IGLO Digital Working Group: Quantum Strategy Development

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- Commission funding for quantum – 4 pillars: quantum computing and simulation, quantum sensing, quantum communication and basic science
- Move towards policy implementation
- Quantum Europe Strategy (2025)
    - To position Europe as a global leader in quantum by 2030
    - Infrastructure, monetisation, research and development
    - Quantum Europe
        - R&I – From lab to market
            - Discover -> Build -> Use -> Quantum Europe R&I
        - Quantum infrastructure – Scaling quantum capabilities
            - Quantum sensors, gravimeters, inertial navigation, MRI
            - Interoperability and hybrid systems
            - Quantum computers in 10+ EU countries – EuroHPC for quantum accelerator
            - EuropQCI to secure quantum communication
            - Pilot lines for production and testing
        - Dual use – Strategic autonomy in space, security and defence
            - Quantum sensors for GNSS-free navigation
            - Quantum communication in IRIS satellites
            - Roadmaps: PQC dual-use applications, ESA cooperation
            - Quantum in EU defence and NATO strategy
            - Deployment of quantum manufacturing and chips
        - Quantum ecosystem – Growing Europe's quantum economy
            - 6 industrial pilot lines
            - EU Design Facility + cloud-based tools
            - Public procurement to stimulate demand
            - QU-Test: EU-wide certification and benchmarking
            - IP strategy and resilience for EU supply chain
            - Some quantum technologies are already in the deployment in the market – sensing and metrology
        - Skills – A quantum workforce for the future
            - 110 00+ graduates per year in related fields
            - European Quantum Skills Academy (proposal published)
            - Training, scholarships, internships, mobility schemes
            - Outreach to schools and Widening countries
            - Talent portal and "Teach the teacher" modules
            - Robust IP strategy
            - All the skills needed for PhD students to become quantum aware
- From strategy to implementation
    - Research and innovation – Roadmaps, grand challenges (outcome-focused), flagship activities
    - Infrastructure – EuroHPC, EuroQCI, sensing, testing facilities
    - Industrialisation – Pilot lines, design tools, competence clusters
    - Market uptake – Lead users, procurement, standards
- Key challenges to address:
    - Difficulty to industrialize and scaling (lags in industrial deployment)

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- Lack of coordination at the EU level (fragmented national programmes)
- Risk of hostile takeovers (strong global competition)
- Fragile supply chain (supply chain vulnerabilities)
- Weak demand (for security and defence criticality)
- At the EU level, we risk losing significance if we don't focus on these challenges
- Quantum technologies are very diverse, not a single technology to focus on

- Legislative instrument to address these challenges -> development ideas based on 3 pillars
  - Future quantum policies, 2026 Q2 – end of summer – proposal, 2026 Q4 – final
  - It will resemble the Chips Act II more than the AI Act
  - 3 pillars:
    - Quantum Europe R&D Programme, coordination at the EU level to overcome fragmentation across member states
      - Deploying EU-level computing, communication and sensing infrastructure
      - Leveraging Joint Undertakings with member states to pool resources
      - Creating skills and fostering talents
    - Quantum made in Europe, moving from lab to fab
      - Integrating and upscaling proven pilot lines in industrial fabrication plants
      - Strengthening the EU's quantum industrial readiness and competitiveness
      - Supporting scaling up of European quantum companies
    - Safeguarding quantum technology, strengthening the supply chain and enabling sovereignty
      - Adopting EU-wide supply chain monitoring systems (need to design a monitoring system)
      - Protecting critical European technologies
      - Removing dependencies on non-EU core (QPUs, chip fabrication) and enabling techs (cryogenics, lasers, control electronics)
      - Need to work with international partners, everything to be done in Europe
- Quantum Strategy Implementation
  - Roadmaps:
    - Computing, communication and sensing
    - Supply, industrialisation, standards
    - Cross-cutting challenges (including security/defence sections)
- Q&A
  - European Quantum Board
    - Only a high-level board would provide political visibility, but it may not be sufficient to identify concrete bottlenecks, technical gaps and implementation barriers across the quantum ecosystem
    - High-level political engagement is still necessary, especially because quantum technologies require major long-term investments and coordination among Member States
    - If the board is only advisory, there is a risk that Member States gradually lose interest, as they may not feel sufficiently involved in shaping priorities or decisions
    - The board should therefore function not only as an advisory body, but also as a strategic discussion forum where Member States can engage with priorities, investment needs and policy direction
    - The most effective model would combine several layers:
      - high-level political engagement to secure commitment and visibility
      - strategic coordination to discuss priorities and investment choices
      - technical advisory input to identify practical gaps, bottlenecks and implementation needs
  - Germany published a roadmap for quantum

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        - Shows that some Member States are moving ahead with national strategies and investment plans
        - However, national roadmaps cannot simply make a “180-degree turn” in response to new EU-level initiatives. Countries already have existing commitments, priorities and funding decisions that they need to respect
        - This means that EU-level coordination should not replace national strategies but rather help align them where possible
        - A key challenge will be to design EU quantum governance in a way that supports coordination without creating disruption for countries that are already implementing
    - Majority of competence clusters
        - Many competence clusters and related support structures are already in place, and some have already been selected
        - Regional and national hubs already exist, so the objective should not be to build a completely new structure from scratch, but to connect and strengthen what is already there
        - Creating another layer of hubs could make the landscape even more fragmented. Stakeholders already need to navigate Digital Innovation Hubs, AI hubs and other platforms, which can make it difficult to identify the right tool or support mechanism
        - Visibility and accessibility will therefore be crucial. If the system becomes too complex, even well-designed instruments may not reach the actors they are meant to support
        - Quantum should also be better connected with other digital technologies. The interface with AI is particularly important, though the practical model for “quantum AI” remains unclear
        - Unlike some other strategic technologies, quantum is not yet structured around a clear supply chain, and it should not be treated as if it already were. Governance and support tools need to reflect this more exploratory and ecosystem-based nature
    - Associated countries – international corporation for supply chains
        - International cooperation will be important for quantum supply chains, but it should be based on a clear and structured approach rather than ad hoc decisions
        - Existing instruments, especially association to Horizon Evropa, should be used as the main entry point for cooperation with international partners
        - A future quantum strategy or Quantum Act could help formalise this framework and make the rules easier to understand for both European and non-European partners
        - Clear communication will be essential: partners need to know what access to Horizon Evropa means, what they are eligible for, and where the political “red lines” are
        - Countries such as Japan and Korea could be relevant partners, but cooperation should distinguish between:
            - associated countries outside the EU that are already part of the European research framework
            - broader international partners outside Europe, where cooperation may be more selective and politically sensitive
        - Competitiveness should remain one of the key criteria when deciding how open or targeted international cooperation should be
    - Private-public business model, EU funding
        - The need for clearer business models in quantum, especially where public funding and private-sector interests meet
        - Public actors can access EU funding, but they need to follow the established rules, eligibility conditions and policy objectives attached to these instruments
        - The private component should be more business-oriented, with clearer links to market needs, investment logic and future commercial use
        - Good practices would be useful to help stakeholders understand how to structure proposals that combine public objectives with private-sector relevance

- Standardisation remains a general challenge for Europe's quantum ecosystem. Europe tends to be strong in standards and regulatory frameworks, but this can be difficult for start-ups if the process slows their transition from the lab to the market
- The proposed Competitiveness Compass seal could help increase visibility, but there is also a risk of creating yet another label in an already crowded landscape. Too many seals and platforms may reduce clarity rather than improve it
- Full technological autonomy is difficult to achieve in practice. For example, China shows a more full-stack approach, including measures to limit dependence on external partners, but this model may not be realistic or desirable for Europe
- The key question is how far Europe should go in protecting strategic technologies. Protecting everything could become counterproductive, as it may limit cooperation, slow down innovation and weaken competitiveness
- A more realistic approach would be to identify genuinely critical dependencies while keeping the ecosystem open enough to benefit from international cooperation, investment and market access
- Scale up funding
    - Quantum companies need stronger scale-up funding, not only early-stage research support
    - The Quantum Act can improve coordination, but it cannot close the funding gap on its own. Without better scale-up instruments, Europe may struggle to keep promising quantum companies in Europe
- EU Quantum Flagship – sub-components like QuantERA
    - The EU quantum landscape is spread across several instruments, including the Quantum Flagship, QuantERA, CEF, Digital Europe and other funding streams
    - It is neither realistic nor necessary for all European quantum funding to come from a single source. Different instruments serve different purposes and target different stages of development
    - Stronger coordination across these instruments is needed, ideally through a high-level board or similar structure that can provide political guidance and ensure strategic alignment
    - The main objective should be practical clarity for stakeholders, combined with a long-term vision for Europe's quantum ecosystem
    - The Quantum Flagship could play a stronger coordinating role, supported by people with both political understanding and the ability to connect different funding and policy priorities

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