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Analysis of today
Assessment of tomorrow

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Global quantum consortia: Huge investments are changing the future of computing

The seventy-seven-year history of computing power is currently experiencing a new upswing. Next week, on 7 May, the Science Committee of the US House of Representatives will convene a hearing titled "From Policy to Progress: How the National Quantum Initiative Shapes U.S. Quantum Technology Leadership," highlighting Washington's strategic reliance on quantum technology.

Already today, at the experimental stage, quantum computers enable the accelerated discovery of new drugs by reducing the number of expensive laboratory tests and enabling a more accurate assessment of financial risks, thereby limiting unexpected losses.

In logistics, algorithms based on quantum principles ensure more optimal delivery routes, which shortens transport times and reduces CO_2 emissions.

In the field of climate modelling, quantum simulations ensure more accurate predictions of extreme weather events and thus support better agricultural planning and infrastructure protection.

In the area of communications security, pilot Quantum Key Distribution (QKD) networks provide theoretically impenetrable encryption that protects critical data from industrial and government espionage.

Advanced quantum simulations of materials shorten the development cycle of new batteries with higher energy density and pave the way for more efficient electric vehicles.

European research projects

At the same time, a ten-year quantum "flagship" programme with a budget of 1 billion euros is underway in Brussels that aims to develop competitive quantum computers, sensors, and communication channels.

In the first phase (2018–2022), more than a hundred research projects were supported, and in April 2025, six pilot sites in Spain, the Netherlands, and Romania began testing connections for quantum data exchange.

The plan is to build commercial quantum networks for financial institutions and government agencies by the end of the decade.

The UK is not an exception. Its National Quantum Initiative (NQI), launched in 2014 with an initial investment of £270 million, has received more than £1 billion in public funding to date.

Just recently, on 14 April, a further £121 million was approved by United Kingdom Research and Innovation (UKRI) and the Engineering and Physical Sciences Research Council (EPSRC) for new research centres in Cambridge, Edinburgh, and Oxford, as well as grants for young scientists.

This makes the UK one of the top three countries investing in quantum technologies in terms of per capita investment.

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In Canada, the National Strategy for Quantum Technologies was published in April 2025, coordinated by Innovation, Science and Economic Development Canada (ISED) and supported by federal and provincial authorities.

The priorities are the development of more resilient systems ("fault-tolerant"), the promotion of spin-out companies from university laboratories, and the introduction of the "Quantum Skills Passport," which enables the easy exchange of experts between centres around the world.

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The private sector is investing heavily

The private sector is investing heavily: Reuters reported that IBM will invest USD 150 billion in US factories for quantum processors and associated data centres over the next five years.

Google, Microsoft, and PsiQuantum are announcing similar programmes, while the global value of venture capital flowing into quantum start-ups will reach USD 3 billion in 2024 — almost twice as much as in 2023.

A fundamental breakthrough in capacity expansion innovation came from Oxford: on 6 February, researchers demonstrated the execution of a quantum algorithm on two modular processors connected by optical channels.

Modularity, networking nodes with a few hundred qubits instead of building one giant machine, enables earlier implementation of systems with millions of qubits and lays the foundation for a future highly secure quantum internet.

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The investments have already reshaped the market: global spending on quantum technologies has exceeded USD 44.5 billion, and analysts predict it will grow to USD 106 billion by 2040.

Today, more than 20 national programmes, more than 50 major industry partnerships, and hundreds of university consortiums are working on hardware, software, and security protocols.

A bottleneck in development

But the challenges are still great. Error correction requires hundreds of physical qubits for each "logical" qubit, placing stringent demands on cryogenic systems and electronic control.

At the same time, the lack of trained engineers and algorithmists is creating a bottleneck in development.

Institutions such as the Massachusetts Institute of Technology (MIT) and the Swiss Federal Institute of Technology (ETH) in Zurich are introducing interdisciplinary programs that combine physics, computer science, and engineering, but the labour market still demands more specialists.

> The quantum threat to today's encryption standards is becoming more and more tangible

The quantum threat to today's encryption standards (Rivest–Shamir–Adleman–RSA; Elliptic Curve Cryptography–ECC) is becoming more and more tangible, so governments are rapidly adopting post-quantum cryptography protocols.

In contrast, pilot Quantum Key Distribution (QKD) networks provide theoretically impenetrable encryption that protects critical data from industrial and government espionage.

Race for supremacy in quantum computing

In the next five years, at least three research centres are expected to have a demonstrator with around a thousand qubits that is capable of outperforming conventional supercomputers in specific tasks.

In parallel, pilot QKD networks will connect regional capitals, and by 2030, the first commercial quantum computers with built-in error correction will solve challenges in the fields of pharmaceuticals, climate modelling, and finance.

A Quantum Technologies Act modelled on the EU AI Act is being drafted in Brussels to create a framework that promotes innovation while protecting critical infrastructures

To avoid regulatory chaos, international organisations are working on standardisation.

Working groups from the International Organisation for Standardisation/International Electrotechnical Commission Joint Technical Committee 1 Subcommittee 41 (ISO/IEC JTC1/SC41) and the European Telecommunications Standards Institute (ETSI) are developing standards to clearly define qubits, network connections, and security requirements.

A Quantum Technologies Act modelled on the EU AI Act is currently being drafted in Brussels to create a framework that promotes innovation while protecting critical infrastructures.

Billions of dollars are changing the future of computing, and it is clear that quantum is no longer just a topic for specialist conferences.

Governments, technology giants, and universities are in a race for practical supremacy in quantum computing, and the coming years will determine who will lead this revolution to commercial maturity.

All of this means that quantum technologies are no longer just news from the future but news that is happening now.