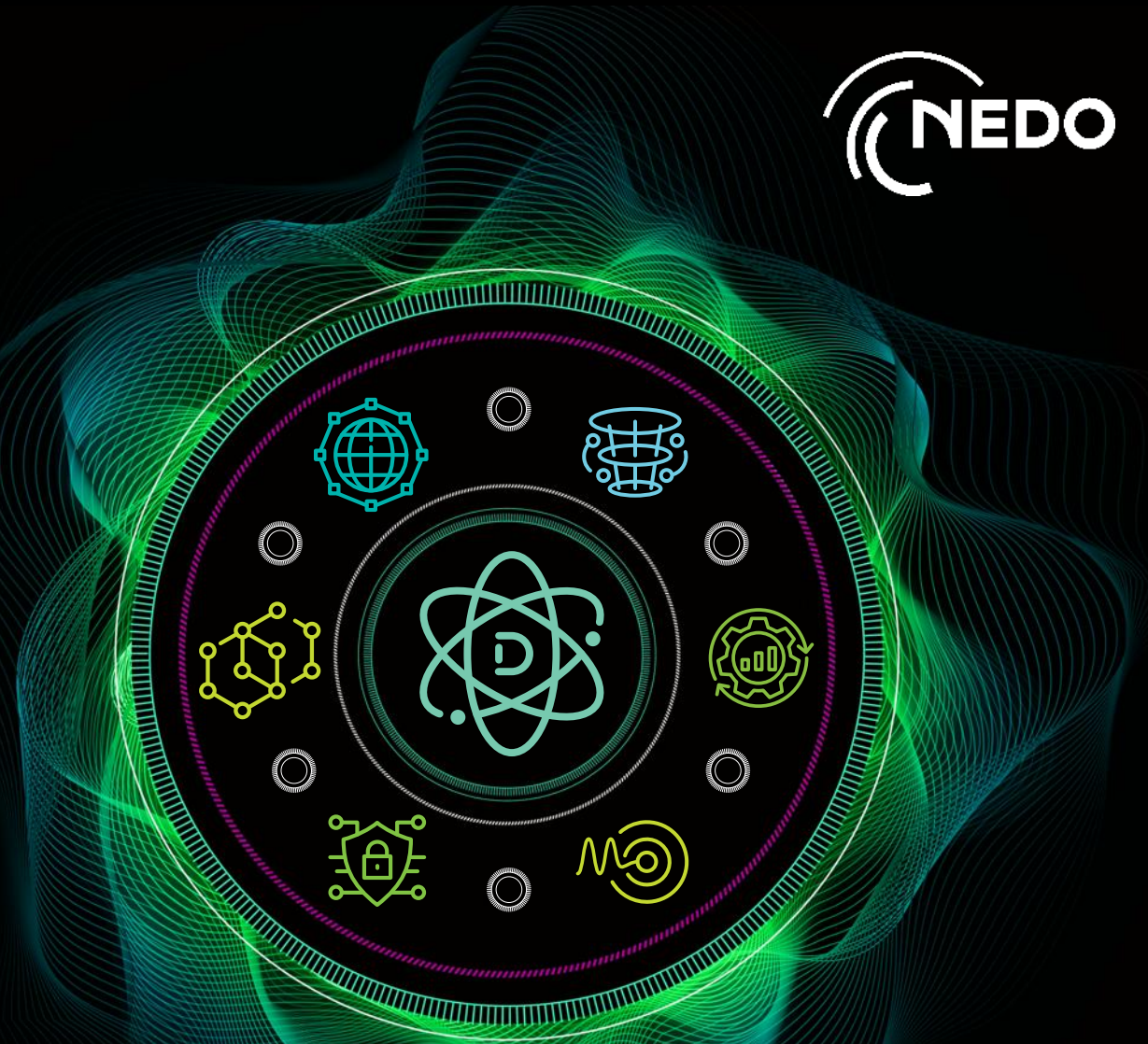
Quantum Computing Use Cases

Healthcare utilizing personal health data



Promotion of SDGs with Quantum Technology

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New Energy and Industrial Technology Development Organization (NEDO)

個人ヘルスケアデータを活用した医療
Healthcare utilizing personal health data

NO IMAGE

ユースケース概要 **Use Case Overview**	個人のヘルスケアデータを医療機関と連携し、早期に健康異常を検知 Linking personal healthcare data with medical institutions to detect health abnormalities early.
解決できる課題と効果 **Issues to be addressed and their effects**	診断・治療の超高度化および医療格差の是正 Advanced diagnosis and treatment, and the correction of healthcare disparities.
量子技術の貢献 **Contributions of quantum technology**	小型かつ高精度なセンサーデバイスが普及し、個人の微細な体内変化を検知 Small, highly accurate sensor devices detect minute changes within an individual's body.

実現予想時期 **Expected realization period**	(Year)2030～2035
産業分類 **Industry classification**	情報・金融・その他サービス Information・Financial・Other services
関連するQRAMI階層 **Related QRAMI layers**	物体層 Asset layer
関連する量子技術 **Related quantum technologies**	量子センシング、量子コンピュータ Quantum Sensing、Quantum Computer

新規性 **Novelty**	既存の模倣 Existing imitation
達成難易度 **Difficulty of achievement**	容易 Easy
社会貢献度 **Social contribution level**	特定の業種に貢献 Contributions to specific industries
市場規模 **Market size**	10兆円～ 10T¥～

Detail

Healthcare utilizing personal health data

Issues to address

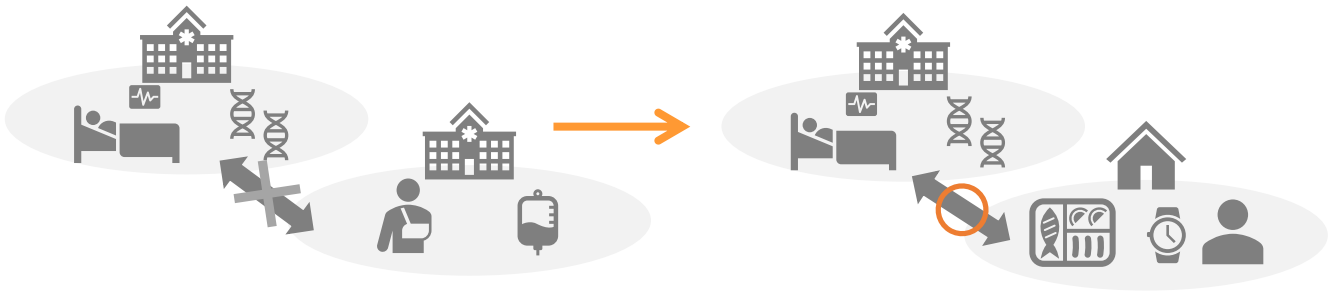
- Ultra-advanced diagnosis/treatment and eradication of unknown diseases (bridging cross-regional healthcare gaps)

Use case overview

- With the increased precision of devices, more advanced personal healthcare data can be routinely collected, enabling the early detection of health abnormalities.
- **By sharing this information with medical institutions and conducting high-precision analysis using quantum technology, early diagnosis and treatment of diseases, as well as the elucidation of rare diseases, become possible.**

Implementation vision

Achievement target period: 2030–40



- Small and high-precision terminals (smart glasses, non-invasive BMI, in-body implant sensors, etc.) will become widespread, enabling the acquisition of advanced personal healthcare data (smell, brain waves, body changes, etc.). By analyzing these data and detecting health abnormalities and stress at an early stage, high-quality diagnosis can be provided.
- Quantum cryptography communication will enable exchanging and utilizing a wide variety of healthcare data between hospitals and individuals.

Expected benefits

- Accurate diagnosis based on personal healthcare data
- Elucidation of the mechanism of unknown diseases through advancement in medical research

Action plan

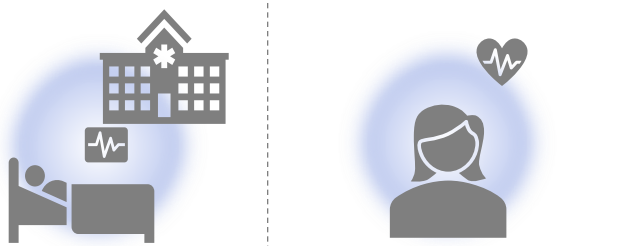
QRAMI hierarchy	Action
Business	Services that utilize personal information for diagnosis/treatment
Functional	Develop system that enables exchange and utilization of data between medical institutions and personal devices
Information	Collect and manage examination data (full medical checkup information, etc.) from medical institutions and healthcare data obtained individually
Communication	Exchange data between medical institutions and individuals (communication of confidential data using QKD and PQC)
Asset	Develop sensors capable of obtaining advanced information (smell, brain wave, pain, gait, stress, etc.)
Policy aspect	Integrate personal information and medical institution examination data through the adoption of medical IDs

Roadmap

Healthcare utilizing personal health data

2023
Conventional medicine

Diagnosis/treatment at medical institutions



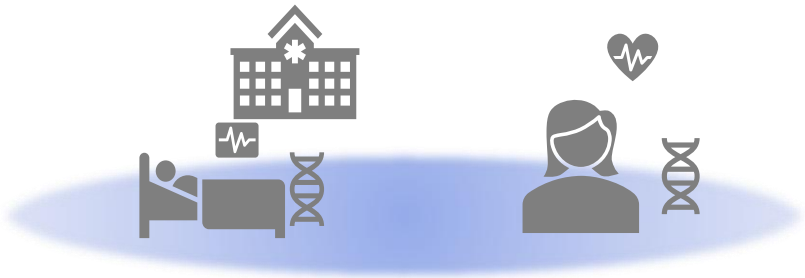
Data by medical institution

Personal healthcare data

- ✓ Data from medical institutions and healthcare data obtained through personal devices are independent.
- ✓ Going to medical appointments takes time, leading to a widening gap in healthcare access. Additionally, there are still many diseases that have yet to be elucidated.

Around 2030 to 2040
Acceleration of collaboration between medical institution and personal healthcare data

Advanced medical care using personal healthcare data

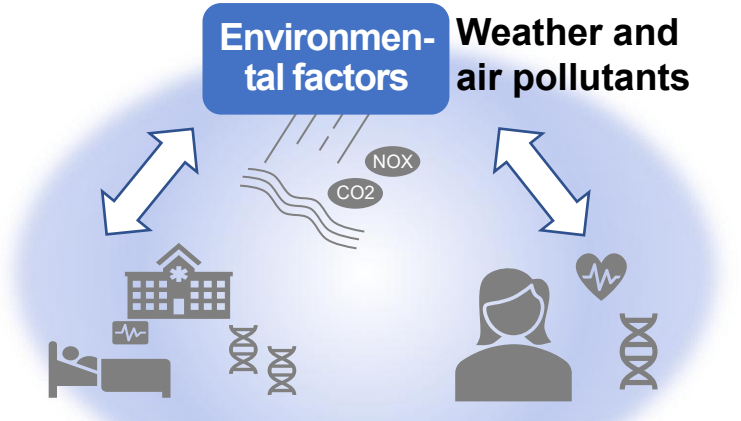


Data by medical institution ⇔ Personal healthcare data

- ✓ Sophistication of healthcare data (smell, brain wave, body condition, etc.) that can be obtained on a daily basis with personal devices and their use for diagnosis at medical institutions.
- ✓ Early detection of health abnormalities and stress, promoting research on the mechanisms of unknown diseases.

Around 2050
Real-time provision of ultra-advanced, personalized medical care

Ultra-advanced medical care utilizing individual genomic and healthcare data and environmental factor data



Data by medical institution ⇔ Personal healthcare data

- ✓ Link all kinds of personal data with real-time information on environmental factors to provide ultra-advanced and individually optimized medical care in real time.
- ✓ Promote research on early signs of pre-symptomatic conditions and contribute to the eradication of unknown diseases.

Roadmap

Healthcare utilizing personal health data

	2023	203x	204x	205x
	Diagnosis/treatment at medical institutions	**Advanced medical care using personal healthcare data**		**Ultra-advanced medical care utilizing individual genomic and healthcare data and environmental factor data**
Business	Conventional medical services	Services that enable diagnosis and treatment using personal information		Optimal medical services based on personal information (genome) and real-time environmental factors
Interface	Medical information retrieval API	Medical information retrieval API		Medical information retrieval API
Functional	Independent system for each medical institution	System that allows data exchange and utilization between medical institutions and personal devices		**Healthcare-related data and environmental data linkage and analysis platform (secure and systematic)**
Information	**Examination data of each medical institution (full medical checkup information, etc.)**	**Examination data of each medical institution (full medical checkup information, etc.) Healthcare data obtained individually**		**Examination data of each medical institution (full medical checkup information, etc.) Healthcare data obtained individually Real-time environmental factor data**
Communication	**Exchange of data from individual medical institutions Exchange of data in personal devices**	**Exchange of data between medical institutions and individuals (communication of confidential data using QKD and PQC)**		**Exchange of data between medical institutions and between medical institutions and individuals (communication of confidential data using QKD and PQC)**
Integration	Medical equipment (Examination/treatment equipment) Healthcare apps for personal devices	Standard that enables obtaining data directly from medical equipment (captured on the NW, not USB)		Various wearable terminal devices Home appliances that detect physical condition (refrigerator, TV)
Asset	**Specialized equipment in each medical institution Sensors in personal devices (accelerometers, gyro sensors, etc.)**	**Sensors capable of obtaining advanced information (Smell, brain wave, pain, gait, stress, etc.)**		**Compact sensors that can capture advanced healthcare data without the individual being aware of it Environmental sensors with location information**
Policy aspect	Promotion of PHR utilization Only a limited number of medical institutions can handle personal medical information	Integration of personal information and medical institution examination data through the adoption of medical IDs		Revision of Medical Practitioners' Act, Pharmaceutical and Medical Device Act (former Pharmaceutical Affairs Act), etc. Expansion of scope of diagnosis and treatment that can be performed by non-physicians

More use cases are available on our website. We invite you to explore them.
https://www.quantum-computing-use-cases.nedo.go.jp/english/

More Use Cases

New Energy and Industrial Technology Development Organization (NEDO)
AI and Robotics Department (e-mail: quantum_ai@ml.nedo.go.jp)

This collection of use cases was obtained as a result of the work commissioned by the New Energy and Industrial Technology Development Organization (NEDO) "Cyber-Physical Development Business of Quantum/Classical Hybrid Technology/Study of Use Case of Quantum Technology" and the “Post-5G Information and Communications System Infrastructure Reinforcement R & D Project (Quantum Industrialization)/Comprehensive Study for Promoting the Industrialization of Quantum Computers ”.