

# Quantum Wargaming

Company Overview



Quantum Computing Education,  
Experience and Business Capabilities

# Introduction

Dear friends!



During my 25+ years as a strategy and innovation consultant, I have seen a tremendous rise in the role of digital technology in creating a competitive advantage and achieving market leadership. Digital capabilities drove nearly all disruptive innovations in this century. When new technologies appear on the horizon, it is impossible to foresee their potential impact on industries and competition. Many thought the first personal computers were just better and more efficient typewriters, while the internet was initially viewed as a more convenient messaging tool. We are about to witness a new technology revolution – Quantum Computing. The last thing we should do now is to argue whether fault-tolerant quantum computing is possible and when these computers can be built. Instead, we need to get ready and embrace a bumpy ride. Do you want to take a chance of being left behind?

Welcome to Quantum Wargaming, the best approach to learning the business of quantum computing and becoming quantum-ready!

**Alex Kandybin**

Founder

# Quantum Wargaming Company Vision & Mission

Quantum Computing Education, Experience and  
Business Capabilities

## Vision

Quantum computing will disrupt many industries, offering companies and governments the opportunity to create significant value by accelerating the development of new materials and medicines, improving the efficiency of manufacturing and distribution processes, and solving complex environmental problems.

## Mission

At Quantum Wargaming, we serve private companies, public institutions and governments to:

- Provide quantum computing education.
- Perform valuation of quantum businesses and technologies.
- Develop quantum computing business strategies.
- Conduct Quantum Wargaming exercises to test strategy, identify opportunities, and define quantum readiness capabilities.

# Our Services



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## Education

### Quantum Computing Fundamentals for Business Professionals

How business leaders should think about quantum computing, its value and disruptive potential? What capabilities are required to prepare for the quantum computing future?

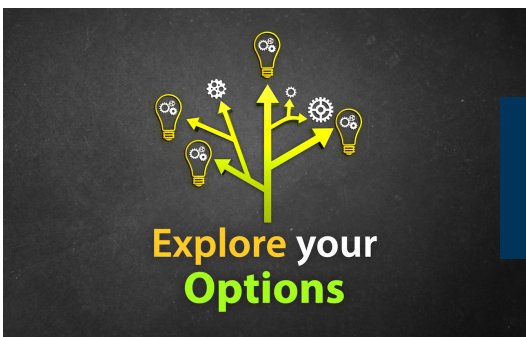


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## Valuation

### Perform Valuation of Quantum Computing Businesses and Technologies

Determine the financial value of companies developing quantum computing hardware and software. Estimate the value of future quantum computing applications in various industry segments.



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## Strategy

### Develop Quantum Computing Business Strategy

Perform quantum readiness diagnostics against industry's best practices/benchmarks. Identify gaps and develop strategic options to improve competitiveness and capture the value.



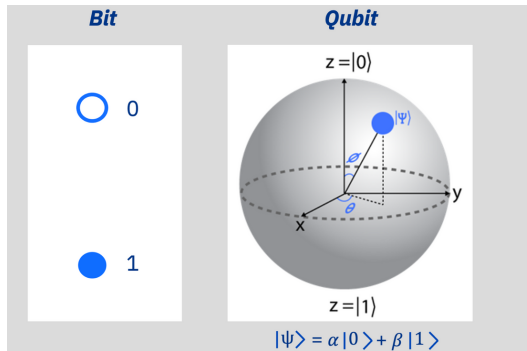
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## Wargaming/Scenario Planning

### Conduct a Quantum Wargaming Exercise or a Scenario Planning Session

Test potential strategies, verify financial value, identify necessary capabilities, and set investment priorities in a comprehensive wargaming exercise or in an interactive executive session.

# Education Tracks



- What makes quantum computers so different from classical computers?

- What are the key applications /use cases for quantum computers?
- Are there any practical applications now?



- What is the potential value of quantum computing technology?
- How disruptive quantum computing innovation may be?

- What is expected timing for the first practical applications?
- How can we objectively estimate the timing?

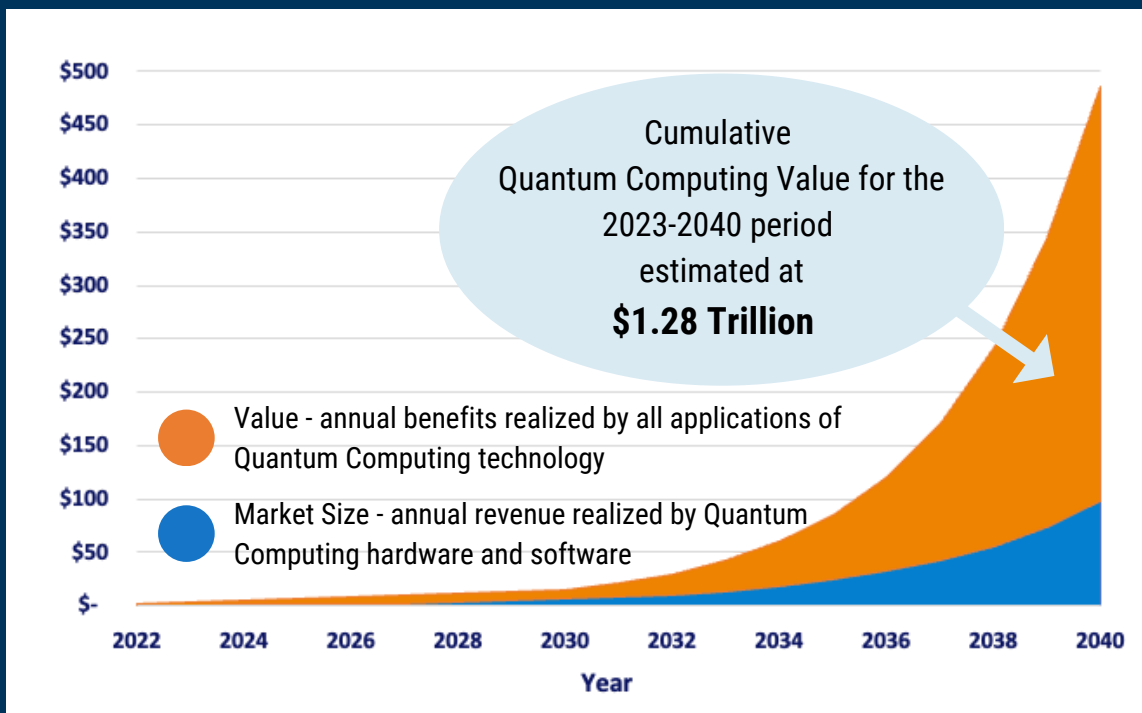


# Quantum Computing Value

## Quantum Computing Value Chain



## Quantum Computing Applications Will Deliver Significant Value



**What is YOUR STRATEGY to Capture Part of This Value?**

# Why Act Now?

We have developed an analytical tool to estimate the timing of specific quantum computing applications.

**Number of Qubits  
and Gates**

**Gate  
Fidelity**

**Error  
Correction**

**Timing from  
Roadmap**

- We find available algorithms for solving the problem of interest in the existing literature.
- The description of the algorithm usually allows for estimating the number of qubits and the number of gates required to run it.
- Based on the number of qubits and gates in the algorithm, we can estimate gate fidelity (required accuracy) to ensure that the execution of the algorithm is likely to produce the solution.
- The required gate accuracy and the error correction methodology allow calculating the "physical" to "logical" qubit conversion rate. Typically, for each logical qubit, we need from several hundred to a thousand physical qubits.
- Based on roadmaps published by many quantum hardware manufacturers (e.g., IBM, Google, IonQ, etc.), we can estimate when systems with the required number of physical qubits will be available.

Our analysis suggests that the first practical applications of quantum computing can be expected in the next 3-5 years.

**It will take more than 3 years to build the necessary capabilities to achieve "quantum readiness."**

# Quantum Wargaming



## What Is Quantum Wargaming?

Quantum wargaming for business is a dynamic, interactive, and strategic team exercise where you can operate in the simulated environment of mature quantum computing technology. You can develop and test quantum-based innovation and operations strategies to compete with several other players/companies. Unlike strategic planning, your strategic moves depend on the actions/moves of your competitors.

## What Are the Benefits?

- Fast learning of quantum computing foundations and their business applications
- Alignment and shared vision on:
  - Quantum-related opportunities, threats, and risks
  - Capabilities required to achieve quantum readiness
  - Insights on some specific strategies
- Improved perspectives on strategic priorities and investments in the future
- Organizational buy-in for developing and implementing a quantum computing strategy

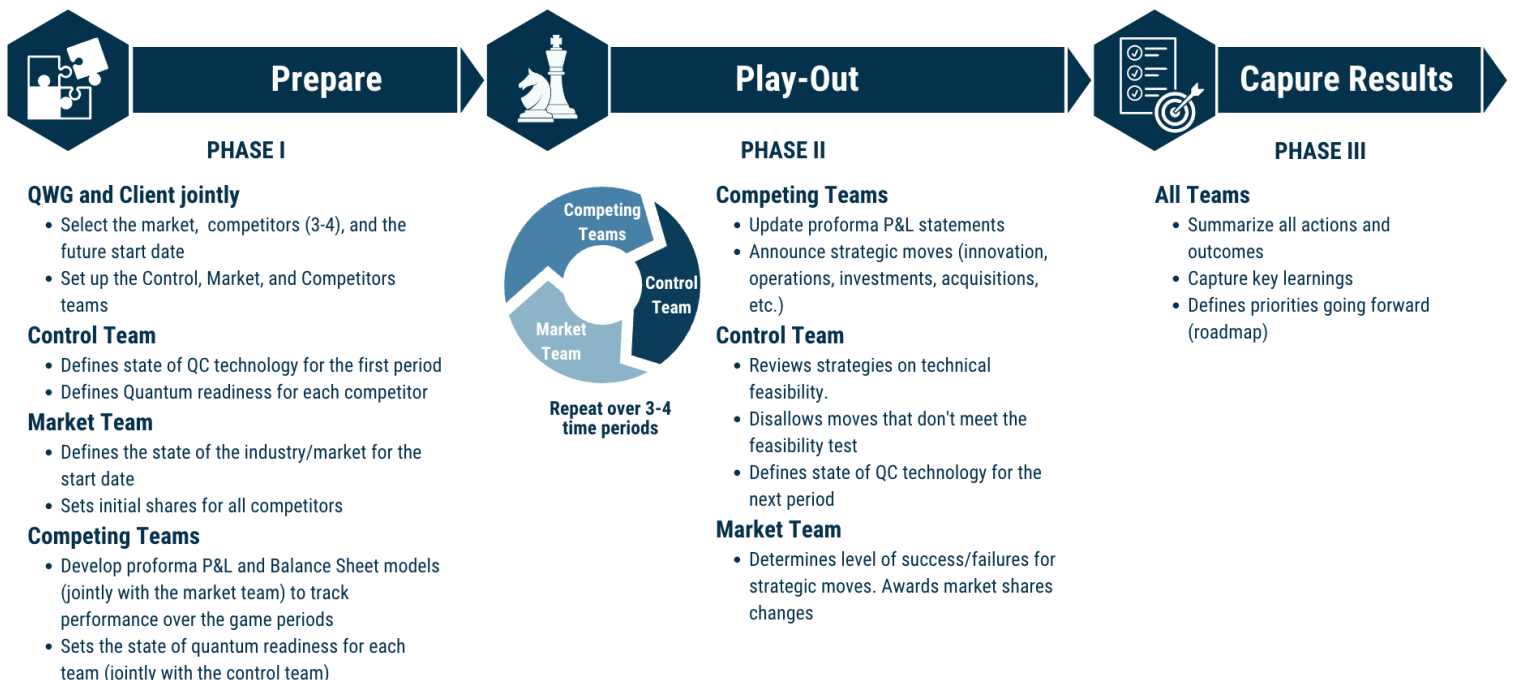


# How Does It Work?



- Game participants are assigned to teams: competing companies (3-4 teams), customers (market team), and technology oversight (control team)
- Control team defines the state of quantum technology and the quantum capabilities of competitors. It also ensures the technical feasibility of played-out strategies
- Competitor Teams assess technologies and their applications and make strategic moves (innovation, operations, acquisitions, etc.)
- Market Team determines the operational and market success of strategic moves announced by competitors
- Game is played through several periods

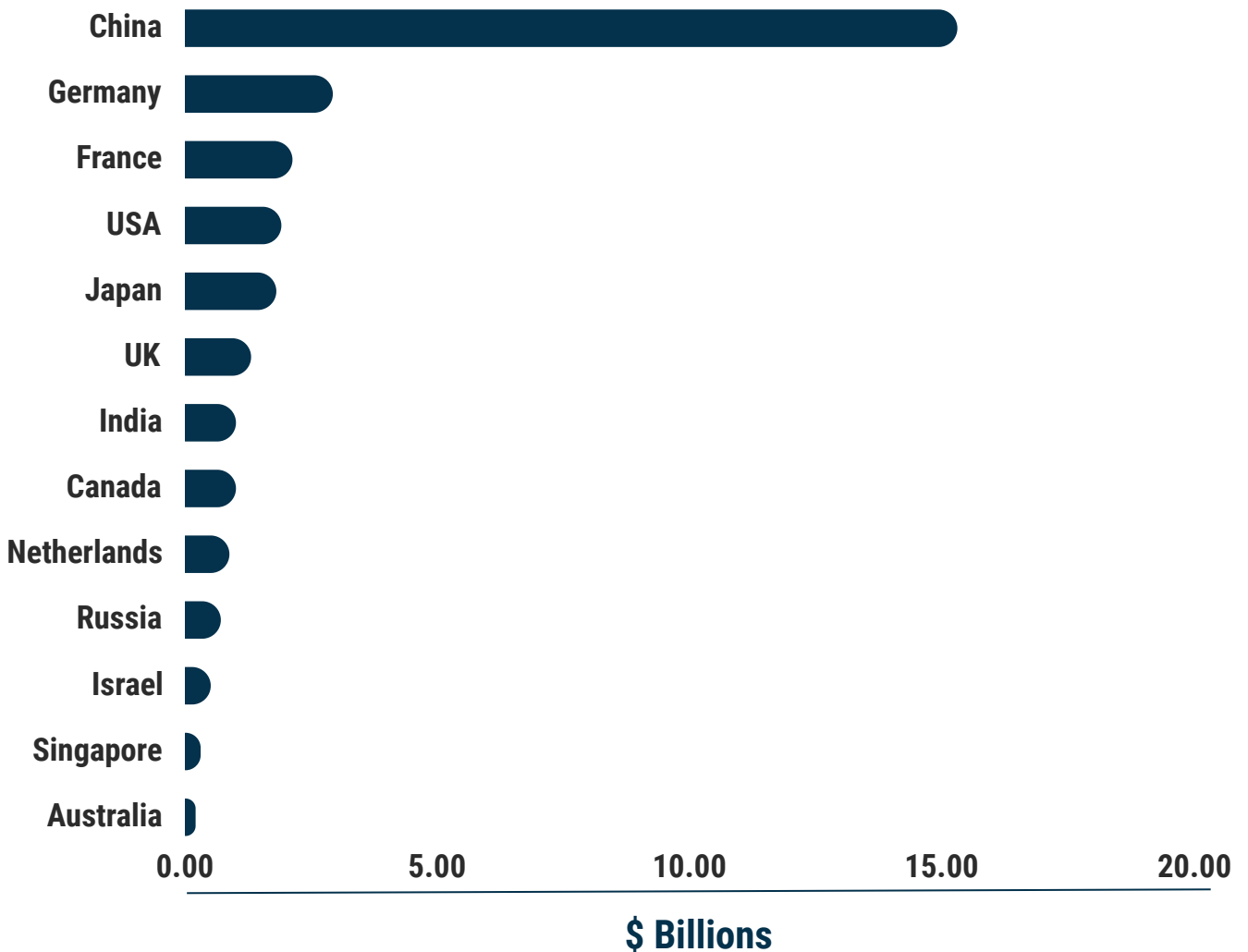
## Quantum Wargaming Approach



# The Race Is On

Private and Government investments in quantum computing grow exponentially

**China announced more government funding of quantum computing initiatives than the 12 following countries combined**



# About the Founder



## Alex Kandybin Founder

Alex Kandybin is a founder of Quantum Wargaming and is based in the USA (New York, NY, and Kennebunkport, ME). He is a former Lead Partner and Vice President of Booz & Company (Booz, Allen & Hamilton) and an Executive at IBM. Alex has also worked as an Adjunct Professor (Innovation Strategy) at the Columbia Business School.

During his 25+ years in strategy consulting, industry, and academia, Alex has developed expertise in innovation, business strategy, and quantum computing capabilities.

Alex holds two US patents and authored many scientific and business articles. Some of his publications in Forbes, Strategy + Business, HBR, and MIT Sloan Management Review are listed below:

- Alexander Kandybin, "Innovation Requires Both Challengers And Defenders. Which Are You?," Forbes, September 2016
- Alexander Kandybin, "Diagnosing Dislocation," Strategy + Business, Autumn 2016. Learn to recognize different types of disruption threats and design the best strategic response.
- Alexander Kandybin and Vessela Genova, "Big Pharma's Uncertain Future," Strategy + Business, Spring 2012.
- Alexander Kandybin, "Which Innovation Efforts Will Pay?," MIT Sloan Management Review, Fall 2009, Vol.51 No.1
- Les Moeller and Alexander Kandybin, "Down – Following Consumer," Harvard Business Review, January – February 2009
- Alexander Kandybin and Surbhee Grover, "The Unique Advantage," Strategy + Business, Autumn 2008. To succeed in a mature industry, the trick isn't being first – it's being hard to copy.
- Alexander Kandybin and Martin Kihn, "The Innovator's Prescription: Raising Your Return on Innovation Investment," Strategy + Business, Summer 2004.
- Alexander Kandybin, Martin Kihn, and Cesare Mainardi, "Reinventing Scale: How to Escape the Size Trap," Strategy + Business, Second Quarter 2002, Issue 27.
- Tim Laseter, Alexander Kandybin, and Pat Houston, "Marketing and Operations: Can This Marriage Be Saved," Strategy + Business, First Quarter 2002, Issue 26.
- Alex led many large-scale business transformations to improve competitiveness, raise innovation effectiveness and build advanced digital capabilities, including AI/ML and quantum computing.

## Education

MBA with High Distinction from the University of Michigan Ross School of Business

Ph.D. in Applied Chemistry and M.S. in Chemical Engineering from Moscow Mendeleev University of Chemical Technology

# Thank You



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