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D2.2 Stakeholders Survey Analysis

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1. Introduction

This deliverable presents the results and insights gained from two electronic surveys that have been distributed to stakeholders from the scientific and business communities that are currently working in the domain of quantum technologies or are interested in expanding their research and/or business activities in this deep-tech domain.

The 2 online surveys have taken place from 2 December 2024 till 26 January 2025.

The main objectives of both surveys were to:

- Assess the current level of knowledge and awareness in quantum technologies.
- Identify specific training needs and preferences.
- Understand the relevance of quantum technologies to stakeholders.
- Recognize barriers that may hinder access to training in quantum technologies.
- Collect feedback about the design of effective, tailored training programs on quantum technologies.

In total, **101 responses have been collected** to both surveys, out of which 88 responses to the survey addressing the scientific community, and 13 responses to the survey addressing the business community. The participants in both surveys are coming from various countries, such as Italy, Finland, Spain, Portugal and Cyprus.

2. Description of the surveys

2.1 Survey addressing research organizations/scientists

The first online survey addressed scientists, engineers, researchers, and technical professionals working in academic, industrial, or research settings who are interested in, or currently working with quantum technologies.

The survey is composed of the following sections:

- Section 1: Responders demographic information
- Section 2: Current knowledge in quantum technologies
- Section 3: Research applications and interest
- Section 4: Training preferences
- Section 5: Barriers and challenges
- Section 6: Additional feedback

2.2 Survey addressing enterprises/entrepreneurs

The second online survey addressed entrepreneurs, founders, executives, and decision-makers in startups or established companies who are interested in, or currently working with, quantum technologies.

The survey is composed of the following sections:

- Section 1: Responders demographic information
- Section 2: Companies demographic information
- Section 3: Current knowledge in quantum technologies
- Section 4: Business applications and Interest
- Section 5: Training preferences
- Section 6: Barriers and challenges
- Section 7: Additional Feedback

3. Results obtained in the survey addressing the scientific community

In total 88 responses have been collected from stakeholders from the scientific community coming from the following countries: Italy, 65%; Finland; 14%, Spain, 14%; Cyprus, 2%; Portugal, 1%; Other, 2%. Below we present the results obtained under each section of the survey.

3.1 Section 1: Responders demographic information

Section 1 aims to collect demographic information about the responders in the survey. Based on the feedback collected, almost 70% of the respondents are men, while the rest 30% are women. Moreover, 57% of the respondents fall in the age group 18 to 24 followed by the age groups 25 to 34 (13%) and 35 to 44 (13%).

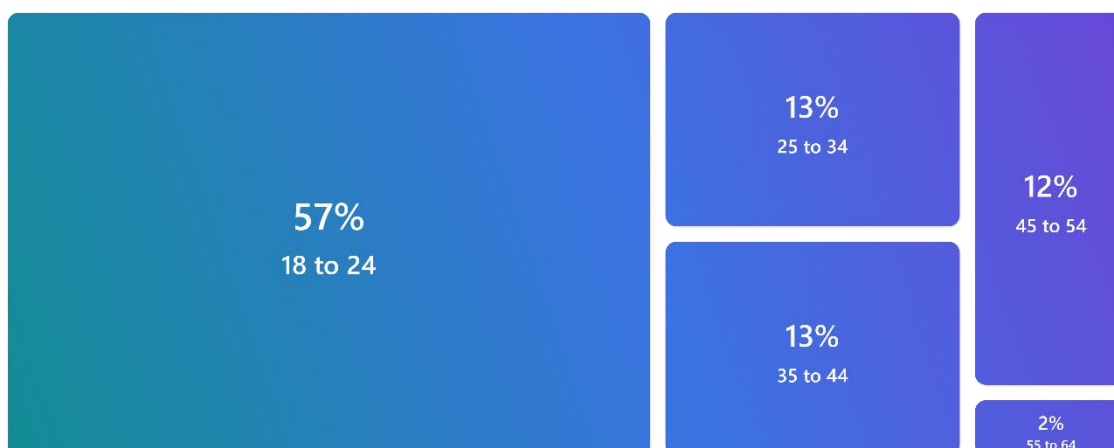


Figure 1: Survey with scientific community - Age group of respondents.

Considering the profile of the respondents, 56% are graduate students, 22% are researchers, 5% are engineers, 3% are postdoctoral fellows, 2% are scientists and 9% have another profile. Moreover, 15% have expertise in computer science, followed by electrical engineering (4%), materials science (4%), mathematics (2%), physics (1%) and chemistry (1%), while 70% have expertise in other domains. Upon looking at the type of organizations the respondents are employed, the majority of them coming from academia (59%), followed by Other (30%), industry (6%) and start-ups (3%).

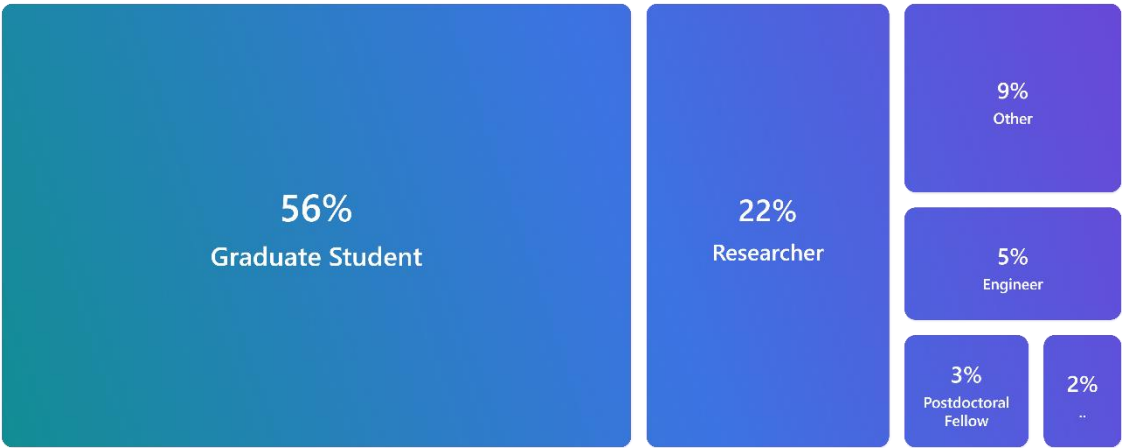


Figure 2: Survey with scientific community – Role of respondents at the organization.

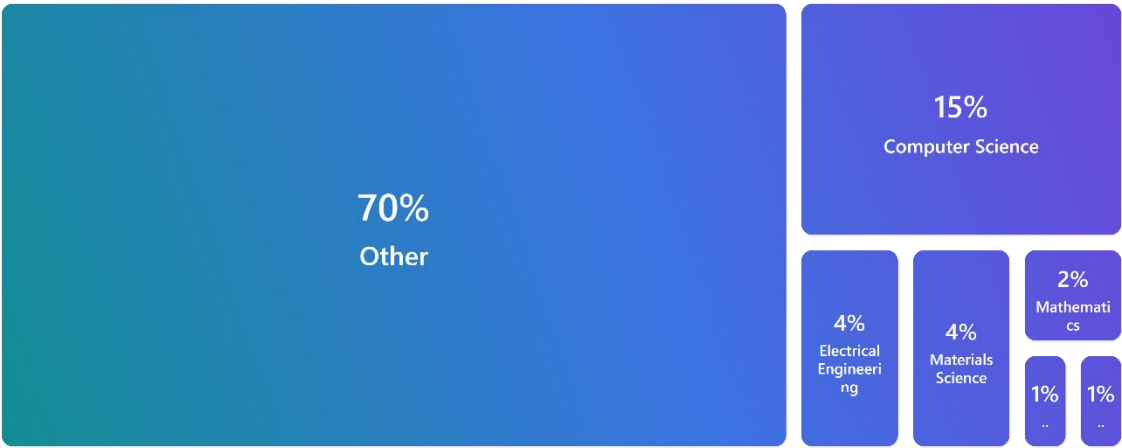


Figure 3: Survey with scientific community – Field of expertise of respondents at the organization.

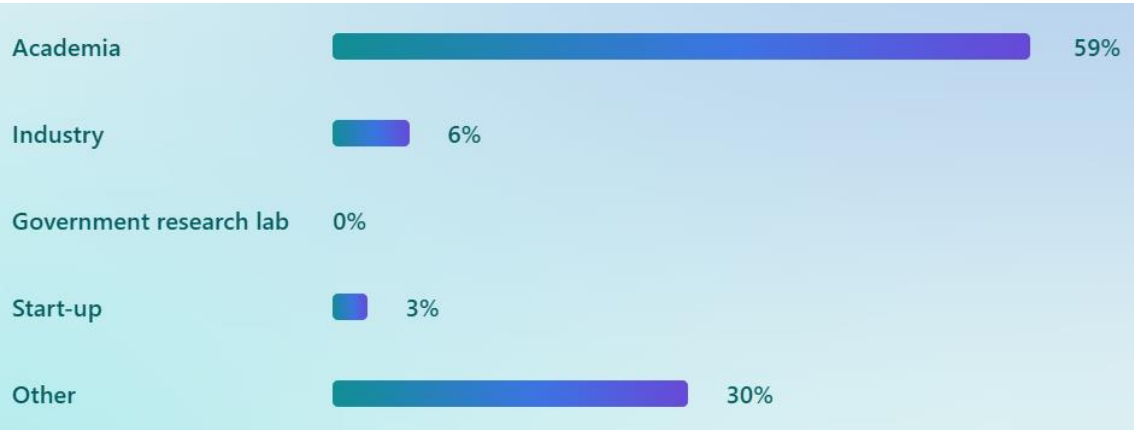


Figure 4: Survey with scientific community – Type of organization the respondents belong to.

Although 84% of the respondents cited that they do not have a background in quantum technologies or related fields, the majority of them declared that they have been working in their current field of expertise for less than 1 year (52%), while 20% cited that they have been working in their current field of expertise for more than 10 years.

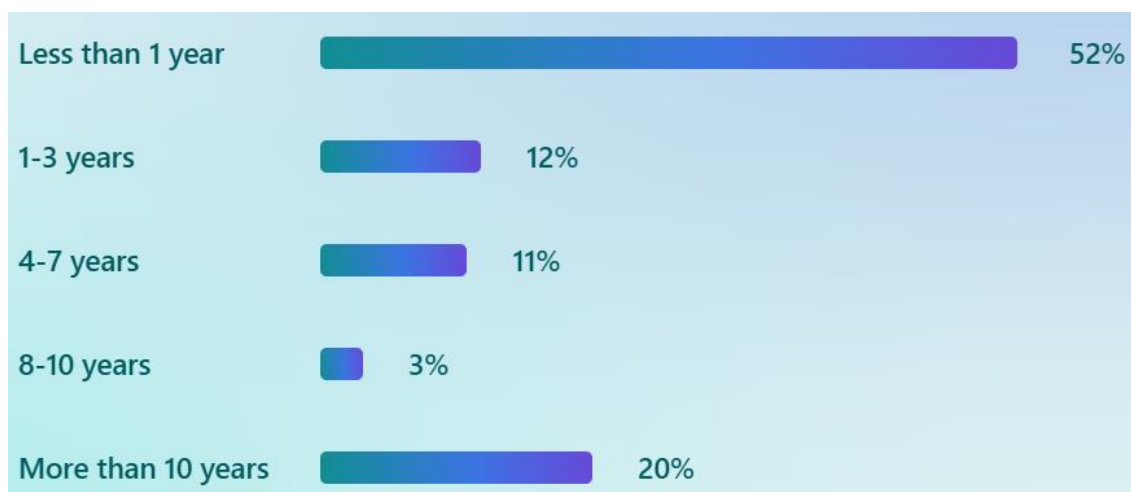


Figure 5: Survey with scientific community – Duration the respondents are working on the current filed.

3.2 Section 2: Current knowledge in quantum technologies

Section 2 aims to evaluate the current knowledge of the respondents in quantum technologies.

Looking at the background of respondents in quantum technologies, 84% declared that they do not have such background, and just 16% have relevant expertise. The majority of the respondents who have experience with quantum technologies are self-taught (78%), while 7% hold a vocational degree, 7% hold an undergraduate degree, 2% a graduate degree, 2% a PhD and 2% have work experience in quantum-related fields.

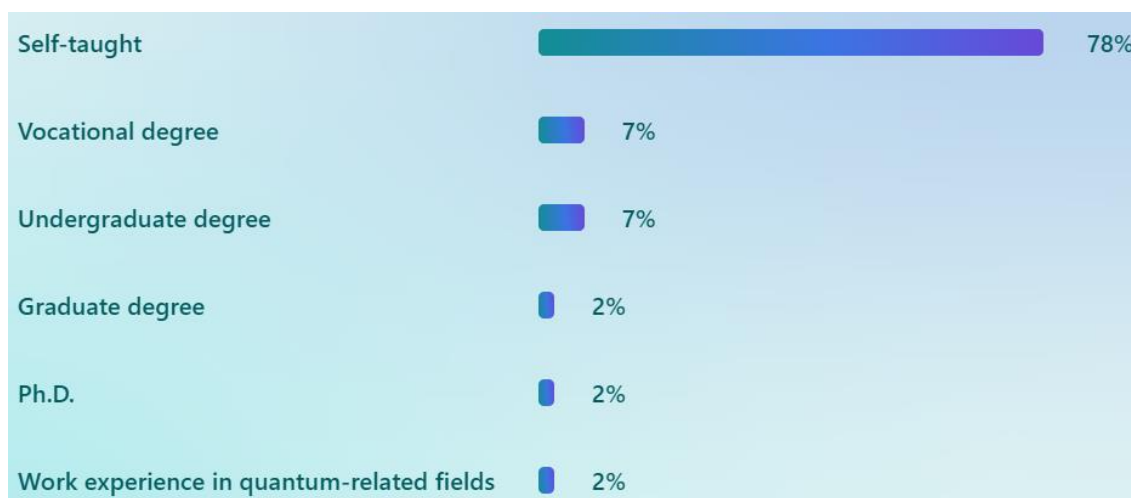


Figure 6: Survey with scientific community – Ways the respondents have acquired experience with quantum technologies.

Furthermore, using a scale 1 = Not familiar to 5 = Very familiar, we examined the familiarity of the respondents with diverse quantum technologies, such as quantum computing, quantum communication, quantum cryptography, etc. As a general rule, the majority of the respondents have no or marginal familiarity with any quantum technology.

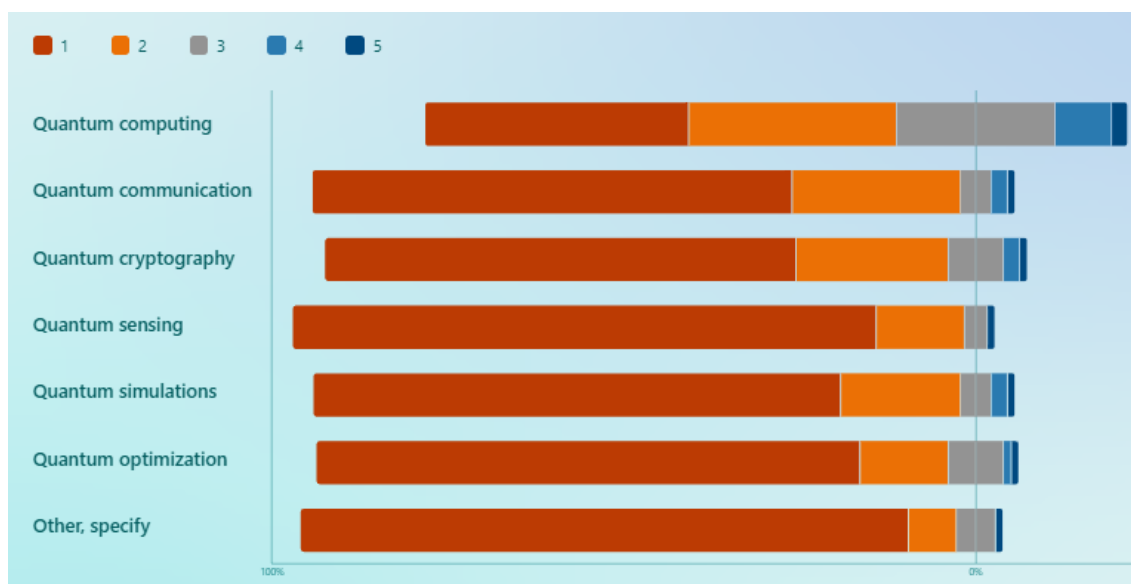


Figure 7: Survey with scientific community – Familiarity of respondents with quantum technologies.

Moreover, 87% of the respondents declared that they have not attended any previous training or courses in quantum technologies, while the remaining 13% of respondents who have attended, said that those were

university programs (18%), online courses (15%), conferences (3%), workshops (3%) and other kind of training (59%).

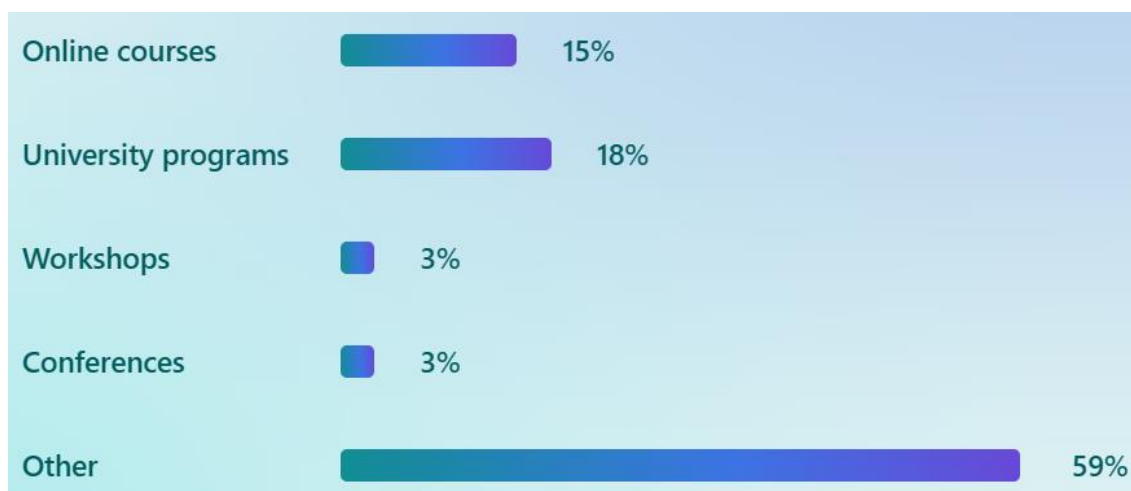


Figure 8: Survey with scientific community – Type of training on quantum technologies that the respondents participated in.

3.3 Section 3: Research applications and interest

Section 3 aims to collect feedback on the research applications and interest of the respondents in quantum technologies.

Looking at the relevance of quantum technologies with the research activities of the respondents, 30% of them said that quantum technologies are slightly relevant, 30% moderate relevant, 15% highly relevant, 13% not relevant and just 9% critical for future research.

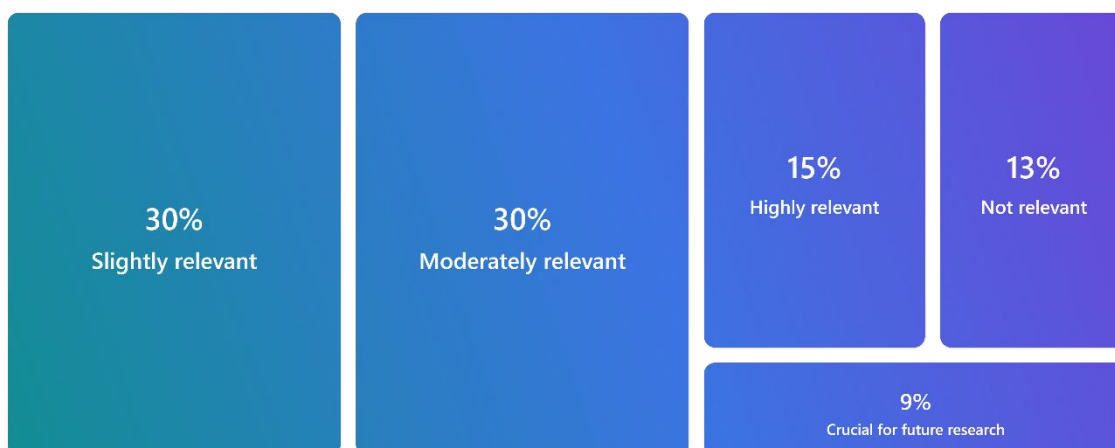


Figure 9: Survey with scientific community –relevance of quantum technologies with research activities of the respondents.

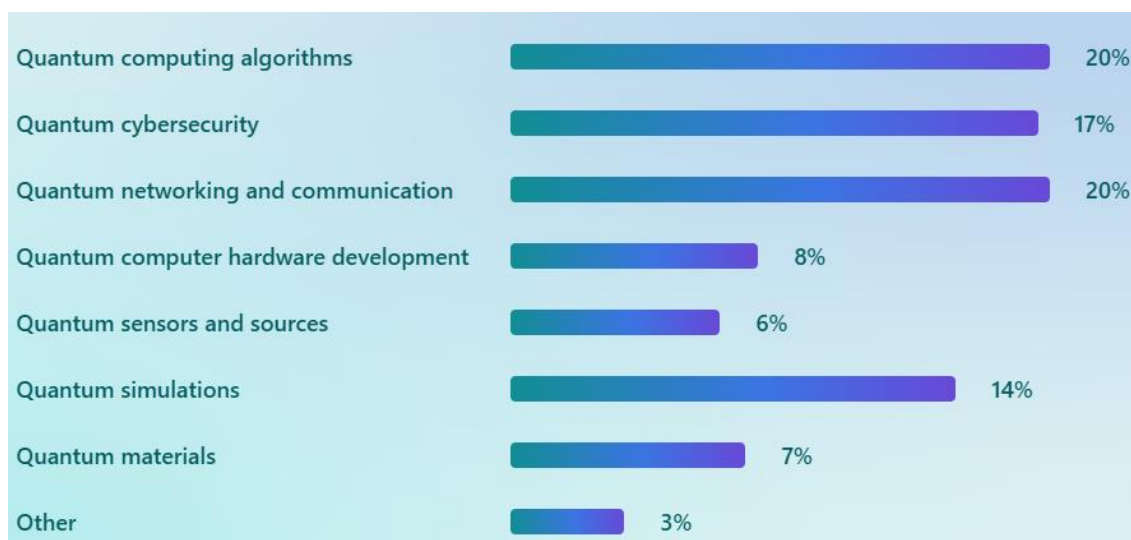


Figure 10: Survey with scientific community – areas of quantum technology that the respondents are most interested in learning about.

Although 80% of the respondents said that they currently do not actively explore quantum technologies for their research, the top 3 quantum technologies that have been identified as most interesting for learning are quantum computing algorithms (20%), quantum networking and communication (20%) and quantum cybersecurity (17%).

Moreover, quantum optimization algorithms for banking and finance, transport, etc. (23%), quantum communication networks (21%) and quantum cryptography and cybersecurity (21%) have been identified as the top 3 applications of quantum technologies that respondents are most interested in.

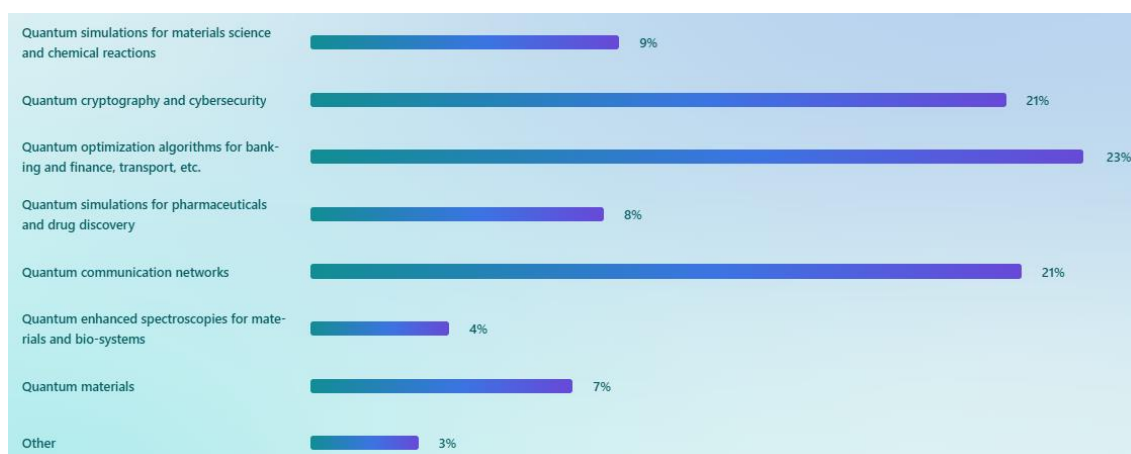


Figure 11: Survey with scientific community – Applications of quantum technologies that the respondents are most interested in.

Finally, although 82% of the respondents said that they currently do not use any tool for quantum technologies, 7% declared that they use IBM Quantum, 5% Google Quantum AI and 3% other.

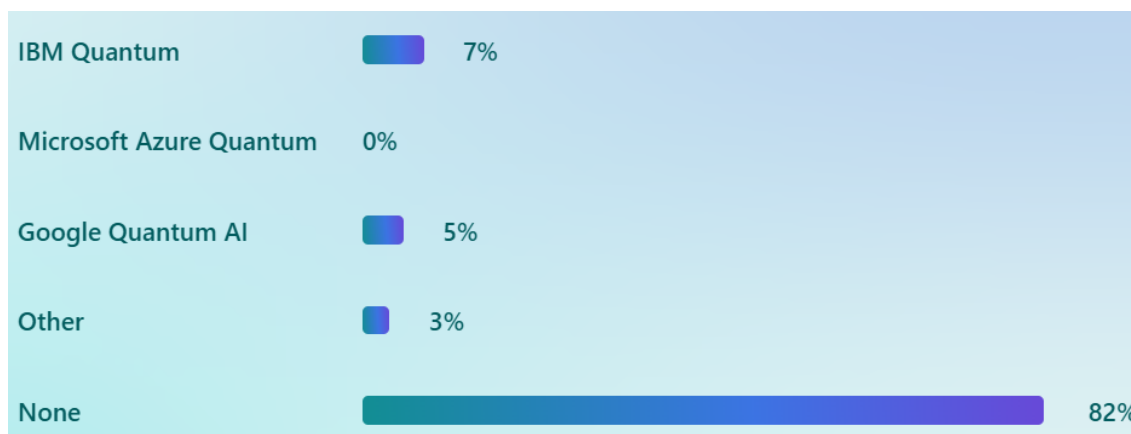


Figure 12: Survey with scientific community – Tools or platforms that the respondents currently use for quantum technologies.

3.4 Section 4: Training Preferences

Section 4 aims to collect feedback on the training preferences of scientists on quantum technologies. Looking at the training preferences, hybrid training seems to be the most preferable (43%), while a significant percentage of the respondents (30%) is interested in online self-paced learning. Moreover, 17% prefer peer-to-peer learning or collaborative projects, while 9% prefer online real-time instructor-led sessions.

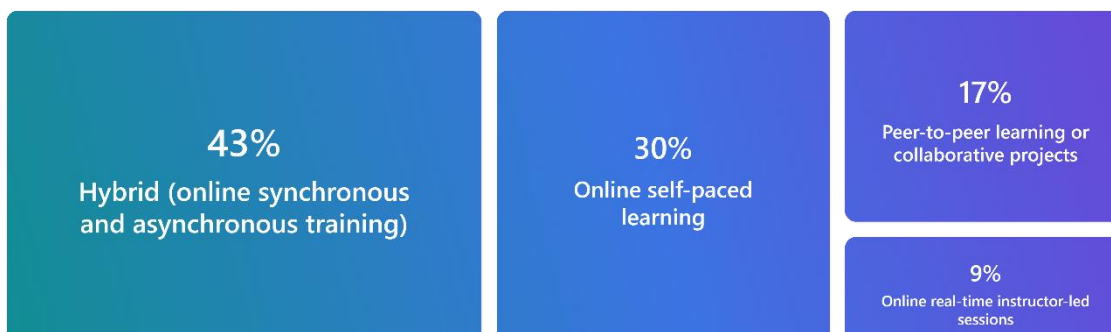


Figure 13: Survey with scientific community – Format for training that respondents prefer.

Considering the level of depth of the training on quantum technologies, 48% are looking for intermediate training (i.e. some technical knowledge), 45% are looking for basic introductory training (i.e. non-technical) and 5% are looking for advanced training (deep technical dive).

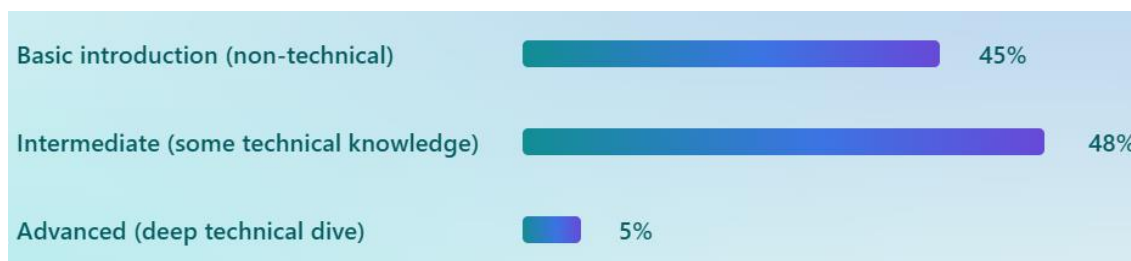


Figure 14: Survey with scientific community – Level of depth of the training that respondents prefer.

3.5 Section 5: Barriers and Challenges

Section 5 aims to dive into the barriers and challenges that the scientific community faces when dealing with quantum technologies.

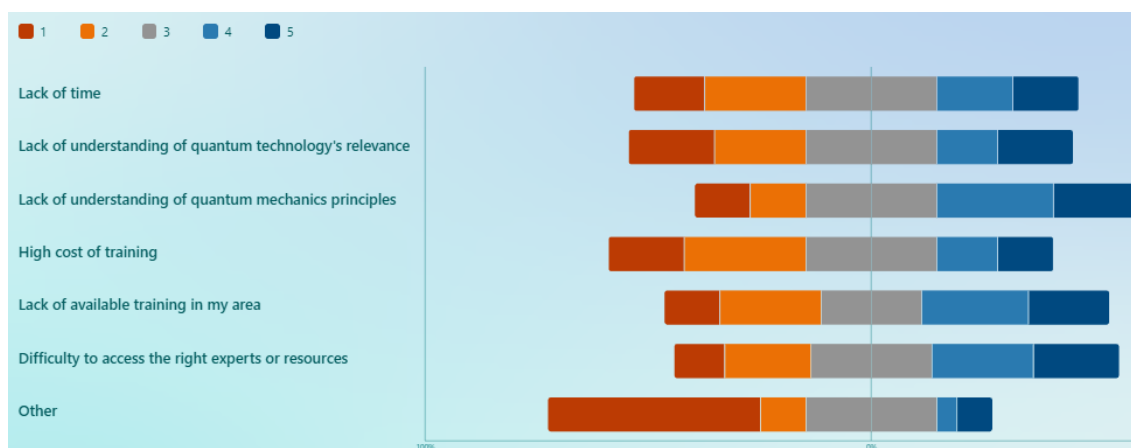


Figure 15: Survey with scientific community – main barriers preventing the respondents from engaging with quantum technology training

Based on the responses collected, the high cost of training seems to be a moderate challenge, while the key challenges are the lack of understanding of quantum mechanics principles, the lack of available training, and the difficulty to access the right experts or resources. Technical understanding has been declared as the domain that needs most attention in quantum technologies training for scientists (39%), while 27% of the respondents

said that business strategies and use cases, as well as practical applications and implementation of quantum technologies (also 27%) are domains that training on quantum technologies should focus on.

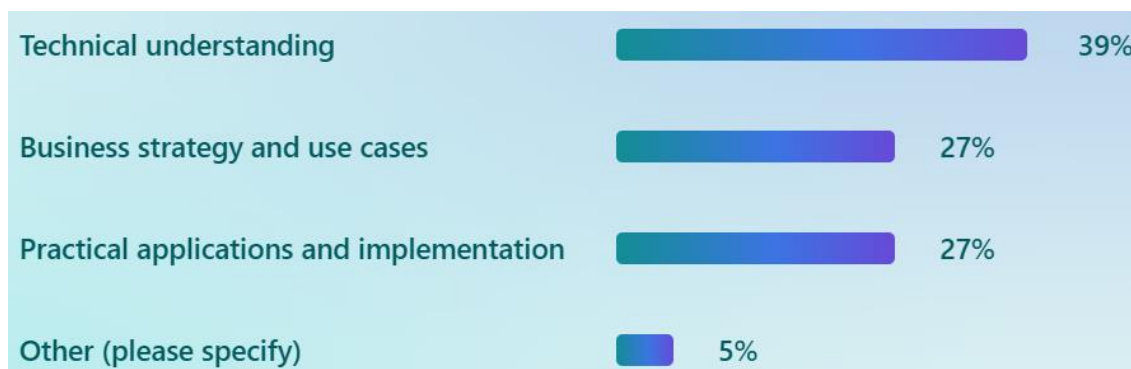


Figure 16: Survey with scientific community – skills or knowledge that respondents feel need the most attention in quantum technologies training.

3.6 Section 6: Additional Feedback

In the last section of the survey for scientists, the respondents have identified additional resources or support that would help them succeed in quantum technologies, such as:

- free online courses with practical examples and short videos
- easy to follow training materials
- opportunities to experiment with real quantum computers or high-fidelity simulators
- advanced courses, certifications, or workshops on quantum algorithms, quantum programming languages, and hardware design
- practical usage of quantum technologies in various industries
- non-technical learning resources that start by explaining what quantum is in understandable layman language, not abstraction.

4. Results obtained in the survey addressing the business community

In total 13 responses have been collected from stakeholders from the business community.

4.1 Section 1: Responders demographic information

As in the previous survey, Section 1 aims to collect demographic information about the respondents. Based on the feedback, 69% of the respondents are men, while the remaining 31% are women. Moreover, 38% of the respondents fell in the age group 55 to 64 followed by the age group 45 to 44 (30%).

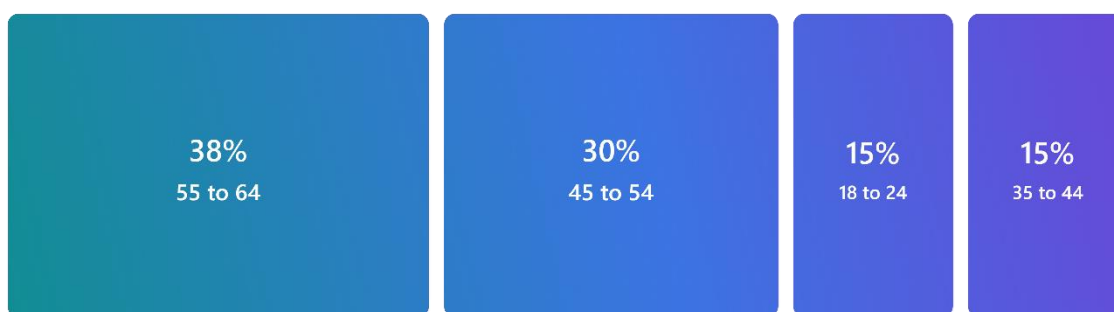


Figure 17: Survey with business community - Age group of respondents.



Figure 18: Figure 17: Survey with business community - Position of respondents in the enterprises.

Looking at the profile of the respondents, 38% hold the position of CEO/Executive, 23% hold the position of CTO/Technical Lead, 15% are Founders/Co-founders and 23% hold another position in the company.

4.2 Section 2: Company demographic information

Section 2 aims to collect feedback about the profile of the companies participating in the survey. Out of the 13 companies participating in the survey, 81% are coming from Spain and 19% from Finland with the majority of them (76%) operating for more than 10 years.



Figure 19: Survey with business community – Years the company is active

Considering the size of each enterprise, 38% have more than 250 employees, 30% have 10-50 employees and finally, 30% have less than 10 employees. Moreover, 46% of the companies have an annual turnover between €500,001 and €10,000,000, 23% have an annual turnover higher than €100,000,000, 15% have an annual turnover lower than €100,000 and finally, 15% have an annual turnover between €100,000 and €500,000.



Figure 20: Survey with business community – size of the company is based.



Figure 21: Survey with business community – annual turnover of the company.

The main sectors in which those companies operate are telecommunications (15%), energy (15%) healthcare, pharmaceuticals (7%) and Other (61%).

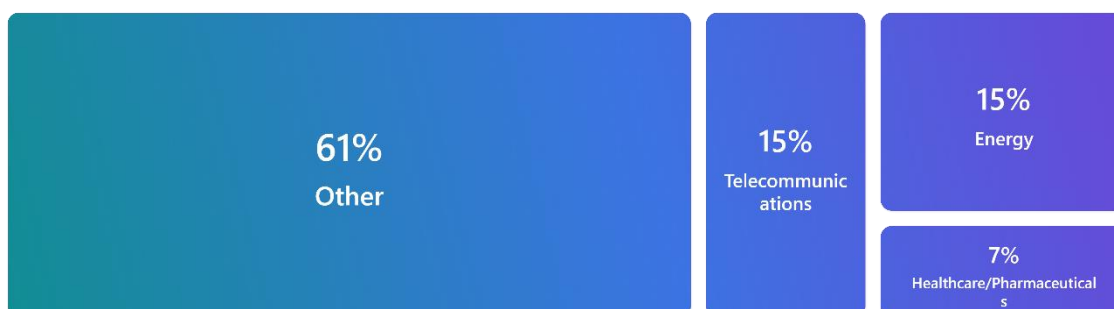


Figure 22: Survey with business community – markets in which the company operates.

Finally, none of the enterprises surveyed currently use quantum technologies.

4.3 Section 3: Current knowledge in quantum technologies

Section 3 aims to collect feedback about the current knowledge of the respondents in quantum technologies.

By unveiling the background of respondents in quantum technologies, just 7% declared that they have a relevant background from self-studying (66%) or through attending a vocational program (33%).

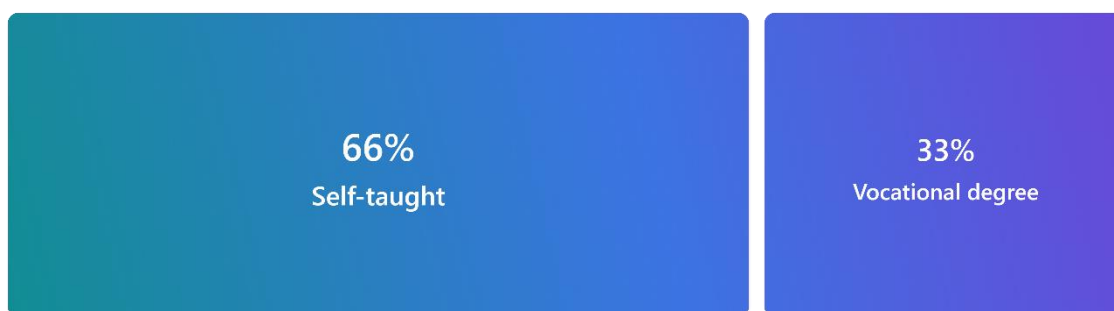


Figure 23: Survey with business community – Ways the respondents have acquired experience with quantum technologies.

Furthermore, using a scale 1 = Not familiar to 5 = Very familiar, we examined the familiarity of the respondents with diverse quantum technologies, such as quantum computing, quantum communication, quantum cryptography, etc. As in the case of the survey targeting scientists, the majority of the respondents have no or marginal familiarity with any quantum technologies. The technology with which the respondents seem to be more familiar is quantum computing.

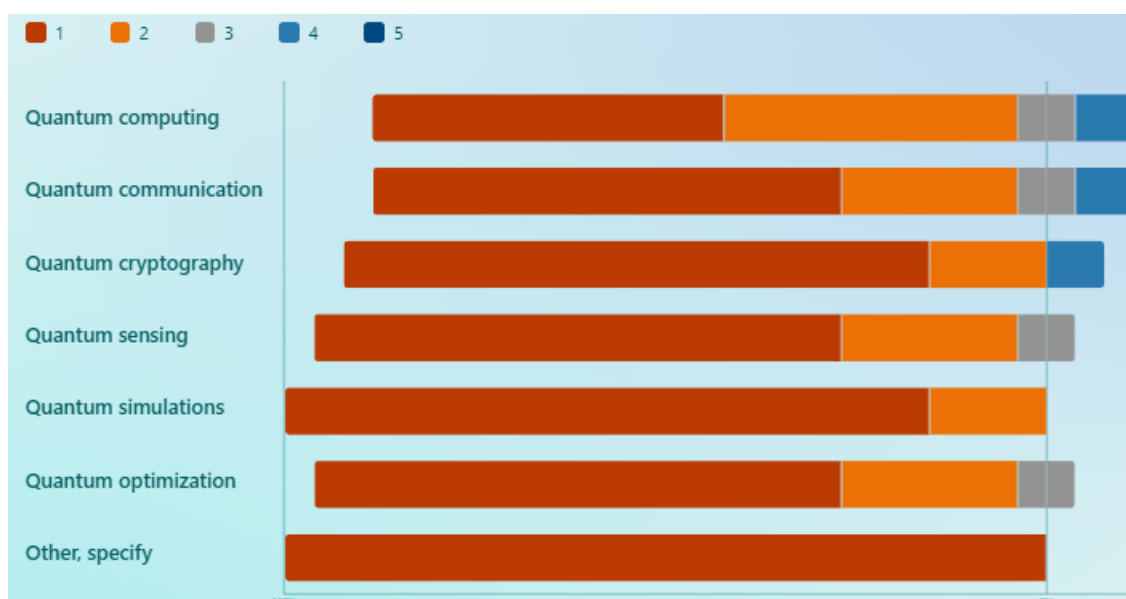


Figure 24: Survey with business community – Familiarity of respondents with quantum technologies.

Moreover, just 15% of the respondents said that they attended any previous training or courses in quantum technologies, those being conferences (50%) or online courses (50%).

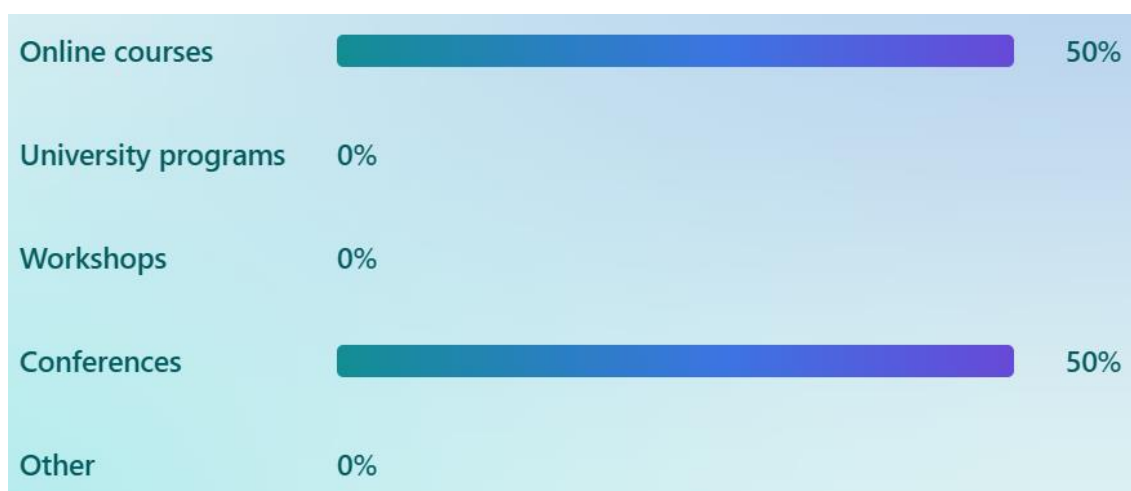


Figure 25: Survey with business community – Type of training on quantum technologies that the respondents participated in.

4.4 Section 4: Business applications and interest

Section 4 aims to collect feedback on the business applications and interest of the respondents in quantum technologies. Based on the feedback gathered, 30% of the respondents considered quantum technologies not relevant to their business, 30% moderately relevant, 15% highly relevant and finally, 15% slightly relevant.

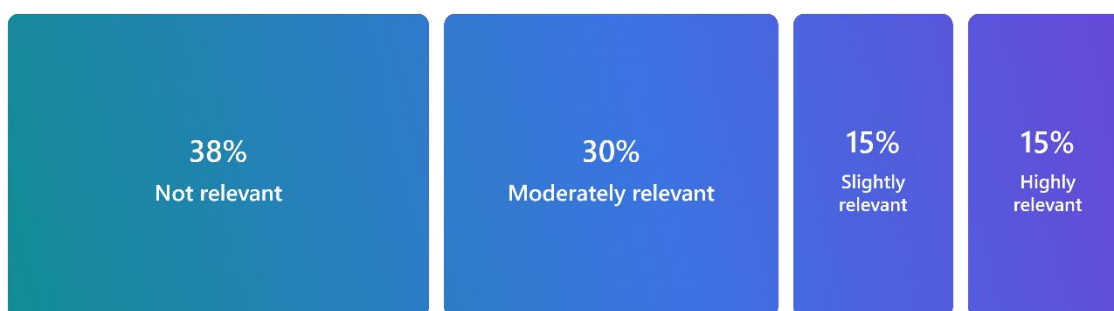


Figure 26: Survey with business community –relevance of quantum technologies with research activities of the respondents.

Although 61% of the respondents said that they are not actively exploring quantum technologies for their business (a smaller percentage in comparison to the survey targeting scientists), the quantum technology that has been identified as the most interesting for learning is quantum computing algorithms (20%) while other technologies have been also identified as interesting, e.g. as quantum networking and communication

(17%) or quantum simulations (17%).

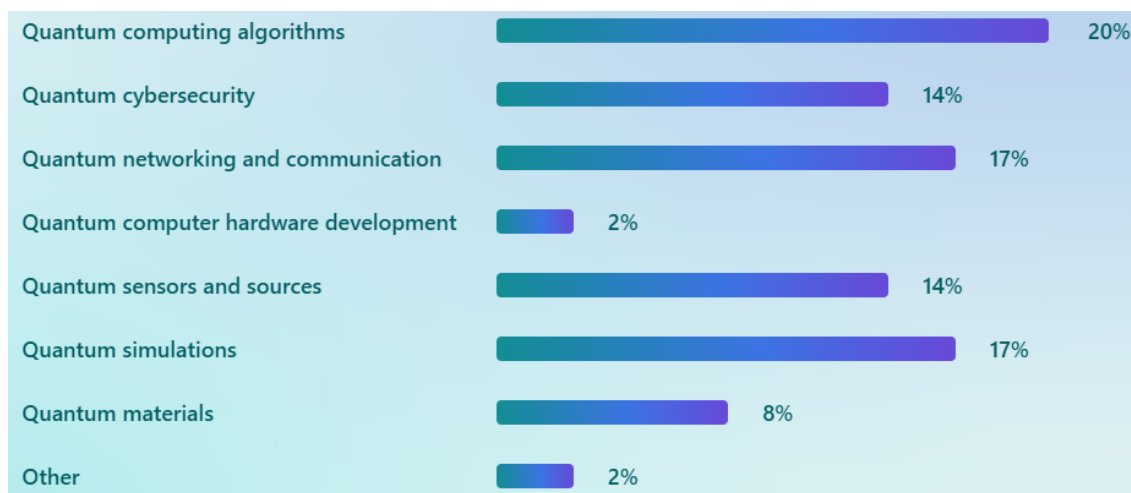


Figure 27: Survey with business community – areas of quantum technology that the respondents are most interested in learning about.

Quantum cryptography and cybersecurity (23%), quantum optimization algorithms for banking and finance, transport, etc. (19%) and quantum communication networks (19%) have been identified as the top 3 applications of quantum technologies that the respondents are most interested in.

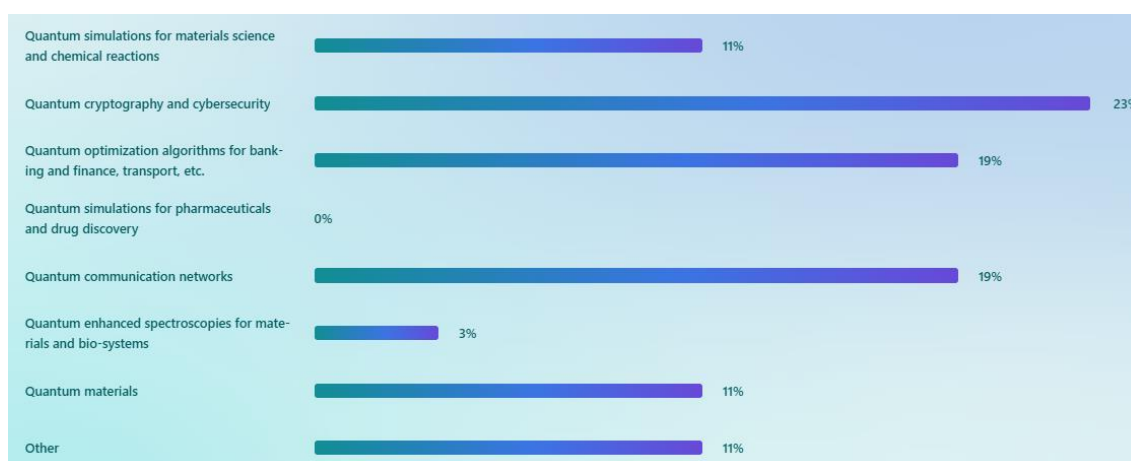


Figure 28: Survey with business community – Applications of quantum technologies that the respondents are most interested in.

4.5 Section 5: Training preferences

Section 5 aims to collect feedback on the training preferences of enterprises

on quantum technologies. As in the case of the survey targeting the scientific community, hybrid training seems to be the most preferable (53%), while 23% of the respondents are interested in online self-paced learning. Moreover, 15% prefer peer-to-peer learning or collaborative projects, while just 7% have as a preference online real-time instructor-led sessions.

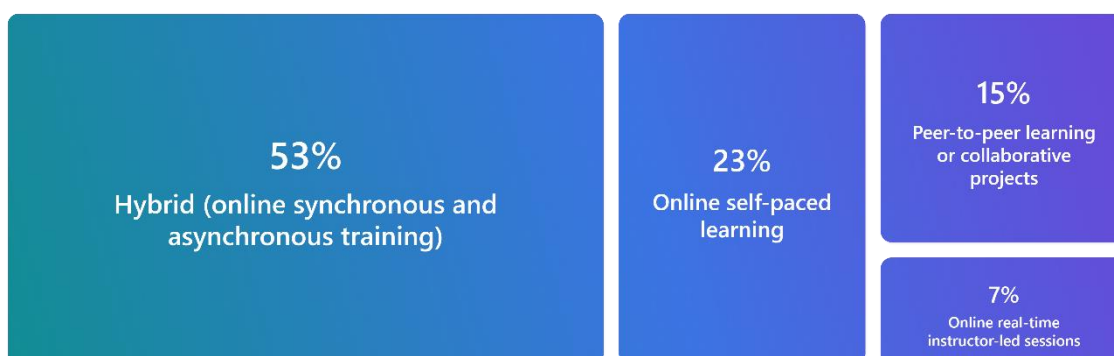


Figure 29: Survey with business community – Format for training that respondents prefer.

Considering the level of depth of the training on quantum technologies that enterprises are looking for, the results obtained are more or less the same as those obtained from the survey targeting scientists. 46% are looking for intermediate training (i.e. some technical knowledge), 38% are looking for basic introductory training (i.e. non-technical) and 15% are looking for advanced training (deep technical dive).

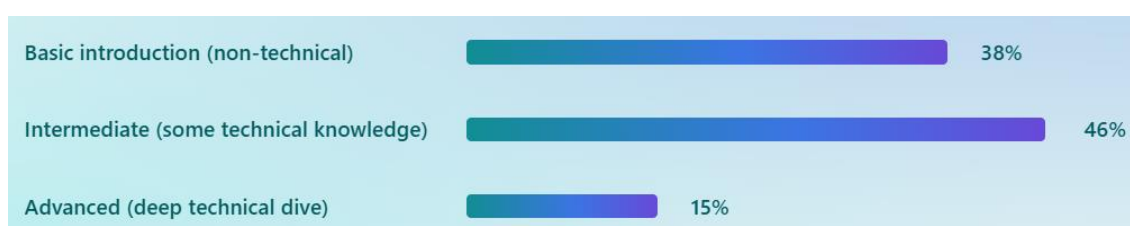


Figure 30: Survey with business community – Level of depth of the training that respondents prefer.

4.6 Section 6: Barriers and challenges

Section 6 aims to dive into the barriers and challenges that the business community faces when dealing with quantum technologies. Based on the feedback collected, the lack of understanding of quantum mechanics

principles, the lack of available training, and the difficulty to access the right experts or resources are the main challenges that the business community faces when trying to exploit quantum technologies.

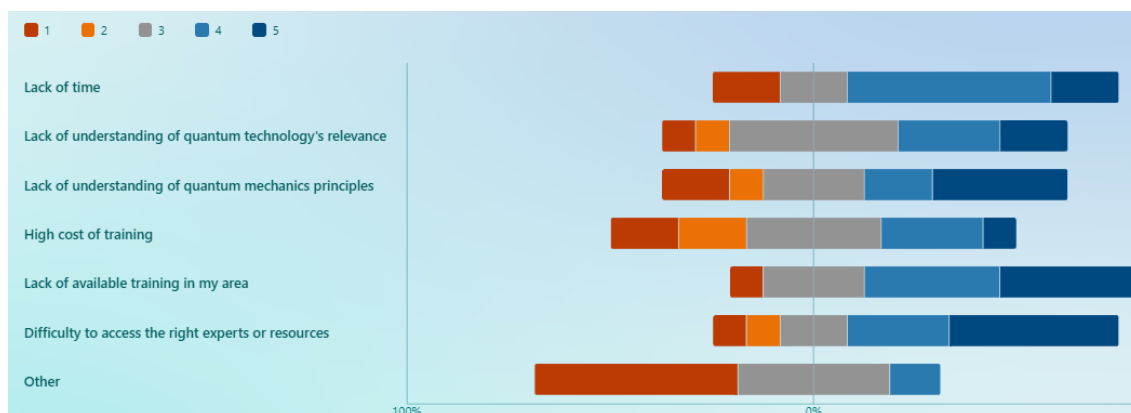


Figure 31: Survey with business community – main barriers preventing the respondents from engaging with quantum technology training

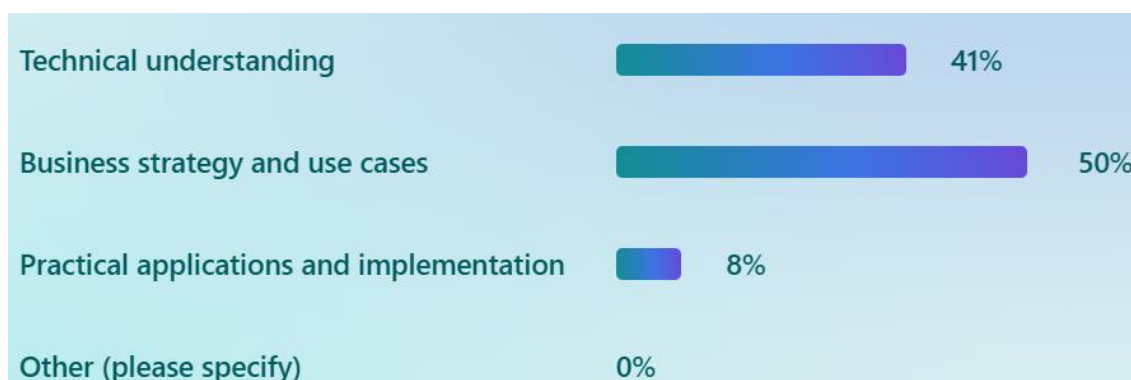


Figure 32: Survey with scientific community –skills or knowledge that respondents feel need the most attention in quantum technologies training

Finally, in contrast to the survey targeting scientists, business strategies and use cases of quantum technologies have been identified by the surveyed enterprises, as the domain with the key knowledge and skills gap (50%), followed by technical understanding (41%) and practical applications and implementation (8%).

4.7 Section 7: Additional feedback

In the last section of the survey targeting enterprises, the respondents have

identified additional resources or support that would help them succeed in quantum technologies, such as business cases of quantum technologies in the energy sector, exit cases and future evolution, and integration of quantum technologies in business.

5. Discussion and insights

In this deliverable we present the results obtained from 2 surveys on the use and training needs in quantum technologies of scientific and business communities. The differentiation on the number of responses collected in the two surveys can be justified by the low adoption rate of quantum technologies by the industry in comparison to the research.

In the first survey targeting scientists, although 84% of the respondents had no background in quantum technologies, the majority of those that have such a background were self-taught (78%). Quantum computing algorithms, quantum networking, and cybersecurity have been identified as the most interesting quantum technologies to learn with focus mainly on introductory and intermediate level courses. Moreover, hybrid learning is the most preferable learning method. The key skills gaps have been identified at the domain of understanding quantum concepts, as well as business applications of quantum technologies.

From the second survey targeting enterprises, it is derived that just 7% have experience with quantum technologies (a considerably lower percentage in comparison with the survey targeting scientists) with most of them (66%) acquiring this experience through self-taught (66%). Their experience evolves around quantum computing, while just 15% of the respondents have attended training, mostly via conferences and online courses. Moreover, while scientists struggle with technical complexities of quantum technologies (39%), businesses focus more on real-world applications and business cases of quantum technologies (50%).

Looking at the correlation between demographic information (i.e., country, age, and gender) and training needs and challenges, we conclude that scientists from different countries share common training needs, primarily focusing on quantum computing, networking, and cybersecurity, while businesses in Spain and Finland show more interest in quantum cryptography, finance applications, and optimization algorithms. However, in both surveys, a major challenge across countries is the lack of available training and expertise in quantum technologies. Younger scientists preferred introductory and intermediate-level training, while older

participants expressed a need for specialized hands-on courses. Moreover, younger professionals in business were slightly more interested in learning technical aspects but still lacked familiarity with quantum technologies. Finally, according to the survey targeting scientists, the training preferences were similar across genders, but women expressed more concern about accessibility and clarity of training materials, while according to the survey targeting businesses, women were more likely to emphasize the need for structured training programs and industry-specific use cases. However, both genders face similar challenges: cost of training, lack of quantum knowledge, and difficulty for accessing experts.

The **key actionable insights** derived from both surveys are summarized below.

1. Starting with beginner-friendly training focused on basic quantum concepts.
2. Developing specialized courses focusing on high demand quantum technologies, e.g. quantum computing.
3. Providing hands-on exercises using well-known platforms such as IBM Quantum and Google Quantum AI.
4. Using layman-friendly language before introducing complex theories.
5. Offering a hybrid training approach, i.e. self-paced online courses + interactive instructor-led sessions.
6. Creating short learning materials, such as short videos, infographics, quizzes.
7. Integrating in the curriculum real-world applications of quantum technologies in various industries

As a **conclusion** and based on the feedback collected through both surveys:

1. The training addressing scientists should focus on technical understanding and hands-on projects.
2. The training addressing businesses should include simplified introductions to quantum technologies, industry case studies, practical implementations, and road maps for integrating quantum technologies in business.



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