Quantum Computing in German Industry 2026

Between Expectations and Implementation

bitkom

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DOI (German version)
10.64022/2026-quantum computing

Executive Summary

Quantum computing has made its way into the German economy and is predominantly viewed as a strategic opportunity. Operationally, however, it has only been implemented to a limited extent. This study shows that there is still a significant gap between general openness and concrete implementation. Many companies recognise long-term competitive potential but hesitate due to technological uncertainties, limited resources, and unclear use cases. While some are taking initial steps, the majority are still waiting. The survey highlights where companies currently stand and what conditions are necessary to move from interest to widespread application.

The results are based on a nationwide telephone survey conducted by Bitkom Research on behalf of the digital association Bitkom, targeting companies with more than 100 employees in the manufacturing and service sectors. A total of 607 interviews were conducted between weeks 42 and 48 of 2025.

Key findings:

- **Quantum computing is widely known but rarely deeply embedded**
  100 percent of the surveyed companies have heard of quantum computing; 54 percent have a general understanding of the concept, and 43 percent can explain it well. Only 8 percent are deeply engaged with the topic.
- **Strategically acknowledged, operationally cautious**
  67 percent view quantum computing predominantly as an opportunity, 62 percent expect a long-term improvement in their competitive position, and 39 percent currently assign central or rather significant importance to the topic. However, 64 percent indicate that they prefer to wait for the experiences of other companies.
- **IT security is recognized – preparation remains limited**
  Around 43 percent of surveyed companies perceive a rather or very high risk to their IT security. At the same time, among companies already engaged with or interested in quantum computing, around 34 percent have not yet initiated any preparatory measures.
- **Competence building is a central challenge**
  61 percent of companies with a connection to quantum computing (i.e. active or in planning) have no internal capabilities for application or defence. 66 percent currently do not plan any concrete training measures in this area.
- **Capacity, technology maturity, and orientation hinder further engagement**
  65 percent of surveyed companies cite a lack of personnel resources as a barrier. 61 percent see the insufficient maturity of the technology as an obstacle, and 56 percent lack an overview of available offerings or application examples.
- **Companies interested in QC seek practical support**
  69 percent want financial support for pilot projects, 67 percent seek low-threshold or subsidised access to quantum platforms, and 66 percent call for greater market orientation.

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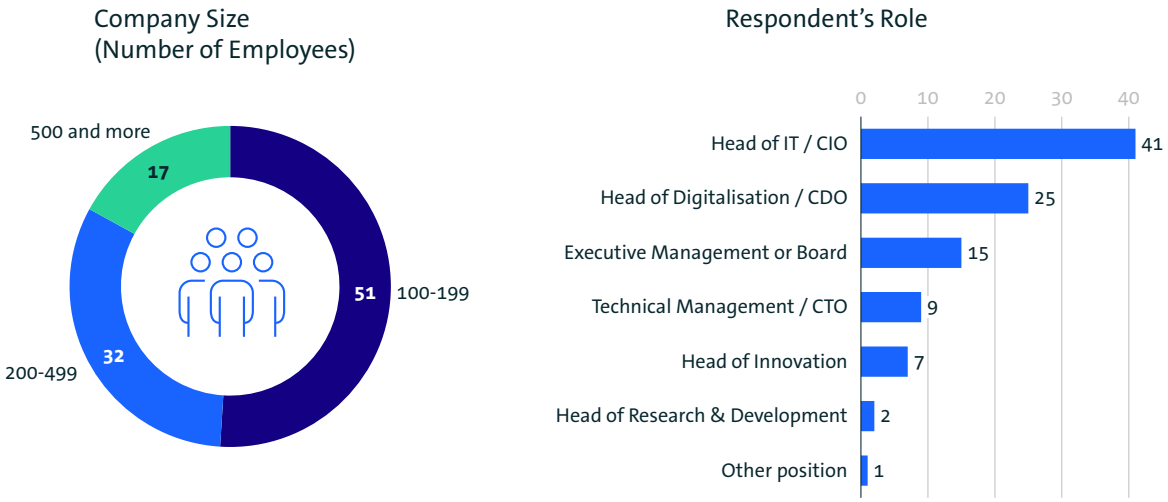
Database

Company Size and Respondent Profile

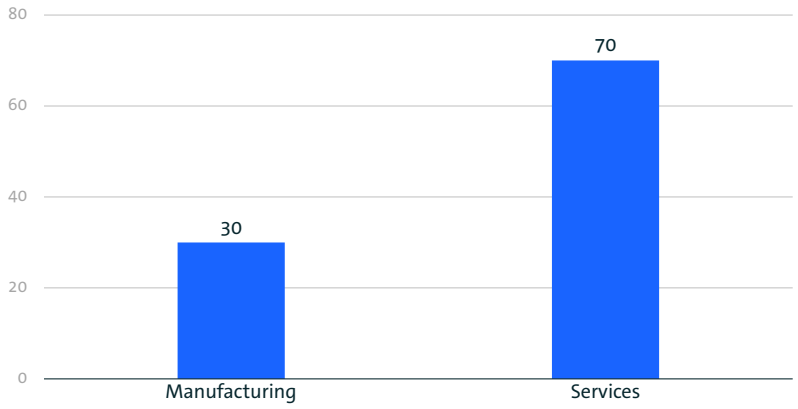


in percent

Base: All surveyed companies with 100 or more employees (n=607) | Source: Bitkom Research

Figure 1: Number of Employees and Role in the Company

Industry Breakdown



in percent

Base: All surveyed companies with 100 or more employees (n=607) | Source: Bitkom Research

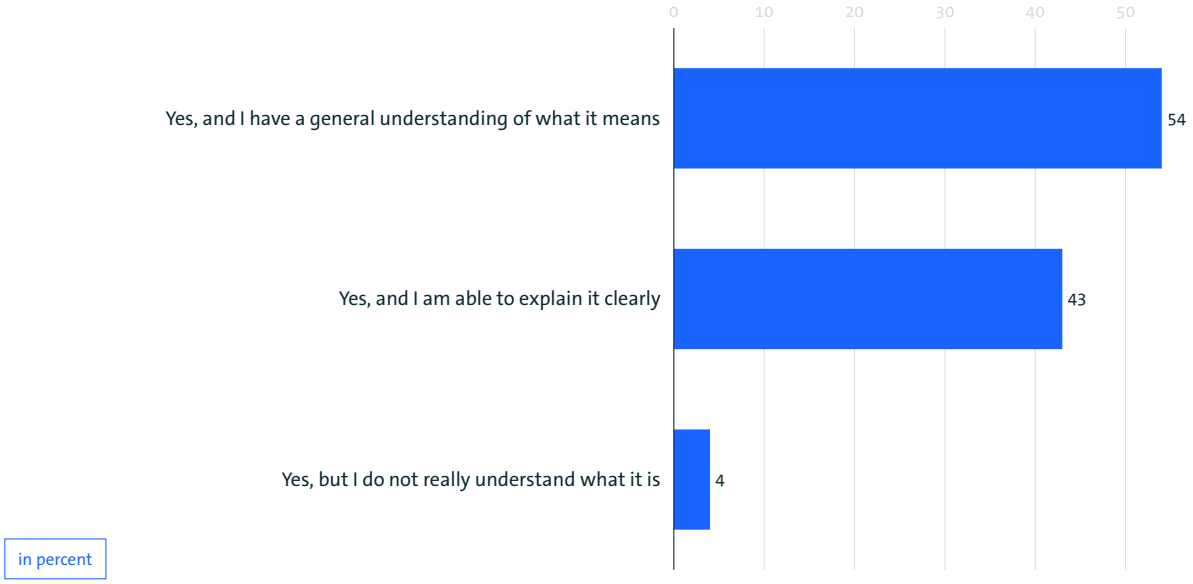
Figure 2: Surveyed Industries

1 Perception & Strategic Classification

1 Perception & Strategic Classification

1.1 Awareness & General Attitude

How familiar are you with the term »quantum computing«?



Base: All surveyed companies with at least 100 employees (n=607) | Source: Bitkom Research

Figure 3: Awareness and Understanding of "Quantum Computing"

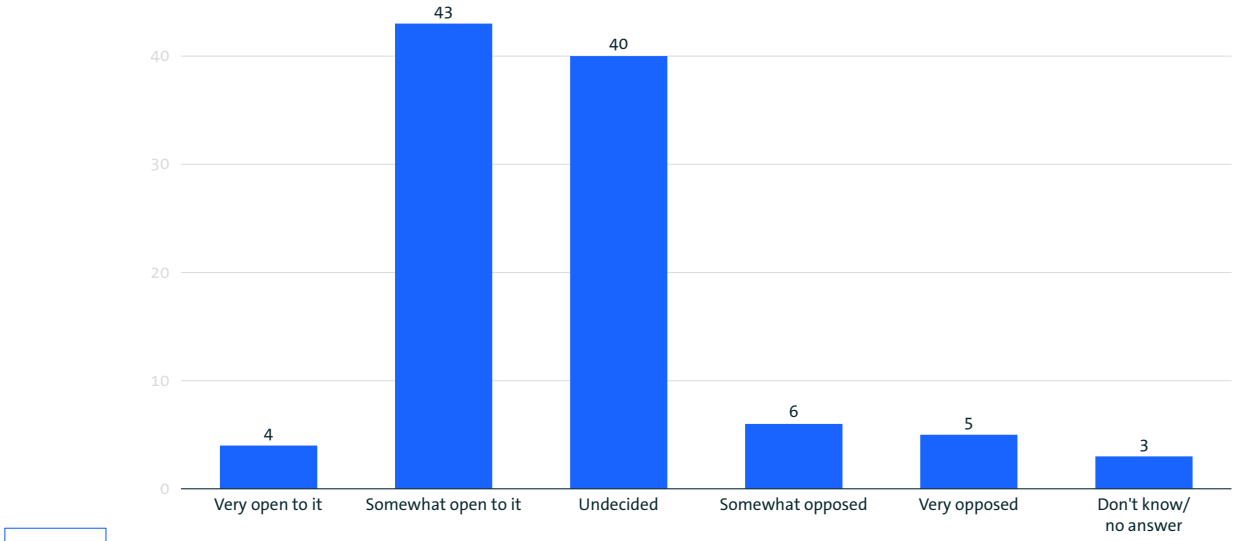
Awareness of Quantum Computing Is High Among Companies

None of the surveyed companies report that they have never heard or read the term "quantum computing." This means that virtually all companies are at least aware of the technology.

However, levels of understanding vary: 54 percent state that they have a general understanding of quantum computing, while 43 percent say they can explain it well. Only 4 percent report that they are familiar with the term but are not exactly sure what it means.

Overall, quantum computing is present across companies of all sizes and industries, with differences between groups tending to be gradual.

What's your company's overall stance on quantum computing?



Base: All surveyed companies with 100 or more employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

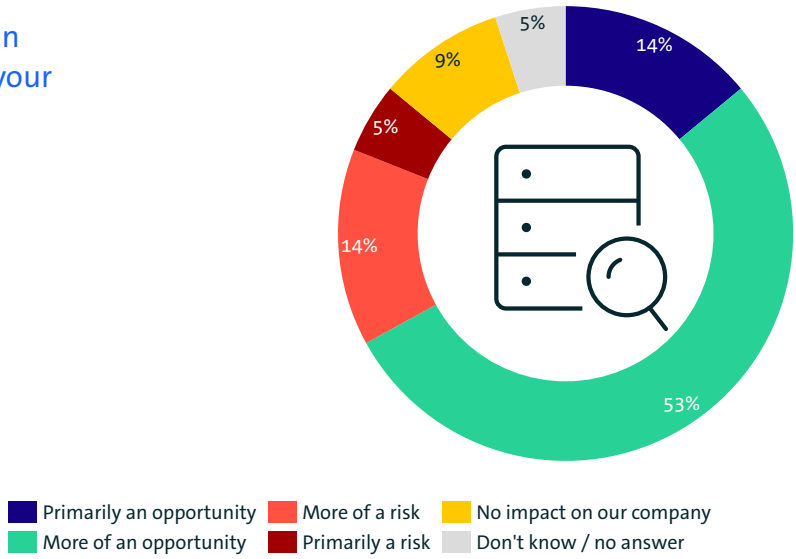
Figure 4: Attitude Towards Quantum Computing

Companies' general attitude towards quantum computing is largely open to undecided: 47 percent of respondents state that their company is "very" or "somewhat open" to the topic. A further 40 percent remain undecided, while clear rejection remains the exception at 11 percent.

Overall, this indicates a broadly positive baseline attitude among nearly half of companies, while outright rejection of the technology is rare.

> Companies are generally open or cautious towards quantum computing: 47 percent are open to the technology, a further 40 percent remain undecided, and only 11 percent clearly reject it.

Do you see quantum computing primarily as an opportunity or a risk for your company?



in percent

All surveyed companies with 100 or more employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 5: Assessment of Opportunities and Risks of Quantum Computing

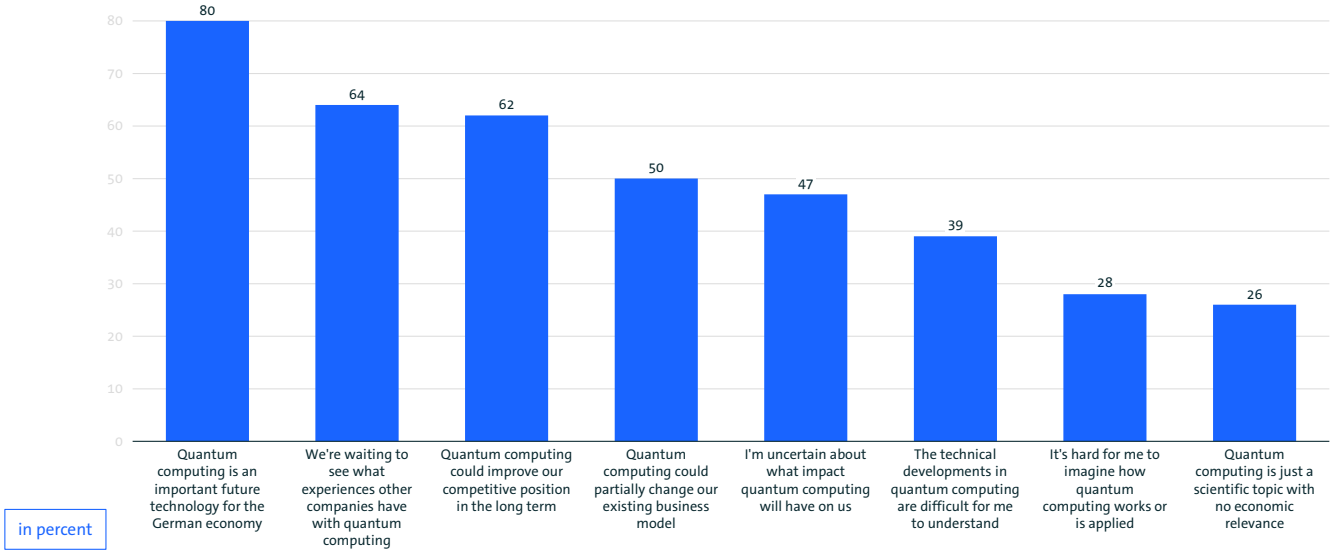
Quantum computing is predominantly perceived as an opportunity by companies, although it also carries certain risks: 67 percent view it "rather" or "largely" as an opportunity for their organisation, while 19 percent assess it "rather" or "largely" as a risk. A further 9 percent expect quantum computing to have no impact on their organisation.

Overall, this shows that quantum computing is strategically relevant for many companies, with the perceived opportunities clearly outweighing the associated risks.

> Quantum computing is seen as a strategic opportunity: 67 percent see potential, 19 percent perceive risks, and only 9 percent expect no impact.

1.2 Strategic Importance, Opportunities and Orientation Gaps

To what extent do the following statements about quantum computing apply to your company or reflect your view?



Basis: All surveyed companies with 100 or more employees who are interested in or using quantum computing (n= 463) | Figures for "Applies fully" and "Tends to apply" | Multiple responses possible | Source: Bitkom Research

Figure 6: Assessment of the strategic significance, opportunities, and orientation gaps of quantum computing

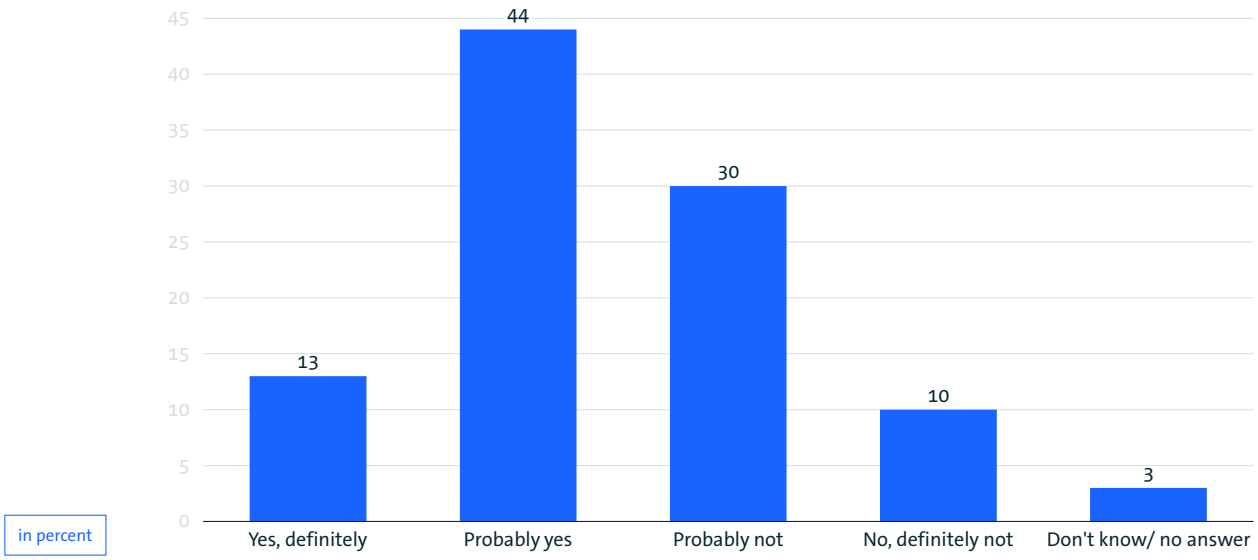
Between Opportunity, Risk, and Waiting

The strategic importance of quantum computing is widely recognised by companies: around 80 percent of surveyed companies agree that it is an important future technology for the German economy. Approximately 62 percent also see potential to improve their long-term competitive position, and half of the surveyed companies expect quantum computing to have an impact on their own business model.

At the same time, a clear gap in orientation is evident: many companies still struggle to keep pace with technical developments (39 percent) or to assess the practical implications for their own organisation (47 percent). A further 28 percent can barely envisage how quantum computing works or is applied, while 26 percent primarily view it as a scientific topic without economic relevance.

Against this backdrop, companies are adopting a wait-and-see approach: 64 percent are waiting to see what experiences other companies have with quantum computing before taking action themselves. Overall, the findings show that while quantum computing is recognised as strategically relevant, uncertainties and gaps in orientation remain.

Do you expect competitors to use quantum computing?



Base: All surveyed companies with 100+ employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

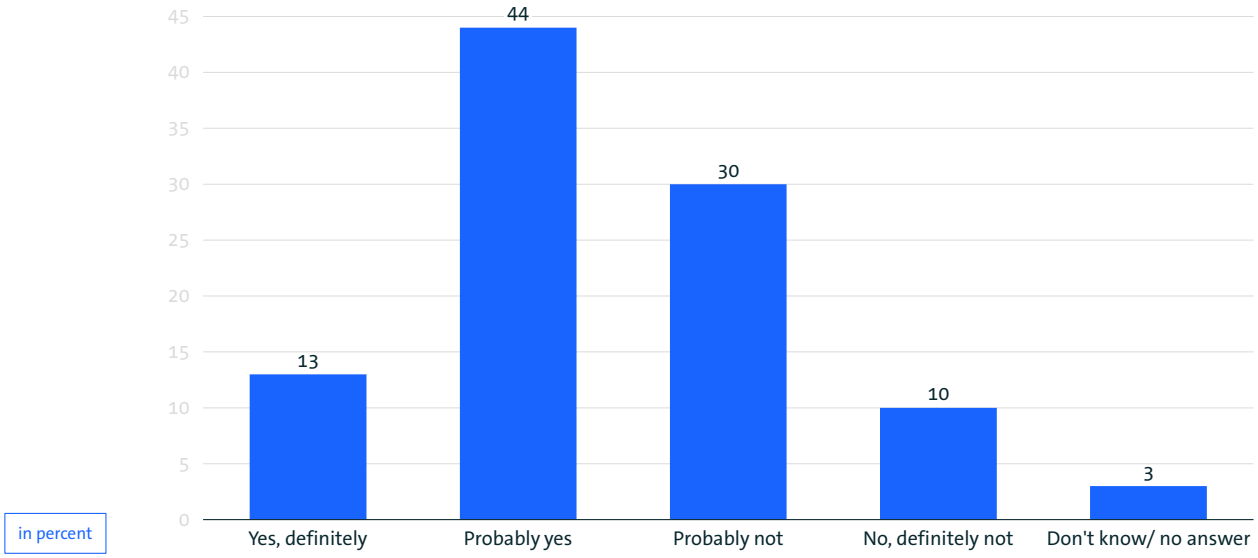
Figure 7: Expectation that competitors will utilize "quantum computing"

The majority of respondents believe that competitors will use quantum computing. 44 percent consider this likely, while 13 percent are certain that it will happen. By contrast, 30 percent do not expect this, and 10 percent definitely rule it out.

Competitive pressure is increasing: 57 percent of surveyed companies expect their competitors to use quantum computing.

1.4 Germany in International Context

Do you expect competitors to use quantum computing?



Base: All surveyed companies with 100+ employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 8: Assessment of Germany's Competitiveness in Quantum Computing Compared Internationally

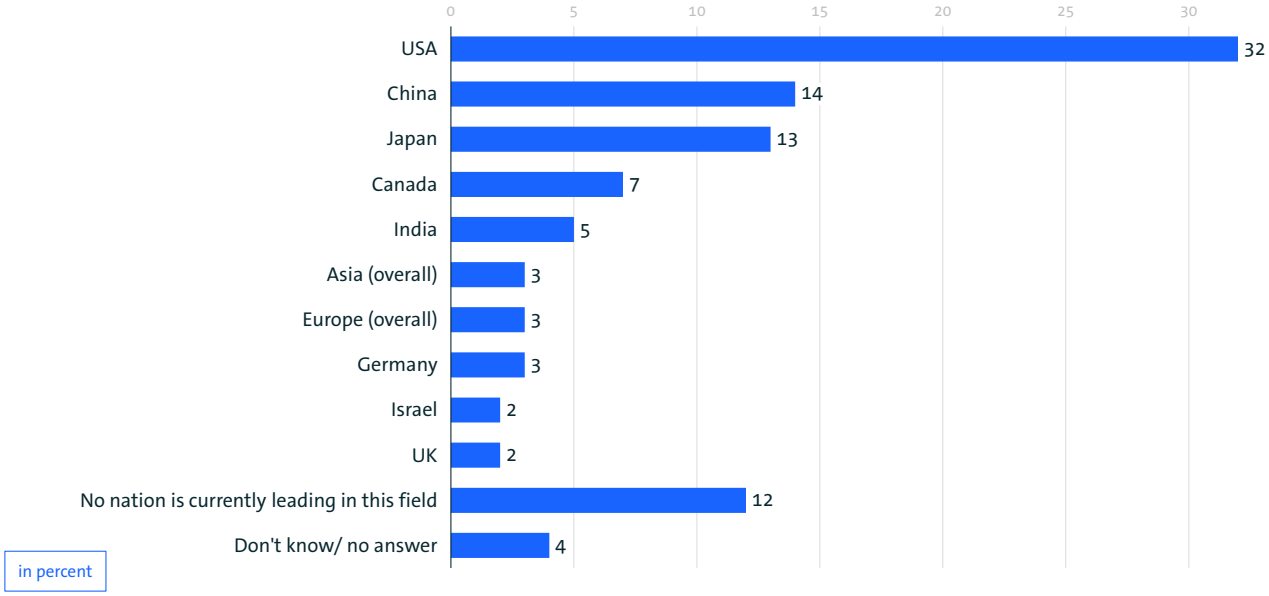
The German economy is predominantly perceived as being in the mid-tier or top group in quantum computing on an international scale: 32 percent of respondents place Germany in the top group—3 percent see it as a global leader and 29 percent as part of the top tier.

At the same time, 35 percent place Germany in the mid-tier. Around 29 percent consider the country to be lagging behind, including 25 percent as a follower and 4 percent as trailing.

Overall, this presents a balanced picture, reflecting both potential and existing challenges.

> Germany is predominantly perceived as being in the international mid-tier or top group in quantum computing—32 percent classify it as part of the top group, while 29 percent see a need for improvement.

Which nation do you currently consider to be leading in the field of quantum computing?



Basis: All surveyed companies with 100 or more employees (n=607) | deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 9: Perceived Leading Nations in the Field of "Quantum Computing"

When assessing which nation is currently leading in the field of quantum computing, the USA is most frequently mentioned (32 percent), followed by China (14 percent) and Japan (13 percent). Other countries cited include Canada (7 percent), India (5 percent), as well as Asia, Europe, and Germany (3 percent each). Israel and the United Kingdom are each mentioned by 2 percent.

Notably, 12 percent of respondents do not currently consider any nation to be leading, suggesting that the global level of maturity is still perceived as open or evolving. Only 4 percent did not provide an answer or were unsure.

> The USA is clearly perceived as the leader in quantum computing (32 percent), followed by China (14 percent) and Japan (13 percent), while 12 percent currently do not see any country as leading.

"Reality Check"

Quantum Computing International

Companies' assessments of global leadership in quantum computing can be compared with current data on patents, publications, and funding. Are these perceptions plausible?

USA

In the survey, the USA is most frequently cited as the leading nation (32 percent). International analyses support this perception—particularly with regard to funding, intellectual property (IP), and ecosystem dynamics. According to the OECD, around 60 percent of globally recorded funding for quantum companies is attributed to US-based firms, indicating structural strength in capital mobilisation and scaling (OECD, Mapping the Global Quantum Ecosystem). The USA is also strong in internationally relevant IP: 48 percent of international patent families in quantum technologies originate there, with particularly high activity in quantum computing (McKinsey, 2025; QuIC, 2026). In addition, the USA has established itself as a central hub in the global quantum ecosystem, characterised by strong company dynamics and a leading role in the startup and business environment (OECD, 2025; McKinsey, 2025).

China

China is identified as a leading nation by 14 percent of respondents. However, international analyses suggest a higher level of technological dynamism—particularly in terms of patent activity and scientific publications. China leads globally in QC-specific patent filings (around 32 percent of global filing activity, compared with around 22 percent for the USA) and also accounts for a very high share of scientific publications (around 42 percent) (McKinsey, 2025).

However, although China holds the highest overall numbers, most patent families remain nationally oriented. The comparatively cautious perception within the German economy may indicate that China's high level of activity largely takes place domestically or within the scientific domain, making it less visible in international markets and collaborations.

Germany and Europe

For Germany, the survey reflects a nuanced picture: the German economy is predominantly placed in the middle tier (35 percent) or the top group (31 percent). International analyses support the characterisation of a "strong base, but weaker scaling dynamics": OECD/EPO data rank Europe as the second-strongest hub for international patent families, with Germany as one of its key contributors.

In terms of ecosystem dynamics, OECD mapping shows that Europe is among the leading regions, with many organisations entering the quantum ecosystem in recent years. At the same time, Europe lags behind the USA in private capital mobilisation and scaling. Overall, companies' perceptions align well with international evidence: Germany and Europe are technologically strong but need to catch up in achieving broad industrial scaling and funding.

"Reality Check"

Overall, companies' assessments of the international competitive landscape appear largely plausible. The USA is rightly perceived as leading—particularly in terms of funding, internationally relevant IP, and ecosystem dynamics. China performs strongly on patent and publication indicators but is perceived more cautiously from a business perspective.

For Germany and Europe, a consistent picture emerges: a strong research and innovation base and high ecosystem activity, alongside structural challenges in private funding, scaling, and the transition to broad industrial implementation.

Sources: Quantum Technology Monitor, McKinsey, 2025; Mapping the Global Quantum Ecosystem, OECD & EPO, 2025; A Portrait of the Global Patent Landscape in Quantum Technologies, QuIC, 2026.

Use Case

Quantum Computing: From Idea to Proof of Concept to Productivity – Value Creation Today

In the future, quantum computers will solve (partial) tasks—similar to AI-specific hardware—for which we often cannot yet compute sufficiently good solutions today. This will take place in hybrid architectures within the data centre—on-premises in your own data centre, as a shared service, or via the cloud. However, beyond access to the necessary hardware, further prerequisites must be met for productive use: the data required for computation must be available at the appropriate quality and speed, and the application scenario must deliver value on the deployed hardware.

Addressing these questions today can already unlock new potential within your organisation: if your use case is suitable for digital or quantum annealers, industry-scale computations can already be carried out today, enabling a measurable return on investment. At the same time, you build expertise in quantum computing, allowing you to independently assess feasibility, avoid vendor lock-in, and, above all, prepare your data pipelines. The best starting point is a proof of concept—a compact, agile project in which different applications are explored and a selected use case is implemented in practice. After just a few weeks, you will know whether—and to what extent—you can achieve improvements over your current solution.

With our clients, we have successfully demonstrated the following use cases:

- Up to 6 percent lower logistics costs for delivery and collection in electronics retail, enabled by optimised vehicle capacities across Germany.
- Up to 60 percent higher Sharpe ratio in the construction of risk-diversified investment portfolios.
- Up to 20 percent shorter travel times and 9 percent lower fuel consumption in urban traffic through optimised traffic light control.
- Up to 40 percent improvement in solution quality in cell planning within the telecommunications sector, alongside a fivefold increase in computational speed.
- Significant acceleration in early-stage drug discovery, reducing typical timelines from 24–48 months to around 8 months.

Figure 10: Proof of Concepts Flowchart (Fsas Technologies)

Fsas Technologies—as a wholly owned subsidiary of Fujitsu, committed to Japanese values—designs IT infrastructure for sustainable, energy-efficient data centres, as well as resilient and sovereign IT services and innovative data and digital solutions.

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2 Corporate Maturity: Relevance and Adoption Dynamics

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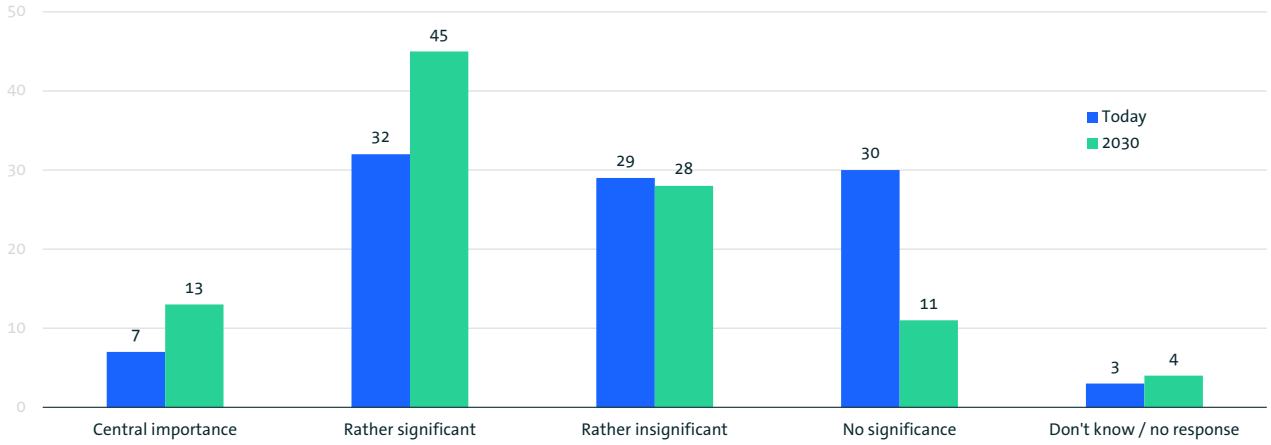
2.1 Strategic Importance

How significant is quantum computing for your company? (Today and by 2030)



in percent

Basis: All surveyed companies with 100 or more employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

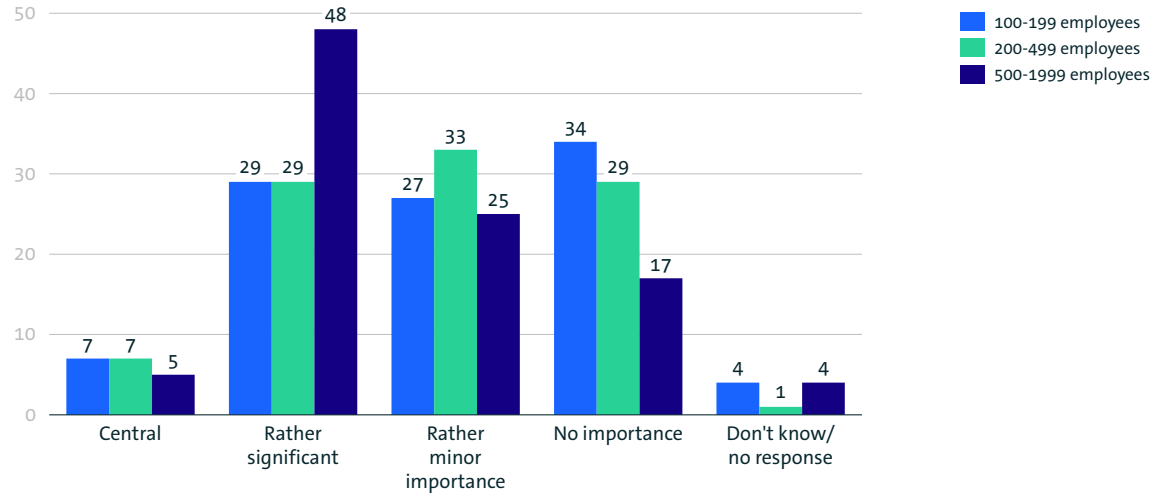
Figure 11: Assessment of the importance of quantum computing for businesses today and in 2030

The relevance of quantum computing is already being recognised today and is expected to increase further by 2030. Currently, 39 percent of companies attribute "central" or "rather significant" importance to quantum computing, with 7 percent considering it of "central importance" and 32 percent of «rather significant importance".

By contrast, 29 percent assign the topic relatively low importance, while 30 percent currently attribute no importance to quantum computing. Looking ahead, the expected importance by 2030 increases markedly: 13 percent then consider quantum computing to be of "central" importance, and 45 percent of "rather significant" importance. A particularly strong increase in relevance is expected among small and medium-sized enterprises in the coming years (see the following illustrations).

> The strategic importance of quantum computing is expected to grow significantly: today, 39 percent consider it to be of central or high relevance, rising to 58 percent by 2030.

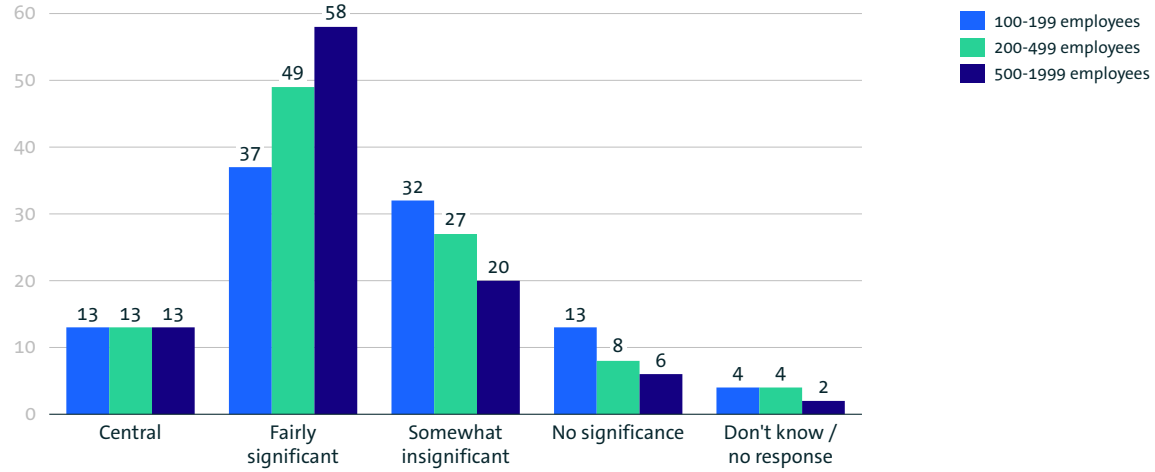
How significant is quantum computing for your company today?



Base: All surveyed companies with 100 or more employees (n=607) | deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 12: Assessment of the current significance of quantum computing for companies by size

How significant will quantum computing be for your company in five years (i.e. by 2030)?

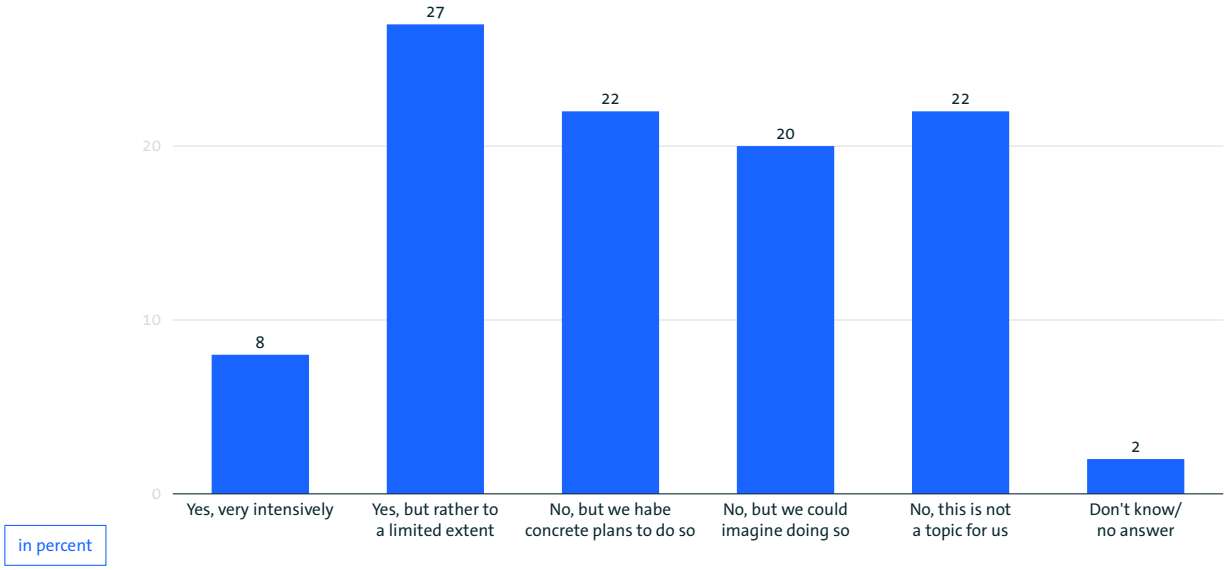


Base: All surveyed companies with 100 or more employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 13: Expected significance of quantum computing for businesses in the year 2030 by company size

2.2 Level of Engagement

Has your company already engaged with the topic of quantum computing?



Base: All surveyed companies with 100 or more employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 14: Intensity of Engagement with the Topic "Quantum Computing" in the Company

Despite its high perceived strategic importance, quantum computing is still approached cautiously by many companies. A considerable number of businesses are already engaging with the topic, though often not very intensively: 35 percent have explored quantum computing, a further 42 percent are planning to or considering doing so, and 22 percent currently regard it as irrelevant to their business. Overall, quantum computing is at least on the "radar" for around three-quarters of companies—however, the dominant mode remains observation and initial orientation.

This illustrates a significant gap between expected relevance and actual implementation dynamics: although quantum computing is often already attributed with central or high importance, practical engagement frequently remains at an early or less intensive stage. This is consistent with the broadly cautious stance observed among companies.

> Although its importance is expected to grow by 2030, adoption remains at an early stage: 35 percent have already engaged with quantum computing, and a further 42 percent are planning or considering it—but most remain in the observation and initial orientation phase.

Excursus

Learning Curve in the Adoption of New Technologies – The Example of Artificial Intelligence

An examination of the introduction of artificial intelligence (AI) shows that engaging with new technologies typically takes several years. There is often a prolonged phase of learning and adaptation between recognising technological opportunities and their widespread practical application.

Bitkom data clearly illustrates this pattern: as early as 2022, even before the breakthrough of generative AI applications, around 65 percent of companies saw AI as an opportunity for their business. At the same time, 64 percent stated that AI was not yet relevant to them. This discrepancy highlights a typical implementation gap: technologies are initially viewed positively before being adopted at scale.

In the following years, particularly with the increasing availability of easy-to-use generative AI applications, this gap narrowed significantly. The development shows that the diffusion of new technologies does not occur abruptly but follows a multi-year learning curve. This process is primarily accelerated by three factors: lower barriers to entry, visible and economically relevant use cases, and the systematic development of capabilities within companies.

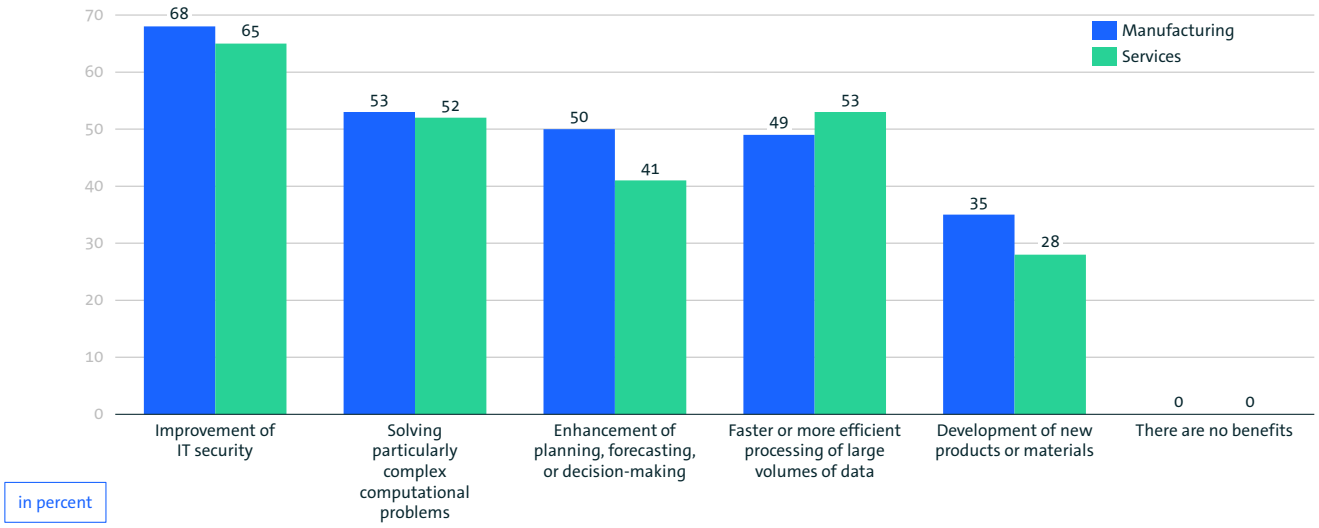
The comparison underlines the importance for organisations of monitoring technological developments at an early stage and gaining initial experience. Those who only react once technologies are already widely established risk missing the next technological wave.

↗ Bitkom-Dataverse

"AI in the German Economy"

2.3 Advantages of Quantum Computing

What potential benefits do you associate with the use of quantum computing in business?



Base: All surveyed companies with 100 or more employees interested in or using quantum computing (n= 463) | Multiple responses possible | Source: Bitkom Research

Figure 15: Perceived Benefits of Quantum Computing

Among companies with a connection to quantum computing (i.e. active or in planning), clear advantages are identified despite the technology's still low level of maturity:

The main advantage is seen in the potential to improve IT security, suggesting that companies primarily associate quantum computing with cryptography and IT security.

In addition to efficiency gains and faster data processing, companies also highlight the ability to solve particularly complex computational problems and to enhance planning, forecasting, and decision-making.

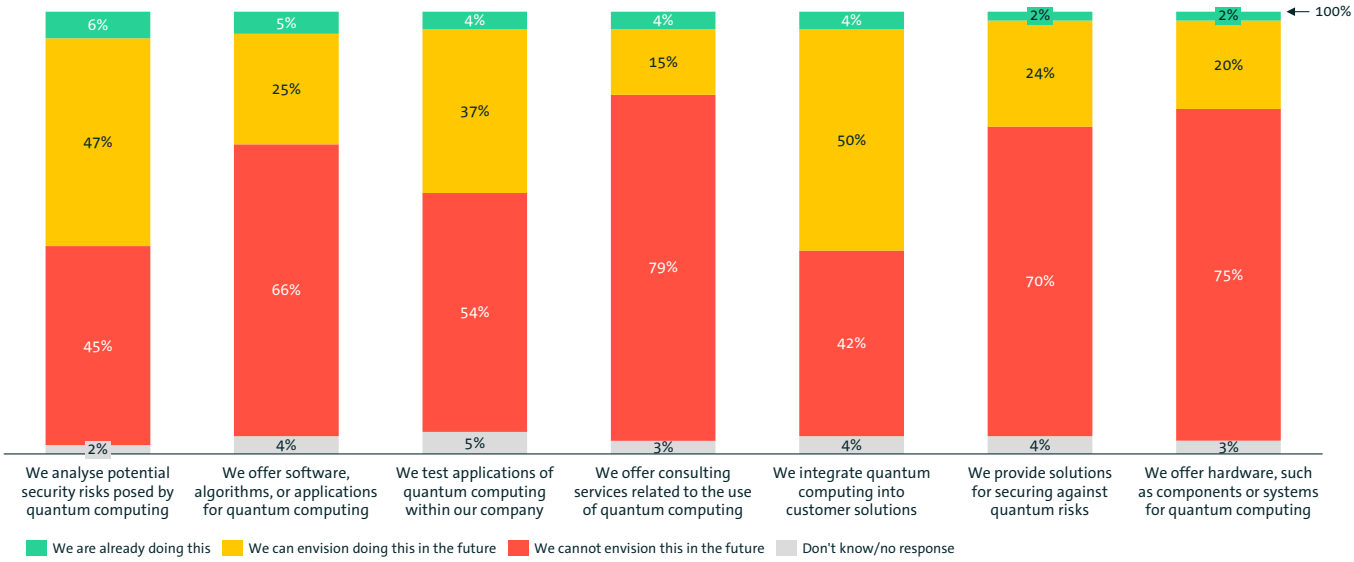
This shows that quantum computing is not only viewed as a means of accelerating calculations but is also seen as offering strategic advantages for complex tasks and analytical processes.

Not just faster computing: In addition to efficiency and speed (52 percent), companies engaged with the topic also cite advantages in solving complex computational problems (52 percent) and in planning, forecasting, and decision-making (43 percent). This highlights that quantum computing is seen as offering more than just increased speed.

↗ Bitkom-Dataverse

2.4 Activities & Market Roles

What activities is your company currently undertaking in quantum computing, and what are you planning for the future?



Base: Companies with 100 or more employees interested in or using quantum computing (n=463) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 16: Already implemented and planned activities of companies interested in or using quantum computing

Quantum computing is strategically on the radar, but practical implementation is still at an early stage.

The existing interest and engagement among surveyed companies are only to a limited extent reflected in active implementation: most activities remain in an exploratory phase.

Across all surveyed action areas, the share of companies already implementing relevant activities remains in the low single digits. The most common activity is the analysis of potential security risks (6 percent). Five percent are already offering software, algorithms, or applications, while 4 percent are integrating quantum computing into customer solutions. Only 4 percent are testing specific application use cases within their own organisation.

The majority of companies see the next steps in proof-of-concept and assessment: 47 percent can envisage systematically analysing risks, and 37 percent plan to test application use cases. By contrast, product development or proprietary technology offerings are less frequently prioritised.

On the supply side, integration into existing customer solutions is seen as a key scaling pathway: around 4 percent are already doing so, and 50 percent consider it a viable future option—the highest forward-looking value reported. Offering software or algorithms is considered feasible by 25 percent (5 percent already implemented), and hardware offerings by 20 percent (2 percent already realised). The market is therefore likely to grow more through integration and proximity to applications than through pure technology providers.

Quantum security is, so far, primarily addressed internally: although many companies analyse risks, only around 2 percent already offer concrete security solutions, while 24 percent can envisage doing so in the future. "Quantum security" thus currently appears more as an internal adaptation topic than as a standalone product field.

Use case

QCMobility – Maritime Traffic: Quantum Algorithms for Shipping

Customer Challenge

Waterways and canals are a central part of international supply chains, with locks representing unavoidable bottlenecks. Disruptions lead to delays, longer delivery times, and higher costs. The more ships that can be processed within a short period, the better—while ensuring that locks are operated safely and in compliance with regulations. Additional pressure arises from larger vessels and limited overtaking opportunities. Efficiency optimisation and risk assessment must therefore be addressed jointly.

Lock scheduling is a coupled, complex optimisation problem with many constraints: grouping ships into lock cycles and determining their sequence, particularly when coordinating multiple locks along a route. In operations, fast and reliable decisions are required, as classical methods reach their limits with increasing problem sizes. Even small deviations can propagate delays throughout the system—with economic consequences.

Approach at planqc: Maritime Traffic

planqc applies quantum solutions to systematically improve lock and traffic planning under real-world conditions. The planning process is structured so that key variables (e.g. assignment, sequence, timing) and mandatory constraints (safety, capacities, operational limits) are mapped mathematically. Building on this, operational and disruption scenarios are analysed using quantum algorithms to generate high-quality approximate solutions.

Specifically, a hybrid approach is used: first, a quantum method such as QAOA (Quantum Approximate Optimisation Algorithm) or a digital counter-diabatic approach is executed multiple times, producing a set of candidate solutions, from which a robust initial solution is selected. This initial solution is then refined: several nearby alternatives are constructed, spanning a limited search space.

In the next step, a quantum-based evaluation assesses the quality of these alternatives and how they can be meaningfully combined. In the current project phase, this quantum step is implemented via suitable simulation, with the aim of later running it on quantum hardware. Subsequently, classical computing resources are used to determine the best improvement within this solution space—the optimal solution among the variants.

In simplified terms: quantum algorithms rapidly identify suitable, compliant lock plans, which are then systematically varied and compared to derive step-by-step optimal solutions.

The planqc Approach

In the maritime QCMobility use case, planqc employs a hybrid quantum workflow to develop, test, and quantify the impact of quantum algorithms in a realistic optimisation problem. The focus is on designing algorithms that operate under real-world constraints and metrics, and on robustly demonstrating how this approach compares with classical methods. The quantum component is currently simulated, but the workflow is designed for execution on quantum hardware. This approach serves as a proof of relevance, linking algorithm design, evaluation, and applicability in an industrial context.

planqc also applies quantum-inspired methods such as tensor networks to efficiently structure large solution spaces on classical hardware. This enables scalable algorithms to be developed for realistic instances and allows their scaling behaviour to be analysed. At the same time, requirements for future quantum hardware (size, quality, deployment timing, operation) can be derived—making their deployment technically and economically plannable.

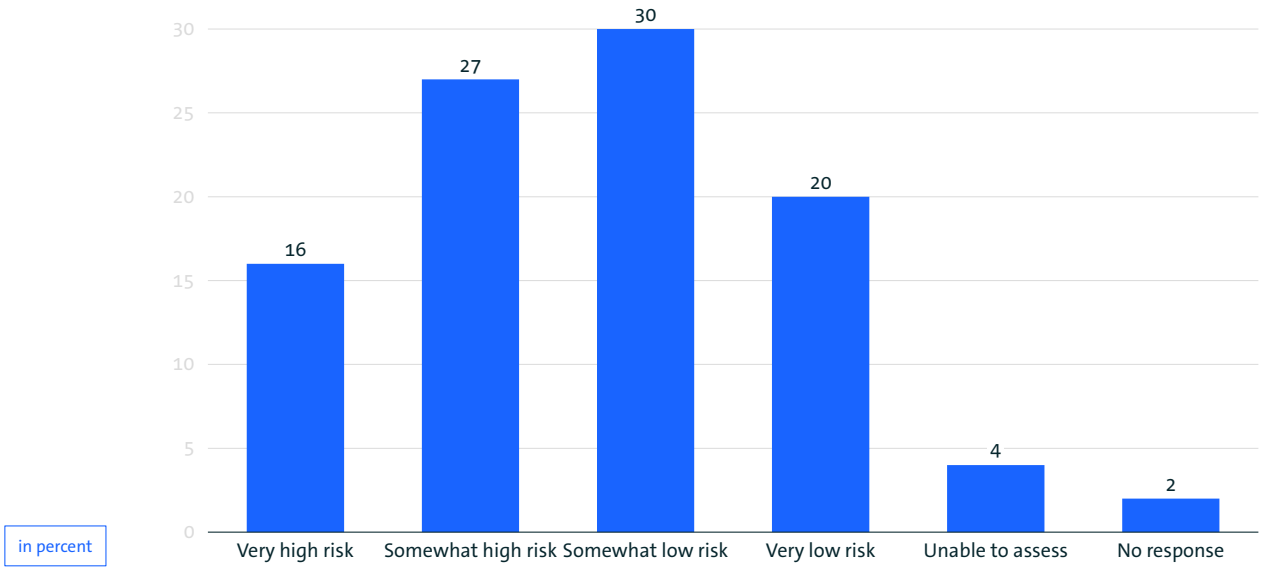
Dr. Martin Kiffner
Head of Algorithms
www.planqc.eu

3 Security & Resilience

3 Security & Resilience

3.1 Assessment of IT Security Risk

How high do you consider the risk of quantum computing to your company's IT security?



Base: All surveyed companies with 100 or more employees (n=607) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 17: Assessment of the Risk of Quantum Computing for IT Security and Initial Measures

The assessment of the IT security risk posed by quantum computing is distinctly polarised. While 44 percent of surveyed companies perceive it as a "rather" or "very high" risk, 50 percent consider the risk to be "rather" or "very low".

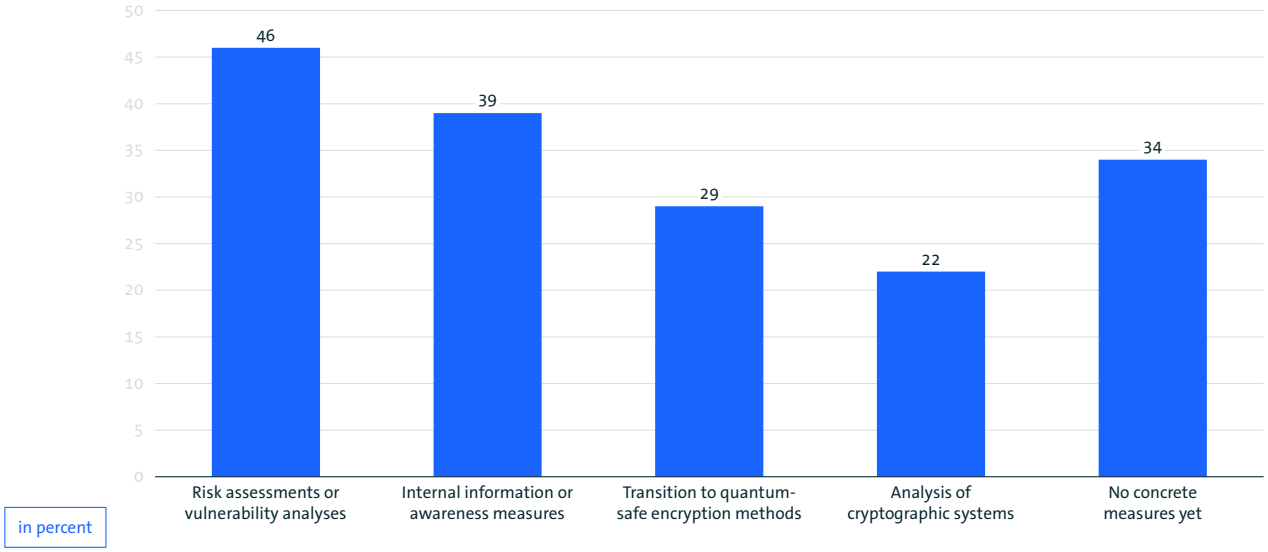
Together with the previously observed strong emphasis on IT security as an advantage (↗see p. 12), this shows that companies clearly associate quantum computing with the topic of security. At the same time, the assessment of its specific impact on their own organisation remains heterogeneous.

This suggests that quantum computing is already perceived as a strategically relevant security issue; however, its classification within a company's own context still involves uncertainties. Accordingly, guidance and practical frameworks for assessment are becoming increasingly important.

> Perceptions of risk are divided: 44 percent consider quantum computing to pose a high IT security risk, while 50 percent view it as low risk.

3.2 Preparation and Measures

Which of the following measures has your company implemented or is planning to implement to address potential risks from quantum computing?



Base: All surveyed companies with more than 100 employees interested in or using quantum computing (n= 463) | Multiple responses possible | Source: Bitkom Research

Figure 18: Already implemented and planned measures to prepare for potential IT security risks from quantum computing

Companies interested in or already using quantum computing initially focus on assessment and awareness when preparing for potential IT security risks. The most frequently cited measures are risk assessments or vulnerability analyses (46 percent) and internal information and awareness activities (39 percent). More specific technical measures, such as transitioning to quantum-safe encryption methods (29 percent) or analysing cryptographic systems (22 percent), currently play a less prominent but still relevant role.

A third of companies (34 percent) state that they have not yet considered any specific measures.

The responses reveal a plausible maturity pattern: assessment steps (risk and vulnerability analysis, cryptanalysis) are typically undertaken first, followed by internal capacity-building measures (information and awareness), and finally technical implementation (migration to quantum-safe methods).

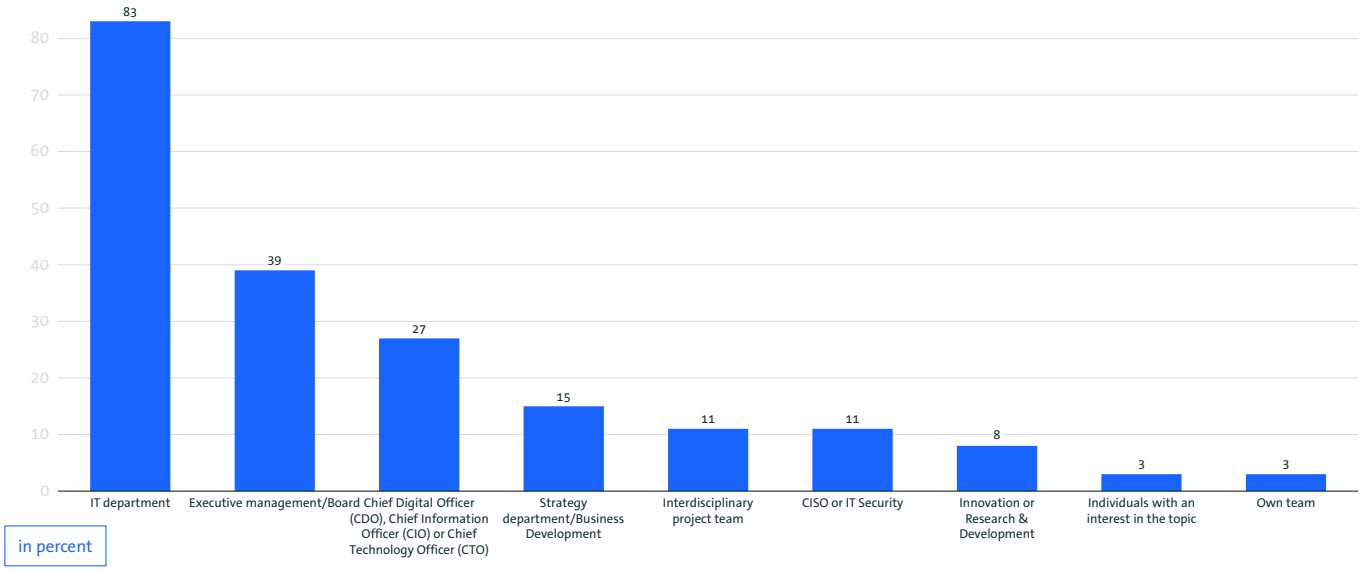
Larger companies are more active and have more frequently already implemented measures (↗Bitkom-Dataverse).

4 Organisation and Capabilities

4 Organisation and Capabilities

4.1 Governance and Responsibilities

Who is currently responsible for quantum computing in your company?



Basis: Companies with 100 or more employees that are interested in or use quantum computing (n=463) | Multiple responses possible | Source: Bitkom Research

Figure 19: Responsibilities and Governance Structures for Quantum Computing

Quantum computing is primarily anchored within the IT department in companies with QC involvement (i.e., active or in planning). In 83 percent of companies, responsibility lies with the IT department.

The executive level plays a relevant but secondary role: 39 percent cite management or the board of directors, with this share being slightly higher in smaller companies (↗41 percent for 100–199 employees, 42 percent for 200–499 employees).

C-level roles such as CDO, CIO, or CTO represent an important, though not dominant, anchor at 27 percent.

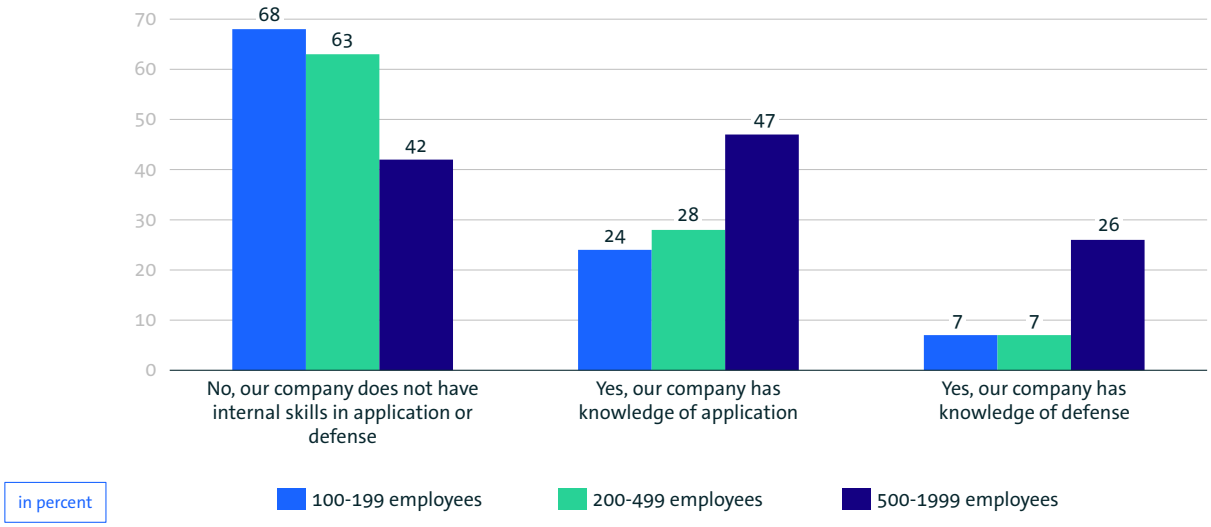
Security roles (CISO/IT security) currently play a more limited role and are cited by only 11 percent of companies.

Dedicated governance structures are rare: interdisciplinary project teams take on responsibility in 11 percent of companies, while dedicated teams remain the exception (3 percent).

Overall, it is evident that quantum computing is predominantly treated as an IT or digital topic rather than a strategic transformation program. Dedicated governance or broader organizational anchoring—such as through dedicated teams or stronger security ownership—remains rare.

4.2 Skills and Professional Development

Does your company have in-house expertise in quantum computing?



Base: All surveyed companies with 100 or more employees interested in or using quantum computing (n= 463) | Multiple answers possible | Source: Bitkom Research

Figure 20: Internal Quantum Computing Competencies in the Surveyed Companies

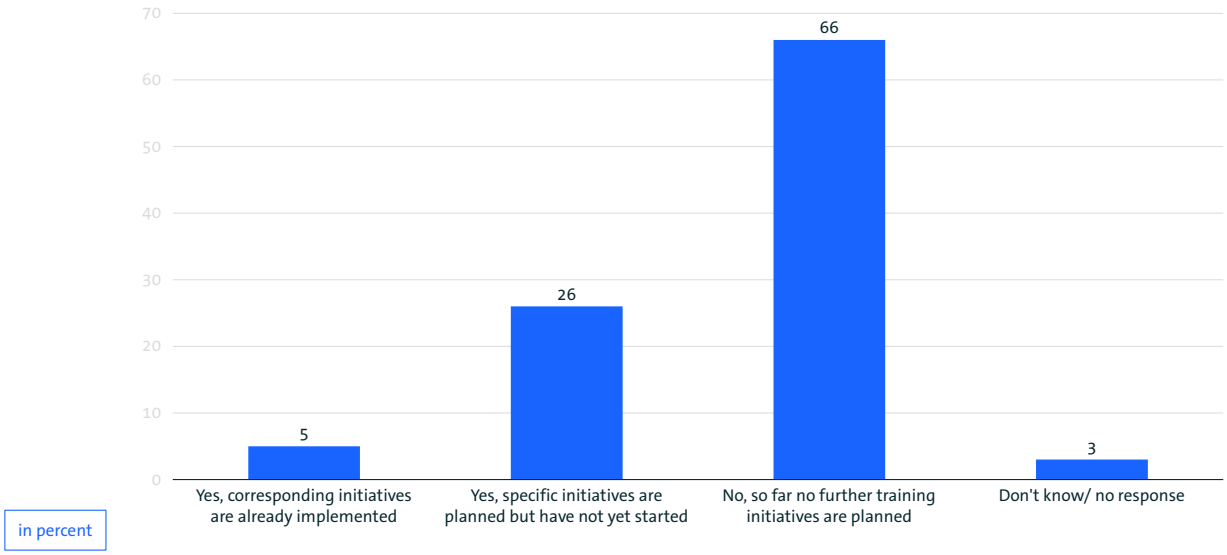
The majority of surveyed companies currently lack internal expertise in quantum computing:
↗61 percent report that they have no capabilities for application or defense.

Internal knowledge of specific application use cases is significantly more widespread than knowledge of defense:
↗30 percent of companies report knowledge of applications, while 11 percent report knowledge of defense.

A strong size effect is evident: in larger companies, the share with relevant capabilities increases significantly. In companies with 500 to 1,999 employees, already 47 percent report knowledge of applications and 26 percent knowledge of defense, while the share without capabilities drops to 42 percent.

The data show that many companies still lack the internal capacity to thoroughly assess quantum computing; larger companies are considerably more advanced and possess greater expertise.

Does your company have specific plans or initiatives to train employees in quantum computing?



Based on: All surveyed companies with 100 or more employees that are interested in or use quantum computing (n= 463) | Multiple responses possible | Source: Bitkom Research

Figure 21: Status of planned or implemented training measures

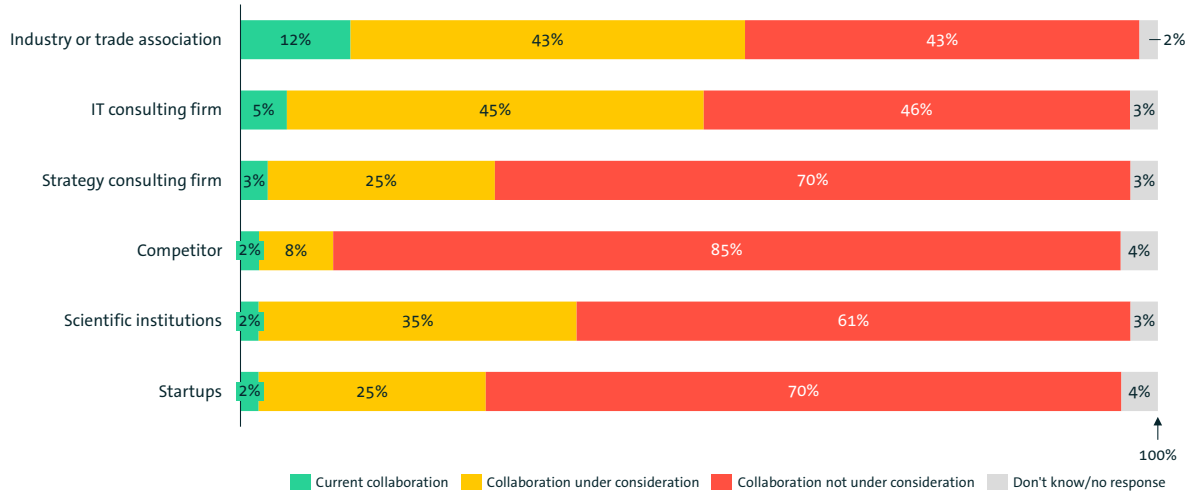
The development of competencies in the field of quantum computing is still at an early stage for most companies. Only 5 percent of companies have already implemented relevant measures. Another 26 percent have concrete plans for training initiatives but have not yet begun implementation. Two-thirds of companies (66 percent) report that no measures are currently planned. The standstill is particularly pronounced among smaller companies: among businesses with 100–199 employees, 73 percent state that no measures are planned (↗Dataverse).

Overall, it is evident that even among companies with existing engagement in quantum computing, there is often a lack of internal capability to comprehensively assess the technology—and that systematic skills development has, in many cases, not yet begun.

> Despite strong interest, skills remain limited and qualification efforts are stagnating. 61 percent of companies engaged with quantum computing have no internal capabilities for application or security, and 66 percent currently have no plans for further training.

4.3 Collaboration and Partnerships

Is your company considering collaboration on quantum computing with the following partners?



Base: Surveyed companies with 100 or more employees interested in or using quantum computing (n=463) | Deviations from 100 percent are due to rounding | Source: Bitkom Research

Figure 22: Current and Planned Partnerships Related to Quantum Computing

When internal specialization is still limited, partnerships and external resources play an important role in entering the field of quantum computing.

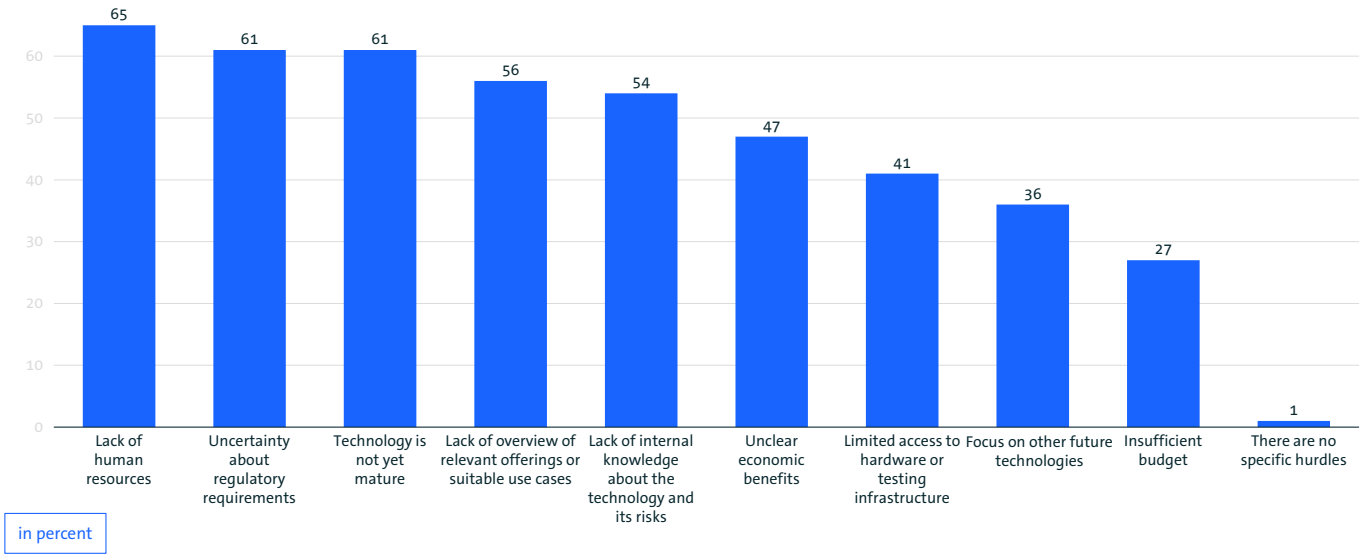
However, current collaboration levels remain relatively low: the most common partnerships are with industry or interest groups (12 percent) and IT consultancies (5 percent). Collaborations with academic institutions (2 percent), strategy consultancies (3 percent), competitors (2 percent), and startups (2 percent) remain the exception. At the same time, there is significant potential for future collaboration: many companies can envision partnerships particularly with IT consultancies (45 percent), associations (43 percent), and academic institutions (35 percent).

Collaborations with startups (25 percent) and strategy consultancies (25 percent) are also conceivable, while partnerships with competitors are not considered by the majority of companies (85 percent).

The findings suggest that companies are primarily seeking guidance, expertise, and access—through consultancies, associations, or academic institutions—while collaborations with competitors are currently rarely feasible.

4.4 Challenges and Support Needs

What factors currently hinder your company from further exploring the use and impact of quantum computing?



Base: All surveyed companies (n= 607) | Multiple responses possible | Source: Bitkom Research

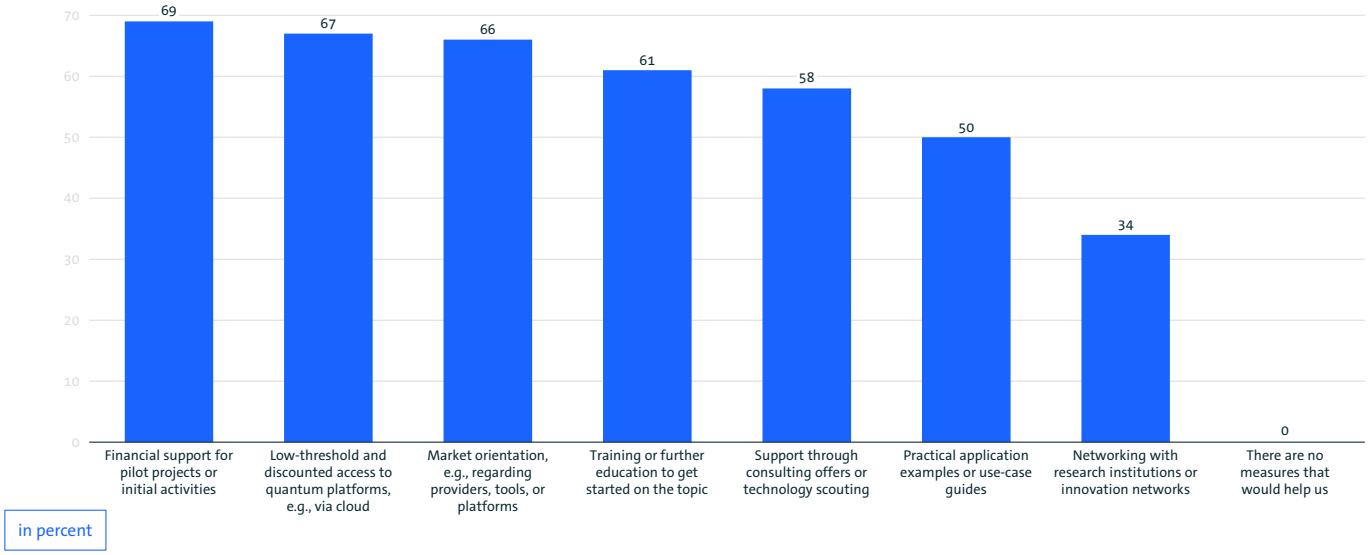
Figure 23: Factors Currently Hindering the Use of Quantum Computing

Although the relevance of quantum computing is rated highly by companies, numerous obstacles hinder the next step and slow down further practical engagement with the technology.

The bottleneck is most evident in personnel resources and competencies: 65 percent of companies report that a lack of staff makes working with quantum computing difficult, and 54 percent of respondents cite insufficient internal knowledge about the technology and its risks as a barrier. Close behind are challenges related to orientation: uncertainties about regulatory requirements (61 percent), the still-maturing nature of the technology (61 percent), and a lack of overview of available offerings or concrete application examples (56 percent) hinder implementation. Economic factors are currently less pronounced, but for 47 percent of companies, the benefits are still not clearly tangible.

Interestingly, "insufficient budget" is cited as a barrier by only 27 percent of companies, indicating that gaps in orientation and knowledge are the primary obstacles. Overall, the pattern can be interpreted as a combination of resource constraints and lack of orientation: companies recognize the strategic importance of quantum computing but are not yet able to adequately assess it or translate it into concrete next steps.

Which of the following measures would help your company make further progress in quantum computing and its applications?



Base: All surveyed companies with at least 100 employees interested in or using quantum computing (n= 463) | Multiple responses possible | Source: Bitkom Research

Figure 24: Measures that would help advance the use of quantum computing

For companies already engaged with quantum computing, the key levers to drive further concrete action clearly lie in the areas of enablement, access, and initial funding:

Financial support for pilot projects or initial activities is cited most frequently (69 percent) and is seen as the strongest driver for moving from "interest" to "experience." Easy access to quantum platforms, for example via cloud services, follows at 67 percent and lowers entry barriers by enabling learning and testing without requiring significant internal investment. Market guidance—such as information on providers, tools, or platforms (66 percent)—as well as training and education for entering the field (61 percent), advisory support or technology scouting (58 percent), and practical application examples or use-case guides (50 percent) are also considered key measures.

The survey shows that the bottleneck lies less in fundamental willingness and more in a lack of resources, orientation, clarity regarding maturity levels, and uncertainty about the business case.

Companies need fewer "visions" and more concrete enablement tools, such as support for pilot projects, easy access to platforms, as well as greater market transparency and use-case transfer. While strategic relevance is high, operationalization currently fails primarily due to limited resources, lack of orientation, unclear maturity levels, and uncertainty around the business case. The previously observed «wait-and-see" approach can be understood as a rational response under conditions of uncertainty.

Quantum Computing in Action: Fraunhofer as a Pioneer of Real-World Applications

The Fraunhofer Society, through its Fraunhofer Quantum Computing Competence Network, is one of the key drivers of application-oriented quantum computing in Germany and Europe. Since its founding in 1949, it has positioned itself as a force for industry-related innovation, delivering solutions that enable companies to gain a technological edge—including in the field of quantum computing.

The institutes of the Fraunhofer Society combine industry expertise with deep domain knowledge from both industry and research, and translate this into concrete, practical use cases. The 22 member institutes of the Fraunhofer Quantum Computing Competence Network (as of March 2026) each have their own research focus and together cover a broad range of application areas (see also Fig. 25): from production and logistics to material simulation and design, as well as energy supply, the chemical and pharmaceutical industries, image processing, IT security, microelectronics, artificial intelligence, and the financial sector. As such, they are highly relevant and capable partners for industry—the member institutes conduct successful research in projects with and for partners from a wide range of sectors, including Airbus, BMW, Thales, DB Systel, Hamburg Port, Boehringer Ingelheim, E.ON, Infineon, PricewaterhouseCoopers, Accenture, and R+V Versicherung AG.

The Fraunhofer Institutes act as intermediaries between the theoretical potential of quantum computing and its practical value creation. Before companies invest in a field such as quantum computing, they require reliable information on the maturity, risks, and benefits of the technology.

Fraunhofer fulfills this role, among other ways, by providing neutral evaluations of quantum computing technologies, developing demonstrators, and conducting comprehensive benchmarking to compare and advance the performance of different hardware and software approaches.

Fraunhofer institutes carry out open-ended technology research in quantum computing by simultaneously pursuing multiple hardware approaches, including superconducting and photonic qubits, neutral atoms, and ion traps, as well as alternative approaches such as spin qubits. In this way, the most suitable technological platform can be objectively identified for each industrial use case—resulting in a technology-neutral, industry-oriented basis for evaluation.

Quantum computing is a field that requires not only technological expertise but also a deep understanding of mathematical models, physical principles, and software stacks. The knowledge developed within the Fraunhofer Institutes is not intended to remain isolated; therefore, Fraunhofer systematically develops training programs and workshops tailored to different target groups. These enable companies to realistically assess and strategically leverage quantum computing at an early stage.

Fraunhofer sees itself as a competent research partner and, at the same time, as a key player in the industrial application of quantum computing in Germany.

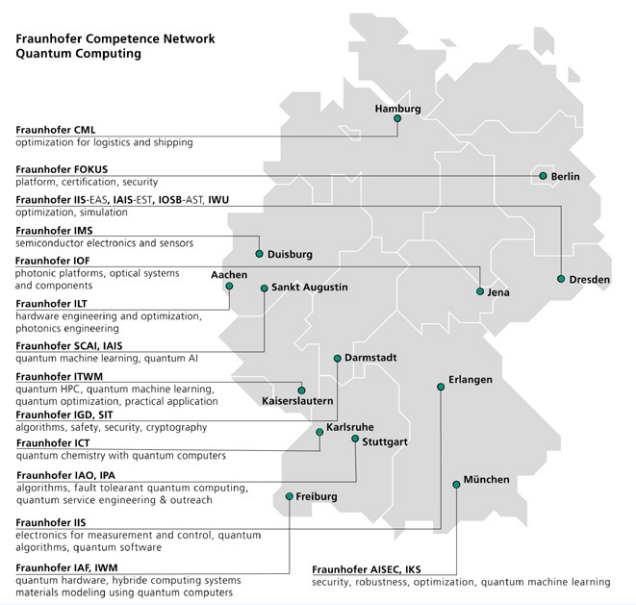


Figure 25: Fraunhofer Quantum Computing Competence Network

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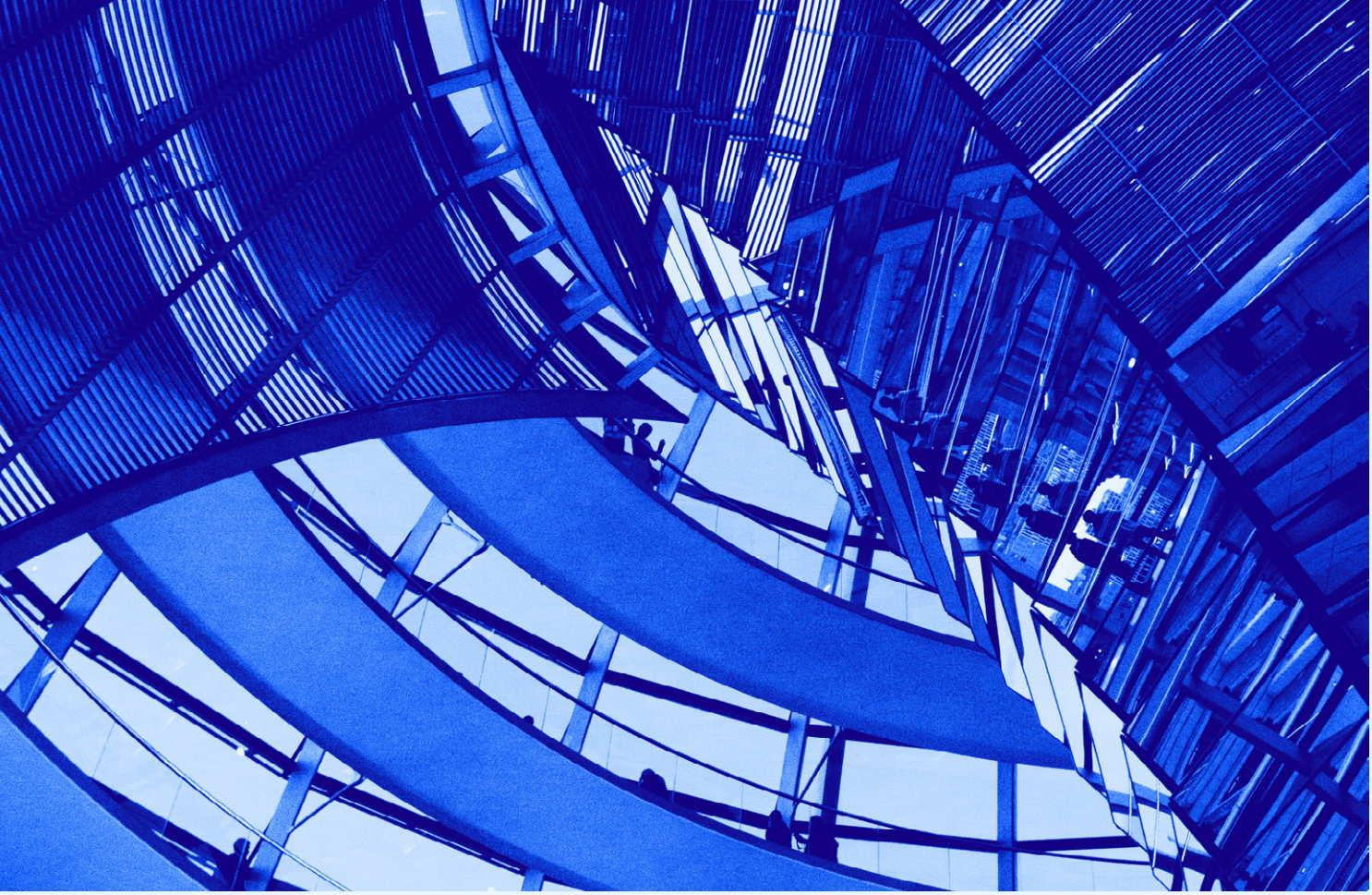
5 Conclusion & Recommendations

From Waiting to Action – Recommendations for Business and Policy Makers

The survey results indicate that quantum computing is already on the radar for many companies and is perceived as an opportunity. However, the transition from observation to concrete next steps remains rare. This leads to clear priorities for action for both business and policymakers, aimed at strengthening guidance, piloting, and skills development. The following recommendations outline practical approaches to accelerate adoption and readiness.

Action Plan for **Companies**

- **Establish Responsibility and Governance:** Quantum computing requires a clear owner and an appropriate governance structure—for example, shared responsibility between IT/CTO and a relevant business unit. A regular steering cadence helps translate strategic direction into concrete next steps and ensures decisions are consistently followed through.
- **Develop a Use-Case Shortlist and Launch "No-Regret" Pilots:** A concise shortlist of use cases (e.g., two to three prioritized applications) creates focus. Prioritization should follow clear criteria—data availability, business relevance, and feasibility—complemented by realistic success metrics. "No-regret" pilots enable fast learning cycles and provide a sound basis for decision-making.
- **Systematically Build Skills:** Skills development remains a key bottleneck and should not be left to chance. A structured skills plan is more effective than ad hoc learning: short training formats for management, IT, and business units establish a common baseline, while a small core team can be further trained in use-case evaluation, PoC design, and vendor assessment.
- **Establish a Parallel Security Workstream:** The implications for IT security should be addressed alongside use-case exploration. An early inventory of cryptographic dependencies, risk assessment, and a pragmatic migration path toward quantum-resistant methods provide early planning certainty. Further insights are provided by the ↗Bitkom guideline on quantum-safe communication.
- **Define a Partner Strategy:** As internal resources are often limited, a deliberate division of responsibilities between internal teams and external partners is advisable. External expertise can add targeted value, particularly in strategic guidance and scouting, market assessment, methodological validation (research/transfer), as well as prototyping, integration, and platform access (startups, providers, service companies).



Action Plan for **Policy & Ecosystem**

- **Prioritize Pilot Support as an Experience Engine:** Agile, learning-oriented instruments for pilot support (short durations, clear learning and transfer objectives, pragmatic termination criteria) accelerate the transition from exploration to reliable results in a business context.
- **Scale Access to Quantum Resources:** Low-threshold, scalable, transparent access to quantum platforms—especially for SMEs and user industries—should be enabled via cloud/platform models and pragmatically supported through standardized contract and compliance modules.
- **Support Market and Use-Case Transparency:** Continuous guides like use-case libraries, provider/tool overviews, reference architectures, and guides for selection, PoC design, and success measurement reduce uncertainty and increase comparability and transfer.
- **Regulatory Clarity and Implementation Support for Quantum-Safe Procedures:** Planning security arises from concrete, actionable guidance: guidelines, testing logics, and model processes for risk analysis, crypto agility, and migration—allowing companies to shift from waiting to structured preparation.
- **Promote Broad and Practical Skills Development:** Qualification should be designed as part of a user-oriented transfer and innovation architecture and closely linked to pilots, demonstrators, and transfer formats. Modular training, certificates, and train-the-trainer approaches ensure that experiences systematically flow back into companies, facilitating quicker scaling.

6 Methodology

Survey 2025

Client	Bitkom
Methodology	Online survey
Population	Companies from the manufacturing and service sectors with 100 or more employees
Target respondents	Persons with primary responsibility for new, innovative technologies (especially CTOs, Heads of R&D), members of the executive board or management board
Sample size	n=607
Survey period	Week 42 to Week 48, 2025
Weighting	Representative weighting of the dataset based on the current VAT statistics from the Federal Statistical Office
Statistical margin of error	+/- 3 percent

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Alissa Geffert

DOI (German version)
10.64022/2026-quantum computing

Quantum computing has reached the German economy and is predominantly seen as a strategic opportunity. But how far does this openness truly extend? This study report, based on a nationwide company survey, shows how widespread knowledge, interest, and concrete activities related to quantum computing currently are. The results clearly indicate that there is still a significant gap between its general recognition as a future technology and its operational integration. Many companies see long-term competitive potential but hesitate due to technological uncertainties, a lack of resources, and unclear use cases.

DOI (German version)
10.64022/2026-quantum computing

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