



KAMARAJ IAS ACADEMY
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World Economic Forum (WEF) report

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Context:

The **World Economic Forum (WEF)** released a report on **20th January 2025** titled "**Embracing the Quantum Economy: A Pathway for Business Leaders,**" which explores the economic potential of quantum technologies.

Key Insights from the Report:

- **WEF's Quantum Economy Network (QEN)**, part of the Centre for the Fourth Industrial Revolution, helps stakeholders understand and prepare for the economic impacts of quantum technologies.
- The report outlines the **economic impact** of quantum technologies, showcasing their potential to revolutionize industries and enhance capabilities beyond current technologies.

Key Quantum Technologies:

1. Quantum Computing:

- A developing field that uses quantum mechanics to tackle problems beyond the reach of classical computers, offering new solutions for complex challenges.

1. Quantum Sensing:

- Quantum sensors offer unprecedented sensitivity and precision, used in tools like **atomic clocks**, **accelerometers**, and technologies for **navigation**, **medical imaging**, and **geophysics**.

1. Quantum Communication:

- Ensures **secure data transmission through theoretically unbreakable encryption**, crucial for cybersecurity and the development of future products and services.

Technological Challenges:

The report highlights several hurdles to unlocking the potential of quantum technologies:

- **Error Rates:** Quantum bits (**qubits**) are fragile and vulnerable to errors from environmental interference and decoherence.
- **Scalability:** Building large-scale quantum computers is challenging due to error rates and resource demands.
- **Interoperability:** Integrating quantum systems with classical systems requires hybrid models and new software.
- **Sensitivity and Precision:** Real-world performance of quantum sensors is affected by temperature fluctuations and electromagnetic interference.
- **Security and Reliability:** Ensuring secure, long-distance quantum communication faces issues like signal loss and noise.

Path Forward:

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To fully realize the potential of the quantum economy, the report stresses the importance of:

- **Public-private partnerships** to drive innovation.
- **Investment in education** to build expertise in quantum technologies.
- **Strong regulatory frameworks** to support safe and effective development of quantum technologies.

By addressing these challenges and fostering collaboration, quantum technologies could unlock significant economic opportunities in sectors like cybersecurity, healthcare, and computing.