PENDER

Forward thinking. Finding value.

Quantum Computing – "Where things can be "this" and "that" at the same time"

While quantum computing sounds like the kind of technology that has travelled back in time from the future, believe it or not, the concept was first proposed in 1981 by Richard Feynman (who was awarded the 1965 Nobel Prize in Physics for his fundamental work in quantum electrodynamics). He asked "What kind of computer are we going to use to simulate physics?...Can you do it with a new kind of computer - a quantum computer?"[1]

Today over 150 quantum computing applications have been developed by companies and academics, often working together. Pender portfolio holding, D-Wave Systems based in Burnaby, British Columbia, has already commercialised a quantum computer. The company's first customer, Lockheed Martin in 2011, installed their machine at the University of Southern California (USC) where they have been developing applications to verify and validate software.

What is quantum computing?

What started as an interest in simulating physics say, to better understand the cosmos, has become a need to better understand everything from drug discovery to our own DNA, but with the explosion in data already available, and the data generated by these applications, existing tools do not have the required processing power. "We generate vast amounts of data...it's very difficult to generate useful insights often times from that data," Eric Ladizinsky, Co-Founder and Chief Scientist, D-Wave Systems. Only new tools can provide answers. Greg Tallant, Research Engineering Manager at Lockheed Martin believes, "It's a game changer for the corporation, it's a game change for our customers, and ultimately it's a game changer for humanity."

How does it work?

To speed up computation, quantum computers tap directly into an unimaginably vast fabric of reality – the strange and counterintuitive world of quantum mechanics. Rather than store information using bits represented by 0s or 1s as conventional computers do, quantum computers use quantum bits, or qubits, to encode information as 0s, 1s or both simultaneously. This superposition of states, along with the quantum effects of entanglement and quantum tunneling, enable quantum computers to consider and manipulate many combinations of qubits simultaneously to produce quadratic and exponential speed-ups over conventional computers.

Why do we need it?

Despite the incredible power of today's supercomputers, many complex computing problems still cannot be addressed by conventional systems. How are we going to solve the most complex, even intractable problems associated with new drug discovery, bioinformatics, artificial intelligence, machine learning, cyber security, logistics and financial analysis? Quantum computing exists and it has the potential to help solve these problems. The possibilities are limitless.

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[1] Keynote speech: Simulating Physics with Computers by Richard P. Feynman, published in the International Journal of Theoretical Physics, VoL 21, Nos. 6/7, 1982.
https://people.eecs.berkeley.edu/~christos/classics/Feynman.pdf

D-Wave has also supplied quantum computers to Los Alamos National Labs, Volkswagon and Google, who are working in partnership with NASA. Hartmut Neven, Director of Engineering at Google has said "We actually think quantum computing may provide the most creative problem-solving process under the known laws of physics". Watch a video produced by Google that unravels more about how quantum computing works.

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Rolf Dekleer is an observer on the board of D-Wave Systems which is a portfolio holding in two of Pender's investment funds: Pender Growth Fund Inc (TSX-V:PTF) and the Working Opportunity Fund.