ABHINAV
NATIONAL MONTHLY REFEREED JOURNAL OF RESEARCH IN SCIENCE & TECHNOLOGY
www.abhinavjournal.com

QUANTUM INFORMATION SCIENCE: EMERGING BASIC SCIENCE FOCUSED INFORMATION SCIENCE DOMAIN

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ABSTRACT

Information Science is a science which lies on interdisciplinary aspects and components. Information Science is mainly responsible for Information activities such as information collection, selection, organization, processing, management and dissemination. Quantum science is actually Quantum based science based on physical information that is held in the state of a Quantum Systems. Quantum Information Science is actually broadly combination of Quantum Information and Information Science. Deeply Information Science is combination of some other science, Technology, Management and Humanities domain. Quantum Information Science is actually an academic cover in quantum Information processing. It is mainly responsible for speedy and Transparent Information and data within computer systems and mainly in Information Channel. This paper is talks about Quantum Science and its Integration with Information Science. Paper illustrates basic nature and characteristics of Quantum Information Science. Paper also mentions the emerging application and utilization of Quantum Information Science.

Keywords: Quantum, Quantum Information Science, Quantum Computing, Physical Information, Information Science, Quantum Science, Information Infrastructure, Basic Science

INTRODUCTION

Quantum Information Science [QIS] is actually extension of Quantum Computing. Quantum Information Science is mistakenly treated as Quantum Information Theory but it has several differences with this. Quantum Information Science is actually extension and origin of Quantum information processing which is form Quantum Computing. Though Quantum computing is form Quantum Physics. The main failure of Quantum Information Theory in experimental research in the area leads the origin and development of Quantum Information Science. Some experts claim that, Information Science when depends on effects in Physics is called Quantum Information Science. Apart form theoretical matter related to computational models experimental topics in Quantum Physics integrated and makes a basic science domain- Quantum Information Science :- with applied science nature. There are so

many subfields are there which includes quantum algorithm, Quantum Computing, Quantum Cryptography, Quantum dense coding, Quantum Computational complexity, Quantum Communication. Quantum Information Science is dedicated to speedy and transparent information collects ion, organization and processing. Ultimately Quantum Information Science dedicated to Information Transfer or Dissemination with the help of Quantum channels [33].

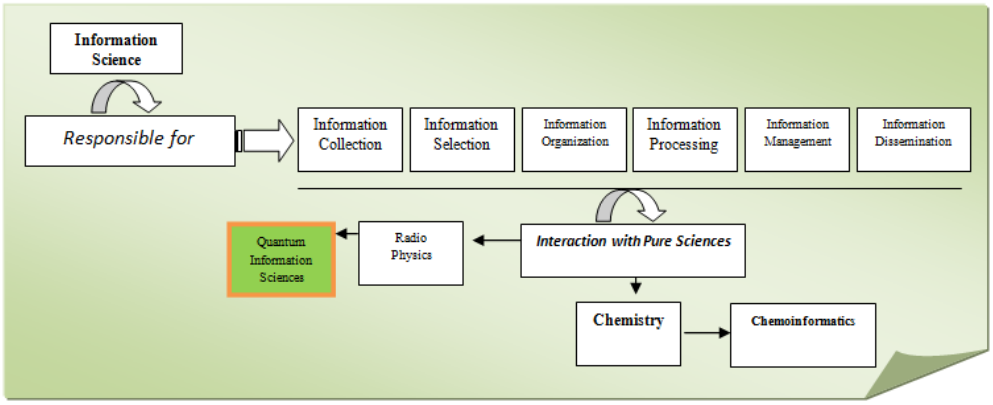

Fig: 1. Depicted Information Science and creation of new subjects by interaction

OBJECTIVES

The main aim and objective of this study is includes:-

- To learn about Quantum Information Science [QIS] and its origin;
- To know about the basic features and characteristics of Quantum Information Science [QIS] and Quantum Computing;
- To know about the importance and role of Quantum Information Science [QIS], Quantum Computing, Quantum Information Systems and so on;
- To find out possibilities of Quantum Information Science [QIS] in the academic programme or academic research;
- To learn the main challenges and opportunities of Quantum Information Science [QIS];
- To see the interdisciplinary nature of Quantum Information Science [QIS] at a glance.

Quantum Information Science [QIS]: The Science of Sciences:-

Broadly Quantum Information Science [QIS] is a combination of two important science domains. One is Quantum Science/Quantum Computing and another is Information Science. The first one is the combination of physics and mathematics and some gradients of statistics; where as Information Science is actually combination of computer science, mathematical science, information studies, cognitive studies, management science. Thus, two important science components Quantum Information Science [QIS] is actually combination of several organization and institutions [33,34].

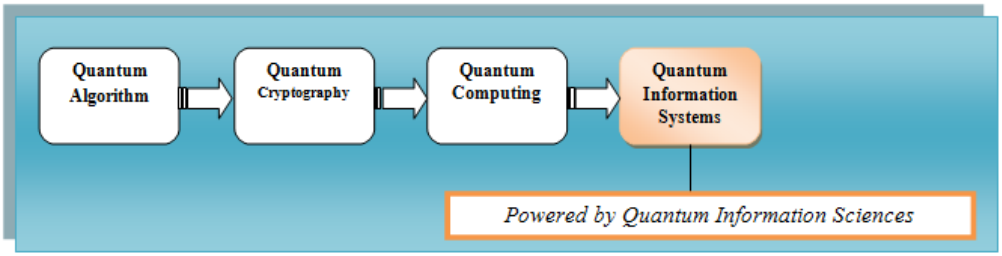

Fig: 2. The way of transparent Information Services powered by QIS

In computing information is mainly transfer in general bit but Quantum Computing is lies on Quantum Information or Qbit. The most popular unit of Quantum Information is this Qbit; which is run on two level Quantum Systems. Practically the two state Quantum Systems can actually be a superposition of the two states at any given time.

Quantum Computing is mainly lies on physics and physical science in many respects, mainly in the solid state physics and condensed physics. Quantum Information and any kind of changes and manipulation within it are only possible to measure with analogue of Shannon entropy. The problem and information processing which are not possible with Quantum Computing based Information Science practice in Polynomial time. Thus, Quantum Physics, Information Theory, Computer Science are among the crowing intellectual achievement of the past century. The Quantum Information Science [QIS] is emerging as important theoretical and experimental science field of interdisciplinary nature [13].

Quantum Information Science [QIS]: Basic features and Attributes:-

Quantum Information Science [QIS] has several basic features and attributes; now look these are one by one:-

- Quantum Bit is the ultimate oxygen which transfer information within a small gradients such as computers;
- Quantum Information Science [QIS] is mainly deals with Quantum Theory and Quantum Science;
- Information carried by a Quantum System flouts such common sense principles;
- Large scale computers are able in calculate and manipulate and process billion of data or information within a moment; which is in traditional computer systems are important;
- Quantum Information Science [QIS] is actually combination of quantum enriched and powered computers, network devices and hardware;
- Quantum Computers are able to search in a time proportional to the square root of N;
- Virtually, a Qbit is a quantum system that can exist in a coherent superposition of two distinguishable states;
- For commercialization of quantum computer, quantum cryptography method may be utilized;

- Quantum Information Science [QIS] is larger than Quantum Information Technology and Quantum Information Technology is larger than Quantum Computer Science, which is lies on Quantum Computers;
- Quantum entanglement is the non classical connection exhibit among the parts of a composite Quantum Systems;
- In Quantum Computer Systems, channel and processor are able to take several information at a time.

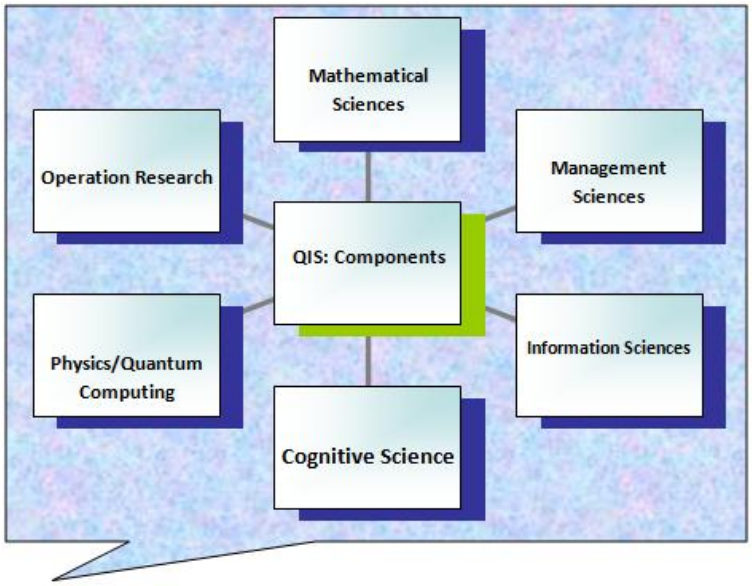

Fig: 3. Showing main components of Quantum Information Sciences at a glances

Quantum Information Science [QIS] and Transparent Information World

Quantum Information Science [QIS] is actually enriched with Atom, molecular, Optical Physics; which is mainly responsible for faster and transparent communication between the processor and the speed may be much higher than Qbit dependent computer system. Virtually Quantum Information Science [QIS] allows higher information transformation between the components of Information Systems such as Computer Hardware, Computer Networks and one Information Centre to another centre; directly or indirectly.Quantum Networks is build with Quantum powered computers and Quantum hardware for transparent information and communication between several component of computer networks. Quantum Information Processing is mainly powered by scaling. Optical Fiber plays an important role for Quantum Data Processing [18,33].

Based on thousand of Quantum Networks it is possible to build Quantum Internet; which should be more and more reliable and faster and any video and large amount of data can be extracted within a moment. The reason on Quantum Internet is running around the world. Through Quantum Protocols and algorithm it is possible to introduce quantum internet service; which should be super powerful and transparent in billion of data, information, audio and video transformation between one server to another and ultimately in personal

computers. Quantum Information Science [QIS] is helpful in Big Data Management and Information Repository Management, within a moment it is possible to send large amount of data from one data centre to data centre and from this to information networks through dedicated optical based information channel which support Qbit[34].

Quantum Information Science [QIS] is possible to utilize in the several sector which includes Banking, Healthcare, Finance and Corporate Management and so on. The online banking and financial services may gain rapidly with the help of Quantum Processing and Information Channel. The information explosions are the two important challenges in Information Science practice; but information overload many ways possible to remove with the help of Quantum Computing. The spatial and space applications, neural application powered by Quantum Computing may also open up a new arena in Quantum Information Science [QIS]. The interdisciplinary academician may find out several new prospect and parameters in Quantum Information Science [QIS] no doubt [33,18,34].

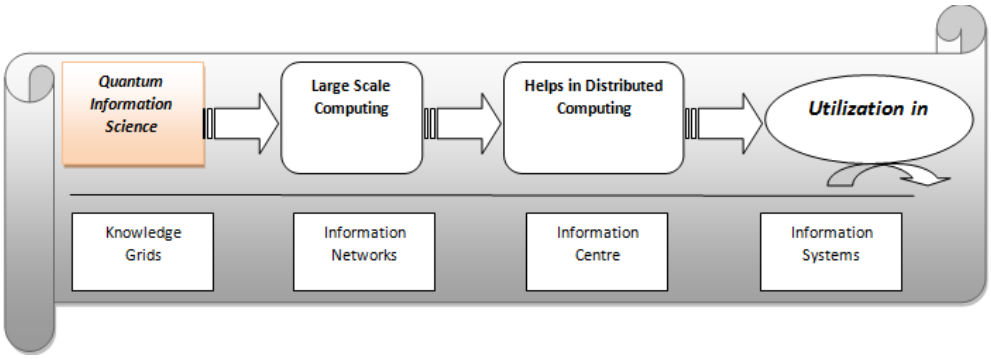

Fig: 4. Depicted Wider role QIS in Information World

Quantum Information Science [QIS]: Future Academic Prospects

Quantum Information Science [QIS] still absent in most of the Quantum Physics, Quantum Computing are included in some of the Curriculum of BSc/MSc-Physics, Computer Science. But there is a great need to introduce Quantum Information Science [QIS] in the Information Schools or IT Schools for all round development of the domain. The full-fledged degree on Quantum Information Science [QIS] such as BS/MS/BSc/MSc- Quantum Information Science [QIS] may be helpful for the creation of a healthy domain and practice of information. UG/PG curriculum and even higher secondary curriculum may also cluster Quantum Information Science [QIS] as knowledge gradients in their curriculum depending upon need and nature of the Degree and subject. The I-School may be an important domain for sophisticated Quantum Information Science [QIS] development; this school is the combination of so many subject expert and subject incorporated like Computer Science, IT, Information Systems, Management and other domain based on need such as Medical Information Science [MIS], Chemical Information Science [CIS] and so on.

Full-fledged programme and research work may be carried out in collaboration or joint venture with I-Schools and Physical science department for complete and sustainable development of the domain. Ministry of Science and NSF-USA are working best for Quantum Information Science [QIS] academic development like industrial development [33,19,20].

FINDINGS

- Quantum Information System is a professional field where as Quantum Information Science [QIS] is an academic cum professional field;
- Quantum Information Science [QIS] is an interdisciplinary field incorporating Computer Science, IT, Information Systems, Information Studies and from other hand Physics, Chemistry and Mathematics;
- Quantum Information Science [QIS] as academic programme and specialization still very limited; but there are tremendous opportunities available in this domain;
- Proper funding and planning in this field is very limited.

SUGGESTION

- It is better to start Quantum Information Science [QIS] as an academic programme either full-fledged degree such as BSc/MSc or specialization in the related programme;
- By adequate modification it is possible to start in the schools level;
- Funding and planning may be provided in multiple department such as IT, Computer Science, Science and Technology, Earth Science and so on;
- Professional workshop on Quantum Information Science [QIS] need to improve in academics for its overall growth;
- Information Schools [I-Schools] may be good place for Quantum Information Science [QIS] learning and teaching.

CONCLUSION

Quantum Science is emerging rapidly in so many domains such as Information Technology, Electronics and Communication Engineering, Computer Science and so on. The integration and results of Quantum Science in Information Science brings several new aspects in Information Infrastructure; the future information revolution may get wider benefit with Quantum Information Science and its solid practice. It is essential to start QIS based education programme, work shop, seminar and conference based on Quantum Information Science and allied domain.

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