



QUANTUM COMPUTING: BANK'S FUTURE

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Abstract

With the advancement of technology throughout the world, business is continuously evolving. The tech hit is so heavy that it draws our attention towards its potentials. In one way or another, businesses have become digitalized. Stakeholders are much more concerned about up liftment through the use of cutting-edge technology. Similarly, financial institutions are not different. Quantum computing is one among the novel technologies which will take off in the years to come. "Any sufficiently advanced technology is indistinguishable from magic," Arthur C. Clarke. The purpose of this study is to describe the significance of quantum computing in banking industry and Indian government's progress towards "Quantum skill" for efficient and effective usage. The review of literature for this study is based on the most recent national, international papers, articles on latest updates, variety of periodicals pertaining to the concerned area to determine the study's originality. The research is conceptual in nature. The paper exhibits the current state of affairs and attempts made by the Indian government to boost the banking industry with quantum computers for successive transition.

Key words: *Technology, Quantum Computing, Financial Institution, India.*

1.1 Introduction

Technology has been instilled in our routine. We just don't use technology; we are living with it and predominantly much more than before. Still, there is always room for surprises that keeps knocking. If we zone out from the advancement of technology, we will be pulled off from the market as we knew that technology gets outdated every often.

Business today is constantly changing with the change in technology across the world. The tech hit is so heavy that it draws us to the new world of reality. It is driving changes in almost all the industry at their pace. Industries should be ready to face multiple challenges. The banking industry is not exceptional and it is a pioneer in becoming digitalized. Stakeholders are even more concerned about upliftment through the implementation of latest technologies. To predict future threats, financial institutions need to know the current challenges. On the other hand, few banks have already identified the requirements and implications of latest technology into the financial institutions and benefits are being reaped.

Quantum computing is one such novel technology that will boom in the years to come in India. It will revolutionize the entire system. It will not be confined to few organisations; rather it is required for all the sectors which are dealing with money and huge database.

Quantum computing is a field in computer science that focuses on the advancement of computer technologies based on quantum theory's principles. It takes advantage of unique ability to allow them to exist in more than one state. Superposition and entanglement are two characteristics on which these supercomputers are based. It was later revealed that quantum algorithms may solve some computer problems more effectively than their conventional equivalents, such as machine learning and artificial intelligence, as well as big data and digital manufacturing. Quantum computers can potentially outperform existing (and future) computers.

Literature Review

- 1. Quantum computing and the brave new world:** In March 2018, India's Prime Minister Narendra Modi announced plans to invest \$1.1 billion to support Quantum Technologies and Applications(NM-QTA). The



first private company to make a foray into quantum computing was D-Wave. Google, IBM, Intel, Honeywell, Microsoft, Fujitsu, Toshiba and Hitachi take advantage of technology's leadership position, relying on a stable stream of academic staff to conduct university research and transfer from affiliates to the private sector.

2. **Potential use cases of Quantum Computing in Banking & Financial Services:** The Company's portfolio analysis, fraud detection, optimization, and quantum-proofing of cyber security systems, high-frequency trading, and asset valuation and clustering. Quantum computing can help in banking and financial services such as portfolio analysis and fraud detection, as well as other uses of technology in banking and financial services.
3. **Taking the quantum leap in international development:** We live in an age of digital transformation, and quantum computing can transform development operations. the applications of quantum computing in areas such as cyber security, driverless vehicles, financial services and material science will soon be apparent. Asia is a perfect testing ground for these solutions because its populations are keen adopters of new technologies. Asia is a perfect testing ground for these solutions because they are most popular in Asia.
4. **India wants to build a computer 10,000x faster than today's best, and beat China to it:** India wants to win the race for its IT and security needs, as well as export revenues. In New Delhi, Quantum computers are the next Holy Grail in information technology, and amid national security threats and the increasing reliance on computers, India has decided, it does not want to lose this race. And it won't be science for the sake of science.

Prof. Anirban Pathak, explains just why this mission is so important to India. Of these, about 50 have been shortlisted, the action plan has been readied, and the QuST mission will be launched in next three months.

5. **India sets off on pursuit of quantum computers, the 'holy grail' of modern tech:** In the first phase of its foray into the development of quantum computers, India is beginning to build infrastructure and raise human resources: The course for this was set on January 8th and 9th at the very first mission meeting of the Department of Science & Rs 80 crore Quantum-Enabled Science & Technology (QuEST) program held at the International Institute of Information Technology (IIIT) -Hyderabad.
6. **Quantum Computing & AI for Financial Industry:** Goldman Sachs and JPMorgan Chase expect to use quantum computers in their businesses in real time in the next few years. Standard Chartered, meanwhile, is the latest bank to commit to invest and research into quantum computers as part of an academic partnership. Within the next five years, companies around the world will have full access to quantum computing as a service. This means a large number of organizations will benefit.
7. **Quantum computing in banking, a disruptive opportunity? :** Quantum computing has the potential to unlock major advances in the banking industry. The Commonwealth Bank of Australia invested \$5 million in quantum computing in December 2014. Goldman Sachs, JP Morgan, HSBC, BNP Paribas, Crédit Agricole, Japan Post Bank, Citigroup, Wells Fargo, Barclays, Royal Bank of Canada, BBVA, ABN Amro and ING have invested in quantum technology. Financial services center on risk management. In order to manage risk, financial institutions must be able to measure and manage their assets, liabilities, and cash flows. Whoever manages to minimize their risk and maximize their profits dominates the market. In the near future, financial institutions will have a strong position in the quantum technology race.
8. **Quantum Commercialized: Financial Services Likely First Industry To Take Advantage:** JPMorgan and Goldman Sachs are both involved in the development of quantum computing, conducting research into practical uses of the research. Quantum computing has the potential to give an investment bank a competitive advantage by improving their skills and furthering their ability to retain clients and attract and create new opportunities. In recent years, the world's leading banks have been looking beyond artificial intelligence to quantum computing. The technology could speed up asset-pricing models as well as cultivating performance improvements, says John Defterios, the CEO of the asset-management company, BNY Mellon Asset Management. He says there's a "there" there in quantum for financial services, but the challenges of financial services are comparatively less complex.
9. **Huishang Bank turns to quantum communication:** Some Chinese banks are using quantum communication between data centers and back-up centers. By the late 2020s a quantum computer will be able to reveal all sensitive data passing through financial networks today. A quantum hack could disrupt verification process, inserting false messages; it could even do so across a network, making it possible to corrupt blockchains. A



new cryptography is emerging based on physics instead of relying just on mathematics. China has been making the most progress, with the world's first quantum-communications satellite, Menciuss.

10. **Expect significant commercial uses of quantum computers within 5 years:** Arvind Krishna, Senior Vice-President, Hybrid Cloud, and Director of IBM Research, talks about how quantum computing will deliver a quantum leap in problem solving. Krishna added, Quantum computing has a capacity to solve problems that today's computers probably never can. Quantum computing is a field of computing that is capable of solving problems that today's computers probably never can. A computer is a device used to process data, while the new device works by processing information through its electromagnetic properties. Software will have to be rewritten and new ways of writing algorithms will need to be created. Within the next five years, we'll see significant commercial uses of quantum computers.
11. **Quantum Computing and the Financial System:** Quantum computing has the potential to transform the global economy and the financial sector by making it possible to solve complex problems in a matter of minutes. Quantum machines can greatly reduce the time it takes to analyze complex risk positions or run Monte Carlo simulations, as well as increase their accuracy. The potential of quantum computing to speed up machine learning and artificial intelligence has also been explored.
12. **Quantum computing: applications to banking:** The financial industry is constantly searching for new technologies that can leverage higher performances in the hope of achieving higher profits. For instance, the progress in the fields of data science and artificial intelligence is an example of how financial services have been, and still are, benefiting of new technologies such as exploring new business models and markets which they would not have been able to even imagine in the past. The optimization of a portfolio becomes in fact more and more complex and time consuming when the number of instruments, drivers and targets grows.

Research Gap

Quantum computing has given brightness to many fields in different dimension in different countries which could be witnessed from the above review of literatures. Most of investigation is focused on data-intensive applications, optimization problems, and simulations and modeling, but the authors have not touched upon the current status and initiatives taken up by the Central Government for the growth of banking sector tremendously through quantum computers in India.

Statement of the problem

To inspect where openings lie in any industry, the initial step is to distinguish combinatory issues that could create generous substantial value whenever opened. It is additionally underscored that quantum computers are not yet accessible at the degree of force and unwavering quality required for tackling various sorts of issues.

Objectives of the study

1. To explore the progress of quantum computing in India.
2. To analyses how Central Government in India is making efforts to reinforce quantum computing in banking industry.

Scope of the study

Quantum computers are computers of tomorrow. Operating at the particle level, quantum computers are used to solve equations which are complex that current computers cannot solve or solve within any reasonable timeframe. While quantum computers can exponentially increase banks efficiency, for instance, so too can nefarious actors, including hackers and nation-states, leverage quantum computers to break existing encryption keys and attack consumer information. Solving such problems will overcome great difficulties in computing and to resolve complex transactions. Banking institutions should comprehend quantum computers future capability to support cyber security in anticipation of the exponential risks posed by the same computers utilized by some wrong hands.



Methodology

The research study is descriptive in nature. In order to accomplish the objectives of the study, secondary data from various websites, journals and articles pertaining to the concerned area of study is considered. The study is a Conceptual one and does adopt a purely qualitative strategy.

Conclusion

Technology plays a major role in today's economic development of the country. Availing banking services has become easy by technological advancement. Many clients who provide banking services through technology should also be aware of the most promising tool i.e. Quantum Computing.

Quantum computer will revolutionize the computational world. Quantum figuring progresses forward being in it's soonest arranges, other than few gadgets at this point exist that would reinforce various pieces. This means a large number of organizations will benefit from a range of benefits including faster, more efficient, and more secure computing, according to experts.

India has a solid start-up custom and attracting venture capital could be simple. India should accept the opportunities that emerge and counter the security challenges that arise in this field. Central Government's investment of Rs. 8000crore will draw the attention of many stakeholders. One such stake holder is banks, financial institutions will develop their quantum technology power and the number of specific applications will simultaneously raise.

There are a lot of justifications for why individuals ought to be amped up for Quantum processing, as it will impact our life however not in the ways that we expect what we can't anticipate seeing the innovation staying nearby our family yet the impacts of quantum figuring will be felt by working on the quality of life of individuals all throughout the world through the formation of better technologies.

Limitations of the study

Regardless of the importance of this study which is one amid a small number of studies that has reviewed and analyzed the significance to accept and make use of quantum computing applications in a competent and progressive nation like India, there are yet certain limitations present which can be downtrodden in future. This paper is confined to Indian Government initiatives so far in effective utilization of quantum computing. And there are possibilities where an attacker may use a quantum computer to corrupt central bank digital currency (CBDCs) and block chain networks, as well as corporate internal networks.

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