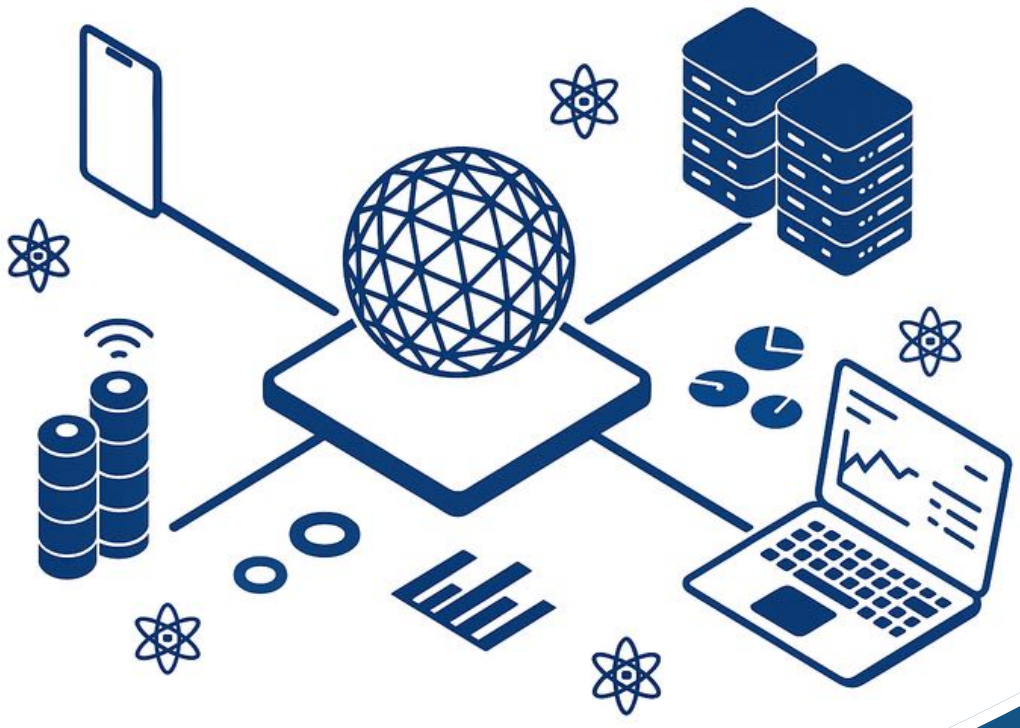
NEWSLETTER

Diplomatic Council Quantum Series

by Harald A. Summa
and Matthias Reidans



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About The Authors

Harald A. Summa is Chairman of the Diplomatic Council Quantum Leap Initiative, founder and honorary president of eco – Association of the Internet Industry, and former CEO of DE-CIX, the world's largest Internet exchange. For over two decades, he has shaped Europe's digital infrastructure and advised the German government on digital-economy strategy, serving on national and regional innovation councils.

Matthias Reidans, Innovation Programme Manager at the Diplomatic Council Quantum Leap Initiative, brings more than 25 years of experience in datacenter transformation, cloud migration, and digital modernization. A recognized expert in quantum infrastructure, he has led strategic projects for IBM, tecRacer, and Rosenberger-OSI, and advocates responsible, real-world deployment of quantum technologies across industries.

About This Series

The Diplomatic Council Quantum Series provides a strategic overview of global developments in quantum technology – from scientific milestones and market dynamics to questions of security, leadership, and readiness.

This edition highlights key breakthroughs and industry trends shaping the path from research to commercialization.

At the end, Harald A. Summa and Matthias Reidans share their perspectives on what these developments mean for innovation, governance, and the future of quantum communication.

Key Focus Areas in This Edition

Scientific Breakthroughs

Harvard, MIT, and Caltech redefine scalability – moving neutral-atom systems from lab prototypes to fault-tolerant contenders.

Market Acceleration & Investment

From Google's acquisitions to IQM's record funding – commercialization gains pace and venture capital turns into strategic sovereignty.

Quantum Readiness & Security

Thales' 2025 Data Threat Report reveals a widening gap: 60% prepare for the post-quantum era, while 40% still lag behind.

Leadership & AI in the Quantum Age

A new generation of leaders blends science with strategy – as AI tools like GPT-5 accelerate research itself.

The Quantum Flywheel

A self-reinforcing cycle emerges: breakthroughs reduce risk, capital scales innovation, and markets turn vision into momentum.

From Breakthrough to Momentum: Quantum Computing Crosses the Threshold

October 2025 may go down as the month when quantum computing finally stepped out of the laboratory and into industrial reality – and November continued the momentum. Within just a few weeks, breakthroughs from research labs, billion-dollar investments, and the first clear signs of commercialization converged into a single message: the field is no longer asking if quantum computing will scale, but how fast.

The signal first came from academia. At Harvard and MIT, researchers achieved what has already been dubbed "the forever machine" – a 3,000-qubit neutral-atom system that ran continuously for more than two hours without interruption. Using optical conveyor belts and tweezers, the team managed to automatically replace lost atoms during runtime without erasing stored quantum information. As lead scientist Mikhail Lukin put it, the result shows "a very direct path toward realizing quantum computers capable of executing billions of operations and running for days on end."

Almost simultaneously, Caltech broke another record: a 6,100-qubit neutral-atom array with a coherence time of 13 seconds and single-qubit fidelity of 99.98 percent. For the first time, the platform's two historic weaknesses – longevity and scalability – were resolved in one stroke.
And progress didn't stop there: new approaches such as scalable quantum error detection, photonic processors, and hybrid AI-quantum models have begun to extend these academic breakthroughs into applied architectures. Neutral atoms have moved from experimental curiosity to serious contender for fault-tolerant and commercially relevant systems.

3,000 Qubits

Harvard and MIT achieve record-breaking neutral-atom stability – "The forever machine" runs for hours without interruption.

6,100 Qubits

Caltech sets a new scalability record – coherence time of 13 seconds, 99.98 % fidelity.

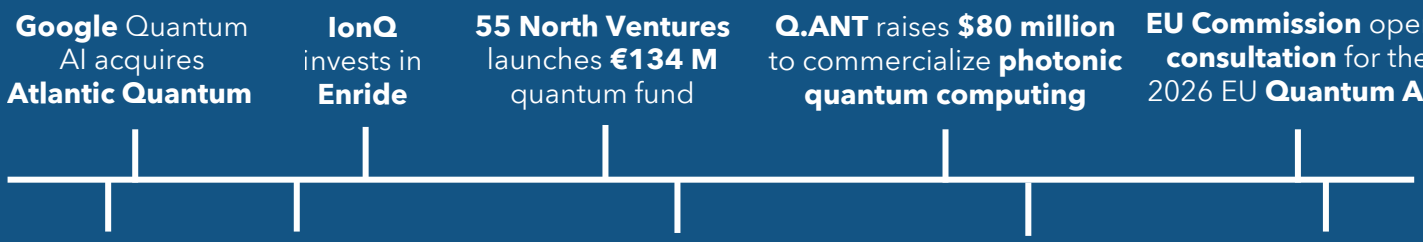
October 2025 didn't just bring scientific breakthroughs – it triggered a wave of quantum investments across the globe.
Google Quantum AI acquired Atlantic Quantum, an MIT spin-out specializing in superconducting hardware. Rigetti Computing sold two on-premises systems worth 5.7 million USD – a single deal equal to nearly three-quarters of its previous-year revenue. IonQ announced a strategic partnership with Einride and the U.S. Department of Energy to explore quantum-secure satellite networks. In Europe, IQM raised 300 million USD in the largest quantum round outside the U.S., funding its next expansion across the Atlantic.

Capital formation surged worldwide.
Denmark's 55 North Ventures launched a €134 million quantum fund backed by national investors, while the U.S. state of Connecticut unveiled its QuantumCT initiative with 10 million USD in seed funding and access to 160 million USD from the National Science Foundation. Germany's Q.ANT secured 80 million USD to commercialize photonic computing, and Singapore's Qai Ventures established a 150 million USD quantum-AI fund to accelerate start-ups across Asia.

Momentum extended far beyond the West.
China's first atomic quantum computer, the Hanyuan-1, achieved its initial commercial sales exceeding 5.6 million USD, marking one of the few atomic systems ready for mass deployment.
At the policy level, the European Commission opened consultation on the forthcoming EU Quantum Act – a strategic effort to link research, industrial capacity, and supply-chain resilience under one European framework.

The picture is unmistakable: quantum technology has evolved from laboratory promise to a global investment race – fast, strategic, and irreversible.

Global Quantum Investment Wave Fall 2025

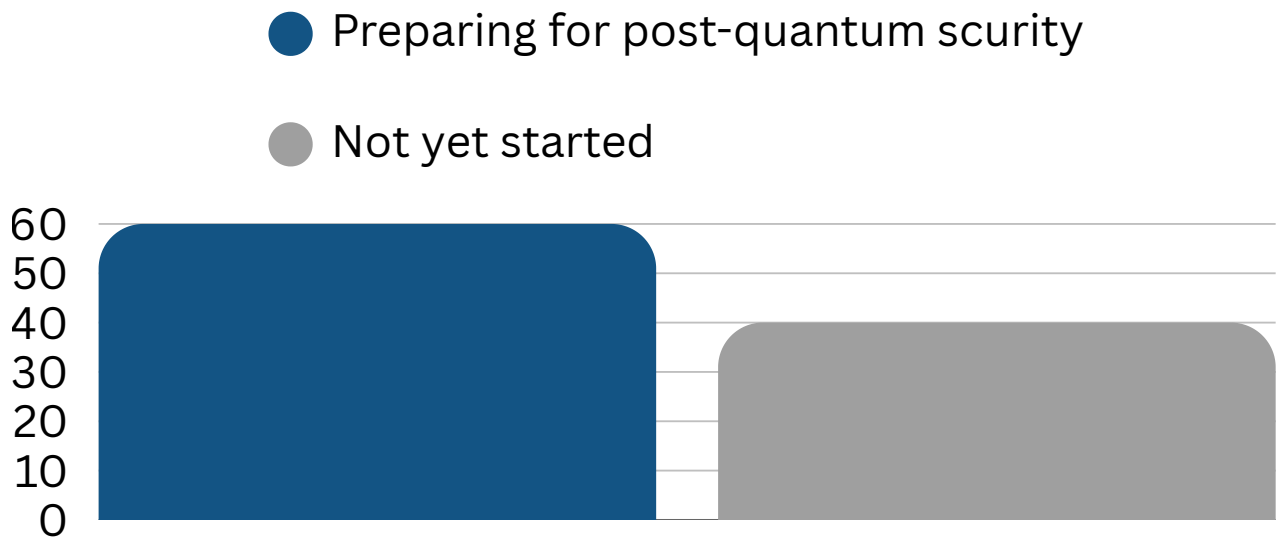


The Readiness Gap

Quantum computing is advancing faster than most organizations can adapt. According to the Thales Data Threat Report 2025 – based on insights from more than 3,000 IT and security experts across 20 countries – the gap between technological capability and enterprise preparedness is widening.

While global breakthroughs in quantum hardware, capital formation, and algorithms accelerate, many organizations still lack coherent strategies for post-quantum security and cryptographic agility.

This readiness gap will define how fast societies can transform innovation into secure and trusted infrastructures.



Yet the study warns of a dangerous fragmentation. One in three enterprises plans to rely on cloud or telecom providers for post-quantum encryption, risking inconsistent and poorly integrated security architectures. Already, 57 percent of firms manage five or more key-management systems – a complexity that increases the likelihood of misconfiguration and data exposure.

The trendline is clear: awareness of quantum threats has grown sharply since 2021, shifting from general concern to concrete fear of encryption compromise and key-distribution vulnerabilities. But with 40 percent of organizations still unprepared, the gap between technological progress and enterprise readiness is widening. As Thales notes, post-quantum defense "requires coherent strategies, cryptographic agility, and immediate action to protect today's data from tomorrow's capabilities."

From Awarness to Action: Building Quantum-Safe Infrastructure

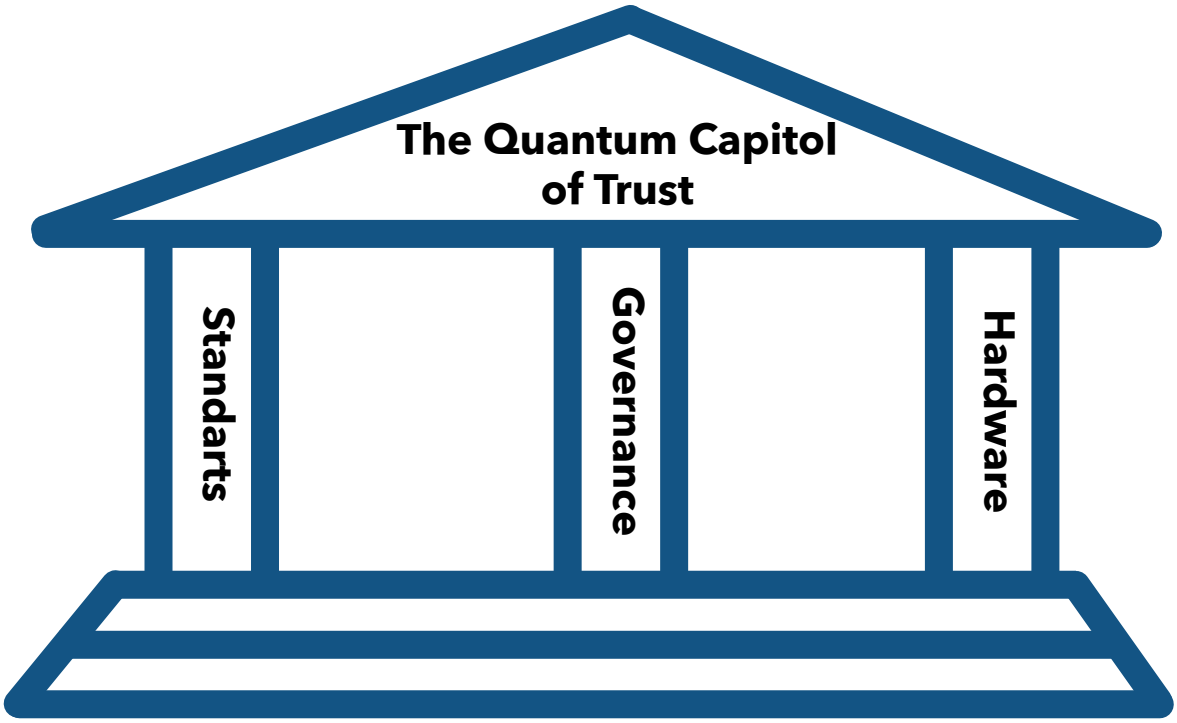
As the readiness gap becomes visible, global initiatives are shifting from observation to orchestration. Governments, standards bodies, and technology pioneers are defining the roadmap for a quantum-secure digital future.

In the United States, the NIST post-quantum cryptography standards (FIPS 203–205) now formalize algorithms for encryption, digital signatures, and hashing. Executive Order 14144 extends these mandates across federal systems, setting timelines for migration in national security and critical infrastructure.

Singapore's Cyber Security Agency has followed with its Quantum-Safe Handbook and Readiness Index, providing organizations with self-assessment tools to evaluate their quantum preparedness. The European Commission is preparing the EU Quantum Act, aimed at harmonizing research, industry, and security under one strategic framework.

Industry players are also taking the lead. At SEALSQ, hardware-level PQC integration marks a decisive step toward resilience: quantum-resistant chips, secure roots of trust, and cryptographic agility built into the supply chain itself. Similar efforts across telecom, cloud, and semiconductor sectors signal that post-quantum security is no longer theoretical – it is becoming operational.

The transition will not happen overnight, but the direction is set. Quantum readiness is evolving from a compliance exercise into a new layer of digital sovereignty.



Quantum Meets AI: The New Security Frontier

The fusion of quantum computing and artificial intelligence marks one of the most transformative frontiers in digital innovation. Quantum systems promise to accelerate AI models beyond classical limits – enabling faster optimization, deeper simulations, and new forms of autonomous reasoning.

At the same time, this convergence introduces new security and governance challenges. Quantum-accelerated AI could decrypt classical cryptography, manipulate large-scale systems, or exploit vulnerabilities in data integrity. As SEALSQ CEO Carlos Moreira noted at the IQT Quantum + AI Summit in New York, "AI and quantum will define the boundaries of trust itself."

Early use cases already point to tangible benefits:

- Molecular simulation and materials science: AI-driven quantum models drastically shorten discovery cycles.
- Climate prediction and logistics: Quantum-enhanced optimizations yield precision outcomes from chaotic systems.
- Secure autonomous systems: Quantum-safe identities enable trustworthy machine-to-machine communication.

The dual edge of this evolution is clear – quantum computing amplifies both intelligence and risk. Establishing quantum-safe AI infrastructures will be key to ensuring that autonomy, transparency, and trust evolve together.

Strategic Outlook

As AI and quantum computing converge, their impact extends beyond technology. Enterprises will need to align data strategy, governance, and infrastructure with post-quantum standards such as NIST's FIPS 203–205 and upcoming EU Quantum Act requirements. Governments are already framing hybrid AI-quantum systems as critical infrastructure – emphasizing resilience, cryptographic agility, and cross-border interoperability.

From chip design to cloud computing, the next competitive advantage will lie in quantum-safe intelligence – systems capable of learning, reasoning, and securing themselves simultaneously. The race is no longer only about computational power, but about trust as the new currency of innovation.

The Quantum Accelaration Cycle

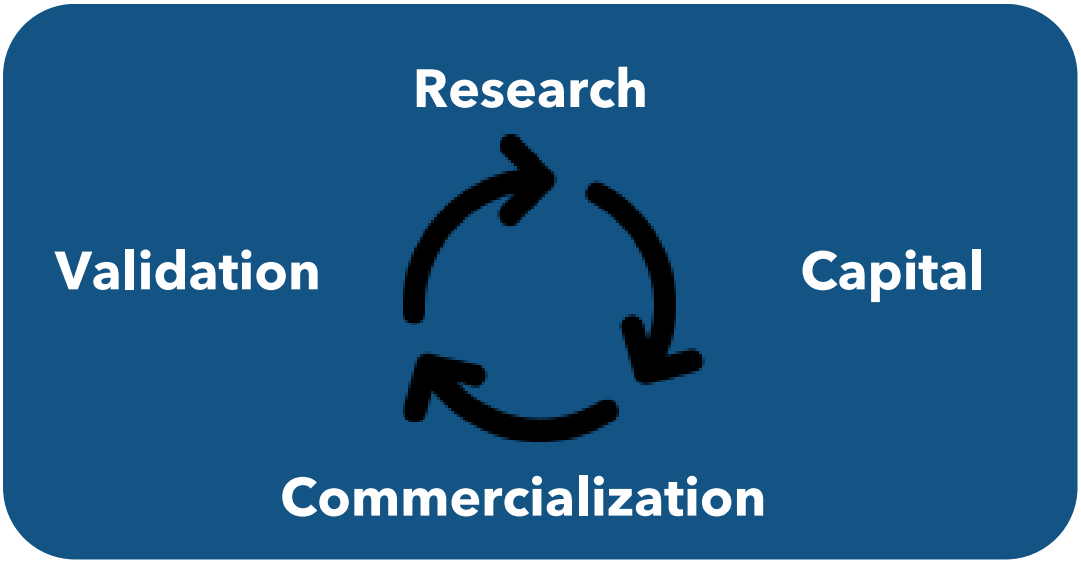
Behind the hardware and funding headlines, algorithmic research quietly advanced as well. A new preprint describes a modular, adaptive factoring algorithm that reduces Shor's qubit requirements to blocks of only 3–4 qubits – implying that RSA-2048 could, in theory, be cracked within a week on next-generation neutral-atom hardware. Another paper introduced a continuous phase of transversal gates for stabilizer codes, simplifying fault-tolerant logical rotations essential for quantum simulation. The timeline for post-quantum cryptography may therefore shrink faster than many policymakers expect.

Leadership is evolving alongside the technology. In his Quantum's Business column, Brian Lenahan highlights a new generation of quantum leaders who combine scientific insight with strategic and organizational depth – "trailblazers who are also stabilizers." With the market projected to exceed 100 billion USD by 2035, effective leadership may become as decisive as hardware architecture.

Even artificial intelligence has entered the workflow. Professor Scott Aaronson reported using GPT-5 Thinking to compress a week of mathematical reasoning into half an hour – a small glimpse of how AI may accelerate quantum research itself.

All these developments form a pattern: a self-reinforcing flywheel of commercialization. Foundational breakthroughs reduce scientific risk. Strategic capital scales innovation. Commercial deployments translate research into revenue. Market validation attracts new investment – spinning the wheel faster with each turn.

The signal is getting louder. Quantum computing's trajectory is now set by momentum, not speculation. The question that remains is no longer whether quantum advantage will arrive, but who will harness it first.



Quantum Sustainability and Beyond

Quantum computing is evolving from a race for power into a race for purpose. As systems become more capable, attention is turning to their environmental footprint, ethical design, and long-term societal benefit. Unlike AI or classical supercomputers, quantum hardware offers exponential performance gains while consuming exponentially less energy. This energy advantage positions quantum as a sustainability enabler across industries.

In materials research, quantum simulations accelerate the discovery of cleaner catalysts and more efficient batteries. In logistics, quantum algorithms optimize supply chains, reducing emissions through smarter routing and resource use. In energy, quantum-enhanced grid simulations balance production and demand in real time, supporting the transition to renewables. Each use case reflects a deeper principle: sustainability as computation.

But sustainability is not only ecological – it is also ethical. The growing power of quantum systems demands responsible governance. That includes fair access to quantum resources, carbon-aware datacenters, secure data handling, and transparent AI-quantum interactions. The emerging field of quantum responsibility aims to align innovation with global values of trust, inclusivity, and resilience.

The coming decade will determine whether quantum computing fulfills its promise as a technology for humanity. The question is no longer how fast we advance, but how wisely we progress. True sustainability will mean mastering quantum's dual potential – using it not just to accelerate discovery, but to preserve the world that makes discovery worth pursuing.

Harald A. Summa – A Turning Point for the Quantum Economy

The research and developments of quantum mechanics have changed the well-being of humanity in the last 100 years more sustainably than the Industrial Revolution. The next 10 years will make a decisive contribution to changing digitalisation in a revolutionary way. In this decade, quantum will move from theory to the fabric of our digital civilisation—reshaping how we compute, secure, and communicate. What steam and electricity were to industry, quantum will be to intelligence: a new substrate for progress. Our responsibility is to pair discovery with wisdom, so capability becomes prosperity and trust. If we choose well, this will be remembered as the decade that set the direction for the next century.

Matthias Reidans – Building Quantum Readiness into Reality

Quantum transformation will not arrive overnight – it will be engineered through thousands of technical decisions made today. The organizations that act early, with clear governance and flexible migration strategies, will gain a decisive advantage. The transition to post-quantum security is the first real test of digital maturity: combining cryptographic agility, interoperability, and user trust across complex systems. What matters most now is execution – turning standards into practice and innovation into reliability. Entering the new era of quantum-readiness no longer means merely protecting data from quantum threats. It means building systems, organizations, and strategies that are secure, resilient to change, capable of adapting to emerging technologies, and aligned with the pursuit of sustainable, long-term value.