QED-C

5th Annual Global QC Market Survey: Continued Progress But Changes in the Air

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QC Market Executive Summary/Highlights

- The global quantum computing (QC) market is estimated to have been worth $1.07 billion in 2024, with a projected average annual growth rate of 27%, driving the global market to $2.2 billion on 2027
- Based on a survey of 115 respondents representing 82 QC companies:
  - 41% estimate their organization's revenues will increase by more than 25% in 2025, up from 36.6% in 2024
  - 18% are looking to 2025 gains to be on the order of 11-25%, almost double last year's percentage of 9.8%
  - The number of firms that see flat or nearly the same revenues dropped from 25.6% in 2024 to 9.8% in 2025
- Partnerships have become a fundamental activity within QC supplier sector
  - 83% had partnerships with other QC supplier(s)
  - 74% had partnerships with at least one government research organization
  - 71% had partnerships with at least one QC end user
- Anticipated cloud and on-premises revenues will be nearing parity in 2027
  - Total on-prem activities projected to account for 46% of QC market in 2027
  - Up from 31% in last year's market study
- Modeling/simulation anticipated to remain the #1 algorithm by revenue in 2027
  - Significant appearance of mixed QC algorithms follows refinement of *Other* option from previous years
  - Optimization and AI remain major algorithms

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QC Market Executive Summary/Highlights (cont.)

- Aspiring QC end users are looking for new algorithms and ways to address concerns with future classical performance
  - But many are still exploring for the sake of exploration
  - One in four are looking at real-time compute opportunities
  - Interest in lowering total compute costs is gaining traction
    - 2023 Survey: 9.0%
    - 2025 Survey: 23.5%
  - Not so with reducing power/cooling costs
    - 2023 Survey: 17.3%
    - 2025 Survey: 14.8%
- About half of the respondents (52%) expect the availability of utility class QC in the next 2-5 years
  - About one in three say five years or more
  - About 8% say they are already here or will be in the next year
- Almost half of the respondents see a chance for a quantum winter
  - Significant jump from last year in ‘very high’ from 14% to 24%
  - Combined with drop in ‘somewhat unlikely’ from 33% to 25%
- LLMs – and likely generative AI in general – are seen as near-term competitor for QC end user interest by 47% of respondents, up from 42% last year

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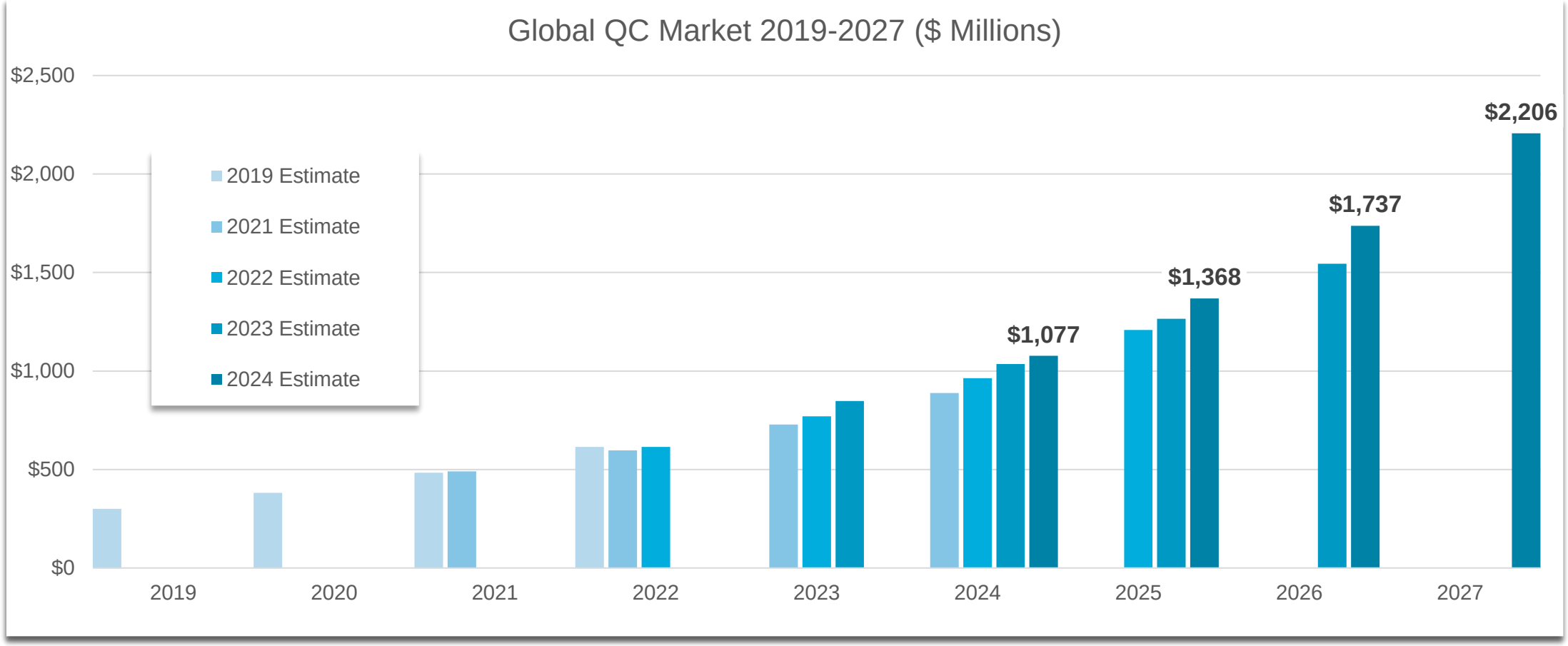
QC Market Estimate: $1.07 billion in 2024

27% annual growth rate drives global QC market to $2.2 billion in 2027



- Exponential curve begins to dominate growth
- Consistently underestimating growth?

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QC Market Projection Considerations

Key factors contributing to growing QC market complexity

- Increased interest/orders/installations for on-premises systems will drive significant revenues for some
  - D-Wave FY 2024 bookings exceeded $23 million, a 120% increase over FY 2023, due in large part to a single system purchase by Davidson Technologies
  - QuEra was awarded a $42 million contract in 2024 by Japan's AIST to deliver an on-premises QC
- Losses generally, and sometimes significantly, outweigh revenues
  - Company A posted revenues of $10.8 million with a net loss of $201.0 million for 2024
  - Company B recognized revenue of $43.1 million with a net loss of $331.6 million for 2024
- Most QC companies are private, and most intend to stay that way for at least the next few years
  - Limited financial reporting requirements
  - The bulk of funding inputs are not revenue based but instead come from VC or government sources
- External funding numbers are growing substantially and will likely skew markets
  - PsiQuantum will deliver QC in 2027 funded by the Australian government for $620 million
  - Honeywell announced the competition of a $300 million equity fundraise for Quantinuum
  - Quantum computing startups have already raised $1.5 billion in venture funding in 50 deals ($30 million/deal average) compared of nearly $963 million in 77 deals in 2022 ($12 million/deal average)

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QC Supplier Survey:
Road Map and Key Demographics

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2024 QC Market Dynamics Study Roadmap

Formulate global status and prospects from a data-driven perspective

- Conducted QC supplier survey to gather data and insights on QC market dynamics
- Many thanks for assistance from various QC consortia in reaching out to their respective membership base to encourage participation in this effort:
  - Quantum Economic Development Consortium (QED-C) **(Project Sponsor)**
  - European Quantum Industry Consortium (QuIC)
  - Quantum Industry Canada
  - Japan Quantum STrategic industry Alliance for Revolution (Q-STAR)
  - Australian Quantum Alliance
  - UKQuantum
  - Korea Quantum Industry Association
- Gathered results to span:
  - Geographic variety, company size (total and QC-related revenues), market concentration, QC industry sentiment, and impressions on general trends in the sector
- Analyzed results from 115 respondents representing 82 different companies
  - Individual responses for industry-wide questions
  - Combined single response for multiple inputs from single organizations

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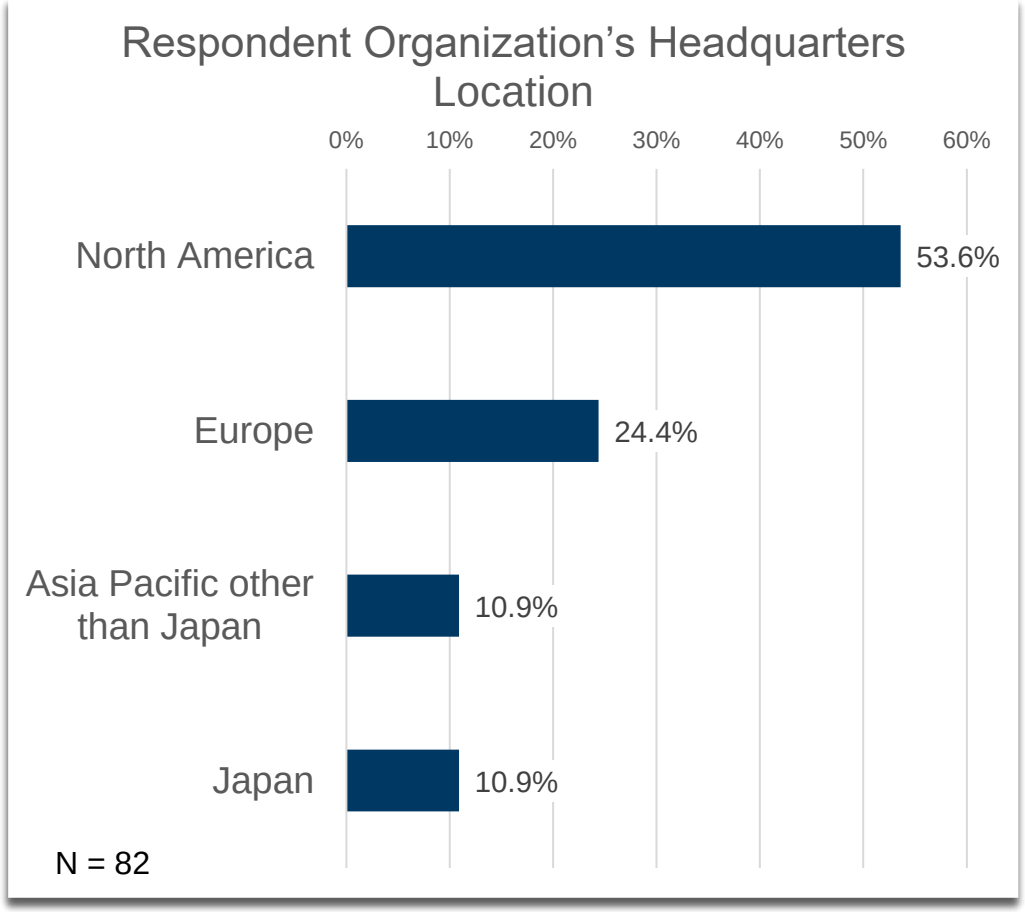
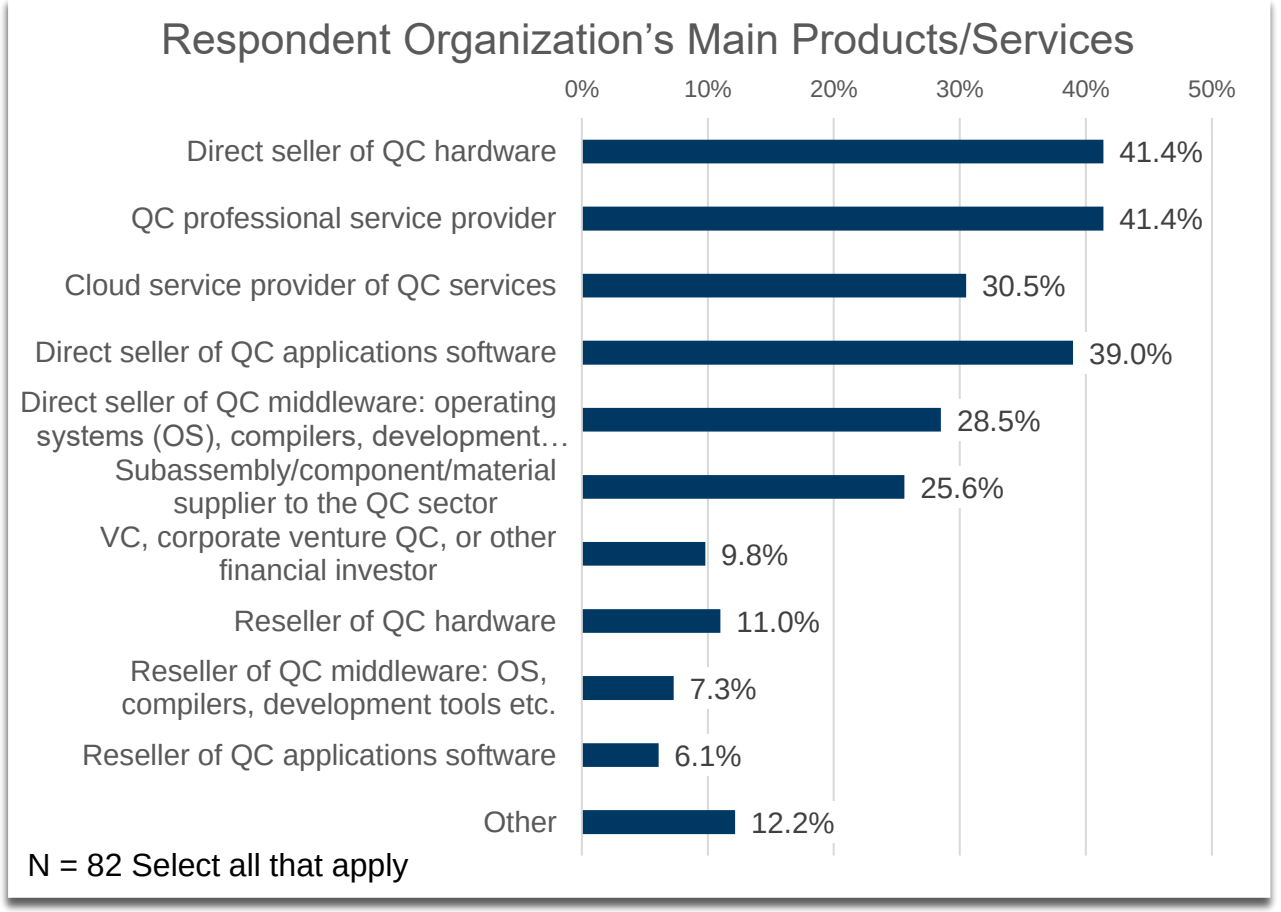
QC Supplier Demographics: Location and Activity

Casting a wide regional and functional net





50% of respondent organizations had either R&D or manufacturing facilities outside their organization's headquarters country

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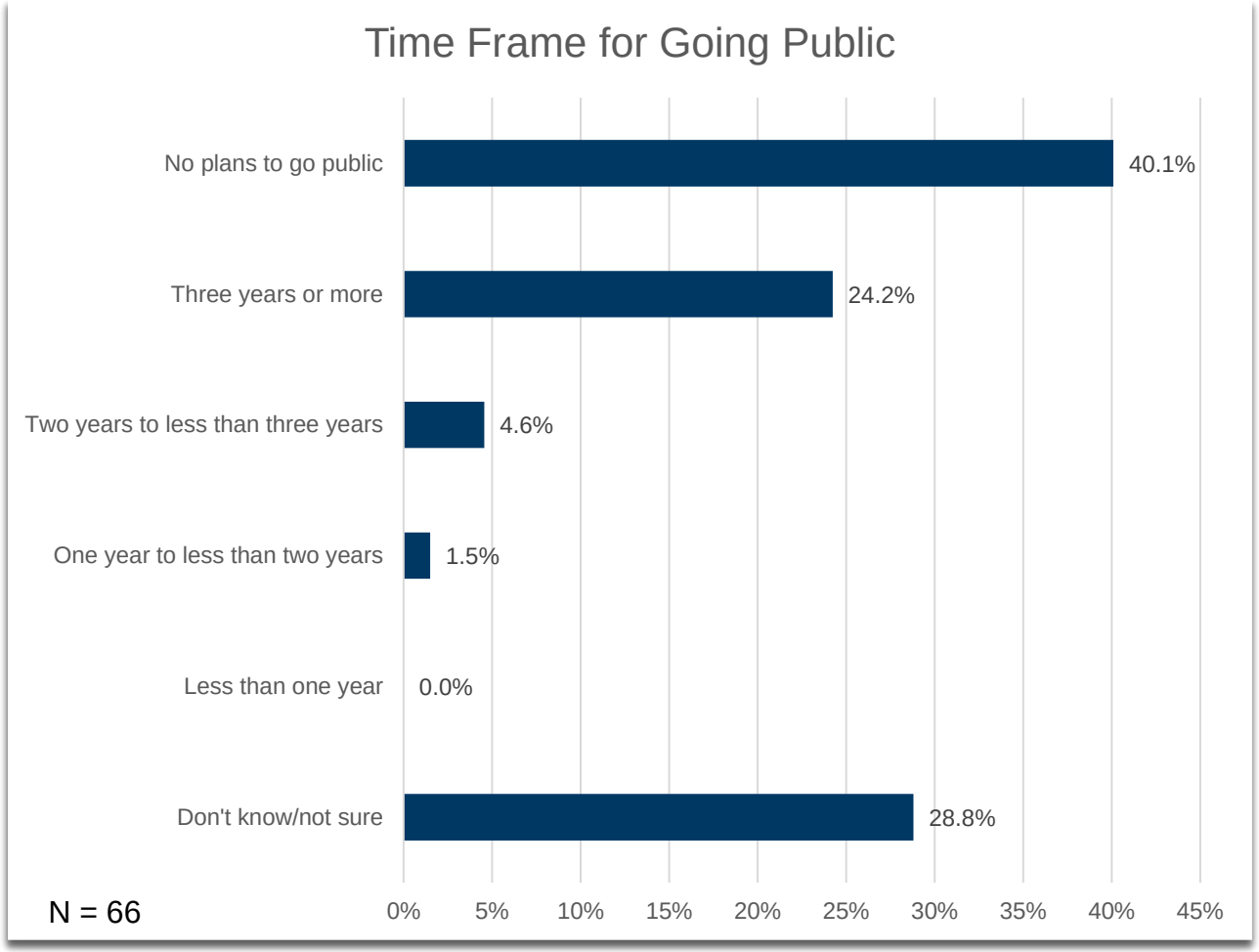
QC Supplier Demographics: Public/Private

80 of respondents' organizations were private, 20% public



- Very few private firms plan to go public in the next two years (~1%)
  - 40% have no current plans
  - 25% looking at 3 years or more
  - But more than one quarter don't know
- For the 16 firms that are currently public, 81% have been that way for more than five years
  - Only a handful went public in the last five years

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QC Partnerships: With QC Suppliers

Most respondent organizations have a range of QC supplier partnerships

Option	% Selected
Access to QC-related technical expertise	42.6%
Access to larger customer base within key sectors/verticals	39.7%
Access to financial resources	38.2%
Access to new QC-related hardware technologies/capabilities	35.3%
Foster public attention	35.3%
Access to new QC-related software capabilities/capabilities	33.8%
Access to new sectors/verticals (e.g., financial, energy, pharmaceuticals)	23.5%
Access to new geographic markets	23.5%
Access to fill QC-related hardware product gaps	20.6%
Access to classical IT technology	16.2%
Access to fill QC-related software product gaps	10.3%
Access to IP, patents, or proprietary information	10.3%
Access to classical IT experts	8.8%
Other	2.9%

N = 68, Select all that apply

- 83% of respondent organizations have a commercial partnership or other relationship with at least one other QC supplier
- Average respondent selected 3.4 options
- Access to QC expertise, focused client base, and new technologies top the list of selected options
- Partnerships to access classical IT technology or expertise was considered a low priority
- IP not yet an overwhelming concern

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QC Partnerships: With Government Research Community

Most respondent organizations have a range of partnerships with a govt. research organization

Option	% Selected
Access to government funding	62.3%
Access to government-funded QC research activities	42.6%
Explore the hybrid quantum/classical QC systems	39.3%
Foster public attention	36.1%
Access to leading-edge QC hardware development	34.4%
Access to key advanced quantum computing experts	32.8%
Explore key government QC use cases	31.1%
Explore key government QC applications	29.5%
Explore the co-design of QC systems	27.9%
Access to leading-edge QC research in algorithms	26.2%
Help develop quantum/classical hybrid algorithms	24.6%
Access to leading-edge QC research in applications	21.3%
Support for publication of QC-related research in key journals	18.0%
Access to leading-edge QC software development	16.4%
Access to key advanced classical computing hardware	13.1%
Access to key advanced classical computing experts	8.2%
Access to key advanced classical computing software	8.2%
Other	4.9%

N = 61, Select all that apply

- 74% of respondent organizations have a partnership with at least one government research organization
- Average respondent selected 4.9 options
- Most selected option was access to government funding, by almost two-thirds of the respondents
  - Access to government QC research ranked nearly as high
  - Hybrid QC/classical work was also of high interest
- Access to classical IT - in any form, hardware, expertise, software - not a priority for government partnerships

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QC Partnerships: With QC End Users

Most respondent organizations have a range of partnerships with QC end users

Option	% Selected
Explore new QC sector/vertical-specific QC-related opportunities	74.1%
Field test/evaluate new QC hardware	44.8%
Field test/evaluate new QC software	44.8%
Explore key performance gains over classical counterpart	43.1%
Establish sector-specific capabilities	41.4%
Foster public attention	39.7%
Encourage follow-on sales	36.2%
Explore QC/classical integration issues	31.0%
Access QC end user QC expertise	29.3%
Explorer QC sector/vertical-specific performance opportunities on existing classical workloads	27.6%
Access QC end user classical IT expertise	8.6%
Other	5.2%

N = 58, Select all that apply

- 71% of respondent organizations have a partnership with at least one QC end user
- Average respondent selected 4.2 options
- Field testing QC hardware and software both selected 44.8%
- Exploring sector-specific opportunities was overwhelming justification (74.1%)
- Building sector-specific skills (41.4%) and exploring QC performance advantages (43.1%) also key drivers

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QC Supplier Survey:
Current and Future Revenue

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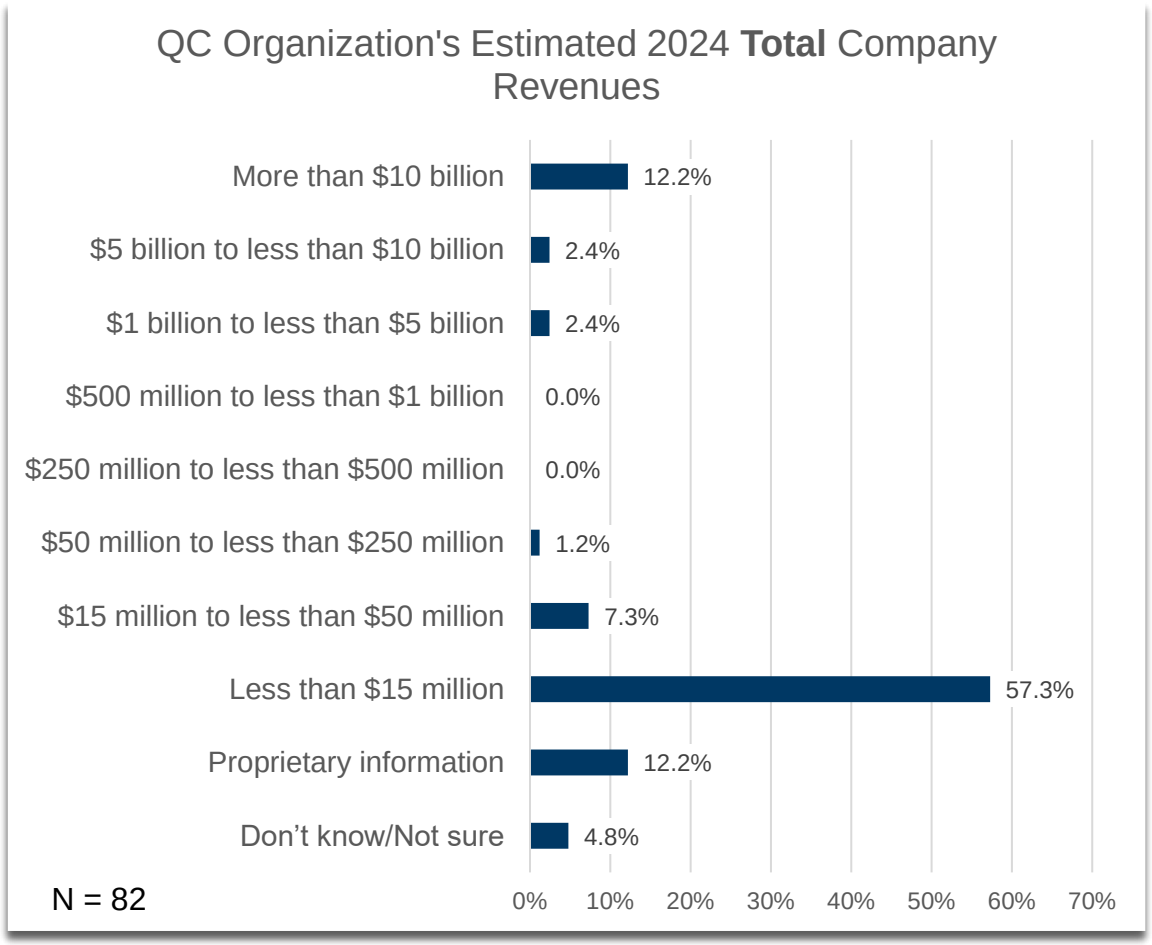
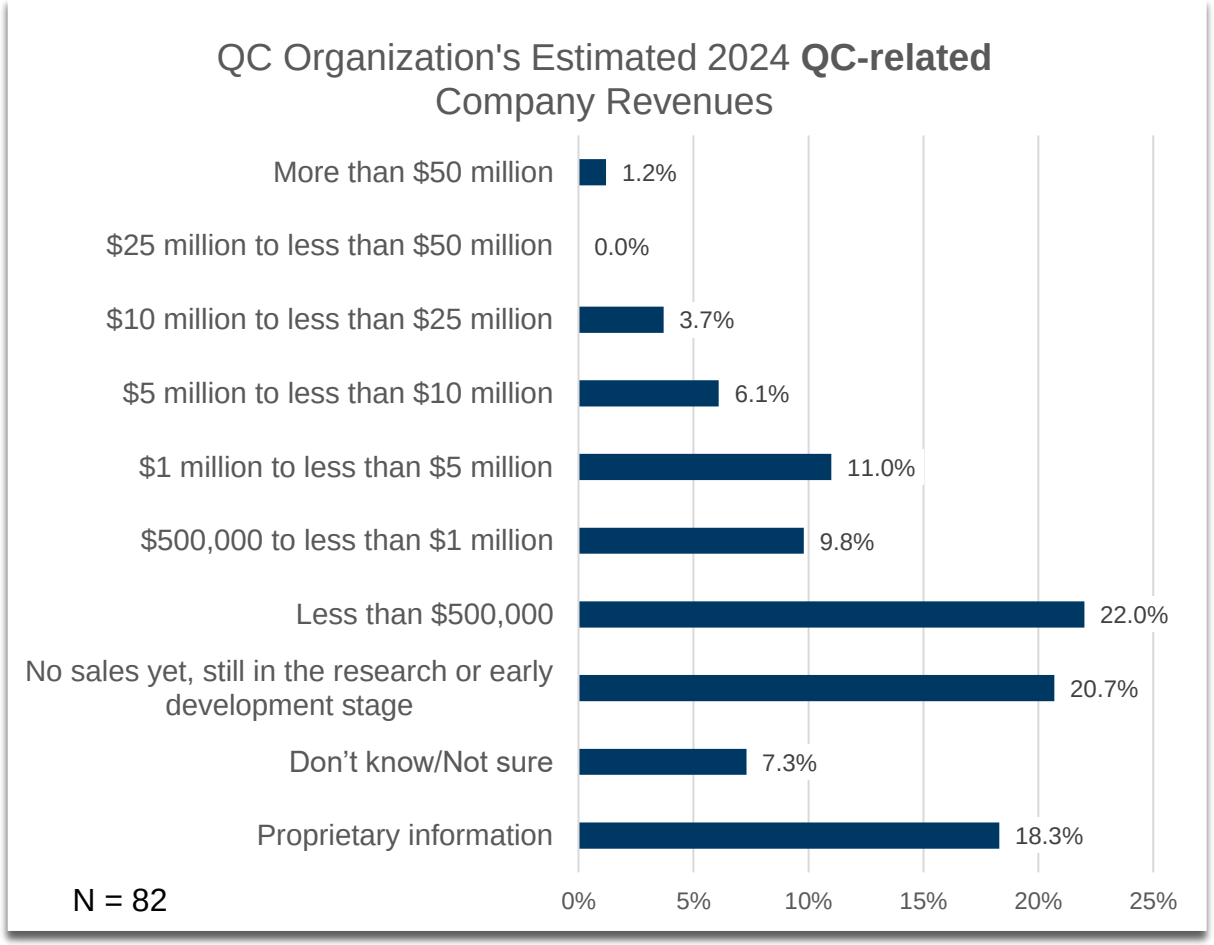
QC Suppliers: 2024 Total and QC Revenues

QC revenues: 42% < $500K, 22% > $1 million, 4 companies above $10 million





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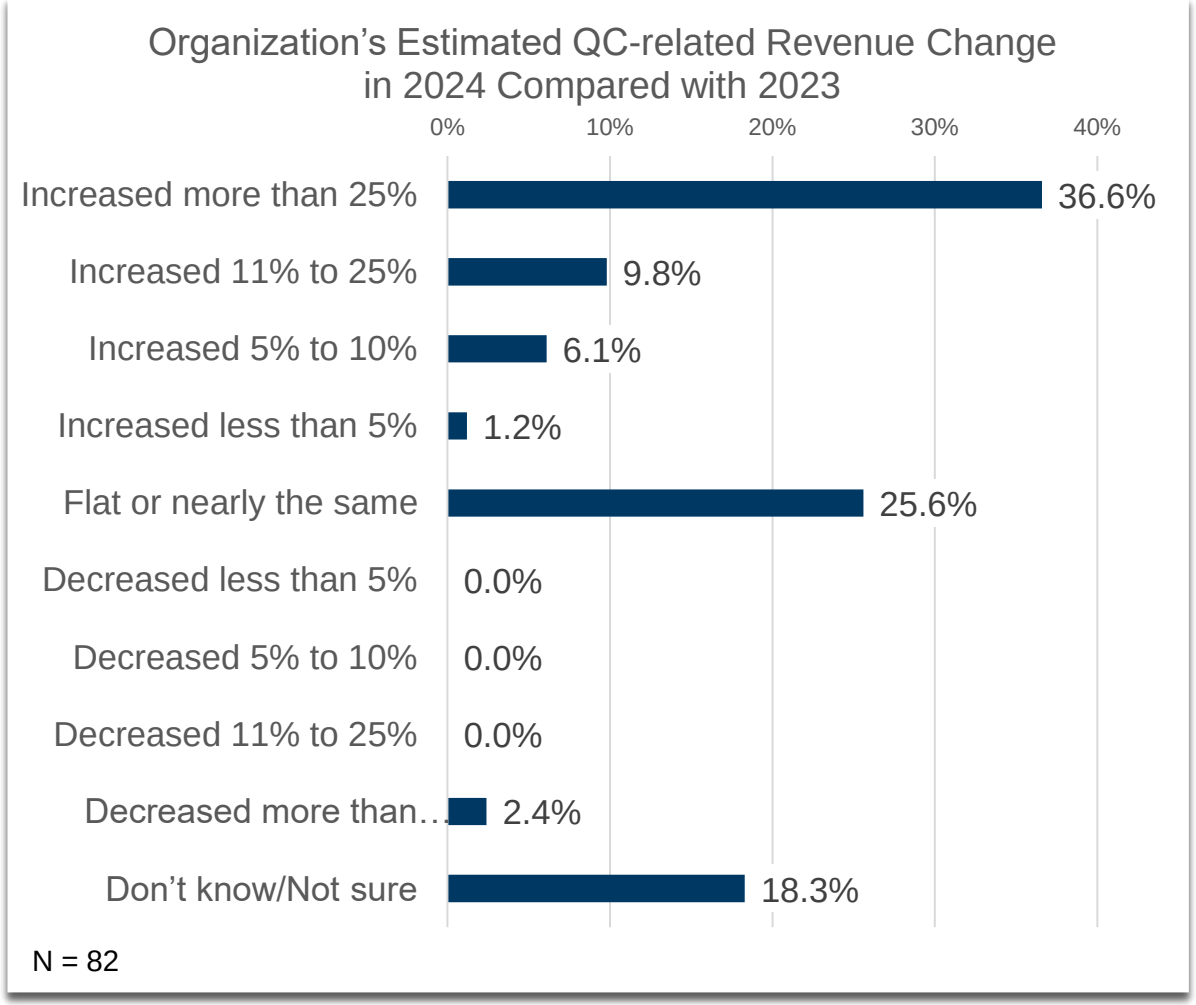
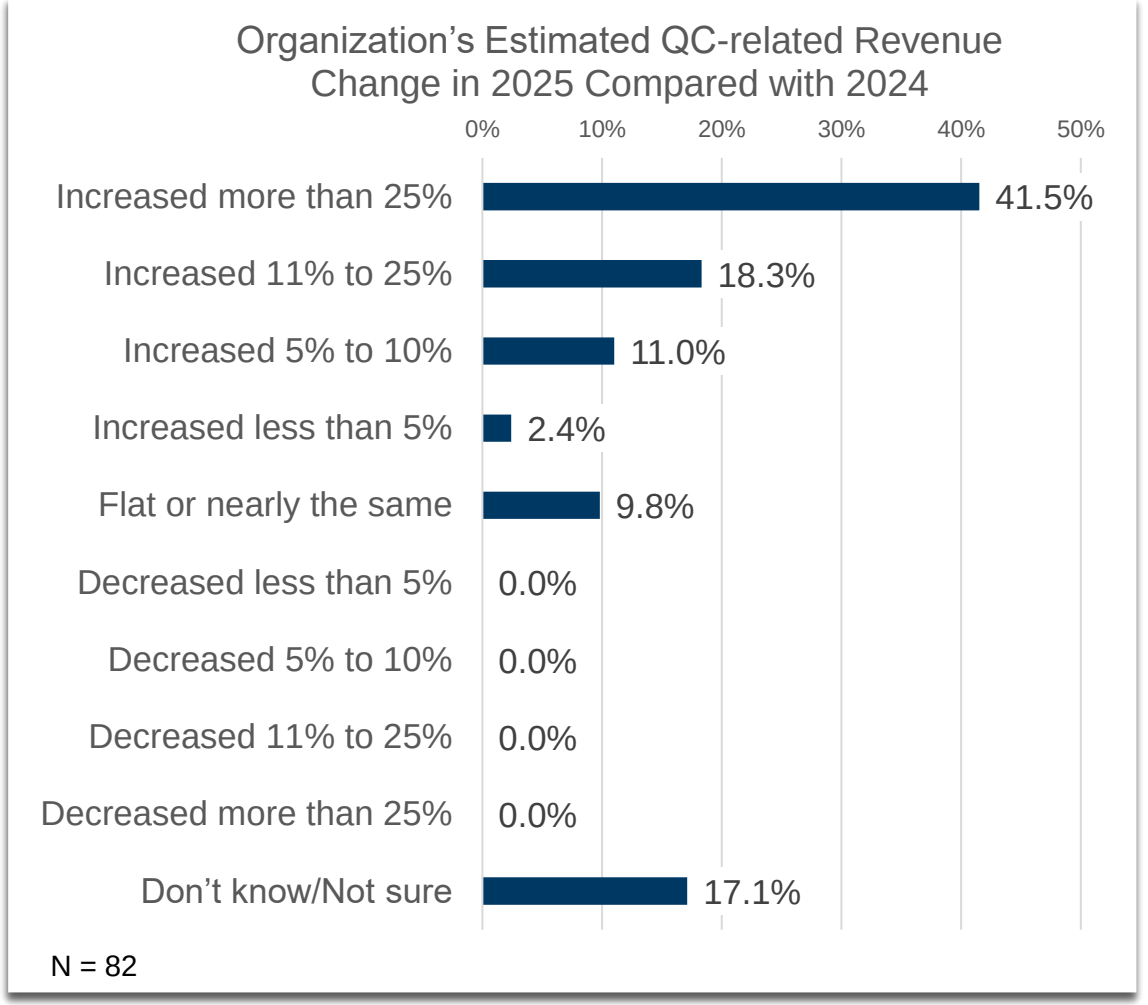
QC Suppliers: Accelerating Revenue

42% expect more than 25% growth in 2025, no expected decreases





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QC Suppliers: 2024 QC Financial Resource Inputs

Government-provided R&D major financial resource, followed by VCs

Option	% Responses
Government-provided R&D funding	52.4%
Venture capital funding	45.1%
Internal organization R&D budgets	35.4%
Commercial user payments for on-premises QC products and services	24.4%
Commercial user payments for cloud access models	18.3%
Government end user payments for on-premises QC products and services	17.1%
Academic user payments for on-premises QC products and services	14.6%
Government end user payments for cloud access models	9.8%
Academic end user payments for cloud access models	8.5%
Private loans	3.7%
Commercial loans	3.7%
Stock offerings	2.4%

N = 82

- QC suppliers rely on a mixture of income/funding inputs to support their operations
- About half of organizations surveyed received funding from government organizations or VCs
- One third from internal R&D budgets
- 24% received payments from commercial end users for direct products and services
  - 17% from government
  - 15% from academia
- More traditional financial instruments (stocks and loans) not widely used

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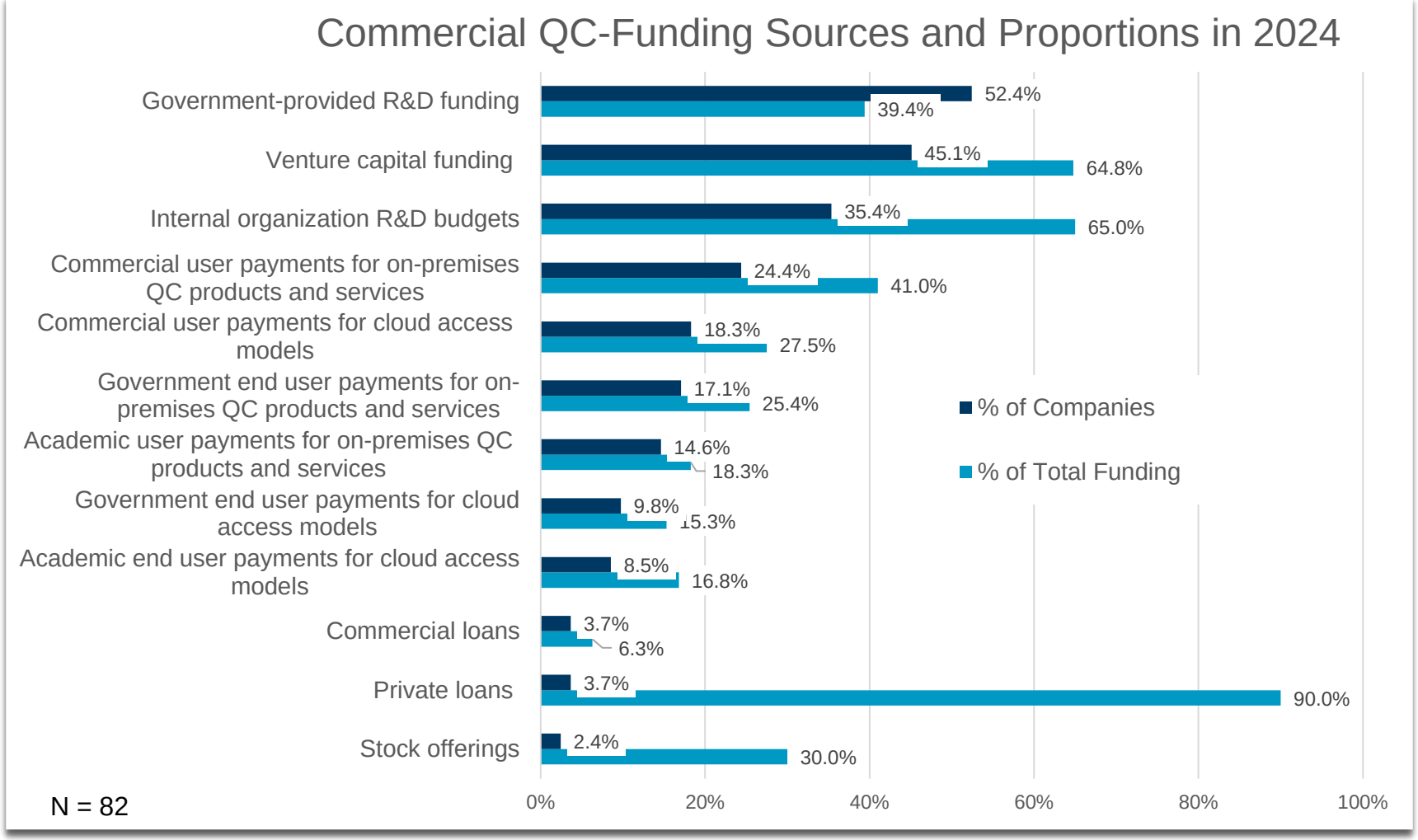
QC Suppliers: 2024 QC Funding/Proportions

Funding Option Prevalence vs Level of Resource Inputs



- 52% of respondent organizations receive some form of government R&D funding at an average worth about 40% of their total resource input
- 45% receive funding from VCs to support an average of 65% of their total resource input
- Internal R&D budgets, available to 35% of respondent organizations provide almost two-thirds of resource inputs

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Focus on QC Market Segments, Algorithms, Access, End User Sectors, and Budgets

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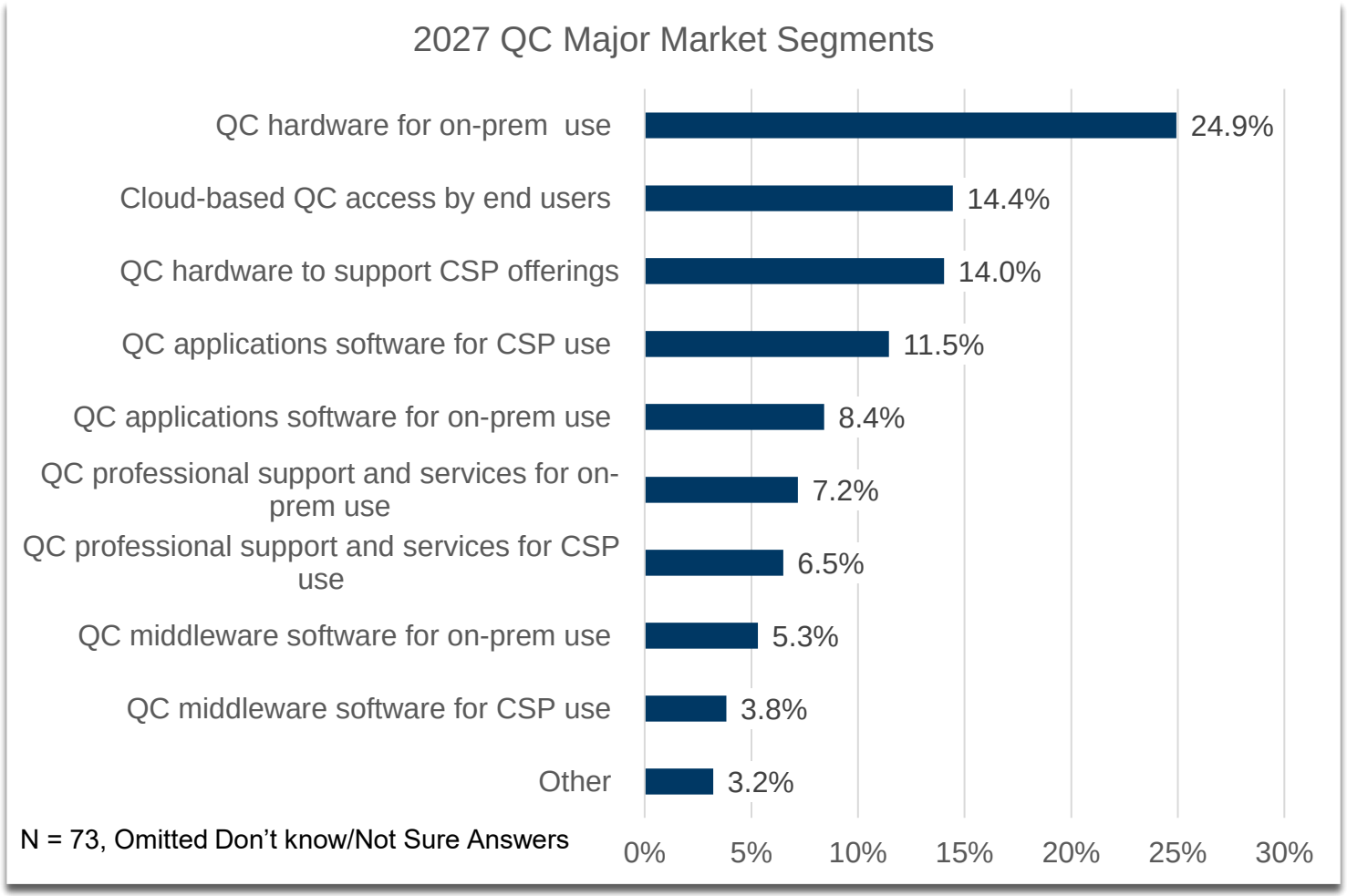
QC Market 2027: Major Market Segments

QC hardware 30% of the market, CSP-related revenues about half



- Cloud and on-premises revenues nearing parity in 2027
  - Total on-prem activities account for 46% of QC market in 2027
  - Up from 31% in last year's estimate for 2026
  - Denotes larger number of smaller cloud efforts or smaller number of larger on-premises counterparts?
- QC hardware for on-prem + cloud = 38.9%
  - Equates to $855 million QC hardware market in 2027
- Total professional services sector 14% of QC market in 2027, worth $310 million

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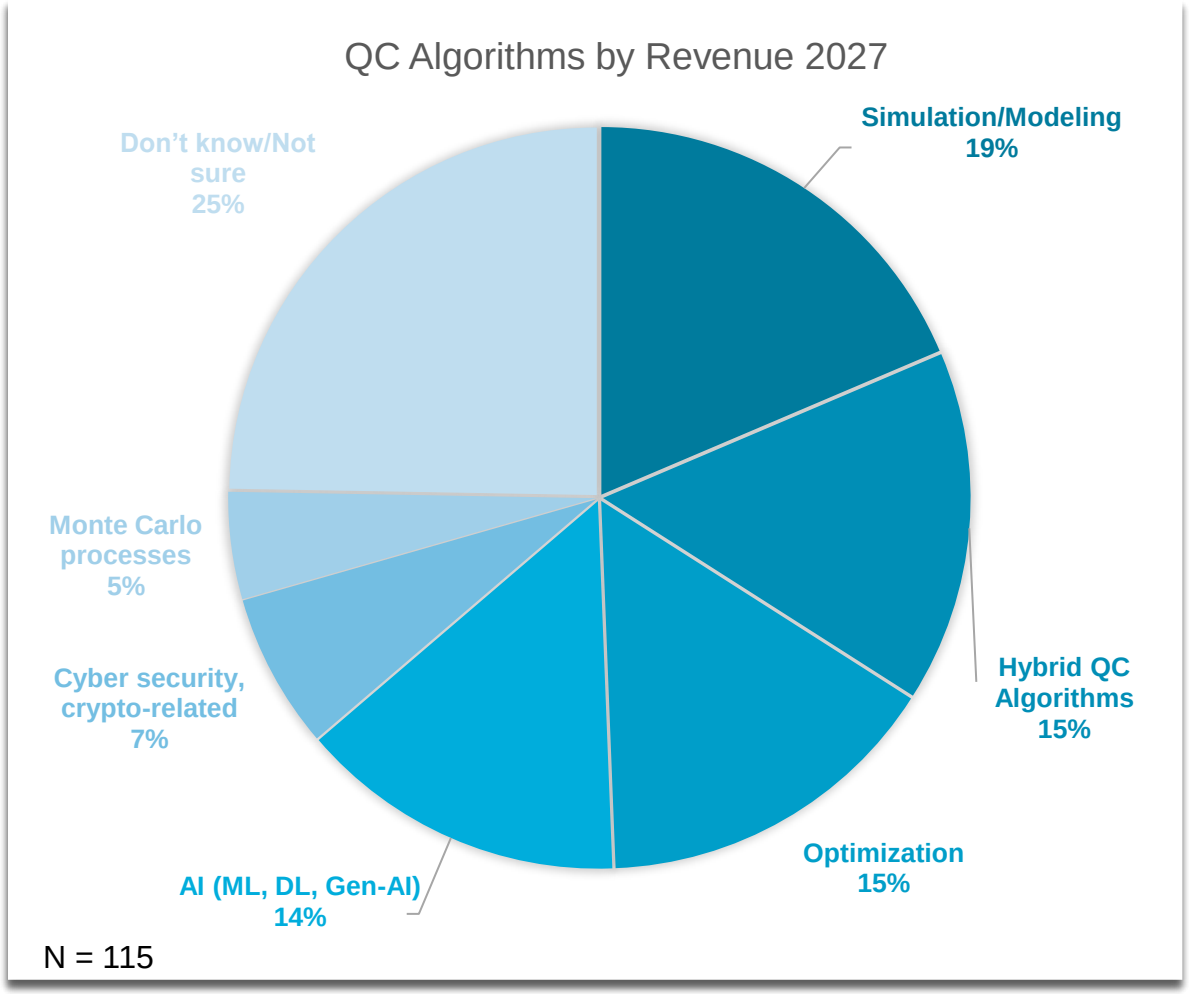
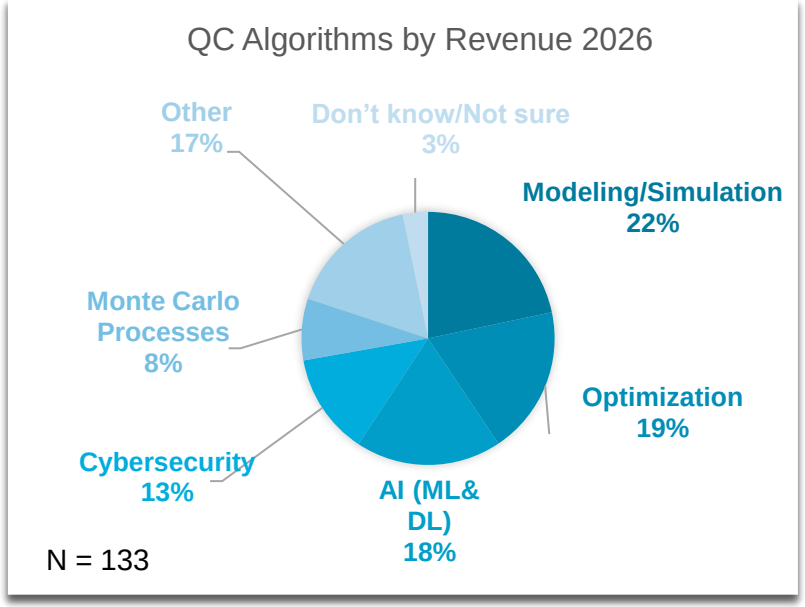
QC Market 2027: Major Algorithms by Revenue

Mod/sim #1 algorithm, but hybrid comes to the fore



- Modeling/simulation remains at #1
- Appearance of hybrid QC algorithms follows refinement of Others option from previous years
- Don't know/Not Sure dominates responses
  - Is this a problem for the QC supplier base?



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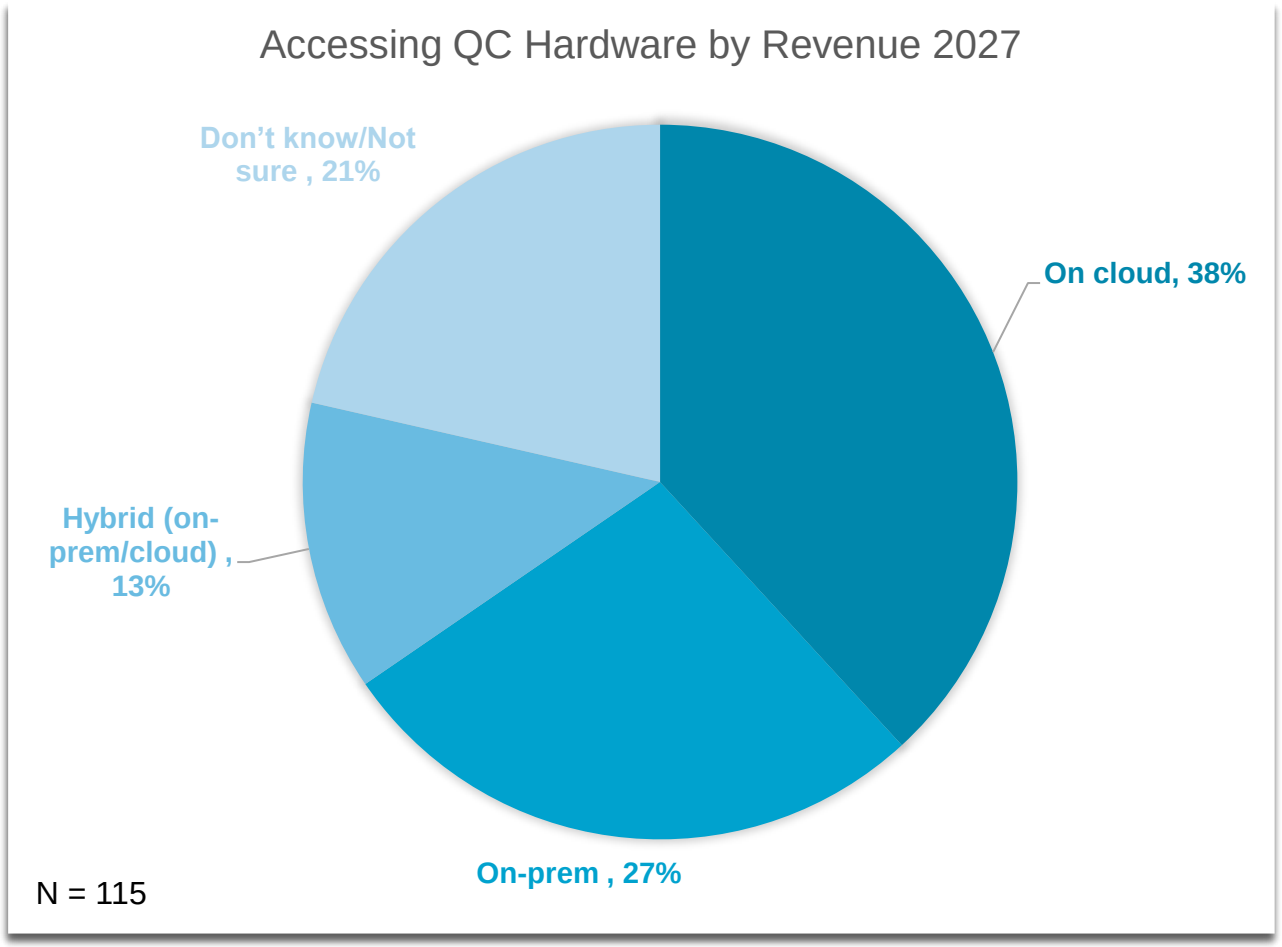
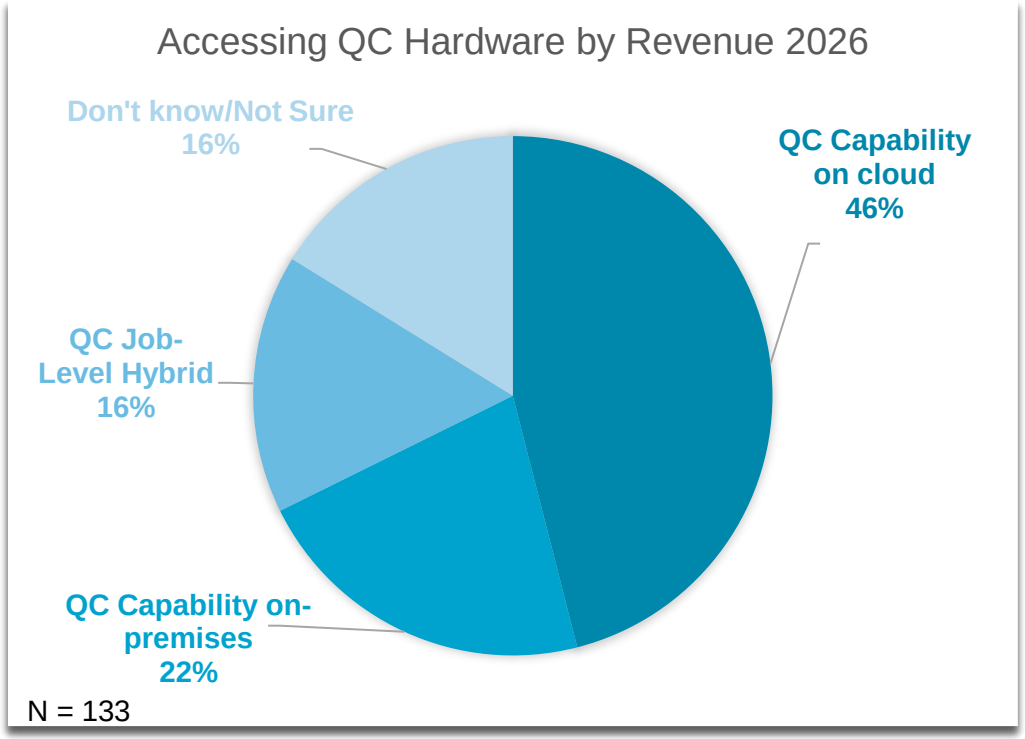
QC Market 2027: Access to QC Hardware

Cloud continues to dominate but on-prem moving up



- Cloud revenues move from 46% to 38%
- Biggest move since tracking this number
- More Don't know/Not sure: more fence sitting?



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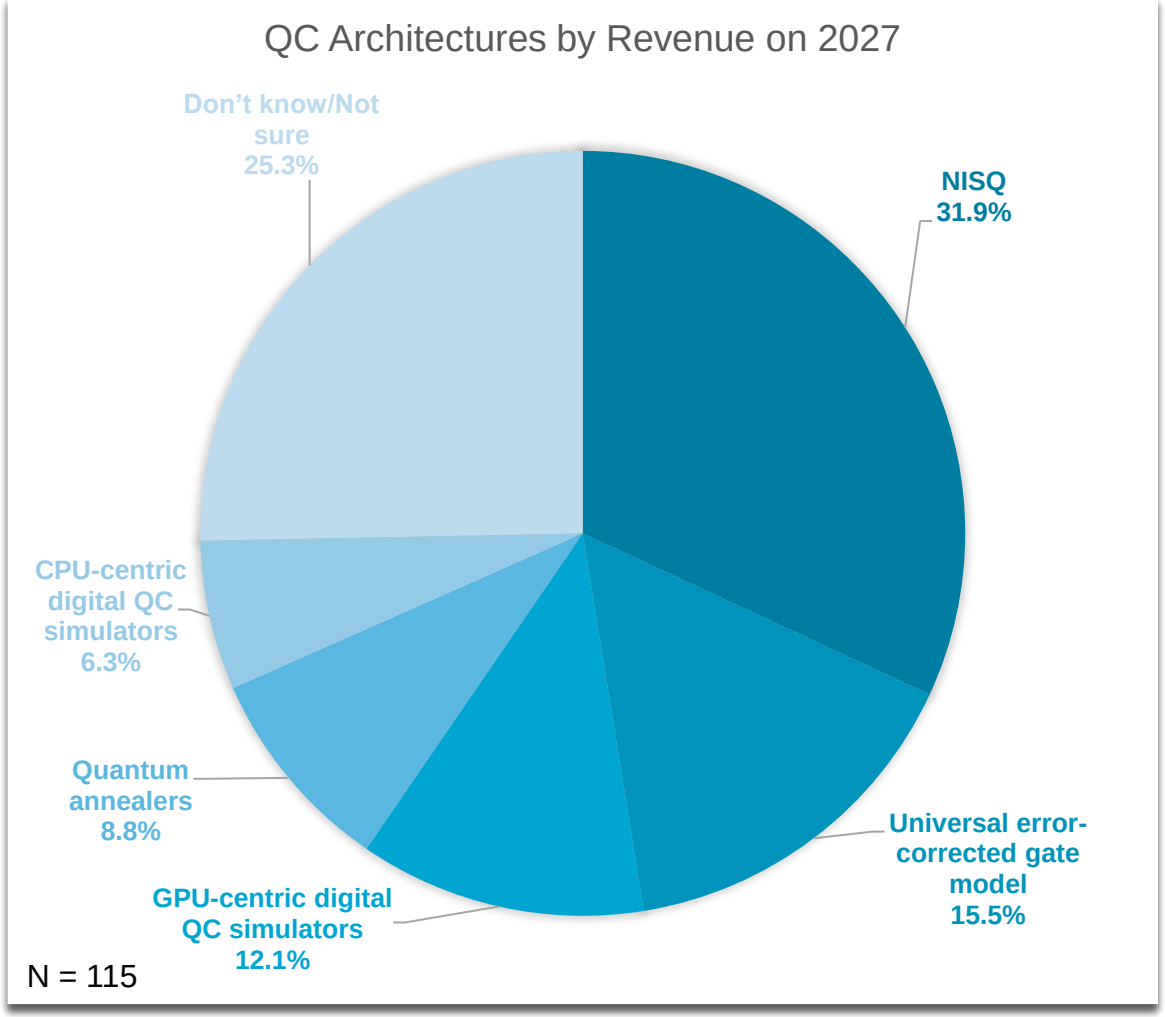
QC Market 2027: QC Architectures

NISQ maintains lead, QC simulators still major element of QC architecture



- NISQ dominates QC architecture in 2027
  - 2X universal error corrected gate model alternative
- Digital simulators (CPU and GPU based) combine for almost 19% of hardware market
  - But GPUs are preferred at 2x CPU rate
  - Room for options here
- Many Don't Knows/Not Sures
  - More fence sitting or lack of information?

N = 133

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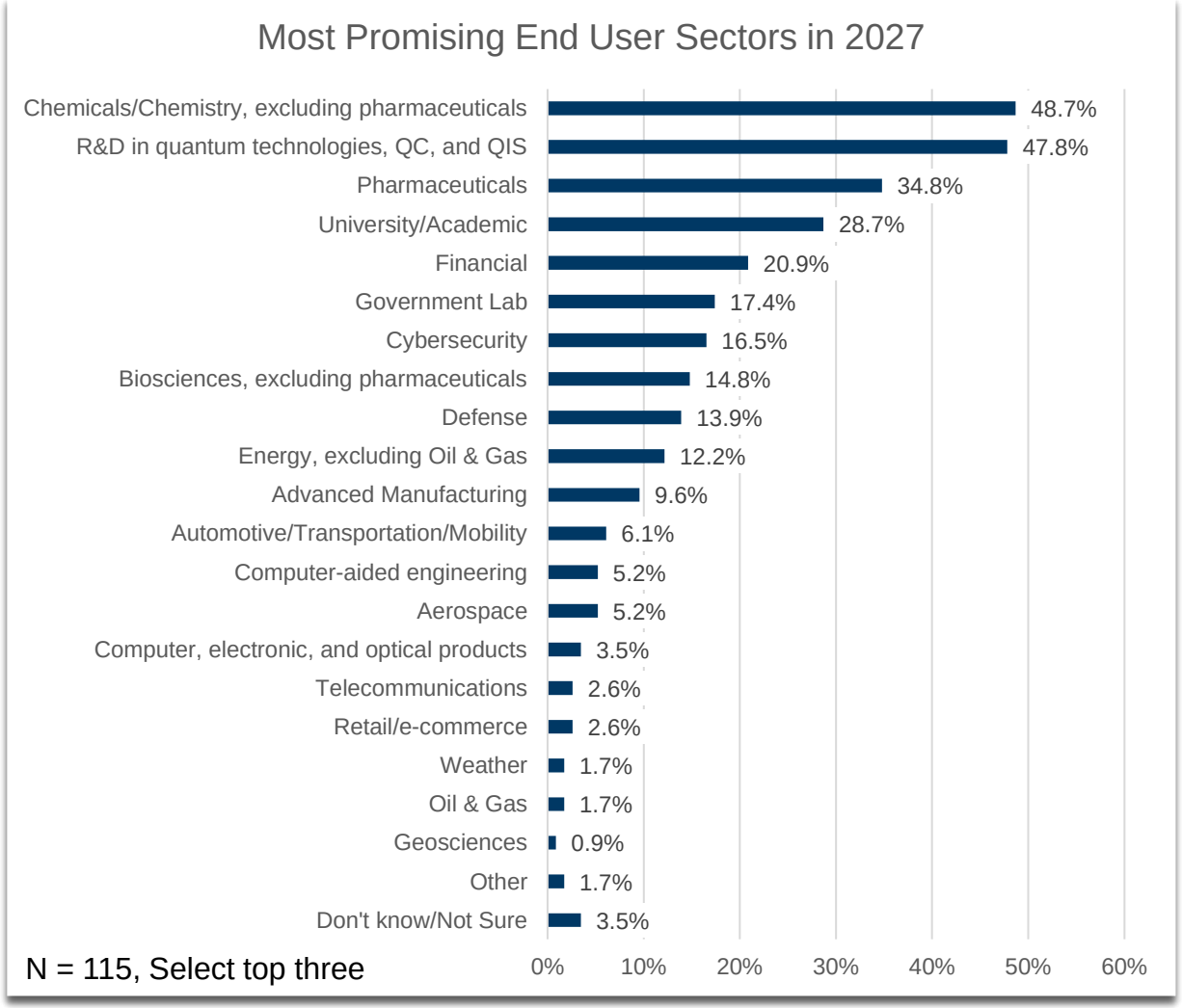
QC Market 2027: Top End User Sectors

Chemicals and QC R&D on top, but broad applicability envisioned



- Chemical/Chemistry sector hits number 1
  - Up from #2 last year, #4 year before that
  - Reinforces early emphasis on mod/sim, especially computational chemistry, as major algorithm
- Likewise, pharmaceuticals continues its upward climb
  - 21% last year, 35% this year
- Applicability spans academic, commercial, and government spaces
- Finance drops from 30% to 21%
  - Optimization issues, saturation or contrived lack of visibility?
- Government labs hold steady, for now
- Although nearly every sector choice deemed important by some, there are clear concentrations in key areas

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QC Market 2027: Primary End User Motivations

New algorithms and future classical performance concerns lead

Option	% Selected
Implement new algorithm(s) not possible on classical counterpart systems	56.5%
Address concerns with future performance capabilities of classical computing systems	51.3%
Explore organizationally relevant QC use case potential with no expectations of near-term advantage	47.0%
Develop in-house familiarization with QC skills with no expectations of near-term end use deployment	45.2%
Engage with the QC vendor community for future activities	31.3%
Enable better real-time computational capabilities	27.8%
Realize faster turnaround time on existing classical counterpart systems	27.0%
Reduce overall computing systems costs	23.5%
Reduce overall computational power and cooling requirements	14.8%
Don't know/Not sure	5.2%
Other	2.6%

N = 115, Select all that apply

- Implement new algorithms and address concerns with future classical performance selected by majority of respondents
  - Classical developments could impact QC uptake
- An average of 3.3 options selected per respondent
- Many are still exploring for the sake of exploration
- One in four are looking at real-time compute opportunities
- Reduce overall compute systems cost:
  - 2023 Survey: 9.0%
  - 2025 Survey: 23.5%
- Reduce Power/Cooling Costs
  - 2023 Survey: 17.3%
  - 2025 Survey: 14.8%

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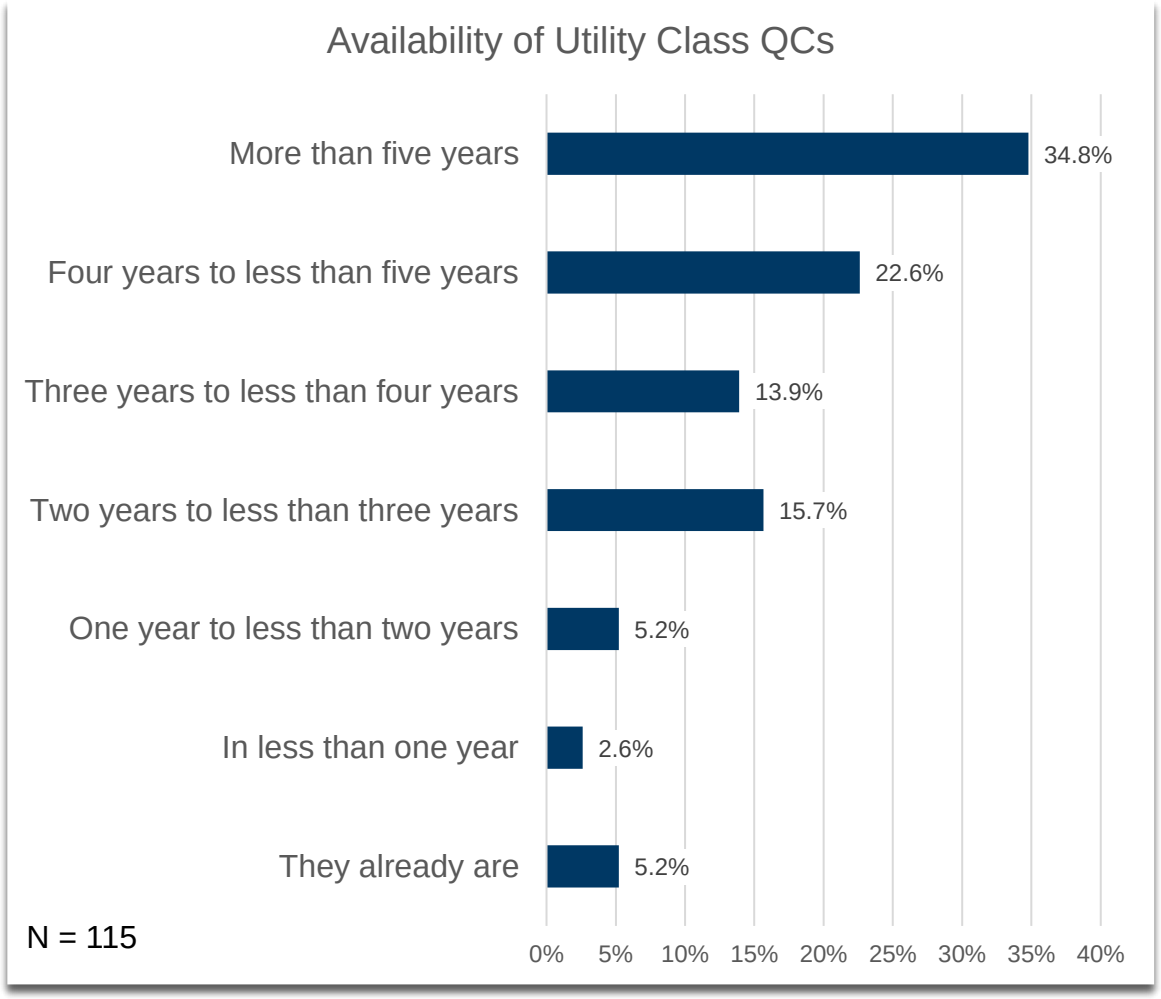
Utility-Class QCs: Expected Time Frame

About half of the respondents indicate a time frame of 2-4 years



- About half of the respondents (52%) expect the availability of utility class QC in the next 2-5 years
- About one in three say five years or more
- About 8% say they are already here or will be in the next year
- Utility class QCs are defined as systems used for mission- or business-critical, production-level compute jobs
- Utility class definition says little about specific QC metrics and benchmarks and more about perceived end use capabilities

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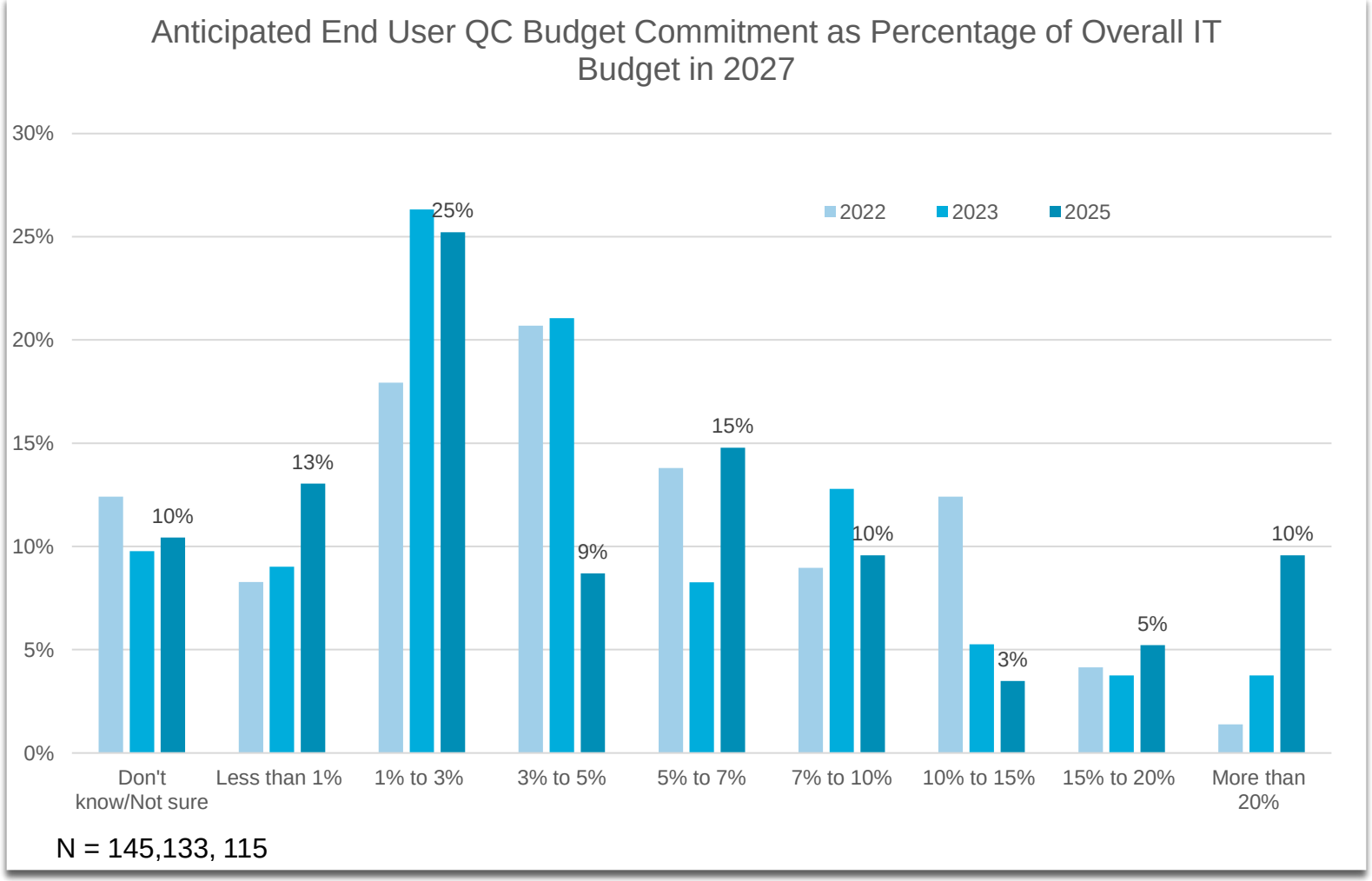
QC 2027: Anticipated QC Budget Commitment

Half see QC budgets at 1%-7% of total IT budget, but 10% see 20% or more



N = 145,133, 115

- One in four, the largest group, are seen as committing 1% to 3% of their overall IT budget to QC
- 49% are seen as committing between 1%-7% of their overall IT budget to QC
- 1 in 18 see it reaching between 10% or more
- Spending at 20% or more of total IT budget goes to one in ten

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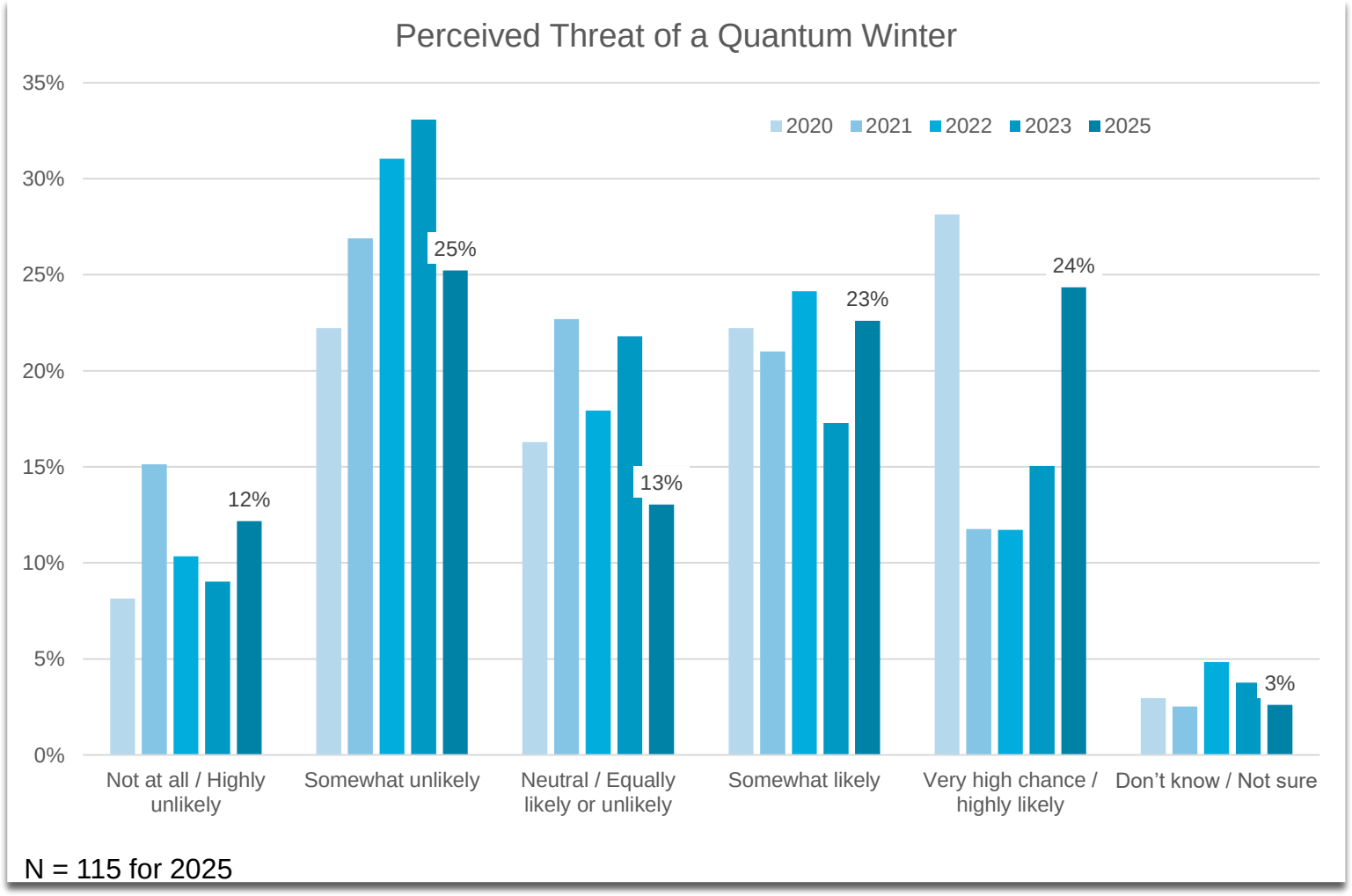
Whither Quantum Winter?

Rising concerns with many suspects



- Almost half of respondents see a chance for a quantum winter
  - Significant jump in very high chance from 14% to 24%
  - Combined with drop in somewhat unlikely chance from 33% to 25%
- More revenues are coming in, but losses are high
- Budget shifts from focused R&D to broader production
- Costly transition from cloud to on-premises
- Gen- AI distractions
- N.b. Respondents optimistic about their own survival
- *Quantum winter defined here as a greater than 25% decline in investment in QC R&D that lasts more than three years - in the next ten years*

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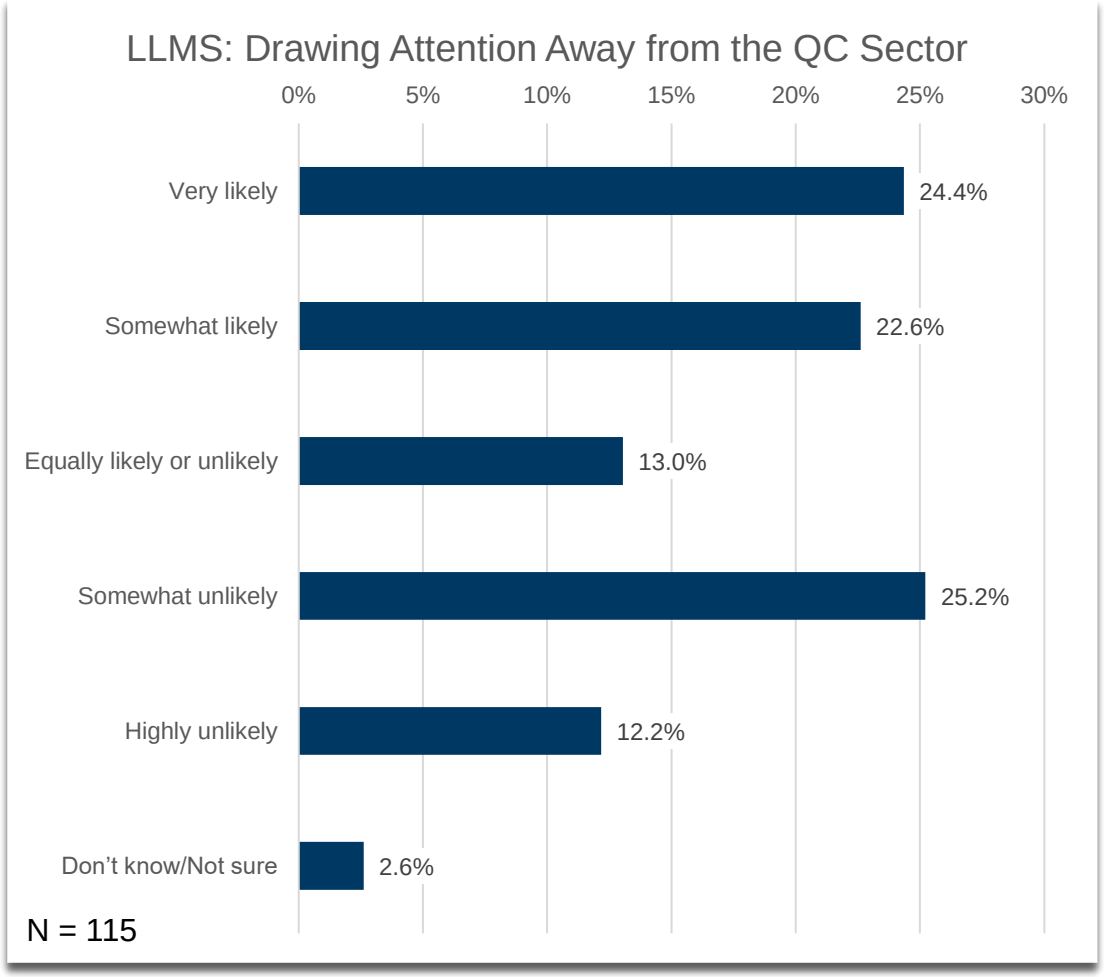
QC Distractions and LLMs

How likely is it that the emergence of large language models like ChatGPT and BERT will draw attention away from end user interest in quantum computing?



- LLMs - and likely generative AI in general - seen as near-term competitor for end user interest in QC by 47% of respondents
  - Up from 42% last year
- 37% not overly concerned
  - Down from 42% last year
- Demonstrates need for QC to continue to deliver on technology/performance gains
- Highlights perceived end user interest in performance gains no matter how it is delivered

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QUESTIONS?

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Float to the top or sink to the bottom. Everything in the middle is the churn.

- Amos Burton, Engineer *The Expanse*

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