Position paper
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CSC's feedback on the call for evidence for an EU Quantum Act

EU Quantum Act must strengthen synergies between HPC/AI and all pillars of quantum technologies

CSC welcomes the intention to support research, innovation, investments and supply chains related to quantum technologies with an EU Quantum Act. The governance and funding models developed through the Act must reflect the fact that **quantum technologies are convergence technologies**: they must be developed alongside high-performance computing (HPC), cloud/edge compute, trusted data spaces, and AI capabilities. Europe already invests heavily in HPC and related infrastructures, and the Quantum Act should explicitly use these mature assets to accelerate industrialisation and European value capture across quantum computing, sensing, and communications.

Creating coordinated policy measures

To support the mutually reinforcing development of quantum technology and other critical digital technologies, coordinated, multidisciplinary policy measures must be developed. In particular, policies must support **exploring the opportunities presented by hybrid computing** that combines the different strengths of quantum computing (QC), high-performance computing (HPC), and artificial intelligence (AI). Quantum computers will not replace classical HPC supercomputers but complement them, and the greatest innovation potential will likely be found at the intersection of QC, HPC and AI.

The Quantum Act should emphasise synergies between HPC/AI and all pillars of quantum technologies, and translate that principle into **joint roadmaps, joint calls, and shared infrastructure services**. For quantum computing, the importance of classical support software (error correction, compilation, calibration, scheduling, verification and benchmarking) is already widely recognised. The Act should elevate this further by supporting "productisation software" (workflows, orchestration, validation, security, and developer tooling) as a strategic industrial layer where Europe can build globally competitive companies.

For **quantum sensing**, the role of HPC/AI in signal enhancement and noise filtering, sensor optimisation, calibration, and real-time control should be treated as essential, as this is often the difference between a laboratory instrument and a deployable product. For **quantum communications**, HPC/AI will be increasingly central in error mitigation, network optimisation, traffic engineering, protocol design, and monitoring. Across all pillars, AI-assisted hardware and device design (including control electronics and photonic components) is becoming critical. Europe should invest early in these "design-to-manufacture" capabilities to build high-value industrial activity.

Building on existing infrastructures

Existing hybrid infrastructures that already combine HPC, AI, and quantum resources must be **scaled into a European-wide service layer**, with access models comparable to EuroHPC (transparent calls, user support, and access for RDI), while ensuring clear pathways to industrial uptake. EuroHPC's approach of integrating quantum computers as accelerators alongside supercomputers is a strong foundation to build on. The Quantum Act should reinforce and extend it to include stronger AI integration, developer services, and sector-specific pilot programmes.

These hubs should be based on **tight coupling of research, industry, and infrastructure**, providing them with shared European testbeds and pilot lines as common assets. To create early markets and medium-term value, the hubs should run **flagship pilots** in sectors where Europe is globally competitive: climate and energy, materials, telecoms, manufacturing, etc. These pilots should be **backed by demand-side instruments** such as pre-commercial (public) procurement and reference deployments, so that "pilot" translates into repeatable products and services rather than one-off demonstrations.

To create ideal conditions for cooperation, it is crucial to ensure that the European quantum hubs are mutually **interoperable**. Beyond that, the EU must work towards better influencing **global standard setting** in quantum computing. Ability to set mutual standards, when possible, helps keep European data safe and provides a competitive advantage in this future technology.

Securing critical supply chains

When it comes to securing critical supply chains, the first step must be to create an EU-level "**quantum asset and dependency map**" that goes beyond listing actors: it should identify capacity, bottlenecks, single-points-of-failure, and scale-up needs across the full stack, making visible and interconnecting Europe's own resources throughout the supply chain: full-stack hardware vendors, cryogenics manufacturers, control electronics, software stacks, algorithms, and application pilots. To avoid vendor lock-in to non-EU commercial products, it is key to promote **open-source tooling** for quantum programming, control, and workflow orchestration. Interoperability and standards among European actors are of key importance.

Some layers of the quantum stack (e.g. self-sufficiency in building full-stack quantum computers) require strategic autonomy, while others (e.g. algorithms, standards, basic research) benefit hugely from open international collaboration. The Quantum Act should **operationalise "open strategic autonomy"** through EU-level guidance on export controls, IP management, and dual-use considerations, providing clear, predictable rules

and legal certainty for European research organisations and companies engaging in international projects.

Supporting fundamental research and skills

While it is crucial to support the kind of close-to-market flagship projects described above, it is equally important to ensure favourable conditions for **fundamental research** that lays the foundation for future innovations. It allows for exploring entirely new paradigms while also helping to identify limitations, error sources, and scalability challenges early, reducing costly failures in later stages. It is also key for building talent and knowledge ecosystems as it attracts and trains highly skilled scientists and engineers, creating a pipeline of expertise necessary for scaling quantum technologies into industry.

In addition to supporting fundamental research, European quantum **skills development** must be supported by expanding STEM programs and centres of excellence while also leveraging European state-of-the-art HPC, AI, data and quantum infrastructures to attract and develop. Beyond technical skills, understanding the implications of digital transformation across sectors is essential. Diversification of the skills base is needed to ensure multi-disciplinary understanding on how this transformation affects societies and what kind of skills are required in the future. In addition to structural developments, a systematic scheme for expert exchanges, research visits, and partnerships will strengthen talent development, attract global professionals and retain existing experts, ensuring a robust European ecosystem that boosts technological sovereignty and competitiveness.

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