The Quantum Revolution and IP: Advancing and Protecting America's Innovative Edge

The Hudson Institute & The Federalist Society

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About ITIF

- The world’s leading science and technology policy think tank.
- Supports policies driving global, innovation-based economic growth.
- Focuses on a host of issues at the intersection of technology innovation and public policy across several sectors:
  - Innovation and competitiveness
  - IT and data
  - Telecommunications
  - Trade and globalization
  - Life sciences, agricultural biotech, and energy
IPRs Deliver Five Key Benefits, As They:

1. Create incentives for domestic innovation.
2. Generate revenues enabling investment in future generations of innovation.
3. Induce knowledge spillovers that help others innovate.
4. Ensure companies can focus on innovating; not having to protect their IP.
5. Promote the international diffusion of technology, innovation, and know-how.
Innovation-Based Industries Share Three Distinct Characteristics

1. They compete by inventing next-generation products or services.

2. They are characterized by very high initial fixed costs (e.g., R&D/design), but lower marginal costs of production.

3. They fundamentally embody and depend on intellectual property.
Implications for Quantum Computing

1. Massive R&D investments will be required.

2. Need IP framework that enables the development of technology in a cooperative/collaborative environment.

3. Need to secure IP rights globally to allow emergence of competitive firms/markets.
Why Quantum Computing Leadership Matters For Nations

1. The emergence of new computing architectures can shift where global computing leadership resides.

2. QC will become a key enabling technology determining the competitiveness of virtually all downstream industries.

3. A robust source of high-value jobs, output, and exports.

4. Immense national security implications.
Trends in Global Quantum Computing Patent Applications

Source: The Economist, “Sensing sensibility: Quantum technology is great for measuring” March 9, 2017
Overall Quantum Information Technology Patent Families by Publication Year


Trends in Global Quantum Computing Patent Applications

Since 2013, the number of QIT publications listing China as the priority country grew by almost 750%.

72% of the academic patent families published in QIT since 2012 have been from Chinese universities. 12% from the United States.

China dominates *quantum applications*, with three times as many patent families projected for 2017 as the United States.

“North American organizations may control the computer, but Asian ones may control how those machines are used.”
Trends in Global Quantum Computing Patent Applications

Quantum Information Technology Patent Families by Organization

Top 10


11-20
What Are America’s Competitors Doing?

**National Laboratory for Quantum Information Sciences**

- $10B; 4,000-sq. ft. research center in Heifi, China.
- Already fielded a 2,000-km long quantum communications pathway; a quantum communications satellite; satellite-to-ground quantum network.
- Alibaba alone investing $15B in QC/AI/IoT in the next three years.

*China has stated a clear goal “to surpass the United States in quantum computing leadership within the decade.”*
What Are America’s Competitors Doing?

**UK National Quantum Computing Technologies Program**

- Develop hubs of quantum computing excellence.
- Quantum Innovation Fund offers $200K prizes to QC innovators.
- $337M investment. (U.S. would have to invest $2B to match).

**EU Flagship Initiative on Quantum Technologies**

- Launched 2018 with €1 billion commitment.
- Creates the European Quantum Technologies Roadmap
What’s America Doing?

**National Quantum Computing Initiative Act**

- Calls for 10-year, interagency effort to accelerate progress in quantum information science (QIS) and technology development.

- Create a National Quantum Coordination Office (coordinate agency efforts).

- Allocate $1.275B to QIS R&D over next five years, including $125M annually for 5 “National Quantum Information Science Research Centers.”
Conclusions

1. Quantum computing represents a transformative platform technology that will impact the competitiveness of all sectors.

2. U.S. leadership cannot be taken for granted.

3. Countries must make quantum computing leadership a national priority.
Thank You!

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