

# Taking the pulse: operator views and plans on quantum technologies

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## GSMA Intelligence

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# Executive summary

Over the last two years the rise of quantum has flown slightly under the radar, crowded out by the hype of AI. But this should not diminish the implications of quantum technologies for a range of businesses, including telecoms operators. The use cases for operators include improving network security, network efficiency and commercial service innovation.

Quantum technologies are often considered to be comprised of three distinct pillars, all of which bring considerable benefits:

- **Quantum computing** boosts processing power for complex optimisation tasks.
- **Quantum communication** enhances secure data exchange and cryptography and, in the long term, will unlock future quantum-networking capability.
- **Quantum sensing** delivers ultra-precise measurement capabilities.

The focus in this report is on the strategic implications of quantum technology deployments and the risks of not taking action. To support this, in September–November 2025, GSMA Intelligence surveyed 100 network strategy and procurement decision-makers from operators around the world to understand their view on quantum technologies, use cases, deployment status and plans, opportunities and strategic partnerships.

Below are the main findings:

- **Deployments:** The results show there is growing momentum behind adoption of quantum technologies among operators, with 60% of them having quantum technologies in their roadmap. This is positive given that the technology is nascent. However, of those with plans to deploy, only 12% plan to do so in the next 12 months, with most pushing it out 2–3 years. Meanwhile, 40% (almost half the industry) have no plans for quantum technologies in their roadmap. This presents a risk (from unrealised security improvements) and an opportunity cost (from missing out on product innovation), suggesting there is an awareness gap that needs to be closed.
- **Use case priorities:** Among the top benefits of quantum technologies for operators are bolstering network security and improving network efficiency. Improving services is not currently seen as a top priority, but this will likely change over time. While operators will eventually prioritise quantum technologies as a revenue enabler, the early focus is on bolstering security and the core. This is why quantum key distribution (QKD), quantum entropy and quantum machine-learning/AI are most advanced in terms of deployment status. For now, the top priority is to build a secure and efficient foundation, ensuring networks are efficient and robust against a developing threat landscape, before shifting to commercial opportunities. This investment priority makes sense, as commercial opportunities can only be launched once the network foundation is secure.
- **Enterprise demand:** While quantum technologies will affect many industries, financial services, manufacturing, healthcare, pharmaceutical and smart mobility will be most impacted. Additionally, sectors such as utilities and energy, public sector and logistic/transportation are also set to benefit significantly from advances in quantum technologies. These industries are likely to experience great transformation, creating new

opportunities for operators that can position themselves as trusted commercial partners. Operators can assist enterprises with quantum solutions in their private network. In this scenario, the operator provides the infrastructure and expertise needed to integrate quantum-secure communication and data transfer within the enterprise's existing private network.

- **Barriers:** Technology immaturity is cited by operators as the greatest barrier impacting their strategy roadmaps, followed by lack of skilled internal talent and high implementation costs. This means that, despite the promise of quantum technologies, progress among operators may be slower than anticipated. They will struggle to realise the full benefits of quantum solutions until these barriers are addressed, and it is therefore important to leverage resources and strategic partnerships to overcome hurdles.
- **Active steps:** Operators are participating in industry consortia to share knowledge and engaging in collaborative research partnerships with universities to help plug skills gaps. Many are also investing in staff training programmes and recruitment drives targeting data scientists and quantum engineers. To address high implementation costs, operators rely on cloud-based quantum computing services to reduce capex. These actions will allow them to harness the benefits of quantum technologies while reducing the risks and opportunity costs associated with inaction. Overcoming these hurdles is a strategic imperative for operators looking to remain competitive as quantum technologies reshape the industry.

Return-on-investment (ROI) benchmarks, successful pilot implementations and ongoing proof-of-value initiatives are key drivers for advancing the adoption of quantum technologies. Operators that have already integrated quantum technologies, particularly regarding security and efficiency, can already reap the benefits of the technology.

Looking ahead, the adoption of quantum technologies in the telecoms industry is expected to progress through several distinct phases over the next five years. In the next 12 months, operators will continue to focus on research, pilot projects and early-stage deployments in areas such as QKD. Operators will also focus on testing and developing business models and enhancing in-house expertise. Over the next 2–3 years, as the technology matures, along with business models and professional knowledge, we anticipate a broader adoption of quantum technologies, including implementation from hesitant operators. In five years' time, quantum technologies will likely become an integral part of telco infrastructure, enabling advanced commercial services.

# 1. Why quantum technologies matter for telcos

Quantum technologies are often considered to be comprised of three distinct pillars, all of which bring considerable benefits:

- **Quantum computing:** By utilising qubits, which exist in a quantum superposition of 0 and 1 bit values, quantum computers can efficiently search large solution spaces, enhancing processing power for complex optimisation tasks such as site placement, multiple-input/multiple-output (MIMO) configuration, production scheduling and traffic routing.
- **Quantum communication:** By creating quantum entanglement between separated nodes, a range of new capabilities can be unlocked, including quantum key distribution (QKD) in the near term and distributed quantum computing in the longer term. In addition, quantum random number generators, or quantum entropy, can generate secret keys or private keys with enough entropy at high speeds, which is essential for encryption security.
- **Quantum sensing:** By utilising the sensitivity to their environment of atoms, electrons and photons in superposition states, quantum sensors can measure electromagnetic and gravitational fields with ultra-high precision and accuracy, enabling new techniques for integrated sensing such as high-resolution fibre sensing, enhanced radio frequency detection and infrastructure monitoring.

The rise of quantum technologies has flown slightly under the radar, crowded out by the hype of AI in tech in the last two years. However, this should not diminish the implications of quantum technologies for a range of businesses, including telcos. The main benefits for operators can broadly be split into three groups:

- **Improving network security:**
  - Quantum technologies offer a wide range of advanced security applications for the telecommunications sector. For instance, QKD enables highly secure key exchange, safeguarding communications against interception. Quantum computing can enhance network protection by detecting anomalous or malicious traffic, identifying vulnerable nodes and supporting the rapid design of effective security patch frameworks. Additionally, quantum entropy can be leveraged to strengthen cryptographic processes, ensuring robust encryption for sensitive data and communications.
- **Improving network efficiency:**
  - **Network optimisation and energy management:** Telecoms networks run using a huge number of parameters simultaneously. Quantum algorithms can efficiently and accurately solve combinatorial problems to support use cases, including traffic routing and shunting (e.g. moving traffic away from congested portions of a city network to underused cells) and sleep states to reduce energy usage

- **Radio resource management:** Quantum computers can optimise massive MIMO configurations and beam formation at the cell-site level. Via the application of quantum machine-learning algorithms for accurate traffic forecasting, quantum computing is also expected to be used to improve network slicing provisions to paying clients at a given quality of service.
- **Anomaly and fault detection:** Linked with the security application, quicker anomaly detection can help operators and their vendor suppliers to pre-empt attacks and perform rapid identification and targeted resolution of network faults, limiting the impact on end users.
- **Commercial product upgrades:**
  - **Improving existing services:** Quantum technologies can improve a variety of services. These include assuring network slices or private wireless service-level agreements (SLAs); utilising more effective analytics to optimise products, particularly ones in enterprise settings that rely on low-latency connectivity (e.g. digital twins or automated guided vehicles in factories); strengthening the encryption of managed services and IoT fleets with quantum entropy; and using QKD to provide symmetric encryption to high-assurance clients.
  - **Supporting new services:** A more nascent benefit involves the use of quantum technologies to support new product development. This could involve advanced IoT-sensing capabilities (e.g. weather predictions in an agricultural setting); vehicle-to-everything solutions for the automotive industry, in parallel with the push towards autonomous vehicles; providing quantum computing as a service to clients in other sectors; or (in the long term) leasing fibre to support quantum-networking applications

While there are a range of telco use cases of quantum technologies, which this report explores, the main focus of the analysis is on the strategic implications of quantum technology deployments and the potential risks of not taking action.

To support this, in September–November 2025, GSMA Intelligence surveyed 100 network strategy and procurement decision-makers from operators (e.g. CEOs, CTOs, CSOs, Head of/VP of Innovation, Head of/VP of Quantum) around the world to understand their view on quantum technologies. The goal was to better understand operators' investments in quantum technologies, the main use cases and their status of deployment, challenges, opportunities and strategic partnerships.

## 2. Deployment and investment plans

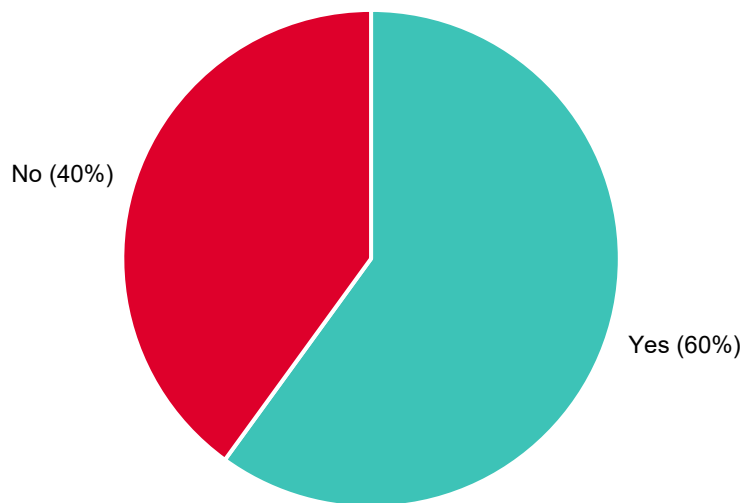
### 2.1 Growing commitments to quantum technologies

Results from the GSMA Intelligence survey show a clear picture of growing momentum behind the adoption of quantum technologies among telecoms operators. Specifically, 60% of operators already include quantum technologies in their strategic roadmap, highlighting a proactive commitment to next-generation network enhancements.

**Figure 1: 60% of operators globally already have quantum technologies in their roadmap**

Does your organisation already have quantum technologies in its roadmap? (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025

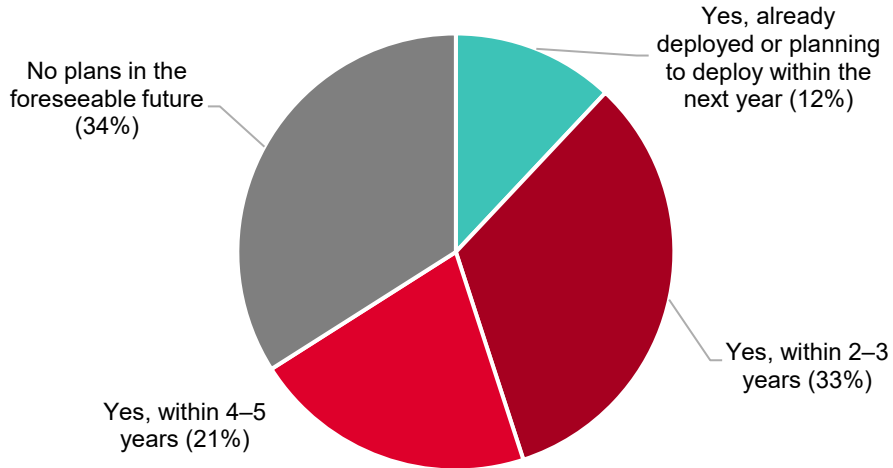


Furthermore, an even greater proportion (66%) plan to deploy quantum technologies within the next 1–5 years. While not all operators currently have quantum-related initiatives as part of their immediate strategy, there is widespread recognition of the long-term value and necessity of planning for deployment. The gap between those that already include quantum technologies in their roadmap and those that plan to deploy in the next 1–5 years suggests that some operators are still in the exploratory or preparatory stages.

**Figure 2: 12% of operators will deploy quantum technologies by 2026, with 54% planning to deploy in 2–5 years**

Does your organisation plan to deploy quantum technologies in the next 1–5 years? (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025

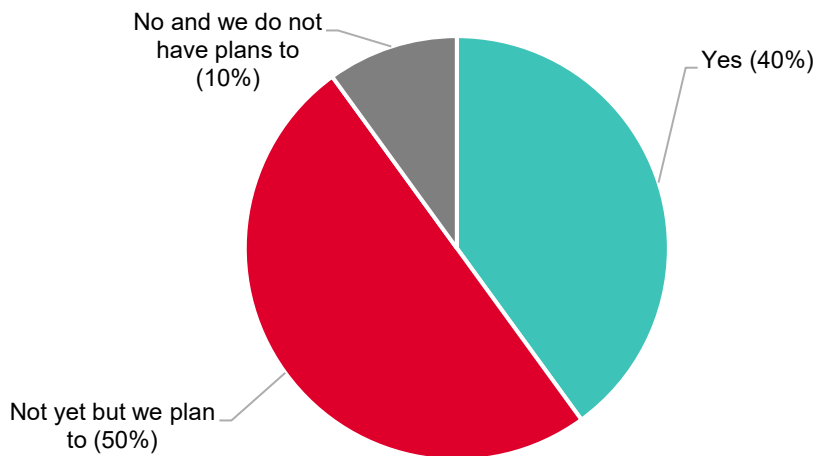


Among the operators that have quantum technologies in their roadmap, 40% already have internal quantum capability in place. This enables operators to better understand, manage and implement quantum technologies, ensuring they can adapt solutions to their specific needs and maintain a competitive edge. Additionally, 77% of them have already selected a vendor/specialist to invest in and/or work on quantum technologies.

**Figure 3: Among operators with quantum technologies in their roadmap, 40% have internal quantum capabilities**

Does your organisation have in place quantum internal capability (i.e. a specialist quantum technology team)? (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025



Base: Operators that have quantum technologies in their roadmap.

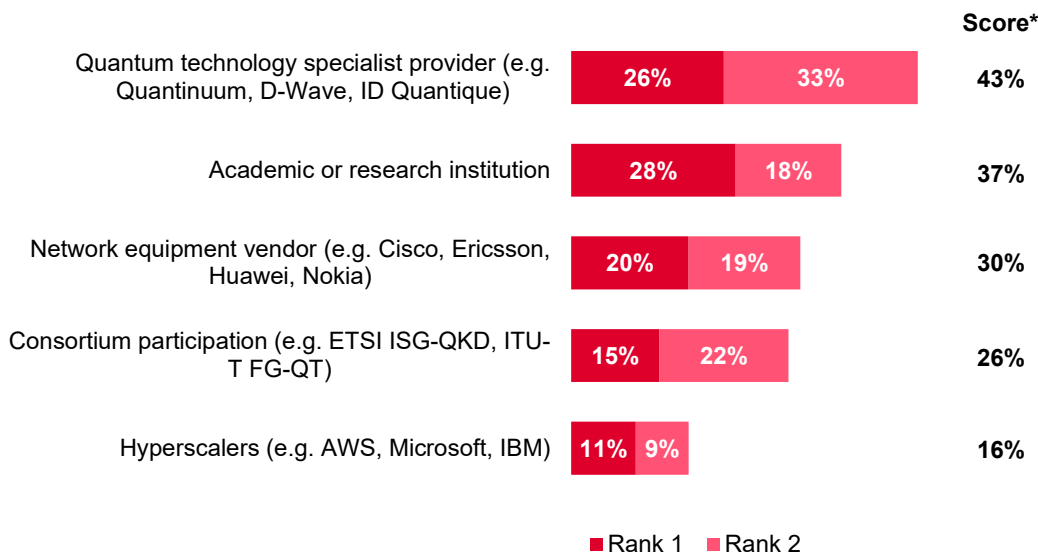
## 2.2 Partnership strategies depend on deployment plans

The choice of partners illustrates how operators are prioritising deep expertise and innovation: a majority (59%) prefer working with dedicated quantum-technology providers, while a significant share also look to academic institutions (46%) and established network equipment vendors (39%). This spread demonstrates a pragmatic approach that leverages a mix of cutting-edge research, specialist knowledge and established industry experience to accelerate quantum-technology deployment. For operators, prioritising partnerships with quantum-technology providers and network equipment vendors is logical, as it allows them to enhance quantum capabilities within their networks (e.g. QKD, quantum computing). Meanwhile, collaborating with academic and research institutions facilitates the development of practical use cases based on quantum technologies that are still maturing, including quantum machine learning.

### Figure 4: Operators are taking a pragmatic approach, working with a mix of partners to deploy quantum technologies

Who are your preferred partners to invest and/or work on quantum technologies? (Select top two) (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025



\* Score calculated as (Rank 1 \*1) + (Rank 2 \* 0.5)

Note: Totals may not add up due to rounding.

However, among operators that have no plans yet to deploy quantum technologies, hyperscalers come out on top as the most preferred partner for telcos, with a score of 43%.

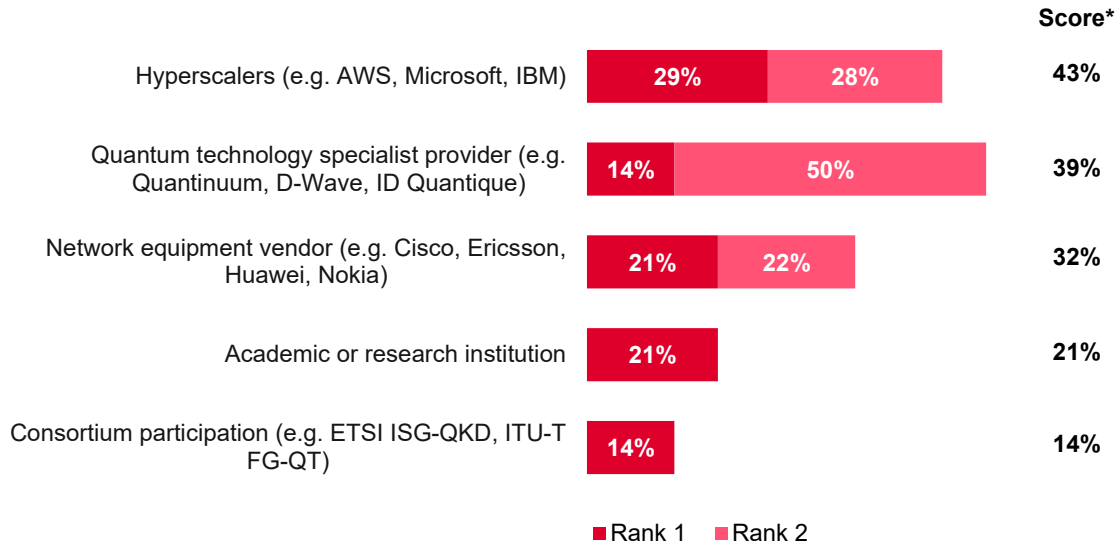
This highlights a contrast in strategy: while early adopters tend to take a broader approach, those late in their quantum journey see hyperscalers as among the most appealing partners, likely due to their ability to provide proven compute and commercial value without significant internal investment. This dynamic underscores the pivotal role hyperscalers are expected to play in democratising access to quantum technologies across the telecoms sector. For operators that are cautious about investing heavily in quantum capabilities, hyperscalers represent a low-risk option to explore the potential of quantum technologies. The strategy of early adopters offers greater autonomy and innovation at the cost of higher investment and complexity. Conversely, late

adopters benefit from the speed and low risk of hyperscaler partnerships, but may face limitations in customisation, value proposition and long-term capability building.

**Figure 5: Hyperscalers are the partner of choice among operators that have no plans yet to deploy quantum technologies**

Who would your organisation select to invest with? (Select top two)\*  
(Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025



\* Score calculated as (Rank 1 \*1) + (Rank 2 \* 0.5)

Base: Operators that have no plans yet to deploy quantum technologies.

## 3. Quantum use cases

### 3.1 Use case perceptions and deployment status

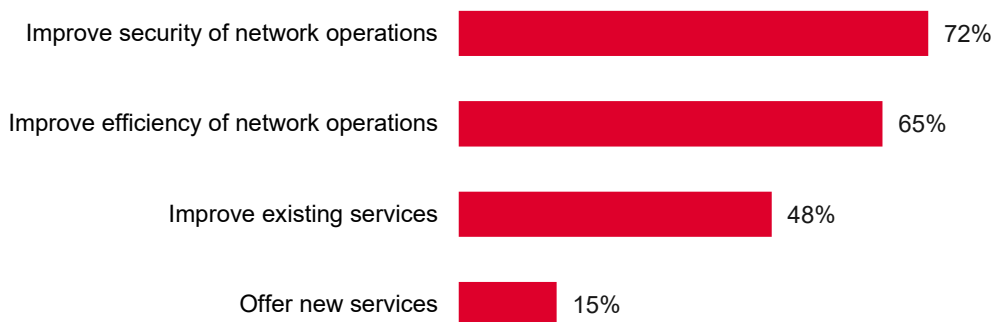
When asked to identify the top benefits of quantum technologies, 72% of respondents in our survey pointed to improved network security and 65% highlighted improved network efficiency. A lower but still significant share of operators (50%) see service improvement (e.g. quality of service or even new products) as the top benefit.

The findings demonstrate that operators principally view quantum technologies as a way to enhance network security and efficiency. As cyberattacks become more sophisticated and the network attack surface increases, the ability to safeguard networks is increasingly critical for ensuring service continuity, maintaining trust and protecting sensitive information. Meanwhile, sustained cost pressures and the incentives and commitments to reach net zero have made energy efficiency a strategic priority for operators.

Improving services is not currently seen a top priority, but this will likely change over time. While operators will eventually prioritise quantum technologies as a revenue enabler, the early focus is on bolstering security and the core. By first addressing operational and foundational challenges, operators can build a more resilient and high-performing network, upon which future innovations and services can be successfully rolled out.

**Figure 6: Security and efficiency are seen as the top benefits of quantum technologies**  
What would be the expected benefit of deploying quantum technologies to your organisation?  
Select top two (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025



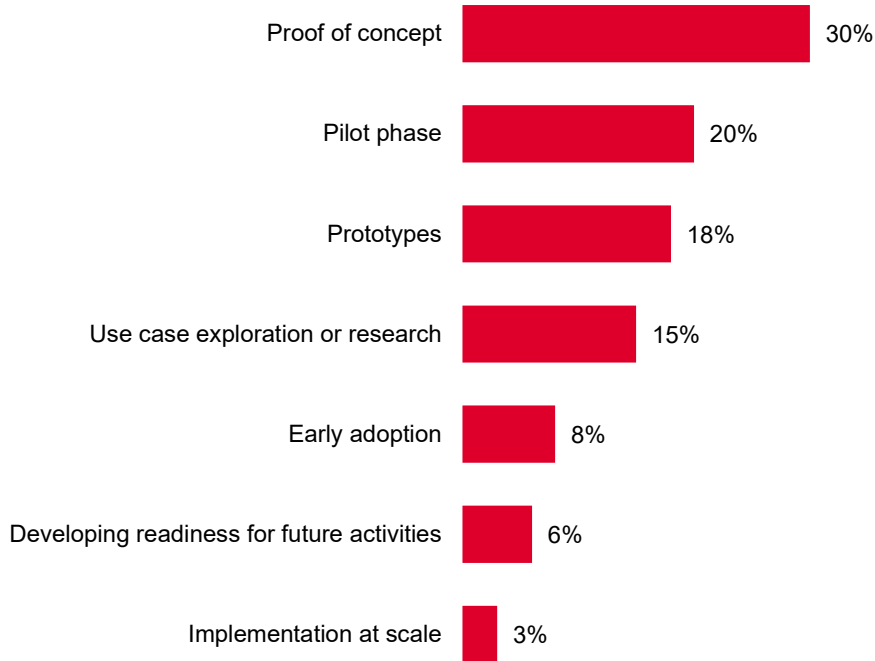
Given the high importance that operators place on network security and efficiency, it is unsurprising that QKD, quantum entropy, quantum machine-learning/AI and quantum computing are the most advanced use cases in terms of deployment status. Currently, QKD is also viewed by 70% of operators as the most commercially promising quantum technology.

Nevertheless, even for their most mature quantum technologies, operators remain at an early stage of deployment: 30% report that their most advanced quantum technology is still in the proof-of-concept phase, 20% are at the pilot stage, 18% are working with prototypes and only a minority have progressed to early commercial deployment or implementation at scale.

**Figure 7: A minority of operators have commercially deployed their most advanced quantum technology, with most still validating or testing business use cases**

What is the status of the most advanced quantum technology deployment in your organisation? (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025

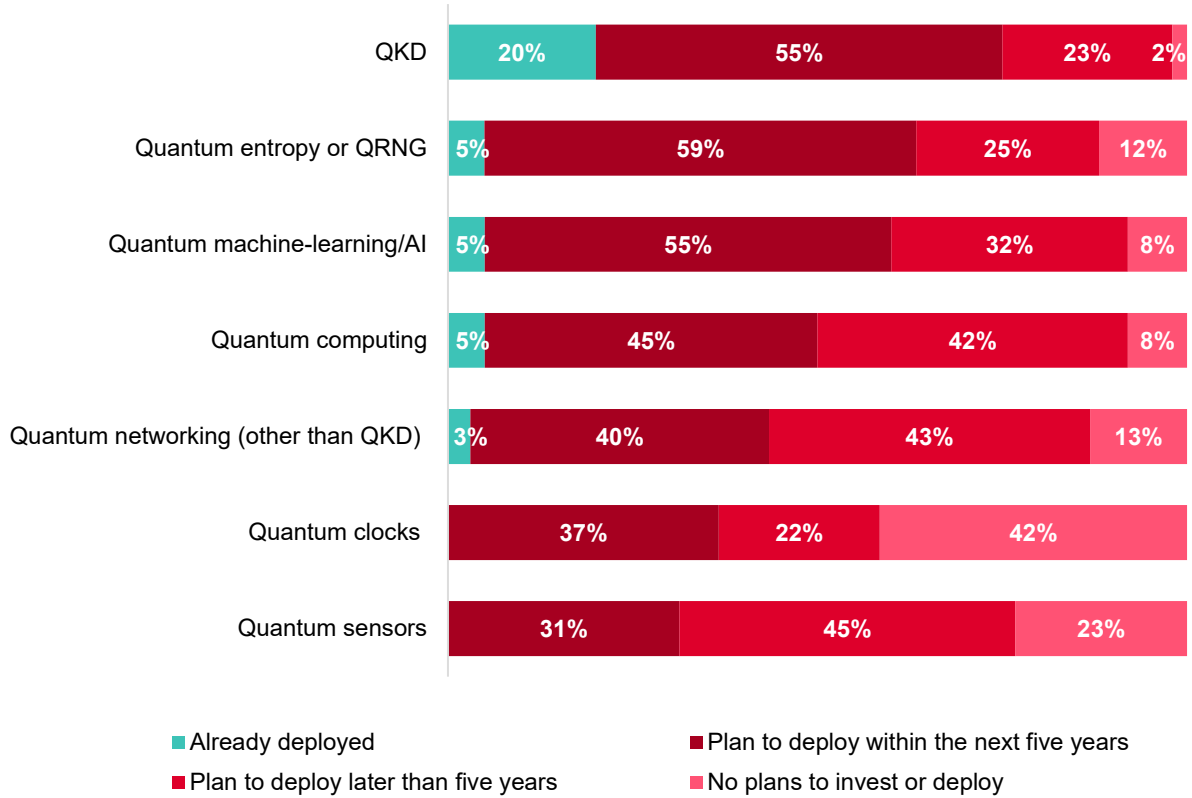


This suggests that while there is enthusiasm and strategic intent among operators to adopt quantum technologies, the industry is still in the early stages deployment. The fact that many quantum use cases remain in the proof-of-concept or exploration and experimental phases indicates that widespread, commercial-scale implementation is still a few years away. Significant operational benefits are likely to emerge only as quantum technologies mature and move beyond the experimental phase. Meanwhile, operators are prioritising the essential prerequisites for accelerating the deployment of quantum technologies. This includes securing substantial government investment, cultivating a highly skilled workforce and rigorously validating the commercial viability of quantum solutions. Addressing these critical factors is fundamental to overcoming the most significant barriers to adoption and ensuring the successful integration of quantum capabilities into core network operations.

**Figure 8: QKD, quantum machine-learning/AI, and quantum computing are the most developed use cases**

For each of the below quantum technologies, what is the deployment status for your organisation? (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025



As quantum technologies mature, operators are likely to see tangible improvements in safeguarding their infrastructure against increasingly sophisticated cyberthreats and in optimising network performance. These use cases will help operators enhance network reliability and operational efficiency while laying the foundation for the introduction of innovative products and services.

**Table 1: Europe: deployment status of quantum use cases among leading operators**

Source: GSMA Intelligence, based on company websites

Operator	Partner	Quantum use case	Status of deployment
<b>Vodafone</b>	Orca Computing	Vodafone tapped Orca Computing's expertise to explore the use of quantum computing to help with planning, installing and optimising large mobile radio and broadband networks.	Use case exploration
<b>TIM</b>	QTI and Telsy	TIM, together with Telsy and QTI, successfully implemented a high-capacity link between two data centres in Athens, secured with QKD.	Testing phase
<b>Telefónica</b>	Idemia, LuxQuanta, Qrypt, Quside, QoolNet	Telefónica's early engagement in quantum technologies puts it in a leading position to realise opportunities and prepare for security risks. The operator has established a dedicated centre of excellence for quantum technologies. It is also advancing QKD, having deployed it operationally within the EuroQCI network and used it to secure communication between two hospital group's healthcare centres in Madrid. Additionally, Telefónica is working alongside partners to deploy quantum technologies, such working with Qrypt and Quside to implement quantum entropy, along with post-quantum cryptography, into security-critical IoT and cloud environments.	Initial commercial deployment
<b>Orange</b>	Toshiba	Orange Business' quantum offering includes three layers. The first consists of consultancy and advisory services provided by Orange Cyberdefense. The second offers quantum security on a service basis, on top of Orange Business' Evolution Platform for connectivity management. The third layer is infrastructure, combining post-quantum cryptography (PQC) algorithms and QKD hardware to provide full cryptographic confidence.	Initial commercial deployment

**Table 2: Asia Pacific: deployment status of quantum use cases among leading operators**

Source: GSMA Intelligence, based on company websites

Operator	Partner	Quantum use case	Status of deployment
<b>Singtel</b>	ID Quantique, Cisco, Fortinet, Nokia, and Palo Alto Networks	Singtel launched its hybrid quantum-safe network in 2025, which integrates QKD with PQC. The solution extends protection to core data centres, mission-critical sites, branch offices, remote facilities and cloud environments.	Initial commercial deployment
<b>China Telecom</b>	The Hong Kong University of Science and Technology	China Telecom has deployed an integrated QKD and PQC metropolitan area network, covering the city of Hefei to provide secure services to government organisations.	Initial commercial deployment

**Table 3: North America: deployment status of quantum use cases among leading operators**

Source: GSMA Intelligence, based on company websites

Operator	Partner	Quantum use case	Status of deployment
<b>Verizon</b>	Quantum Xchange, Toshiba	Verizon is actively involved in QKD research and trials, partnering with technology providers such as Quantum Xchange and Toshiba.	Pilot phase
<b>AT&amp;T</b>	Caltech, Stanford (via INQNET), Quantum Dice	AT&T has demonstrated the implementation of entropy as a service, powered Quantum Dice, and its use in a digital QKD VPN use case created by AT&T.	Proof of concept and demonstration

In addition to enhancing network infrastructure, there is a clear focus on monetising investments to ensure a positive return while simultaneously addressing the evolving needs of enterprises – particularly those in the financial, manufacturing, pharmaceutical and automotive sectors. For instance, quantum computing can optimise production scheduling in manufacturing, set trading prices in finance, resolve complex supply-chain challenges and speed up drug discovery. Meanwhile, quantum entropy can provide robust entropy sources for IoT devices, further strengthening operational efficiency and security.

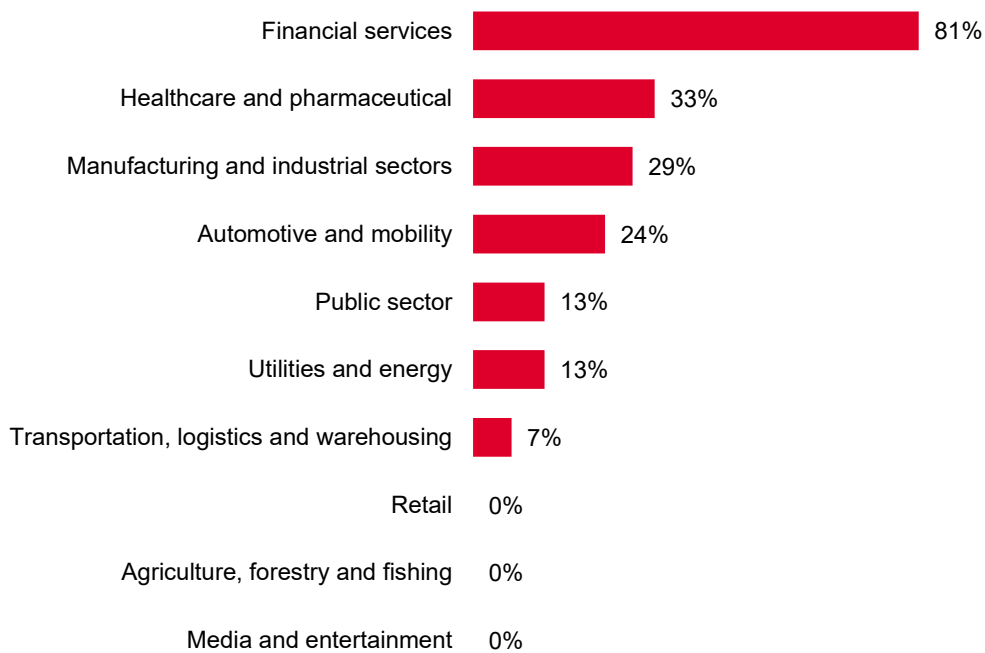
### 3.2 Demand across industries

While quantum technologies will affect many industries, financial services, manufacturing, healthcare, pharmaceutical and smart mobility will be most impacted. Additionally, sectors such as utilities and energy, the public sector and transportation/logistics are also set to benefit significantly from advances in quantum technologies.

**Figure 9: Financial, manufacturing, pharmaceutical and automotive will drive the most demand for quantum-based solutions.**

Rank the vertical sectors expected to drive demand for quantum technology-based services for your organisation\*

Source: GSMA Intelligence Operator Quantum Survey 2025



\* Percentages show the combined score of Rank 1 + Rank 2

The potential impact of the growth of quantum technologies in these industries is substantial: businesses operating within these sectors may gain a competitive advantage through enhanced analytical capabilities, improved efficiency and accuracy, enhanced security and accelerated innovation. Important applications of quantum technologies in financial services include more accurate risk modelling, fraud detection and portfolio optimisation. Quantum computing can also enable financial services to re-engineer operational processes such as front-office and back-office decisions on client, treasury and asset management.<sup>1</sup> In manufacturing, quantum-based solutions could streamline complex supply chains and production processes. In healthcare and pharmaceuticals, quantum simulation could speed up drug discovery and tailored medicine, leading to better patient outcomes. Meanwhile, smart mobility could see breakthroughs in traffic management and autonomous vehicle technology through the use of quantum technologies.

<sup>1</sup> Exploring quantum computing use cases for financial services, IBM, 2019

## Case study

### Quantum-driven improvements in transportation and logistics

Rotterdam has become the first port in the world to test QKD to address the exposure of the maritime and port sector to cyberattacks. The Port of Rotterdam Authority, Q\*Bird, Single Quantum, Cisco, Eurofiber, Portbase, Intermax and InnovationQuarter tested a scalable quantum network connection in the port based on multipoint connections.<sup>2</sup>

Meanwhile, the Hamburg Port Authority (HPA) has successfully demonstrated an approach to a more sustainable transportation of goods. By working with Fujitsu, HPA has proven potential to reduce congestion in its harbour areas. Applying Fujitsu's quantum-inspired Digital Annealer technology and services to real traffic data, HPA has established the possibility of optimising traffic throughput across the harbour areas. Instead of local management of individual traffic-light managed crossings, the quantum-based approach optimises the entire grid. This significantly cuts dwell times for ships, trucks and cars, resulting in faster supply-chain interaction and lower levels of greenhouse gases.<sup>3</sup>

The city of Los Angeles also regulates its truck traffic with quantum computing. D-Wave Quantum is leading a project with the main objectives of reducing truck waiting times and minimising the total distance travelled by cranes. The application optimises crane movements to select the most efficient container loading order based on various parameters. This approach has significantly reduced the average waiting time from 2–3 hours to less than one hour.<sup>4</sup>

Ultimately, organisations that embrace quantum technologies will be better positioned to drive progress, capture new market opportunities and address critical challenges more effectively than their competitors. Quantum technology is set to revolutionise industries, creating strategic opportunities for operators to strengthen their role as trusted, reliable enterprise partners and contributors to national economic resilience. While further roles for operators are expected to emerge as the market develops, a number of strategic opportunities are already expected:

- Operators can provide infrastructure and expertise needed to integrate quantum technologies, including QKD and QRNG, into existing private networks for enterprise, enabling enhanced security of sensitive data transmission.
- Operators can deploy QKD networks at a metropolitan or national scale, enabling protection of critical national infrastructure, including hospitals and energy grids, as well as high-assurance financial and banking data.
- Operators can leverage widespread secure cloud infrastructure to provide access to quantum computing hubs, enabling enterprises to benefit from the transformative benefits of quantum compute with low risk and low initial investment.

<sup>2</sup> "Quantum computing to protect against cyber attacks", PierNext, January 2025

<sup>3</sup> "Fujitsu Quantum-inspired optimization services cut traffic jams and CO2 emissions at Hamburg Port", Fujitsu, December 2021

<sup>4</sup> "Quantum computing to protect against cyber attacks", PierNext, January 2025

- Operators can utilise dark and lit fibre to enable quantum communication across wide distances, contributing key infrastructure for the integration of quantum computers into data centres and the development of next-generation applications, including distributed quantum computing. This will potentially unlock a new generation of services based on the transmission of quantum information.

### Case study

#### HSBC utilises BT and Toshiba's quantum-secured metro network

BT, in partnership with Toshiba, has launched a quantum-secured metro network in London, which uses QKD to protect data moving between businesses. Organisations such as EY, HSBC and Equinix are already on the network, testing quantum-secure use cases.<sup>5</sup>

Using QKD, HSBC connected its global headquarters in Canary Wharf and a data centre in Berkshire (62 km away) to explore how the technology can defend against future cyberthreats and quantum attacks. The technology has been trialled in multiple scenarios, including financial transactions, secure video communications and one-time-pad encryption, as well as AWS edge computing capabilities using an AWS Snowball Edge device.

HSBC processed 4.5 billion payments for customers in 2022, worth an estimated value of £3.5 trillion. These electronic payments rely on encryption to protect customers and businesses from cyberattacks.<sup>6</sup>

<sup>5</sup> "Securing the UK's quantum economy", BT

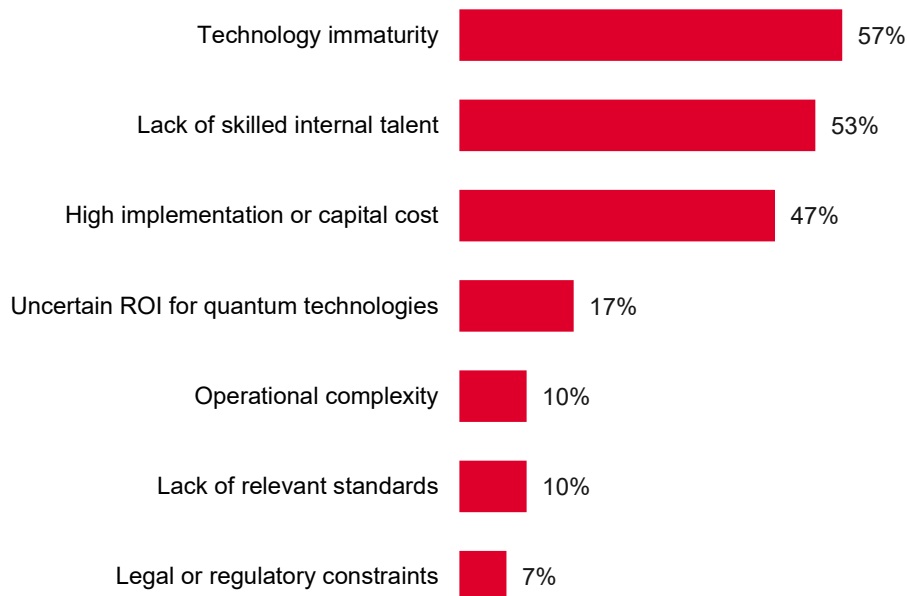
<sup>6</sup> "HSBC becomes first bank to join the UK's pioneering commercial quantum secure metro network", HSBC, July 2023

## 4. Outlook: paving the way for quantum readiness

Despite ongoing advancements in quantum technology, the majority of telecoms operators continue to view AI as the principal driver of technological progress, particularly within the realm of cybersecurity. In fact, only 2% currently consider quantum technology to be a priority over the next two years, according to a GSMA Intelligence survey.<sup>7</sup> This prevailing sentiment appears to be that quantum solutions are emerging, but the technology is still immature and, therefore, the industry focus and investment should remain largely concentrated on AI-driven innovation for now.

**Figure 10: Quantum technology immaturity is the biggest barrier to quantum strategies**  
Which barriers do you expect to have the greatest impact on your organisation’s quantum strategy over the expected roadmap period? Multiple responses allowed (Percentage of respondents)

Source: GSMA Intelligence Operator Quantum Survey 2025



Quantum technology immaturity is cited as the greatest barrier impacting operators’ quantum strategy roadmaps. Over half of operators (53%) also pointed to a lack of skilled internal talent and 47% think high implementation costs are a significant barrier. Operators are actively working towards addressing these challenges. For instance, 71% of operators participate in industry consortia and 68% engage in collaborative research partnerships with universities. In response to the prevailing skills gap, a substantial 78% of operators are proactively investing in the development of their workforce, frequently utilising advanced AI-powered training programmes and courses to ensure employees are equipped with the requisite expertise.

<sup>7</sup> [Staying one step ahead: telco security in 2025](#), GSMA Intelligence, 2025

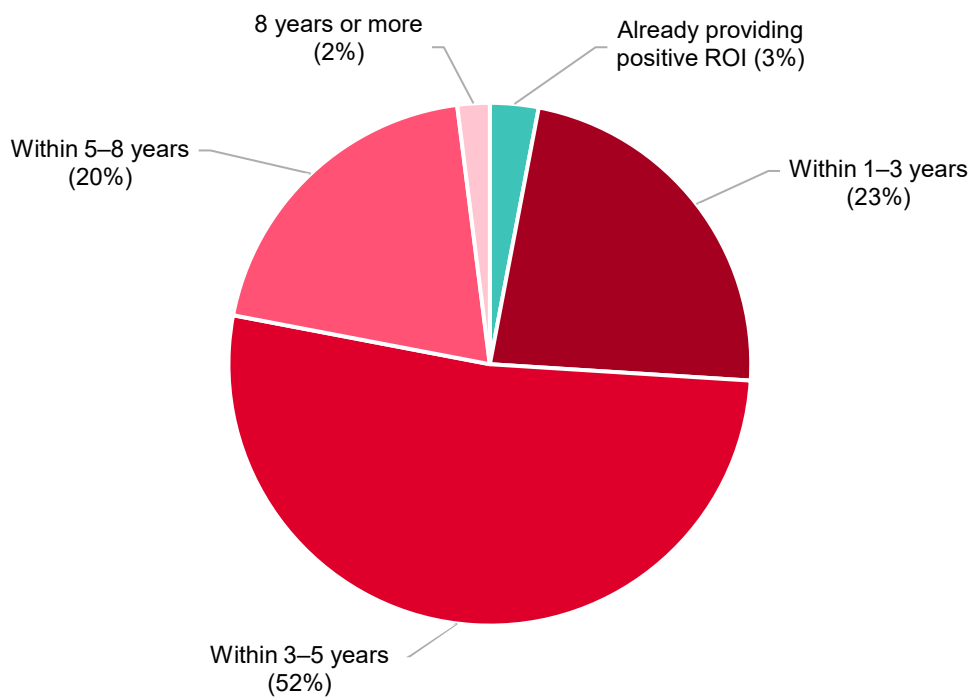
By focusing on high-value sectors, leveraging cloud-based quantum services to control capital expenditure and sharing costs through co-investment, operators are positioning themselves to gradually overcome quantum implementation costs.

Although the full-scale adoption of quantum technologies in telecommunications may be delayed, the groundwork is being laid now for smoother integration in the future. Operators’ actions suggest a pragmatic approach: they are preparing for quantum advancements while continuing to rely on existing AI-driven security measures. This transitional strategy helps ensure that when quantum technologies mature, the sector will have the talent, partnerships and infrastructure in place to capitalise on their benefits and minimise security risks. Return on investment (ROI) benchmarks, pilot success stories and proof-of-value programmes will contribute to accelerating the adoption of quantum technologies. Among operators that have already integrated quantum solutions, particularly regarding security and efficiency, some are already seeing a competitive advantage and positive ROI (see Figure 11).

**Figure 11: Some operators are already seeing or soon expecting positive ROI**

How soon does your organisation expect positive ROI from quantum technologies? If your organisation has no plans to deploy, please give your opinion on ROI for the sector as a whole.

Source: GSMA Intelligence Operator Quantum Survey 2025



Looking ahead, the adoption of quantum technologies in the telecoms industry is expected to progress through several distinct phases over the next five years. In the next 12 months, operators will continue to focus on research, pilot projects and early-stage deployments in areas such as QKD. Operators will also focus on testing and developing business models and enhancing in-house expertise. Over the next 2–3 years, as the technology matures, along with business models and professional knowledge, we anticipate a broader adoption of quantum technologies, including implementation from hesitant operators. In five years’ time, quantum technologies will likely become an integral part of telco infrastructure, enabling advanced commercial services.

