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Enabling the Quebec quantum ecosystem

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USE CASE

# Quantum Optimization

SECTOR

## Insurance
## Finance
## Government

*Just as the classical computer has changed today's optimization and risk management practices, quantum and hybrid algorithms represent the next big evolution.*

**Opportunity** Quantum and hybrid algorithms offer better computing power when it comes to optimization algorithms. Indeed, these calculations will be more efficient and will be able to consider many more variables than traditional algorithms[1].

**Threat** The advantage offered by these algorithms will change the paradigm in this industry and companies that will delay in using them will not benefit from the competitive advantage that early adopters will have.

### Applicable quantum technologies

- Hybrid quantum algorithms
- Distributed quantum algorithms

### Commercial applications

- Investment portfolio optimization
- Insurance premium optimization
- Risk management
- Financial products personalization
- Development of new financial products

### Examples of actors in the innovation chain

DEVELOPPERS: 1QBit, Berkindale analytics, BOLTZ.AI, agnostiq, ZAPATA, MULTIVERSE COMPUTING

ECOSYSTEM: XANADU, rigetti, D-Wave The Quantum Computing Company, IBM

USERS: beneva, Banque Nationale, TD, RBC, HSBC, intact, BMO, Desjardins

Created in collaboration with NUMANA

Public partner Québec

USE CASE: Quantum Encryption

SECTOR

# Insurance - Finance - Government

## Factors preventing adoption

Quantum algorithms are currently limited by the number of qubits and the maturity of quantum processors. It is estimated that 1000 quality qubits represents the size of a processor to be competitive, whereas most current solutions are less than 100 qubits[2,3,4], and of lower quality.

A major challenge remains the management and attribution of data in the quantum algorithm.

Ultimately, quantum and classical algorithms will work in parallel in order to maximize the computing power according to the data and the computation to be performed.

## Risks of the status quo

Financial companies are already investing heavily to achieve fractional second gains[5,6].

With the speed of transactions in today's markets, quantum and hybrid technologies will soon be the new standard for this industry.

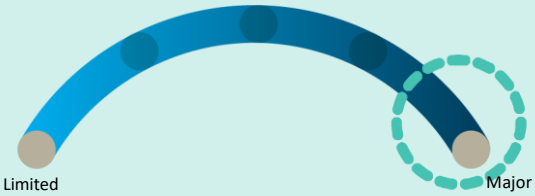
The same logic applies to insurance companies. These algorithms will lead to better products, greater personalization and better risk management[7].

Considering the initial adaptation period required, late adopters will find it difficult to catch up with their technology gap despite significant subsequent investments.

## OPPORTUNITY window


Despite the current limits of technological development, it is possible to start work on new hybrid algorithms and to adapt the quantum portion of these in proportion to the evolution of quantum processors. This will allow the expertise to be gradually developed while benefiting from the advantages that quantum calculations can present.

## POTENTIAL impact for businesses




Just as the classical computer has changed today's optimization and risk management practices, quantum and hybrid algorithms represent the next big evolution.


1. https://www.nature.com/articles/s43588-020-00018-3
2. https://www.nature.com/articles/d41586-021-03476-5
3. https://news.harvard.edu/gazette/story/2019/10/harvard-weighs-in-on-googles-quantum-supremacy/
4. https://news.harvard.edu/gazette/story/2019/10/harvard-weighs-in-on-googles-quantum-supremacy/
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6. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2417988
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Québec Quantique aims to promote the adoption of quantum technologies by Québec businesses and organizations.


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