Annual Survey Results

THE STATE OF AQ

Global Quantum Intelligence
& SandboxAQ

2023

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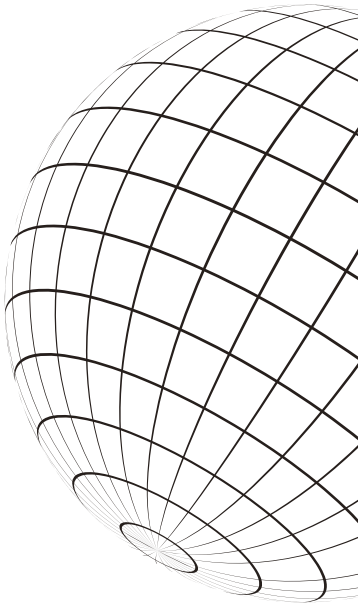
EXECUTIVE SUMMARY



AQ is a major competitive advantage for 75.4% of businesses

AQ is an emerging field combining the power of Artificial Intelligence and Quantum Technologies with applications that range from computing and simulation over sensing and communication to cryptography and others.

As a very young and specific field, we set out to survey the decision makers of our community on the state of AQ. This report shares the results of this first ever effort to analyze AQ and it is rather surprising.

While the universe of quantum tech users remains relatively small today, 120 of them responded to this survey - through their status of them being active users, the below insights become ever more meaningful.

Their responses are powerful and what stands out is that many consider AQ to be a strategic differentiator.

Their eye is not on incremental improvements or cost cutting, rather, senior management and executives are focused on creating new revenues and solutions with AQ. And, often, they do so alone or in partnership with academia, rather than with large vendors, consultancies or integrators.

Of course, not all is rosy; about half of respondents have only an emerging understanding of AQ and, at best, plans for how to implement it. Skills & resources are rare and timelines long.

Broadly speaking, a leadership group that comprises roughly ¼ of respondents is emerging and working actively on AQ. A roughly equal group of followers is trailing close behind, while the rest of the target market is standing on the sidelines.

The following report shares detailed results and analysis on their responses. And we hope to do so every year going forward to monitor progress and trends.

OBJECTIVES OF THE SURVEY

The field of A.I. combined with Quantum Technologies - called AQ - is emerging as a vital application of these advanced technologies. This survey is the first effort ever to assess the state of AQ, identify priorities and challenges.

AQ refers to the combination of artificial intelligence and quantum technology

- Quantum technology refers to any solutions that rely on quantum mechanics, which is much broader than quantum computing and includes sensing, communications and cryptography
- Artificial intelligence and software combines with quantum tech to address significant business and scientific challenges

Current AQ initiatives are already combining AI and Quantum technology to solve hard problems in the areas of cybersecurity, communications, sensing and simulation. With your help and for the community's education, we want to determine adoption and market trends in the usage of AQ in enterprise environments.

Since the field of AQ is unprecedented, this is the first ever such effort when it comes to assessing its current state and taking a look into the future.

Our intention is to make this an annual effort and as such track the progress of AQ. Our goal is twofold:

- To offer providers of AQ input and guidance on what the market and users are saying about AQ.
- And to offer users a voice as this new field is taking shape, products and solutions hit the market and new projects see the light of day.

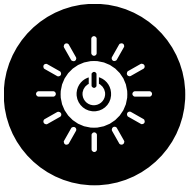
THE SURVEY

The survey had four key segments

GQI and SandboxAQ collaborated on designing and publishing a survey that reflects the current extent and knowledge of the field of AQ.

It was shared with a curated audience of quantum technology influencers and decision makers globally via GQI's newsletters and social media that has been built in this specific niche since 2015. While everyone was encouraged to respond, we went to great lengths to ensure that we obtained the opinions and feedback of key leaders in the space.

1 AQ AND YOUR ORGANIZATION



2 DRIVERS AND GOALS

3 AQ USE CASES

4 AQ ROADBLOCKS

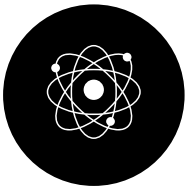
THE SURVEY

Since the field of AQ is so new, we made suggestions within each of the above categories to guide the reader to the best of our knowledge. Specifically, we assumed certain use cases and applications for AQ that fall within the following areas.

For each, we proposed a number of possible use cases as multiple choice options.

1 AQ FOR QUANTUM COMPUTING

2 AQ FOR QUANTUM SENSING



3 AQ IN SIMULATION

4 AQ FOR QUANTUM COMMUNICATIONS

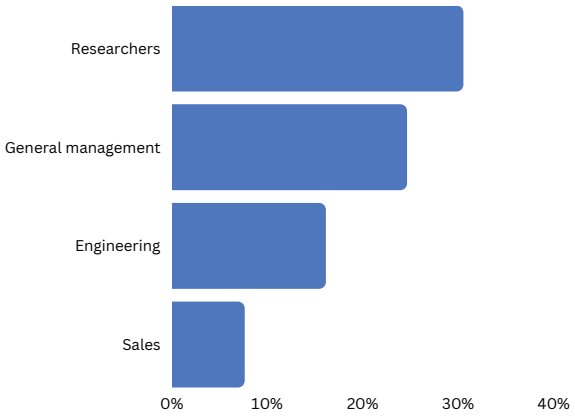
AUDIENCE DETAILS

Demographics

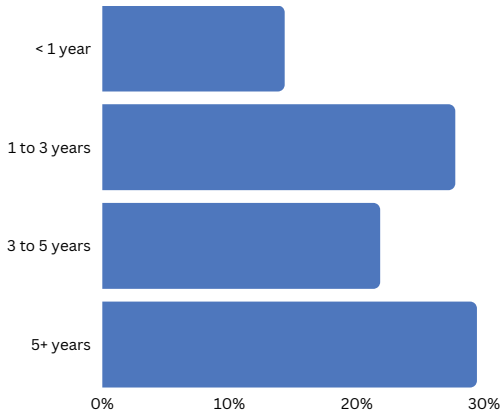
The audience was composed of senior decision makers from business & academia, distributed mostly evenly across regions and industries, with a variety of different levels of experience and commitment to quantum tech.

The respondents to this first ever AQ survey represent the following demographics.

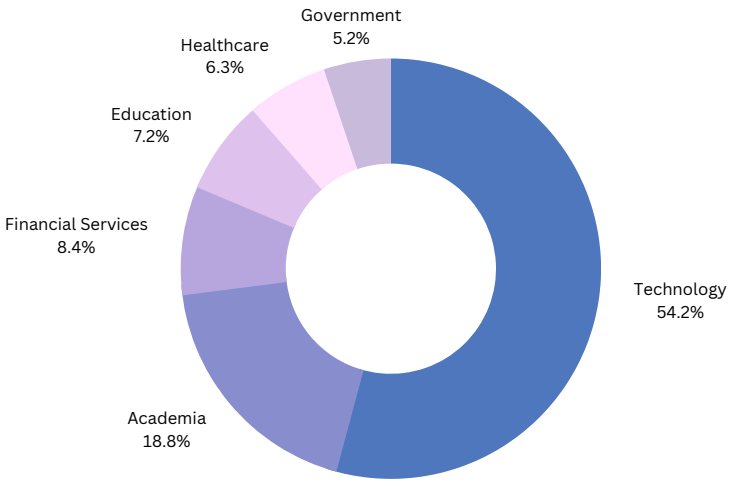
By role



Years in quantum

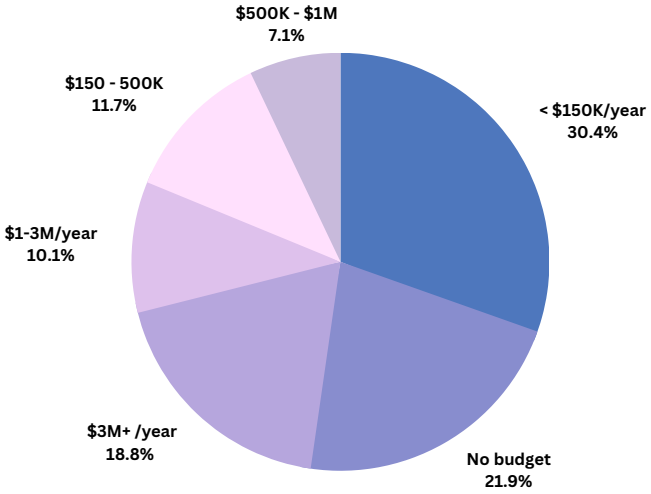


By sector

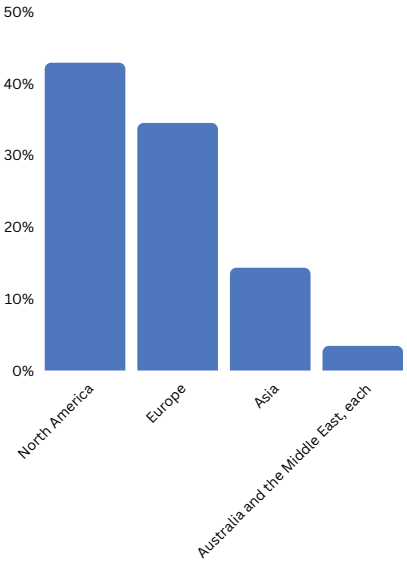


AUDIENCE DETAILS

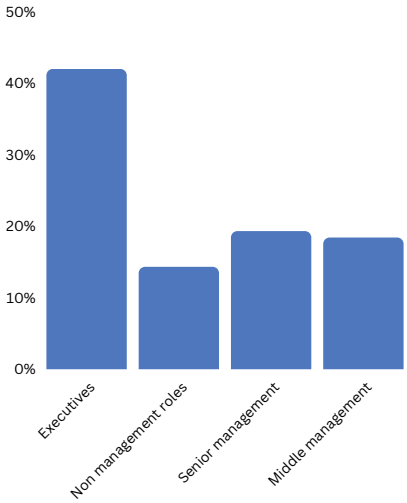
Quantum budgets



By region



By seniority



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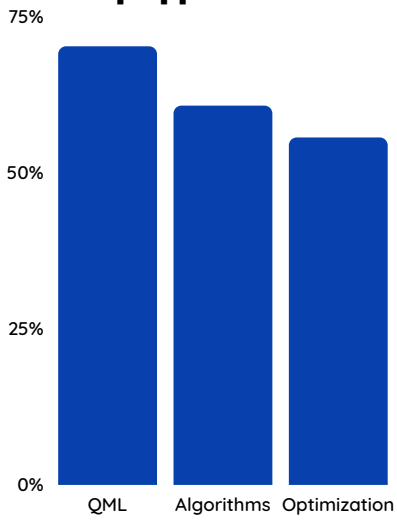
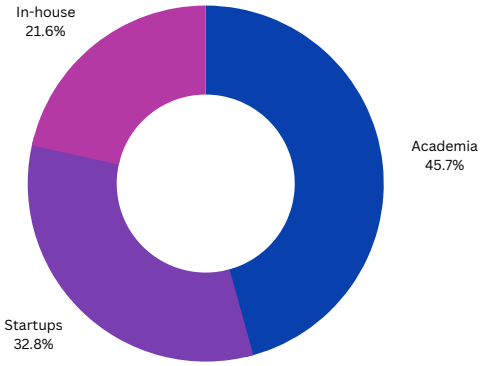
THE RESULTS

Top applications



Partnering



30.3% already have an AQ POC project under way and 10.9% say they have AQ in a production environment.

And more than 41.2% of respondents have dedicated staff for these efforts.

Embedding AQ into current solutions or building tools to do so off the shelf.

33.6% are building new solutions with AQ.

This is overwhelmingly driven by new business opportunities as identified by 58% of respondents.

Almost half (48.8%) expect their current efforts to have reached production maturity by 2024.

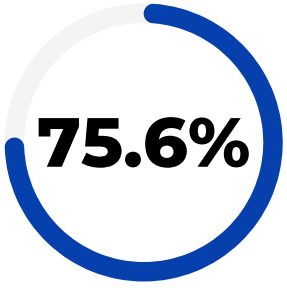
76.5% **Application: Quantum Computing**

49.6% **Application: Simulation**

Revenue growth

Increasing revenue (29.4%), competitive pressures (22.7%) and differentiation (41.2%) make up the balance of the top motivations cited.

AQ is strategic



The followers

In general, a large variety of applications across quantum sensing, cryptography and communications are being explored with meaningful results across 3 dozens of use cases in these fields.

18.5% see this happening in 2025, better education & training is mentioned by almost half as a key roadblock and 45.4% are waiting for the maturity of AQ to grow.

34.5% are planning AQ projects rooted in an emerging understanding of the field as cited by 44.5% of the population.

Application focus

72.3% **R&D projects**

36.1% **Training & skills**

Partners & POCs

22 % of all users rely on consultancies or system integrators and 76% say that they are investing in some sort of hardware with or without qubits, quantum memories and other.

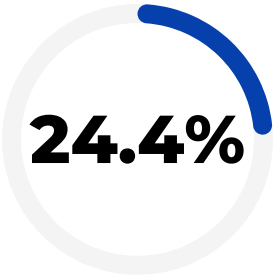
Drivers

This seems to be driven by advancements in AQ that make it more approachable as expressed by 27.7% of respondents and directive of their leadership in 13.4% of all cases.

The laggards

No desire to learn AQ

AQ is irrelevant

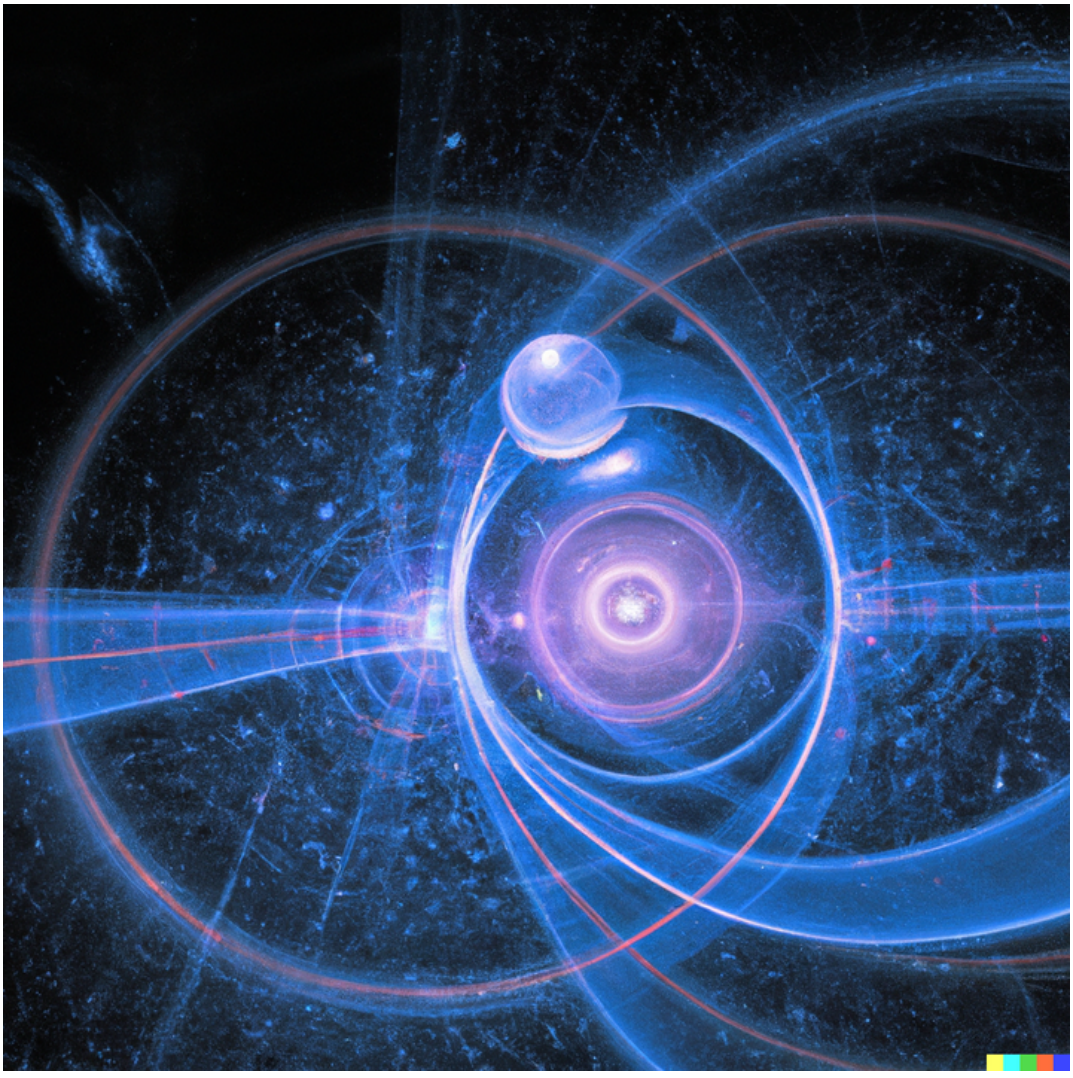


25.5% have invested less than $150K into quantum, and 23.5% not a single dollar. Half have less than 3 years of corporate experience in the field and 22% describe themselves as being in junior roles within their organization.

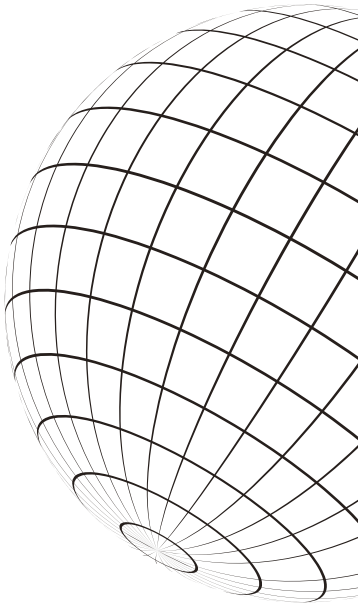
Only 24.4% of respondents said that they do not have any existing plans for AQ. A relatively low number for a young field like quantum but then again, the survey respondents might be biased towards AQ action.

Almost 60% have no dedicated staff for AQ and express only a small desire to invest into education, skills, training or other initiatives.

32.8% do not think that AQ will arrive before 2026 and budgets (32.8%), management sponsorship (14.3%) and internal skills (22.7%) are lacking to accelerate this.



ANALYSIS



Large, strategic support for AQ

While surveys have an inherent bias and those actively engaged in the topic of it are more likely to respond, we are surprised by the share of actors who are actively engaged in AQ already.

Three quarters of businesses consider AQ a major competitive advantage and, in consequence, are investing into it with an eye on embedding it into existing solutions, or, more interestingly, creating new ones.

All on a timeline that does not exceed 24 months, a split second in quantum time considering the maturity of the overall field.

The applications of AQ are broad, as one would expect, however, a strong focus on computation and simulation leads the commercial efforts in the field.

Considering that ⅔ of respondents work in business, almost half of which at a senior management level or above, the fact that ⅓ of them is spending $1M+ on quantum, based on a track record in the field that exceeds 3 years in 40% of all cases, this becomes a very powerful indicator of where the field of AQ is trending.

Those who believe in AQ are familiar with it, investing into it, and believe it will have a strategic business impact by 2024. That is stunning.

This clearly rings the alarm bells for those who are not yet engaged in it.

Even more so since these AQ leaders are largely doing so on their own, or in cooperation with academia as well as smaller startups. This hints at proprietary efforts in the field that are so strategic that users prefer not to outsource them or work with system integrators, consultants or large vendors.

ANALYSIS

While these results might surprise some, almost half of respondents are at best in the planning stages of AQ projects and even more than that consider the understanding of the field as emerging.

Accordingly, the focus of this group is much more on R&D, their timelines are somewhat longer, their investments more cautious and collaborations centered more around trial & error, education and skills, often with larger vendors, consultants or partners.

AQ is being experimented with across a very broad set of quantum applications and use cases, while, at the same time, showing surprising homogeneity across respondents. This suggests that the leading implementation scenarios for AQ are well understood and accepted, and businesses are simply looking to gather experience and first results before committing to some of them.

The good news is that in both cases initiatives seem to be driven by desires to grow, differentiate and compete, led by senior management and above, rather than cutting costs or iterating existing products. AQ is perceived as a game changer.

Amongst all of the enthusiasm a note of caution is in order as a large percentage of the audience either does not understand AQ, thinks it is relevant or has the budgets & skills to invest in it.

A lot of work will need to be done to educate, communicate and support these businesses.

CONCLUSIONS

The future state of AQ?

1

PARTNERING

The survey clearly validates a need for AQ and the desire for users to partners with startups who can help provide technology and solutions.

2

SPLIT USERS

Those who know, know. Those who don't need education, training & skills.

Clear market segments & opportunities emerge from this.

3

STRATEGIC AQ

Applications are strategic game changers designed to find new revenue streams and markets.

Business use cases are needed.

4

EARLY DAYS

A large population is not aware of the strategic potential of AQ and has no budget or desire to change that.

An opportunity for patient partners.

A strategic opportunity for vendors to capitalize on AQ business use cases. And a call to action for the 50% of users who do not recognize the strategic nature of AQ.

In both cases, timelines are near term, budgets are real and commitment is at the leadership level of corporate users - no quantum hardware necessary.

Annual Survey Results

THE SURVEY

this survey is a collaboration between SandboxAQ and Global Quantum Intelligence, LLC.

Additional details and analysis is available upon request for GQI members.

A follow up survey and analysis will be conducted in 2023.

We thank all respondents for their participation in the first AQ survey and look forward to the next edition.

Contact

Global Quantum Intelligence, LLC
www.global-qi.com
info@global-qi.com