GLOBAL FINANCIAL INNOVATION NETWORK

FCA FINANCIAL CONDUCT AUTHORITY

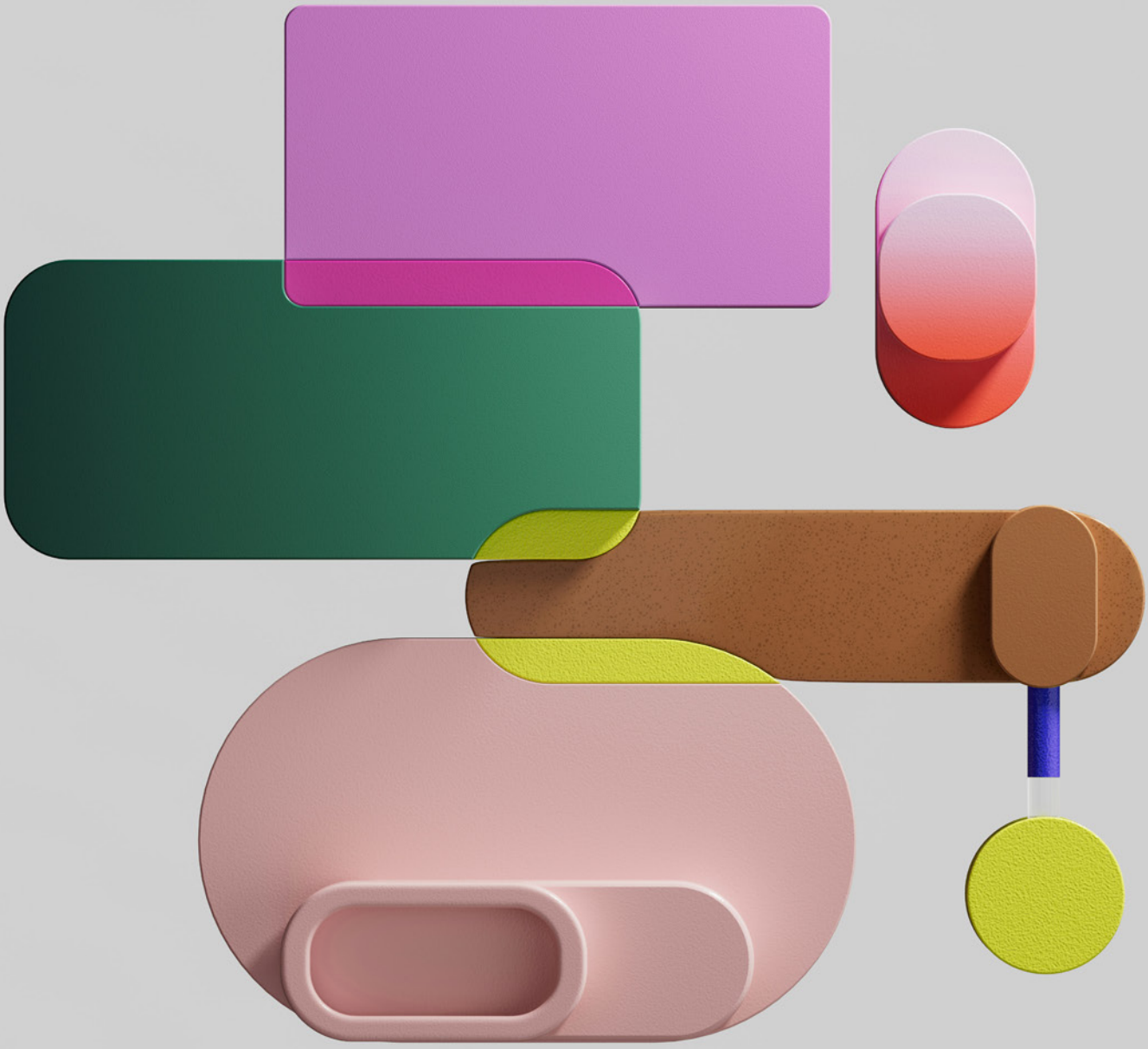
BC Securities Commission Invest Right

ASC Alberta Securities Commission

IFSCA

Project Otto Toolkit

November 2026



Contents

3 Foreword by the Chair
4 Preface
5 Acknowledgements
6 At a glance
9 Introduction: From emerging technology to regulatory maturity
11 Say-Do-Engage: A framework for measuring maturity
12 Measuring maturity
13 How to use this toolkit
14 Global Trends: The regulatory maturity landscape
15 Overall maturity across quantum security and quantum innovation
17 Say-Do-Engage: How Global maturity is developing
18 Global patterns of maturity across regulatory activity
22 Peer grouping
23 Understanding peer groups
24 Peer group archetypes
26 Regulatory maturity in context: Peer group analysis
27 Adapters
31 Contributors
35 Shapers
41 Emerging practice
47 From insight to action
48 Conduct a maturity audit
48 Set strategic goals
50 Strategic considerations
58 GFIN: From insight to collective progress
60 Annex One: Methodology
61 Purpose and analytical approach
61 Respondents and geographical coverage
61 Survey structure and parameter counts
62 Maturity scale and scoring
62 Aggregation and presentation of results
63 Treatment of 'tied' modal scores
63 Peer group allocation
64 Positioning, coordinating, and mobilising maturity thresholds
64 Nature of the conclusions
65 Limitations
66 Annex Two: Survey questions
67 Peer group
69 Quantum security question set
73 Quantum innovation question set

Foreword by the Chair

Quantum computing presents financial regulators with a familiar but increasingly urgent challenge: how to prepare for technological change when its timing and impact remain uncertain.

The potential threat to cryptographic security demands action well before the risks materialise. At the same time, quantum computing offers opportunities for financial services innovation that are only beginning to emerge. Regulators must be ready to address both, balancing preparedness with proportionate support for experimentation and innovation.

Project Otto represents an important contribution to that effort.

Drawing on insights from 25 regulators across the Global Financial Innovation Network (GFIN), it provides a practical assessment of regulatory maturity and identifies where capabilities are developing, where gaps remain and how we can learn from one another.

Its findings reinforce the importance of building expertise, sharing evidence and strengthening international cooperation. They also demonstrate that regulatory maturity is not simply about intervention, but about developing the judgement and capabilities to act effectively when needed.

For GFIN, this is precisely the value of collective endeavour: helping regulators anticipate change, accelerate learning and develop coordinated, proportionate responses.

Our challenge is not to predict the quantum future with certainty, but to ensure we are prepared to shape it responsibly.



Colin Payne
Head of Innovation, FCA, GFIN Chair

Preface

Project Otto is a collaborative initiative of the Global Financial Innovation Network (GFIN), led by the Financial Conduct Authority (FCA) in partnership with the Alberta Securities Commission, the British Columbia Securities Commission, and the International Financial Services Centres Authority (IFSCA). The project was developed and first proposed to the GFIN Board in July 2025. Its stated aim was to explore how financial regulators around the world can assess and develop their preparedness for quantum computing. The proposal was approved by the Board, with Members invited to express interest in contributing to the initiative.

The project takes its name from Otto Stern, the physicist best known for the Stern-Gerlach experiment, one of the first experiments to directly measure quantum effects. The name reflects the project's central objective: to provide the first structured attempt to measure and understand regulatory maturity in relation to quantum technologies. In the same way that Stern's work helped make the behaviour of quantum systems observable, Project Otto seeks to make regulatory preparedness visible, measurable, and comparable across jurisdictions, while acknowledging the differences between regulators and their operating contexts.

Over nine months, the Project Otto team developed a regulatory maturity framework for quantum security and innovation, surveyed twenty-five GFIN members, gathered examples of regulatory practice from participating jurisdictions, and translated those insights into practical considerations for action. The final output is a toolkit intended to provide a global snapshot of regulatory maturity, highlight emerging approaches, and present examples of existing best practice. The toolkit is designed to support regulators in developing their own strategies for engaging with quantum technologies, as well as to encourage cross-jurisdictional cooperation.

Acknowledgements

Project Otto has been shaped by the expertise and insight of regulators across the GFIN community. We would like to acknowledge the Financial Conduct Authority's Project Otto team, namely: Bimal Shah, Charlie Markham, Hisho Rajanathan, Jen Garcia, Lucasta Bath, and Neil McKenna for leading the research, analysis and development of this toolkit. We are grateful to our Project Partners, the Canadian Securities Commission (Alberta Securities Commission and British Columbia Securities Commission) and the International Financial Services Centres Authority (IFSCA) for their expertise and support throughout the project.

We would also like to thank the GFIN members who contributed their perspectives through project roundtables, and to the 25 member regulators that participated in the Project Otto Survey. Their experiences provided the evidence base for this work and helped to shape the toolkit.

This toolkit is a starting point rather than a definitive model of regulatory maturity.

The hope is that this work provides a basis for continued discussion and refinement, both on how regulatory maturity should be understood, and how regulators can prepare for technologies whose risks and opportunities are still taking shape.

Design by: Pier Mattioli

At a glance

Regulatory maturity in quantum security and innovation

The recent pace of developments in Quantum Computing has resulted in financial regulators being faced with two very different realities: a growing security imperative, but also an emerging innovation opportunity. These realities give rise to two distinct but interconnected regulatory demands, requiring different postures and operating on different timescales. The first tasks regulators with facilitating the financial sector's transition to quantum security. The second asks them to understand emerging applications and determine when regulatory support, engagement, or intervention may be appropriate. Despite their differences, both require regulators to develop effective regulatory responses amid uncertainty over the pace of technological development and the timing of real-world impact.

Project Otto examines how financial regulators around the world are responding to these interconnected demands, and what regulatory maturity looks like as they evolve. Conducted though the Global Financial Innovation Network (GFIN), the analysis draws on self-assessments from 25 member regulators operating across different mandates, market contexts and institutional models. Regulators assessed their current practice against structured maturity statements covering a range of activities, capabilities, and forms of engagement across both domains

The project constructed the Say-Do-Engage framework to distil how regulators articulate their position, build and operationalise capability, and engage with the wider ecosystem. Reponses were anonymised and analysed at both a whole-cohort and peer group level, allowing the toolkit to examine overall maturity and the different capability profiles through which maturity is emerging.

Headline findings

- **Maturity is being built in tandem through foundational capabilities.** Regulators with greater maturity in quantum security also tend to demonstrate greater maturity in quantum innovation. Regulators should treat security and innovation as distinct but mutually reinforcing issues. Across both, regulatory maturity is being built primarily through activities such as horizon scanning, research programmes, internal expertise and external engagement. These activities strengthen understanding, generate evidence, and develop networks in both domains simultaneously. For regulators beginning to engage with quantum security and innovation these foundational capabilities may prove especially beneficial.

- **Differing levels of maturity across peer groups present learning opportunities.** Regulators operating across similar market and institutional contexts often display materially different maturity profiles. As such, peer context helps explain maturity, but it does not determine outcomes. Regulators across all peer groups should consider whether their activities are being influenced by strategic choices, structural constraints or operating contexts. For more mature regulators, peer comparisons can identify opportunities for collaboration and leadership. For maturing regulators, it can highlight areas where peer learning and the sharing of approaches across similar operational contexts can accelerate maturity.

- **Quantum security is moving from awareness towards preparedness.** Quantum security is generally more mature than quantum innovation. Most regulators are maturing though capabilities relating to preparedness, including standards engagement, horizon scanning, and developing supervisory understanding. As these foundations strengthen, regulators begin to translate them into clearer external supervisory and policy positions. For the most mature regulators, the opportunities are in supporting market readiness through guidance and ecosystem coordination, as well through contributing to international initiatives.

- **Quantum innovation remains largely exploratory.** Most regulators are monitoring developments in quantum innovation and engaging with experts, but fewer have progressed to observing proof-of-concepts, supporting experimentation, or using structured innovation infrastructure to generate practical evidence. Where appropriate, and in response to an identified regulatory need, regulators can assess their existing innovation infrastructure to understand if sandboxes or testing environments could support regulatory learning and facilitate industry experimentation.

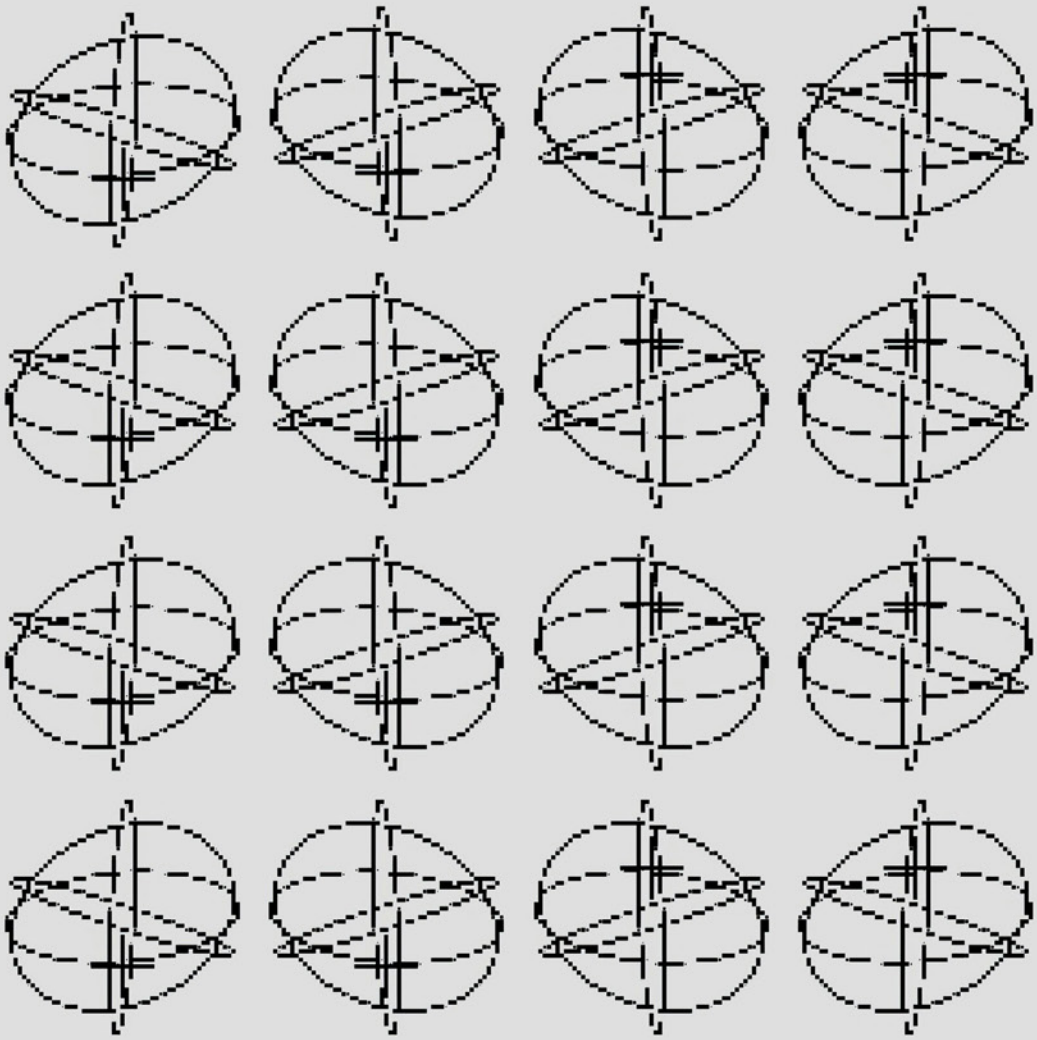
- **Maturity is not a fixed destination.** Quantum technologies will continue to evolve, as will the risks, opportunities, and regulatory responses associated with them. Regulatory maturity should therefore be viewed as an ongoing capability rather than a fixed end state. This toolkit supports regulators in assessing their current level of maturity, understanding trends across peers, and turning those insights into actions that support further development. For maturing regulators, the toolkit can help establish sustainable foundations for understanding and responding to the evolution of quantum computing. For more mature regulators, it can help identify where capabilities can be further embedded, specialised and applied to support market activities and shape global regulatory approaches.

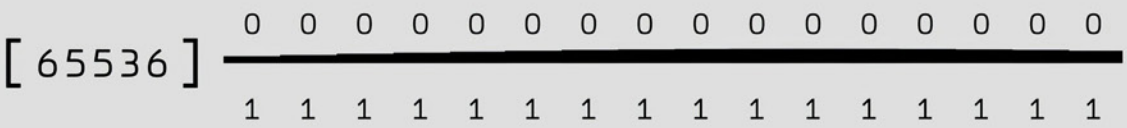
Next steps and limitations

Project Otto highlights the importance of collective action in addressing a technology whose risks and opportunities are inherently global. Many of the capabilities associated with greater maturity, such as horizon scanning, research, standards engagement and experimentation, lend themselves naturally to collaboration across jurisdictions and between regulators. GFIN is therefore well positioned to act as a platform for peer learning, knowledge sharing and coordinated activity, enabling regulators to reduce duplication and share expertise. Project Otto provides a common framework for regulators to think about quantum maturity: it has also deepened relationships and created an initial evidence base, thus laying the foundations for more sustained international cooperation.

This toolkit provides a snapshot of regulatory maturity at a particular point in time. The findings are based on regulators' self-assessment of their own activities and capabilities. The sample is not statistically representative of the global regulatory community, and differences in mandates, market contexts, resources and institutional responsibilities affect both the relevance of particular activities and the maturity scores reported. The findings should therefore be viewed as descriptive. They provide a basis for reflection, discussion and peer learning rather than a ranking or benchmark of regulatory performance.

Introduction: From emerging technology to regulatory maturity





It has become something of an adage in regulatory circles that emerging technologies bring both risks and opportunities. While the statement is true, it is also increasingly insufficient. As a shorthand, it obscures nuanced questions for regulators and market participants: which risks matter? Which opportunities are commercially relevant? When should regulators act? And what does being prepared actually require? Simply recognising that technological change can produce both opportunities and risks tells us little about what regulators should do in response.

Identifying and understanding that distinction is critical. Regulators do not observe technological change in a vacuum. Through the choices they make about what to monitor, where to build expertise, and when to engage with market participants and innovators, they shape the environments in which emerging technologies develop. In reference to the adage of risks and opportunities, knowing what to do, when to act and how far to act is an increasingly crucial regulatory capability in its own right.

Quantum computing provides an unusually useful lens through which to explore that challenge. The security risk posed by quantum computing presents both regulators and firms with the challenge of mitigating the risk before the underlying threat materialises. Simultaneously, quantum innovation raises a different set of questions about experimentation, adoption, and potentially transformative financial services use cases. These two dimensions do not necessarily develop at the same speed, nor do they require identical regulatory responses. But together, they raise a broader question: what does regulatory maturity look like for a technology that demands preparation, even though its impact, timing, and application remain uncertain?

This question sits at the heart of Project Otto. Through GFIN, regulators operating in different markets, with drastically different mandates and institutional contexts, have an opportunity to consider what their collective activity might tell us about regulatory maturity. Project Otto seeks to identify the observable activities, tools, and forms of engagement through which regulators are building maturity across quantum security and quantum innovation. In doing so, it provides an initial international view of where regulatory maturity is developing, how that development differs across contexts, and what regulators may learn from one another.

This toolkit is not intended to produce a ranking of regulators, nor to suggest that higher observed activity across every measurement represents better regulation.

Instead, it seeks to provide two things: a snapshot of how quantum regulatory maturity is developing internationally, and a practical toolkit through which regulators can consider their own position and possible next steps. By examining global patterns, comparing regulators in similar contexts, and identifying emerging examples of more mature practice, the toolkit can help decision-makers move from the broad recognition of 'risk and opportunity' towards more concrete questions about organisational readiness, priorities, and strategy.

Say-Do-Engage: A framework for measuring maturity

Project Otto has developed the Say-Do-Engage framework to evaluate maturity. This framework was refined through a series of roundtables, bilateral discussions, and desk-based research. It groups the capabilities and regulatory tools (referred to as parameters) into three dimensions: Say, Do, and Engage.



Say captures how regulators articulate positions, expectations, and understanding



Do captures the internal research, upskilling and supervisory activity through which regulatory capability and evidence are built



Engage captures how regulators interact with firms, experts, and the wider innovation ecosystem

These categories allow for a distillation of the survey's findings into more easily digestible insights. In particular, they provide a summary of which regulatory approaches appear most developed and consistently used.

For example, the Say-Do-Engage framework helps to distinguish a regulator that has strong internal capability but has not yet translated that into market expectations, and a regulator that has a strong degree of engagement with firms but has not yet embedded quantum awareness into its own supervisory functions. These two regulators might have similar overall maturity scores but diverge substantially in terms of the actions they need to prioritise next. The Say-Do-Engage categories were developed following extensive analysis of the roundtables conducted at the beginning of Project Otto, to which various GFIN members contributed.

Measuring maturity

Regulatory maturity was measured through a structured set of survey questions which covered both security and innovation. Respondents were asked to assess their organisation's level of maturity for a given parameter by selecting the statement which most accurately reflected their organisation's position. This statement-based approach aimed to make the scoring more consistent by asking respondents to consider the closest match to their current practice, rather than selecting a numerical score.

The survey used four maturity levels intended to cover the full spectrum of maturity from early awareness to embedded and evolving capability:

Level 1	**Ad hoc**: indicates activity that is either absent or performed only on an informal basis.
Level 2	**Defined**: indicates that an activity has been recognised and given some structure but is not yet consistently embedded across relevant functions.
Level 3	**Integrated**: indicates activities that form part of established regulatory processes, with clear links to outcomes and other areas of regulatory work.
Level 4	**Adaptive**: indicates the highest level of maturity where activities are embedded, regularly reviewed and able to evolve in response to internal and external changes.

The framework provides a practical way to identify patterns across the global regulatory ecosystem and to understand how regulatory approaches are developing in context. The value of the framework is that it helps regulators see where they already have foundations in place, where capability may need to be strengthened, and which activities may be most proportionate to develop next.

Using the framework

The full list of survey questions and maturity statements is set out in the technical annex. Regulators can use these questions to repeat the survey internally, assess their own maturity across Say, Do, and Engage, and identify practical next steps for quantum security and quantum innovation.

How to use this toolkit

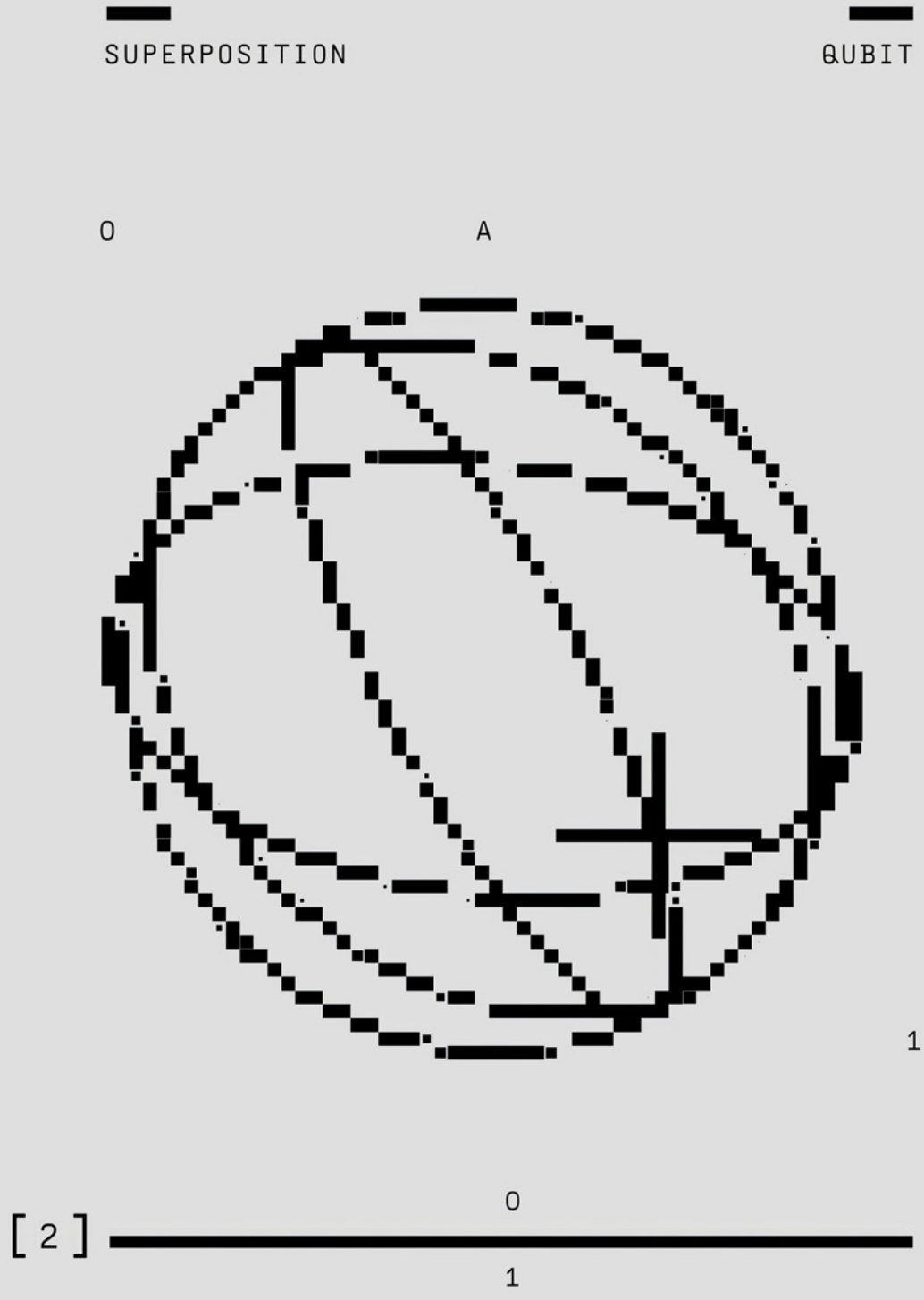
This toolkit is designed to help readers move from understanding the current landscape of regulatory maturity to considering what that means for their own organisation, market, or strategic priorities. It contains four core sections that provide complementary perspectives that can be used to identify global trends, compare approaches in context, and translate the emerging picture into strategic considerations for action.

1. **Global Trends**: provides an international view of how regulatory maturity is developing across quantum security and innovation, including how maturity differs across parameters in the Say, Do, and Engage framework.
2. **Peer grouping**: situates those global findings within different regulatory operating environments. Peer groups help readers interpret maturity in the context of organisations operating in similar market and institutional conditions.
3. **Emerging best practice**: examines areas where more mature regulatory practices are already visible and draws on use cases from regulators around the world. These use cases provide reference points illustrating how different organisations are building maturity.
4. **Turning insight into action**: combines these findings to support strategic consideration of what comes next. Readers can use the section to consider what actions could be prioritised over the near term to improve regulatory maturity.

The four sections are intended to support a progression from acknowledging the global landscape, to understanding operating contexts within it, learning from emerging practice, and finally identifying proportionate action. The toolkit serves to help decision-makers structure how they think about regulatory maturity and develop actions most appropriate to their regulatory context.

“Maturity” in this toolkit refers to the degree to which the activities measured by the framework are developed or embedded. It should not be understood as an assessment of regulatory quality or effectiveness. A lower score may reflect a regulator's mandate, market conditions, risk assessment or deliberate decision not to pursue a particular activity.

Global Trends: The regulatory maturity landscape



This section considers the global regulatory maturity landscape as a whole. It explores where respondents sit across quantum security and quantum innovation, before examining how maturity is distributed across the parameters that form the framework.

The aim is not to create a ranking of regulators, and responses have been anonymised. This section seeks to identify the patterns emerging across the survey population: it highlights where activity is becoming established, where maturity remains at an early stage, and where approaches continue to differ.

Overall maturity across quantum security and quantum innovation

Figure 1 (next page) provides the starting point for the analysis. It plots each respondent's overall maturity in quantum security against quantum innovation. The shaded areas on the graph provide a visualisation of maturity scores across peer groups, which is examined in later sections.

Quantum security and quantum innovation maturity appear to develop together. Across the survey population, greater maturity in quantum innovation is generally associated with greater maturity in quantum security. These aggregate scores cannot determine a causal relationship.

Respondents generally reported higher maturity scores for quantum security than for quantum innovation. Most of the respondents sit above the line representing equal maturity across quantum security and quantum innovation. This suggests that regulators are relatively more mature in quantum security.

Overall regulatory maturity remains concentrated at developing levels. Although regulatory activity is demonstrated across both quantum security and quantum innovation, most respondents remain within the lower and middle sections of the figure. While quantum computing remains an emerging technology, these results demonstrate that both quantum innovation and security have started to evolve beyond issues of awareness but have not yet become embedded across the full range of regulatory activities measured by the survey. This presents an opportunity to build on the existing awareness and capability into more structured regulatory activity that matures alongside the underlying technology.

Figure 1. Relationship between innovation and security maturity



The definitions for these terms can be found in the 'Peer Grouping' section.

Innovation score:
The mean average of each individual responses across all quantum innovation questions.

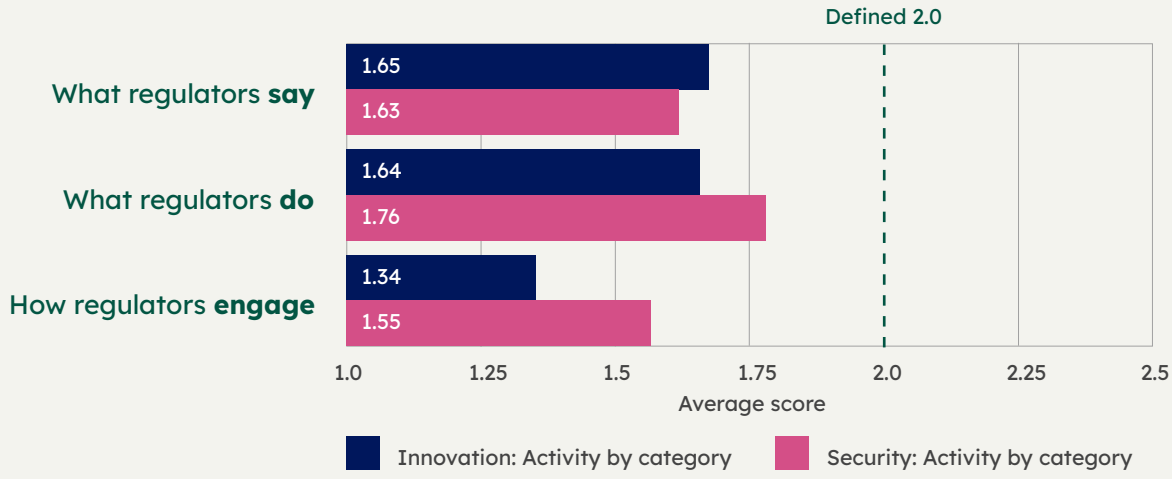
Security score:
The mean average of each individual responses across all quantum security questions.

Regulators are developing different combinations of security and innovation maturity. While quantum security and innovation maturity are broadly positively related, some regulators are significantly more mature in one area than the other. This variation could reflect the differences in regulatory priorities as well as operating contexts. The later peer group analysis provides a different lens to examine this variation, allowing for comparison between similar regulators to understand how maturity is emerging in more comparable contexts.

Say-Do-Engage: How Global maturity is developing

Interpreting the survey results through the Say, Do, and Engage framework applies another lens on the global maturity landscape. It highlights whether regulators are primarily developing maturity through the ways in which they articulate and signal expectations, build understanding and translate it into activity, or interact with the wider ecosystem. Comparing these dimensions provides an overview of how and where regulatory maturity is beginning to emerge.

Figure 2. Themes and trends: Say - Do - Engage hierarchy



Average score: The average of the whole survey population across questions in Say, Do, and Engage categories.

Regulators are building maturity through action rather than articulation. Across both quantum security and quantum innovation, 'What Regulators Do' is the highest or effectively highest maturity score.

This means that regulatory maturity is primarily developing through activities such as horizon scanning, research, internal capability-building, and supervisory engagement. These activities are associated with building an evidence base and institutional understanding, rather than formal interventions through guidance, regulatory frameworks or other market-facing activities. This difference is more pronounced in quantum security, suggesting that regulators are making progress but are yet to translate that activity into guidance, formal expectations or sustained forms of market engagement.

Engagement on quantum innovation is the least mature dimension. Quantum innovation 'Engage' presents the lowest average across the maturity framework. This may reflect the maturity of the market as much as the maturity of the regulators themselves. 'Engage' activities such as proof-of-concept (PoC) observation, testing environments, and sandboxes require both regulatory capability and sufficiently mature use cases from firms.

Global patterns of maturity across regulatory activity

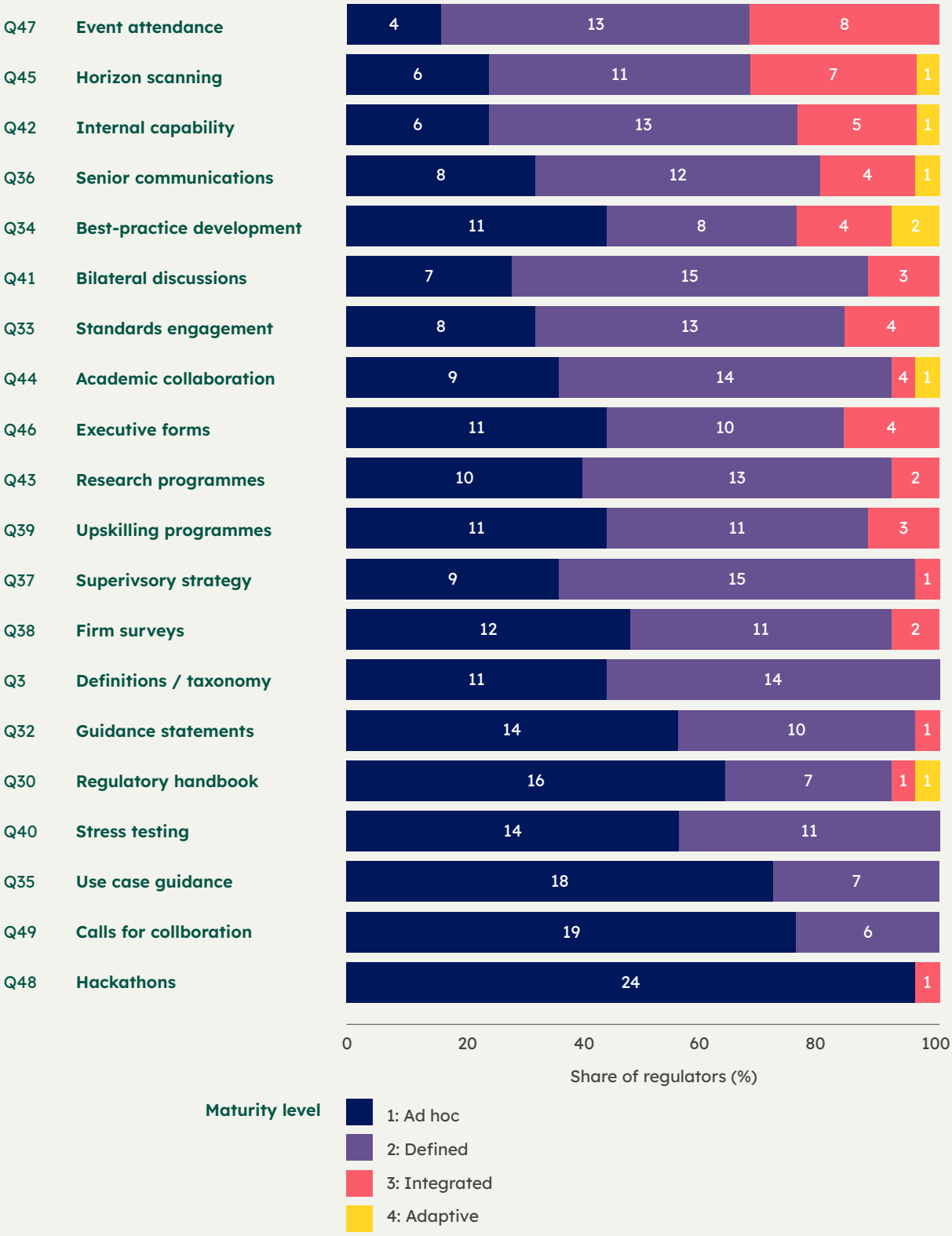
The analysis so far has demonstrated how maturity levels differ across both quantum security and quantum innovation. The following subsection examines the specific activities that sit within those categories to identify where regulatory activity is becoming established, where maturity remains at an earlier stage, where approaches are converging, and which capabilities appear to support progress across both quantum security and quantum innovation.

Quantum security

See Figure 3 (next page).

Quantum security maturity is most established in activities that build awareness, capability, and networks. Event attendance is the most mature parameter with 84% (21 out of 25) of respondents at a maturity score of two ('Defined') and above. Horizon scanning and internal capability follow closely, with 76% (19 out of 25) of respondents having moved beyond level one ('Ad hoc') in both parameters. Bilateral discussions, standards engagement, academic collaboration and supervisory strategy also show a majority of respondents at level two ('Defined') or above. These activities enable regulators to understand the topic, develop expertise and connect to relevant stakeholders before committing to more formal regulatory interventions.

Figure 3. Global security maturity distribution by question



Regulatory maturity in quantum security is concentrating around the midpoint measurement. For around half of the quantum security parameters, the most common maturity score is two ('Defined'). In contrast, no parameter has a modal maturity score of three ('Integrated') or four ('Adaptive'). This paints a picture of regulatory maturity progressing beyond Ad hoc but not yet consistently integrated and adaptive across the surveyed population.

Quantum innovation

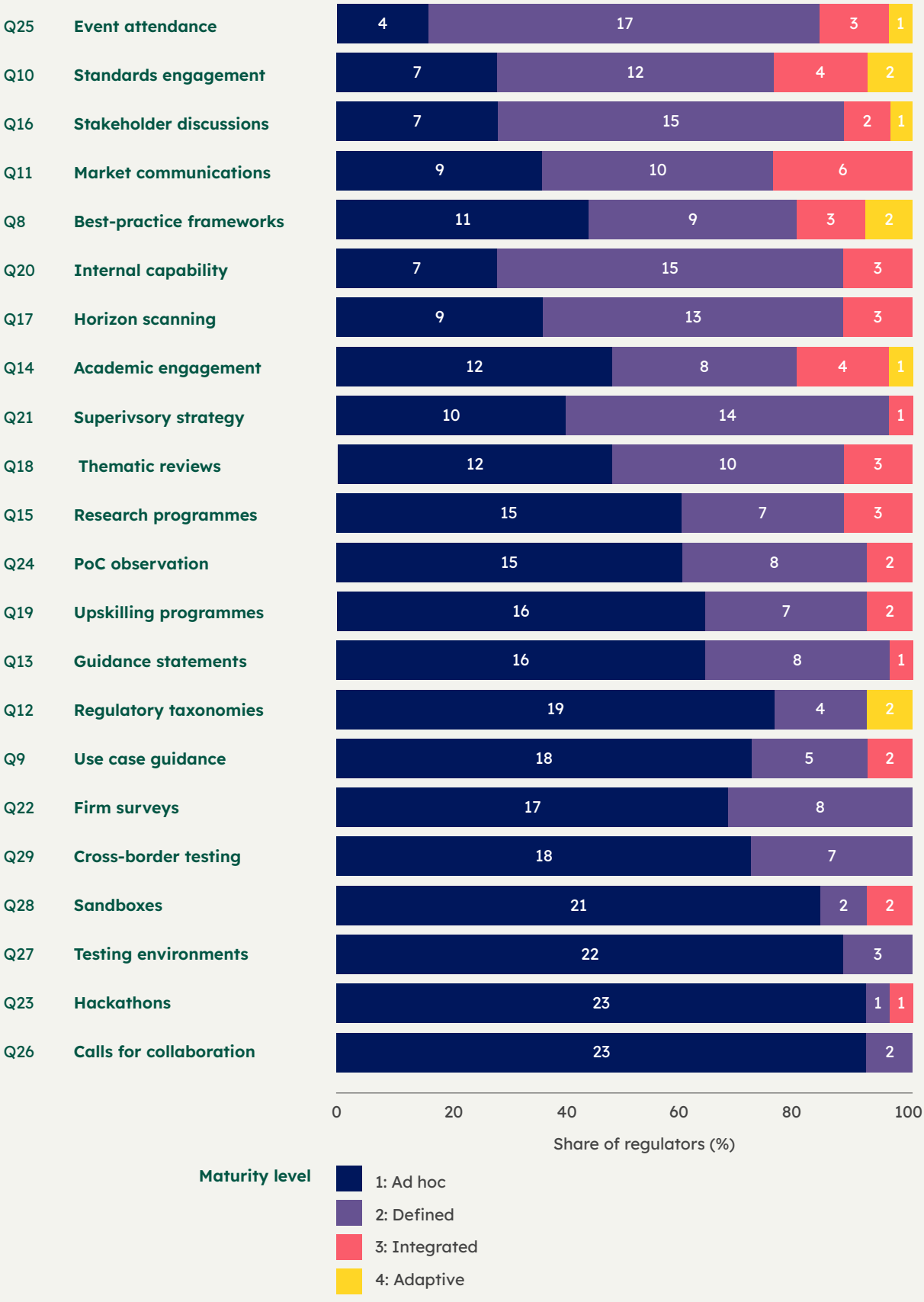
See Figure 4 (next page).

Quantum innovation maturity is most established in activities that keep regulators connected to emerging developments. Similarly to quantum security, event attendance is the most mature parameter, with 84% (21 out of 25) of respondents at a maturity score of two ('Defined') and above. Standards engagement, stakeholder discussions, horizon scanning, and internal capability building also show significant progression into maturity levels two ('Defined') and above. The common feature of these parameters is that they enable regulators to build an understanding and maintain collaborative networks in the developing ecosystem. In the context of quantum innovation, this indicates that regulators are tracking developments while regulatory implications remain uncertain.

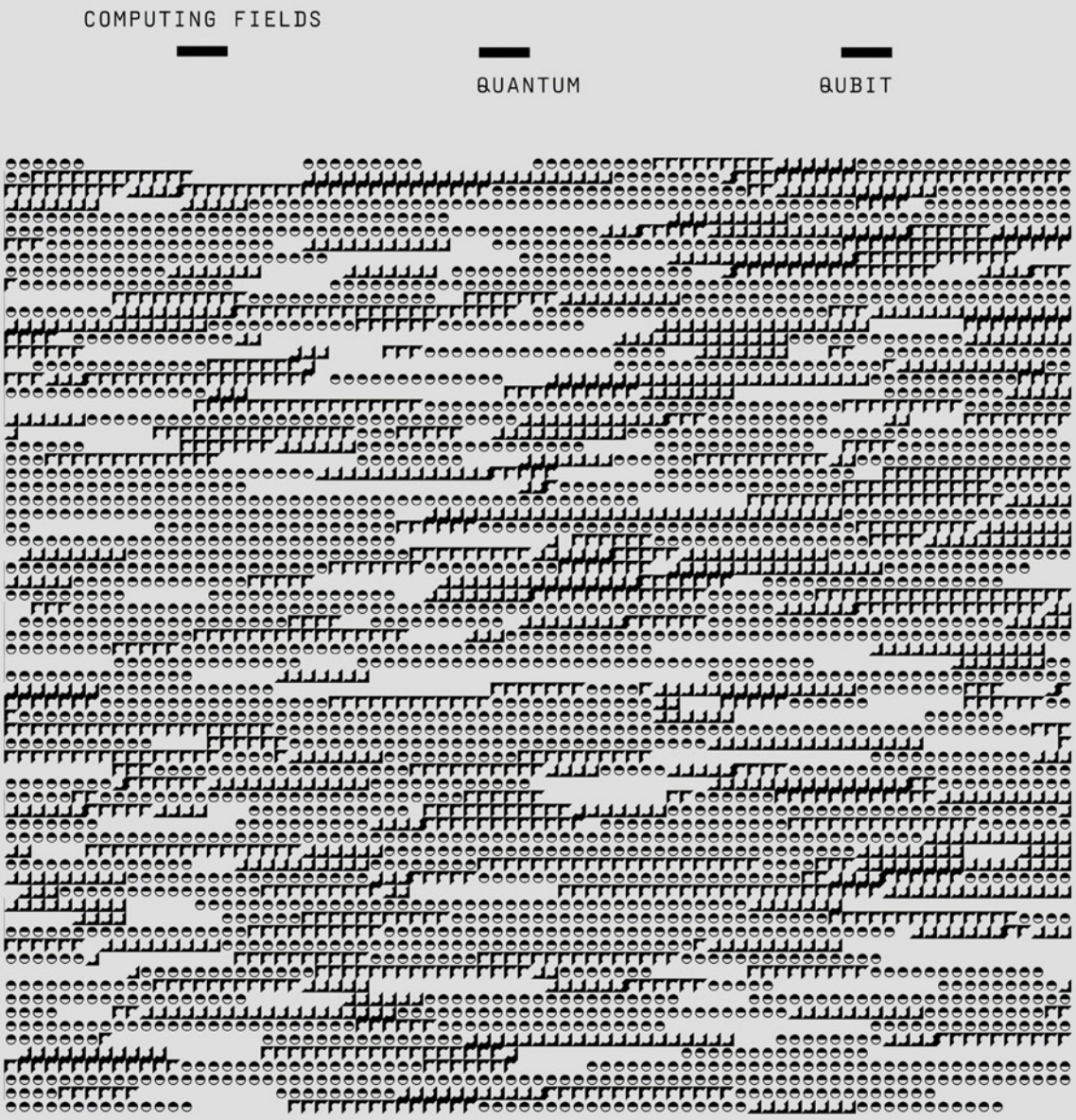
Quantum innovation is exploratory, not experimental. Regulators are showing higher levels of maturity in horizon scanning, research, communication, and engagement in standards discussions. In contrast, responses show less maturity in PoC observation, testing environments, sandboxes, hackathons, and cross-border testing. The data therefore shows a clear gap between understanding quantum innovation and actively creating or participating in testing environments.

Regulatory maturity in quantum innovation has not yet developed a shared foundation. Across most of the parameters, the modal maturity score is one ('Ad hoc'). Unlike quantum security, which shows early signs of maturity across the parameters, the quantum innovation results show that most of the parameters are immature.

Figure 4. Global innovation maturity distribution by question



Peer grouping



Understanding peer groups

The global snapshot provides a view of regulatory maturity across the full survey population. However, regulators operate with different mandates, institutional structures, market contexts and approaches to both innovation and technology risk. These are structural factors that shape what regulatory maturity looks like in practice.

To provide a more granular view of the global trends, the toolkit uses peer groups to explore how regulatory maturity in both quantum security and quantum innovation is expressed across different regulatory contexts. These groups seek to provide a more meaningful basis for interpreting maturity by identifying where particular maturity characteristics are more or less developed across different types of regulators.

Crucially, these characteristics should not be interpreted as constraints on the level of maturity regulators can achieve. Peer groups are intended to provide context rather than describe maturity. As demonstrated by Figure 1, and the analysis throughout this section, regulators within the same peer group display materially different maturity profiles, and membership of a particular group does not determine the level of maturity an organisation can reach.

The peer group framework is based on responses to six contextual questions designed to capture relevant characteristics of a regulator's operating environment. These questions covered: regulatory models, market context, institutional scale, innovation posture, innovation mandate, and approach to technology risk.

Regulators can use these questions as a reference point to consider where their own organisation sits in relation to these peer groups. These questions and their associated weightings can be found in Annex Two, so that regulators can replicate the survey experience or interpret maturity findings through the lens of their own operational context.

Peer group archetypes

Applying the peer-group questions results in three broad regulatory archetypes:

- **Adapters**
  Regulators operating in smaller more nascent markets, with more focused mandates and limited institutional capacity. Approaches to technology risk and financial innovation develop in line with market needs and regulatory priorities.
- **Contributors**
  Regulators operating in established markets with notable regulatory mandates and institutional capabilities. They actively engage in developing domestic and international approaches to technology risk and financial innovation.
- **Shapers**
  Regulators operating in large, influential markets with broad mandates. They possess significant capacity to shape domestic and international approaches to technology risk and financial innovation.

Figure 5 (next page) shows the median maturity profile for each peer group across quantum security and quantum innovation and the interquartile range of responses. These radial graphs illustrate the typical shape of maturity within each peer group and the variation that exists between regulators operating in similar contexts.

The median profiles differ across the three groups, indicating that regulatory context is associated with different expressions of maturity. However, the ranges either side of those medians also show notable variation within each archetype. This means that even within the archetypal groups, where regulators are operating under broadly similar conditions, they are not progressing uniformly. This reinforces the interpretation that peer groups are a lens for interpreting maturity and not a maturity classification in themselves.

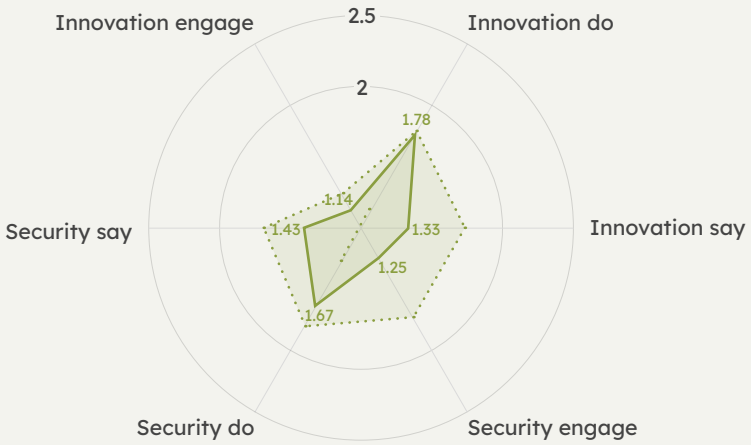
Figure 5. Innovation and security profiles by peer group

— Median peer-group profile

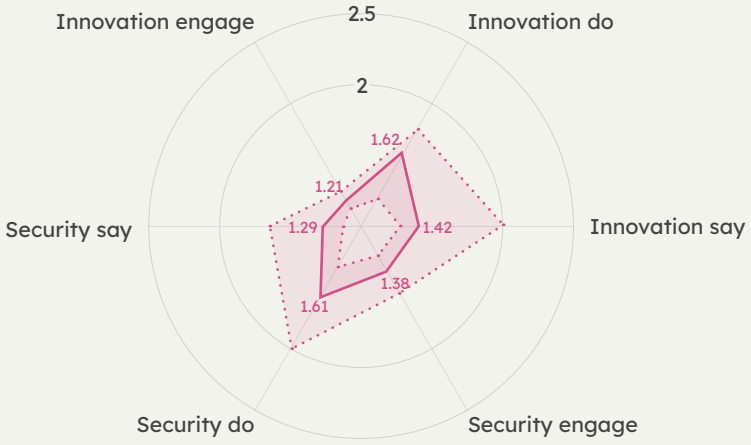
Interquartile range (middle 50% of regulators)

····· IQR boundaries

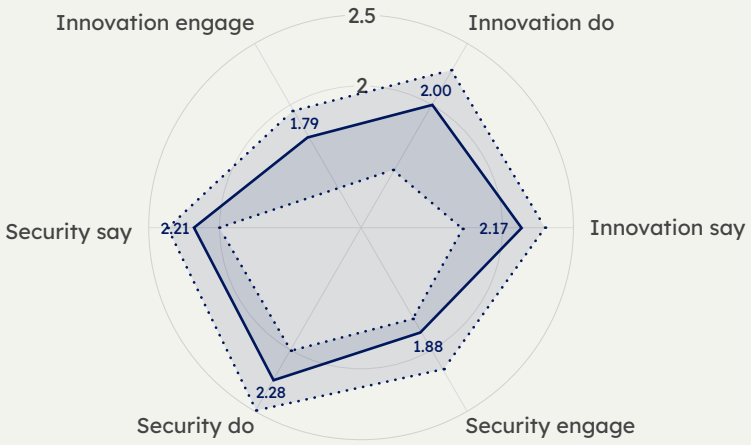
Adapters
(n=7)



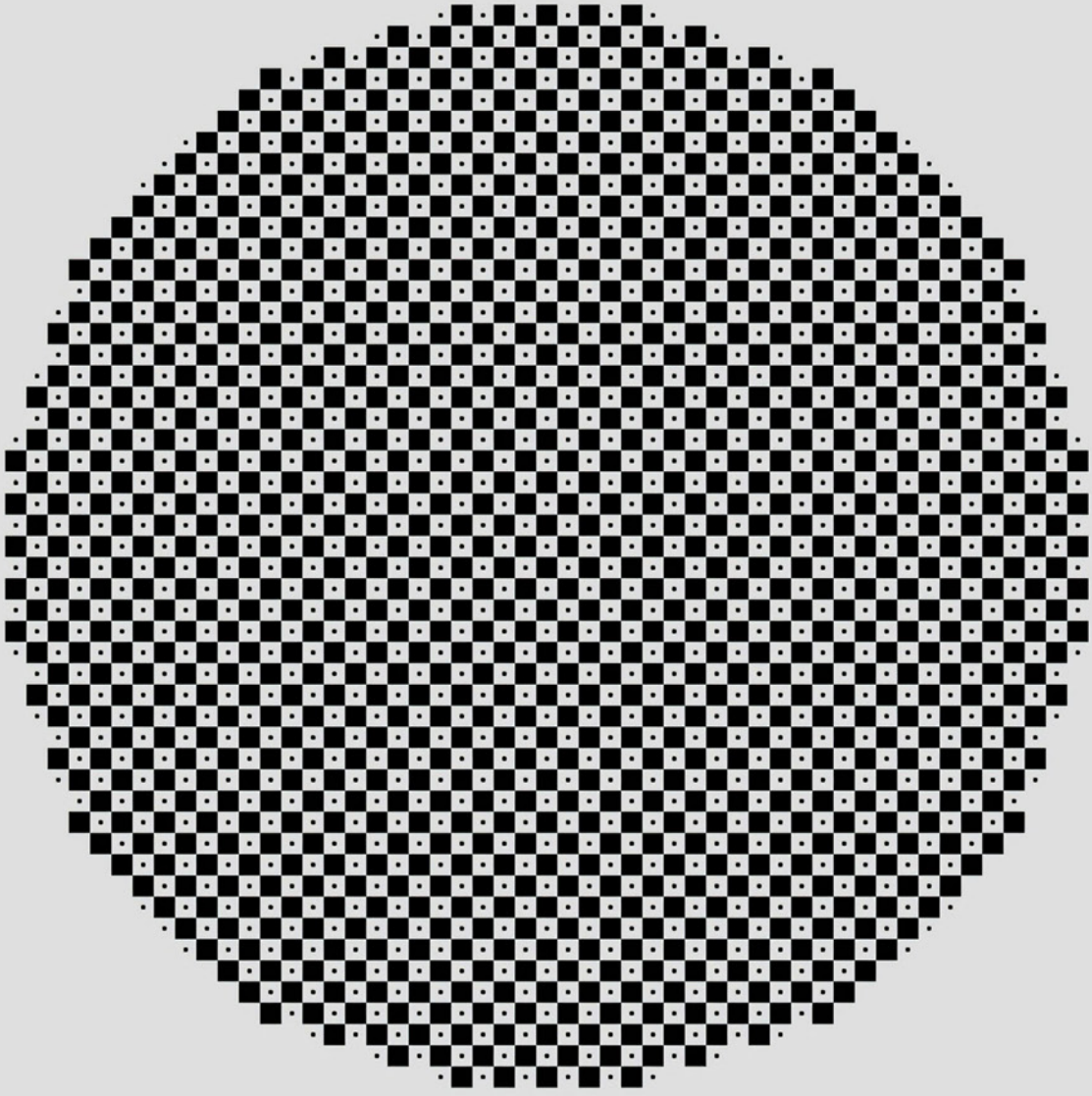
Contributors
(n=12)



Shapers
(n=6)



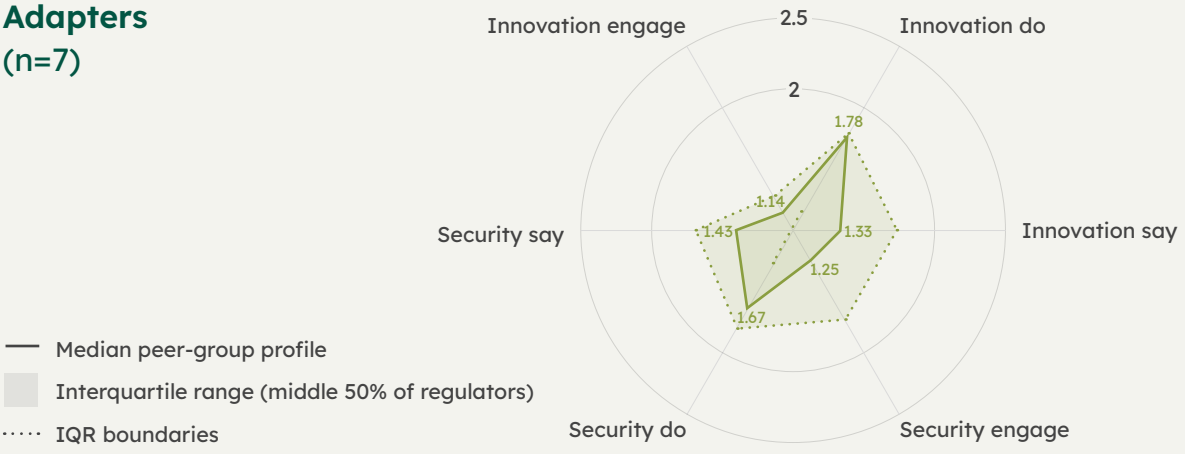
Regulatory maturity in context: Peer group analysis



Adapters

Regulators in the Adapters archetype operate in smaller or less influential markets, typically with more focused mandates and limited institutional capacity. Their approaches to technology risk and financial innovation tend to be adapted to more limited mandates, domestic market needs, and focused regulatory priorities. Their operating context may provide fewer immediate incentives or resources for extensive quantum activity, but it does not prevent meaningful maturity where the issue is relevant to their jurisdiction.

Adapters
(n=7)



At a glance

- **Maturity across the framework is emerging but is concentrated around 'Ad hoc' capabilities.** The median maturity profile for Adapters is closer to a maturity score of one ('Ad hoc'), with some advancement to a maturity score of two ('Defined'). The spread around this median is important. The interquartile ranges show that some regulators have matured across both quantum security and quantum innovation. In general, this peer group combines relatively early overall maturity with limited instances of more mature practices.
- **Security 'Say' and 'Do' are the strongest dimensions of maturity.** The most developed areas of the Adapter peer group relate to how regulators are beginning to understand, articulate, and act on the topic of quantum security. The higher levels of maturity in these areas demonstrate a peer group that is starting to extend beyond general awareness into more structured regulatory activity.

- **A relative balance between quantum security and quantum innovation.** Adapters' maturity scores for Innovation 'Say' and 'Do' are broadly comparable with, and in part slightly stronger than, the equivalent security dimensions. This means that Adapters are characterised by a relatively balanced development across both security and innovation dimensions, rather than maturity being concentrated in one area.

What this means for Adapter regulators

For Adapter regulators, increasing maturity does not require replicating the regulatory approaches of larger peers in full. The immediate opportunities for advancement are within a focused set of capabilities that enable regulators to identify relevant developments, access external expertise, and make informed decisions about whether further activity is justified.

To this end, horizon scanning, research, leveraging existing internal capabilities, and external engagement through varied networks can act as maturity multipliers across both quantum security and quantum innovation. Crucially, mature practice within this peer group demonstrates that constrained operating environments do not necessarily impose a ceiling on maturity. While overall maturity may be lower among Adapter regulators, capabilities that are materially relevant to their markets, mandates, or priorities can still progress rapidly and reach more mature levels.

Where maturity is emerging

The question-level results reveal that the maturity progression across Adapters is highly selective. Rather than progressing evenly across the framework, Adapters appear to concentrate effort in particular types of activity while leaving others at an earlier stage. The analysis focuses on the capabilities around which 'Defined' maturity is beginning to emerge.

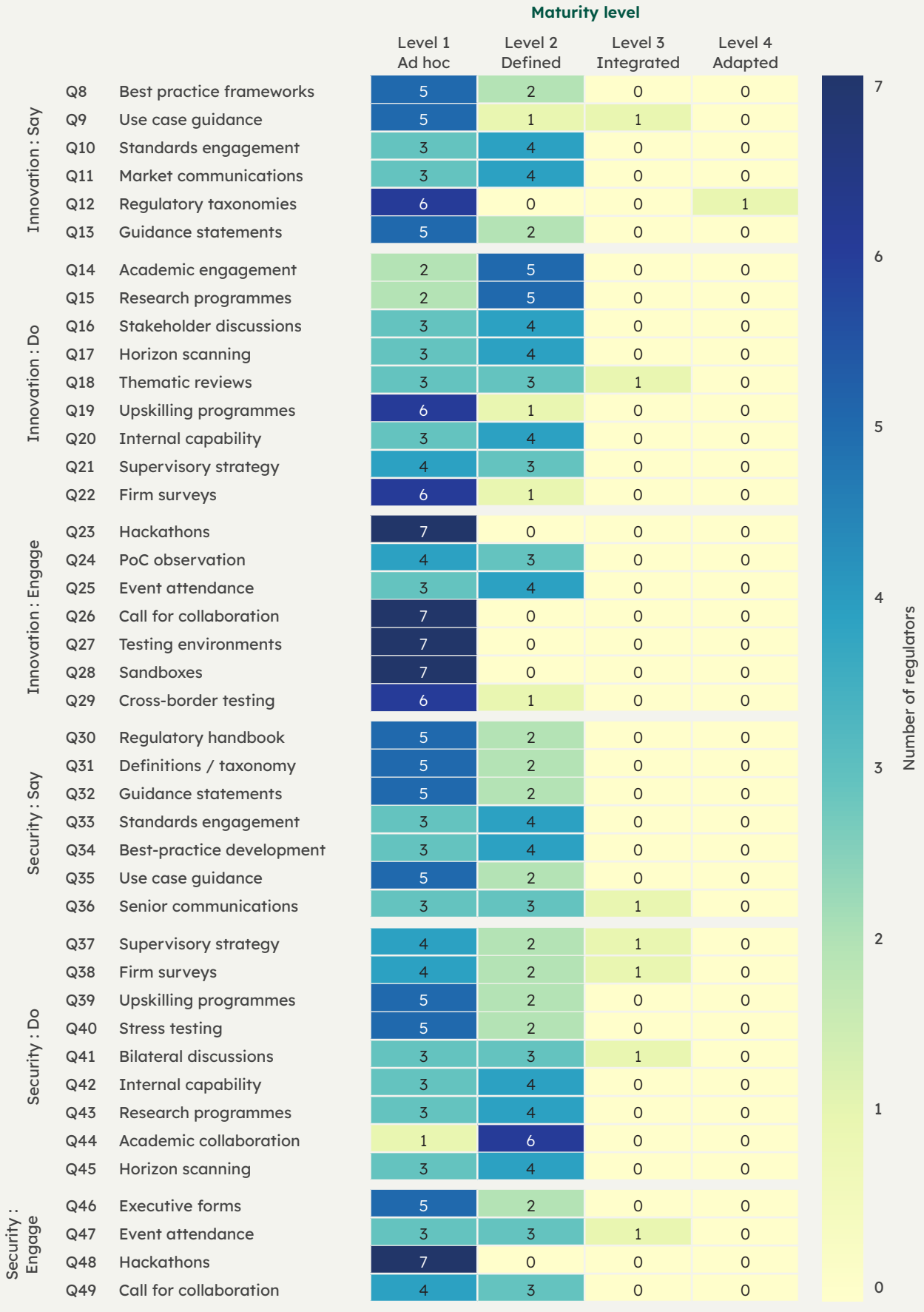
Building on foundations

Building on foundations identifies parameters where a score of two ('Defined') is the most common response. For Adapters, this lens helps to show which capabilities are being prioritised, and therefore how maturity is emerging.

Definition: a parameter where a maturity score of two ('Defined') is the most common response within the peer group. Tied responses are excluded from this analysis.

- **Defined maturity is consolidating around knowledge, expertise, and building external networks.** Level two ('Defined') is the most common response for 14 of the 42 parameters assessed across the survey. This shows that Adapter regulators have already developed a base of 'Defined' capability, despite their lower overall maturity profile across the survey. Across both quantum security and innovation, level two ('Defined') maturity is concentrated in activities such as horizon scanning, research programmes, academic collaboration, internal capability, and standards engagement. These capabilities enable regulators to understand technological developments, access specialist expertise, and remain connected to the emerging ecosystem without requiring the infrastructure or resources associated with more interventionist regulatory activities. Crucially, this concentration does not imply a ceiling on maturity. These examples demonstrate that a more focused operating context may constrain the breadth of capabilities developed at any one time. They do not, however, limit the level of maturity that can be achieved where an activity materially relevant to the regulator's market, mandate or priorities.

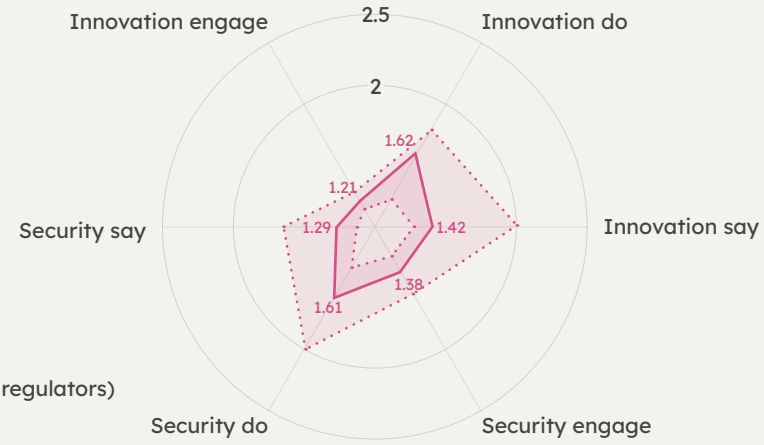
Figure 6. Adapter regulators maturity distribution by activity



Contributors

Regulators in the Contributor archetype operate in established markets with meaningful institutional capacity. They participate actively in domestic and international approaches to technology risk and financial innovation. While they tend to have the structures and external networks to identify topics and contribute to their development, they generally have less market influence, institutional scale, and narrower mandates.

Contributors
(n=12)



At a glance

- **Maturity is developing irregularly rather than across a common base.** The median profile sits between a maturity level of 'Ad hoc' and 'Defined'. There is less evidence of a broad regulatory response developing simultaneously across both quantum security and quantum innovation. The interquartile ranges show that some regulators have advanced in Security 'Say' and 'Do', as well as Innovation 'Say'. This indicates that maturity is concentrated unevenly across regulators and activities.
- **'Do' is the most mature dimension of Contributors.** This demonstrates that the peer group is developing maturity through activities such as horizon scanning, research, internal capability building, supervisory activity and engagements with other stakeholders. In this respect, the activities may be functioning as a bridge between recognising quantum security and quantum innovation as emerging issues and developing a more formal regulatory response.

- **Approaches to quantum security and quantum innovation are maturing more evenly.** Contributors show greater similarity between quantum security and quantum innovation within each ‘Say’, ‘Do’, and ‘Engage’ dimension than between the three dimensions themselves. This suggests that Contributors might be leveraging common emerging technology capabilities, such as research, horizon scanning, internal expertise, and external networks to progress across both domains at the same time.

What this means for Contributor regulators

For Contributor regulators, the immediate maturity challenge is as much about broadening capability as it is about deepening it. Some mature practice is already occurring within the peer group, but it has not yet formed a consistent baseline across regulators or across either the quantum innovation or quantum security frameworks.

For Contributor regulators, the maturity opportunities are associated with building on already consolidated capabilities relating to understanding, internal capability building, and external connectivity. Where individual Contributor regulators have already progressed further, their experiences can help peers embed and adapt these practices more quickly. In doing so, the peer group can transition maturing but diffuse capabilities into a widespread baseline across the peer group.

Where maturity is consolidating and progressing

The question-level results provide a more detailed view of how maturity is progressing amongst Contributor regulators. The analysis focuses on the two maturity patterns that most clearly distinguish the group: the common maturity baseline and where ‘Defined’ practice is consolidating. Taken together, these perspectives reveal a peer group in transition: capability is beginning to be established across several areas but remains unevenly distributed.

Maturity baseline

The maturity baseline identifies activities in which no Contributor is at the lowest level of maturity (‘Ad hoc’). It provides a view of the common foundations and an indication of the capabilities that are beginning to form a shared foundation across the peer group.

Definition: parameters where none of the peer group respondents selected level one ('Ad hoc') maturity.

- **No maturity baseline has yet formed across Contributors.** Across both quantum security and quantum innovation, every parameter includes at least one regulator with a maturity score of one ('Ad hoc'). However, this headline obscures the fact that two activities – standards engagement and event attendance – only one of the regulators in this peer group has a maturity score of one ('Ad hoc'). This is consistent with the Contributor operating context, where regulators have sufficient capacity to participate actively in wider regulatory, industry and international discussion, even though they may be less likely to shape those agendas independently. Both standards engagement and event attendance provide important channels to access and contribute to emerging practice.

Building on foundations

This subsection considers where Contributors have already matured beyond 'Ad hoc' activity and established a 'Defined' level of maturity. These areas provide the most suitable foundations for near-term maturity progression because the capability is already present across much of the peer group.

Definition: a parameter where a maturity score of two ('Defined') is the most common response within the peer group. Tied responses are excluded from this analysis.

- **The maturity opportunity in quantum innovation centres on staying close to technological development.** Across quantum innovation and quantum security, the 'Defined' foundation is clustered around standards engagement, stakeholder discussions, horizon scanning, internal capability, and event attendance. These activities enable Contributors to follow developments and participate in the emerging ecosystem but fall short of more formal or experimental activities. For Contributors, the clearest route to progressing maturity may be to use the relationships already being built to maintain awareness and develop an understanding of where deeper research, supervisory engagement or experimentation may be proportionate or beneficial.

Figure 7. Contributors - Quantum security (n=12)

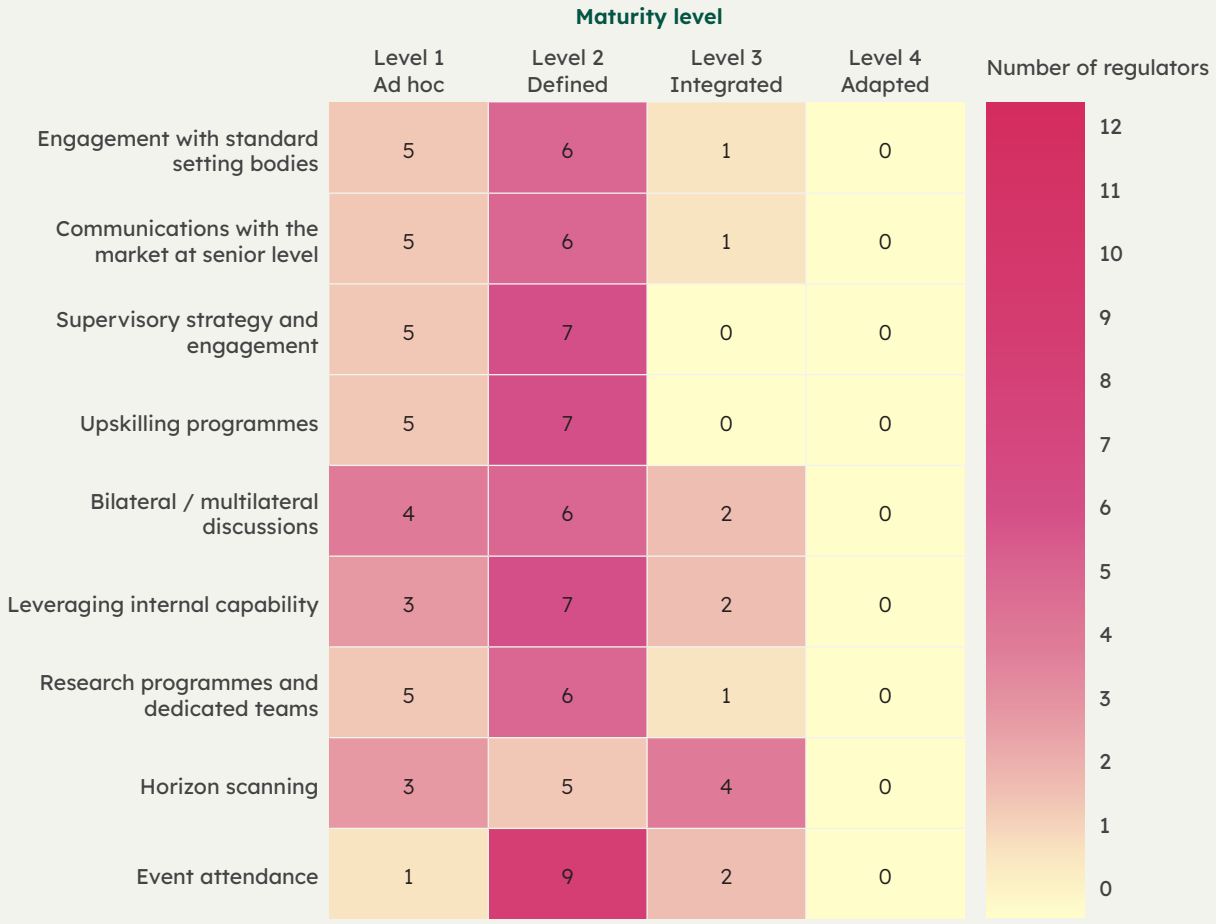
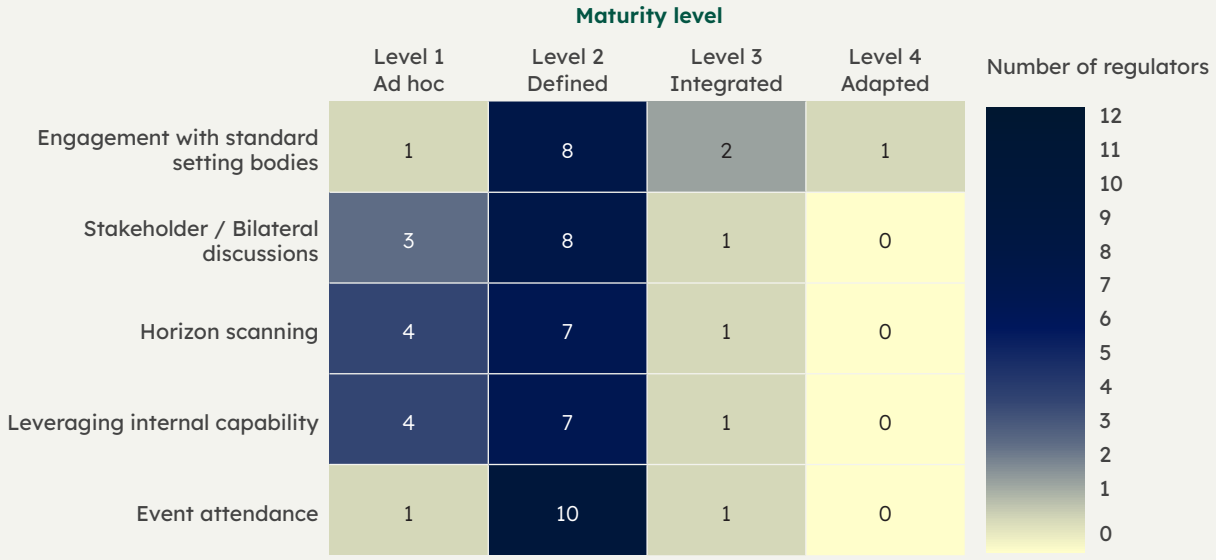


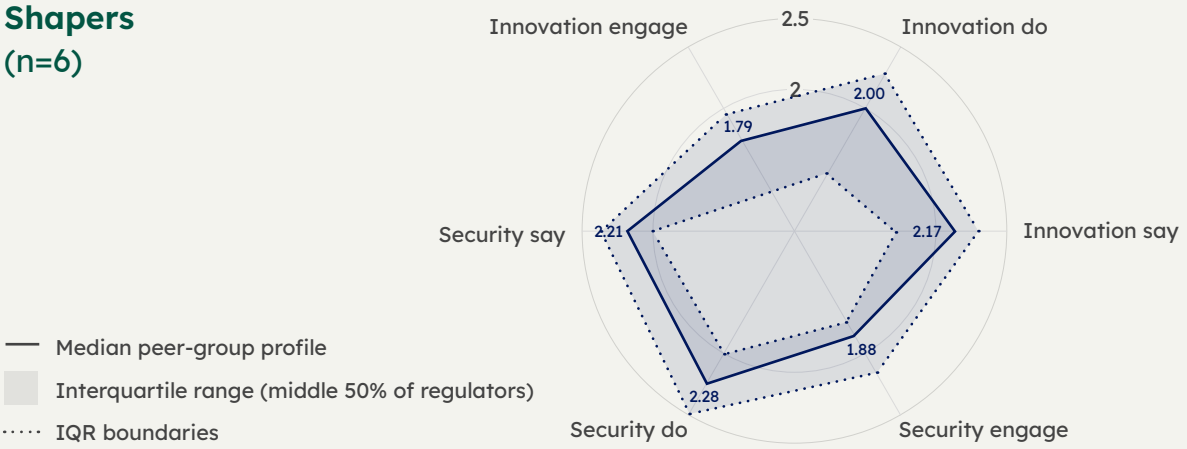
Figure 8. Contributors - Quantum innovation (n=12)



Shapers

Regulators in the Shapers archetype operate in regulatory and market contexts that provide them with significant scope to shape both domestic and international approaches to the use of emerging technologies in financial services. The analysis below considers how regulatory quantum maturity is developing within this peer group.

Shapers
(n=6)



At a glance

- **Shapers have established capability across the full maturity framework.** The median profile of Shapers is clustered around a maturity score of two ('Defined') for 'Say', 'Do', and 'Engage'. This demonstrates that quantum security and quantum innovation have moved beyond 'Ad hoc' activities and are beginning to feature across a broader range of regulatory functions. This shows that Shapers have a wider base from which more advanced activity can develop.
- **Quantum security is more mature, but engagement is a limiting constraint.** Security 'Say' and 'Do' are the most mature aspects of the median profile, indicating that Shapers have developed mature insight gathering capabilities and are developing their regulatory positions on the security challenge. In contrast, 'Engage' is the most immature aspect, with quantum innovation engagement the least developed. This supports the distinction seen in the global analysis: regulators are better positioned to understand, assess, and communicate on quantum than to consistently translate capability into deeper forms of market engagement and experimentation.

- **Substantial variation despite operating in comparable contexts.** Shapers have not developed maturity uniformly across Say, Do and Engage. While these regulators have similar market influence, institutional scales and mandates, they occupy materially different positions across quantum security and quantum innovation maturity. This suggests that peer context shapes the conditions in which maturity develops but does not determine outcomes. Differences in priorities, timing, and organisational choices impact regulatory maturity levels alongside environmental factors. This creates both the conditions for early leaders and peer learning where more mature practices are already demonstrated within the group.

What this means for Shapers

Shapers have already established a broad foundation of regulatory quantum maturity, including a 'Defined' regulatory response to quantum security.

However, much of the activity remains at the 'Defined' stage rather than 'Integrated' stage. The next phase of maturity is likely to focus on embedding existing activity into regulatory practice, strengthening engagement, and translating understanding into more external-facing approaches. In other words, using research to inform supervision priorities, supervisory engagements to inform wider market communications, and external engagements to feed into regulatory expectations and priorities.

The variation within the group provides an opportunity for relevant peer learning about how 'Defined' capabilities can be matured, institutionalised, and adapted to similar regulatory contexts. This includes opportunities to facilitate and learn from experimentation where market developments justify it. In doing so, Shapers can move beyond primarily monitoring innovation towards influencing its development.

Where maturity is consolidating and progressing

The question-level results provide a more detailed view of how maturity is developing amongst Shapers. The analysis focuses on the maturity patterns that most clearly distinguish the group: where a common maturity baseline has already formed, where 'Defined' practices provide a foundation for progressing maturity, and where individual regulators are already demonstrating higher levels of maturity. Taken together, these perspectives provide an insight into the established levels of maturity, and the immediate opportunities for Shapers.

Maturity baseline

The maturity baseline identifies where activity has become sufficiently established such that no regulator in the Shapers peer group is at the lowest level of maturity. It provides a view of the common foundations where the peer group has matured beyond 'Ad hoc' activity, and indicates the capabilities that are beginning to form a shared foundation across the peer group.

Definition: a parameter where none of the peer group respondents selected level one maturity ('Ad hoc').

- **Shapers have established a comprehensive maturity floor in quantum security.** Shapers report that around half of the total parameters in the quantum security framework have matured beyond level 1 ('Ad hoc'), spanning 'Say', 'Do', and 'Engage'. The breadth suggests that quantum security is moving beyond technical research or horizon scanning activity, with a foundation beginning to emerge across multiple aspects of regulatory functions.
- **The quantum innovation maturity baseline is narrower and concentrated in more foundational capabilities.** The innovation parameters that have matured beyond level one ('Ad hoc') are market communications, internal capability, supervisory strategy and engagement, and event attendance. This indicates that Shapers have formed the capabilities to understand and respond to quantum innovation, but this maturity has not spread more broadly across innovation-related regulatory activity.

Building on foundations

This subsection identifies areas where Shapers have already established a 'Defined' level of maturity. These areas represent some of the most immediate opportunities for increasing maturity: activity is no longer 'Ad hoc' but has not yet become consistently 'Integrated' into regulatory mechanisms.

Definition: a parameter where a maturity score of two ('Defined') is the most common response within the peer group. Tied responses are excluded from this analysis.

- **Shapers can readily advance maturity across Security, 'Say', 'Do', and 'Engage'.** The activities clustered at a maturity score of two ('Defined') span the entire quantum security framework. This means that Shaper regulators have the foundations to quickly mature from understanding the risks facing markets to actively monitoring them, testing their implications, and shaping how firms respond.

Crucially, individual Shaper regulators have already attained level three ('Integrated') maturity across several of these activities. This demonstrates that further progression is achievable within the peer group and creates opportunities for more mature approaches to be shared and adapted by peers, potentially accelerating maturity.

Acceleration opportunities

While quantum security shows a relatively clear progression from established foundations, quantum innovation presents a different pattern. In several areas, more advanced practice is already emerging even when a broad 'Defined' foundation has not yet formed across the peer group. Stretch opportunities demonstrate where some Shapers have already matured further, thus providing practical examples for others seeking to progress.

Definition: a parameter where at least one regulator within the peer group has reached level three ('Integrated'), but none have yet reached level four ('Adaptive').

- **Quantum innovation shows pockets of maturity without a common foundation.** For Shapers, acceleration opportunities span parameters across the entire Say, Do, and Engage framework. In several of these areas, the most common maturity score remains level two ('Defined'), yet at least one regulator has already reached a maturity score of three ('Integrated'). Although individual regulators have achieved more mature approaches in areas, such as dedicated research teams, hackathons, testing environments, and sandboxes, these activities remain underdeveloped across the peer group overall. This may represent an important transition for innovation maturity. The variation across the peer group indicates that some regulators are beginning to advance from observing and understanding quantum innovation towards actively creating opportunities to explore and facilitate it.

Figure 9. Shapers - Quantum security (n=6)

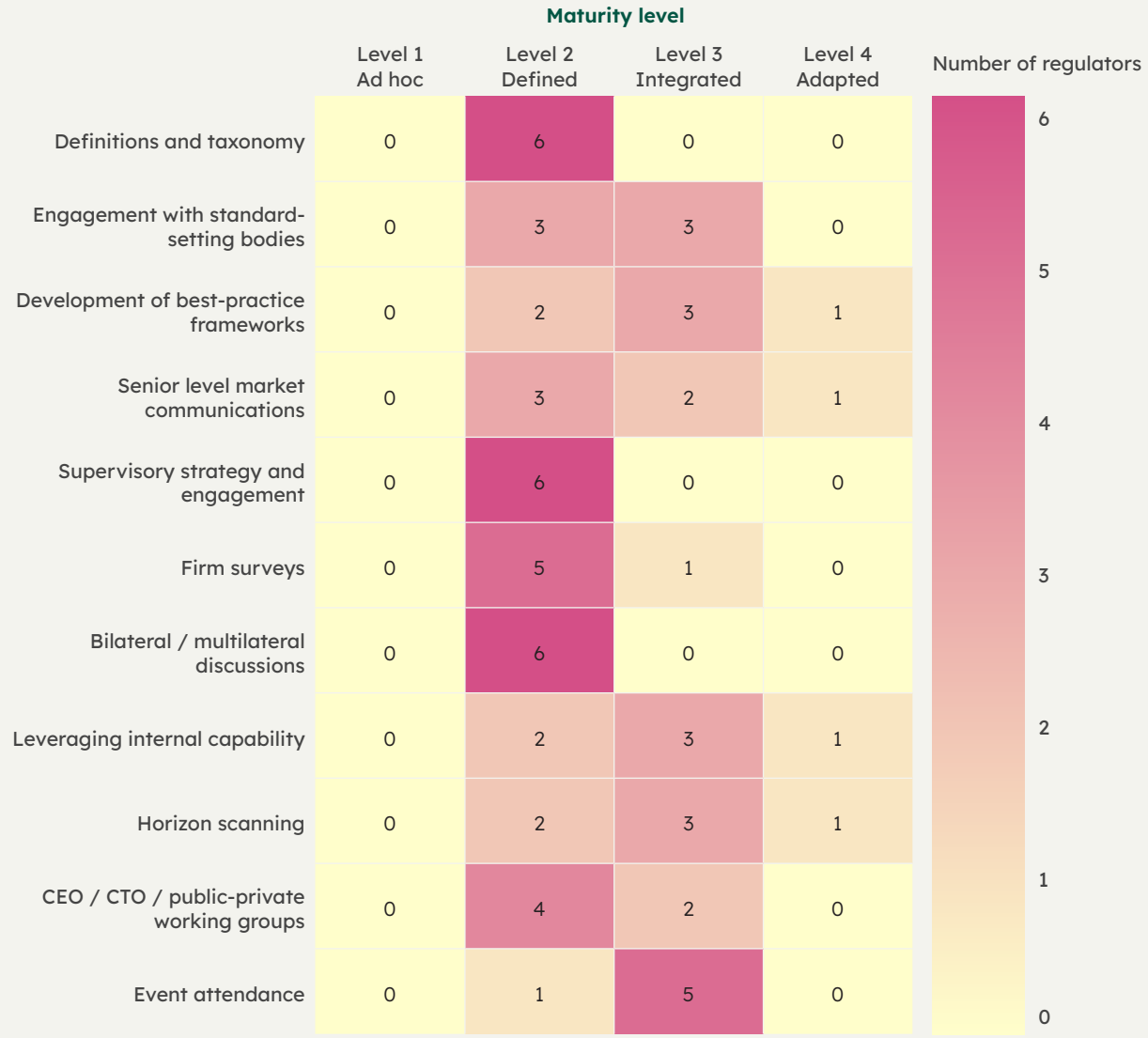
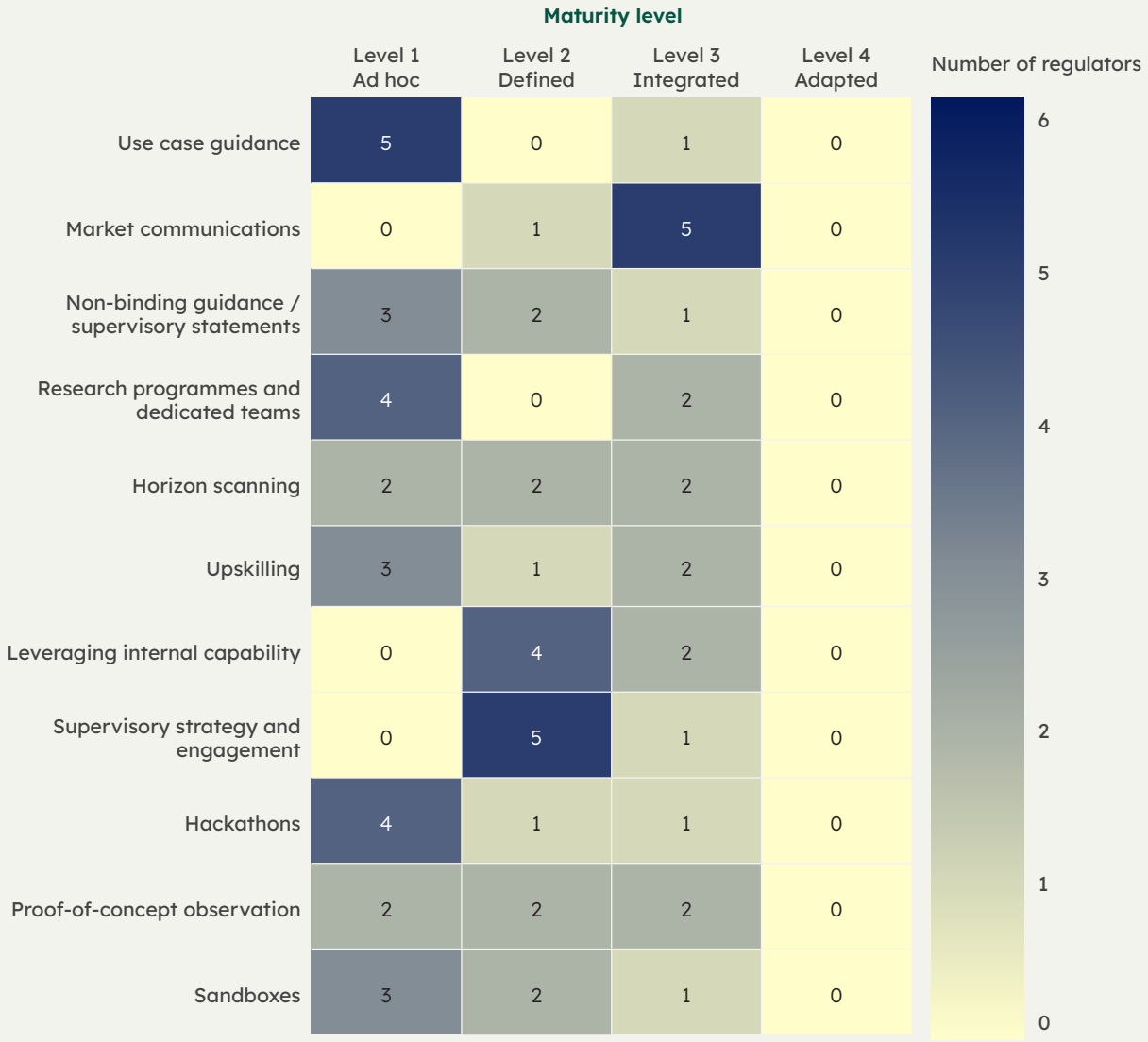
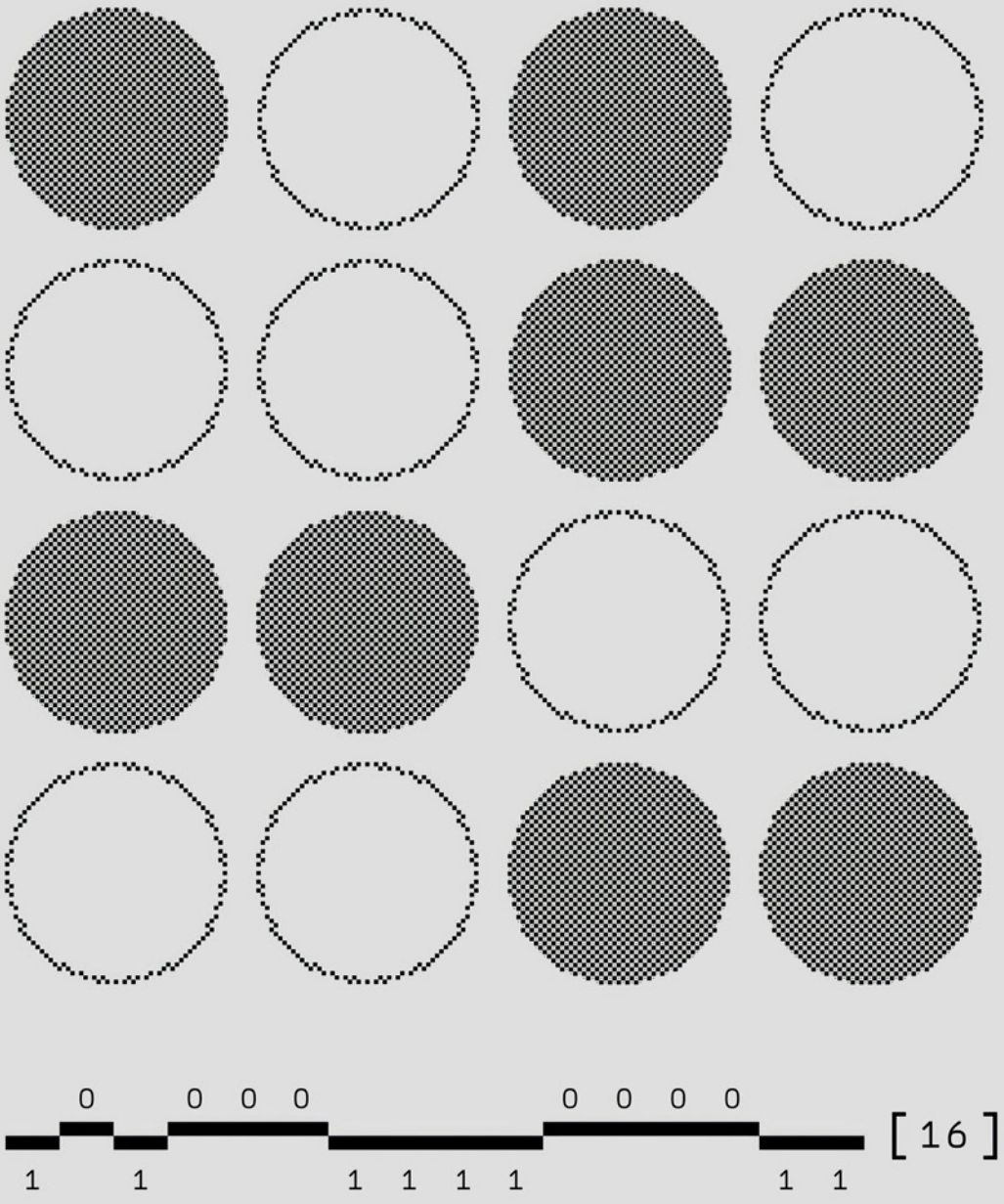


Figure 10. Global market shapers - Quantum innovation (n=6)



Emerging practice



More mature practices are occurring, but these remain concentrated among a minority of respondents. This section explores these capabilities in greater detail, drawing on case studies from survey respondents to illustrate how maturity is developing in practice.

Canadian Securities Administrators Quantum Computing Working Group

Building capability, developing evidence bases, and using shared tools as a precursor to formal intervention

Context

The Canadian Securities Administrators established a cross-jurisdictional working group to improve understanding of quantum computing developments relevant to securities regulators, capital market participants, and market infrastructure. Participants were drawn from multiple Canadian provincial securities regulators and CSA technology and security committees. The group's initial focus was to map the quantum landscape influencing Canadian capital markets.

Objectives

To bring together experts from different disciplines to develop a structured understanding of quantum innovation opportunities and quantum security risks, and to identify where further regulatory attention may be required before more formal policy or supervisory interventions are launched.

Tools used

- Horizon scanning
- Leveraging internal capability
- Upskilling
- Bi-and multilateral discussions
- Cross-jurisdictional coordination
- Stakeholder mapping
- Research programmes

Evidence generated

The mapping exercise considered use cases, advantages, risks, limitations, post-quantum cryptography, blockchain decryption risks, harvest-first risks, relevant stakeholders, government initiatives, international engagement and the existing regulatory framework. This converted a broad and uncertain topic into a more manageable set of workstreams and helped the group identify areas for deeper exploration. It also helped to make the connections and overlaps between different regulatory domains more explicit.

Outcomes

- Improved institutional understanding of quantum computing
- Clearer identification of regulatory issues and priorities
- Greater visibility of overlaps between innovation, cyber security, market infrastructure and policy domains
- A foundation for deciding whether, where and how to pursue more formal regulatory activity
- Creation of a shared vocabulary and conceptual framework across participating regulators

Transferability

High

The approach can be adopted by regulators at different stages of maturity because it does not require formal powers, extensive resources, or advanced technical capabilities at the outset. Regulators can convene experts from legal, policy, innovation, market, cyber security and technology functions to distinguish internal and external implications, prioritise risks, and identify future workstreams. As regulators mature, they can use the outputs to inform surveys, maturity assessments, stakeholder engagement, guidance development, scenario exercises or experimentation programmes.

Dubai Financial Services Authority (DFSA) Emerging Technology Risk Regulatory College

Accelerating readiness by building networks and leveraging external expertise

Context	The DFSA's Emerging Technology and Risk Regulatory College used convening powers to bring together financial authorities, international organisations, academic institutions and industry specialists to consider the interaction between quantum risk, cyber resilience and artificial intelligence. It combined expert briefings with regulator-only roundtables, allowing authorities to compare emerging risks, supervisory practices and possible policy responses.
Objectives	To accelerate regulatory learning and readiness by leveraging external expertise and international networks, enabling regulators to better understand quantum-related risks and their implications for supervision and policy development.
Tools used	• Bi- and multilateral discussions • Horizon scanning • Upskilling and leveraging internal capability • Academic and joint research projects • Research programmes and dedicated teams • CEO/CTO/ Public-private working groups
Evidence generated	The College generated evidence and insights relating to quantum computing risks and opportunities; the interaction between quantum risk, cyber resilience, and AI; supervisory practices across regulators; policy and regulatory issues; and practical implications of quantum. Discussions were converted into a published report, allowing insights to be captured and shared beyond those directly involved in the event.
Outcomes	• Accelerated institutional learning and capability building • Improved understanding of emerging technology risks • Greater access to specialist expertise that individual regulators may not possess internally • Enhanced international information-sharing and cooperation • Production of a repeatable regulatory output through publication of a report capturing lessons and insights • Creation of an evidence base to support future supervisory and policy work
Transferability **High**	Highly transferable, although the format can be adapted to the resources available. Larger regulators may be able to convene international colleges and publish formal reports, while smaller regulators could replicate the model through regional workshops, virtual roundtables or targeted expert briefings. Regulators wishing to adapt the model are advised to begin with a clearly-defined supervisory question, and to reflect on the mix of expertise needed to facilitate discussions.

International Financial Services Centres Authority (IFSCA) FinTech Innovation Sandbox

Using practical experimentation to translate theoretical learning into regulatory judgement

Context

The International Financial Services Centres Authority (IFSCA) FinTech Innovation Sandbox used IFSCA's existing innovation infrastructure to explore practical applications of quantum computing in financial services. The use cases focused on portfolio optimisation and fraud detection and were developed within the sandbox by an entity working in partnership with an established financial institution. The sandbox provided a controlled environment in which the regulator could observe testing and learn from emerging applications.

Objectives

To move from theoretical to practical regulatory understanding of quantum computing applications in financial services. This was achieved by observing real-world experimentation, assessing emerging capabilities and limitations, and identifying potential regulatory implications.

Tools used

- Sandbox monitoring
- Firm engagement
- Proof-of-concept observation
- Horizon scanning
- Internal capability building and upskilling
- Innovation pathways and testing environments

Evidence generated

The sandbox generated evidence relating to the practical application of quantum computing to portfolio optimisation and fraud detection. It exposed current technical capabilities and limitations. It also allowed for the exploration of validation approaches used by firms developing quantum applications, and shed light on the regulatory implications that may arise as applications approach commercial viability.

Outcomes

- Increased regulatory understanding of practical quantum use cases
- Enhanced internal capability and technical literacy regarding quantum technologies
- Direct exposure to live or near-live experimentation
- Better understanding of firm capabilities and evidential requirements
- Identification of potential regulatory questions and areas for future work
- Development of a stronger evidence base to inform future supervisory and policy decisions

Transferability

Moderate

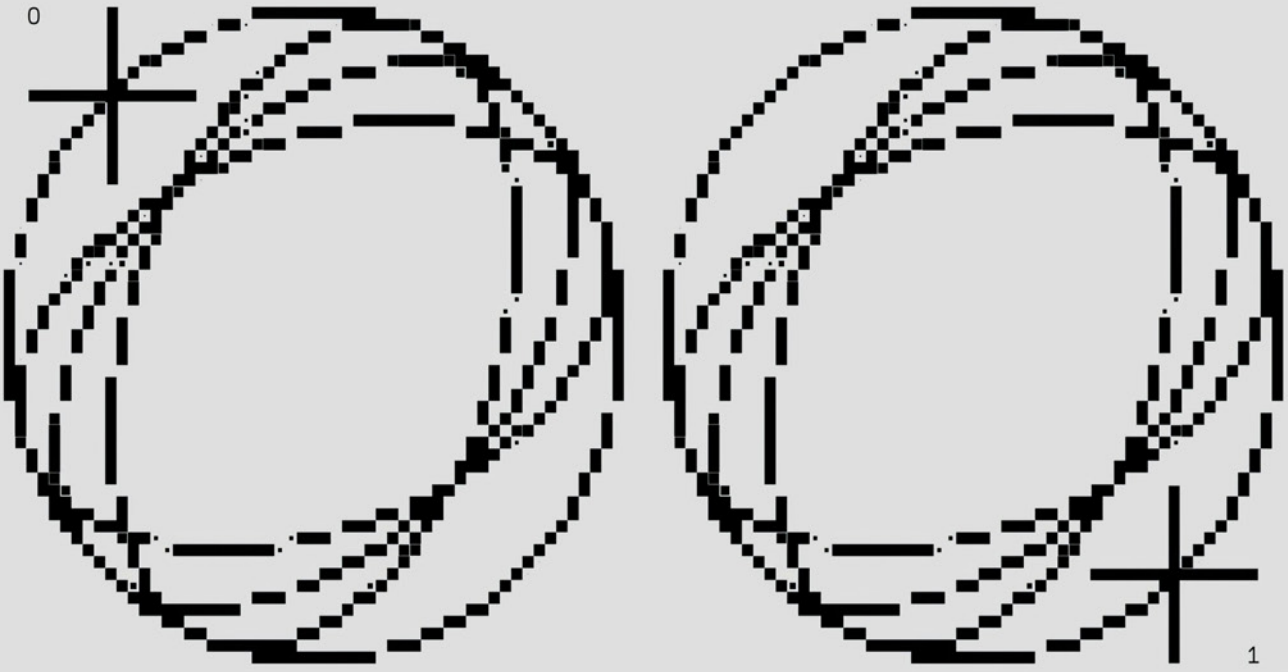
Highly transferable for regulators that already operate sandboxes, testing environments or innovation pathways. Existing innovation infrastructure can be adapted to provide practical exposure to quantum technologies without requiring new regulatory powers or immediate intervention. The approach allows regulators to learn from real-world experimentation and test assumptions against practical evidence, as well as identify gaps or potential gaps in evidence.

Financial Conduct Authority
PQC-QUEST

Using structured, recurring supervisory engagement and information-gathering to inform quantum security activity

Context	The Financial Conduct Authority's PQC-QUEST is a supervisory assessment tool which was developed to improve understanding of how selected firms are preparing for the cyber security implications of quantum computing and the transition to post-quantum cryptography (PQC). The tool was designed to provide supervisors with a structured means of assessing organisational readiness, governance arrangements, migration planning, cryptographic inventories, third-party dependencies, testing and ongoing monitoring. The initiative was developed with input from legal, data protection, technology, resilience and cyber specialists, and was informed by collaboration with the Bank of England, Prudential Regulation Authority, and the UK's National Cyber Security Centre.
Objectives	To develop a repeatable supervisory capability that enables the regulator to assess firms' preparedness for quantum-related cyber security risks, identify gaps in readiness, compare emerging themes across firms, and prioritise future supervisory engagement.
Tools used	• Supervisory strategy and engagement • Internal capability building and upskilling • Horizon scanning • Multilateral discussions • Firm surveys and engagement
Evidence generated	PQC-QUEST generated evidence relating to firms' level of PQC migration preparedness. Specifically, it looked at governance and senior management oversight of quantum-related cyber risks, as well as prioritisation and migration planning approaches. Third-party dependency risks, cryptographic discovery and inventory practices, and testing and monitoring readiness were all also assessed. Ultimately, the framework converted a complex and emerging cyber security challenge into a structured evidence-gathering process that could support supervisory assessment and prioritisation.
Outcomes	• Creation of a repeatable supervisory capability • Improved understanding of firm preparedness for quantum-related cyber risks • Identification of gaps, weaknesses and emerging themes across firms • Enhanced ability to prioritise supervisory engagement • Greater organisational capability to assess quantum security readiness • Translation of horizon-scanning and research activities into an operational supervisory process • Creation of a stronger evidence base to support future policy and regulatory decision-making
Transferability **Moderate**	Moderately transferable, but primarily for regulators with an established level of organisational maturity and cyber security expertise. The approach demonstrates how emerging technology risks can be incorporated into supervision through structured assessments and evidence gathering, in effect building a feedback loop between horizon scanning, research, and supervisory action. The underlying methodology could be adapted to other emerging technologies beyond quantum computing.

From insight to action



The preceding sections show how regulatory quantum maturity is developing across the global landscape, how that maturity differs across peer contexts, and where more mature practice is already beginning to emerge. The purpose of this final section is to help readers translate those insights into considerations for action.

Conduct a maturity audit

The starting point for organisational action is a self-assessment of current maturity. By using the survey in the annex, regulators can assess their current maturity across the Say, Do, and Engage framework, and identify areas of relative strength as well as gaps that may warrant further action. The objective is not for each regulator to maximise maturity across every parameter, but to understand where their organisation currently stands, and how that position aligns with its mandate, market context, and exposure to quantum-related risks and opportunities.

Set strategic goals

Following a maturity audit, the next step is for regulators to decide where further development would be the most beneficial and proportionate. This subsection sets out strategic considerations for maturity progression across Say, Do, and Engage at different levels of regulatory maturity. These considerations are intended to support regulators to move from insight to action: to decide where activity should be established, where existing capabilities can be deepened , and where more advanced activity may be appropriate.

For each regulator, this will be an exercise that involves considering a range of different factors, including, but not limited to: their regulatory mandate and statutory or organisational objectives; their risk profile and time horizon; their resources and institutional capacity, including their existing security and innovation infrastructure; their role in the wider financial and regulatory ecosystem; and their dependencies on other government departments, regulatory bodies, or non-governmental organisations.

The following strategic considerations are not intended to be universal or prescriptive. The considerations are drawn from activities observed across the survey population, particularly those where maturity varies most significantly between regulators at different maturity levels.

At earlier stages, the focus is on establishing the foundations needed to understand, monitor, and engage with quantum developments. As maturity increases, the emphasis shifts towards embedding and connecting capabilities so that they better inform regulatory decision-making, supervisory activity, and operating models. For the most mature regulators, the considerations extend further into more resource-intensive forms of activity, reflecting the edge of practice observed and thus avenues for the continued development of maturity.

The actions suggested are illustrative only. Actions should be taken in response to clearly defined and articulated regulatory or market needs, or because they align with the regulator's strategic objectives. Actions should be treated as a means to an end, as opposed to an end in and of themselves.

Where regulators have an unbalanced Say-Do-Engage profile, they may wish to focus on activities from different rows: for example, a regulator may assess that it is already moderately mature in the Say and Do domains, but less mature in the Engage domain. It may therefore focus on considering where quantum sits in relation to existing functions to strengthen its Engage profile and then concentrate on clarifying strategic priorities to the market or formalising its internal coordination efforts to further develop its Say and Do profiles.

Interpreting maturity bands

The positioning, coordinating, and mobilising maturity bands are analytical tools designed only to support interpretation of survey results.

The thresholds were derived from the distribution of scores observed within the Project Otto survey population and are therefore sample-relative rather than universal benchmarks. As a result, quantum security and quantum innovation have slightly different thresholds, to reflect differences in their score distributions. More detail on methodology can be found in Annex 1.

Higher scores should not be interpreted as inherently better regulation: the appropriateness of any activity depends on a regulator’s mandate, market context, resources, and exposure to quantum-related risks and opportunities.

Some activities may be less relevant, or not relevant at all, to particular authorities. As such, a regulator that adopts a deliberately light-touch approach should not be viewed as deficient or inferior.

The framework is intended to help regulators reflect on their current capabilities and identify proportionate next steps, not to prescribe a single model of maturity.

Positioning regulators

Maturity scores: <1.50 innovation, <1.40 security

Characteristics
These regulators are at an early stage of developing quantum maturity, with limited formal ownership and largely 'Ad hoc' levels of activity across Say, Do, and Engage. Their immediate strategic priorities may be to establish strong foundations, including naming an accountable team or sponsor, developing a common internal language, and mapping quantum against their mandate, strategic objectives and existing risk responsibilities.

Strategic considerations for quantum security

Say	Establish a common understanding of quantum security risk, informed by the standards, timelines, and guidance shaping transition efforts. Once an internal position is established, regulators can determine whether market-facing communications are required.		
	Potential actions	**Accountable functions**	**Expected output**
	Develop a common framing and terminology for quantum security risk, informed by relevant standards, timelines, and guidance	**Regulatory/Policy** • Cyber and operational resilience • Support from emerging technology subject matter experts	Internal terminology document or a short taxonomy
	Establish an internal position and determine whether market-facing communication is required	**Senior leadership** Cyber and operational resilience	Internal position document, and, where appropriate initial market-facing messaging
Do	Identify and manage quantum security risk across the organisation by assigning clear internal ownership, formalising horizon scanning, and identifying priority areas within the regulator's remit. These foundations enable regulators to build capability and determine where more targeted supervisory, policy or guidance activity may be required.		
	Potential actions	**Accountable functions**	**Expected output**
	Assign clear organisational ownership of quantum security risk	**Senior leadership** Technology, cyber, or operational resilience	Accountable executive and supporting expert network
	Establish or formalise horizon scanning activity for quantum security	**Research / Strategy** Cyber and emerging technology	Regular updates on quantum security related developments
	Identify areas of the regulatory remit most exposed to quantum-security risk	**Regulatory / Policy** Cyber and operational resilience	A map of initial priority firms or sub-sectors

Engage	Build awareness and relationships through participation in existing industry, regulatory, and public-private forums. The aim is to develop a network and develop an understanding of emerging practices and market preparedness.		
	Potential actions	**Accountable functions**	**Expected output**
	Participate in industry events and existing forums	**Regulatory / Policy** Cyber and operational resilience	Engagement plan for priority forums and events and post-engagement summaries
	Use engagement to understand market preparedness and emerging practice	**Supervision** Cyber and operational resilience	A consolidated document of quantum security activities already undertaken or in flight across firms
Strategic considerations for quantum innovation			
Say	Develop an initial framing of quantum innovation and its relevance to financial services without setting expectations ahead of sufficient evidence. Regulators can then use light-touch market communications to signal interest in learning about emerging use cases.		
	Potential actions	**Accountable functions**	**Expected output**
	Develop a view of potential quantum computing use cases and industry terminology	**Research / Strategy** Emerging technology / innovation	Initial use case map and terminology glossary
	Signal regulatory interest through light touch market communications	**Senior Leadership** Emerging technology / innovation	A short market-facing message such as a blog
Do	Build an initial evidence base on quantum innovation through horizon scanning, internal capability, and exploratory research. These activities will help regulators to understand where quantum fits within existing innovation and emerging technology structures, and whether emerging use cases justify more structured regulatory focus.		
	Potential actions	**Accountable functions**	**Expected output**
	Formalise horizon scanning and establish internal ownership of quantum innovation	**Research / Strategy** Emerging technology / innovation	Named owner and regular horizon scanning insights
	Build an initial evidence base on relevant use cases and market activity	**Research / Strategy** Emerging technology / innovation	Initial use case and market maturity assessment
	Assess whether more structure innovation activity is appropriate	**Senior Leadership** Emerging technology / innovation	Decision on whether further research, engagement or experimentation is needed

Engage	Engage with the quantum ecosystem in a targeted and exploratory manner to understand emerging use cases and market readiness. At this stage, the aim is to stay connected without committing significant resources.		
	Potential actions	**Accountable functions**	**Expected output**
	Attend relevant quantum computing and financial services events	**Research / Strategy** Emerging technology / innovation	An engagement plan and summary of insights from event attendance
	Build a network of relevant ecosystem participants	**Research / Strategy** Emerging technology / innovation lead	Initial stakeholder map and record of emerging themes

Coordinating regulators

Maturity scores: 1.50 – 2.00 innovation, 1.40 – 1.90 security

Characteristics
These regulators have moved beyond initial awareness and are already undertaking activity that spans the Say-Do-Engage framework; however, this activity may not be consistently coordinated or embedded across relevant functions. For these regulators, the priority should therefore be to move from general awareness to more structured action. This will involve greater internal coordination, a focus on embedding quantum into operational thinking, and work on strengthening the evidence base and internal expertise. Additionally, regulators in this group may benefit from ensuring that quantum is clearly aligned with strategic priorities and that this alignment can be properly articulated to colleagues, stakeholders, and market participants.

Strategic considerations for quantum security

Say	Translate the internal understanding of quantum security risk into a clear external position. Regulators may wish to consider communicating the risk most relevant to their mandate and provide signals about preparedness and emerging expectations.		
	Potential actions	**Accountable functions**	**Expected output**
	Communicate quantum security risks and transition expectations relevant to regulatory mandate	**Regulatory / Policy** Cyber and operational resilience	Market communications in the form of senior level statements or consultation/discussion papers
	Develop supervisory messaging or guidance where greater clarity is required	**Regulatory / Policy** Cyber and operational resilience	Supervisory communication or initial non-binding guidance

Do	Develop from siloed activity towards a coordinated approach to quantum-security risk and market preparedness. Regulators at this stage can consider formalising how developments are monitored, build capability across relevant functions, and strength the evidence base needed to inform supervisory and policy activity.		
	Potential actions	**Accountable functions**	**Expected output**
	Coordinate quantum security activity across relevant functions	**Research / Strategy** Cyber and emerging technology	Cross-functional coordination forums or knowledge sharing mechanism
	Develop role-specific capability across supervisory, policy, and technology teams	**Regulatory / Policy** Cyber and operational resilience	Targeted upskilling programmes
	Assess firm preparedness through targeted surveys or supervisory engagement	**Supervision** **Cyber and operational resilience**	Sector preparedness assessment and initial supervisory expectations
Engage	Move from awareness building towards more deliberate engagement with industry and public-private networks. Regulators can use established forums to deepen their understanding of market preparedness, transition challenges, and areas where regulatory activity may support the mitigation of quantum security risk.		
	Potential actions	**Accountable functions**	**Expected output**
	Establish or participate in structured regulatory and public-private working groups on quantum security	**Senior leadership** Cyber and operational resilience	Recurring industry forum and agreed areas for discussion to inform further regulatory activity
Strategic considerations for quantum innovation			
Say	Transition from signalling general interest in quantum innovation towards a clear articulation of the use cases and developments that are regulatorily relevant.		
	Potential actions	**Accountable functions**	**Expected output**
	Communicate emerging use cases of regulatory relevance	**Senior Leadership** Emerging technology / innovation	Senior-level marker communications or publication on use cases of interest
	Develop best practice principles or initial guidance for firm experimentation with quantum use cases	**Regulatory / Policy** Emerging technology / innovation	Published principles or initial guidance for firm experimentation with quantum use cases

Do	Develop broad observation towards coordinated evidence gathering on market activity and emerging use cases. Regulators may wish to consider developing a more structured evidence base to identify where quantum innovation may become relevant to their mandate.		
	Potential actions	**Accountable functions**	**Expected output**
	Map market activity though firm surveys or structured stakeholder discussions	**Research / Strategy** Emerging technology / innovation	Assessment of firm and sector activity on quantum use cases
	Identify priority use cases through thematic reviews	**Research / Strategy** Emerging technology / innovation	External publication on priority use cases and early regulatory considerations
	Formalise research though academic partnerships or research programmes	**Research / Strategy** Emerging technology / innovation	Academic partnerships or research publications on priority use cases
Engage	Transition from broad quantum ecosystem engagement towards more structured interaction with emerging quantum use cases. Regulators may wish to test their understanding of market activities, and where appropriate, begin observing or supporting targeted experimentation.		
	Potential actions	**Accountable functions**	**Expected output**
	Observe firm Proof-of-concept or use case experimentations	**Research / Strategy** Emerging technology / innovation	Lessons from experimentations and implications to inform regulatory priorities and future activities
	Identify whether targeted testing or collaboration would provide sector and regulatory benefit	**Senior Leadership** Emerging technology / innovation	Decision on whether an experimentation initiative, sandbox, or call for collaboration can effectively facilitate quantum experimentation

Mobilising regulators

Maturity scores: >2.00 innovation, >1.90 security

Characteristics
These regulators demonstrate quantum activity which is embedded across a range of relevant functions. They influence wider market behaviours through their engagement, signalling, or supervisory work and have a defined position on both quantum security and quantum innovation. Their strategic aim should be to shape ecosystem approaches and standards and to support common activities across firms, sectors, and jurisdictions.

Strategic considerations for quantum security

Say	Translate an established understanding of quantum security risk into a clear regulatory position with defined transition expectations. Regulators may consider providing firms with sufficient clarity to plan for and execute migration while evolving expectations to align with technological developments and migration experiences.		
	Potential actions	**Accountable functions**	**Expected output**
	Set out clear expectations and transition prioritises	**Regulatory / Policy** Cyber and operational resilience	Published supervisory guidance or a roadmap for transition expectations
	Develop or refine guidance and best practice frameworks for PQC transition	**Regulatory / Policy** Cyber and operational resilience	Detailed guidance or industry-informed best practice frameworks for transition
	Consider formal regulatory changes or handbook alterations where evidence justifies action	**Regulatory / Policy** Cyber and operational resilience	Decision on whether formal rule or handbook amendments are required
Do	Embed quantum security considerations into relevant supervisory, policy, resilience, and technology activity so that internal capabilities and market evidence inform regulatory activity. Regulators can consider leveraging technical analysis, stress testing and international coordination to deepen their understanding of preparedness and migration challenges.		
	Potential actions	**Accountable functions**	**Expected output**
	Embed quantum security considerations across relevant supervisory, policy, and technology functions	**Senior Leadership** Cyber and operational resilience	Integrated operating model or cross-functional work programme
	Use stress testing or technical analysis to assess firm and sector preparedness and transition risks	**Supervision** Cyber and operational	Stress-test findings or detailed firm/sector preparedness assessment
	Coordinate with peer regulators on supervisory approaches and global transition challenges	**International** Cyber and operational resilience	Agreed areas for bilateral or multilateral coordination

Engage	Take an active role in convening the domestic and international financial services stakeholders on the topic of quantum security preparedness. Regulators can consider using structured public-private engagements to share migration experiences, surface common transition challenges, and support global consistency in industry and regulatory approaches to the quantum security transition.		
	Potential actions	**Accountable functions**	**Expected output**
	Convene senior public-private forums to coordinate quantum security activity	**Senior Leadership** Cyber and operational resilience	Established working group and agreed programme of priority issues
	Use calls for collaboration where collective action could address common transition challenges	**Innovation** Cyber and operational resilience	Defined collaborative initiative focused on specific migration challenges
Strategic considerations for quantum innovation			
Say	Articulate a clear regulatory position on how responsible quantum experimentation and adoption can develop within the regulatory remit. Regulators can consider producing greater clarity on the principles that improve experimentation, while developing more detailed guidance where market activity warrants it.		
	Potential actions	**Accountable functions**	**Expected output**
	Publish principles on responsible quantum experimentation and adoption	**Regulatory / Policy** Emerging technology / innovation	Published principles through documentation or strategic market communications
	Publish targeted use case guidance or experimentation best-practice frameworks	**Regulatory / Policy** Emerging technology / innovation	Use case guidance or experimentation best practice frameworks
	Shape international standards and approaches as quantum applications mature	**Regulatory / Policy** Emerging technology / innovation	Input into or lead the development of international standards or shred regulatory frameworks
Do	Integrate quantum innovation into relevant research, policy, supervisory, and innovation process so that evidence informs regulatory decisions. Regulators can consider deepening capability on quantum use cases and experimentation to answer emerging regulatory questions.		
	Potential actions	**Accountable functions**	**Expected output**
	Integrate evidence on quantum innovation into relevant supervisory, policy, and innovation processes	**Regulatory / Policy** Emerging technology / innovation	Integrated regulatory operating model where evidence drives regulatory activity and decision making
	Develop specialist capabilities to research and experiment with quantum use cases	**Research / Strategy** Emerging technology / innovation	Targeted research programmes and development of specialist capabilities to understand experimentation process and outcomes

Engage	Leverage structured experimentation to deepen understanding of quantum use cases and their regulatory implications. Regulators can consider deploying testing environments, sandboxes, or cross-border collaboration where these mechanisms can provably facilitate market innovation and support regulatory learning.		
	Potential actions	**Accountable functions**	**Expected output**
	Use calls for collaboration or hackathons to explore quantum experimentation, adoption and regulatory implications	**Innovation** Emerging technology	Collaborative experimentation or challenge programme with insights to inform regulatory activity
	Establish sandboxes or testing environments to support experimentation on priority use cases	**Innovation** Sandboxes and emerging technology	A quantum experimentation environment to facilitate market innovation and regulatory learning
	Pursue cross-border testing where priority use cases raise shared regulatory questions	**International** Emerging technology / innovation	Joint testing initiative to inform global regulatory learning on quantum use cases

GFIN: From insight to collective progress

As acknowledged in the introduction to this report, quantum is a global technology which will have impacts across the world. Quantum challenges are not limited by jurisdictions, and collective effort will be needed to tackle them. Many of the parameters and tools surfaced in this project lend themselves well to cross-border collaboration; some even presuppose it.

Collective action should be driven by an identified regulatory or market need, rather than being automatically treated as the next stage of maturity. As this report has endeavoured to make clear, maturity is not a single, fixed destination, and actions should be responses to legitimate needs, rather than means to an end.

Evidently, there is very significant variation in maturity across the parameters used in Project Otto; however, this toolkit has identified which of them may be particularly fruitful for collective action and peer learning. They include:

- **Event attendance:** GFIN-organised quantum events could be developed as a way of bringing together world-leading experts in quantum and regulation, allowing attendees at all stages of maturity to benefit.
- **Horizon scanning:** Joint horizon-scanning networks could strengthen the identification and analysis of developments and better inform when local, regional, or global regulatory activity may need to accelerate.
- **Research programmes:** Jointly run research programmes may benefit from the pooling of shared expertise and resources, the sharing of costs, and the reduction of duplication of effort across participating regulators. Furthermore, this would support regulators in jointly tackling emerging policy questions and identifying early areas of potential divergence and fragmentation.
- **Market communications at senior levels:** Collective engagement with markets reduces opportunities for regulatory arbitrage and clearly signals regulators' intention to work together to mitigate risks and leverage opportunities.
- **Issuing of non-binding guidance:** Although regulators may wish to tailor formal guidance to suit their own local markets and mandates, the collective issuance of non-binding guidance can help to ensure consistency through shared expectations and understanding among market participants.

- **Development of best-practice frameworks:** Regulators can pool practical experience in the development of these frameworks, combining lessons from different markets and levels of maturity to provide a stronger evidence base.

In addition, more mature regulators should aim to be particularly ambitious and focus their efforts going forward on cross-border harmonisation, testing and experimentation, and on representing collective regulatory positions to international standards-setting bodies.

Shared initiatives can help reduce duplication of effort and broaden access to expertise. Through mechanisms such as peer learning, knowledge sharing, collaborative research and cross-border dialogue, regulators may be able to accelerate progress more effectively than through individual action alone. Additionally, shared initiatives between regulators at different stages of maturity can bring significant advances in preparedness.

Project Otto has demonstrated the viability of regulators coming together and developing an understanding of quantum maturity. The regulators who engaged in this project represented a wide range of sizes, remits, and powers, and yet it was these differences that revealed the most about current maturity and routes to progress, strengthening the resulting analysis. The case studies provided by project participants and detailed above illustrate the value of sharing approaches that have worked, as well as the lessons learned from those approaches.

In conclusion, Project Otto should be viewed as an initial foundation for sustained international collaboration. Its lasting value will depend on whether regulators use the relationships, evidence and common framework developed through the project to deepen their own maturity and to pursue collective action where the challenges cannot be addressed effectively by any one authority alone.

Annex One: Methodology

This annex lays out how the Project Otto team arrived at the conclusions in this report.

Purpose and analytical approach

Project Otto used a structured survey to produce a snapshot of how financial regulators are advancing their preparedness for quantum security and quantum innovation. The analysis sought to identify patterns in regulatory activity and engagement.

The list of tools and parameters used in the survey was developed through project roundtables with GFIN members and desk-based research conducted by the project team. The Project Otto team grouped parameters into the three Say, Do, and Engage dimensions. These groupings allowed the analysis to distinguish between regulators with similar maturity scores but different capabilities.

Respondents and geographical coverage

The survey was distributed to 85 GFIN members and was open from 3rd June – 31st August 2026. 25 regulatory authorities completed the survey, giving a response rate of 29%. Several regulators declined to take the survey. Between those that did respond, a broad range of different regulatory models, institutional sizes, market contexts, innovation mandates, and approaches to technology risk was represented.

The sample provided coverage across Europe, North America, South America, the Middle East, Asia-Pacific, and Africa. Because the sample is relatively small and to avoid inadvertent identification of authorities, the published analysis anonymises respondents. Named examples are included only where an authority provided material for use as a case study or otherwise agreed to attribution.

The sample is not statistically representative of the global population of financial regulators: results should be interpreted as descriptive of the sample only.

Survey structure and parameter counts

The survey contained:

- Six contextual questions which examined respondents' regulatory model, market context, institutional scale, innovation posture, innovation mandate, and approach to technology risk;
- 22 innovation parameters;
- 20 security parameters.

The innovation framework therefore comprises 22 scored parameters, and the security framework comprises 20 scored parameters. This gives a total of 42 parameters.

Maturity scale and scoring

For each parameter, respondents selected the statement which most closely reflected their organisation's current practice. The statements corresponded to four maturity levels:

- Ad hoc, meaning that the activity is absent or undertaken only occasionally;
- Defined, meaning that the activity is used and has been given some structure but it not consistently used or embedded;
- Integrated, meaning that the activity forms part of established regulatory or operational processes, and has a tangible connection to broader regulatory activities;
- Adaptive, meaning that the activity is embedded, regularly reviewed, and can develop in response to changes in conditions.

Each statement corresponded to a score from 1-4. The use of descriptive statements was intended to ensure consistency of responses, anchoring each selection in an observable description of regulatory practice, rather than an abstract score. All maturity parameters were equally weighted.

Each regulator could then be given:

- Parameter scores for each maturity statement, which was simply the value of the selected maturity statement;
- An innovation score, which was the mean across the 22 innovation parameters;
- A security score, which was the mean across the 20 security parameters;
- A category score, showing the mean of the scores for each parameter as assigned to the relevant Say, Do, or Engage category.

It should be noted that the Say, Do, and Engage categories contain different numbers of parameters: this is why the category scores were calculated directly across each parameter.

Aggregation and presentation of results

The Project Otto team analysed the results at respondent, peer-group, and whole-cohort levels.

- Respondent-level analysis allowed for comparison of each respondent's overall security, innovation, and Say-Do-Engage scores.

- Peer-group analysis allowed for the comparison of maturity profiles among regulators with broadly similar operating contexts.
- Whole-cohort analysis allowed for the examination of response distribution across all respondents.

At the level of individual parameters, the team reported counts, percentages, mean scores, median scores, and the most common response where relevant. Percentages were calculated using the number of usable response (25) as the denominator.

At the peer group level, the team's analysis used the median to show the central response and the interquartile range to show the middle 50% of responses. The median was used because it provides an easily-interpreted central value, and is less likely to be significantly affected by outlier scores. The interquartile range was used to illustrate variation within each peer group.

Modal scores were used in the peer group analysis to identify the maturity level most commonly selected for an individual parameter. This provided a clear indication of where a shared pattern or foundation was emerging within a peer group.

Treatment of 'tied' modal scores

Where the analysis in the toolkit refers to the 'most common' maturity level, this means the mode of the responses to that parameter. If two or more maturity levels were equally common, the parameter was treated as tied. Tied modes were retained in the descriptive data but excluded from analyses that depended on identifying a single most common score.

Peer group allocation

Peer groups were designed to provide context for interpreting maturity. Allocation was based on the six contextual questions at the beginning of the survey, which asked respondents to select the statement which best reflected their organisation's:

- Regulatory model;
- Market context;
- Institutional scale;
- Innovation posture;
- Innovation mandate;
- Approach to technology risk.

Each response option was converted into a score. These scores were combined into a weighted peer-group score that allocated each respondent to one of three categories: Adapters, Contributors, and Shapers.

The peer group scores were as follows:

Adapters: 1.00 - 2.69
Contributors: 2.70 - 3.24
Shapers: > 3.25

Positioning, coordinating, and mobilising maturity thresholds

For the strategic considerations section of the toolkit, respondents were grouped using maturity score thresholds.

Category	Thresholds
Positioning regulators	Innovation < 1.50, Security < 1.40
Coordinating regulators	Innovation 1.50 – 2.00, Security 1.40 – 1.90
Mobilising regulators	Innovation > 2.00, Security > 1.90

These thresholds were selected to distinguish respondents whose average activity remained predominantly close to the Ad Hoc level, those whose activity sat between Ad Hoc and Defined, and those whose average scores had moved beyond Defined in at least one domain. Different thresholds were used for security and innovation to reflect the differing distributions observed in the sample.

Thresholds were derived from the distribution of scores observed across the survey population, using the lower and upper bounds of respondents' average maturity scores to divide the sample into positioning, coordinating and mobilising maturity ranges. Separate thresholds were applied to quantum innovation and quantum security because scores were distributed differently across the two domains: no respondent recorded an average score above 2.57 for quantum security, and 2.67 for quantum innovation. These boundaries should not be interpreted as universal benchmarks: they were devised to facilitate the analysis of this sample only.

The strategic considerations detailed above were developed by examining how the activities and capabilities recorded in the survey differed across these maturity levels and using those observations to identify actions that regulators at comparable stages could consider, subject to their mandates, market exposure and operating contexts.

Nature of the conclusions

The results drawn from this survey are descriptive and exploratory.

The analysis uses observed counts, percentages, means, medians, modes and interquartile ranges to describe the participating authorities and identify patterns meriting further consideration. No hypothesis tests, confidence intervals, significance tests or causal models were applied.

Limitations

The analysis presented in this report is subject to several limitations, which are detailed below:

- **Self-assessment**: Results reflect respondents' own interpretation of their organisation's activity and are therefore subjective. Different authorities may apply the maturity statements with different degrees of caution or confidence.
- **Sample size**: The sample contains 25 authorities. Whole-sample percentages therefore move in four-percentage-point increments, and peer-group findings are based on still smaller numbers.
- **Non-representative sample**: Participants were not selected through probability sampling: participation was open to all GFIN members. The findings cannot be generalised statistically to all financial regulators.
- **Institutional diversity**: Differences in mandate, legal powers, market development, resources and national responsibilities may affect both the relevance of particular activities and the maturity scores recorded.
- **Parameters**: Some parameters can be construed broadly or differently by different respondents, meaning that the same words are used to describe markedly different activities.
- **Peer-group sensitivity**: Allocation depends on the contextual scoring and weighting choices. Different weights or boundaries could change some authorities' peer groups.
- **Technology maturity**: A low score does not necessarily indicate a regulatory deficiency. It may represent a proportionate decision where market activity, use cases or risks are not yet sufficiently developed to justify more intensive intervention.
- **Point-in-time evidence**: The findings provide a snapshot of regulatory activity during the survey period. They do not measure how quickly maturity is changing or account for developments after responses were submitted.

The results should therefore be read as an initial evidence base for discussion, peer learning and further research, rather than as a definitive or statistically representative assessment of global regulatory maturity.

Annex Two:
Survey questions

Peer group

Metric	Weighting	Question	Available answers
Regulatory authority model	25%	Which of these statements best describes your organisation's regulatory role?	**Policy / Advisory Body:** We do not directly supervise firms, our role is policy development, coordination, or advice.
			Sector-Specific Regulator: We regulate a defined segment of financial services (e.g. securities, payments, or conduct).
			Prudential or Central Banking Authority: We oversee financial stability, including prudential supervision and/or central banking functions.
			Integrated / multi-mode regulator: We have responsibility across multiple areas (e.g. conduct, prudential, markets) within a single organisation.
Market context	25%	Which statement best describes the financial system your organisation primarily oversees?	**Domestic / Locally focused systems:** Primarily domestic institutions with limited cross-border activity.
			Regionally connected systems: Some cross-border activity and regional financial integration.
			Internationally connected system: Significant cross-border activity and participation in global markets.
			Global financial centre: A globally significant financial system with extensive international activity and market infrastructure.
Institutional size	15%	Which best describes your organisation's scale and structure?	**Small organisation:** Limited staff and resources, covering a focused regulatory remit.
			Medium-sized organisation: Moderate scale with defined teams across core regulatory functions.
			Large organisation: Significant scale with multiple specialised functions and departments.
			Very large, complex organisation: Extensive scale with multiple divisions, specialised units, and broad operational scope.
Regulatory posture to innovation	15%	Which best describes your organisation's general approach to market developments and innovation?	**Monitoring-focus:** We primarily observe and assess developments to inform our understanding.
			Responsive: We respond to developments as they arise, including through engagement or clarification.
			Engaged: We actively engage with market participants to understand and shape developments.
			Market-shaping: We play an active role in shaping market direction through initiatives, coordination, or leadership.

Innovation mandate	10%	Which best describes your organisation's role in engaging with innovation in financial services?	**No formal role:** We do not have a formal role or dedicated function focused on innovation.
			Informal and ad hoc engagement: Engagement with innovation occurs on a case-by-case basis without a dedicated structure
			Structured engagement: We have established mechanisms (e.g. innovation hub, contact point, or structured engagement process).
			Formal innovation function: We have dedicated programmes or functions (e.g. sandbox, accelerator, or formal innovation initiatives).
Technology risk	10%	Which statement best describes your organisation's approach to technology and cyber-related risks?	**Limited formal focus:** Technology and cyber risks are not addressed through dedicated frameworks or structures.
			General risk coverage: Technology risks are considered within broader risk or supervisory frameworks.
			Dedicated frameworks: We have specific frameworks, teams, or policies addressing technology and cyber risks.
			Structured emerging risk focus: We have dedicated structures or initiatives that explicitly consider emerging technology risks.

Quantum security question set

Say	How comprehensively do your handbooks or binding guidance documents address quantum related security risks?	1. Our handbooks or binding guidance do not address quantum related security risks. 2. Our handbooks or binding guidance acknowledge quantum related security risks at a high level, without specific regulatory expectations. 3. Our handbooks or binding guidance include defined expectations on quantum related security risks, aligned to existing security and resilience frameworks. 4. Our handbooks or binding guidance provide comprehensive, standalone treatment of quantum related security risks, with clear supervisory expectations and forward looking considerations.
	To what extent do your regulatory definitions encompass quantum era security concepts?	1. Our regulatory definitions do not reflect or reference quantum era security concepts. 2. Our regulatory definitions indirectly encompass quantum era security concepts through general or technology agnostic security terms. 3. Our regulatory definitions explicitly encompass key quantum era security concepts, aligned with existing security and resilience definitions. 4. Our regulatory definitions comprehensively and clearly encompass quantum era security concepts, enabling consistent supervisory interpretation and future proof application.
	To what degree do supervisory statements incorporate expectations around quantum related security risks?	1. Our supervisory statements do not reference or address quantum related security risks. 2. Our supervisory statements acknowledge quantum related security risks at a high level, without setting supervisory expectations. 3. Our supervisory statements incorporate defined expectations relating to managing quantum related security risks, aligned with existing supervisory approaches to security and operational resilience. 4. Our supervisory statements comprehensively and proactively incorporate / set expectations relating to quantum related security risks, including supervisory focus and forward looking preparedness and transition
	To what extent does your organisation engage with standards setting bodies on quantum related security risks?	1. Our organisation does not participate in standards setting bodies addressing quantum related security risks. 2. Our organisation monitors or occasionally contributes to standards setting discussions on quantum related security risks without a sustained role, participation or responsibility for outputs. 3. Our organisation regularly engages with relevant standards setting bodies in a structured manner on quantum related security risks, contributing to the development of standards and guidance or technical outputs. 4. Our organisation plays an active and influential role in standards setting bodies on quantum related security risks, helping to shape international norms and best practice.
	How does your organisation participate in developing best practice materials on quantum related security risks?	1. Our organisation does not contribute and engage in the development of best practice materials on quantum related security risks. 2. Our organisation occasionally contributes to best practice materials on quantum related security risks, typically through informal or reactive input. 3. Our organisation regularly contributes to best practice materials on quantum related security risks in a structured manner, supporting alignment with regulatory expectations. 4. Our organisation plays a leading role in developing best practice materials on quantum related security risks, which may include convening stakeholders, setting direction and shaping guidance to support preparedness and long term resilience.

Say	How comprehensively does your organisation's use case guidance address quantum security risks?	1. Our organisation's use case guidance does not reference or consider quantum security risks. 2. Our organisation's use case guidance acknowledges quantum security risks at a high level, without detailed or consistent treatment. 3. Our organisation's use case guidance explicitly addresses quantum security risks across relevant use cases, aligned with existing security expectations. 4. Our organisation's use case guidance comprehensively and systematically addresses quantum security risks, supporting consistent interpretation and forward looking preparedness.
	How effectively do communications to industry leaders address quantum era security risks?	1. Our organisation does not communicate with industry leaders or senior stakeholders about quantum-era security risks. 2. Our organisation communicates about quantum-era security risks with industry leaders or senior stakeholders on an occasional or ad-hoc basis. 3. Our organisation actively communicates with industry leaders or senior stakeholders about quantum-era security risks to support awareness, preparedness, and risk management. 4. Our organisation maintains regular, structured, and strategic communication with industry leaders or senior stakeholders on quantum-era security risks, and uses these engagements to shape industry preparedness and response.
Do	How does your supervisory strategy address quantum era security risks (e.g., PQC transition, "harvest now decrypt later")?	1. Our supervisory strategy does not consider or address quantum era security risks. 2. Our supervisory strategy recognises quantum era security risks, such as migrating to post quantum cryptography and "harvest now decrypt later," but this is not translated into supervisory priorities, expectations or planned interventions. 3. Our supervisory strategy incorporates defined expectations for managing quantum era security risks, aligned with existing cyber and resilience approaches or frameworks. 4. Our supervisory strategy proactively and comprehensively addresses quantum era security risks, setting clear expectations for preparedness, transition planning, and long term resilience.
	To what extent do you collect data on firms' quantum security preparedness?	1. We do not collect data on firms' quantum security preparedness. 2. We collect ad hoc or exploratory data on firms' quantum security preparedness, without a consistent or structured approach. 3. We regularly collect defined data on firms' quantum security preparedness, aligned with existing supervisory data collection frameworks. 4. We comprehensively and proactively collect data on firms' quantum security preparedness, using it to inform supervisory strategy, risk assessment, transition monitoring, preparedness planning and forward looking oversight.
	How mature are your upskilling efforts on quantum security risks and resilience?	1. Our upskilling efforts do not cover quantum security risks, vulnerabilities or resilience. 2. Our upskilling efforts provide basic awareness of quantum security risks and resilience without structured or sustained capability building. 3. Our upskilling efforts include targeted and recurring coverage of quantum security risks and resilience, aligned with supervisory responsibilities. 4. Our upskilling efforts are comprehensive and forward looking, building deep organisational capability and adaptable supervisory approaches to quantum security risks and long term resilience.

Do	How are quantum era security threats reflected in stress tests and strategy?	1. Quantum era security vulnerabilities and threats are not considered in our scenario and stress testing or strategic frameworks. 2. Quantum era security vulnerabilities and threats are acknowledged at a high level in scenario and stress testing or strategy, without defined scenarios or strategic implications. 3. Quantum era security vulnerabilities and threats are incorporated into relevant scenario and stress tests and strategic considerations, aligned with existing cyber and operational resilience frameworks. 4. Quantum era security vulnerabilities and threats are systematically embedded in scenario and stress testing and strategic planning, shaping forward looking supervision and long term resilience objectives.
	To what extent do discussions elicit and share expectations on quantum security risks?	1. Discussions do not address or surface expectations on quantum security risks. 2. Discussions acknowledge quantum security risks but do not consistently elicit or communicate clear expectations. 3. Discussions regularly elicit and share expectations on quantum security risks, aligned with existing supervisory messaging. 4. Discussions proactively and systematically elicit and share clear or defined expectations on quantum security risks, reinforcing preparedness and long term resilience.
	To what extent is existing internal capability leveraged to advance quantum security work and preparedness?	1. Our organisation has little or no internal capability relevant to quantum security, and does not actively leverage existing expertise to support preparedness activities. 2. Some internal capability relevant to quantum security exists within our organisation, but it is leveraged only on a limited, informal, or ad-hoc basis. 3. Our organisation actively leverages internal capability to support quantum security work and preparedness activities, although this is not yet applied consistently across the organisation. 4. Our organisation systematically and strategically leverages internal capability to advance quantum security work and preparedness, and actively develops this capability over time.
	To what extent do research teams investigate quantum era security risks and mitigations?	1. Our research teams do not consider or investigate quantum era security risks or mitigations to be in scope of research activity. 2. Our research teams conduct ad hoc or high level research into quantum era security risks and mitigations without a sustained programme. 3. Our research teams regularly investigate quantum era security risks and mitigations, contributing evidence to support supervisory and policy development. 4. Our research teams undertake systematic and forward looking investigation of quantum era security risks and mitigations, shaping long term regulatory preparedness planning and strategic direction.
	To what extent do you collaborate with academia on quantum security research and publications?	1. We do not engage with academia on quantum security research or publications. 2. We engage with academia on quantum security research or publications in a limited or informal way. 3. We maintain regular collaboration with academia on quantum security research and publications, contributing to evidence based regulatory insight. 4. We have structured and sustained collaboration with academia on quantum security research and publications, shaping regulatory thinking and long term preparedness.
	How does your horizon scanning track quantum era security risks and timelines?	1. Our horizon scanning does not consider quantum era security threats, risks or timelines. 2. Our horizon scanning identifies quantum era security risks in a general way, without structured assessment of timing or implications. 3. Our horizon scanning actively tracks quantum era security risks and indicative timelines, aligned with broader strategic and supervisory planning primarily within existing risk or resilience frameworks. 4. Our horizon scanning comprehensively and proactively tracks quantum era security risks and timelines, shaping forward looking regulatory strategy and preparedness.

Engage	To what extent do executive forums set expectations for quantum security readiness?	1. Executive forums do not consider or set expectations for quantum security readiness. 2. Executive forums acknowledge quantum security readiness at a high level, without articulating clear expectations or direction. 3. Executive forums set defined expectations for quantum security readiness, aligned with broader security and resilience objectives. 4. Executive forums proactively and consistently set clear expectations for quantum security readiness, driving strategic focus and long term preparedness.
	How does participation in industry events support your organisation's understanding of quantum related security risks?	1. Participation in industry events does not contribute to our organisation's understanding of quantum related security risks. 2. Participation in industry events provides limited or high-level insight into quantum-related security risks, but these insights are not systematically incorporated into organisational thinking. 3. Participation in industry events enhances our organisation's understanding of quantum-related security risks and contributes to informed regulatory, policy, or supervisory perspectives. 4. Participation in industry events plays a structured and ongoing role in developing insight into quantum-related security risks, and these insights are systematically used to strengthen organisational preparedness, regulatory thinking, and engagement with industry.
	To what extent do Hackathon events address quantum era security risks and resilience?	1. Hackathons have not been used to support our organisation's understanding of, or preparedness for, quantum-era security risks or resilience. 2. Our organisation is planning a hackathon which will generate insights into quantum-era security risks or resilience. 3. Hackathons are used to improve our organisation's understanding of quantum-era security risks and resilience, and the insights generated contribute to preparedness activities, regulatory understanding, or supervisory perspectives. 4. Hackathons play a structured and ongoing role in developing organisational preparedness for quantum-era resilience and security risks, with insights systematically used to inform regulatory strategy, supervisory activity, and engagement or communication with industry.
	To what extent do open challenges address quantum era security risks and measurable outcomes?	1. Open challenges do not consider quantum era security risks or measurable outcomes. 2. Open challenges acknowledge quantum era security risks but do not consistently explore, define or assess measurable outcomes. 3. Open challenges explicitly address quantum era security risks and include defined, measurable outcomes aligned with regulatory or resilience objectives. 4. Open challenges systematically address quantum era security vulnerabilities, risks and deliver clear, measurable outcomes that shape innovation, preparedness, and regulatory insight.

Quantum innovation question set

Say	Has your organisation worked with external stakeholders (e.g. industry participants, public-private working groups, academics, etc.) to develop best practice frameworks relating to quantum innovation?	1. Our organisation is not working with stakeholders to develop best practice frameworks relating to quantum innovation. 2. Our organisation contributes to the development of best practice frameworks relating to quantum innovation, on a discretionary or ad hoc basis. 3. Our organisation actively works with stakeholders to develop best practice frameworks which support quantum innovation. 4. Our organisation is leading or jointly leading iterative work to develop and/or update best practice frameworks to support quantum innovation.
	Has your organisation issued formal guidance or white papers (consultation or discussion papers) regarding specific quantum-enabled use cases (e.g., risk modelling, portfolio optimization) in financial services?	1. Our organisation has not issued or begun a process to issue formal guidance or white papers addressing quantum use cases in financial services. 2. Our organisation is currently developing a process or is planning to issue formal guidance and/or white papers addressing quantum use cases in financial services. 3. Our organisation has issued limited or exploratory guidance and/or white papers on quantum use cases in financial services. 4. Our organisation has issued formal guidance and/or white papers that aim to explicitly facilitate the use of quantum computing for defined financial services use cases.
	How actively does your organisation contribute to domestic or international standards setting bodies on quantum related innovation?	1. Our organisation does not work with either domestic or international standards setting bodies on the topic of quantum related innovation. 2. Our organisation works with domestic or international standards-setting bodies on a limited and occasional basis. 3. Our organisation plays an influential role in working with domestic and/or international standards-setting bodies to promote responsible development and use of quantum technologies. 4. Our organisation plays a leading role in working with domestic and/or international standards-setting bodies to provide clear and flexible support for evolving quantum innovation.
	How often does your organisation communicate with industry about emerging quantum related innovations?	1. Our organisation does not communicate with industry about emerging quantum-related innovations. 2. Our organisation communicates with industry about quantum-related innovations on an occasional or ad-hoc basis, typically in response to specific needs or requests. 3. Our organisation proactively communicates with industry about quantum-related innovations, but this engagement is not conducted on a regular or structured schedule. 4. Our organisation maintains regular, structured, and ongoing communication with industry, including iterative dialogue to support evolving quantum innovation.

Say	How complete and up to date are your regulatory taxonomies and definitions concerning quantum technologies?	1. Our organisation does not produce regulatory taxonomies or definitions relating to quantum technologies. 2. Existing regulatory taxonomies and definitions may allow quantum technologies to be considered on a discretionary or case-by-case basis, but do not explicitly address them. 3. Regulatory taxonomies and definitions explicitly address quantum technologies and support a consistent understanding across regulatory activities. 4. Regulatory taxonomies and definitions are regularly reviewed and updated to maintain clear, consistent, and flexible coverage of evolving quantum technologies.
	How effectively do your guidance and supervisory statements address quantum related innovations in the financial sector?	1. We have not released and are not planning to release any guidance or supervisory statements relating to quantum-related innovation in financial services. 2. We are developing or preparing guidance and/or supervisory statements relating to quantum-related innovation in financial services. 3. We have released guidance or supervisory statements that address quantum-related innovation in financial services at a general or high level. 4. We have released guidance or supervisory statements that explicitly address quantum-related innovation and set clear expectations for the responsible development and use of quantum technologies in financial services.
Do	How does your organisation engage with academia on quantum related innovation (e.g., co authored papers, workshops)?	1. Our organisation does not engage with academia on quantum-related innovation. 2. Our organisation engages with academia on quantum-related innovation on an occasional, informal, or ad-hoc basis (e.g. one-off interactions or collaborations). 3. Our organisation actively collaborates with academic partners on quantum-related innovation through defined activities (e.g. co-authored papers, workshops, or research projects), but these collaborations are not part of a formal or ongoing structure. 4. Our organisation maintains structured, ongoing partnerships with academia (e.g. formal programmes, consortia, or long-term research initiatives) to support the continued development of quantum innovation.
	How are research programmes structured to study quantum related financial applications?	1. Our research programmes do not address quantum-related financial applications. 2. Research programmes allow for the study of quantum-related financial applications on an ad-hoc, exploratory, or case-by-case basis. 3. Our organisation has structured research programmes that explicitly examine quantum-related financial applications and associated implications for financial services. 4. Our organisation maintains a dedicated, well-resourced research capability on quantum-related financial applications that continuously monitors emerging developments and generates up-to-date insights to inform regulatory thinking, supervisory activity, or industry engagement.
	How do formal and informal engagements with firms/stakeholders (e.g. industry participants, public-private working groups, academics, etc.) cover quantum innovation?	1. We do not have formal or informal engagements with firms or other stakeholders to discuss quantum innovation in financial services. 2. We have occasional formal or informal engagements that allow for discussion of quantum innovation on an ad-hoc basis. 3. We frequently engage (formally and informally) with firms and stakeholders to discuss the development and use of quantum applications in financial services, but this engagement is not part of a regular or structured approach. 4. We maintain a regular, structured programme of formal and informal engagements with firms and stakeholders to discuss and respond to ongoing developments in quantum applications in financial services.

Do	How mature is your horizon scanning for quantum related innovation?	1. We do not conduct horizon scanning focused on quantum innovation or emerging quantum-related developments relevant to financial services. 2. Our horizon scanning activities have considered quantum innovation and emerging developments on an occasional or exploratory basis to support situational awareness. 3. We have a horizon scanning function that explicitly monitors and assesses quantum innovation and emerging developments relevant to financial services to inform regulatory understanding, policy development, and/or supervisory priorities. 4. We maintain a structured, well-resourced, and continuously updated horizon scanning capability that generates forward-looking insight into the evolution of quantum innovation in financial services and actively informs regulatory strategy, policy development, supervisory activity, and/or industry engagement.
	To what extent do thematic reviews examine quantum related innovation in firms?	1. We have not conducted any thematic reviews related to quantum innovation, and there are no current plans to do so. 2. We have not yet conducted a thematic review of quantum innovation, but we are actively planning or developing one. 3. We have conducted thematic reviews that indirectly or implicitly cover topics related to quantum innovation. 4. We have conducted a thematic review that explicitly examines quantum innovation in financial services, and have used the findings to inform our regulatory approach.
	How effectively do your upskilling programmes build internal capability on quantum related innovation?	1. We do not have upskilling programmes that target skills or knowledge in quantum-related innovation. 2. We run internal upskilling programmes that provide introductory insights and focus on building awareness and basic understanding of quantum innovation in financial services. 3. We use upskilling programmes to explicitly develop internal capability to support the understanding and responsible application of quantum-related innovation in our work. 4. We have structured upskilling programmes, including partnerships with external providers, that offer formal training, certifications, or accredited learning pathways to develop advanced internal capability in quantum-related innovation.
	To what extent is your organisation able to leverage existing internal expertise in quantum technologies?	1. Our organisation has little or no internal expertise in quantum technologies, and no strategy for developing or leveraging such expertise. 2. Our organisation has some internal expertise in quantum technologies, but there is no formal strategy to identify, coordinate, or leverage it. 3. Our organisation has significant internal expertise (such as experienced subject matter experts, researchers at doctoral level or higher) in quantum technologies, which is leveraged on an ad-hoc or project-specific basis to support work programmes. 4. Our organisation has significant internal expertise in quantum technologies (such as experienced subject matter experts, researchers at doctoral level or higher), which is consistently and strategically leveraged across work programmes and actively developed over time.
	How are quantum related innovations reflected in your supervisory strategy and engagement model?	1. Supervisory strategy and engagement models are not designed to reflect or engage with quantum related innovation. 2. Supervisory strategy and engagement models allow for consideration of quantum related innovation on a discretionary or ad hoc basis. 3. Supervisory strategy and engagement models explicitly facilitate supervisory engagement on the responsible development and use of quantum technologies. 4. Supervisory strategy and engagement models are tailored to support and provide clear coverage of evolving quantum-related innovation.

Do	To what extent do you collect data on firms' quantum-related innovative initiatives?	1. We have not conducted any data collection relating to firms' quantum-related innovation activities. 2. We have conducted limited, pilot, or primarily qualitative data collection on firms' quantum-related innovation activities to support exploratory understanding or situational awareness. 3. We have developed qualitative and quantitative data collection approaches to assess firms' use of quantum-related innovation and to inform regulatory understanding, supervisory activity, or policy development. 4. We maintain an ongoing qualitative and quantitative data collection capability that generates up-to-date insight into firms' quantum-related innovation activities and actively informs regulatory strategy, policy development, supervisory priorities, or industry engagement.
Engage	How does your organisation use Hackathons to explore quantum related innovation?	1. Our organisation has not used hackathons to explore quantum-related innovation. 2. Our organisation is planning or developing a hackathon focused on quantum-related innovation. 3. Our organisation has conducted a hackathon focused on quantum-related innovation to explore potential use cases, risks, or opportunities. 4. Our organisation has conducted hackathons on quantum-related innovation, and the insights generated have been used to inform the development of our regulatory or supervisory approach to quantum-related use cases in the financial sector.
	How does your organisation observe or evaluate quantum related PoCs in the market?	1. We have not conducted observation or evaluation of quantum-related proofs of concept (PoCs) in the market. 2. Observation or evaluation of quantum-related PoCs has occurred on a limited, exploratory, or ad-hoc basis. 3. We have conducted observation or evaluation of quantum-related PoCs, and the insights generated have been used to inform our regulatory understanding, policy development, or supervisory approach to quantum innovation. 4. We systematically observe and evaluate quantum-related PoCs to generate ongoing insight into developments, and use these insights to inform regulatory strategy, supervisory activity, and engagement and communication with industry.
	How actively does your organisation participate in events and industry roundtables on quantum related innovation?	1. Our organisation does not participate in events or industry roundtables on quantum-related innovation. 2. Our organisation participates in quantum-related events or roundtables on an occasional or ad-hoc basis. 3. Our organisation actively and regularly participates in industry events and roundtables on quantum-related innovation, primarily as a contributor, in order to gather insights and develop regulatory understanding. 4. Our organisation plays a leading and visible role in the ecosystem, including regularly convening or chairing industry events and roundtables, in order to gather insights and actively communicate with industry and stakeholders.
	How are calls for collaboration/open challenges used to advance quantum related innovation?	1. Our organisation has not used calls for collaboration or open challenges to advance our understanding of quantum related innovation. 2. We have launched a call for collaboration or open challenge to gather information from firms' exploration of quantum-related innovation. 3. We use calls for collaboration or open challenges to develop insights into the present and future regulatory implications of quantum innovation. 4. We use calls for collaboration or open challenges to shape our regulatory thinking and strategy to prepare for quantum adoption in the market.

Engage	Does your organisation make use of quantum-enabled testing environments for firms?	1. Our organisation does not make use of quantum-enabled technical testing environments for firms developing or deploying quantum-related innovation. 2. Our organisation is exploring, developing, or making limited use of quantum-enabled technical testing environments to support the technical assessment or validation of quantum-related innovation. 3. Our organisation actively uses quantum-enabled technical testing environments to support selected firms in testing or validating quantum-related innovation under defined technical and supervisory conditions. 4. Our organisation maintains established and structured quantum-enabled technical testing environments that are regularly used to assess, validate, and oversee quantum-related innovation as part of a standing supervisory capability.
	Do you offer sandboxes for firms to test quantum-related innovation in a controlled environment?	1. Our organisation does not operate regulatory sandboxes for firms developing or testing quantum-related innovation. 2. Our organisation is planning or developing regulatory sandbox arrangements to allow firms to test quantum-related innovation under controlled regulatory conditions. 3. Our organisation operates regulatory sandboxes that allow selected firms to test quantum-related innovation within defined regulatory parameters and supervisory oversight. 4. Our organisation operates established regulatory sandboxes for quantum-related innovation and systematically uses insights from firms' testing activities to inform regulatory understanding, supervisory approaches, and industry engagement.
	How mature is your cross border collaboration for quantum related pilots and sandboxes?	1. Our organisation does not participate in cross-border collaboration in quantum-related pilots or sandboxes. 2. Our organisation is participating or planning to participate with some cross border engagement or research. 3. Our organisation is actively participating in cross-border collaboration or research on a quantum-related sandbox or environments. 4. Our organisation uses its convening powers to lead or co-lead cross-border sandboxes and/or pilots to support quantum innovation.

GLOBAL FINANCIAL
INNOVATION NETWORK

GFIN is the international network of financial regulators and related organisations committed to supporting financial innovation in the best interests of consumers.

GFIN was formally launched in January 2019 by an international group of financial regulators and related organisations.

GFIN is a network of over 90 organisations committed to supporting financial innovation in the interests of consumers. It seeks to provide a more efficient way for innovative firms to interact with regulators, helping them navigate between countries as they look to scale new ideas. This includes the ability to apply to join a pilot for firms wishing to test innovativeproducts, services or business models across more than one jurisdiction.

GFIN also aims to create a framework for co-operation between financial services regulators on innovation related topics, sharing different experiences and approaches.

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