Institute

Finland's National Quantum Institute

Innovation | Research | Education

InstituteQ's Mission

Our goal at InstituteQ is to raise the readiness of Finnish society for the disruptive potential and implications quantum technologies will have for society and the economy at large.

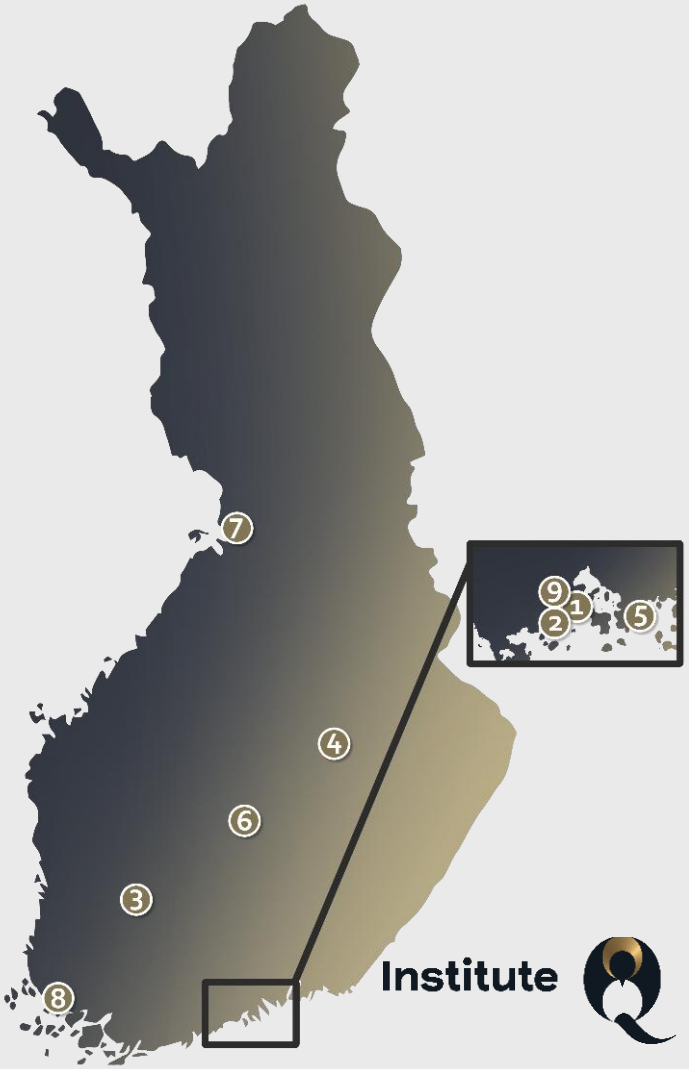
By teaming up our expertise and resources, we aim to carry, implement and mutually benefit from front line research, education, innovations, and infrastructures, that form the competitive edge for our community in the quantum era.

Aalto University · CSC · Tampere University · University of Eastern Finland · University of Helsinki · Jyväskylän yliopisto University of Jyväskylä · University of Oulu · University of Turku · VTT

Institute Q

InstituteQ Members

1. Aalto University
2. CSC – IT Center for Science
3. Tampere University
4. The University of Eastern Finland
5. The University of Helsinki
6. The University of Jyväskylä
7. The University of Oulu
8. The University of Turku
9. VTT Research Centre of Finland



InstituteQ Objectives

- Enable internationally highest-level research and education in quantum technology
- Coordinate national training programs (PhD & MSc) to educate future QST workforce
- Act as national contact point for international collaboration
- Boost development of new business and research
- Develop national infrastructures (such as OtaNano and FiQCI) and connect infra and users
- Act as National Quantum Competence Centre and prepare Finnish society for second quantum revolution
- Shape national quantum policy, informed by the diverse representation of our member partner institutions
- Host regular events focused in quantum technology research, education, innovation and policy

Areas of expertise

Joint: Ecosystem building, scaling up, education and talent development

Volume: Annual volume of operations: > **€40 million**

Tampere University
Novel quantum materials and metamaterials; quantum emitters and lasers; quantum photonics; theory of quantum many-body systems and quantum information

CSC
Hybrid high-performance computing and quantum computing infrastructure (HPC+QC); deployment of QKD in Finland

University of Turku
Quantum optics; open quantum systems; quantum thermodynamics; quantum reservoir computing; complex quantum networks; organic optolectronics; quantum gases

Aalto University
Superconducting technologies; quantum materials; integrated quantum photonics; sensing applications; quantum computers; algorithms and software; quantum communications engineering; quantum foundations; market emergence

University of Oulu
Quantum simulation; cybersecurity; molecular qudits; NV-centers

University of Jyväskylä
Superconducting electronics; quantum materials; radiation sensors; quantum algorithms and software; quantum information theory; quantum optomechanics; silicon spin qubits; hybrid quantum systems

University of Eastern Finland
Micro- and nanodiamond synthesis; quantum-enhanced electromagnetic measurements; quantum photonics

University of Helsinki
Quantum algorithms and software; quantum simulations and NISQ; quantum information and foundations; quantum education research; quantum philosophy

VTT
Microsystems design and fabrication; quantum components and architectures; system integration; quantum computers; quantum standards and atomic clocks; quantum software, algorithms and applications; deployment of QKD in Finland

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InstituteQ's Pillars of Operation

EduQ

education and talent development

ResQ

fundamental and applied research and infrastructure development

InnoQ

innovation and ecosystem development

EduQ overview

Vision: Education on a broad front and for various levels of expertise

- BSc and MSc studies within degree programmes,
- Doctoral studies (QDOC and other programmes),
- Address the needs of the future workforce,
- Retraining models and studies for general public,
- Education resources for schools (for students and teachers).
- Utilise international partner network.

Action: Enhanced education offerings in collaboration with partner organizations

- Shared student and researcher supervision,
- Shared education and teaching resources,
- Cross institutional study agreements
- Open online materials, open university courses,
- Tailored training modules for workforce and executives. Delivered by expert educators.
- Nordic, European and global collaborations

News in EduQ 2026

National educational activities

- Teaching collaboration and **cross-studying** between the InstituteQ partner institutions

Agreement signed in May 2026
1st courses offered in 2026

Further information from Elina Palmgren and Kimmo Tuominen (Univ Helsinki)

- **Upskilling**: executive education with AaltoEE

1st event in June 2026

- **MSc thesis** pilot program

Nordic collaboration

We welcome ideas for future collaboration!

European collaboration

EU projects QTIndu, DigiQ, and European Quantum Academy (EQA)

Global collaboration

Bilateral collaborations

Technology Industries of Finland Centennial Foundation: **Master's thesis pilot program**

MSc thesis pilot program coordinated by InstituteQ, aimed at strengthening collaboration between businesses and higher education institutions and supporting companies in leveraging the potential of quantum computing.

The Foundation will award 25 thesis grants of €20,000 each for theses carried out in collaboration between a company and a university or research institute.

- The thesis topics primarily in quantum computing; targeting end-user companies.
- Grant applications prepared jointly by the student, their supervisor, and the collaborating company.
- InstituteQ will provide expert support to the Foundation in evaluating the applications.
- The grant is awarded to the student and is not intended to cover costs incurred by the company.

The program model is adapted from the ongoing MSc Thesis Program on AI Topics:
https://techfinland100.fi/grants-for-masters-theses-on-ai-topics/

ResQ Strategic Objectives

Attract Talent

- Doctoral Training Program
- Postdoctoral Program
- Chair of Excellence Program
- Faculty Recruitment Program

Provide Access to RI

- Mapping and Steering
- Sharing of Fabrication Know-how
- Access to Hardware Platforms

Foster Research Collaboration

- Currently 97 affiliated PIs
- Finnish Quantum Days
- Colloquia
- Seminars/Workshops

- International leading experts and eminent scholars hosted at InstituteQ
- 3-year term; cumulative commitment of **9–12 months**
- Appointed chairs collaborate with InstituteQ research groups and deliver guest lectures
- **€60k** award during the 3-year term

https://instituteq.fi/chair-of-excellence/

Professor Sergey Kubatkin
Chalmers University of Technology

Chairs of Excellence

Prof. Simon Devitt
University of Technology Sydney

Prof. Charles Marcus
University of Washington

InnoQ overview

Research, development and innovation collaboration to get funding and create jointly new IP (**RDI**)

Driving ideas and IP from universities to commercial use (**Spinouts & IP**)

Bringing together software companies and users to accelerate real world applications, IP capture and quantum use (**Adoption**)

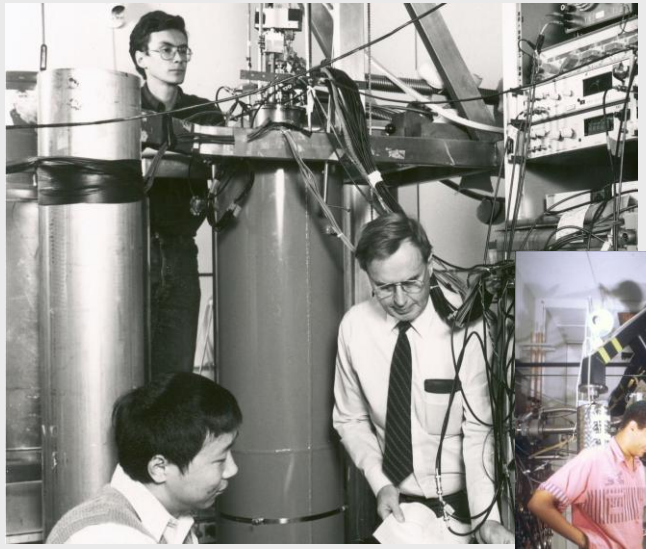
Hosting **BusinessQ network** to facilitate memberships, coordinate meetings and events

InnoQ supports the development of the Finnish quantum innovation ecosystem by active engagement between InstituteQ organizational members, Finnish and international companies, and other stakeholders.

Pre-quantum in Finland

1965 – Low Temperature Laboratory (LTL) was founded by Olli V. Lounasmaa

1973 – LTL achieved global recognition by verifying Helium-3 superfluidity using an in-house built cryostat.



LTL has influenced global advancements in refrigeration and superconductivity, shaping Finland's leadership in QST.

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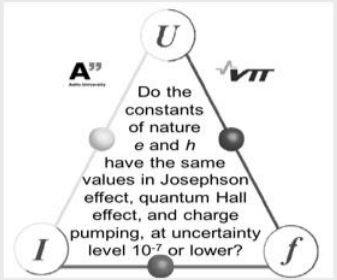
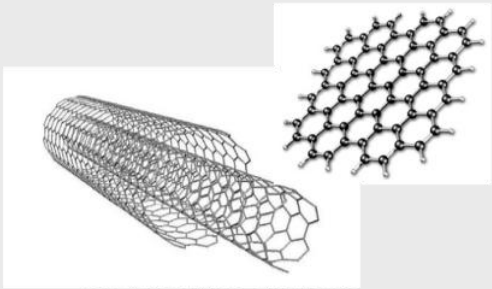
… from ultra-low temperature physics, to nano electronics and quantum technology

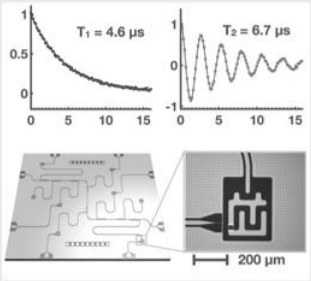
CRYOGENIC TECHNIQUES



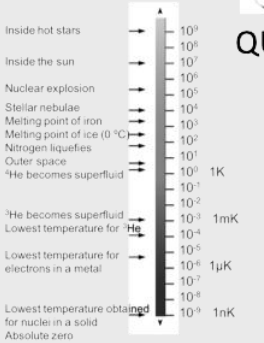
QUANTUM METROLOGY



GRAPHENE, NANOTUBES, 2D MATERIALS

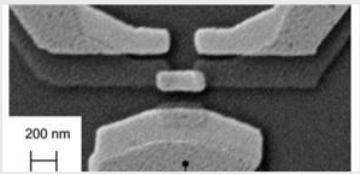


SUPERCONDUCTING CIRCUITS



SUPERCONDUCTIVITY AND SUPERFLUIDITY

MAGNETOENCE-PHALOGRAPHY



NANOELECTRONICS

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Ecosystem

1972
Instruments for Technology Oy Ab

1978 PICOWATT
Instruments for thermometry at ultralow temperatures

2006 aivon
Cryogenic sensors, lab electronics

2013 ASQELLA
Passive sub-mm- wave technology for security applications

2016 Eigenco Oy
Microwave measurement techniques

2020 algorithmiq
Quantum-enhanced solutions to complex problems

2024 AGATE SENSORS
Full-spectrum sensors on a chip

2024 QMill
Algorithms in the NISQ era

2024 ARCTIC INSTRUMENTS
Amplifiers for quantum computers

Institute Q
2021 ->

1995 – 1999
Low Temperature Laboratory, LT physics

2000 – 2005
Low Temperature Laboratory, LT physics and neuroscience

2006 – 2011
Low Temperature Quantum Phenomena and Devices

2012 – 2017
Low Temperature Quantum Phenomena and Devices

2018 – 2025
Quantum Technology Finland (QTF)

2026-2033
Centre of Excellence in Quantum Materials (QMAT)

2024 – 2031
Finnish Quantum Flagship

1989 Mustekala ky
Functional neuroimaging
(currently global business area of York Instruments Ltd)
YORK INSTRUMENTS

2005 Nanoway cryoelectronics
CBT thermometers

2008 BLUEFORS
Cryogenic cooling systems

2015 BEAT2PHONE
(VitalSignum Oy)
Mobile health technology sensor applications

2021 QUANSCIENT
Quantum simulation-as-a-service platform

2018 IQM
Superconducting quantum computing

2023 SemiQon
Silicon based quantum processors

2024
QDOC
Doctoral Pilot

Infrastructures

- **OtaNano** for fabrication, characterization, measurement and testing (> 300 individual research equipment, 2600 m^2 cleanrooms), + in preparation: **Kvanttinova**, piloting environment
- **FiQCI** for quantum/supercomputing facilities (HPC-QC, first devices in operation)

- **NaQCI** national QKD network
- **FinnLight** for photonics and light-based technologies

CSC

FinnLight

Aalto University

NaQCI.fi EuroQCI

National Research & Education Initiatives

FQF

The Finnish Quantum Flagship

Hosted within InstituteQ, the Finnish Quantum Flagship is an 8-year project jointly funded by its various host organizations and the Research Council of Finland.

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The Finnish Quantum Flagship

FQF

8 years — Project timeline (2024-2031)

7 — Host organizations

€13M — Initial Research Council of Finland funding

Quantum Doctoral Education Pilot

€23M
IN FUNDING

90
QUANTUM DOCTORAL POSITIONS

Centre of Excellence in Quantum Materials

Led by the University of Jyväskylä, other QMAT institutions include Aalto University, Tampere University and VTT. QMAT will run from 2026-2033.

30 years

QMAT represents a 30-year long unbroken chain of quantum-themed Centres of Excellence.

FQF

Project overview

€13M Initial Research Council of Finland funding

7 Host organizations

8 years Project timeline (2024-2031)

Programmes

MATERIALS
Quantum materials bring quantum phenomena to the macroscopic scales required for QT, enabling emergent phenomena non-existent in conventional materials.

DEVICES
Quantum devices leverage quantum resources, merging material science and nanotech. Finnish researchers excel in low-temp and nanophysics in this program.

ALGORITHMS, SOFTWARE, INFORMATION
Quantum computing will require algorithms and software fundamentally different from their classical counterparts. This program aims to bridge this gap.

FUTURE
This program drives impact in QT and reserves resources for emerging directions. Annual calls for lighthouse projects ensure renewal and synergy with the ecosystem.

ECOSYSTEM
The program enhances collaboration and fosters innovation and knowledge transfer among universities, RTOs, companies, government entities, and private investors.

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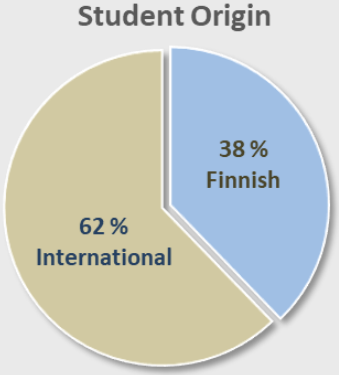
QDOC

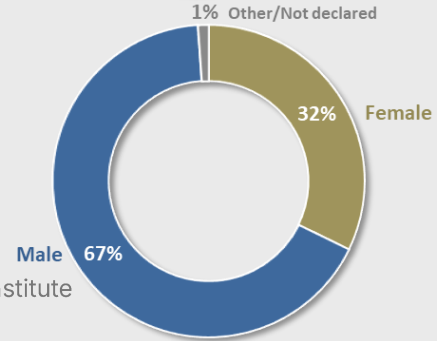
Quantum Doctoral Pilot Programme

QDOC will train the next line of quantum technology experts as part of the Finnish Quantum Flagship's eight-year master plan.

€23M
IN FUNDING
(2024-2027)

90
QUANTUM DOCTORAL POSITIONS





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Finnish Quantum Technology Strategy 2025–2035

The Finnish Ministry of Economic Affairs and Employment published on April 24, 2025 its Quantum Technology Strategy.

InstituteQ plays a critical role in the execution of the Quantum Technology Strategy, including the national coordination of quantum research, education, infrastructure, innovation and international cooperation endeavours.

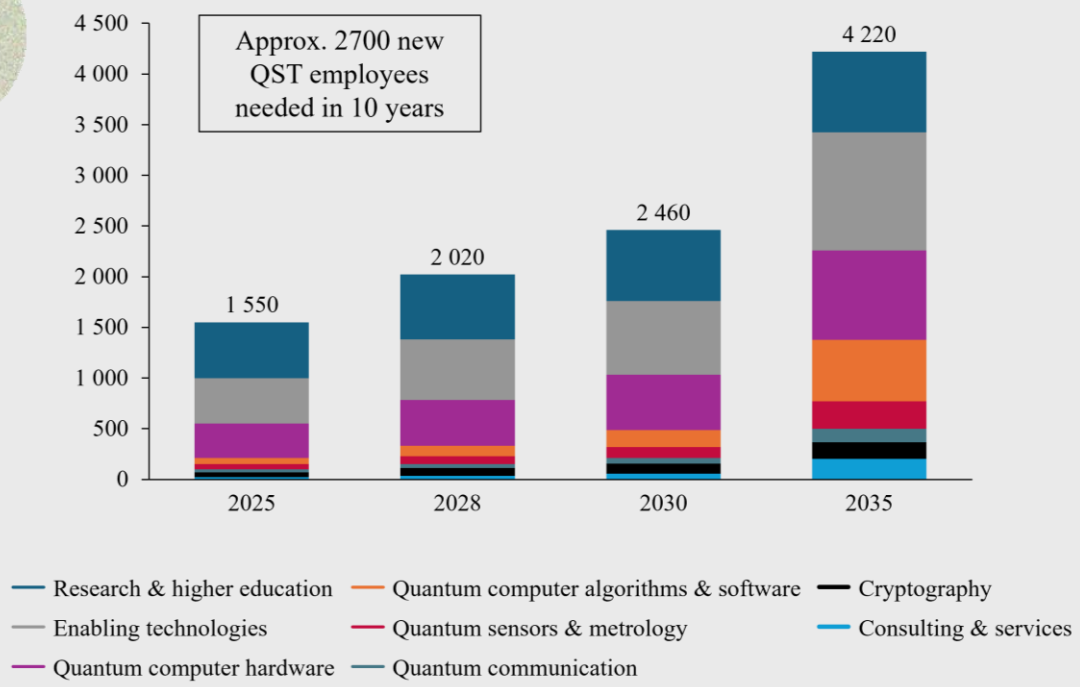
The Finnish quantum workforce is growing

In total, the number of direct jobs in quantum research and technology field is estimated to increase by a total of about 2,700 people by 2035.

At that time, it is estimated that slightly more than 4,200 people work in the field.

This means that the size of the field will almost triple in 2025-35.

Source: The Quantum Science and Technology Workforce in Finland 2035



Finnish Quantum Technology Roadmap

As part of the execution of the Finnish Quantum Strategy 2025-2035, InstituteQ has invited the Finnish quantum community to participate in the ongoing development of a national Quantum Technology Roadmap.

The three focus areas of the roadmap are:

- Quantum computing
- Quantum communication
- Quantum sensing

The roadmap is a living framework that evolves through continuous community engagement.

Download the roadmap here:

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Finnish Quantum Days 2026

September 9–10, 2026

- Hosted by the University of Jyväskylä
- Taking place in the lecture hall of JyU’s main building
- Registration closes August 12: instituteq.fi/fqd-2026

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extras

Finland's Quantum Technology Strategy

2023

2035

€130 M turnover in quantum sector

€50 M investments

460 jobs in industry

Vision 2035 and goals

€3 B turnover in quantum sector

€400 M investments

10,000 jobs in industry

Competitive advantages

Strong research tradition
A research tradition of over 50 years in low-temperature physics, superconductivity and photonics lays a solid foundation for the development and innovation of quantum technology.

Well-functioning national ecosystem
Effective cooperation between research organisations, industry and financiers enables the efficient utilisation of expertise.

Quantum technology and cryogenics
Finland has a leading role in superconducting technolo and cryogenics and a significant and growing role in photonics and semiconductors.

Software development and algorithms
Finnish quantum software companies are global pioneers.

Equipment and component manufacturing
Finland produces high-quality components with international demand. Finland is one of the few countries capable of producing entire quantum computers.

Success factors

Competitive RDI environment
Quantum computer of 1,000 logical qubits
World-leader HPC+QC+AI computing environment
RDI infrastructure for hardware and software development

Strengthening competence
Versatile study paths for educating quantum experts

Long-term quantum RDI programme
Long-term funding for research on quantum technologies and the development and deployment of their applications.

Support for global business growth
Risk financing for start-ups and growth-ups in the scaling phase
Attracting high value added investments.

International cooperation and influencing
Finnish actors are integrated into international markets and networks.

National coordination and cooperation
Resources for coordination and monitoring the situational picture