QUANTUM STATE OF THE INDUSTRY

REPORT 2026

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QUANTUM AT THE INFLECTION POINT

KPMG is proud to sponsor this year's Quantum State of the Industry report, produced by Quantum.Tech in partnership with The Quantum Insider. This report is grounded in survey-backed industry sentiment and captures what our team is seeing in the market: quantum has moved beyond "scientific curiosity" and into a practical transition toward industrialization, shaped as much by execution realities as by technical progress.
A defining shift shows clearly in these pages: the industry is no longer debating if quantum matters; it's working through how quantum becomes deployable and valuable.

Organizations are "engaging, investing, piloting, and preparing," and the focus has turned to the hard work of industrialization. We believe this is a healthy evolution - and it comes with a higher bar. Progress is increasingly measured not by milestones in isolation, but by reliability, scalability, security relevance, and the ability to deliver tangible value in real environments.

The report is equally clear on what's holding adoption back. The data points to barriers that are "multi-factor and interdependent," rather than a single obstacle that disappears with one breakthrough. The report describes this as a "full-stack readiness gap" - a stack of constraints spanning immature hardware, insufficient talent, uncertain commercial value, and the "last mile" challenge of integrating quantum workflows into real enterprise systems.

For frontier tech leaders like you, the implication is straightforward and should not be surprising: treating quantum as a long-range R&D watchlist is no longer enough - but neither is chasing pilots that can't be operationalized. What we see working with our clients is a disciplined approach to experimentation: fewer, tighter pilots that answer the questions executives actually care about. What business problem are we solving? What does success look like? What would we need—across skills, integration, governance, and vendor ecosystem—to move from pilot to scale? The report underscores that the next inflection point for the ecosystem is the industry's ability to convert pilots into scalable deployments.

Security is the other key theme we want to elevate - because it is both urgent and actionable. The report's findings on post-quantum cryptography (PQC) show a clear gap between rising urgency and operational readiness: 57% of respondents rate PQC readiness as low (1–2 out of 5). The report also highlights the "harvest now, decrypt later" reality and frames security as a "sleeping inflection point" that could catalyze industry-wide action. In

our view at KPMG, PQC is one of the first truly enterprise-wide quantum-driven transitions: it's not dependent on a future breakthrough to justify planning. It must start now, since it will take years to replace legacy encryption. Standards are emerging, migration timelines are long, and the cost of waiting tends to show up later - compressed timelines, resource bottlenecks, and elevated risk exposure.

Finally, this report correctly frames geopolitics as more than a backdrop. It states plainly that "geopolitics is now a structural variable," shaped by quantum nationalism, export controls, and the tension between national competition and the continued need for international cooperation to drive breakthroughs. The takeaway for enterprises is not to treat geopolitics as a risk memo; it is a design constraint. Vendor strategy, partnership strategy, supply chain resilience, and talent strategy all need to be built with these realities in mind.

At KPMG, we engage this moment from the center of real-world enterprise demand. Through convenings like the KPMG Quantum Consortium in early March at KPMG Lakehouse, which included some of the most senior enterprise leaders and technical operators in the quantum ecosystem—Fortune 100 C-suite executives, CIOs, CISOs, and hands-on builders from regulated industries—we engaged in candid dialogue on what is viable now, what is emerging next, and how organizations are sequencing real progress.

Our call to action is simple: use this report to pressure-test your quantum strategy.

Ask whether your current approach reflects the realities surfaced here—geopolitical constraint, full-stack readiness, and the growing urgency of post-quantum security. The organizations that move forward with clarity, discipline, and intent will be better positioned than those waiting for certainty that will never fully arrive. If you don't yet have a defined approach, reach out - we can help you shape one that is grounded, practical, and aligned to the realities of your enterprise and industry.

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ABOUT THE REPORT AUTHORS

QUANTUM.TECH WORLD

Quantum.Tech is a global conference and media platform dedicated to advancing enterprise adoption of quantum technologies. It brings together industry leaders, researchers, government representatives, and technology providers to explore practical applications of quantum computing, quantum communications, and quantum sensing.

Through its flagship events, expert-led panels, and strategic networking opportunities, Quantum.Tech focuses on bridging the gap between cutting-edge research and real-world implementation. The platform emphasizes commercial use cases, investment trends, cybersecurity implications, and sector-specific deployment strategies, positioning itself as a key convening forum for the global quantum ecosystem.

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The Quantum Insider is the leading intelligence and media platform for the quantum technology industry. We combine a proprietary intelligence platform, strategic advisory services, and enterprise marketing capabilities to help organizations navigate, shape, and win in one of the most consequential technology shifts of our time. From real-time market visibility and data-driven analysis to brand activation and content — we give leaders the insight and presence they need to stay ahead.

INTRODUCTION

Quantum technologies are moving from promise to presence. What was once a field defined largely by laboratory milestones and long-term forecasts is now being shaped by commercial deployments, government strategy, and a rapidly expanding ecosystem of hardware providers, software developers, integrators, and end users. Over the past year, quantum has continued its transition into a more mature and competitive phase—one where progress is no longer measured solely by qubit counts or academic breakthroughs, but by reliability, scalability, security relevance, and the ability to deliver tangible value in real-world environments.

The quantum industry sits at a pivotal moment. On one hand, investment and interest remain strong, driven by national ambitions, strategic supply chain concerns, and the accelerating demand for computational advantage. On the other hand, expectations have become more grounded. Stakeholders increasingly recognize that quantum computing, sensing, and communications each follow distinct development paths, with different timelines and adoption barriers. The market is beginning to separate hype from impact, and organizations are becoming more sophisticated in how they evaluate quantum readiness. This shift is healthy, necessary, and indicative of an industry that is beginning to define itself in practical terms.

This annual State of the Industry report, authored by Quantum.Tech in partnership with Quantum Insider, captures that evolving landscape through the voices of those shaping it. The findings are based on feedback from across the quantum ecosystem, including technology developers, enterprise users, investors, policymakers, and research leaders. Their perspectives reveal an industry that is simultaneously accelerating and recalibrating—pushing technical boundaries while refining strategies for commercialization, workforce development, and global competitiveness.

Technological advancement remains at the heart of the quantum narrative, but the conversation has broadened significantly. Hardware development continues to be the focal point of both innovation and debate, with competing modalities—superconducting qubits, trapped ions, neutral atoms, photonics, silicon spin qubits, and others—each demonstrating meaningful progress while facing distinct engineering challenges. Across platforms, the drive toward error correction and fault tolerance is intensifying, and the industry is placing increasing emphasis on performance benchmarks that matter for real workloads. The past year has also seen a growing recognition that scalability is not only a question of qubits, but of systems engineering: cryogenics, control electronics, packaging, fabrication, and repeatability are now central to discussions about viable roadmaps.

At the same time, quantum software and algorithm development is entering a more applied era. The industry is moving beyond theoretical advantage and into the difficult work of identifying use cases that can generate near-term value on noisy intermediate-scale quantum (NISQ) systems. Hybrid quantum-classical approaches, improved compilation and optimization techniques, and domain-specific workflows are helping to bridge the gap between today's devices and tomorrow's fault-tolerant machines. For many organizations, the focus is shifting toward building quantum capability internally—testing algorithms, training teams, and integrating quantum experimentation into broader digital transformation efforts.

However, the most advanced hardware and software mean little without people to build and deploy them. Talent remains one of the most pressing constraints facing the sector. The demand for specialists in quantum engineering, error correction, cryogenics, photonics, and quantum-aware software development continues to outpace supply. Industry feedback highlights an urgent need to scale education pathways, improve interdisciplinary training, and create clearer routes from academia into commercial roles. Just as importantly, quantum companies are increasingly competing for expertise with adjacent industries such as semiconductors, AI, aerospace, and advanced computing—making talent not only a skills challenge, but a strategic one.

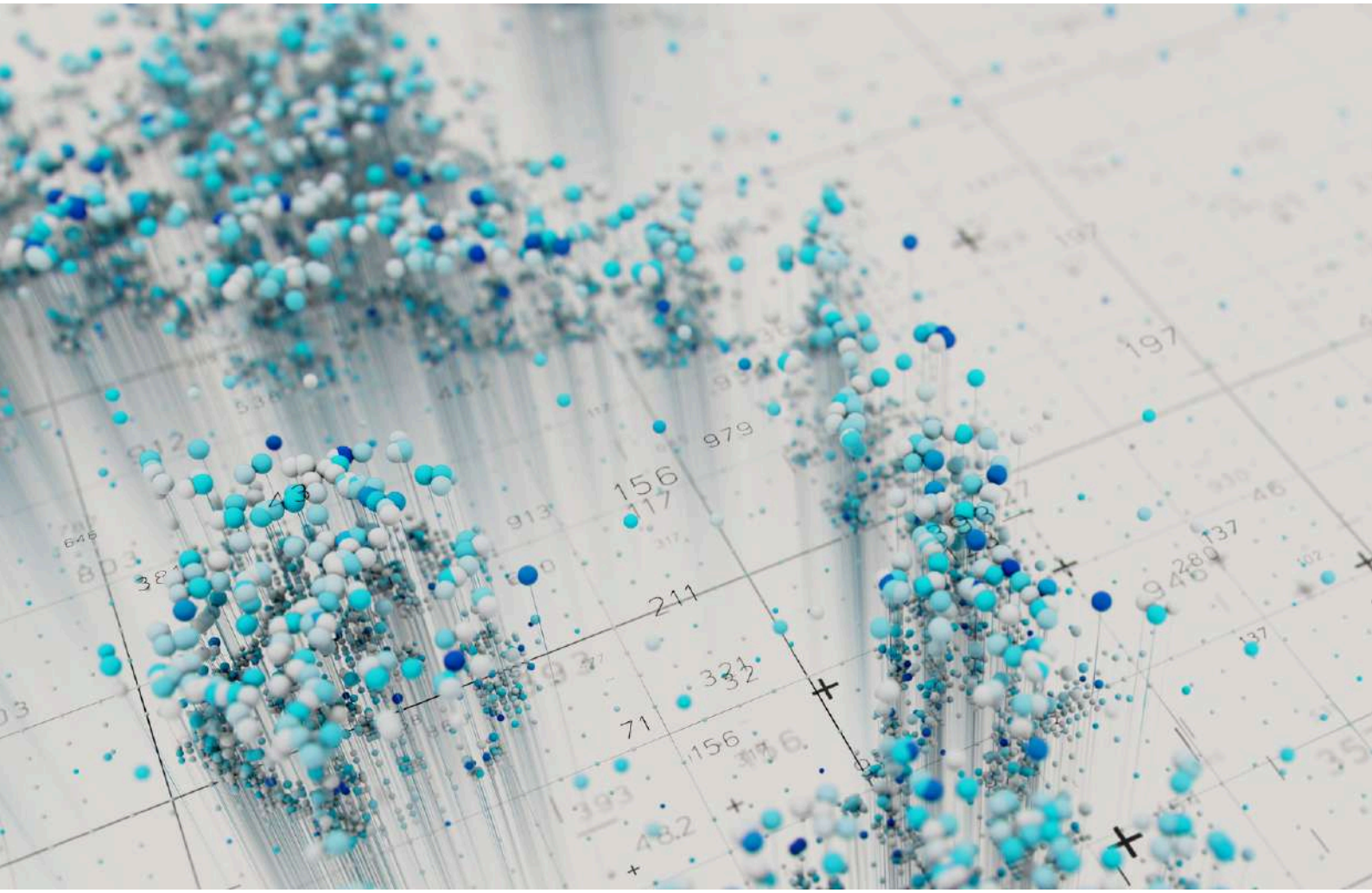
Security has also emerged as a defining theme in the current stage of quantum development. The global transition toward post-quantum cryptography is accelerating, driven by the recognition that quantum computing poses long-term risks to widely used encryption methods. Governments and enterprises alike are moving from awareness to implementation planning, particularly in sectors with long-lived data and infrastructure such as finance, defense, healthcare, and critical national systems. At the same time, quantum technologies themselves are becoming part of the security conversation—not only as threats, but as potential solutions through quantum-safe encryption approaches, quantum key distribution, and advanced sensing capabilities. The interplay between quantum progress and cybersecurity readiness is now a central pillar of industry strategy.

Perhaps more than any other factor, geopolitics is shaping the quantum landscape. Quantum has firmly established itself as a strategic technology with national importance, influencing policy decisions, funding priorities, export controls, and international partnerships. Countries are competing to secure leadership in quantum research, protect intellectual property, and strengthen domestic supply chains. Industry respondents point to increasing fragmentation in global

collaboration, alongside rising concerns about access to key components, fabrication capacity, and rare expertise. The result is a sector in which innovation is deeply intertwined with national strategy, and where companies must navigate not only technical complexity but regulatory and geopolitical uncertainty.

This report reflects these dynamics and provides a grounded assessment of where the quantum industry stands today. It explores key developments in hardware and enabling technologies, evaluates the state of commercialization and adoption, examines talent and workforce pressures, and highlights emerging security and geopolitical realities. The goal is not to predict quantum's future in abstract terms, but to map the practical trajectory of the industry as it is unfolding—based on the insights of those actively building it.

Quantum technologies remain among the most ambitious scientific and engineering undertakings of our time. Their potential to reshape computation, communications, and sensing is profound, but their success depends on coordinated progress across disciplines and sectors. As this report shows, the industry is not waiting for a distant "quantum future"—it is actively constructing the foundations of it today.



METHODOLOGY

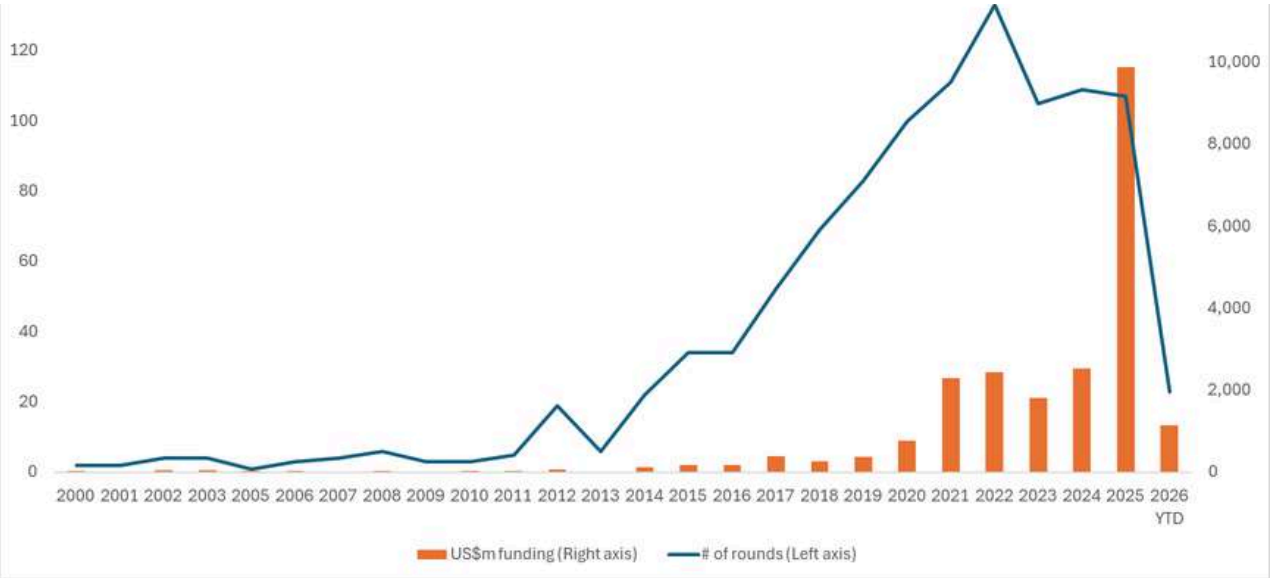
This report is based on findings from an industry-wide survey conducted across the global Quantum.Tech and Quantum Insider databases, with outreach extending to more than 100,000 recipients spanning the international quantum ecosystem.

The survey targeted stakeholders across industry, academia, government, and investment communities, including executives, technical specialists, researchers, strategists, product leaders, and policy professionals. A majority of respondents reported moderate to high familiarity with quantum technologies, ensuring that the insights reflect informed perspectives from individuals actively engaged in quantum development, deployment, and strategy.

The questionnaire used structured five-point Likert scales to measure sentiment across key themes, including hardware maturity, adoption barriers, talent accessibility, R&D investment, post-quantum cryptography readiness and urgency, geopolitical influence, export controls, and international cooperation. Certain questions allowed multi-select responses to better capture the interdependent nature of adoption challenges.

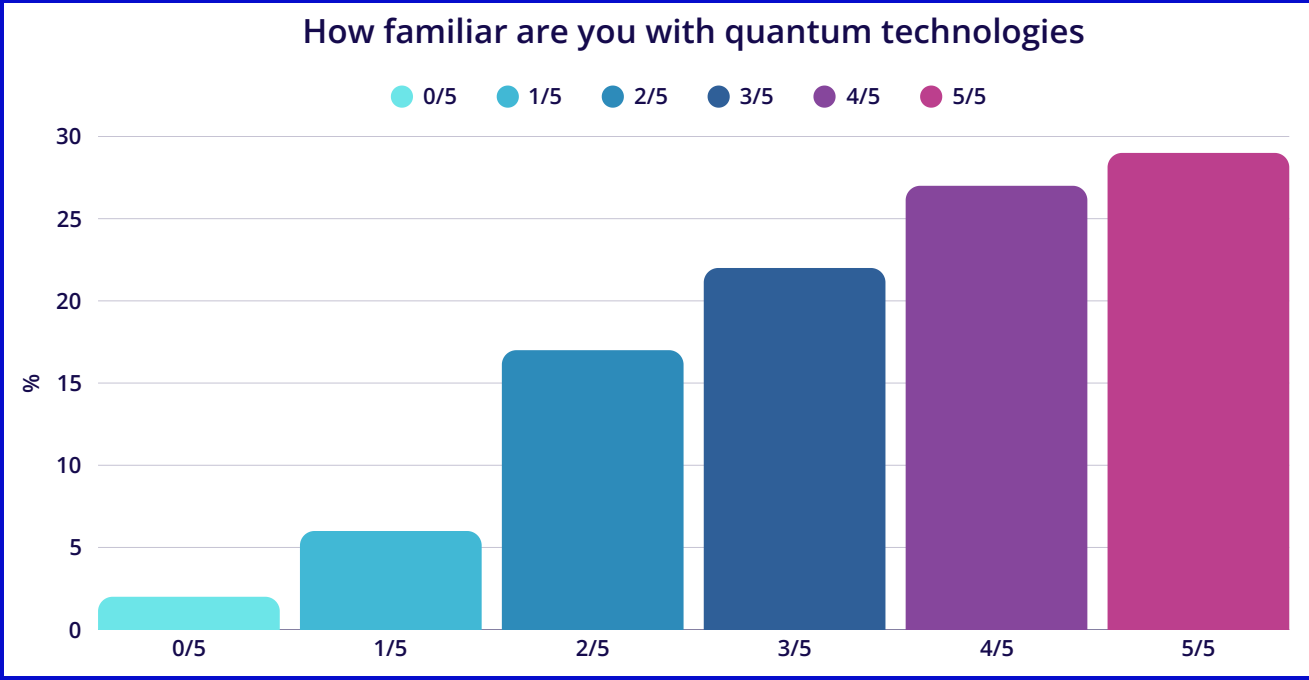
Responses were aggregated and analyzed to identify directional trends and thematic patterns. The report focuses on ecosystem-level insights rather than statistical forecasting, interpreting the data as a reflection of industry sentiment at a critical stage in quantum's commercialization journey.

As with any voluntary survey, results represent perception-based insights and may reflect stronger participation from active industry stakeholders. However, the scale of outreach and the breadth of roles represented provide a credible and timely snapshot of the global quantum landscape.



Source: The Quantum Insider Platform. **Note:** Includes post IPO financing. Excludes non-dilutive funding 2025 is Year To Date as at 19 March 2026 (for 2026 YTD row)

WHAT KNOWLEDGE BASE OF QUANTUM DO OUR RESPONDENTS HAVE?



These results reflect the maturity of respondents, 29% are very familiar, suggesting that the survey responses are informed by a **highly knowledgeable audience**, with most participants reporting moderate-to-strong familiarity with quantum technologies.

Across the scale (0 = not familiar, 5 = very familiar), responses are clearly concentrated at the upper end. The largest group selected **(5 out of 5)**, followed closely by **4 out of 5 27% of respondents**. Combined, **56% of respondents rated their familiarity as high "(4 or 5 out of 5)",** indicating that over half of the sample considers themselves well-versed in quantum technologies.

When we asked what our respondents were doing within their business.

The Facts

The largest group of respondents

37%

EXECUTIVES

HIGH FAMILIARITY

56%

(4 OR 5 / 5)

Technical specialists made up

17%

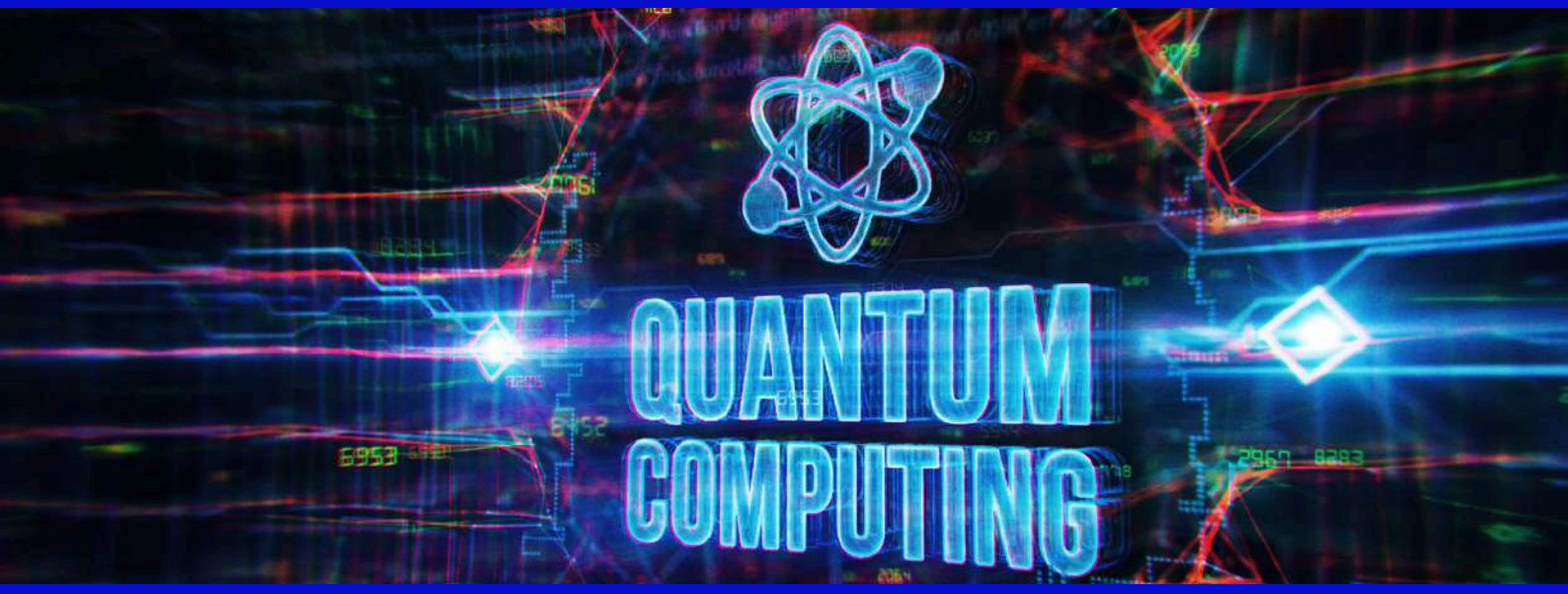
OF RESPONDENTS

The largest group of respondents identified as **Executives 37%**, making this by far the dominant category. This suggests the survey reflects the views of individuals likely responsible for setting organizational direction, investment priorities, partnerships, and long-term positioning in quantum technologies. It also indicates that many responses are informed by a high-level understanding of market dynamics, commercial readiness, and geopolitical considerations.

The second-largest category was **Technical specialists 17%**, providing an important counterbalance to executive perspectives. This group likely brings direct insight into engineering challenges, platform performance, hardware and software bottlenecks, and practical implementation barriers—ensuring that the dataset includes grounded, technical viewpoints alongside leadership sentiment.

A further cluster of respondents came from **Strategy roles 14% and Researchers 11%**. Strategy respondents are likely focused on competitive positioning, adoption pathways, and market opportunity assessment, while researchers contribute perspectives closer to innovation pipelines and emerging breakthroughs. Together, these categories reinforce that the survey captures both near-term commercial thinking and longer-term technical development priorities.

Overall, the role distribution indicates that the findings of the report are strongly shaped by **senior leadership priorities**, complemented by substantial input from technical and strategic experts. This mix supports a well-rounded view of the industry, but also reflects that quantum remains a sector where **strategic direction and ecosystem-building are being driven primarily at the executive level**, with technical development closely following as the key enabler.



WHERE ARE THESE LEADERS AT THE CURRENT STAGE OF DEVELOPMENT?

These results suggest that quantum adoption remains **early-stage overall,** with most organizations still in the process of **evaluating potential** use cases rather than deploying quantum technologies at scale.

The largest group of respondents identified their organization as **"Exploring" 43%,** indicating that nearly half of participants are still in the discovery and assessment phase. This reflects a market where many stakeholders are building internal understanding, identifying relevant applications, and monitoring hardware and software progress before committing significant resources. It also reinforces that quantum remains a strategic priority for many, but not yet an operational technology for most.

> "At the inaugural KPMG Quantum Consortium, we heard the same message reflected in this report: the market has moved from 'if' to 'how.' The winners won't be defined by experimentation—they'll be defined by disciplined pilots tied to a real business problem, a clear success metric, and an honest comparison to what classical systems can do today."
>
> ***Richard Entrup,*** *Managing Director, Enterprise Innovation Head of Emerging Solutions,* ***KPMG US***

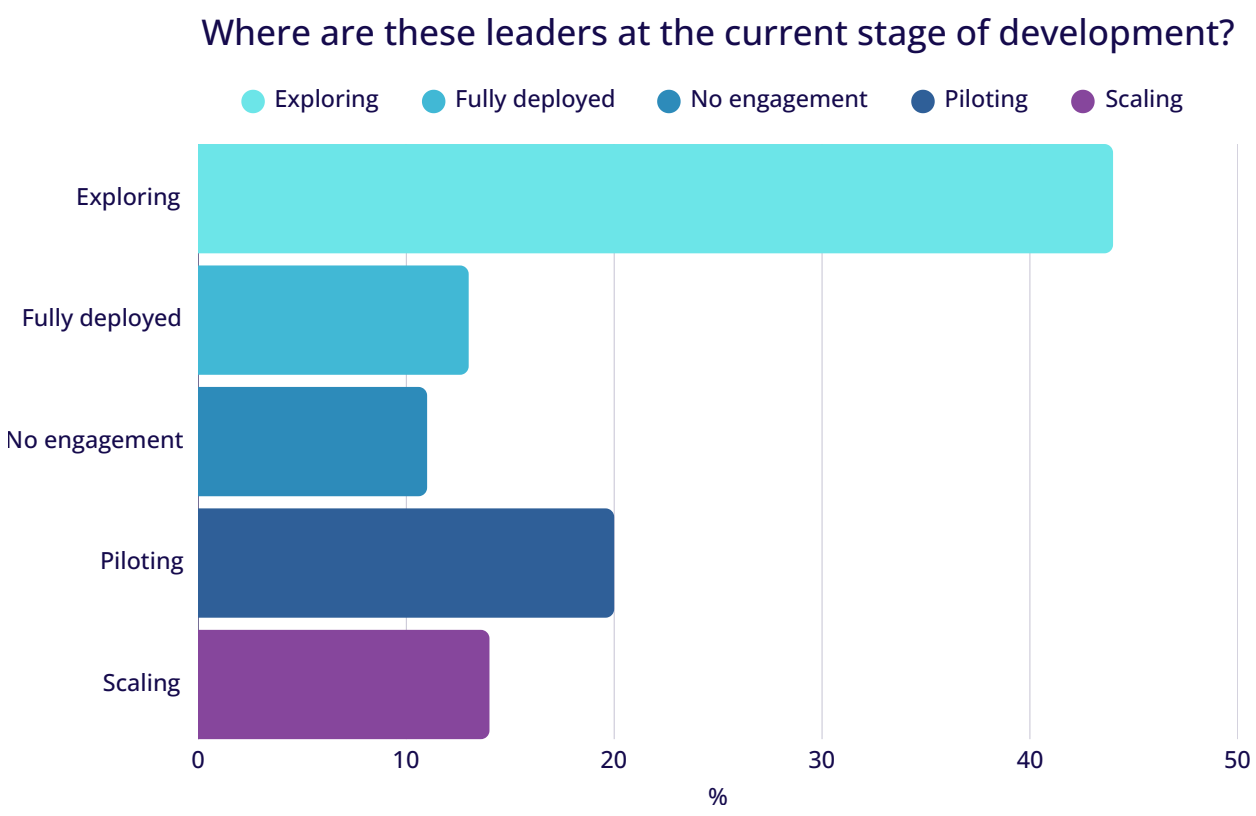
A meaningful portion of respondents reported being in the **"Piloting" stage 20%**. This suggests that a substantial segment of the industry is moving beyond theory into experimentation—running proofs of concept, testing early algorithms, and engaging with quantum hardware providers or cloud-access platforms. The presence of this group points to growing confidence in the technology's near-term potential, particularly in hybrid quantum-classical workflows.

However, fewer respondents are reaching later stages of adoption. Only **14% of respondents reported "Scaling"**, indicating that relatively few organizations are currently expanding quantum initiatives into repeatable programs or broader enterprise integration. This implies that while pilots are increasing, the transition from experimentation to scalable deployment remains a key bottleneck.

Just **12% of respondents indicated quantum is "Fully deployed,"** reinforcing that full operational adoption is still limited to a small subset of organizations—likely those with highly specialized use cases, strong internal expertise, or direct involvement in quantum technology development.

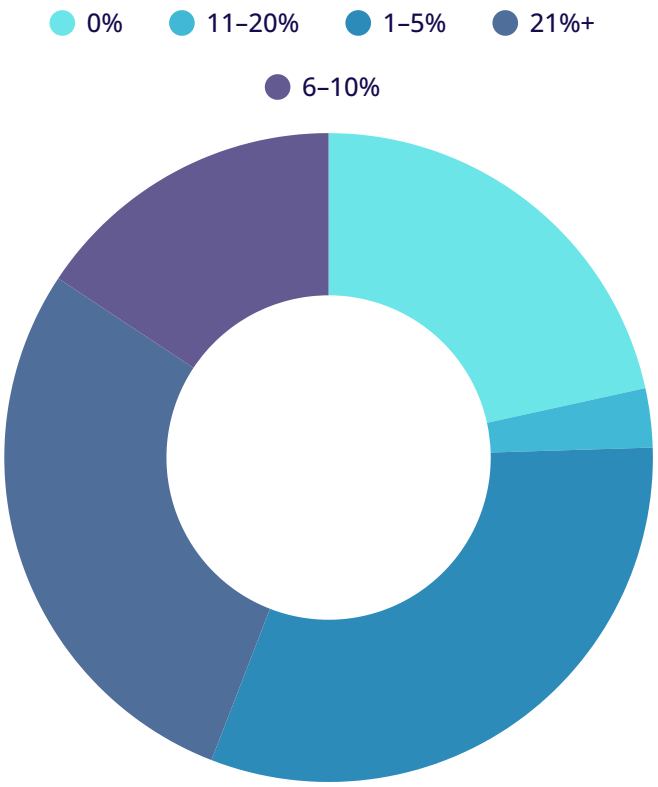
Finally, **11% respondents reported "No engagement,"** which is notable but not dominant. This suggests that quantum awareness and interest are widespread, and that most organizations in the sample are at least paying attention, even if they have not yet initiated formal programs.

Overall, the distribution reflects an industry in the midst of a gradual shift from exploration toward early implementation. The strong concentration in "Exploring" and "Piloting" highlights that quantum deployment is still **largely experimental**, with scaling and full deployment remaining emerging outcomes rather than the norm. The results also suggest that the next major inflection point for the ecosystem will be **the industry's ability to convert pilots into scalable deployments**—driven by clearer ROI pathways, improved hardware reliability, and the growth of internal quantum talent.



CURRENT STATE OF PLAY AND BUSINESS CASES

How much R&D are these leaders currently investing in quantum?



These results suggest that quantum is attracting **meaningful and, in many cases, substantial R&D investment**, but that funding levels remain highly uneven across the industry—reflecting a sector split between early-stage exploration and major strategic commitment.

The largest group of respondents reported allocating **1–5% of their organization's R&D budget to quantum initiatives (32% respondents)**. This indicates that for many organizations, quantum is positioned as a **serious but still emerging priority**—large enough to support pilots, internal capability-building, and partnerships, but not yet at a level that would suggest quantum is central to core R&D strategy.

This range is consistent with organizations in the "exploring" and "piloting" stages, investing to stay close to developments while managing uncertainty around timelines and ROI.

A striking finding is the size of the **21%+ category**. This represents a significant portion of the sample allocating a **very large share of R&D spending to quantum**, suggesting that many respondents are either quantum-native organizations (hardware/software companies), national labs, or firms for whom quantum is a foundational technology strategy. This group reflects the part of the ecosystem driving rapid technical advancement —organizations that are not merely experimenting, but actively building platforms, products, and intellectual property.

The **6–10% category** further supports the view that quantum is moving beyond a niche budget line for a notable subset of organizations. These respondents appear to be making a **material medium-term commitment,** likely supporting structured programs, dedicated teams, and longer-term roadmaps.

At the lower end, **22% of respondents reported allocating 0%** of R&D budget to quantum initiatives, reinforcing that a sizeable minority of organizations remain uncommitted from a funding perspective. This may reflect firms still monitoring developments without internal investment, or those engaging through external partnerships rather than direct R&D allocation.

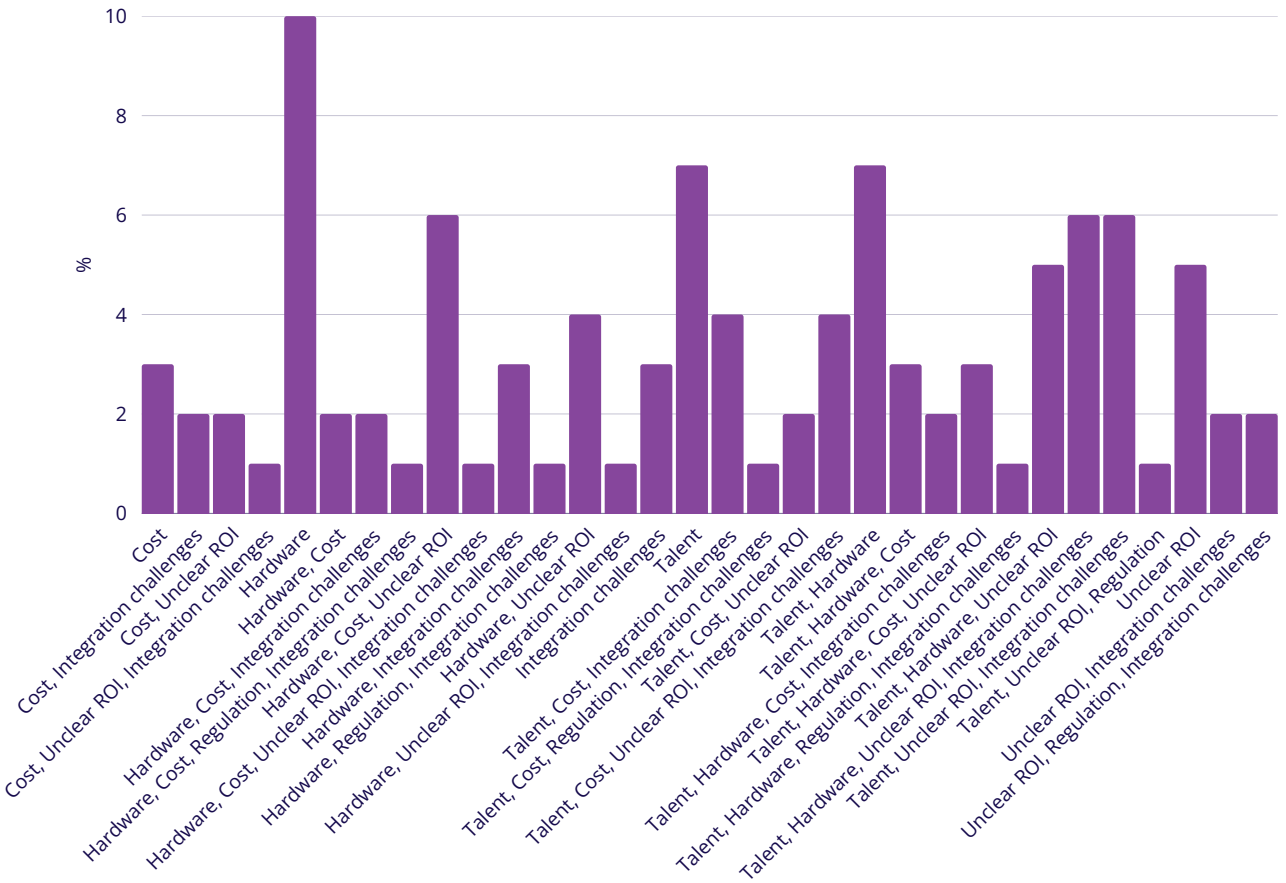
Only **3% of respondents reported allocating 11–20%**, suggesting a polarization in investment behavior: organizations tend to either invest modestly (1–10%), invest heavily (21%+), or not invest at all, with fewer taking a mid-range approach.

Overall, the distribution highlights a market that is increasingly divided between **quantum leaders and quantum observers**. While many organizations are still investing cautiously, a significant proportion are allocating major R&D resources—indicating that quantum has moved into a phase where, for some players, it is no longer experimental, but a strategic cornerstone of innovation and competitive differentiation.

BARRIERS TO PROGRESS

A clear issue that has come up in many conversations with the thought leaders in the industry is barriers to progress; it was a key question we asked in our survey, and we got a huge and mixed response.

What are the biggest barriers to quantum progress?



These results provide one of the clearest indicators in the dataset of **why quantum adoption remains uneven and slow-moving across the wider market**. The data shows that barriers to adoption are rarely viewed in isolation. Instead, respondents overwhelmingly describe quantum adoption challenges as **multi-factor and interdependent**, where technical immaturity, workforce shortages, and business uncertainty reinforce each other.

Rather than pointing to a single dominant obstacle, the responses reflect an ecosystem still working through the transition from experimental capability to scalable deployment.

“The quantum industry is transitioning from experimental capability to scalable deployment”

A multi-barrier reality: adoption challenges are compounding

A striking feature of the dataset is the prevalence of combined answers (e.g., “Talent, Hardware, Unclear ROI, Integration challenges”). This signals that most stakeholders do not see quantum adoption as being blocked by one missing ingredient. Instead, the industry is facing a **stack of constraints,** where progress in one area (e.g., better hardware) does not automatically unlock adoption unless other conditions are met (e.g., skilled teams and clear ROI).

This is an important finding because it suggests that adoption will not be solved through a single breakthrough or a single policy lever. The industry’s adoption curve depends on coordinated progress across **technology readiness, workforce capability, and business integration.**

Hardware is the most dominant barrier—and the anchor for all others

Hardware appears most frequently across responses, either alone or in combination. Even when respondents cite cost, ROI, or talent, they often link those concerns back to hardware limitations.

Standalone “Hardware” received the largest single-category result in the dataset. But hardware is also embedded across numerous combined answers, including:

Hardware +
COST

Hardware +
UNCLEAR ROI

Hardware +
COST + UNCLEAR ROI

Hardware +
INTEGRATION CHALLENGES

Hardware +
REGULATION + INTEGRATION CHALLENGES

Hardware +
TALENT COMBINATIONS

This indicates that the market still sees the technology itself—performance, scalability, error correction, stability, and reliability—as the fundamental gating factor. In other words, the industry believes quantum adoption remains limited not because organizations are unwilling, but because hardware has not yet reached the point where deployment is straightforward or economically justified at scale.

This aligns strongly with the broader state of the sector: despite major advances, quantum hardware is still early in its industrial lifecycle, and organizations are reluctant to commit to adoption when platforms remain uncertain, fragmented, and rapidly evolving.

Talent is nearly as significant—and increasingly viewed as structural

Talent also emerges as a major constraint, both as a standalone issue and as a frequent component in combined answers. Notably, "Talent, Hardware" also appears **several times**, suggesting a widespread perception that even when hardware is available, there are not enough skilled professionals to implement, maintain, and extract value from quantum systems.

This is not just about PhDs in quantum physics. The data suggests that quantum adoption is **bottlenecked by a shortage of professionals who can bridge disciplines:**

Quantum engineering + systems integration

Quantum algorithm development + domain knowledge

Hardware control + software stack optimization

Quantum security + enterprise IT deployment

The frequency of "Talent" appearing alongside "Unclear ROI" and "Integration challenges" is also telling. It implies that the absence of talent doesn't just slow development—it directly impacts the business case. Without skilled teams, organizations struggle to run credible pilots, validate outcomes, and translate experimentation into repeatable workflows.

In this sense, talent is not merely a resourcing issue; it is a commercialization barrier.

Unclear ROI is a persistent adoption blocker, especially for enterprise users

"Unclear ROI" appears both alone **5% of responses** and repeatedly in multi-barrier combinations, especially with hardware and talent. Examples include:

- Hardware, Cost, Unclear ROI
- Talent, Cost, Unclear ROI, Integration challenges **(4% of responses)**
- Talent, Hardware, Unclear ROI **(5% of responses)**
- Talent, Hardware, Unclear ROI, Integration challenges **(6% of responses)**
- Talent, Unclear ROI, Integration challenges **(6% of responses)**

This strongly reinforces the idea that quantum adoption is still struggling with a **value translation problem**. Many organizations may believe quantum is strategically important, but they still lack confidence in identifying use cases where quantum delivers measurable advantage over high-performance classical systems.

Crucially, ROI uncertainty appears tightly connected to hardware maturity. If performance is unstable, if algorithms are still experimental, and if benchmarking is inconsistent across platforms, it becomes extremely difficult for executives to justify scaled deployment.

The presence of ROI concerns across so many combinations indicates that quantum is still perceived as a technology where value is **possible**, but not yet **predictable.**

Integration challenges reflect the "last mile" problem

Integration challenges appear frequently, both alone **(10 % of responses)** and in combination with nearly every other category. This reflects an important reality: even when quantum hardware improves and algorithms mature, adoption requires integration into existing enterprise environments.

This includes challenges such as:

Interfacing quantum workflows with classical infrastructure	**Data pipeline compatibility**	**Orchestration and scheduling**
Cloud access, latency, and reliability	**Cybersecurity and compliance requirements**	**Operational tooling (monitoring, debugging, performance management)**

Integration is often underestimated in emerging tech markets, but these results suggest the quantum industry is now confronting what many industries face when moving from pilot to scale: **the deployment environment is often more complex than the technology itself.**

The high frequency of integration concerns alongside talent and ROI suggests a reinforcing cycle: integration is hard, which makes pilots harder, which makes ROI harder to prove, which makes investment harder to justify.

Cost remains a major friction point, but usually not in isolation

"Cost" appears alone only **3 times**, but it shows up in a wide range of combinations, including:

- Cost + Unclear ROI
- Cost + Integration challenges
- Hardware + Cost
- Hardware + Cost + Unclear ROI
- Talent + Cost + Unclear ROI
- Talent + Hardware + Cost + Integration challenges

This suggests that cost is not being viewed simply as "quantum is too expensive." Instead, cost becomes a barrier when paired with uncertainty: cost is difficult to justify when ROI is unclear, when hardware remains immature, and when integration demands significant internal investment.

In other words, cost is not the root barrier—it is the barrier that becomes visible when confidence is low.

This distinction matters. If ROI clarity improves and hardware becomes more reliable, cost sensitivity may decrease significantly, particularly in high-value industries like finance, pharma, defense, and logistics.

Regulation appears low in volume, but high in strategic significance

Regulation appears infrequently compared with the other barriers, typically as part of multi-factor combinations:

Hardware, Cost, Regulation, Integration challenges

Talent, Cost, Regulation, Integration challenges

Talent, Hardware, Regulation, Integration challenges

Talent, Unclear ROI, Regulation

Unclear ROI, Regulation, Integration challenges

While the number of responses is smaller, its inclusion is important: it suggests regulation is not currently perceived as the primary blocker for adoption, but it is increasingly seen as a complicating force—particularly when adoption begins moving into security-sensitive or compliance-heavy environments.

This may also reflect the fact that regulation often emerges later in the commercialization cycle. As quantum becomes more strategically significant, regulation is likely to become a stronger adoption influence through export controls, procurement restrictions, cryptographic standards, and cross-border collaboration rules.

So while regulation is not the most immediate barrier today, the data implies it is an emerging one.

The most revealing signal: the "full stack barrier" dominates adoption sentiment

The most powerful takeaway from these results is that quantum adoption is being constrained by what could be described as a **full-stack readiness gap**.

The most frequently repeated combinations include:

Hardware +
COST + UNCLEAR ROI

Talent
UNCLEAR ROI + INTEGRATION CHALLENGES

Talent +
HARDWARE + UNCLEAR ROI

Hardware +
UNCLEAR ROI + INTEGRATION CHALLENGES

Hardware +
COST + UNCLEAR ROI + INTEGRATION CHALLENGES

These combinations show that the industry sees adoption as being blocked by the intersection of:

1. Immature hardware

2. Insufficient talent

3. Uncertain commercial value

4. Difficulty integrating into real systems

This paints a picture of a market where progress is happening, but scaling is slowed by structural dependencies. Even strong advances in hardware will not drive mass adoption unless there is a parallel expansion of talent, clearer pathways to ROI, and better enterprise-grade integration tooling.

What this means for the industry's next phase

These results suggest the quantum sector is entering a stage where the key differentiator will not be research novelty, but execution capability. The organizations most likely to succeed will be those that can reduce complexity for customers by solving multiple barriers at once—through integrated platforms, vertical solutions, and strong ecosystem partnerships.
It also implies that adoption acceleration will depend heavily on:

- workforce development programs
- stronger benchmarking and performance transparency
- clearer use-case validation in industry-specific contexts
- productization of quantum workflows (not just access to hardware)
- standardized software stacks and middleware tools

Most importantly, the results indicate that the quantum industry is not facing a single adoption "wall." It is facing a multi-dimensional transition challenge typical of deep tech sectors: moving from scientific progress into scalable infrastructure and repeatable business value.

In summary, the results show that the barriers limiting adoption are dominated by **hardware readiness and talent availability**, closely followed by **unclear ROI and integration challenges**, with cost acting as a compounding pressure rather than a standalone blocker.

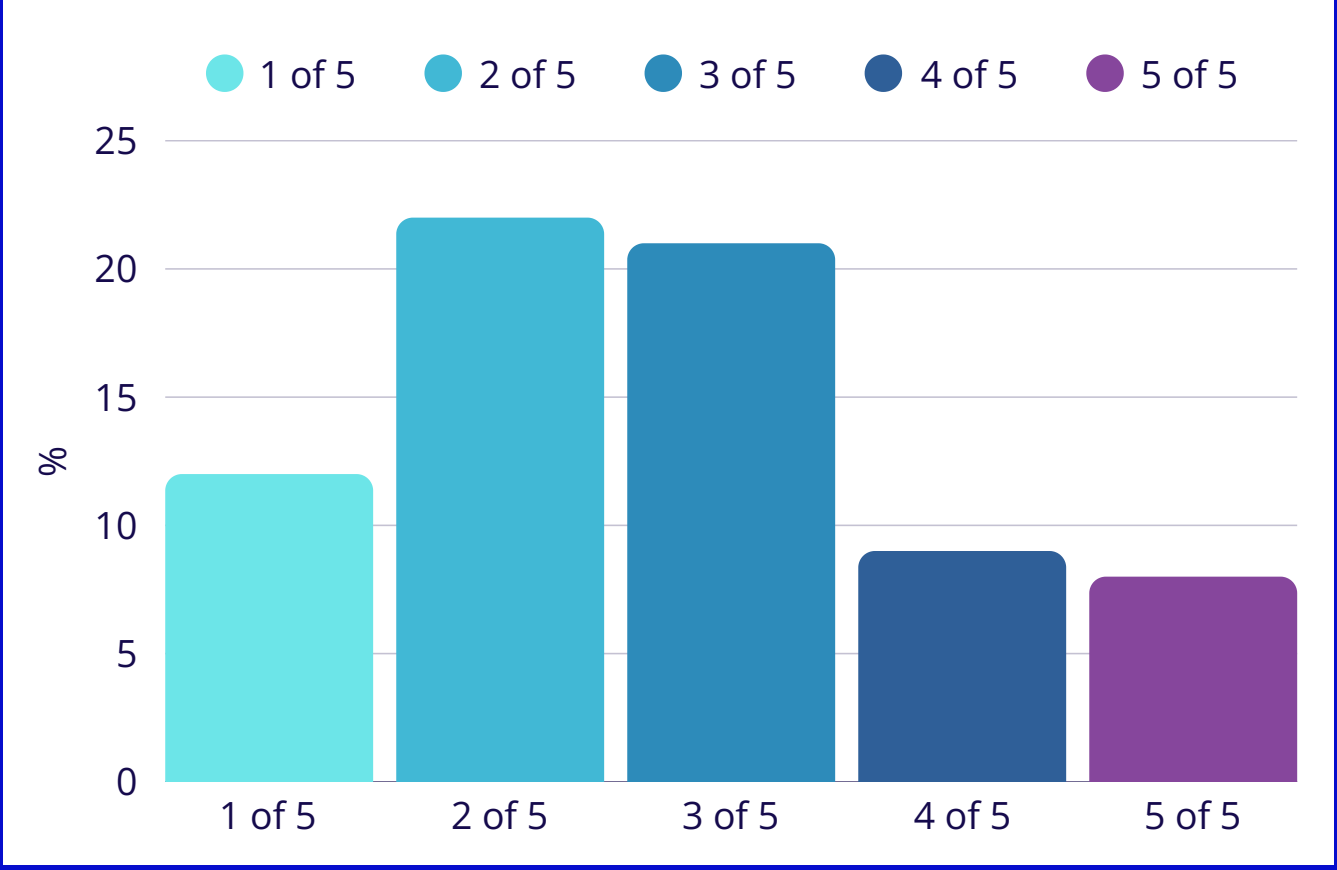
Regulation remains secondary today but is beginning to appear as part of broader adoption complexity.

The strongest signal is that adoption is constrained by interconnected barriers, meaning the industry's path forward will require coordinated progress across technology, workforce, and commercialization. This reinforces a central theme for the current quantum era: the industry is no longer just building quantum machines—it is now being challenged to build the surrounding ecosystem required to deploy them.

TALENT

Talent is a challenge that is coming up again and again in my research conversations as holding the industry back.

We asked our responders, how accessible is high quality talent? The results were telling!



The results from the survey indicate that **high-quality quantum talent is generally viewed as difficult to access**, with sentiment weighted clearly toward the lower end of the scale.

Out of all the responses, the largest group selected **2 out of 5** closely followed by **3 out of 5**. This suggests that most respondents experience talent accessibility as **limited to moderate**—available in pockets, but not consistently or at the scale required to meet growing industry demand.

Notably, **16% of respondents rated accessibility at 1 out of 5**, reinforcing that a significant portion of the ecosystem views quantum talent as **scarce and highly constrained** in their region. When combined, **47 % of respondents rated accessibility as low (1 or 2 out of 5),** meaning nearly half of participants feel that recruiting or retaining quantum talent is a serious challenge.

By contrast, only **24% of respondents rated accessibility as high (4 or 5 out of 5),** with **13% selecting 4 out of 5** and **11% selecting 5 out of 5.** This suggests that while certain regions may benefit from strong academic institutions, established research hubs, or government-supported programs, these areas remain the exception rather than the rule.

Overall, the distribution points to a persistent and widely felt **talent bottleneck**, consistent with broader industry concerns around workforce development. The concentration around 2–3 out of 5 implies that quantum talent is not entirely absent, but remains **insufficiently scalable**, with competition for skilled professionals likely intensifying as organizations move from exploration into piloting and deployment.

GEOPOLITICS

Geopolitics is rapidly becoming one of the most decisive forces shaping the future of quantum technologies. Once viewed primarily as a frontier research domain, quantum is now widely recognized as a strategic capability with implications for national security, economic competitiveness, and technological sovereignty. As a result, governments are no longer simply funding quantum research—they are actively shaping the ecosystem through industrial policy, national programs, procurement initiatives, and long-term strategic roadmaps. This shift is accelerating innovation, but it is also changing the rules of global collaboration and competition.

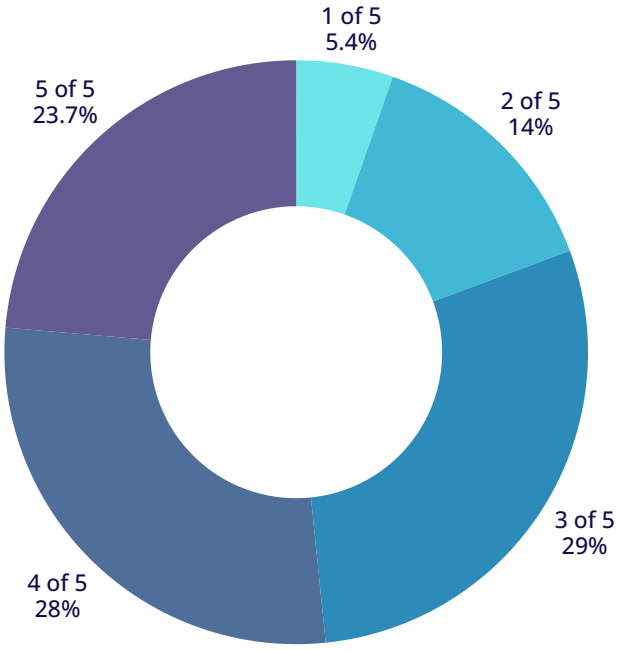
A key geopolitical driver is the growing belief that quantum advantage—whether in computation, sensing, or secure communications—could deliver asymmetric benefits to early leaders. Quantum technologies are increasingly positioned alongside AI and semiconductors as part of the next generation of critical infrastructure. This has intensified competition between major global powers, driving increased public investment and a push to build domestic supply chains for sensitive components such as cryogenics, advanced photonics, control electronics, and specialized fabrication capabilities. The result is a quantum landscape that is being shaped not only by technical feasibility, but by national priorities around resilience, security, and strategic independence.

At the same time, geopolitics is creating new friction in the form of export controls, restrictions on cross-border research partnerships, and heightened scrutiny of foreign investment. While these measures are intended to protect sensitive intellectual property and prevent strategic technology leakage, they risk fragmenting what has historically been a highly international scientific community. The quantum sector depends heavily on global collaboration and talent mobility, and any sustained reduction in cooperation could slow progress, duplicate effort, and increase the cost of innovation. Industry sentiment increasingly reflects this tension: quantum breakthroughs still rely on international cooperation, yet quantum development is being shaped more strongly by national competition.

Ultimately, geopolitics will influence not just who leads in quantum, but how quantum ecosystems evolve—determining where talent concentrates, which markets gain early access to hardware, and which companies can scale through global partnerships. As quantum moves toward commercialization, the industry will need to navigate an increasingly complex environment where technical roadmaps and market strategies are inseparable from regulatory conditions and geopolitical alignment. In this context, quantum technologies are not only an emerging industry—they are becoming a defining arena of 21st-century strategic competition.

Export Controls

What impact do you think export controls will have on the quantum ecosystem?



Overall, respondents view export controls as a **high-impact force on the global quantum ecosystem**, with sentiment clearly weighted toward the upper end of the scale.
Overall, the most common rating was **3 out of 5 (29% of responses)**, suggesting many stakeholders expect export controls to have a **moderate, material influence**, but not necessarily a defining or immediate disruption across all areas of the industry. This mid-range peak reflects a degree of uncertainty—recognition that export restrictions matter, but that the full consequences will depend on how aggressively they are implemented and how global supply chains adapt.

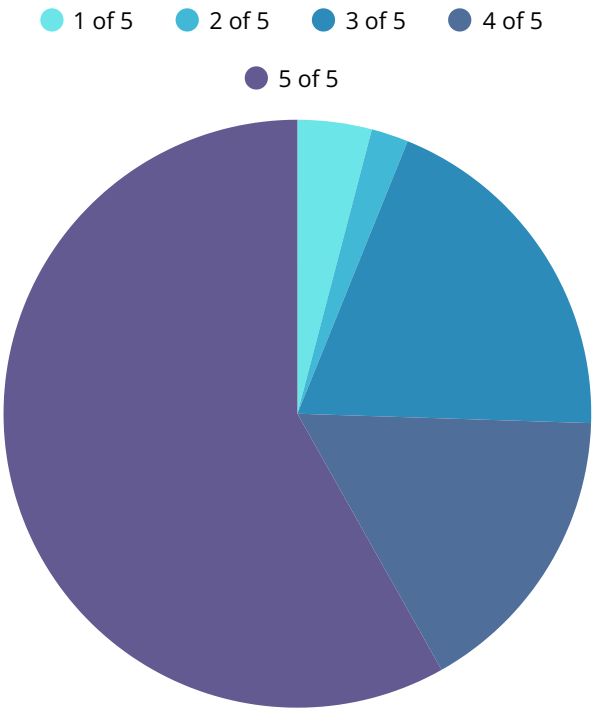
That said, the results skew strongly upward. A combined **51.7% of respondents rated the impact as 4 or 5 out of 5 (28% at 4/5 and 23.7% at 5/5)**, indicating that a significant proportion of the industry anticipates export controls will have a **major to transformative impact.** This suggests that many view geopolitics and trade restrictions not as peripheral issues, but as factors that could meaningfully shape quantum R&D collaboration, commercialization timelines, and access to critical components such as cryogenics, photonics, advanced semiconductors, and precision manufacturing equipment.

In contrast, only **18% of respondents rated export controls as low impact (1 or 2 out of 5)**, with just **5% of respondents selecting 1/5**, reinforcing that relatively few believe export controls will be negligible.

Taken together, the distribution implies that export controls are widely seen as an increasingly important structural pressure on the quantum sector—one likely to influence **international partnerships, talent mobility, supply chain resilience, and competitive positioning**. While not all respondents expect severe disruption, the overall trend reflects a growing belief that quantum technologies are becoming deeply entangled with national security priorities and industrial policy, and that export controls will play a meaningful role in shaping the industry's global trajectory.

International Co-Operation

How important is international cooperation for major quantum breakthroughs?



These results show an **overwhelming consensus** that international cooperation is **critical to achieving major quantum breakthroughs**, with responses heavily concentrated at the top end of the scale.

Out of the **total responses**, the dominant rating was **5 out of 5 (57% respondents)**—by far the largest segment. This indicates that a majority of participants view global collaboration not as a "nice to have," but as **essential** for meaningful progress, particularly in an industry where advances depend on highly specialized expertise, shared scientific knowledge, and access to globally distributed infrastructure and supply chains.

A further **16% of respondents selected 4 out of 5**, reinforcing the strength of this sentiment. Combined, **73% respondents rated international cooperation as highly important (4 or 5 out of 5)**, representing a clear supermajority of the sample.

The mid-range rating of **3 out of 5 (19% of responses)** suggests that a smaller—but still notable—group believes breakthroughs can still occur with more regionalized or nationally driven approaches, perhaps reflecting increasing awareness of geopolitical realities and national investment strategies. However, even this group does not dismiss cooperation entirely, instead positioning it as beneficial but not absolutely decisive.

Only **6% respondents rated cooperation as low importance (1 or 2 out of 5)**, demonstrating that very few stakeholders believe quantum innovation can thrive in isolation.

Overall, the distribution strongly suggests that despite rising geopolitical fragmentation and the growing influence of export controls, the quantum industry continues to view international **cooperation as a foundational driver of innovation**. The results highlight a tension increasingly felt across the sector: quantum is becoming more strategically competitive at the national level, yet its most significant technological leaps are still widely perceived as requiring a global, collaborative research and development environment.

Quantum Nationalism

These results indicate that **"quantum nationalism" is widely perceived as a major force shaping global quantum development**, with responses strongly concentrated in the upper half of the scale.

Out of our responders, the largest groups selected **4 out of 5 (33% responses)** and **5 out of 5 (33% responses)**. Combined, **66% respondents rated the influence of quantum nationalism as high (4 or 5 out of 5)**, suggesting that two-thirds of participants believe national strategic agendas are now significantly directing how quantum ecosystems evolve. This aligns with the growing reality of quantum being treated as a critical technology area tied to economic competitiveness, defense priorities, and long-term sovereign capability.

A further **25% respondents selected 3 out of 5**, indicating a substantial portion of the industry views quantum nationalism as influential, but perhaps not uniformly dominant across all regions or sub-sectors. This mid-range cluster suggests that while national policy is clearly shaping investment and collaboration, the degree of impact may vary depending on the technology domain (computing, sensing, communications), maturity of local supply chains, and regulatory environment.

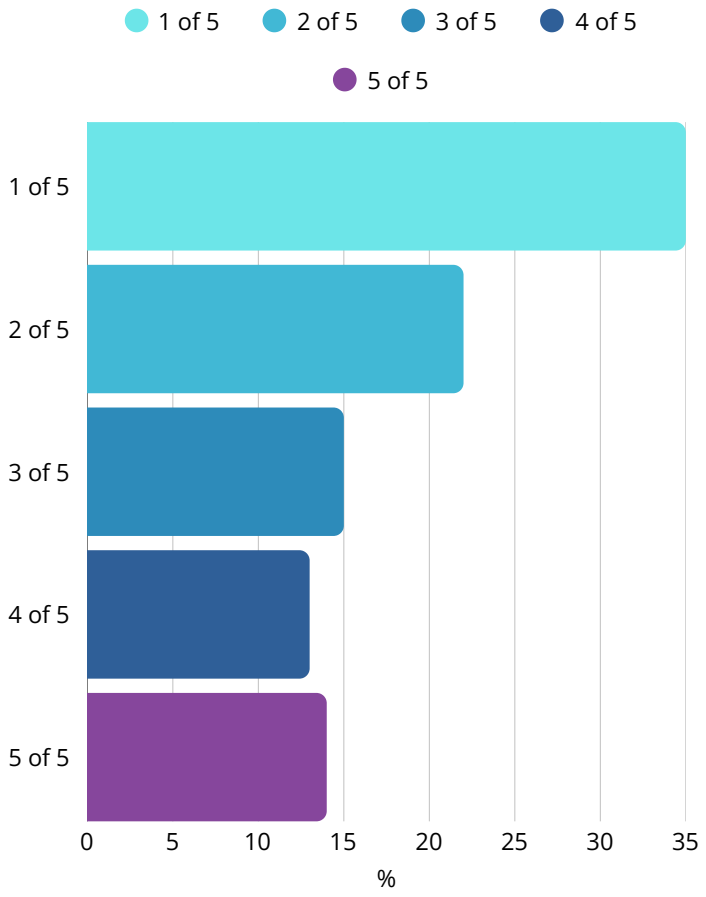
Only **7 % rated the influence as low (1 or 2 out of 5)**, with just **1 respondent selecting 1 out of 5**, reinforcing that very few believe quantum nationalism is a minor or negligible factor.

Importantly, when viewed alongside the earlier results on international cooperation—where **73% of respondents rated cooperation as highly important (4 or 5 out of 5)**—a clear tension emerges. The industry strongly believes that major quantum breakthroughs still depend on **global collaboration**, yet at the same time it recognizes that national interests are increasingly driving **fragmentation, strategic competition, and regionalization** of quantum development.

Taken together, these findings suggest the sector is entering a defining phase where quantum innovation is being pulled in two directions: toward **international scientific cooperation as a catalyst for progress,** and toward **national control and strategic positioning as a driver of policy and investment**. This dynamic is likely to shape not only R&D pathways, but also supply chains, talent mobility, cross-border partnerships, and long-term market structure.

Quantum Preparedness

We asked our respondees; How ready is your organization to migrate to post-quantum cryptography?



These results suggest that **post-quantum cryptography (PQC) readiness remains low across much of the industry**, with many organizations still in the early stages of preparation despite growing awareness of quantum-driven cybersecurity risk.

Out of all asked, the most common rating was **1 out of 5 (35% of respondents)**, indicating that a significant proportion of organizations consider themselves **not ready** to migrate to post-quantum cryptographic standards. This is a strong signal that, for many, PQC transition planning has not yet translated into concrete implementation roadmaps, technical audits, or operational migration programs.

It also suggests that while the threat is widely acknowledged, it is still competing with other priorities for budget, leadership attention, and technical resources.

A further **22% of respondents rated readiness at 2 out of 5**, reinforcing the view that most organizations are still at an **early stage of preparedness**. When combined, **57% of respondents rated readiness as low (1 or 2 out of 5)**—a clear majority of the sample. This points to a broad industry gap between strategic awareness and operational readiness, and suggests that many organizations may be underestimating the complexity of the migration process, particularly in environments with legacy infrastructure, long system lifecycles, or high compliance requirements.

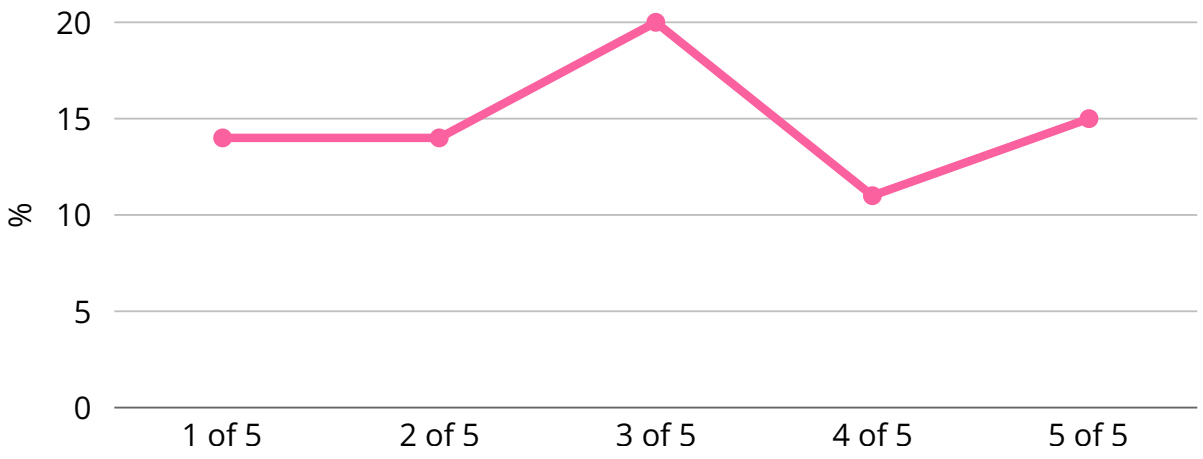
> “Post-quantum cryptography is the first enterprise-wide quantum deadline. With 57% of organizations rating PQC readiness as low, the risk isn’t theoretical—it’s accumulating now. ‘Harvest now, decrypt later’ turns delay into a growing security debt.”
>
> ***Dr. Aaron Kemp**, Senior Director, Quantum Research, Enterprise Innovation, **KPMG US***

The mid-range rating of **3 out of 5 (15% of respondents)** indicates a smaller group that appears to be in an intermediate stage—likely organizations that have begun initial planning steps such as crypto inventories, vendor engagement, internal awareness programs, or early testing of PQC algorithms. This segment suggests momentum is building, but that readiness remains uneven and often limited to exploratory work rather than deployment.

Notably, only **27% of respondents rated readiness as high (4 or 5 out of 5)**, with **13% selecting 4 out of 5** and **14% selecting 5 out of 5.** This implies that fewer than a third of organizations feel well- positioned to migrate. The presence of this group is significant, as it suggests that a subset of the market—likely in highly regulated or security-sensitive sectors such as finance, defense, government, and critical infrastructure—is already progressing toward structured migration efforts. However, they remain a minority.

Overall, the distribution paints a clear picture: while PQC is increasingly recognized as essential, the industry is still **largely unprepared for large-scale transition**. This has important implications. First, it highlights the risk of a widening security gap as quantum capabilities advance, particularly given concerns around "harvest now, decrypt later" threats. Second, it suggests that the migration challenge is not simply technical, but organizational—requiring governance, standards alignment, vendor readiness, and long-term investment. Finally, the results reinforce that PQC is likely to become a defining cybersecurity priority over the next few years, as governments finalize standards, compliance expectations increase, and enterprises face growing pressure to demonstrate measurable progress toward quantum-resilient security architectures.

Conversely we asked; **How urgent is it for your organization to begin PQC transition?**



These results suggest that while **post-quantum cryptography is increasingly recognized as important**, many organizations still view the transition as a **medium-term priority rather than an immediate necessity**. Compared with the previous readiness results, the data also highlights a growing tension between **awareness of urgency and lack of operational preparedness.**

Out of all the responses, the most common rating was **3 out of 5 (27% respondents)**, indicating that the largest group sees PQC transition urgency as **moderate**. This suggests many organizations acknowledge the need to begin planning, but may not yet feel compelled to act immediately—likely due to uncertainty around timelines for cryptographically

At the lower end, **14% of respondents rated urgency as 1 out of 5**, and another **14% rated it 2 out of 5**. Combined, **28% of respondents rated urgency as low (1 or 2 out of 5)**. This is a significant portion of the sample, implying that many organizations still perceive PQC transition as something that can be deferred, potentially viewing it as premature until standards, vendor roadmaps, or regulatory requirements become clearer.

However, there is also a substantial group signalling high urgency. **11% of respondents selected 4 out of 5**, and **15% selected 5 out of 5**, meaning **26% respondents rated urgency as high (4 or 5 out of 5)**. This indicates that more than a quarter of respondents believe action is needed soon—likely driven by concerns over long migration timelines, the "harvest now, decrypt later" threat, and increasing regulatory momentum around quantum-safe security.

When viewed alongside the previous question on readiness—where **57% of respondents rated their organization's readiness as low (1 or 2 out of 5)**—a clear industry gap emerges. Many organizations recognize that PQC transition is becoming urgent, yet most do not feel adequately prepared to execute it. This mismatch suggests that the challenge is not a lack of awareness, but a lack of capability, resourcing, and structured planning. It also implies that as urgency increases—through regulation, customer pressure, or threat escalation—many organizations may struggle to respond quickly.

Overall, these results reinforce that the PQC transition is moving into a critical phase for the industry. Urgency is rising and increasingly polarized, but readiness remains uneven. This creates a strong likelihood that the next 12–24 months will see accelerated demand for PQC implementation support, cryptographic audits, vendor solutions, and migration frameworks —particularly in sectors with long-lived data, legacy infrastructure, and high compliance exposure.

CONCLUSION

FROM MOMENTUM TO MATURITY - THE QUANTUM INDUSTRY'S DEFINING TRANSITION

The findings in this year's report point to a global quantum industry that has moved decisively beyond scientific curiosity, yet has not fully crossed into scalable commercial maturity. Quantum is no longer hypothetical, experimental, or peripheral. It is strategic. It is funded. It is geopolitically significant. But it is not yet frictionless, standardized, or widely deployable.

The industry is now entering a defining transition period — one that will determine whether quantum technologies consolidate into a sustainable industrial ecosystem or remain constrained within high-investment research environments and isolated pilot programs.

The Industry Has Shifted From "If" to "How"

One of the clearest signals from the data is that belief in quantum's long-term importance is no longer the core question. Organizations are engaging, investing, piloting, and preparing. The conversation has shifted from whether quantum matters to how it can be industrialized.

However, the path to industrialization remains complex.

Hardware continues to advance, but user expectations are not yet being consistently met. Organizations are experimenting, yet scaling remains limited. ROI potential is acknowledged, but difficult to quantify. Talent is available in pockets, but not at the scale required for broad adoption.

This does not signal stagnation — it signals transition. Quantum is moving from a breakthrough-driven narrative to an execution-driven one.

The "Full-Stack Challenge" Will Define the Next Phase

The survey results make one theme unmistakably clear: the barriers to adoption are systemic. Hardware, talent, integration, ROI clarity, and cost pressures are interconnected. Progress in one area will not unlock the market on its own.

This is the industry's central challenge.

The next phase of quantum development will not be won by the company with the highest qubit count alone. It will be defined by those who:

- reduce integration complexity
- deliver application-specific value rather than generic access
- create interoperable software and workflow layers
- build scalable talent pipelines
- translate technical metrics into commercial outcomes

In short, the market will increasingly reward ecosystem builders over isolated innovators.

Geopolitics Is Now a Structural Variable

Perhaps more than at any time in quantum's history, geopolitics is shaping the playing field.

Quantum nationalism is widely perceived as influencing development, while export controls are expected to materially impact the ecosystem. At the same time, international cooperation is still seen as essential for breakthrough progress.

This duality will define the decade ahead.

The industry must navigate a reality in which collaboration drives innovation, but national policy increasingly shapes access, partnerships, supply chains, and talent mobility. Quantum leadership will not be measured solely in research output, but in resilience — the ability to build ecosystems that can operate under geopolitical constraint.

Organizations that proactively align technical strategy with regulatory and international realities will be better positioned than those treating geopolitics as an external risk rather than a core planning variable.

Security Is the Sleeping Inflection Point

The findings around post-quantum cryptography readiness are particularly revealing. Most organizations are not operationally prepared for migration — yet urgency is rising.

This gap may prove to be one of the most catalytic forces in the industry.

Unlike quantum computing advantage, which depends on future hardware breakthroughs, PQC transition is a present-tense requirement. Standards are emerging. Regulatory expectations are tightening. Migration timelines are long. And the "harvest now, decrypt later" risk reframes the timeline entirely.

The organizations that act early will face smoother transitions. Those that delay may encounter compressed migration windows, resource bottlenecks, and elevated risk exposure.

PQC is not just a cybersecurity issue — it may become the first large-scale quantum-driven transformation across global enterprise IT infrastructure.

A Market Divided — and That's Not a Weakness

The data suggests a bifurcated market: quantum-native companies investing aggressively, and enterprise organizations engaging cautiously but deliberately.

This division reflects healthy ecosystem formation.

Developers must continue pushing performance boundaries. Enterprises must experiment without overcommitting. Governments must support without distorting. Talent pipelines must grow faster than demand.

The key risk is not divergence — it is misalignment. If developers optimize for metrics disconnected from real-world workflows, or if enterprises wait for perfection before experimenting, progress could stall.

The opportunity lies in tighter feedback loops between builders and users.

What the Current Moment Really Represents

Stepping back, the broader pattern across all findings reveals an industry at an inflection point — not one of hype or contraction, but of calibration.

Expectations are becoming more realistic.
Investment is becoming more strategic.
Policy is becoming more influential.
Security is becoming more urgent.
Adoption is becoming more deliberate.

These are characteristics of a maturing sector.

Quantum is entering its infrastructure phase — where performance, reliability, workforce, interoperability, and regulatory frameworks matter as much as scientific progress.

The Forward Outlook: Three Defining Questions

Looking ahead, the trajectory of the global quantum industry will hinge on three central questions:

Can hardware maturity outpace expectation fatigue?
If systems begin meeting enterprise-grade reliability benchmarks within the next few years, adoption could accelerate rapidly. If not, investment enthusiasm may increasingly concentrate among core technology players rather than end users.

Can the ecosystem close the talent and integration gap quickly enough?
Without scalable workforce expansion and simplified deployment pathways, quantum risks remaining capacity-constrained even as hardware improves.

Will geopolitics fragment or strategically realign the ecosystem?
The balance between national strategy and international cooperation will determine whether quantum develops as a globally interoperable technology layer or as a regionally segmented set of capabilities.

The Industry Is Not Waiting — It Is Building

Despite the challenges, the overarching takeaway from the findings is one of structured progress rather than hesitation. Organizations are exploring. Pilots are expanding. Capital is being allocated. Governments are investing. Standards are forming.

The industry is not stalled. It is constructing foundations.

However, quantum's next leap will not be defined by a single scientific announcement. It will be defined by cumulative engineering discipline, talent scaling, security migration, ecosystem alignment, and geopolitical navigation.

The global quantum industry today is ambitious, strategically significant, and technically advancing — but not yet frictionless or fully scaled.

What happens next will depend less on whether quantum works, and more on whether the ecosystem can collectively make it deployable.

That is the challenge — and the opportunity — that now defines the state of quantum.

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