Nov. 2025, Berlin

# A Data-Driven Look at the Next Quantum Tech Transition

**Results of the Survey "From Lab to Life: Decoding the Quantum Gap" by**

**The Working Group on Equal Opportunities of the German Physical Society**

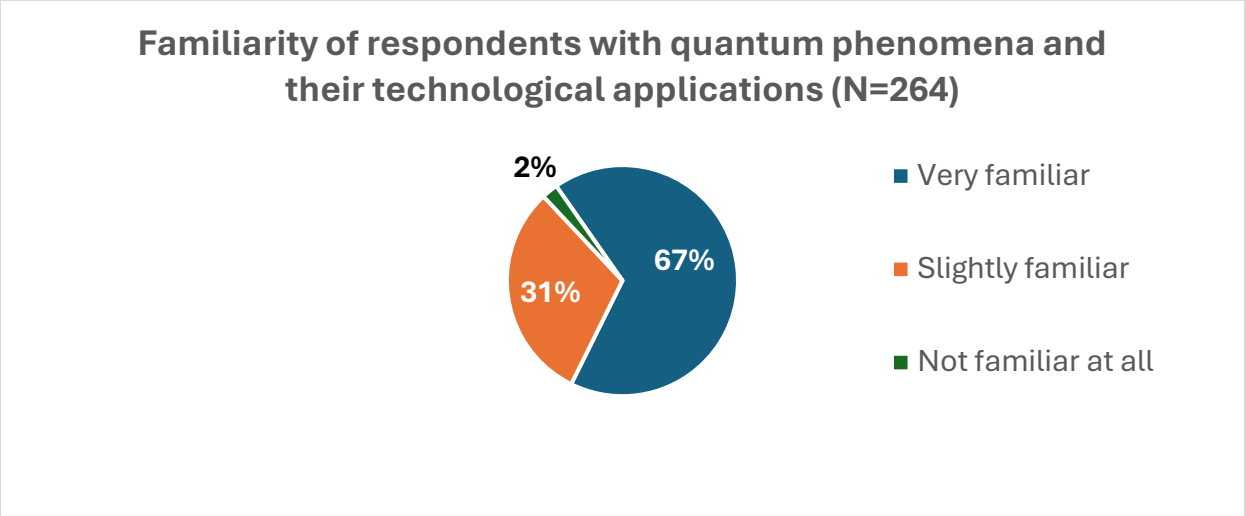
Physics has always been creating its own ecosystems: transformative ideas - from Maxwell's equations to the semiconductor transistor, or the development of cathode-ray tubes that made possible J. J. Thomson's discovery of the electron - have required not only new concepts but also new structures for collaboration, education, and application.

In 2025, which the United Nations has designated as the International Year of Quantum Science and Technology in recognition of one hundred years of quantum science, the field of quantum technology is at an important stage of development. This frame provides an opportunity to assess the current state of the quantum ecosystem and its readiness to translate scientific advances into wider adoption (see https://quantum2025.org). In this context, the Working Group on Equal Opportunities of the German Physical Society (Arbeitskreis Chancengleichheit der DPG) conducted a seven-question survey. The survey aimed to capture diverse perspectives on quantum technology adoption and to examine the potential existence of a "quantum gap" between technological breakthroughs and their widespread dissemination into everyday life.

## Methodology

The questionnaire was distributed to the German Physical Society working groups, namely Working Group Industry AIW, Working Group Equal Opportunities AKC, Section of Atoms, Molecules, Quantum Optics and Photonics SAMOP and partner networks - specifically the Young Chemistry Forum JCF and the Berlin Brandenburg STEM-Network - from September 11 to October 24, 2025. The analysis is based on 264 fully completed responses from a pool of 361 participants, with the respondent profile indicating a highly knowledgeable cohort (67% "very familiar," 31% "slightly familiar" and 2% "not familiar"). The methodology

employed statistical analysis to identify key correlations between technical familiarity, perceived barriers, and preferred acceleration strategies.




## The Perception Gap: Applicability vs. Accessibility of the Quantum Technologies

Participants were asked about barriers to adopting quantum technologies in a multiple-choice fashion. The data reveals that while both the expert and broader communities agree on the hierarchy of challenges, a clear divergence emerges in their perceived severity and the story behind that hierarchy. Both groups rank the challenges identically:

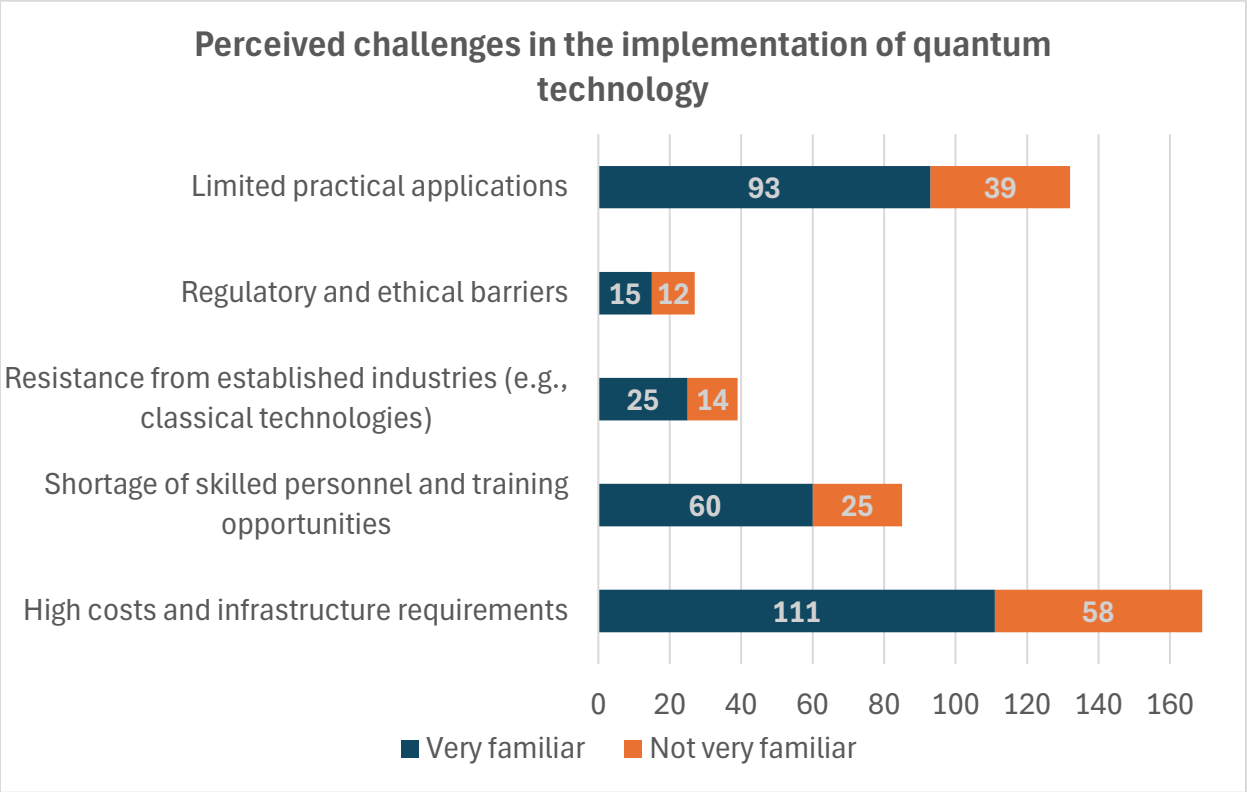
1. **High Costs/Infrastructure**
2. **Limited Practical Applications**
3. **Lack of Skilled Personnel**
4. Resistance from Established Industries
5. Regulatory/Ethical Hurdles

However, the expert community's responses point a broader *applicability issue*. For them, the gap between the top challenge ("High Costs," 111 mentions) and the second ("Limited Practical Applications," 93 mentions) is narrow. This suggests that the struggle to translate scientific progress into tangible, real-world value is a concern nearly as pressing as cost. Their third-place concern, "Lack of Skilled Personnel" (60 mentions), is significantly lower. This suggests that for insiders, proving the technology's fundamental worth is a more immediate barrier than the talent pool.

Conversely, the broader community perceives a formidable *accessibility wall*. The gap between their top challenge ("High Costs," 58 mentions) and the second ("Lack of Skilled Personnel," 25 mentions) is larger. Furthermore, the next challenge, "Limited Practical Applications" (23 mentions), is virtually tied with the skills gap. This may indicate that for this

group, the field is not just expensive, but appears overwhelmingly inaccessible due to a daunting skills shortage and a parallel lack of proven, understandable applications. For them, these two issues are intertwined parts of the same accessibility problem.

This contrast in the weight of their concerns - experts focusing on justifying the technology's core value, while the broader community focuses on the barriers to even approaching it - defines the two sides of the adoption gap.




## Realizing the Quantum Leap

When asked to select multiple-choice accelerators for quantum technology adoption, the community's preferences point to two primary pathways, revealing a self-aware diagnosis of the problem:

**Bridging the Applicability Gap with Proof-of-Concept**

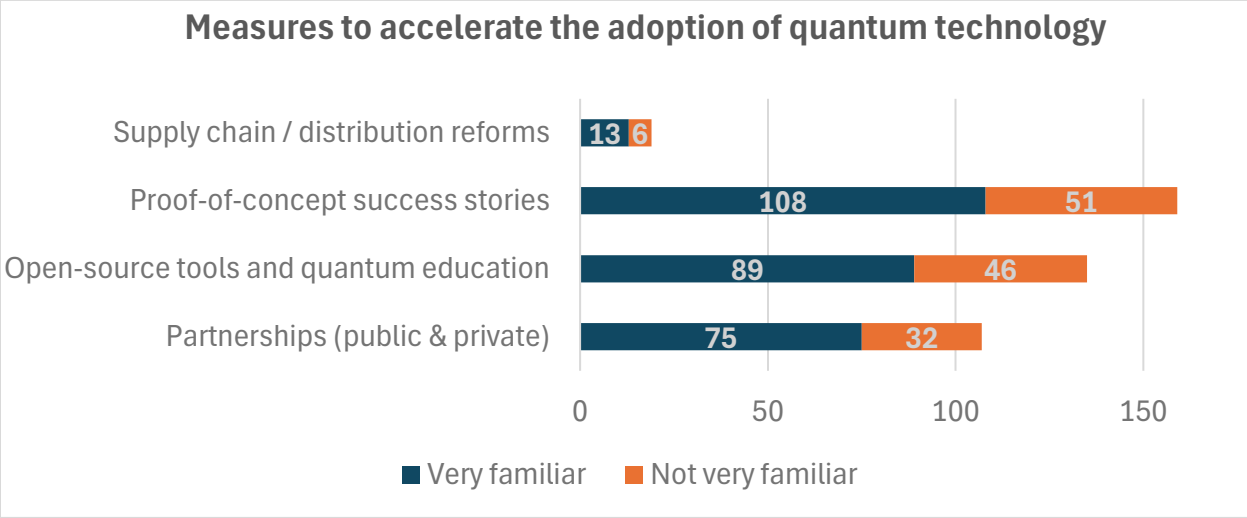
The most popular accelerator was "Proof-of-concept success stories" (159 mentions), representing over 60% of all respondents. This overwhelming preference underscores a market demand for tangible validation over theoretical promise. Respondents called for "An actual useful implementation that looks like it will make money," in the comments highlighting that the path forward is paved with commercial viability, not just scientific curiosity.

**Dismantling the Accessibility Wall with Open-Source Tools and Education**

A statistically significant correlation ($\chi^2$=7.70, p=0.006) exists between identifying the "Lack of Skilled Workforce" as a barrier and preferring "Open-Source Tools & Quantum Education" (135 mentions) as the solution. This isn't just a preference; it's a targeted strategy. The data suggests that those who feel the skills gap most acutely see open-source tools and education as the direct remedy. Respondents stated these tools lower the entry barrier in comments, providing a cost-neutral on-ramp for a new generation of practitioners.

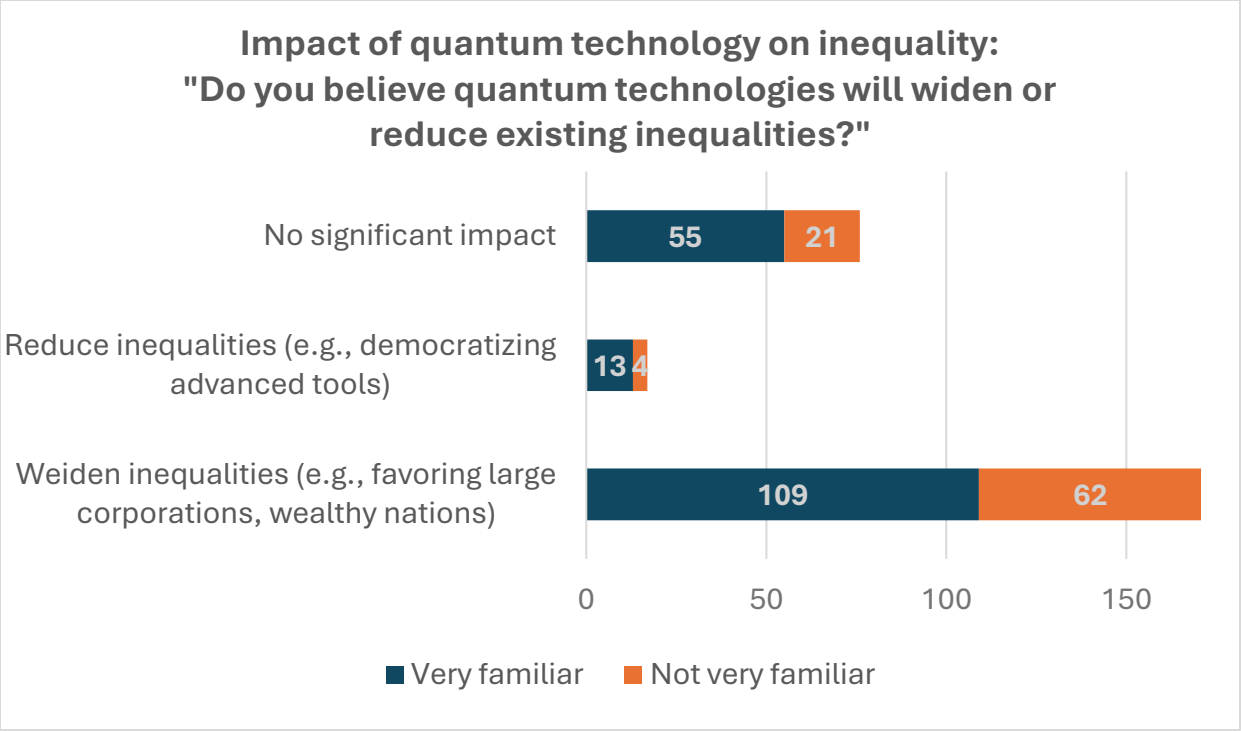
**Supplementary Strategies: Partnerships and Reforms**

The other accelerators, "Public-Private Partnerships" (107 mentions) and "Supply Chain Reforms" (19 mentions), were less prominent but highlight specific systemic needs. Partnerships were seen as a way to share high risks, while supply chain comments pointed to the need for robust infrastructure, noting that “without seamless supply chains, there will be no production” in comments.

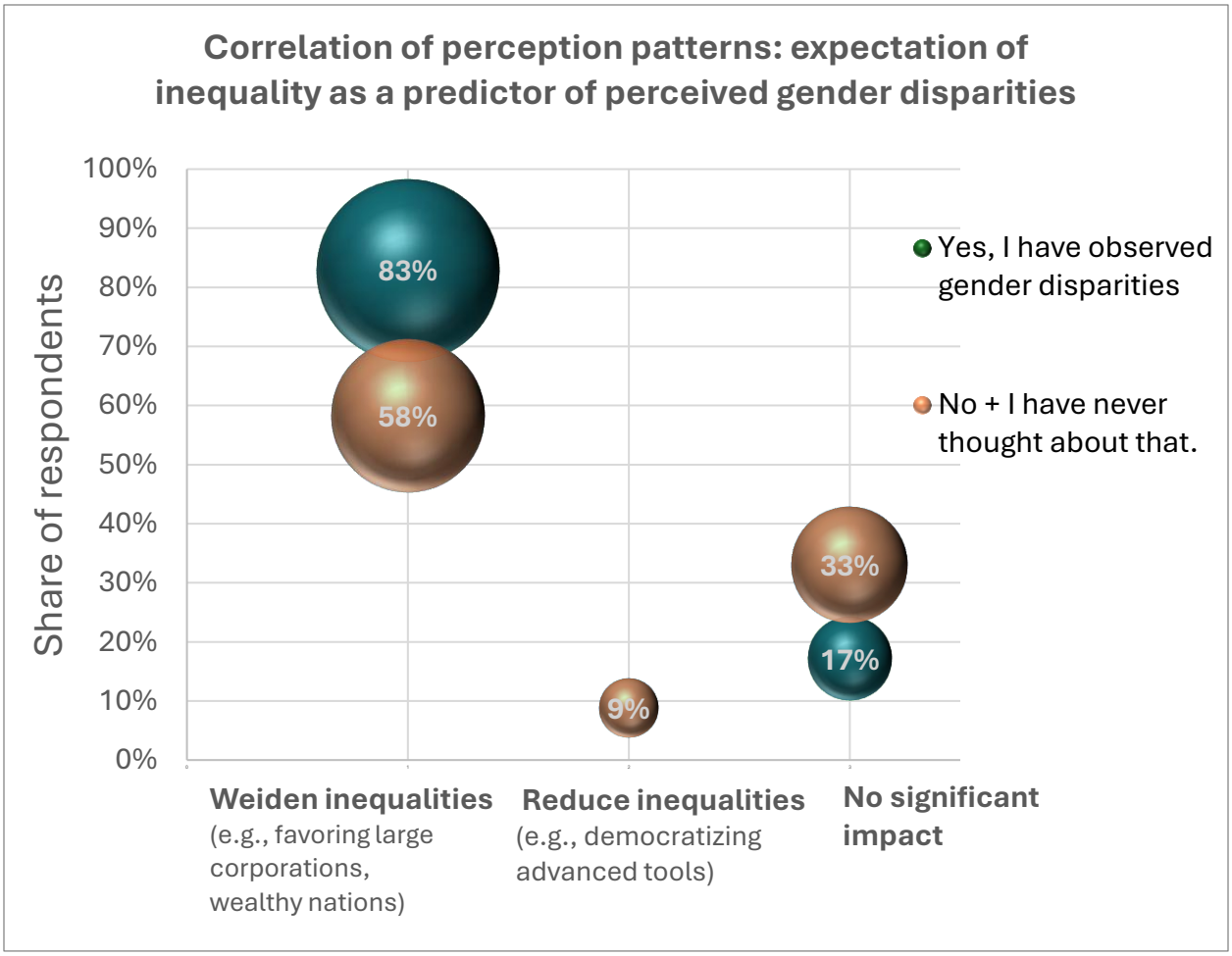



## Paradox of Quantum Technology’s Impact on Societal Challenges

The survey data reveals a near-consensus on a critical social risk: an overwhelming majority of respondents, across both familiarity groups, believe quantum technology will exacerbate societal inequalities.

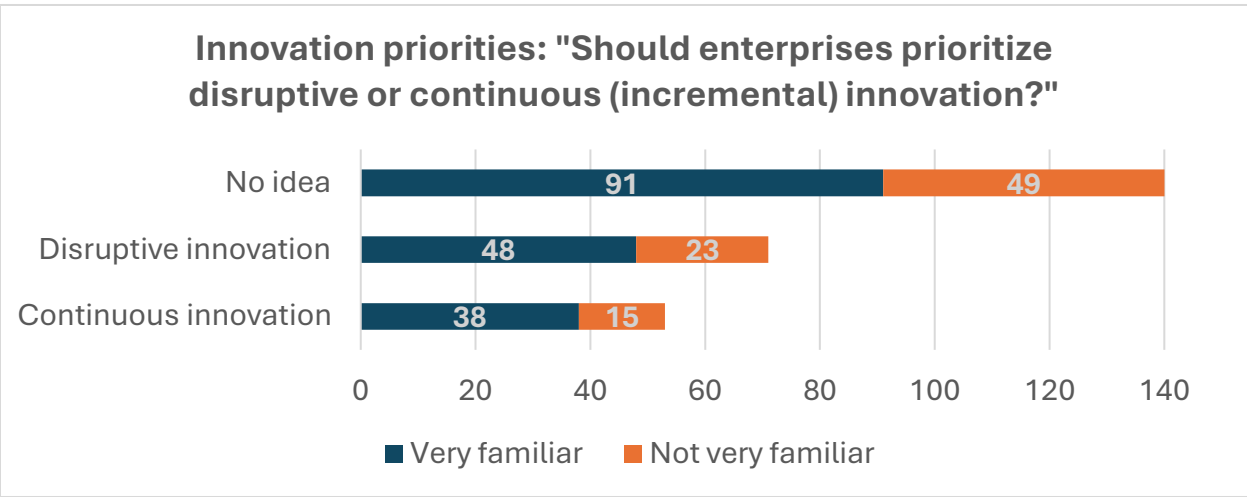



**Moreover, this macro-level concern is a strong predictor of awareness of micro-level inequity:** The data shows a powerful, statistically significant correlation ($\chi^2$=15.44, p=0.0004) between the belief that new quantum technology will widen societal gaps and the personal observation of gender disparities in one's own technical environment. In other words, individuals who are conscious of the technology's potential for exacerbating societal inequality are significantly more likely to be aware of discrimination and inequity in their immediate surroundings. Participant comments describing a "glass ceiling" and "male-dominated networks" confirm that many see the technology's societal risks as an extension of the field's own internal challenges. Therefore, the overwhelming consensus on this risk is a critical signal. It underscores that efforts to build a diverse and equitable quantum ecosystem are not merely a social good but a strategic imperative.




## A Practice-Oriented Perspective on Innovation

To understand participants' perspectives and preferences regarding different types of innovation, they were asked whether they favor incremental, continuous innovation or




instead seek disruptive innovation aimed at achieving quantum leaps. The survey revealed

that both experts and members of the broader community consider both forms of innovation to be essential. Respondents emphasized that the appropriate type of innovation should be determined by the specific application area.

The dominant sentiment - “both are necessary”- reflects a pragmatic understanding that a healthy innovation ecosystem must simultaneously support incremental progress (evolution) and transformative initiatives (revolution). Consequently, the core challenge is not selecting one innovation pathway over the other, but rather building resilient structures in funding, industrialization, and academic policy that enable both to coexist and reinforce each other.

## Conclusion: Interpreting the Data Toward a Coherent Ecosystem

The survey data provide a differentiated picture of the current state of quantum technology adoption, highlighting both shared priorities and distinct emphases across the expert and broader communities. Rather than indicating fundamental disagreement, the results suggest that these perspectives are complementary and reflect different positions within the same emerging ecosystem.

Across respondent groups, **high costs and infrastructure demands** consistently rank as the primary barrier, underscoring the capital-intensive nature of quantum technologies at their current stage. Beyond this shared concern, the data reveal a divergence in emphasis: experts place nearly equal weight on the challenge of **demonstrating practical applicability**, while the broader community assigns greater importance to **skills availability and entry barriers**. This difference does not imply conflicting diagnoses, but rather points to distinct experiences of the same system - one focused on validation and translation, the other on access and participation.

Preferences regarding acceleration strategies align closely with these perceptions. The strong support for **proof-of-concept success stories** reflects a widely shared expectation that tangible implementations are key to advancing adoption. At the same time, the statistically significant link between perceived skills shortages and the prioritization of open-source tools and education indicates a targeted response to accessibility challenges, particularly among those who experience these barriers most directly.

The data also show broad agreement that quantum technologies may exacerbate existing societal inequalities, alongside a strong correlation between this belief and the recognition of inequities within respondents’ own professional environments. This suggests a high level of reflexivity within the community, where concerns about societal impact are informed by observed structural patterns in the field itself.

Taken together, the findings suggest that the current “quantum gap” between scientific outcomes and their widespread technological application is best understood not as a single bottleneck, but as a **set of interrelated challenges** encompassing applicability, accessibility, and inclusion. The survey data point toward an ecosystem-level response in which demonstrable applications, skills development, and structural awareness evolve in parallel. Such alignment reflects the preferences expressed by participants and offers a data-supported foundation for guiding the next phase of quantum technology development.

*For detailed respondent comments, please refer to the **supplementary content**.*