

Quantum i Kongsberg Discovery

Terje Nilsen, Direktør Disruptive
Technologies





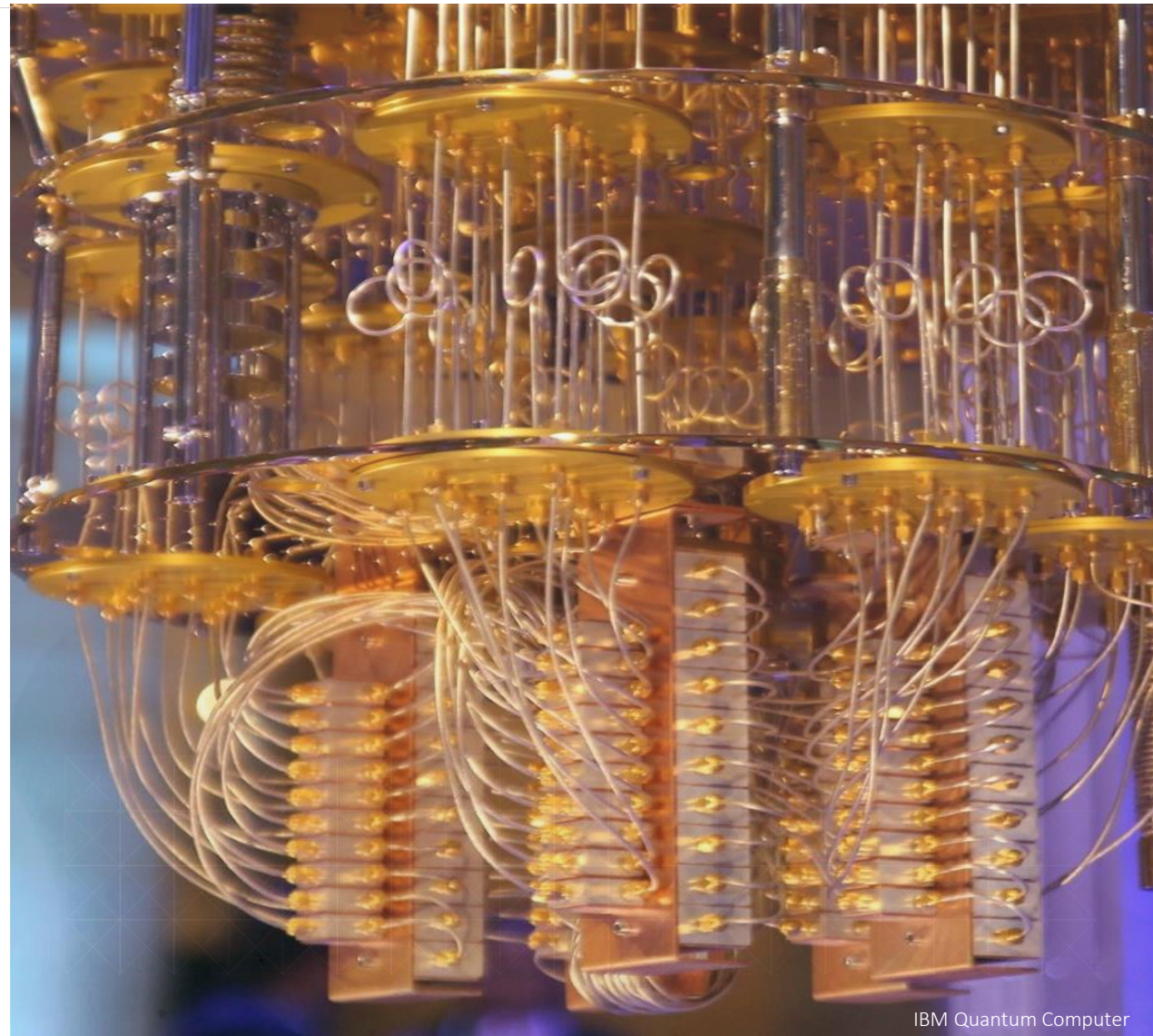
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Why should Kongsberg invest in Quantum Computer knowledge

And what about Quantum
Sensors, Quantum cryptography
and communication

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Terje.nilsen@km.kongsberg.com



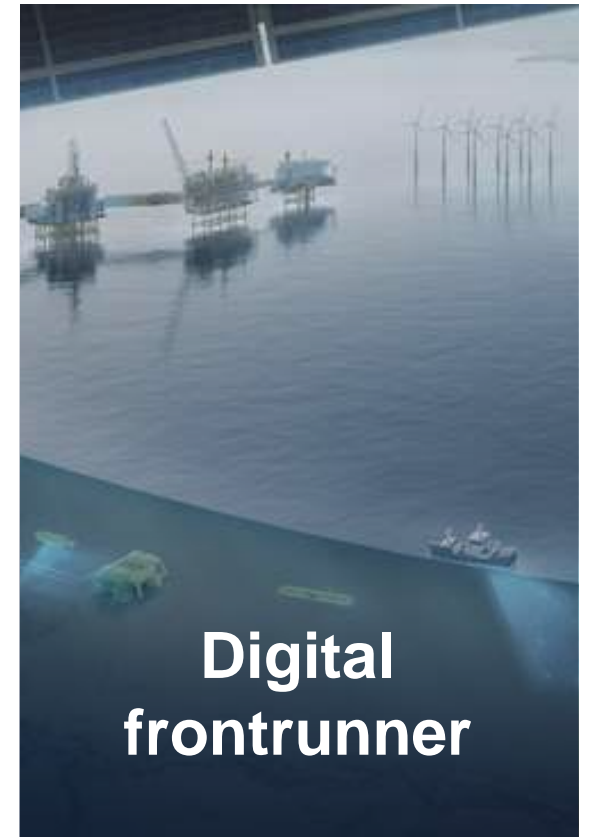
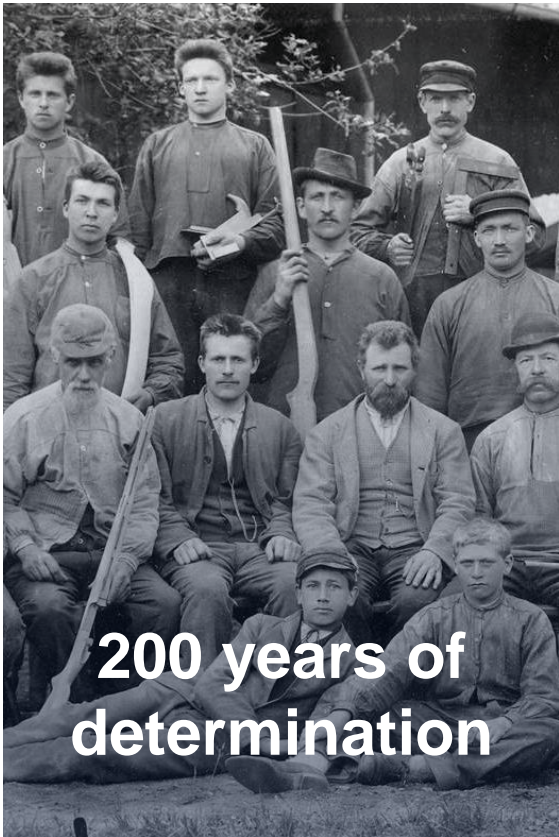
IBM Quantum Computer



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200 years of excellence

Two centuries of achievement, innovation and transformation —fuelling a journey that has seen us start as a small munitions business in Norway and emerge as a pioneering global technology provider.

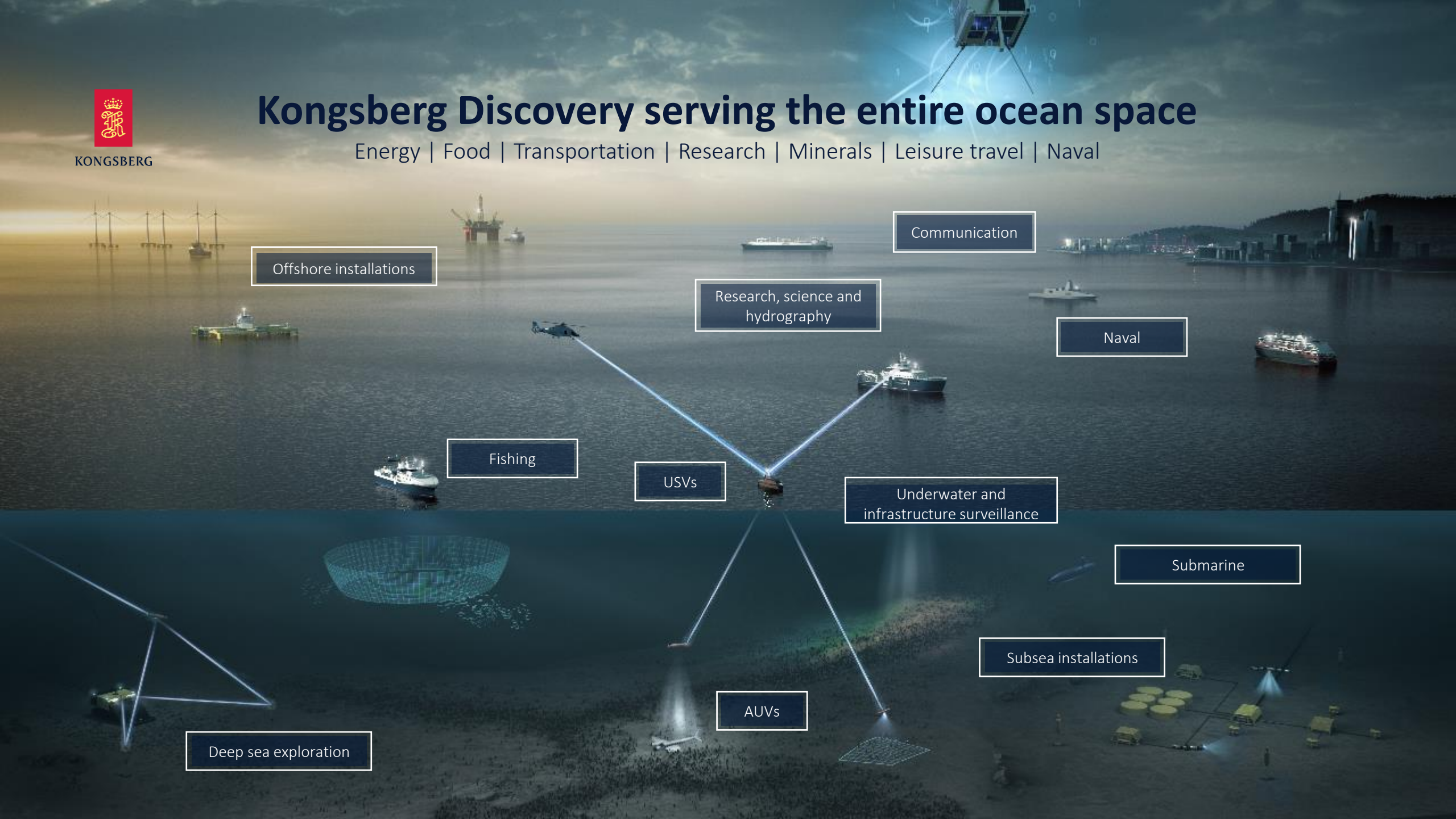




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Kongsberg Discovery serving the entire ocean space

Energy | Food | Transportation | Research | Minerals | Leisure travel | Naval



Offshore installations

Communication

Research, science and hydrography

Naval

Fishing

USVs

Underwater and infrastructure surveillance

Submarine

Subsea installations

Deep sea exploration

AUVs



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Why Quantum Technology

What can Quantum technology do for Kongsberg

- First; Quantum technology is divided into three major parts:
 - Quantum Computing
 - *It is all about solving some equations that classical computers can not solve.*
 - Quantum Communication/Krypto
 - *It is about sending data between two parties absolutely secure.*
 - *This has a sub-activity to prevent future Quantum computers from breaking crypto keys named post-quantum cryptography.*
 - Quantum Sensors
 - *Sensors based on Quantum effects, like entanglement, superposition, tunneling etc.*

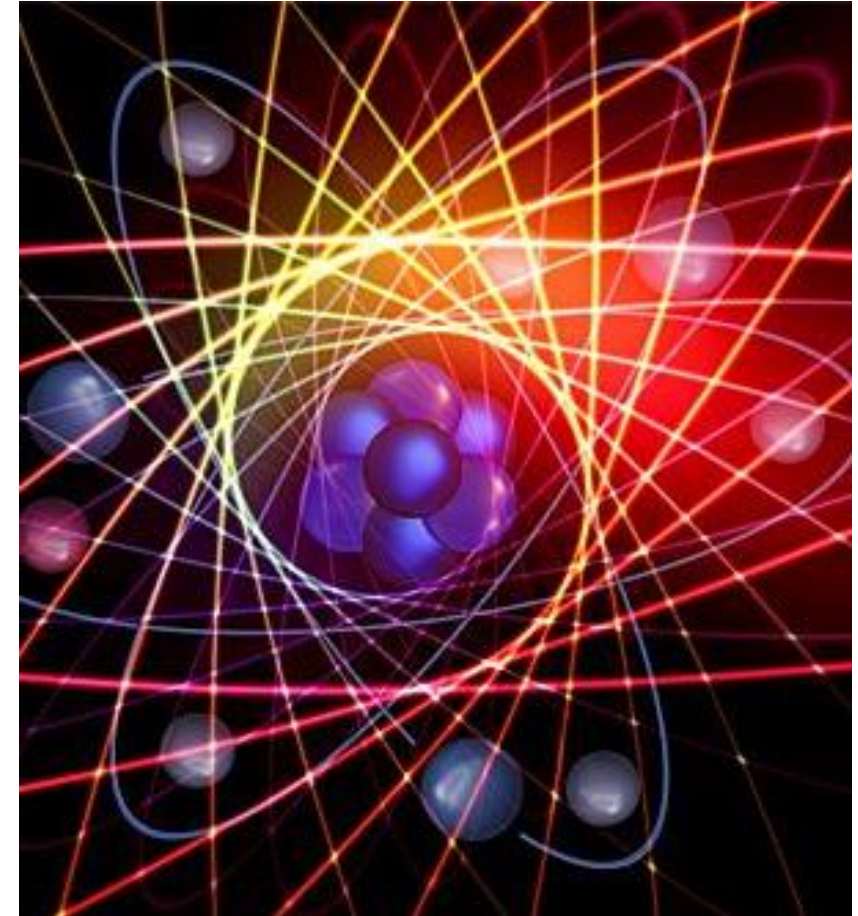


Image from IEC International Electrotechnical Commission



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Why Quantum Technology

What can Quantum technology do for Kongsberg

- All these fields are important to Kongsberg.
 - *KDI delivers software that could benefit from quantum computing algorithms in the future.*
 - *KDA delivers software that uses encryption that must be protected for over 30 years.*
 - *KD delivers sensors that must be competitive in the future.*
 - *All Kongsberg divisions use communication that must be safe and trusted.*
- *We need to stay in front, not be disrupted by competitors, and deliver safe, competitive products in the future.*
- *For Kongsberg, it is important to follow Quantum technology as it evolves.*





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Why Quantum Technology

What can Quantum technology do for Kongsberg



- **As an example:**

- *Kongsberg Discovery delivers HUGIN, an AUV that can operate submerged and autonomously for weeks.*
- *Being fitted with different sensors, it can do surveys, look for lost goods, etc.*
- *One challenge is that there is no GNSS/GPS underwater, so how does it know its position?*
- *In Kongsberg, we have MRU and extremely precise IMU that can estimate positions using inertial motion only.*
- *However, after some time, even that started to drift. Now, there are several additional methods for navigation, but they all have some issues.*
- *The question becomes: Would a quantum-based inertial sensing unit be able to lower the drift issue enough to navigate for weeks without losing its position considerably?*



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Why Standardisation

What can Quantum technology do for Kongsberg

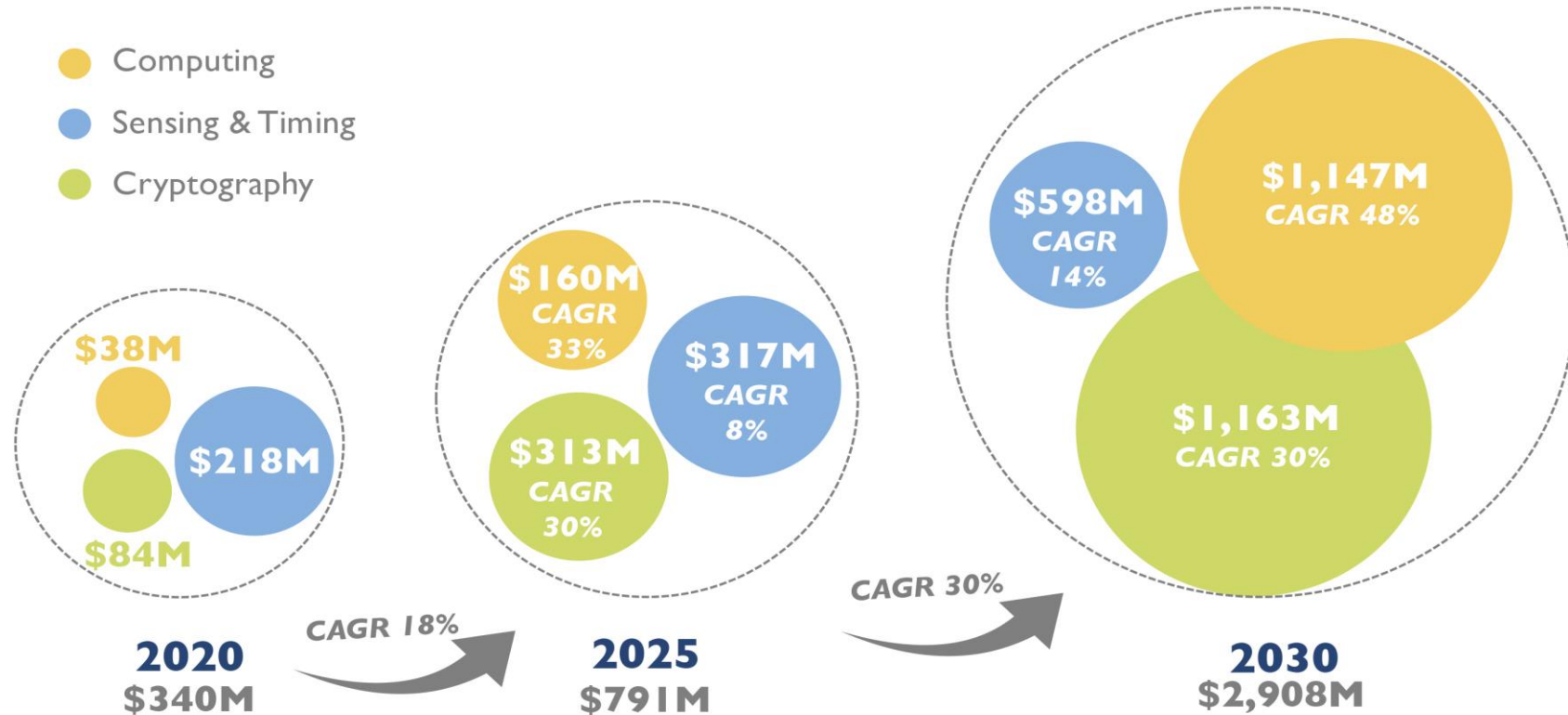
- **When a new technology arrives, fundamentally different from all we know and experience daily, it is important to standardize on certain aspects.**
- **When that is said, it is also important to understand where the limit goes;**
 - We need standardized terminology to know we talk about the same thing.
 - We need standardized test/measuring methods and comparison methodology to be able to compare different products.
 - *This will be very hard, as we also want to compare classical and quantum-based systems, which are fundamentally different.*
 - We need and possibly have standards for equipment used in the quantum industry.
 - *These are mostly classical instruments like lasers, fiber cables, photon detectors, etc.*
 - Product standards make no sense at the moment; almost no quantum technology has proven supremacy at the moment, and thus, we must not limit ourselves to unsound standards.

2020-2030 market forecast for quantum technologies

(Source: Quantum Technologies 2021 report, Yole Développement, 2021)



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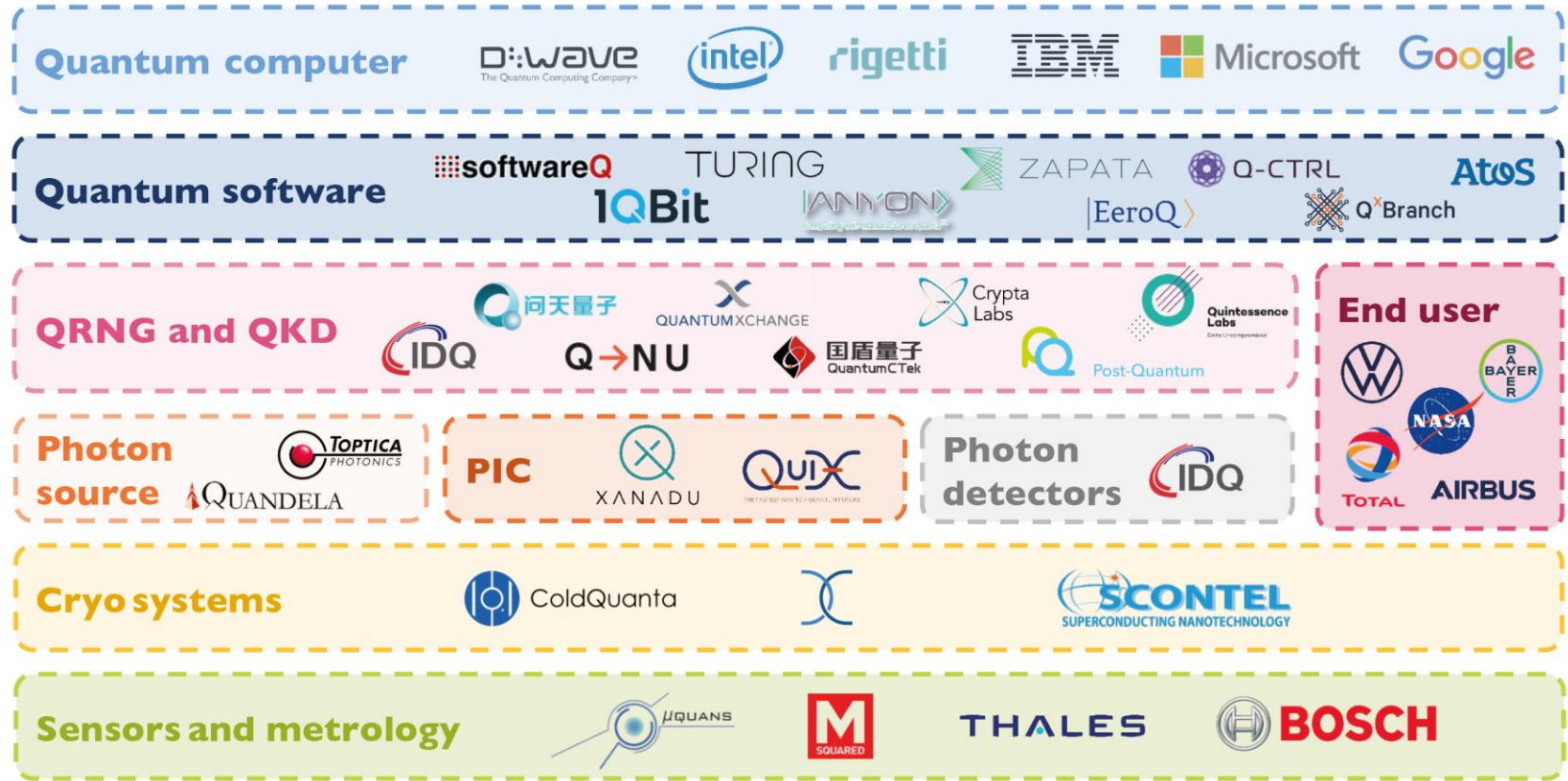


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Example of quantum technology supply chain

(Source: Quantum Technologies 2020 report, Yole Développement, 2020)

Point out Norwegian Companies



Non exhaustive list

PIC: Photonic Integrated Circuit - QKD: Quantum Key Distribution - QRNG: Quantum Random Number Generator



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Thank you

Terje.Nilsen@kd.Kongsberg.com

