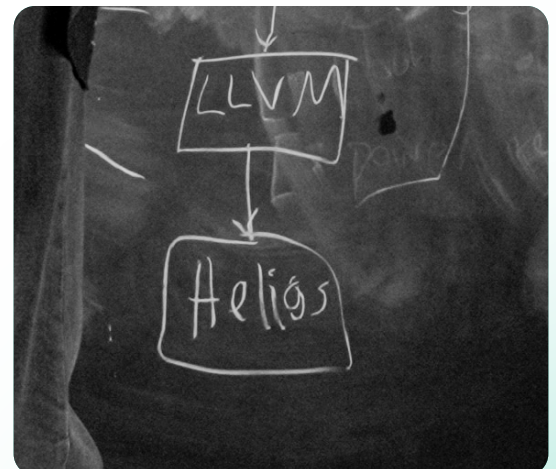
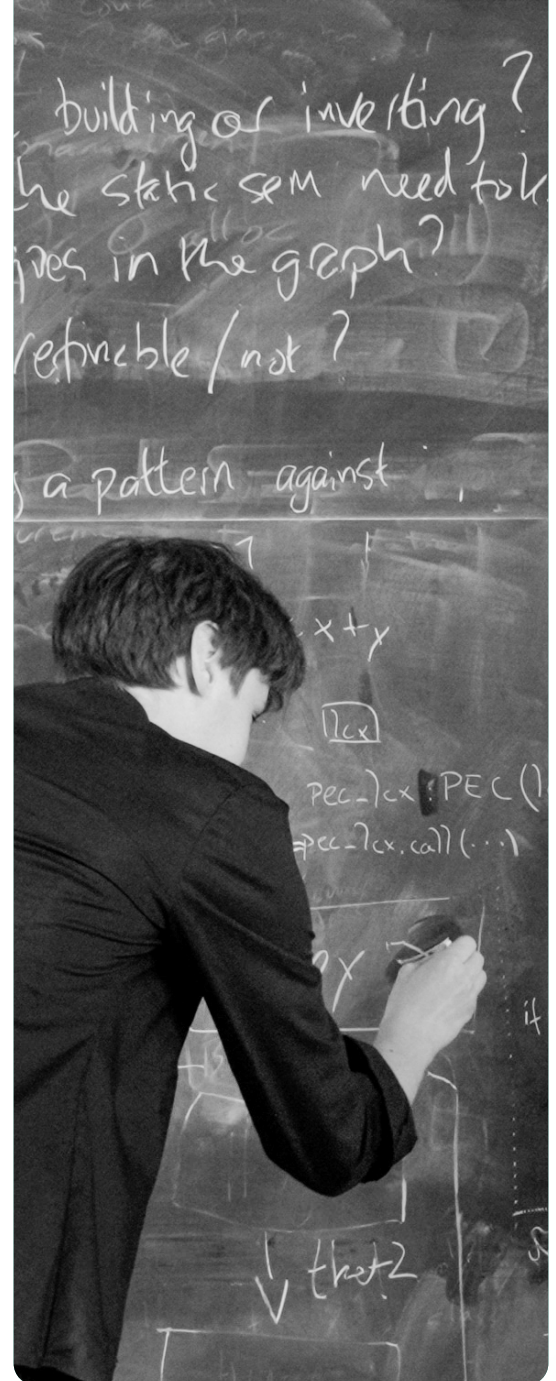
QUANTINUUM CONSULTING SERVICES
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After years of rapid technological advancements, the quantum era has arrived. As classical high-performance computing (HPC) runs up against its scaling limits, quantum computing will accelerate existing methods while solving new challenges beyond the reach of HPC alone. Applications span a wide range of industries from life sciences to energy and materials, to financial services, to transport and logistics.

In pharmaceuticals, imagine a world where a novel cancer drug reaches patients in 3 years instead of 12 because quantum simulation mapped its molecular interactions with a level of detail and precision no classical computer could ever achieve. That single acceleration could unlock billions of dollars in value while saving countless lives.

In logistics, companies are pursuing quantum computing with the aim of optimizing complex processes and supply chains through combinatorial calculations that were once intractable.



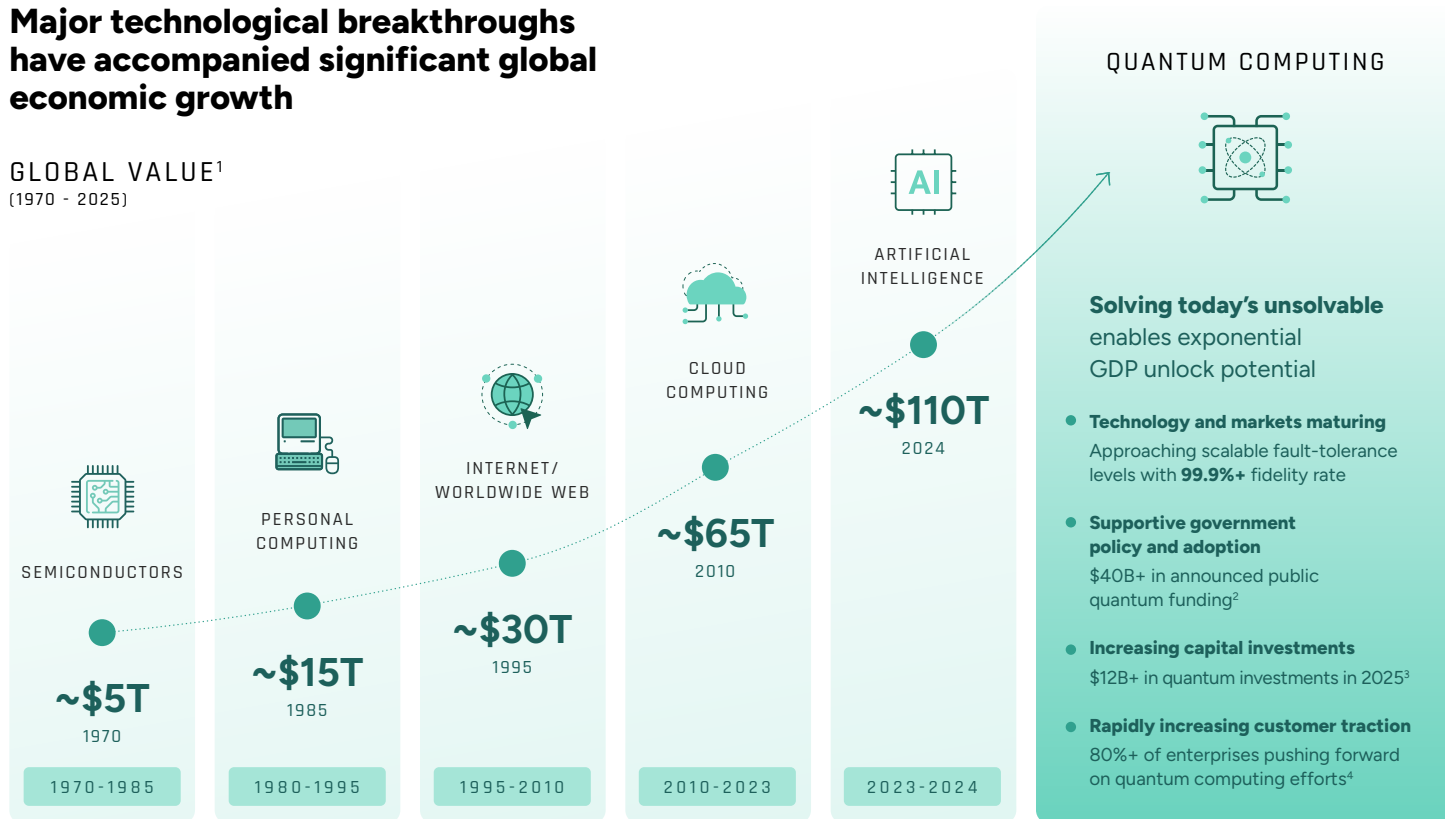
Global GDP growth over the last 50 years has repeatedly been boosted by the invention and commercialization of novel computer-based technologies (Exhibit 1). From the spread of semiconductors & personal computers to the rise of the internet and cloud computing to the arrival of modern GPUs and generative AI, each wave has enabled humanity to tackle bigger, more complex problems and provide access and opportunity to more people around the world. While social, cultural, and political systems are still adapting to these technological breakthroughs, global economic productivity and global quality of life indicators continue to improve. Quantum computing will soon be the next inflection point as the technology now moves from scientific curiosity to commercial implementation.

Quantum computing will not develop in isolation from these earlier technologies. In particular, AI, high-performance computing, and quantum computing will increasingly operate as complementary parts of an enterprise computing stack. For business leaders, the implication is that quantum strategy should not be developed as a standalone technology agenda, but as part of an integrated AI, data, cloud, HPC, and quantum strategy. This will ensure that these technologies are working together to form complete solutions to valuable problems instead of existing as disjointed technology initiatives.

EXHIBIT 1

Major technological breakthroughs have accompanied significant global economic growth

GLOBAL VALUE¹
(1970 - 2025)



¹ Represents GDP measured in current nominal USD; data from World Bank Group

² McKinsey & Company, Quantum Technology Monitor 2024

³ McKinsey & Company, Quantum Technology Monitor 2026

⁴ Based on Hyperion Research's November 2022 report which surveys 300 responses from quantum computing early adopters across US and Europe (Sorensen, Bob; Hyperion Research, 2022, Quantum Computing Early Adopters: Strong Prospects for Future QC Use Case Impact)

Adoption of quantum computing is accelerating, and the opportunity is massive: quantum technologies could contribute a cumulative \$1.3 trillion to \$2.7 trillion in global economic impact by 2035¹ and help tackle some of the thorniest problems facing society. This economic impact is expected to be driven by executing high-value use cases across many different industry sectors, with the largest impacts expected in pharmaceuticals, chemicals/materials, financial services, transport/logistics, and energy. As a result, annual quantum computing investments are up ~6.3x to \$12.6 billion over the last year, with much of that funding coming from the private sector (Exhibit 2). This growth has been driven by convincing demonstrations of scalable hardware technology and a pathway to quantum advantage for high-value industrial use cases in these sectors.

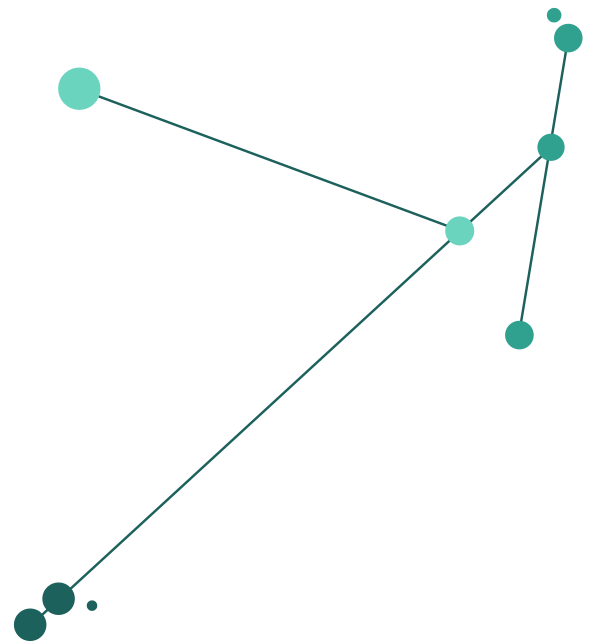
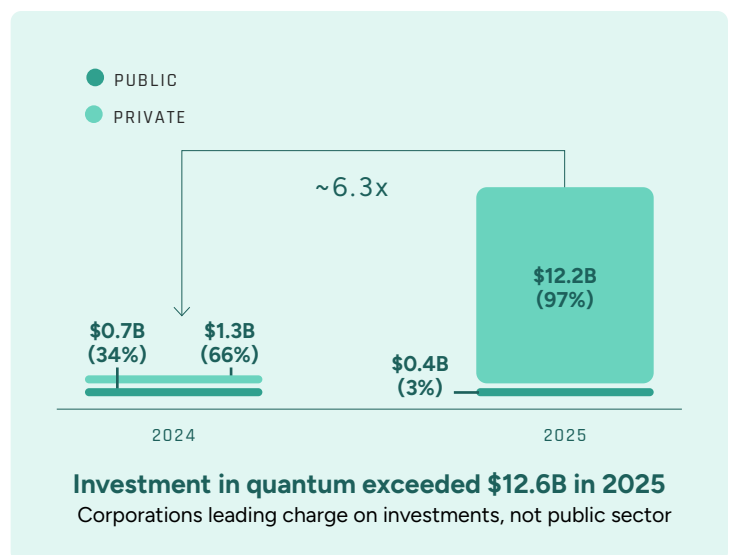


EXHIBIT 2

Quantum investment is accelerating while the ecosystem is already taking shape



¹ McKinsey & Company, Quantum Technology Monitor 2026

As quantum computing begins to reshape industries, early movers will be best positioned to capture a disproportionate share of the value. The quantum ecosystem is taking shape, and the pace of activity and competition is ramping up. Companies that fail to move with urgency now face the very real risk of missing out or falling hopelessly behind due to several factors:

First, the IP race is highly competitive:

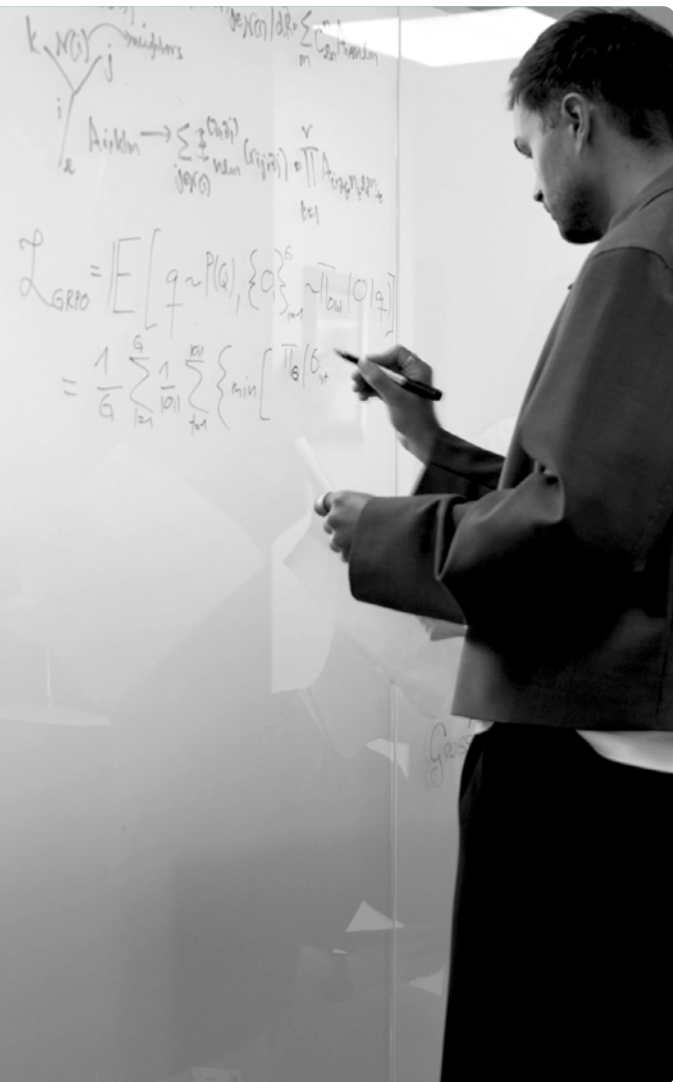
From 2014 to 2024, the industry saw a 500 percent jump in patent filings for quantum technologies.¹ Companies that begin developing proprietary quantum algorithms and workflows today are building reusable intellectual property and domain expertise that competitors will struggle to replicate.

Second, capability building takes time:

Integrating quantum into business workflows - data pipelines, simulation environments, and decision systems - requires multi-year transformation of tooling, teams, and processes. Organizations must recruit and train quantum engineers and redesign core business workflows to integrate quantum algorithms. Late movers face the compounding disadvantage, of early adopters locking in talent pipelines, deepening technical and organizational capabilities, and building the institutional muscle to translate quantum breakthroughs into business value.

Third, quantum talent is at a premium:

Specialized talent is scarce: job postings in the United States for roles with quantum skills increased threefold from 2011 to 2024, with demand outpacing supply.² Early leaders have used partnerships and platforms to accumulate the needed expertise and capabilities.



¹ MIT Sloan School of Management "New MIT report captures state of quantum computing" August 2025

² MIT Sloan School of Management "Building a quantum workforce" September 2025

Quantum is increasingly becoming a priority for many companies

Quantinuum has been at the forefront of commercial implementation. From this vantage point, we have observed three signals of tangible adoption.

01

Hardware has been actively deployed in existing computer environments and can be accessed through selected partnerships. For instance, Quantinuum has installed System Model H1 and H2 at RIKEN's research facility in Japan and will be deploying its Helios commercial quantum computer at a new R&D center in Singapore. It also operates its own quantum facilities in Broomfield, Colorado, and Brooklyn Park, Minnesota in the United States. For organizations seeking cloud-based access, quantum hardware is also available through Oak Ridge National Laboratory (ORNL) and École Polytechnique Fédérale de Lausanne (EPFL).

02

Companies are investing in dedicated quantum teams, budgets, and governance structures. For example, JPMorgan Chase has established an in-house research team seeking to harness quantum to support financial portfolio optimization and risk analysis, and TotalEnergies is harnessing quantum computing to explore carbon capture and storage solutions to mitigate climate change.

03

Companies are building early lighthouse use cases by integrating quantum capabilities into existing workflows. For example, Pfizer has combined quantum computing and generative AI to explore new methods for accurate modeling of drug molecules to understand how they decay. This could help address the over \$11 billion of annual drug inventory prematurely discarded.

Developing an effective quantum strategy requires a clear view of how quantum fits within the organization's broader technology strategy, including AI, HPC, cloud, and data infrastructure. Executives should identify where quantum computing aligns with business priorities, assess the capabilities needed to pursue those opportunities, and select technologies and partnerships that demonstrate credible potential to scale. This foundation enables companies to make focused investments and advance with greater confidence.

Five levels of quantum maturity

Drawing on extensive client experience, we developed a comprehensive quantum maturity framework. It consists of five distinct levels based on markers across talent, technology access, data integration, partnerships, and value realization (Exhibit 3). The more of these elements a company has implemented, the higher its maturity level. Investing in quantum technology projects alone is not sufficient. Companies and their quantum partners must carefully select and develop the right use cases. Today, the leaders in quantum adoption across industries operate at levels 2 and 3. They have established a quantum roadmap that is integrated with their broader digital technology strategy, and they have made substantial investments to explore and develop high-value use cases, with the aim of moving toward level 5 in the next several years to achieve business impact as quantum hardware technology matures.

EXHIBIT 3

Companies progress along five levels of quantum maturity

	Level 1	Level 2	Level 3	Level 4	Level 5
Maturity indicators	Awareness	Exploration	Experimentation	Integration	Scale
Investment	✗ No funding	✓ Limited budget for awareness	✓ Pilot funding	✓ Multiyear investments	✓ Long-term strategic investment
Talent	✗ No talent	✓ Few experts	✓ Small team	✓ Cross-functional team	✓ Enterprise-scale talent base
Use case development	✗ No use cases	✓ Priority use cases defined	✓ Priority use cases in pilot	✓ Pilots scaled	✓ Delivering business value
Partnerships	✗ No partners	✓ Pursuing strategic partnerships	✓ Supporting pilots	✓ Supporting scaling	✓ Mature partner ecosystem
Leadership alignment	✗ Aware - Not engaged	✗ Engaged but with little understanding	✓ Exec sponsor identified	✓ Prioritized in agenda	✓ Embedded in objectives
Strategic quantum roadmap	✗ No strategy or roadmap	✗ Seen as emerging opportunity	✓ Formal roadmap aligned with broader digital strategy	✓ Integration roadmap for quantum, AI, HPC, and data strategy	✓ Scaling roadmap for quantum, AI, HPC, and data strategy
Data readiness	✗ Requirements not defined	✗ Incomplete data	✓ Data standardized	✓ Pilot-ready	✓ Production-grade
Business interest	✗ Limited awareness	✗ Interest emerging	✗ Broad interest	✓ Early work-flow adaptation	✓ Adoption in core processes
Value capture	✗ No business case	✗ Developing business case	✗ KPIs defined	✗ Tracking KPIs	✓ Value and IP captured
Quantum maturity	Low	High			

LEVEL 01

AWARENESS

Organizations have begun discussing quantum computing, but understanding remains limited and activity is largely informal. No clear ownership, use cases, or dedicated budget have been established, and quantum has not yet been incorporated into the organization's broader business or digital technology strategy.

Leadership implication: Build quantum literacy across relevant business and technology leaders to understand where quantum could create value and how it can enhance their broader business strategy.

LEVEL 02

EXPLORATION

Organizations are beginning to assess where quantum computing could be relevant to their business. Potential use cases are being identified and prioritized, often with input from external partners, but internal expertise remains limited and access to quantum capabilities is typically ad hoc.

Leadership implication: Establish a cross-functional working group to identify and assess promising use cases, define evaluation criteria, and determine where deeper experimentation is warranted. Establish a quantum roadmap that is aligned with the broader digital strategy.

LEVEL 03

EXPERIMENTATION

The quantum roadmap is set, and priority use cases have been selected for testing, dedicated resources and initial funding are in place, and organizations are conducting proofs of concept projects with quantum technology providers and other ecosystem partners. Early experiments are beginning to clarify technical feasibility, potential business value, and capability requirements.

Leadership implication: Build the partnerships, talent, and technical capabilities needed to validate priority use cases and translate successful experiments into a repeatable development pathway.

LEVEL 04

INTEGRATION

Organizations have established a multi-year roadmap for integrating quantum, AI, HPC, and data systems and validated use cases are being integrated into business-unit innovation pipelines and production workflows. Cross-functional teams are operational, investment is more systematic, and quantum initiatives are starting to enhance existing workflows and create business value.

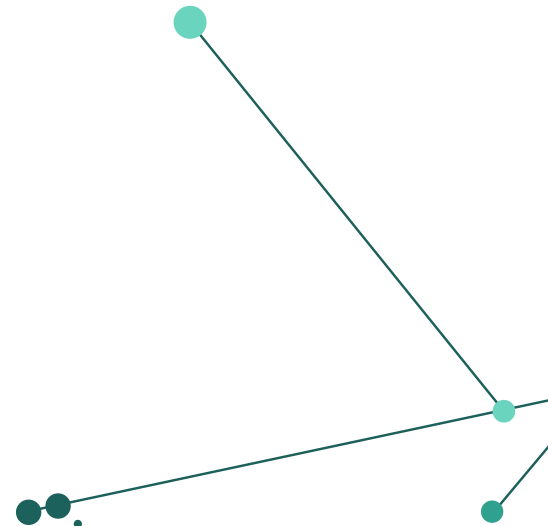
Leadership implication: With early wins and learning obtained, it is now time to establish the operating model required to move successful applications toward production at-scale and repeat this across the company.

LEVEL 05

SCALE

Quantum applications are integrated into complete digital solutions and deployed across relevant products, workflows, or decision-making processes, supported by mature internal capabilities, ecosystem partnerships, and governance. Organizations are developing differentiated expertise and using quantum as part of a broad portfolio of advanced computing capabilities to create sustained business value.

Leadership implication: With quantum, AI, HPC, and data systems now delivering differentiated capabilities and value at scale, leaders should now consider broader business strategy transformation to leverage this competitive advantage in new ways.



Pushing to higher quantum maturity requires deliberate strategic moves

Advances in quantum maturity require a dual focus: to shape business strategy while systematically building and scaling uses cases (Exhibit 4). Companies must first build foundational literacy, clarify where quantum fits within their business strategy, and establish an operational model that supports experimentation before implementing and scaling use cases.

EXHIBIT 4

The quantum computing transformation journey



Quantinuum supports clients along the full journey.

Business strategy levers



Build foundational quantum literacy and strategic alignment

Executives should promote quantum literacy across business and technical leadership. This shared understanding of what quantum computing is, where it creates value, and how it links to core business priorities is essential for making informed quantum computing investment and partnership decisions.

Chart the quantum opportunity map and set the strategy

Determine where computational problems are currently limiting your business and where AI, high-performance computing, quantum computing, or a combination of these approaches could unlock new opportunities. Decide which problems are worth tackling given your mid-term business strategy and establish an appropriate quantum computing strategy that matches your innovation timelines and risk tolerance. Translating business priorities into a clear strategic framework enables companies to make more disciplined investment and partnership decisions, rather than pursuing quantum based on technical interest or hype alone.

Assess high-impact use cases and establish a roadmap

Create a short-list of priority use cases based on estimated value, development cost, and technical feasibility and translate those priorities into a quantum computing roadmap with clear business objectives, timelines, and technical milestones. The roadmap should guide project execution, capacity planning, and future investment decisions. This disciplined approach distinguishes companies building toward scalable quantum capabilities from those that remain limited by isolated proofs of concepts.

Develop internal capabilities

As high-value use cases move into testing and development, begin building deeper internal quantum capabilities to expand the organization's ability to identify, evaluate, and develop additional applications. Over time, this internal capability should support the integration of successful quantum solutions into existing technology environments, business workflows, and broader organizational capabilities.

Update the strategy and transform your business

As quantum solutions become integrated into core business processes and their impact becomes clearer, organizations should reassess how these capabilities could reshape strategy, operating models, and sources of competitive advantage. This includes identifying opportunities to redesign products, services, and workflows around problems that were previously too complex or computationally intensive to solve effectively and determining how those capabilities can create greater value for customers, shareholders, and employees.

Together, these business strategy levers can enable and guide quantum adoption and transformation, so you are not left out.

How we can help

We recognize that achieving quantum maturity is a journey, not a single step. Organizations need the right strategy, capabilities, and partnerships to move from exploration to enterprise impact at-scale. Quantinuum assists companies in navigating every part of this journey with advisory services, use-case identification, capability building, access to technology, and the co-development of scalable quantum solutions. By combining deep expertise with practical implementation experience, Quantinuum is uniquely positioned to help organizations accelerate adoption, build a competitive advantage, and capture long-term value from quantum computing.



Quantum computing was long viewed as a technology of the future. Recent advances have accelerated competition for access, capabilities, and talent, with early adopters increasingly forming strategic partnerships to strengthen their position.

Companies that establish a clear strategic focus, invest in targeted capability building, and pursue the right use cases can lock in IP, progress faster, and derisk their path to value. Companies that defer action and investment in this space may face a growing competitive disadvantage as quantum computing matures. As early movers build talent, capabilities, partnerships, and experience, late entrants may find it increasingly difficult to close the gap.



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Quantinuum Consulting Services helps organizations develop practical quantum strategies, build the capabilities needed for adoption, and identify high-value use cases. The team combines deep quantum expertise with business insight to help companies move from exploration to measurable impact.