Request for Information on Quantum Information Science and the Needs of U.S. Industry

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Quantum information science includes, for example, quantum computing and processing, quantum algorithms and programming languages, quantum communications, quantum sensors, quantum devices, single photon sources, and detectors. What areas of pre-competitive QIS research and development appear most promising? What areas should be the highest priorities for Federal investment? What are the emerging frontiers? What methods of monitoring new developments are most effective?

Answer: The areas of pre-competitive QIS research are hidden subgroup algorithms, quantum annealing, topological quantum algorithm, quantum algorithm for field theory.

The 2009 Federal Vision for Quantum Information Science [1] identified exciting new possibilities for QIS impact, including mineral exploration, medical imaging, and quantum computing. Now, six years later, what market areas do you think would most benefit from quantum information science?

Answer: Medical imaging, quantum computing.

Funding levels and mechanisms, technology, dissemination of information, and technology transfer are some of the potential barriers to adoption of QIS technology. What do you see as the greatest barriers to advancing important near-term and future applications of QIS? What should be done to address these barriers?

Answer: Major barrier is lack of funding for quantum algorithm and quantum complexity theory. More agencies should be funding quantum algorithm research which attempts to solve their business critical problems.

Addressing opportunities in QIS and barriers to applications requires a workforce spanning many disciplines, ranging from computer science and information theory to atomic scale manipulation of materials, and possessing a range of knowledge and skills. What knowledge and skills are most important for a workforce capable of addressing the opportunities and barriers? In what areas is the current workforce strong, and in what areas is it weak? What are the best mechanisms for equipping workers with the needed knowledge and skills?

Answer: The most important vacuum to be filled is the lack of overlap in the knowledge of multiple area. For example, at this moment, a student of computer science is not trained on representation theory and quantum Monte Carlo algorithm, a student of physics is not trained on complexity theory and automata theory.