# Quantum Computing Market Analysis

## Research Prompt

"Market research report on quantum computing."

## Contents

# Search Results

## Introduction to Quantum Computing

Search terms:

- *Applications of quantum computing*
- *Definition of quantum computing*
- *How does quantum computing work*

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Applications of quantum computing* | … This enables quantum computers to solve complex problems exponentially faster. <mark>Quantum computing has potential applications in cryptography, optimization, drug discovery, and machine learning.</mark> However, practical and scalable quantum computers remain a challenge due to issues like quantum decoherence and error correction.… | [Global Quantum Computing Market Size To Grow USD 143.44](#) |
| *Applications of quantum computing* | … This model has several variants, one of which is similar to QAOA-based simulation in its merits, limits and roadmap; but instead of using gate-based quantum processors, it builds a network of artificial "spins" using coherent Ising machines (CIMs). <mark>Three Potential Applications Let's turn to some potential uses of quantum information systems.</mark> Ongoing implementation of certain Ising models could mean that we will see related CIM-based tools even sooner than expected.… | [Quantum Computing: Limits, Options And Applications](#) |
| *Applications of quantum computing* | … With such a wide variety of chemical configurations available, it can take time to find the right one. <mark>Quantum computing can help speed up these processes.</mark> This application is beneficial in pharmaceuticals and vaccine development.… | [Applications of Quantum Computing | IEEE Computer Society](#) |
| *Definition of quantum computing* | The multinational IBM will be the first to market this wondrous technology with the Q System One, a 3x3-metre glass cube with 20 qubits presented in 2019 that will be made available to businesses and researchers. <mark>WHAT IS QUANTUM COMPUTING?</mark> This branch of computer science is based on the principles of the superposition of matter and quantum entanglement and uses a different computation method from the traditional one.… | [What is quantum computing and how does it work? - Iberdrola](#) |
| *Definition of quantum computing* | This is the third year the workshop is offered through Supercomputing (SC). <mark>Quantum computing is emerging as a remarkable technology that promises to achieve major scientific breakthroughs.</mark> This includes solving | [Third International Workshop on](#) |

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| | complex problems whose solution lies well beyond contemporary and even future supercomputers based on conventional technologies.… | [Quantum Computing Software held …](#) |
| *Definition of quantum computing* | … An electric current through a loop of superconducting wire can persist indefinitely with no power source. <mark>Superconducting quantum computing is an implementation of a quantum computer in superconducting electronic circuits.</mark> Superconducting qubits are built with superconducting electric circuits that operate at cryogenic temperatures. … | [What is Quantum Computing? - Quantum Computing Explained - AWS](#) |
| *How does quantum computing work* | … Enter, quantum computers. <mark>How do quantum computers work?</mark> Instead of bits, quantum computers use qubits.… | [Quantum computing and quantum supremacy, explained \| WIRED UK](#) |
| *How does quantum computing work* | … One of the best-known examples of quantum cryptography currently is quantum key distribution (QKD), which provides a secure method for key exchange. <mark>How does quantum cryptography work?</mark> In theory, quantum cryptography works by following a model that was developed in 1984.… | [What is Quantum Cryptography?](#) |
| *How does quantum computing work* | … Do we have to do something fundamentally different? <mark>How do so-called quantum computers figure into this process?</mark> Different Approaches To Quantum New computing systems that leverage the principles of quantum physics may be able to overcome existing limits.… | [Quantum Computing: Limits, Options And Applications](#) |

# Current Market Landscape

Search terms:

- *Growth trends in quantum computing*
- *Major players in quantum computing*
- *Market size of quantum computing*

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Growth trends in quantum computing* | ... Based on the type of component, the global quantum computing market is segmented into software and services. <mark>The software segment in the quantum computing market is anticipated to experience significant growth in the forecast period.</mark> This can be attributed to several factors.... | [Global Quantum Computing Market Size To Grow USD 143.44](#) |
| *Growth trends in quantum computing* | ... This is an entirely different way of computing from what we use today. <mark>Quantum computing, although a nascent technology, can lead to great leaps in innovation.</mark> Where Can We Use It? This emerging technology is flexible and can have significant applications in various industries.... | [Applications of Quantum Computing | IEEE Computer Society](#) |
| *Growth trends in quantum computing* | ... The software segment plays a vital role in enabling the seamless integration of quantum computing with existing classical computing systems and workflows. <mark>As more organizations recognize the potential of quantum computing, the demand for software solutions that facilitate quantum programming and optimization is expected to rise, driving the growth of the software segment in the quantum computing market.</mark> The BFSI segment is expected to grow at a CAGR of around 29.4% during the forecast period. ... | [Global Quantum Computing Market Size To Grow USD 143.44](#) |
| *Major players in quantum computing* | ... R&D. Furthermore, the high IT expenditure, continuous technological advancements, and early adoption of emerging technologies support the expansion of the market in this region. <mark>Key Players in Quantum Computing Market Are: IBM Corporation Telstra Corporation Limited IonQ Inc. Silicon Quantum Computing Huawei Technologies Co. Ltd. Alphabet Inc. Rigetti & Co Inc. Microsoft Corporation D-Wave Systems Inc. Zapata Computing Inc. Quantum Computing Market Size Breakdown by Segment The report analyzes the impact of the major drivers and restraints on the market, to offer accurate market estimations for 2017-2030.</mark> ... | [Quantum Computing Market Size & Share Forecast Report 2030](#) |
| *Major players in quantum computing* | ... In conclusion, the science of quantum computing is quickly developing, and numerous businesses are funding the study and advancement of this technology. <mark>Some of the main businesses leading the way in quantum computing include Google, IBM, Rigetti Computing, IonQ, D-Wave Systems,</mark> | [Top 10 Quantum Computing Companies to Watch](#) |

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| | <mark>Alibaba, Xanadu, Honeywell, Zapata Computing, and Cambridge Quantum Computing....</mark> | [Out for in 2023](#) |
| *Major players in quantum computing* | ... However, getting to that future has a significant amount of roadblocks to overcome first before quantum computing becomes widely available. <mark>Many companies -- of all sizes -- are actively developing and building quantum computers and capabilities.</mark> Companies building quantum computers As quantum computing continues to develop and undergo research, companies are building quantum capabilities in both hardware and software.... | [10 companies building quantum computers \| TechTarget](#) |
| *Market size of quantum computing* | ... You may also like: Quantum Computing Market Size & Forecast The analysts consider the quantum market to include hardware components, QCaaS infrastructure, application software and the value generated by end-users. <mark>Currently, the total quantum computing market size is estimated to be $300 million on the low end to a high of $1.3 billion, according to survey respondents.</mark> The forecast is that by 2025, the market will grow from about $3.5 billion to $10 billion.... | [Quantum Computing Market Expects Double-Digit Growth [2022]](#) |
| *Market size of quantum computing* | <mark>The quantum computing market has captured USD 458 million revenue in 2021, which is projected to rise at a CAGR of 31.2%, to surpass USD 5,274 million in 2030, according to P&S Intelligence.</mark> P_and_S_Intelligence_Logo The deployment of such solutions has experienced a strong upswing in various sectors, including financial services, logistics & support, and cybersecurity, since technology giants are massively investing in this field. ... | [Quantum Computing Will be USD 5,274 Million Market in 2030 ...](#) |
| *Market size of quantum computing* | ... The survey covers the community's opinion on the market sizing for quantum technology and was based on data from 40 participants, from a range of backgrounds, as at the end of September 2021. 80% of respondents were not satisfied with their knowledge on the market size for the quantum computing industry. <mark>The survey looked at marketing sizing for quantum computing, quantum sensing and quantum security markets.</mark> Other Insights on Quantum Market A significant majority of respondents used quantum market sizing information for making strategic decisions yet 80% were not satisfied with their knowledge on the market size for quantum technologies. ... | [Quantum Computing Market Expects Double-Digit Growth [2022]](#) |

# Key Technologies and Innovations

Search terms:

- *Quantum algorithms and software*
- *Quantum error correction*
- *Quantum processors and qubits*

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Quantum algorithms and software* | ... As quantum computing technology advances, there is an increasing need for software solutions that can effectively harness its power and capabilities. Quantum software frameworks, programming languages, and development tools are crucial for researchers, developers, and businesses to design and implement quantum algorithms and applications. The software segment plays a vital role in enabling the seamless integration of quantum computing with existing classical computing systems and workflows.... | [Global Quantum Computing Market Size To Grow USD 143.44](#) |
| *Quantum algorithms and software* | The effort seeks to move beyond the current relatively limited applications available on quantum computers toward more robust algorithms and application software that can be used on a practical level to tackle a range of scientific problems. "I'm incredibly proud of all the work being done at DOE to harness the power of our world-class supercomputers to maintain America's leadership in areas like Quantum Computing," said U.S. Secretary of Energy Rick Perry.... | [Department of Energy to Provide $40 Million to Develop Quantum ...](#) |
| *Quantum algorithms and software* | ... This can be attributed to several factors. As quantum computing technology advances, there is an increasing need for software solutions that can effectively harness its power and capabilities. Quantum software frameworks, programming languages, and development tools are crucial for researchers, developers, and businesses to design and implement quantum algorithms and applications.... | [Global Quantum Computing Market Size To Grow USD 143.44](#) |
| *Quantum error correction* | ... Right now, instead of the trillions of operations that might be needed to run a full-fledged quantum algorithm, we can typically only perform dozens before noise causes a fatal error. Quantum Error Correction So what do we do about this? ... | [What is Quantum Error Correction?](#) |
| *Quantum error correction* | ... quantum error correction ? Every step of quantum computation, and even the outside environment, has the potential to introduce errors and cause the processor to lose quantum information.... | [How IBM Quantum is advancing quantum error correction | IBM ...](#) |

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Quantum error correction* | … There are fewer detections at timestep t = 0 because there is no preceding syndrome extraction, and at t = 25 because the final parities are calculated from data qubit measurements directly. QEC, quantum error correction. c, Detection probability heatmap, averaging over t = 1 to 24.… | [Suppressing quantum errors by scaling a surface code logical qubit …](#) |
| *Quantum processors and qubits* | … A classical processor uses classical bits to perform its operations. A quantum computer uses qubits (CUE-bits) to run multidimensional quantum algorithms. Superconductors Your desktop computer likely uses a fan to get cold enough to work.… | [What is Quantum Computing? | IBM](#) |
| *Quantum processors and qubits* | … In classic computing, computers work through bits that have a value of either '1' or '0'. Quantum computing uses an equivalent called 'qubits,' which can have two values at a given time. Quantum entanglement describes the phenomenon where quantum particles stay connected.… | [Applications of Quantum Computing | IEEE Computer Society](#) |
| *Quantum processors and qubits* | … As if to emphasize how much researchers want to get off the hype train, IBM is expected to announce a processor in 2023 that bucks the trend of putting ever more quantum bits, or "qubits," into play. Qubits, the processing units of quantum computers, can be built from a variety of technologies, including superconducting circuitry, trapped ions, and photons, the quantum particles of light. IBM has long pursued superconducting qubits, and over the years the company has been making steady progress in increasing the number it can pack on a chip.… | [What's next for quantum computing | MIT Technology Review](#) |

# Industry Applications and Use Cases

Search terms:

- *Drug discovery*
- *Optimization problems*
- *Quantum cryptography*

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Drug discovery* | … Here are three possible areas of application: • Drug discovery is a commonly cited combinatorial optimization problem, but amidst a pandemic, it is an urgent matter, too. The search for effective drugs involves an astronomical number of potential matches between medically appropriate molecules and target proteins that are responsible for a specific disease. Classical computers are already used to simulate chemical interactions in the pharmaceutical space and other areas of life and chemical sciences, but it will take quantum technology to move beyond trial and error to tackle the sheer volume of total possible combinations. … | [Quantum Computing: Limits, Options And Applications](#) |
| *Drug discovery* | … This will primarily be due to the increasing demand for advanced diagnosis and treatment procedures for chronic diseases. Moreover, these computing technologies play a pivotal role in drug discovery and development. Hence, the players are focusing on the life sciences industry to increase their customer base.… | [Quantum Computing Market Size & Share Forecast Report 2030](#) |
| *Drug discovery* | … The: What excites me about AI and drug discovery is the convergence between technology, drug development, and biology, which is going to lead to better drugs being developed fasterâ using all of the capabilities that Silicon Valley and the tech ecosystem have developedâ to help us have even greater impact on patients. Christoph Sandler: Today, to discover and develop a drug takes more than ten years. Alex Devereson:… | [How AI could revolutionize drug discovery \| McKinsey](#) |
| *Optimization problems* | Optimization problems can be divided into two categories, depending on whether the variables are continuous or discrete: An optimization problem with discrete variables is known as a discrete optimization , in which an object such as an integer, permutation or graph must be found from a countable set. , in which an object such as an integer, permutation or graph must be found from a countable set. A problem with continuous variables is known as a continuous optimization, in which an optimal value from a continuous function must be found.… | [Optimization problem - Wikipedia](#) |
| *Optimization problems* | … • One classic "hard" problem is that of the traveling salesman (i.e., determining the shortest possible route that visits "n" number of cities while returning to the city of origin). Another combinatorial optimization | [Quantum Computing: Limits,](#) |

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| | <mark>problem, this problem and its variants appear in contemporary form in logistical challenges, including daily automotive traffic patterns.</mark> It takes fewer compute cycles to reroute traffic on blocked highways than to discover a new drug, but the advantage of using a quantum information system is speed: A traffic problem must be solved immediately, not tomorrow or next week. … | [Options And Applications](#) |
| *Optimization problems* | … Deep learning, simulation, and optimization applications leverage quantum computing for better results and low operational costs across various industries. <mark>The optimization process involves finding the optimal solution to a problem, in consideration of its restrictions and the desired results.</mark> Several important business decisions are made keeping in mind quality, cost, and manufacturing time. … | [Quantum Computing Will be USD 5,274 Million Market in 2030 …](#) |
| *Quantum cryptography* | … Let's explain. <mark>What is Quantum Cryptography?</mark> Cryptography is the process of encrypting data, or converting plain text into scrambled text so that only someone who has the right "key" can read it…. | [Quantum Cryptography, Explained \| QuantumXC](#) |
| *Quantum cryptography* | … Cryptography is the process of encrypting data, or converting plain text into scrambled text so that only someone who has the right "key" can read it. <mark>Quantum cryptography, by extension, simply uses the principles of quantum mechanics to encrypt data and transmit it in a way that cannot be hacked.</mark> While the definition sounds simple, the complexity lies in the principles of quantum mechanics behind quantum cryptography, such as: The particles that make up the universe are inherently uncertain and can simultaneously exist in more than one place or more than one state of being. … | [Quantum Cryptography, Explained \| QuantumXC](#) |
| *Quantum cryptography* | <mark>Quantum cryptography is a method of encryption that uses the naturally occurring properties of quantum mechanics to secure and transmit data in a way that cannot be hacked.</mark> Cryptography is the process of encrypting and protecting data so that only the person who has the right secret key can decrypt it…. | [What is Quantum Cryptography?](#) |

# Challenges and Barriers to Adoption

Search terms:

- *Cost and scalability challenges*
- *Ethical and security concerns*
- *Technical limitations of quantum computing*

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Cost and scalability challenges* | … To do useful work, they probably will require thousands of qubits. <mark>Scaling up brings challenges.</mark> Large numbers of qubits are harder to isolate, and if they interact with molecules or magnetic fields in their environment, they collapse or decohere, losing the essential but fragile properties of superposition and entanglement.… | [What Is Quantum Computing? | Caltech Science Exchange](#) |
| *Cost and scalability challenges* | … But if transistors are now approaching the atomic level, have we not reached certain limits? Evidence that progress is slowing includes delayed silicon release cycles. <mark>The challenges are daunting.</mark> When transistors become small enough, electrons have a hard time staying in their intended logic gates. … | [Quantum Computing: Limits, Options And Applications](#) |
| *Cost and scalability challenges* | … Researchers are inventing new designs for qubits and quantum computers and enhancing existing technology. <mark>Established and newer strategies will take time to scale up, increase in reliability, and demonstrate their potential.</mark> How has Caltech influenced quantum computing? From its beginnings, the field of quantum computing has been shaped by Caltech.… | [What Is Quantum Computing? | Caltech Science Exchange](#) |
| *Ethical and security concerns* | … In an increasingly networked society, a wider and better comprehension of cyber security ethics is critical for promoting human prosperity. <mark>The following are the three important ethical issues in cyber security.</mark> Harms to privacy Privacy harm is conceptualized as the negative consequence of a privacy violation.… | [A Holistic Approach to Ethical Issues in Cyber Security - Swiss …](#) |
| *Ethical and security concerns* | … This situation can endanger the patients' lives, particularly in departments where fast network access is required to use life-saving medicines or equipment. <mark>In short, the responsibility of recognizing a sound balance between well-resourced cybersecurity and other kinds of functionality is an ethical issue.</mark> Transparency and disclosure Cyber security is a form of risk management, and because those risks substantially affect other parties, there is a default ethical duty to disclose those risks when identified, therefore affected parties can make informed decisions.… | [A Holistic Approach to Ethical Issues in Cyber Security - Swiss …](#) |

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Ethical and security concerns* | <mark>The following issues are examples of security problems that an organization may have to deal with: A. Ethics and Responsible Decision-Making The foundation of all security systems is formed by the moral principles and practices of those people involved and the standards of the profession.</mark> That is, while people are part of the solution, they are also most the problem.… | [03. (III) Ethical Issues](#) |
| *Technical limitations of quantum computing* | … Eventually, this can result in more human-like responses from AI. Challenges and Prospects If quantum computing is so great, why aren't more industries using it? <mark>There are a few challenges that come with using quantum computing today.</mark> The first issue is the complexity of quantum computing processes.… | [Applications of Quantum Computing \| IEEE Computer Society](#) |
| *Technical limitations of quantum computing* | … We find that the effect of errors cannot always be removed with fault-tolerant quantum computing, because too much error correction can actually introduce more errors than it removes. <mark>This puts a limit on the accuracy of quantum computers tackling large-scale problems.</mark> We show how the available resources should be used to maximize this accuracy. More precisely, fault-tolerant quantum computing relies on the assumption that the noise per gate remains constant as the quantum computer grows in scale.… | [Limitations in Quantum Computing from Resource Constraints](#) |
| *Technical limitations of quantum computing* | However, like any technology, there are disadvantages. <mark>For quantum computing those drawbacks fall into two categories: technical challenges that researchers around the world are racing to solve and potentially undesirable consequences that could arise once quantum computing is implemented at scale.</mark> To learn more about the basic mechanisms of quantum computing, read What is Quantum Computing? Technical challenges to developing and implementing quantum computing For all the differences between classical computers and quantum computers, the state of the art of quantum technology bears resemblance to the early computers of the 1950s.… | [What are the disadvantages of quantum computing? - SDxCentral](#) |

# Future Outlook and Opportunities

Search terms:

- *Emerging markets and industries*
- *Investment and funding trends*
- *Potential for quantum supremacy*

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| *Emerging markets and industries* | … Frontier markets may be upgraded to an emerging market, as was the case for Qatar and Argentina. What's an Emerging Market Economy? An emerging market economy generally is considered an economy that is transitioning into a developed market economy.… | [Emerging Market Economy Definition, How It Works, and Examples](#) |
| *Emerging markets and industries* | … This promotes economic growth. Emerging market economies tend to move away from activities focused on agricultural and resource extraction toward industrial and manufacturing activities. Their governments usually pursue deliberate industrial and trade strategies to encourage economic growth and industrialization. … | [Emerging Market Economy Definition, How It Works, and Examples](#) |
| *Emerging markets and industries* | … This shows that pharmaceutical industries will also be able to market their global products in these new countries. Conquering emerging markets can be challenging for industries. These challenges can be grouped into 3 categories: infrastructure development, cost-containment policies, and value-driven drug evaluation.… | [The Influence of Emerging Markets on the Pharmaceutical Industry](#) |
| *Investment and funding trends* | … Record fundraising rounds by OpenAI, at around $10 billion, and Stripe, at around $6.5 billion, contributed to 37% quarter-over-quarter growth in the US. When excluding the outlier investments, however, US funding declined around 7%, and global funding dropped 9%. China also saw funding increase in the beginning of the year, at 21% over the previous quarter.… | [Global Venture Capital Outlook: The Latest Trends \| Bain & Company](#) |
| *Investment and funding trends* | Continued geopolitical tension, stubborn inflation rates, macroeconomic instability, and banking sector turmoil have fueled anxiety among VC investors and sustained a slowdown in investment activity. That said, global venture investments in the first quarter of 2023 surged 10% from the previous quarter to $95 billion, thanks to two big-ticket deals (see Figure 1).… | [Global Venture Capital Outlook: The Latest Trends \| Bain & Company](#) |
| *Investment and funding trends* | … However, seed-stage deal size ticked up around 7%, and late-stage deal size grew 15%, even excluding outlier funding by Stripe. Deals involving corporate venture capital (CVC) accounted for 26% of all | [Global Venture Capital Outlook: The Latest Trends \|](#) |

| Search Term | Relevant Excerpt | Citation Source |
|---|---|---|
| | funding in the first quarter of the year, a notable bump from 20% in 2022, as activity remained stable despite overall downward trends.… | [Bain & Company](#) |
| *Potential for quantum supremacy* | … Quantum computing supremacy For the time being, classical technology can manage any task thrown at a quantum computer. Quantum supremacy describes the ability of a quantum computer to outperform their classical counterparts. Some companies, such as IBM and Google, claim we might be close, as they continue to cram more qubits together and build more accurate devices. … | [How Do Quantum Computers Work? : ScienceAlert](#) |
| *Potential for quantum supremacy* | … What affects one particle can affect another. These quantum properties translated to computing technology provide promising prospects. These are especially useful when exploring possibilities or going through massive amounts of data. … | [Applications of Quantum Computing | IEEE Computer Society](#) |
| *Potential for quantum supremacy* | … This level of attention is there for a good reason. Quantum computing is indomitable and could increase efficiency in various fields. Here's a quick lowdown on why it's such a big deal. … | [Applications of Quantum Computing | IEEE Computer Society](#) |