BM is betting on quantum computing, but it can’t win without the help of startups. And how long it will take for the bet to pay off is anybody’s guess.

That was the message of the Q Summit, a one-day meeting of quantum-computing researchers, investors, and entrepreneurs hosted by IBM in Menlo Park, Calif., in April. Quantum computing would open the door to a new universe of problem solving, and it could disrupt some conventional digital technologies. The potential is big, but the risks are huge.

“We need startups in the quantum space,” says Joe Raffa, director of IBM Ventures. “There’s a huge amount of work to do,” he says, to cross the “long revenue desert” between investment and commercially profitable results.

Initially, “the quantum computer will be way slower than the classic machine,” says Vijay Pande, general partner at Andreessen Horowitz. But its rate of evolution is “hyper-exponential, so suddenly, in some n years, it will jump over the classic machine. The real question is, when will this transition happen?”

Pande has some predictions. Within 10 years, for certain limited disciplines, he says, quantum computers will begin to dominate. New algorithms for new applications will emerge—algorithms that aren’t currently being developed for classical computers because they would just run too slowly on conventional hardware.

But, says Pande, this all makes it very difficult to address quantum computing as a venture capitalist: “It’s hard to talk about the market if I don’t even know what the algorithms are.”

Bill Coughran, a Sequoia Capital partner and former senior vice president of engineering at Google, says that as an investor he’s “struggled with the question whether quantum computing is [in] ‘development’ or still ‘research.’ VC firms think [along] a 10-year time horizon, not 20 or 30 years. Are we on the cusp of a breakthrough?”

The question, he says, “is still open.”

Startups working on these new algorithms have formed, however, with venture money behind them. Matt Johnson is the CEO of QC Ware, a startup building a commercial software package for quantum computing. Johnson says QC Ware is betting “that the people building the hardware will get it [to the point where] our software is useful.”

Christopher Savoie, CEO of startup Zapata Computing, believes that chemistry will be the first field to benefit from quantum computing, and his company is developing algorithms for drug discovery and chemical design.

These two startups and six more are part of the IBM Q Network, an organization launched in late 2017 to accelerate the development of practical applications for quantum computing.

And despite Coughran’s reservations, Sequoia has made an investment in a quantum startup, Quantum Circuits, just in case the answer to Coughran’s question about being on the cusp of a breakthrough is yes. But he has still another concern.

“Most prominent teams today,” Coughran says, “are built around people with strong academic track records, but those are not always the ideal teams with which to build real companies.”

IBM’s Anthony Annunziata, leader of the Q Network, admitted that to date, there are no commercial applications of quantum computing that beat conventional computing. “We are at the point of getting quantum ready,” he says. “The era of the quantum advantage is still a few years out; it’s hard to see how many.”

It’s not the right time “to go all in, to put tens of millions of dollars into this,” Annunziata continues. “But it’s exciting enough. Things are progressing well enough that [every tech organization] should have at least one person who is your quantum person, who can learn the basics and take it from there.”

—TEKLA S. PERRY

A version of this article appears in our View From the Valley blog.

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