

QUANTUM
TECHNOLOGIES

QTIIndu



QUANTUM
TECHNOLOGY
COURSES FOR
INDUSTRY

**Digital
Europe**



The quantum workforce

Opinion **The FT View**

+ Add to myFT

A quantum future could be bright if managed well

The New York Times

The Next Tech Talent Shortage: Quantum Computing Researchers

'How can we compete with Google?': the battle to train quantum coders

A major skills shortage in quantum computing could harm the UK economy unless universities recruit more students



McKinsey & Company

Deutschland
Home Branchen Funktionen Publikationen Karriere News Über uns Kontakt Unsere Standorte

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Press Release
15. Juni 2022

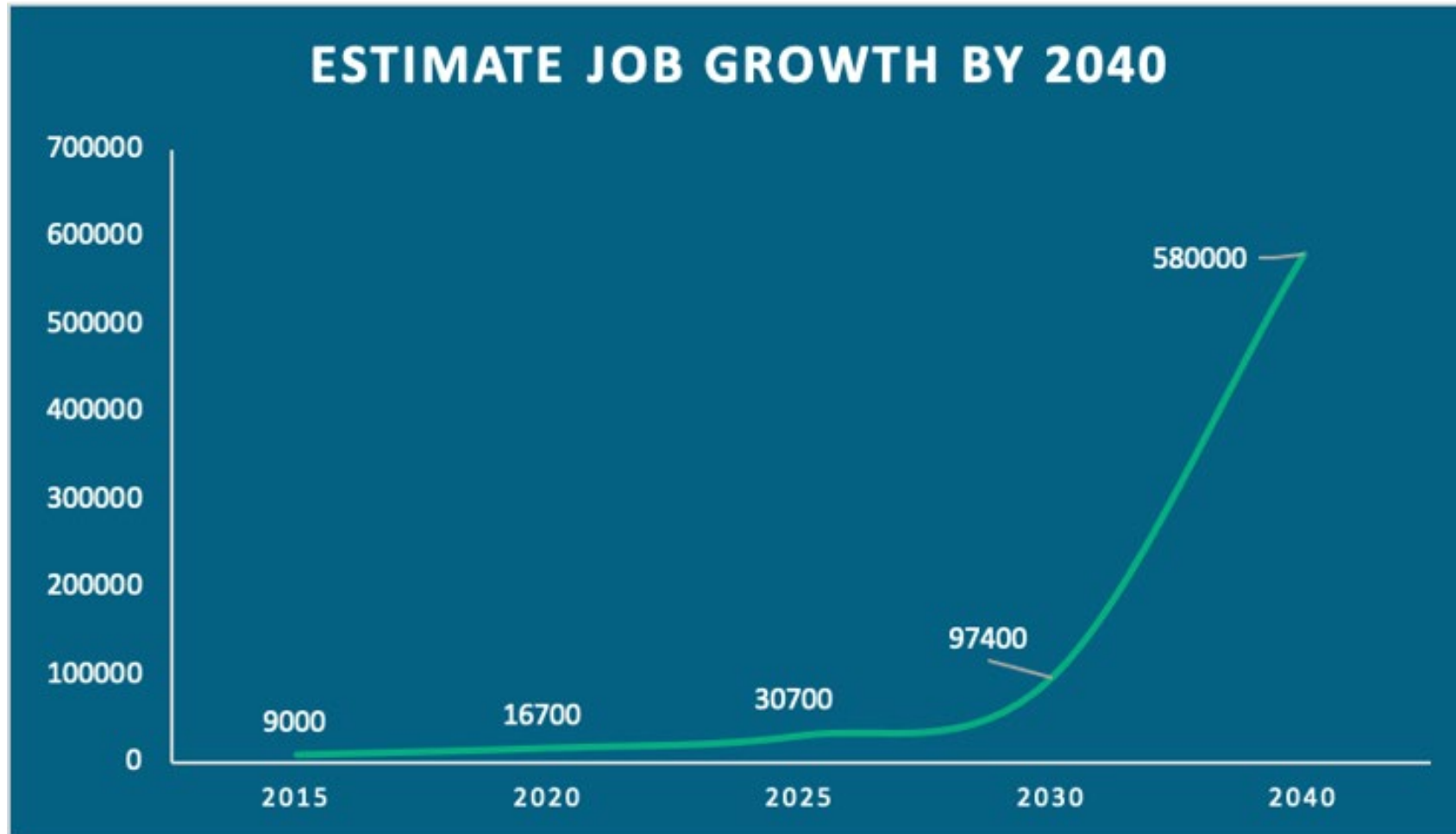
Quantentechnologien: Investitionen steigen weiter – Talentmangel droht

McKinsey Quantum Technology Monitor: Summe der angekündigten Quanten-Investitionen steigt auf 31 Milliarden US-Dollar – 2035 könnten vier Branchen – 700 Milliarden US-Dollar Wertpotenziale über Quanten-Anwendungen erzielen – Deutschland innerhalb der EU mit größtem Anteil an öffentlichen Investitionsmitteln, erstmals tiefere Einblicke in Chinas Investitionsprogramm – Bedarf an Quanten-Talenten übersteigt Angebot um das Dreifache

ANSPRECHPARTNER
Philipp Hühne
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E-Mail schreiben

In 2040, Australia's quantum technology industry could generate over **\$4B revenue** and **16K new jobs**

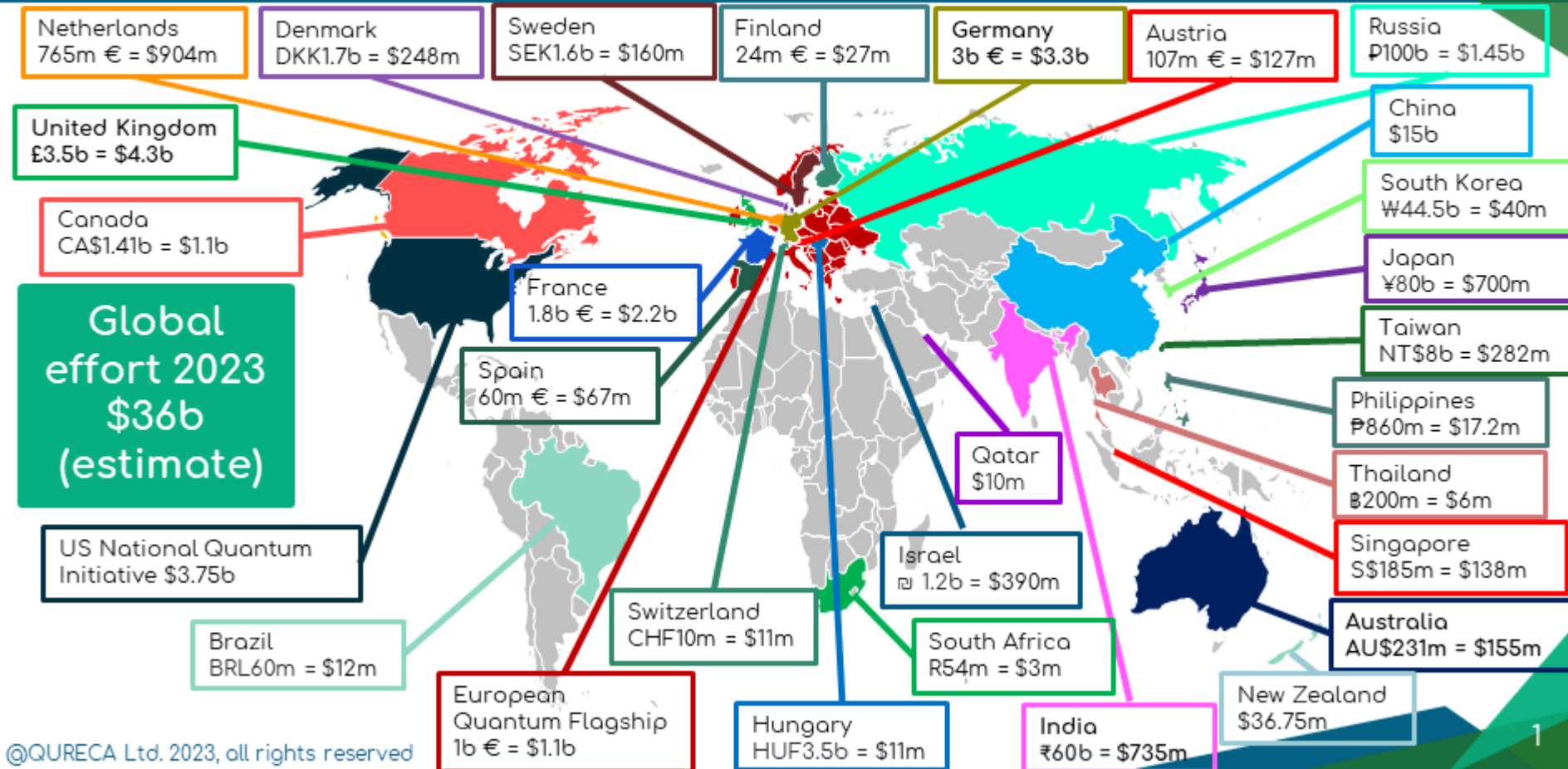
Job market size



We need to train
NOW the
workforce of the
present
and the
workforce of the
future

Global public Investments

Quantum effort worldwide



Goals of Education & Training

Strategic Research Agenda (2019): Overall goals for QTEducation & training:

- Create an ecosystem of a skilled quantum workforce
- Work against a shortage of quantum experts, especially in engineering
- Well-informed society with knowledge and attitudes towards the acceptance of quantum technologies



https://qt.eu/app/uploads/2020/04/Strategic_Research-Agenda_d_FINAL.pdf

QTIndu

Quantum Technologies courses for Industry



Why?

Shortage of talent with advanced training in Quantum Technologies

Solution

To create a training program for professional development of QT specialists for industries and SMEs

Objectives



Develop a pan-European short-term training program in Quantum Technology.



Offer training courses specifically tailored to the requirements of companies and SMEs from different business sectors.



Provide guidelines for scaling up the QTIndu project to a comprehensive pan-European scale.

Partners

Academic Institutions



AARHUS UNIVERSITY



Delft University of Technology



UNIVERSITY OF HELSINKI



Physikalisch-Technische Bundesanstalt
National Metrology Institute



Technische
Universität
Braunschweig



Institut
de Ciències
Fotòniques

Industry Networks



STIFTERVERBAND



Quantum Valley
Lower Saxony



Association for Microsystems and Nanotechnology



ATV

Akademiet for de
Tekniske Videnskaber

Corporates

AIRBUS

SMEs



QURECA
WE SPEAK QUANTUM

The structure of the content

Form ats

virtua l, physical, hands-on, off-the-shelf, custom-made

Dura tions

Dura tion

1. Short: 2-3 full time equivalent days
2. Medium : 4-7 full time equivalent days
3. Long > 1 week

MODULES

Fully documented 1-5 hours **interactions**.

Eg short soft skills symposia, digital educational modules (Composer, Qiskit...), remote access experiments, virtual training activities (games, VR..).

Module material will be made publicly available on relevant EU- platforms

COURSES

Courses will be hosted on an online commercial e-learning platform, linked to a diversity of academic platforms.

Course Topics

Courses

Home > Courses

General Introduction and
Transversal

Quantum Computing and
Simulation

Quantum
Communication

Quantum
Sensing

General Introduction and Transversal

Introduction to the Quantum Ecosystem

Non-Technical Managers
Engineers & Technicians
Researchers
Students
Quantum Enthusiasts
Software Developers
Data Scientists
Executives & Strategists
Marketing
HR

About

This module will present an overview of the ecosystem being built around quantum computing, providing a solid foundation to understand the potential, opportunities, and strategies surrounding quantum technologies.

The screenshot shows a course interface. At the top, a purple banner reads "1 - Why Quantum". Below it, a video player is shown with a slide titled "Overview" containing the following bullet points:

- Future technologies beyond Moore's law
- Overcoming current limits
- Digital security

The video player also shows a progress bar at -0:02 and a 1x playback speed. A woman in a red jacket is visible in the video frame.

The infographic titled "From NISQ to FTQC" includes a circular diagram with five segments labeled 1 through 5. To the right, text explains the challenges of FTQC, mentioning the need for high-fidelity qubits and error correction. Below the infographic, a text box states:

Yes, it's a lot! For that reason, fault-tolerant quantum computation is a long-term goal. We may not be able to solve some complex problems using FTQC right now, but using a hybrid quantum-classical system, meaning accessing the NISQ computers via a cloud access could be useful for some domain specific applications in the next few years.

computers on the market that are able to solve some tasks, there is still a long way to go. To be able to estimate how fast quantum computers are going to grow, there are a lot of different variables that we have to take into account. It is not just the number of qubits that our computer has, but also how precise we know the state of the qubits (fidelity), how much we can rely on the operations done on the qubits (gate error rate), how to connect multi-qubits on chips, how to control qubits at scale, how to determine cost effective power requirements or how to automate the production.



Also available in Spanish

This module is developed by



General Introduction and Transversal

Introduction to the Quantum Ecosystem

Non-Technical Managers
Engineers & Technicians
Researchers
Students
Quantum Enthusiasts
Software Developers
Data Scientists
Executives & Strategists
Marketing
HR

What you will learn:

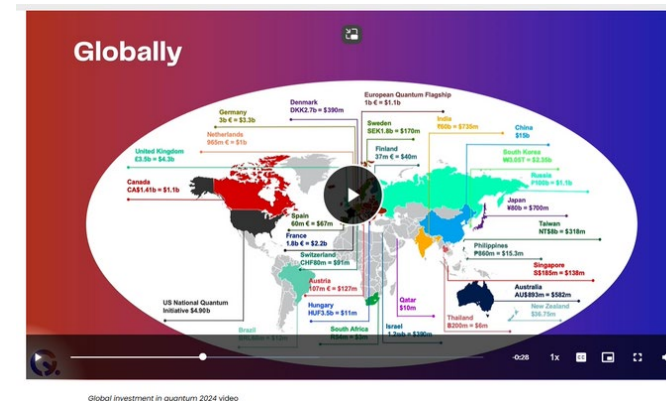
If you successfully complete the module, you will:

- Assess the investment landscape of the quantum industry, including startups, venture capital, and key players.
- Understand the differences between classical and quantum computers abilities.
- Identify and articulate the potential applications and opportunities for quantum computing.

Knowledge check 1

Select the 2 kinds of speedup when solving complex tasks that quantum offers us with respect to classical.

- Exponential speedup
- Lineal speedup
- Sphere scaling
- Polynomial scaling



Also available in Spanish

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QURECA
WE SPEAK QUANTUM

General Introduction and Transversal

Quantum Myths

Non-Technical Managers
Engineers & Technicians
Researchers
Students
Quantum Enthusiasts
Software Developers
Data Scientists
Executives & Strategists
Marketing
HR

About

This module gives you an insight into varying, mostly broad statements regarding Quantum Technologies – especially Quantum Computing. Together, we will review and clarify diverse myths regarding the performance, potential and accessibility of Quantum Computers. Additionally, we have a look at the relation to other important technologies too. You possibly met these interesting myths in your everyday life and asked, whether they are correct or not.



Myth 1

This course is an audio course. This means that the content of the audio file and the content of the text are identical. It is up to you if you only listen to the audio file, only read the text or if you do both listening to the audio file and reading the text.

Additionally, you are allowed to download the audio file. This way you can listen to it without an internet connection. Alternatively, you are allowed to listen it here on the website of course.

- Audio_Full_Female.wav 716.1 MB
- Audio_Full_Male.wav 922.2 MB
- Audio_Myth1_Female.wav 161.2 MB
- Audio_Myth1_Male.wav 161.7 MB



Also available in German

This module is developed by



General Introduction and Transversal

Quantum Myths

Non-Technical Managers
Engineers & Technicians
Researchers
Students
Quantum Enthusiasts
Software Developers
Data Scientists
Executives & Strategists
Marketing
HR

What you will learn:

If you successfully complete the module, you will:

- Deal with everyday statements about Quantum Computing in a differentiated way.
- Evaluate possible diverse scenarios of applications of classical and Quantum Computing.
- Distinguish myths and facts regarding Quantum Computing.

Evaluate the Scenario

You need to develop a new drug by simulating molecular interactions at the quantum level.

Quantum computer

Classical computer

SUBMIT

Knowledge Check

Which of the following statements is true regarding the relationship between quantum and classical computers?

Quantum computers will completely replace classical computers for all tasks.

Quantum computers will complement classical computers and take over specific tasks where they offer significant advantages.

Quantum computers are universally faster than classical computers.

Classical computers are obsolete with the advent of quantum computers.

SUBMIT



Also available in German

This module is developed by



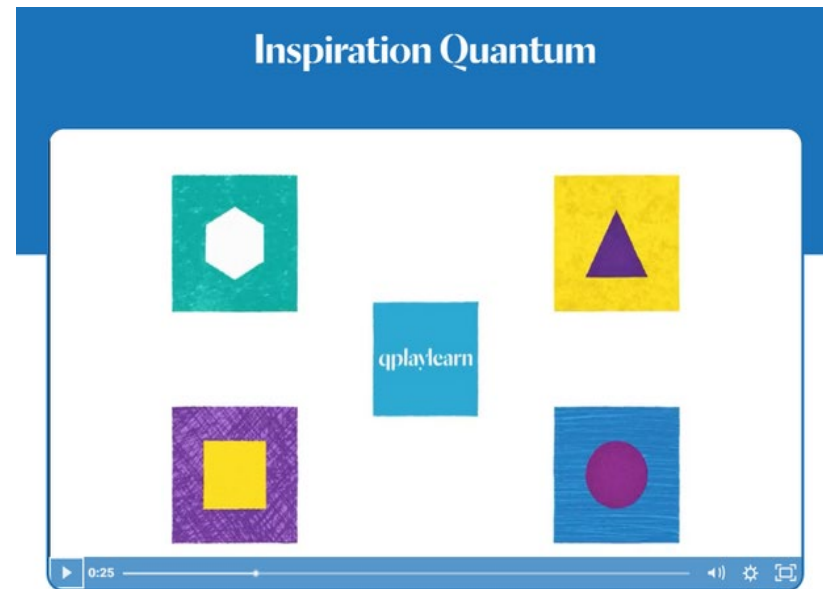
General Introduction and Transversal

Inspiration Quantum

Non-Technical Managers
Students
Quantum Enthusiasts
Executives & Strategists
Marketing
HR

About

This online course introduces basic concepts of quantum science and technologies to prepare you for your quantum computing journey. You will build intuition, familiarity, and competence about the topic without having to dig into its mathematical technicalities, while resting assured about the scientific rigour. At the end of the course, you will be able to read news critically and to distinguish, when it comes to the possibilities of quantum computers, truthful and accurate sources from misleading or hyped media sources.



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UNIVERSITY OF HELSINKI

General Introduction and Transversal

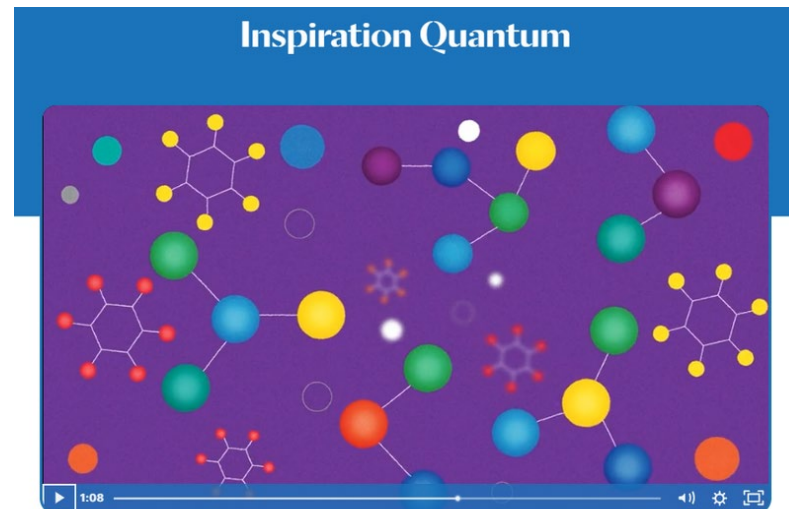
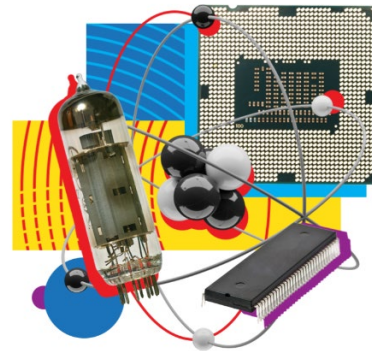
Inspiration Quantum

Non-Technical Managers
Students
Quantum Enthusiasts
Executives & Strategists
Marketing
HR

What you will learn:

If you successfully complete the course, you will:

- Understand the fundamental difference between classical and quantum computers
- Be aware of the distinction between fault-tolerant and near term quantum devices
- Identify possible fields of application of near term devices in the upcoming years



This course is developed
by



Quantum Communication

Introduction to Quantum Communication and Quantum Network Explorer (QNE)

Engineers & Technicians
Students
Quantum Enthusiasts
Software Developers
Data Scientists

About

Quantum Network Explorer (QNE) is currently the only educational platform wholly committed to the advancement of quantum networking. In this course, you will gain proficiency in QNE ADK for quantum network application development and learn to share your creations on QNE's Community Application Library.



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Quantum Communication and the Quantum Network Explorer

This module is
developed by



Quantum Communication

Introduction to Quantum Communication and Quantum Network Explorer (QNE)

Engineers & Technicians
Students
Quantum Enthusiasts
Software Developers
Data Scientists

What you will learn:

If you successfully complete the course, you will:

- Understand the **fundamentals of quantum networks** and their future applications.
- Utilize the diverse resources provided by the Quantum Network Explorer to gain practical insight into quantum networks through hands-on experience
- **Run your own quantum network simulations** by leveraging the pre-built applications available in QNE's Community Application Library.
- **Develop customized quantum network applications** using QNE's Application Development Kit (QNE-ADK) and contribute to the global QNE community by sharing your work
- Use SquidASM as an advanced simulator for quantum network applications, elevating your research capabilities to the next level.

This module is
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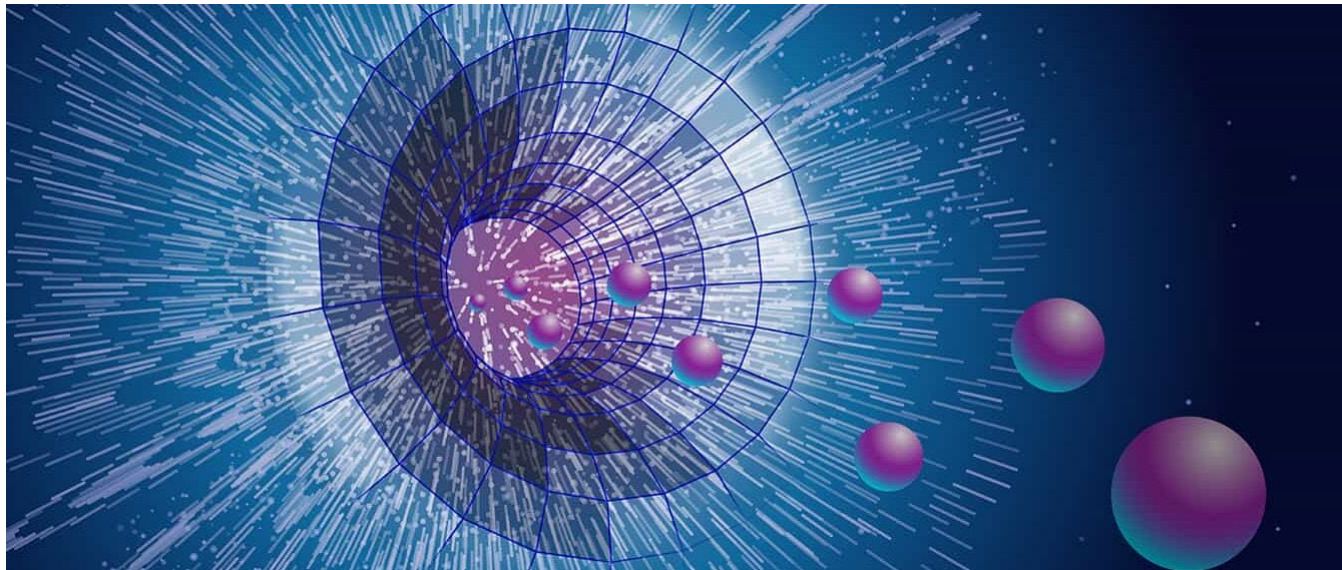
Quantum Sensing

Quantum Sensor Engineering

Non-Technical Managers
Engineers & Technicians
Researchers
Students
Quantum Enthusiasts

About

This is an introductory course to quantum sensing presented through the lens of quantum magnetometry. Three different technologies are discussed (diamond color centers, optical magnetometers, and superconducting devices). The course consists of theory, applications, and hands-on training.



This module is
developed by



Quantum Sensing

Quantum Sensor Engineering

Non-Technical Managers
Engineers & Technicians
Researchers
Students
Quantum Enthusiasts

What you will learn:

If you successfully complete the course, you will:

- Understand the principles of quantum sensing.
- Acquire an overview of different technologies.
- Elucidate advantages and limitations.
- Qualitatively explain the physical phenomena involved.
- Become aware of use-cases and assess potential new applications.
- Perform measurements using our user-friendly quantum education kits.

This module is
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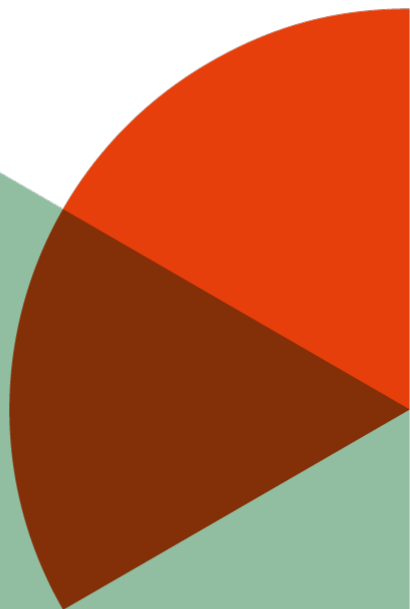


Discussion I

In your context and experience, what's the demand for (more or less) skilled Quantum professionals?



STIFTERVERBAND



QUANTIFYING THE WORKFORCE CHALLENGE IN QUANTUM TECH

Introducing a Study in Progress: QUANTiFaID

Andreas Land

Munich · June 24th 2025

With funding from the:



Federal Ministry
of Research, Technology
and Space



QUANTIFAID PROJECT MOTIVATION & GOALS

- Using an integrated approach, We aim to quantify the current and expected skills gap in Quantum Technology along the business and scientific sector.
 - As a reference, we aim to quantify the corresponding course offerings of German universities.
- Transparency will allow for an alignment of Demand and Supply and strengthen the QT-Ecosystem.

QUANTIFAID CONCEPTUAL BASIS

Based on Competence Framework for QT

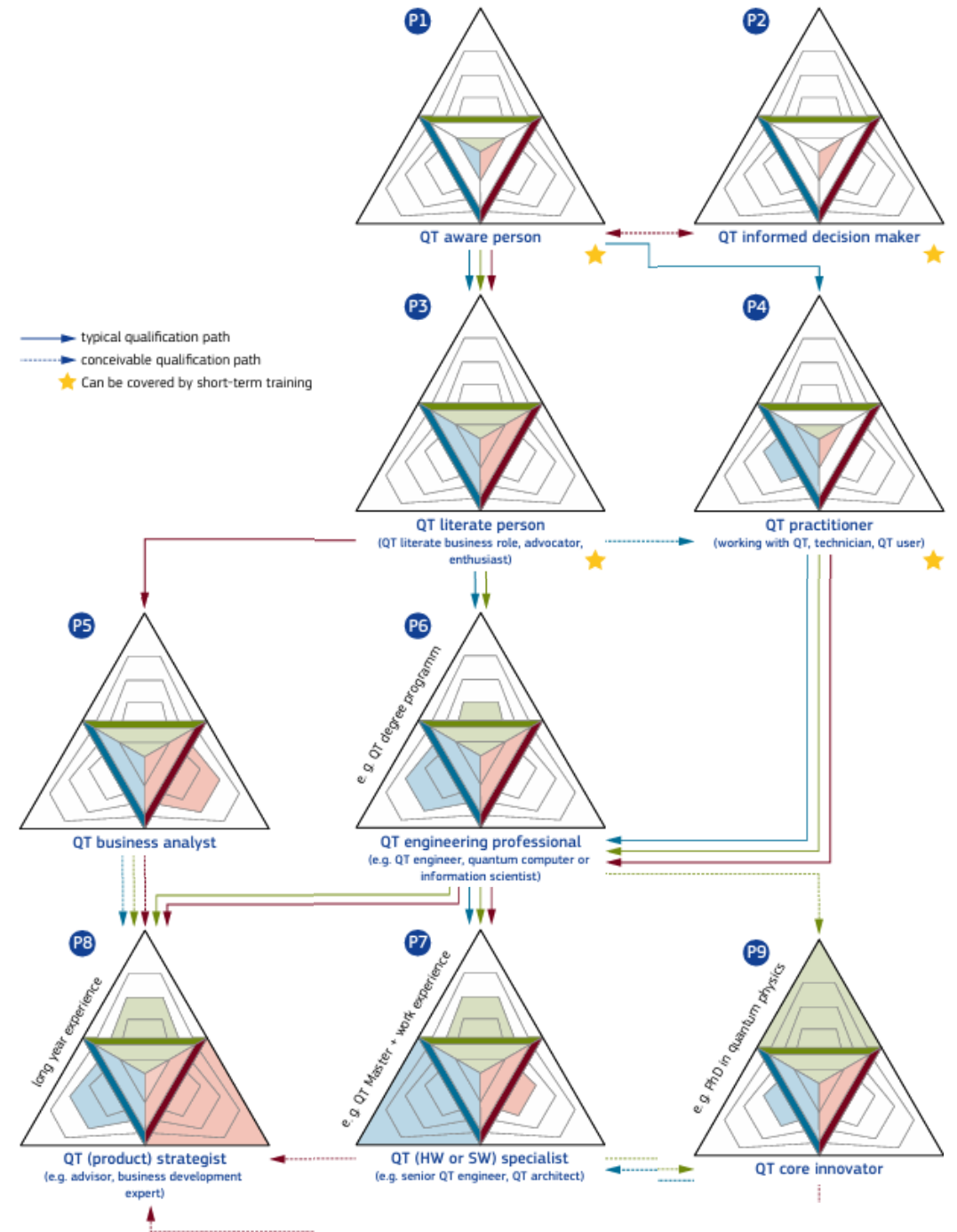
- **Three proficiency Areas** along
- **Eight Competence Domains**
- **Nine Personas** with specific competence levels

Quantum Background
1: Concepts and Foundations
2: Physical Foundations of Quantum Tech

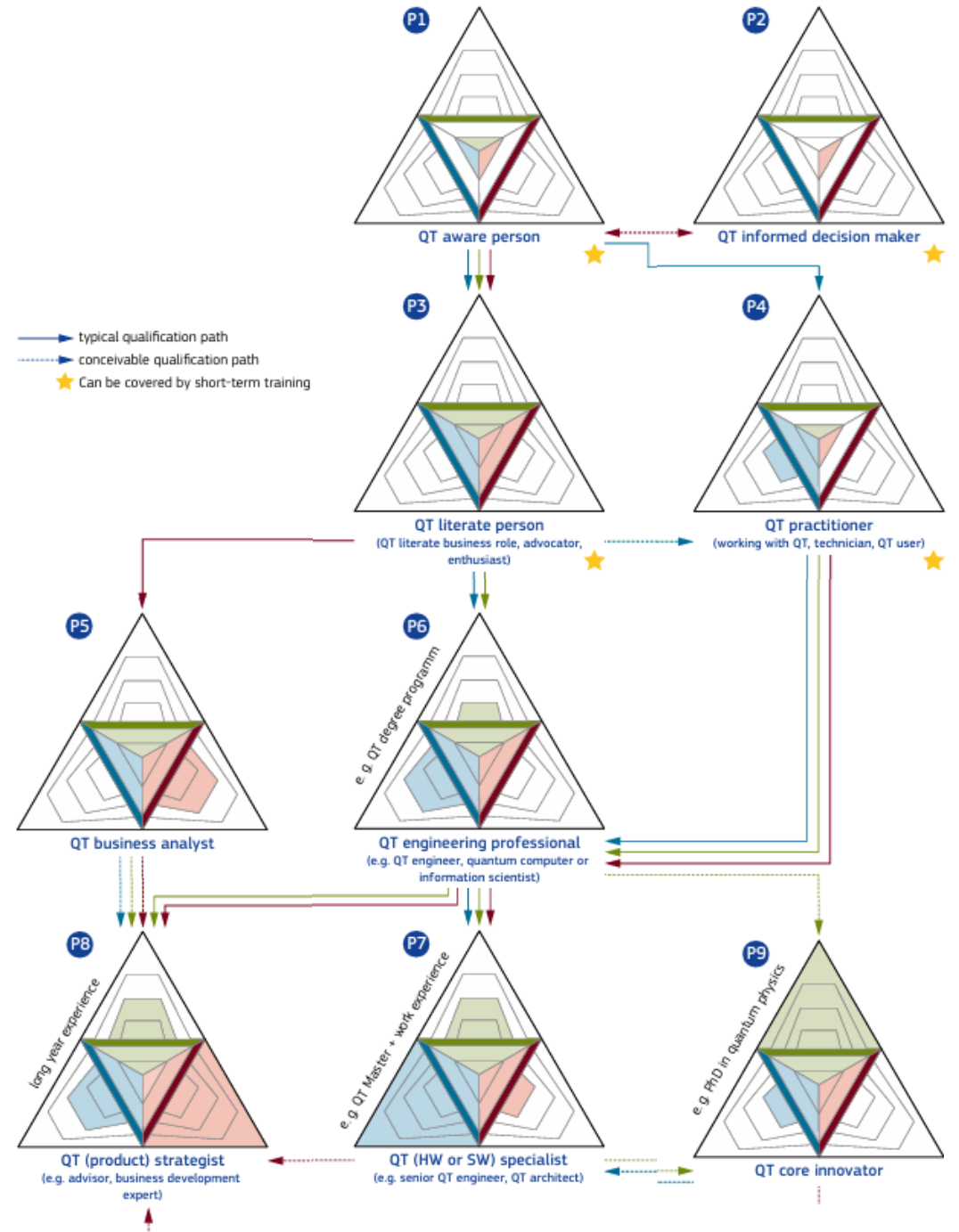
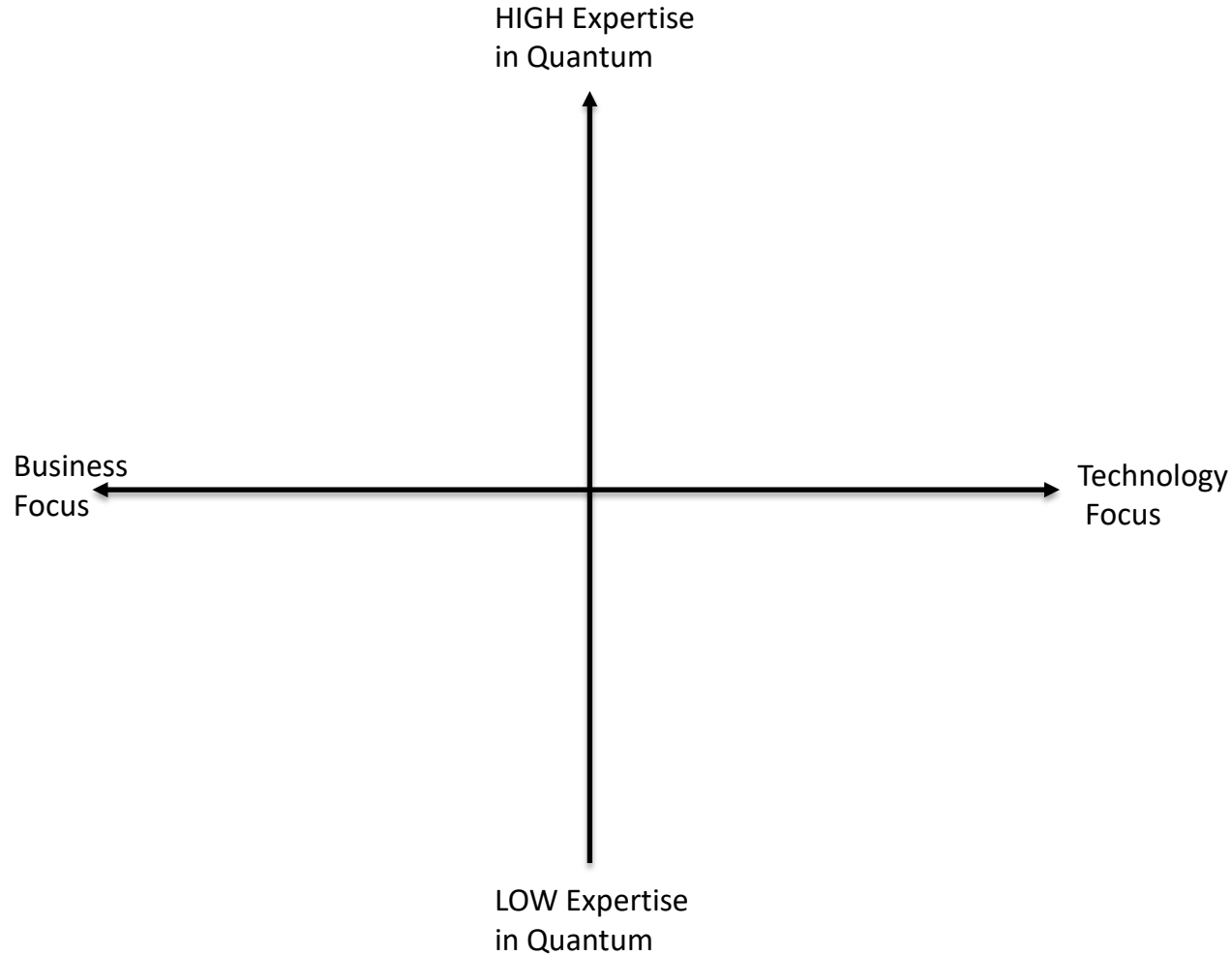
Core Device Technology
3: Enabling Tech
4: Quantum Hardware

QT Systems and Applications
5: Quantum Computing and Simulation
6: Quantum Sensors and Image Systems
7: Quantum Communication and Networks
8: Valorisation

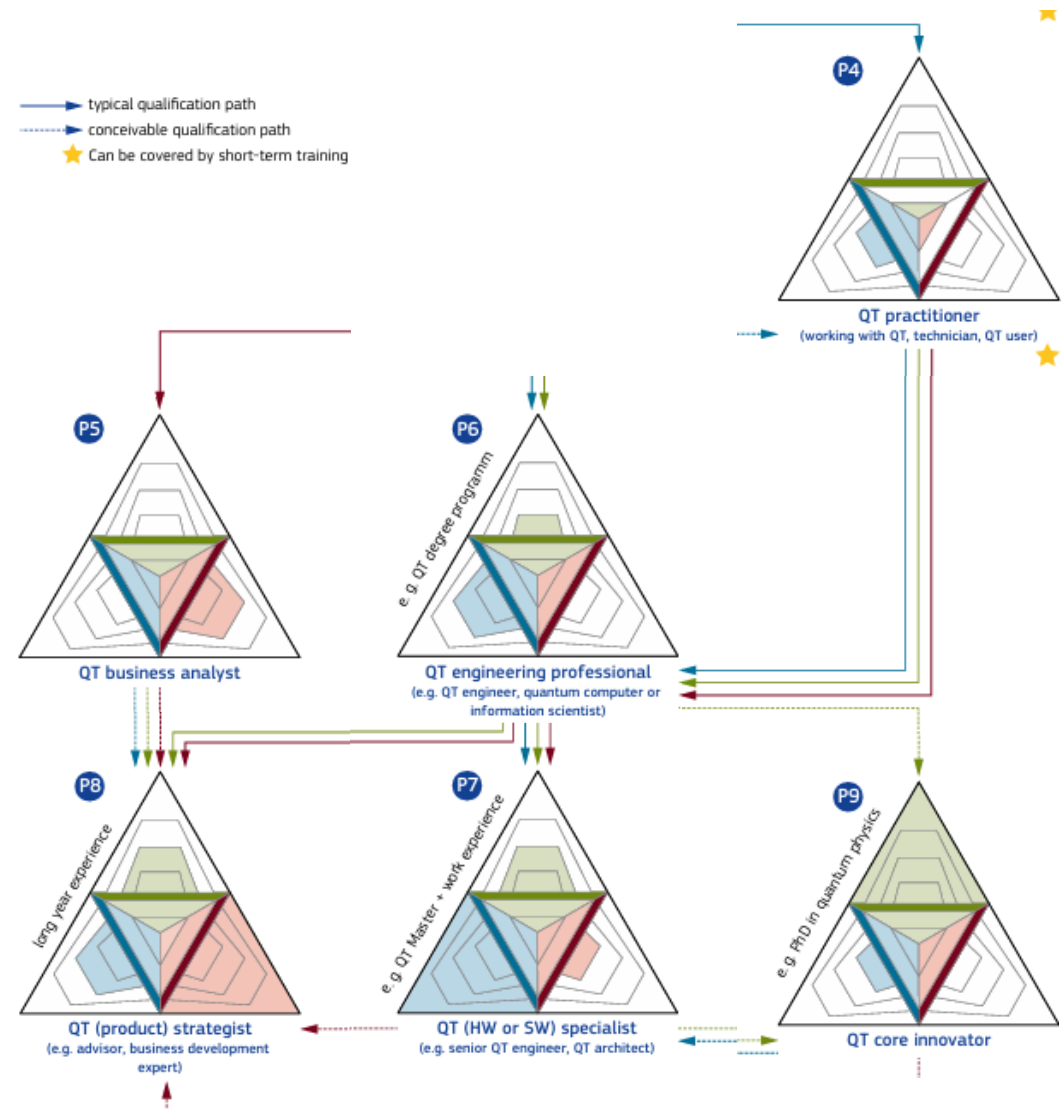
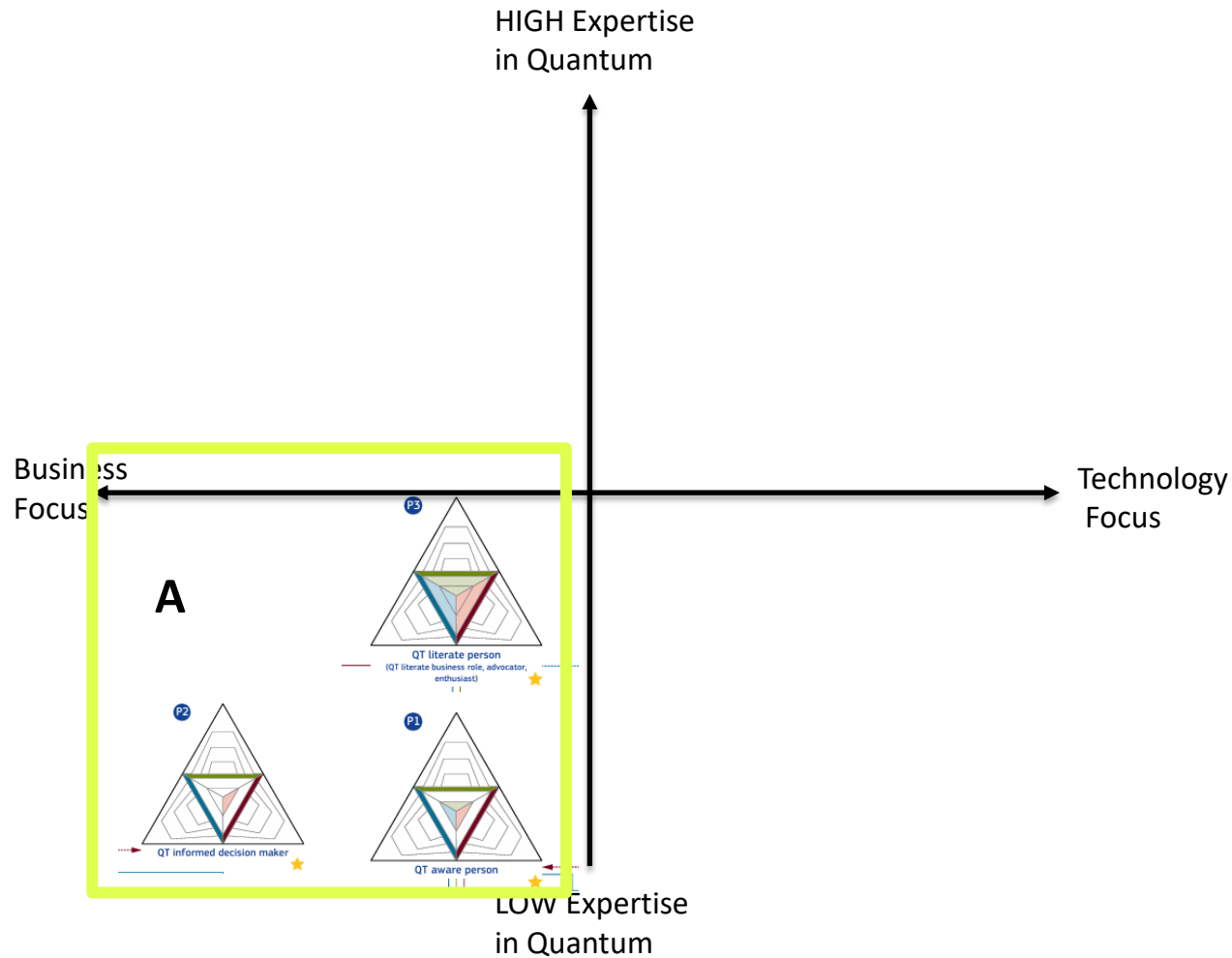
→ Points to Potential Qualification Pathways



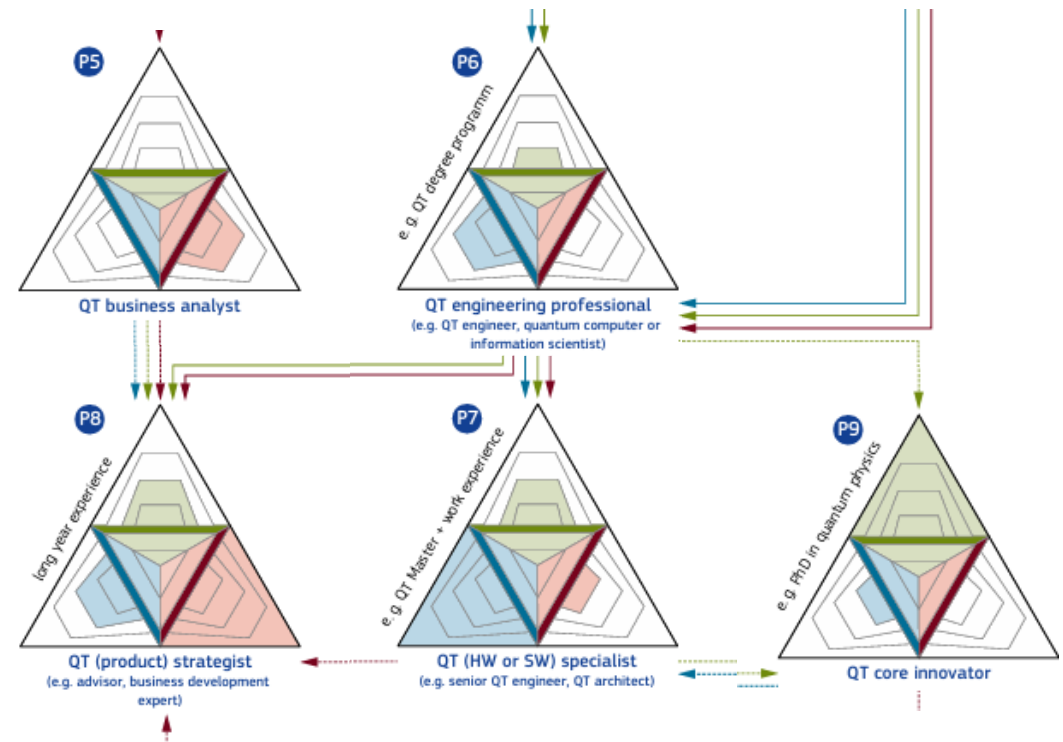
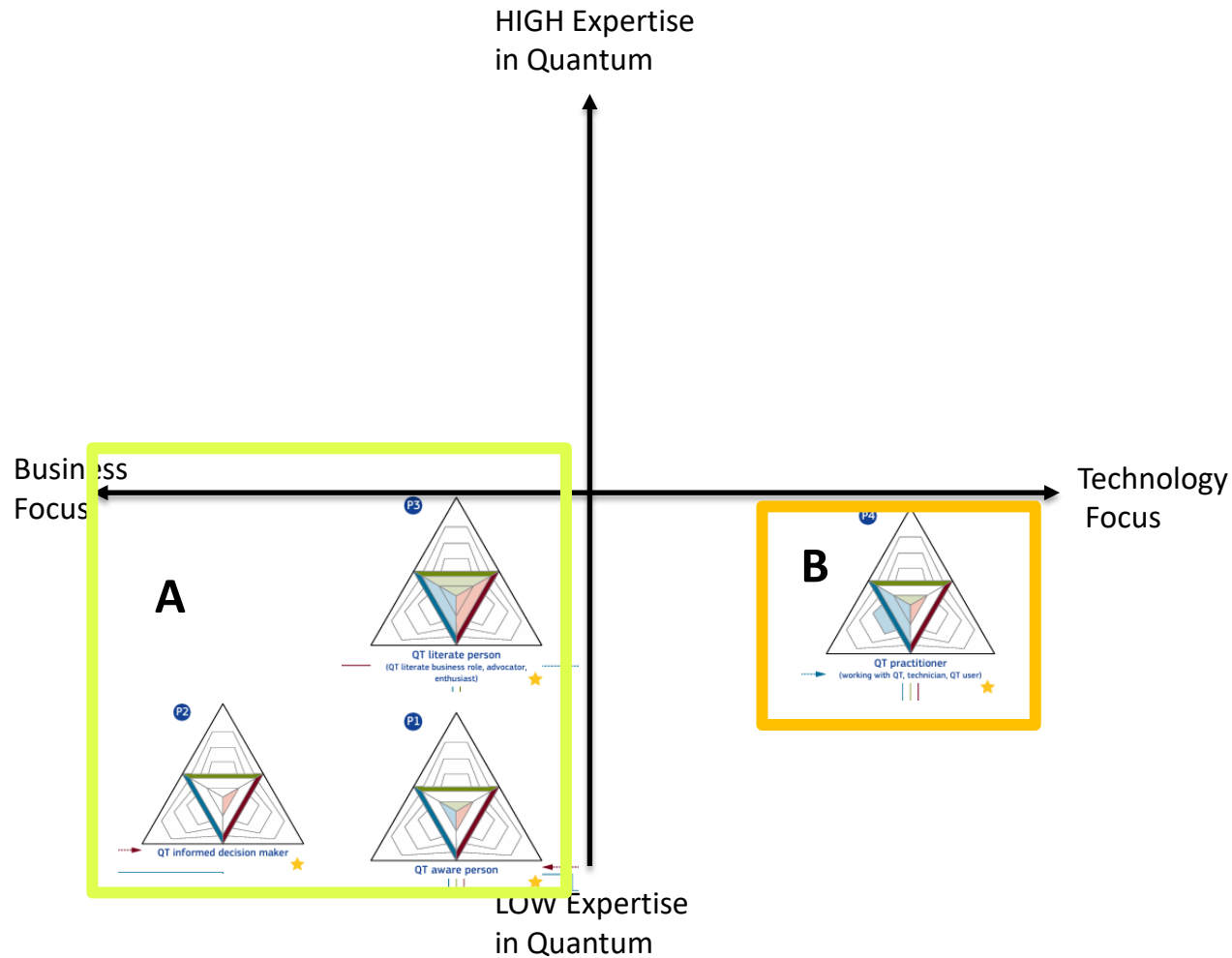
PRELIMINARY RESULTS QUANTIFAID PROFILES



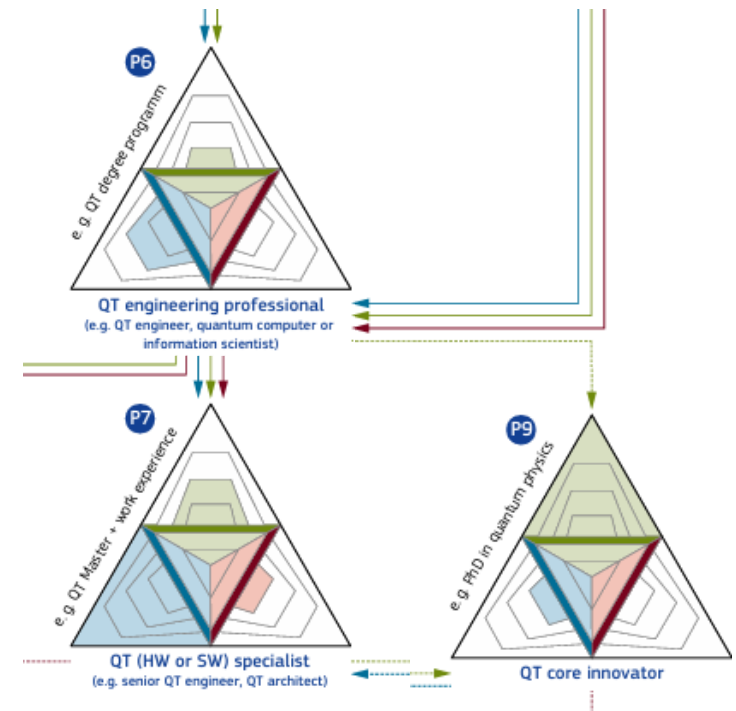
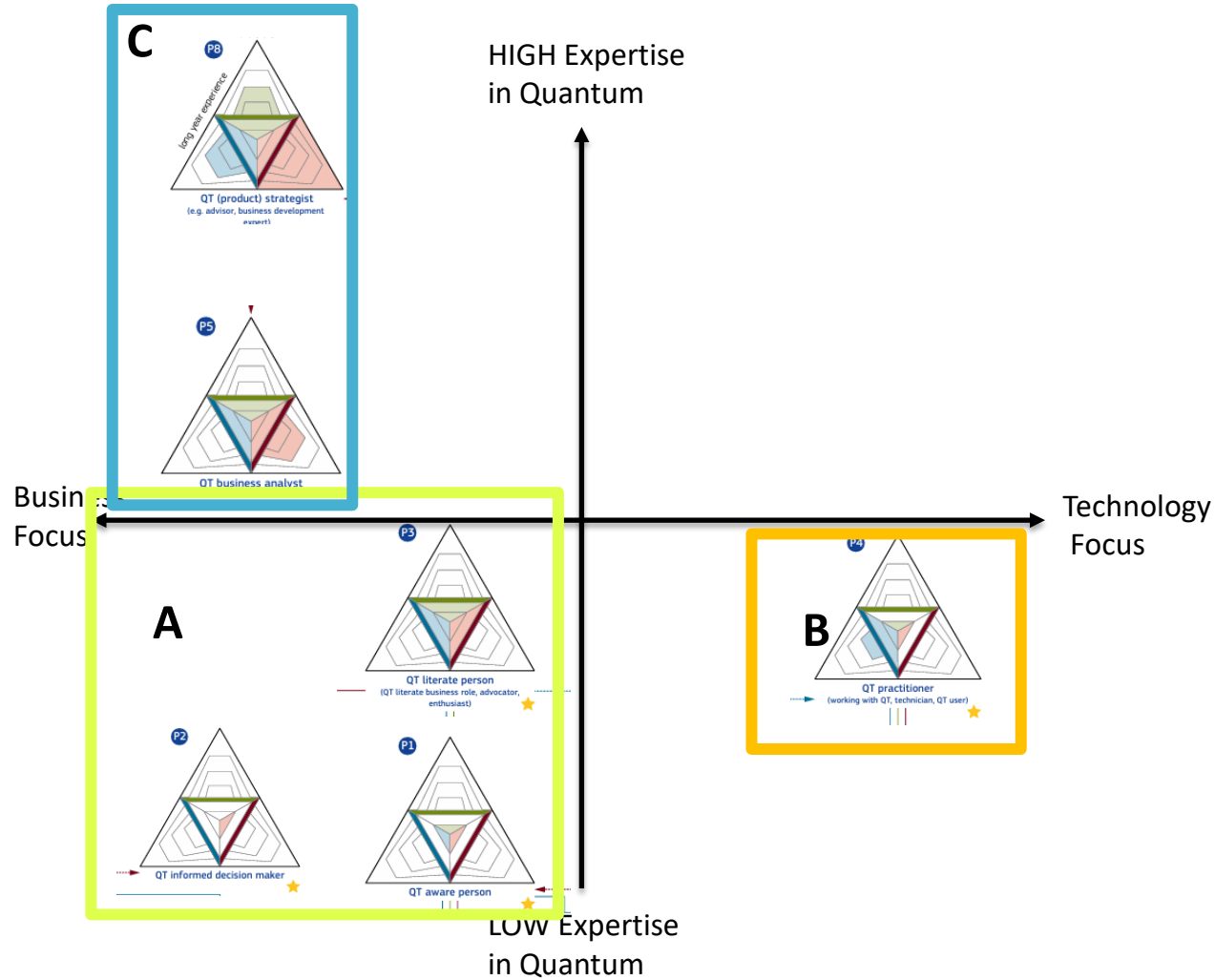
PRELIMINARY RESULTS QUANTIFAID PROFILES



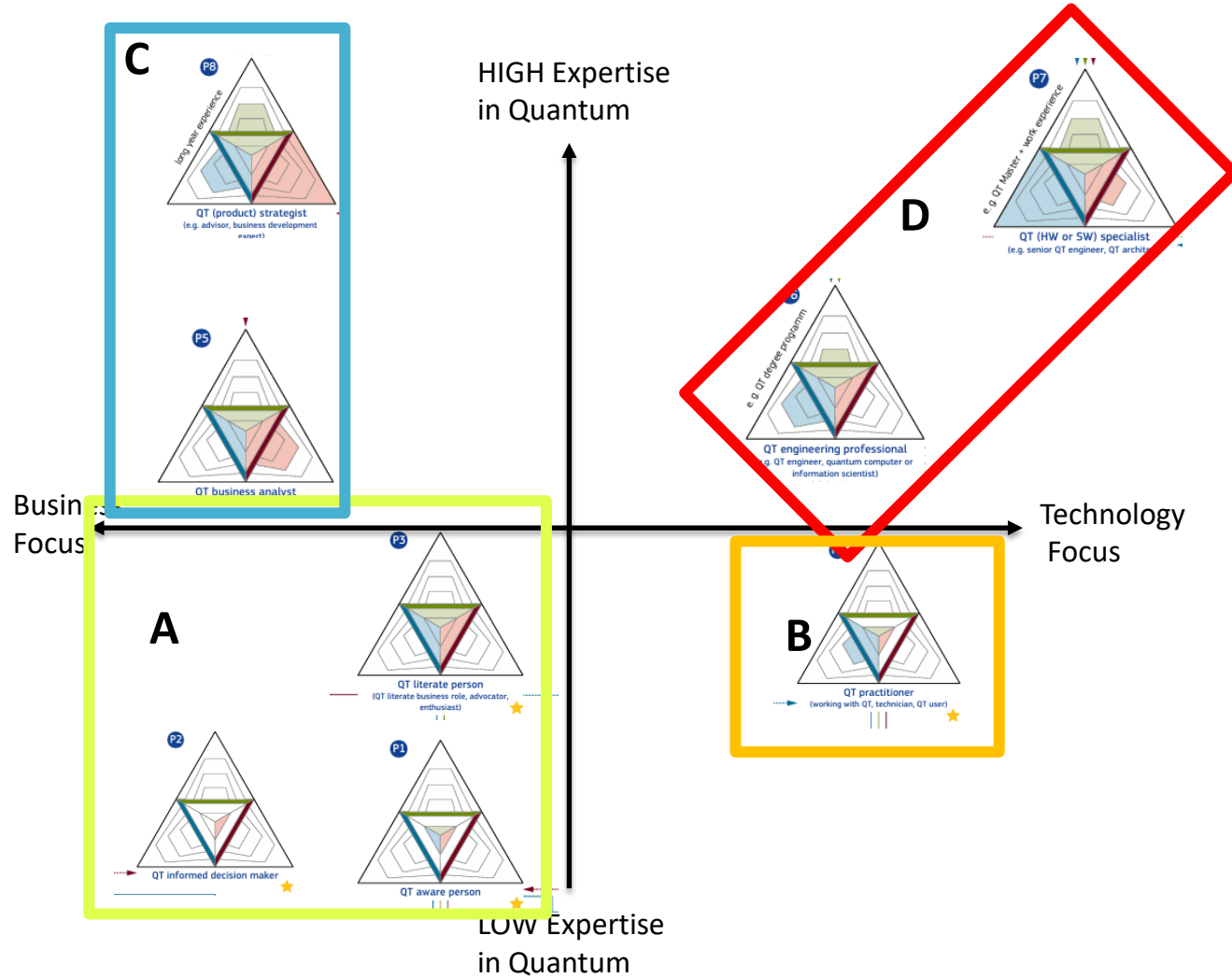
PRELIMINARY RESULTS QUANTIFAID PROFILES



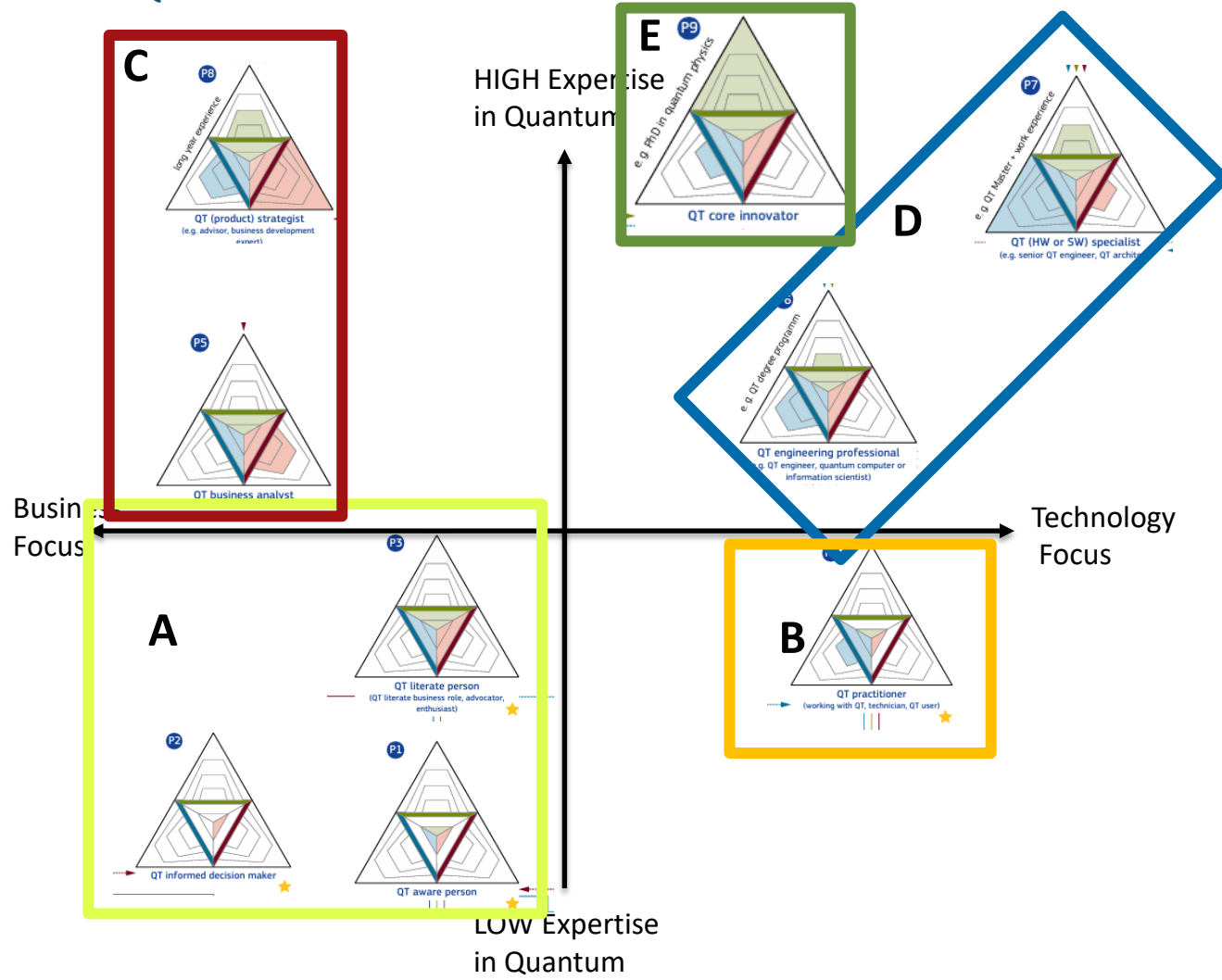
PRELIMINARY RESULTS QUANTIFAID PROFILES



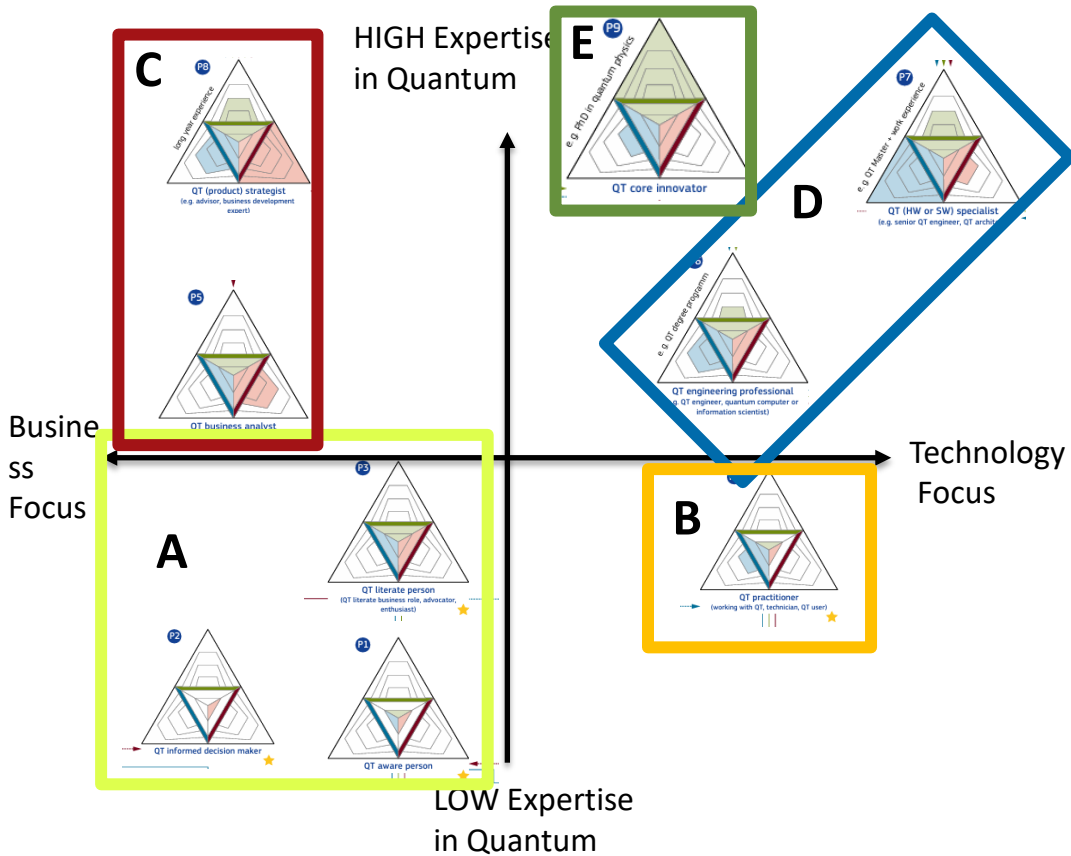
PRELIMINARY RESULTS QUANTIFAID PROFILES



PRELIMINARY RESULTS QUANTIFAID PROFILES



PRELIMINARY RESULTS QUANTIFAID PROFILES



Quantum Native: Personnel with substantial QT-Qualifications

- C: Quantum Strategists**
- (preparation of) *strategic Decisions*
 - High Level of Valorisation Knowledge

- D: Engineers**
- Product development
 - Technology Realisation

- E: Foundational Researcher**
- Quantum Physicist*
 - Development of foundational Ideas for Technology.
 - Low expertise in Application and Realisation

- D I: Hardware & System**
- Integration and Application*
 - High Expertise in *Enabling Technologies & physical foundations*

- D II: Quantum Software**
- Development of *Quantum Based Software Products*
 - Low expertise in physical Basics

Quantum Ready: Personnel with Basic QT-Qualifications

- A: Operational Support**
- Marketing
 - Personnel Development
 - Administration

- B: QT-Aligned Skilled Labour**
- Working *with* QT
 - Engineers (BA)
 - (Lab) Technicians

Discussion II

In your context, what's the biggest need or gap in quantum education?

Discussion III

Thinking about your future career, what domains and levels of quantum expertise do you believe will be most relevant to your work?

Thank you!

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www.qtindu.eu



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101100757.

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