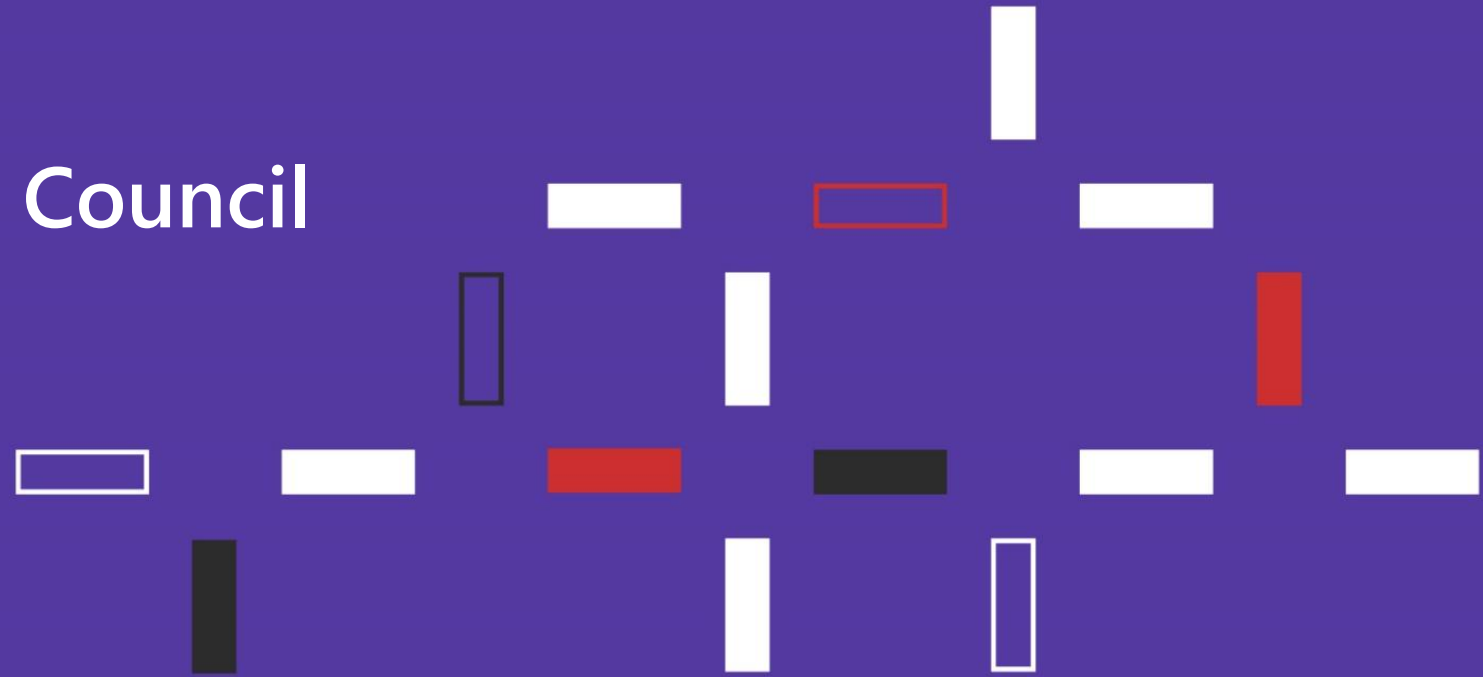
European Innovation Council

Backing visionary entrepreneurs

The European Innovation Council



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WELCOME!

- Be aware that **this meeting is recorded**
- **Recording and slides** of the event will be available very soon **on the event page**
- Please submit **your question as Anonymous** in Sli.do if you do not want your name to appear in the recording.

Join at **Sli.do**

With the event code
#Challenges

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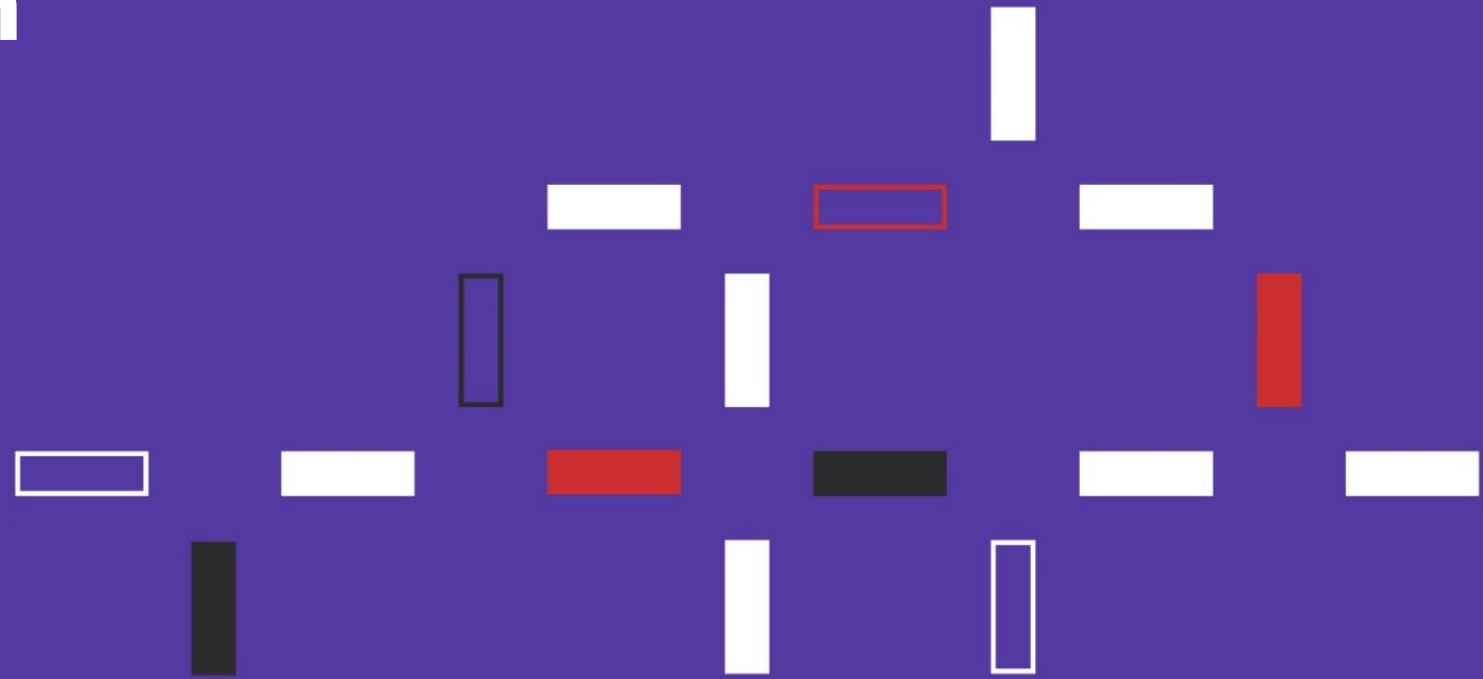
Introduction

Anne-Marie Sassen



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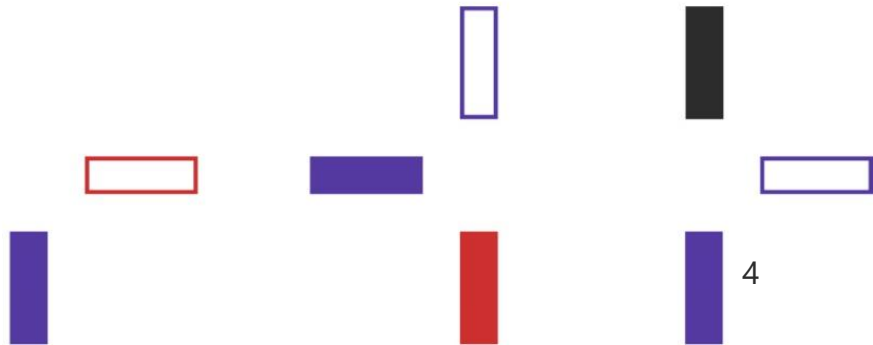
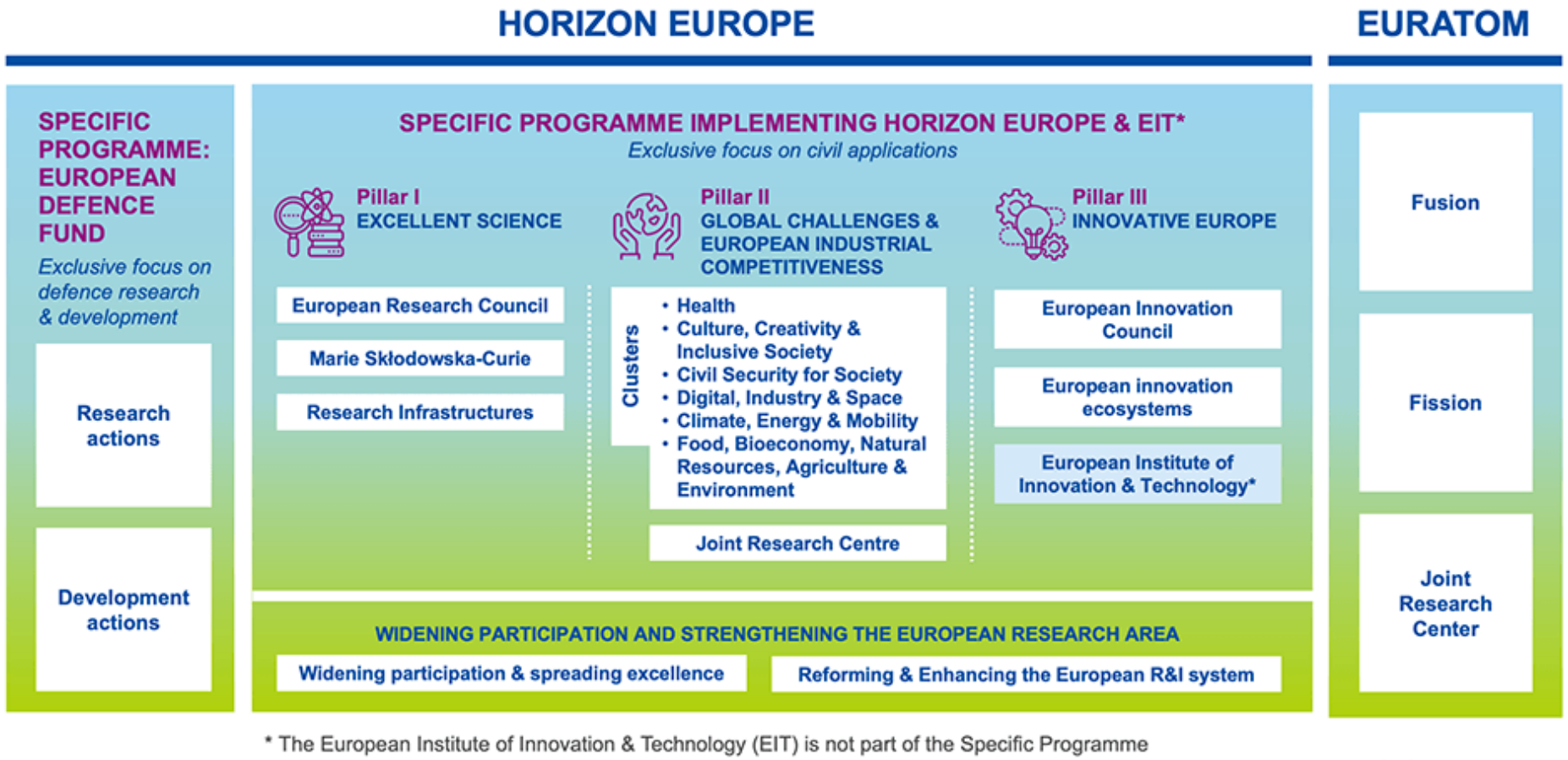
In the next two hours

- 14:00-14:10 **Introduction by Anne-Marie Sassen**
- 14:10-14:25 **Overview of EIC Quantum Portfolio and Chips Act**
- 14:25-14:40 **Accelerator Challenge 'Emerging semiconductor or quantum technology components'**
- 14:40-14:55 **Part A: Quantum technology components**
- 14:55-15:10 **Part B: Semiconductor chip development**
- 15:10-15:55 **Q&A**
- 15:55-16:00 **Wrap-up**



Horizon Europe is a leading research and innovation programme with €95bn budget for 2021 to 2027



* The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

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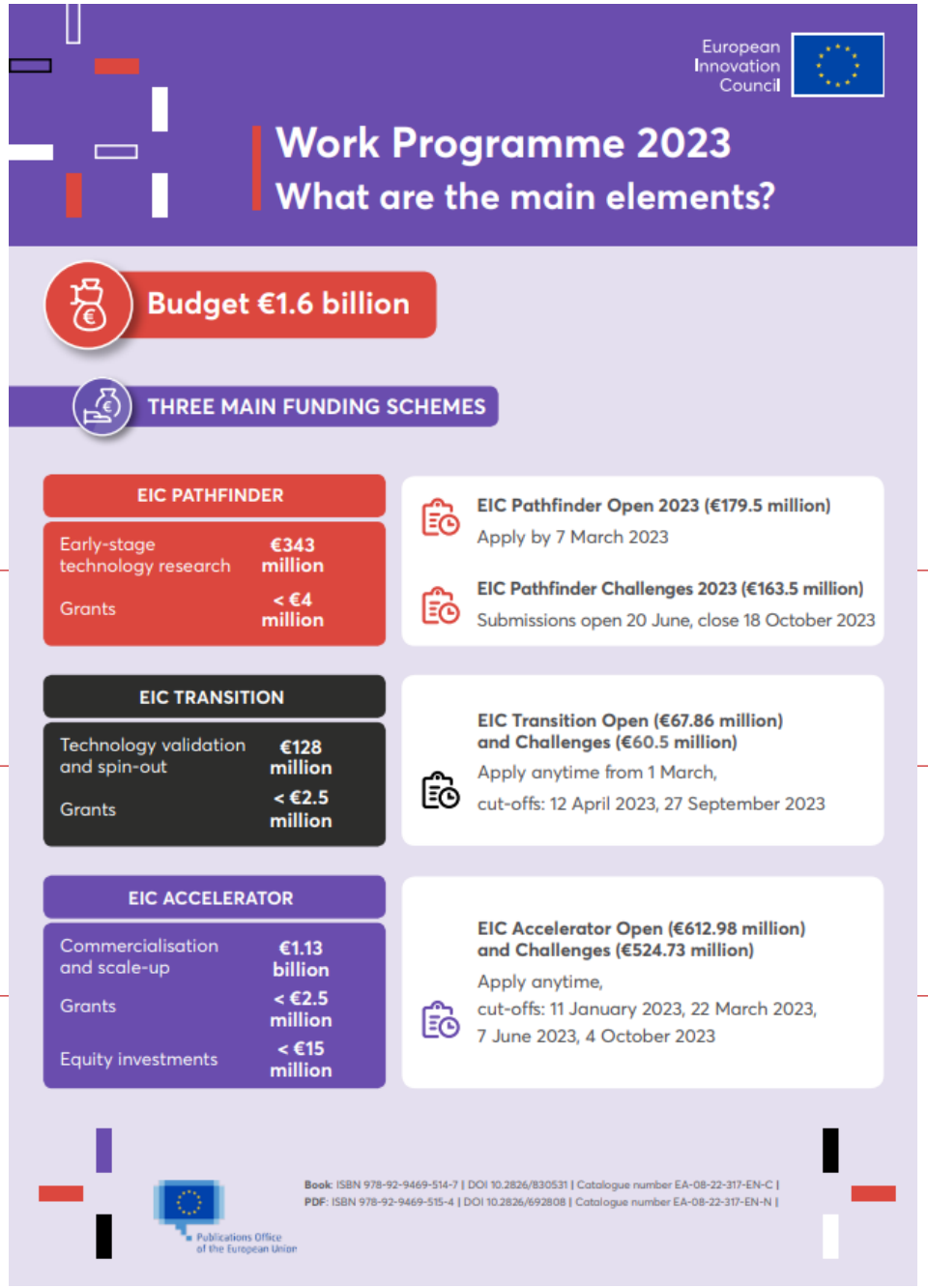


TRL1-4

TRL4-6

TRL6-9

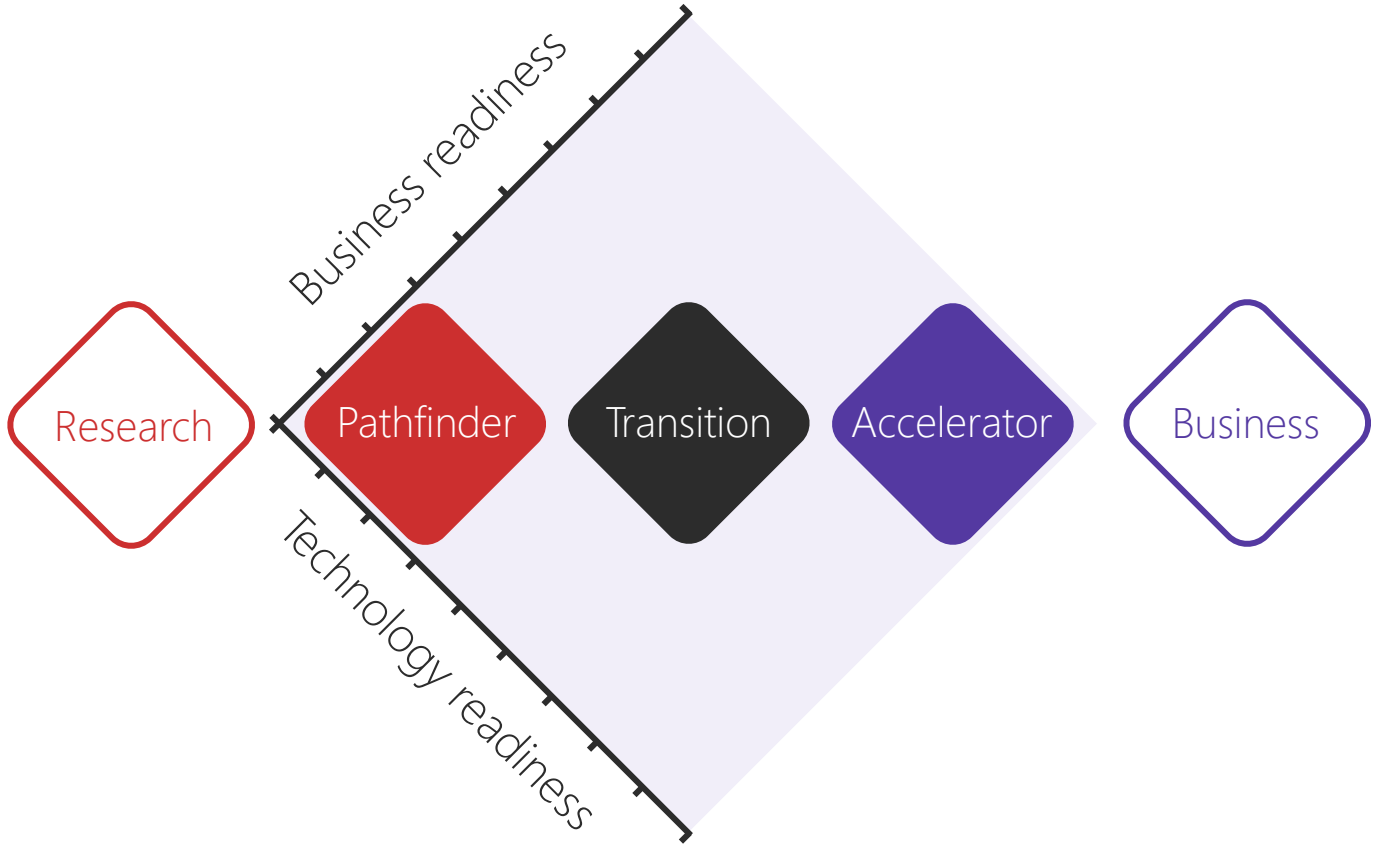
Open: for consortia
Challenge: single, consortia
Science and research

For consortia
For single entities
EIC Pathfinder, ERC PoC
Business readiness

For individual SME / start-ups
Innovation scale-up
Blended finance

EIC stages the entrepreneurial journey as pathfinder, transition, accelerator with increasing readiness levels

WHAT?



WHY?

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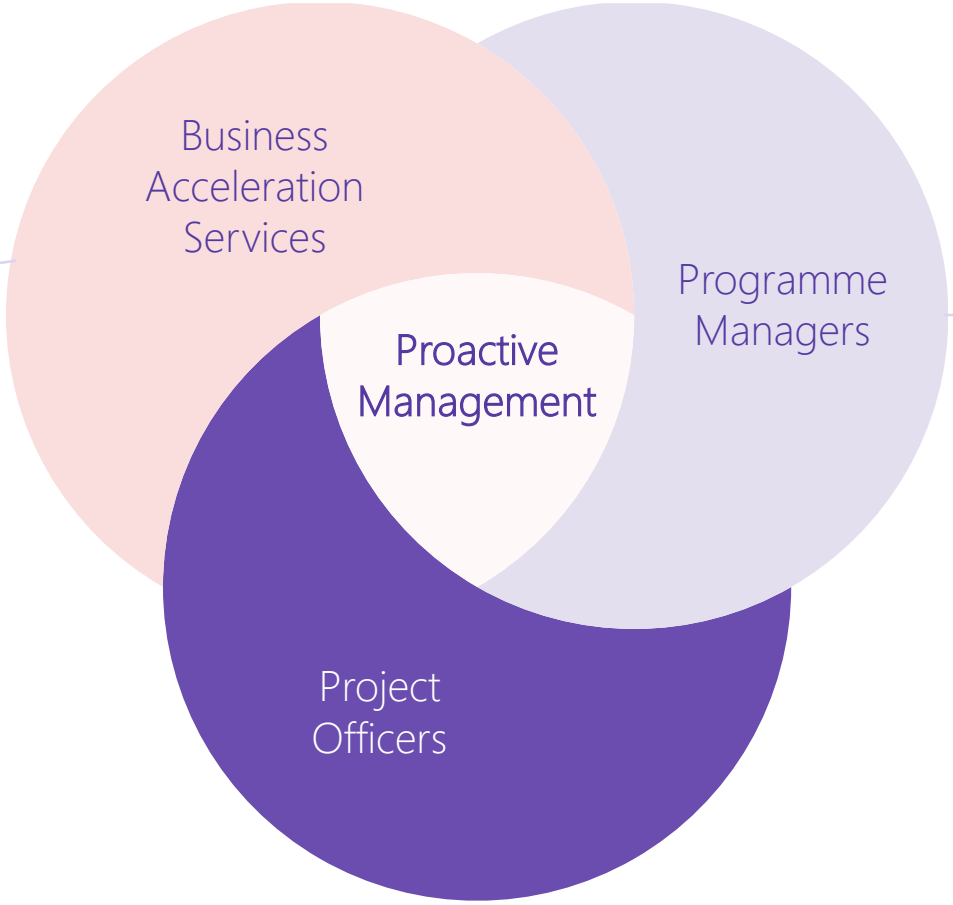
With proactive management the EIC aims to maximize its support to success of the entrepreneurial journey

- Access to entrepreneurs
- Access to mentoring
- Access to ecosystems
- Access to partners, peers
- Access to trainings
- Access to workshops
- Access to expert advice
- Access to recruitment
- Access to industry



- Health, Biotech
- MedTech
- SpaceTech
- Quantum, electronics
- Greentech materials
- Greentech
- AEC
- Agri-food
- Responsible electronics
- Bio-fuels, E-fuels

Challenges
Portfolios

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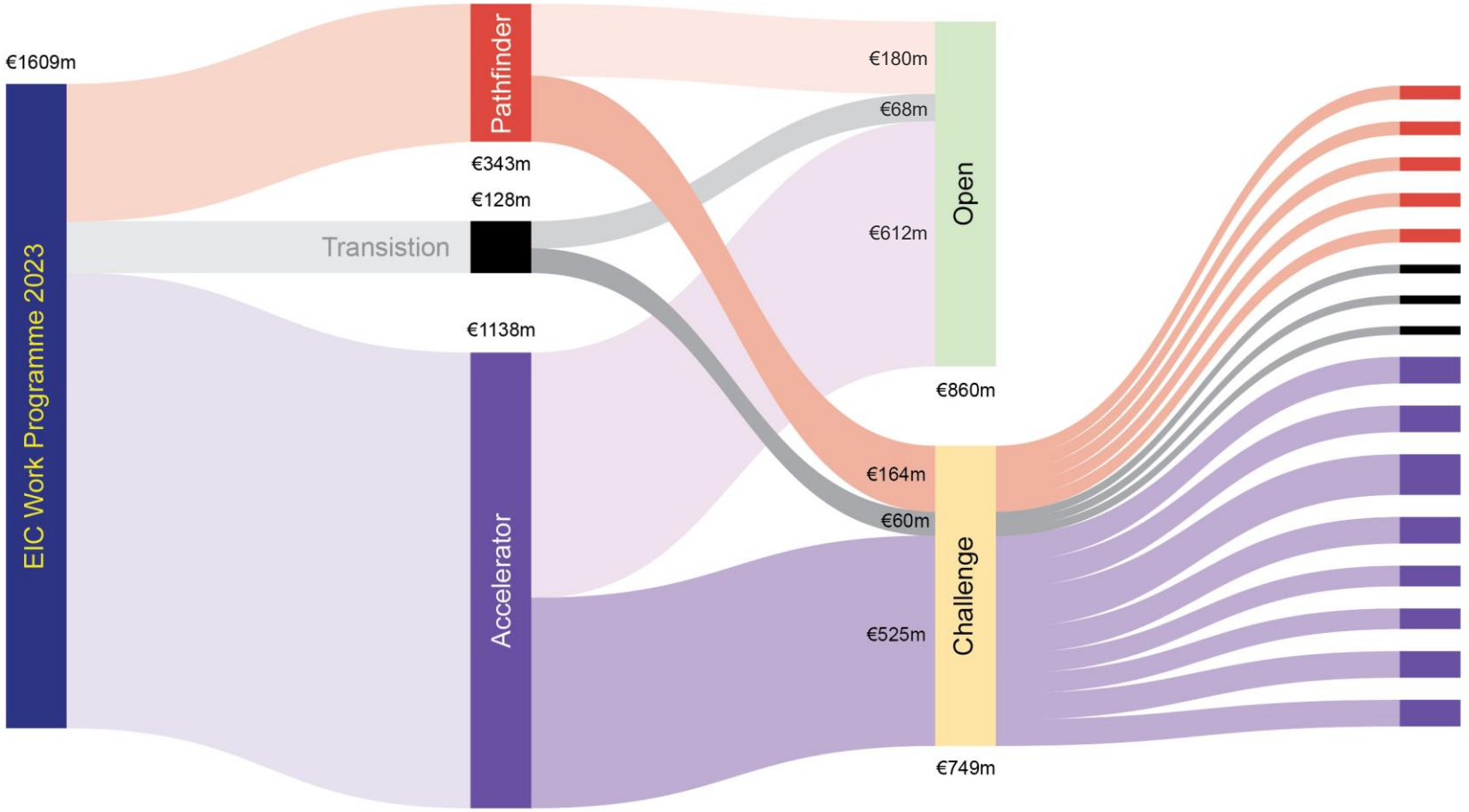
In 2023 EIC allocates ~€1.6bn to Open and Challenge calls by its Pathfinder, Transition, Accelerator programs



€32.7m	P1	Clean efficient cooling
€32.7m	P2	Digitalized construction
€32.7m	P3	Precision nutrition
€32.7m	P4	Responsible electronics
€32.7m	P5	In-space solar energy harvesting
€20m	T1	Medical micro-nano-bio devices
€20m	T2	Environmental intelligence
€20m	T3	Chip-scale optical frequency combs
€65m	A1	Biomarker-guided cancer treatment
€65m	A2	Aerosol and surface decontamination
€100m	A3	Energy storage technologies
€65m	A4	Digitalized construction
€50m	A5	Fault-tolerant quantum computers
€50m	A6	Semiconductor chip design
€65m	A7	Technologies for resilient agriculture
€65m	A8	Space technologies and services

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Cut-off dates of the various calls

Cut-off dates:	Pathfinder	Transition	Accelerator
Open	7 March 2023	12 April 2023 27 September 2023	11 January 2023 22 March 2023 7 June 2023 4 October 2023
Challenge	18 October 2023	12 April 2023 27 September 2023	22 March 2023 7 June 2023 4 October 2023

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Useful links to the EIC Work Programme 2023:

EIC Work Programme 2023:
(the legal basis)

Recording of EIC Info-day 13 December:
(not repeated today)

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EIC Accelerator Challenge:

Emerging Semiconductor and Quantum Technology Components

Samira Nik, Programme Manager
Quantum Tech and Electronics

EIC Goal

What's holding back European innovation?

Innovation **performance**	• **Strong research performance not translated** into innovation • **Lack of breakthrough/ disruptive innovations** that create new markets
Innovation **funding**	Financing gaps (2 "valleys of death") in • **Transition** from lab to enterprise • **Scaling up** for high-risk innovative start-ups
Innovation **ecosystem**	• Many national & local ecosystems, but **fragmented at European** level • Need to **include all regions and all talent** (especially female)

What's holding back European innovation?

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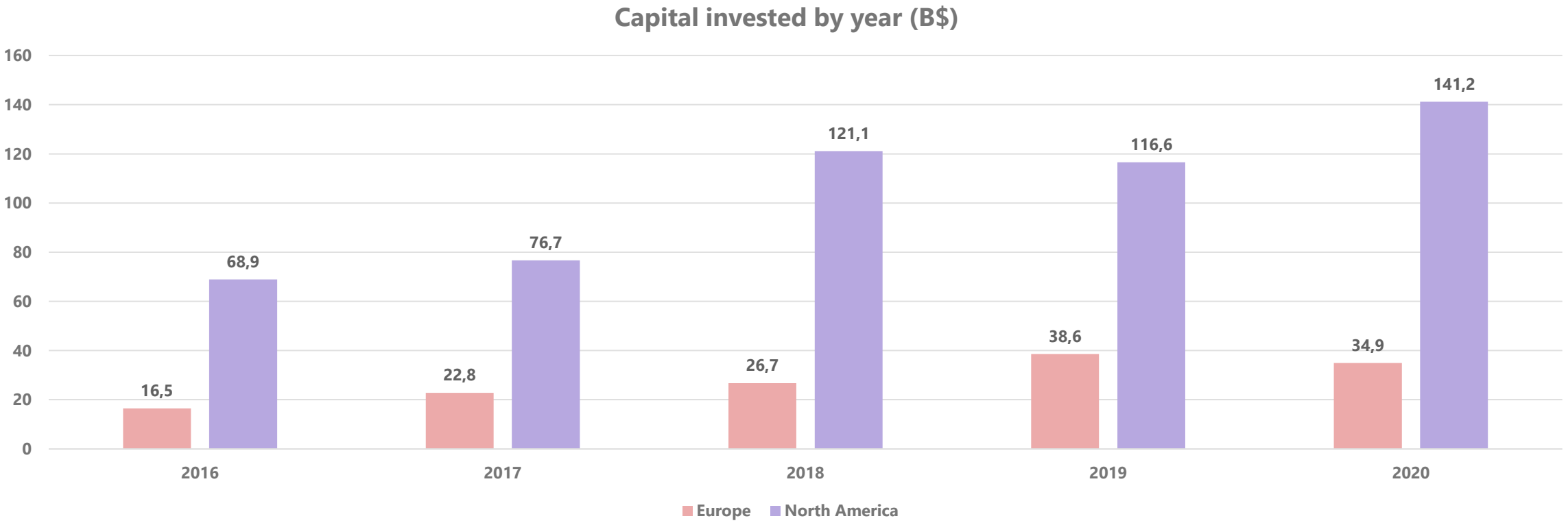
US venture capital investments are **4-5 times** higher than EU



Source: [Invest Europe, Pitchbook]

EIC Quantum Projects

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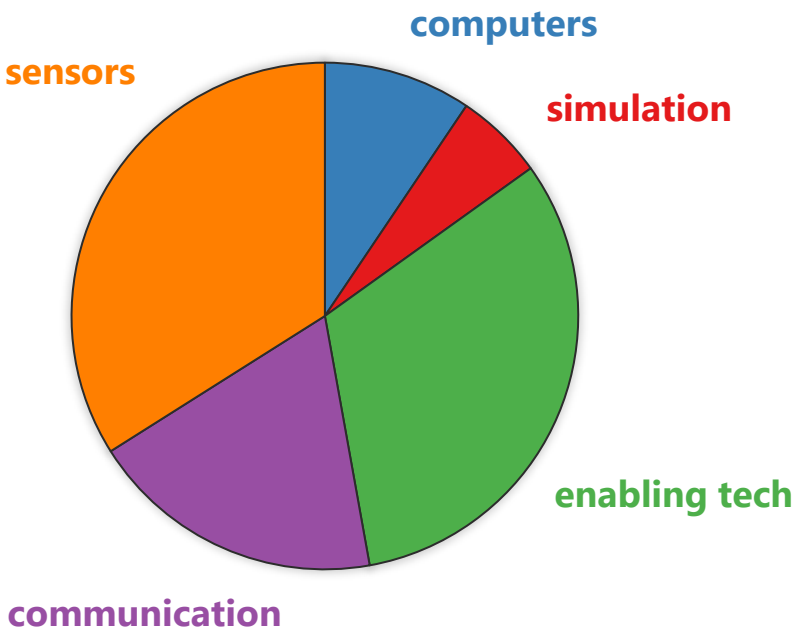
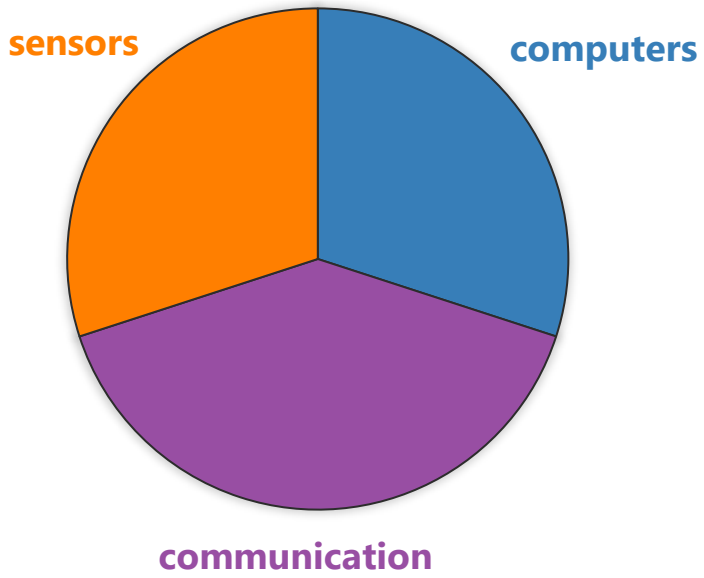
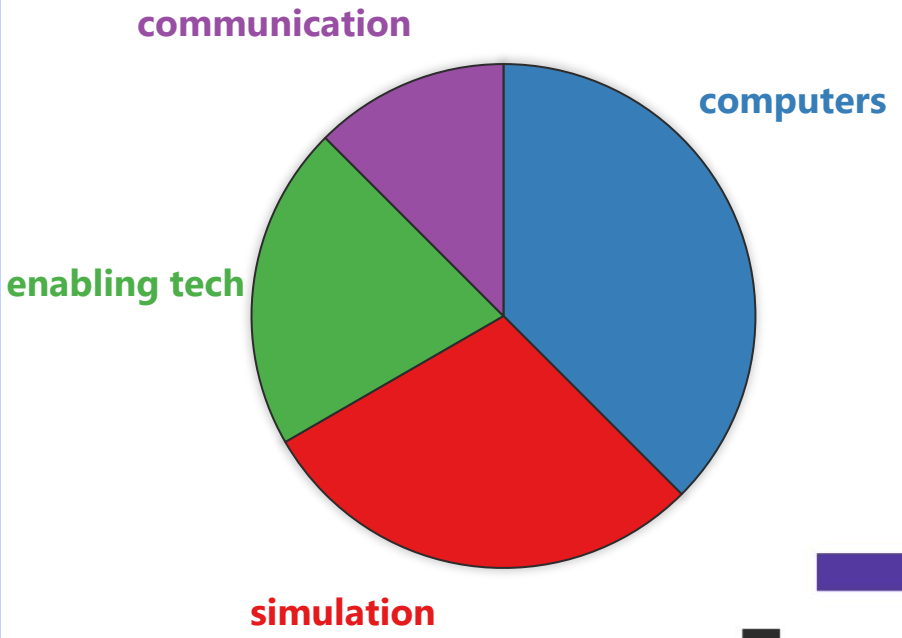
Pathfinder



Transition



Accelerator



EIC and European Chips Act

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- Address semiconductor shortage
- Strengthen Europe's technological leadership
- Budget: € 43 billion
- Goal: 20% market share by 2030

- EIC has a mandate of € 300 million to contribute to European Chips Act

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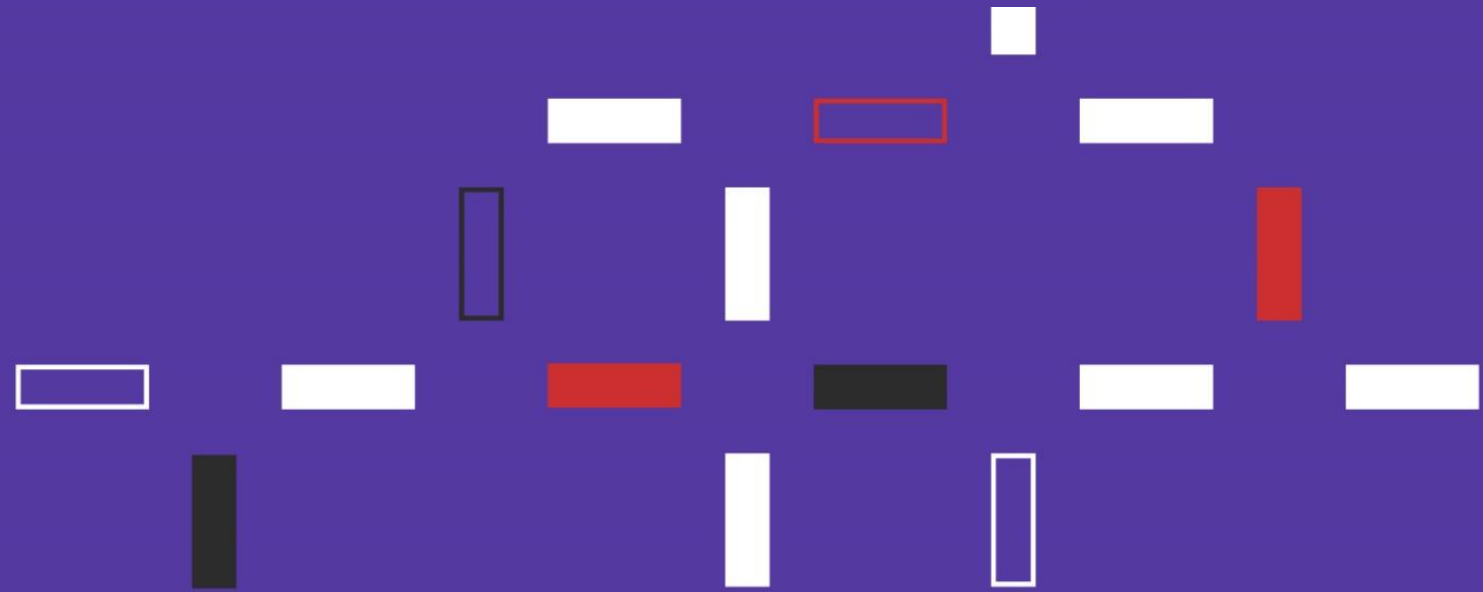
EIC WP2023. IV2.5

EIC Accelerator Challenge ‘Emerging Semiconductor or Quantum Technology Components’



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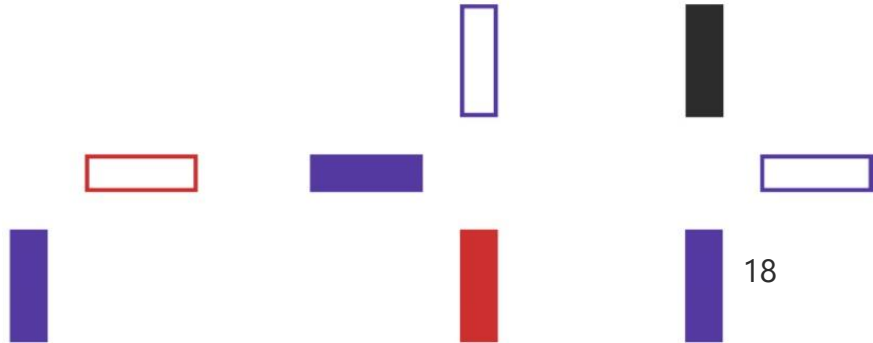
The goal of this Info-day session:

- Provide some background to the Challenge
- Explain the Challenge as presented in the Work Programme
- Answer your questions regarding the Challenge
- Is not to provide you with feedback of appropriateness of your individual proposal to this Challenge call



The Legal Basis: EIC Work Programme 2023:

Challenge Overview

This Challenge contributes to the objectives of the **Chips Act** by supporting the development of critical technologies where start-ups and SMEs with disruptive innovations have the potential to scale up and help ensure the future open strategic autonomy of the Union.

Picture from EE Times Europe

Specific conditions

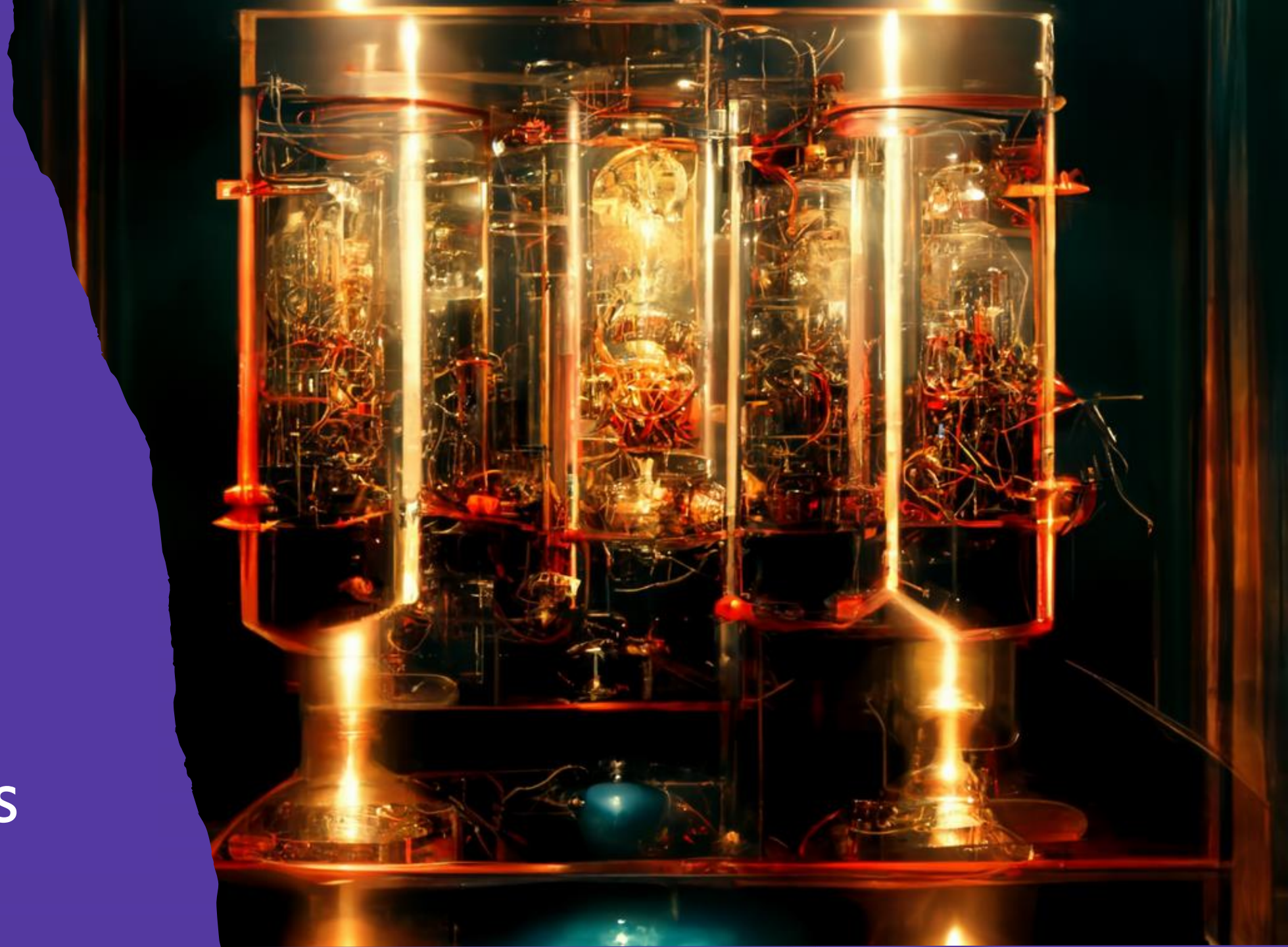
- Applications to this EIC Accelerator Challenge may request an investment component of above EUR 15 million in duly justified cases.
- Technologies of a strategic nature for open autonomy should **not directly or indirectly be controlled by third countries not associated to Horizon Europe or by legal entities of non-associated third countries**.
- **Any technology under this Challenge must be developed in a robust manner, paying specific attention to safety, security and ethics considerations in future applications**.

Indicative budget

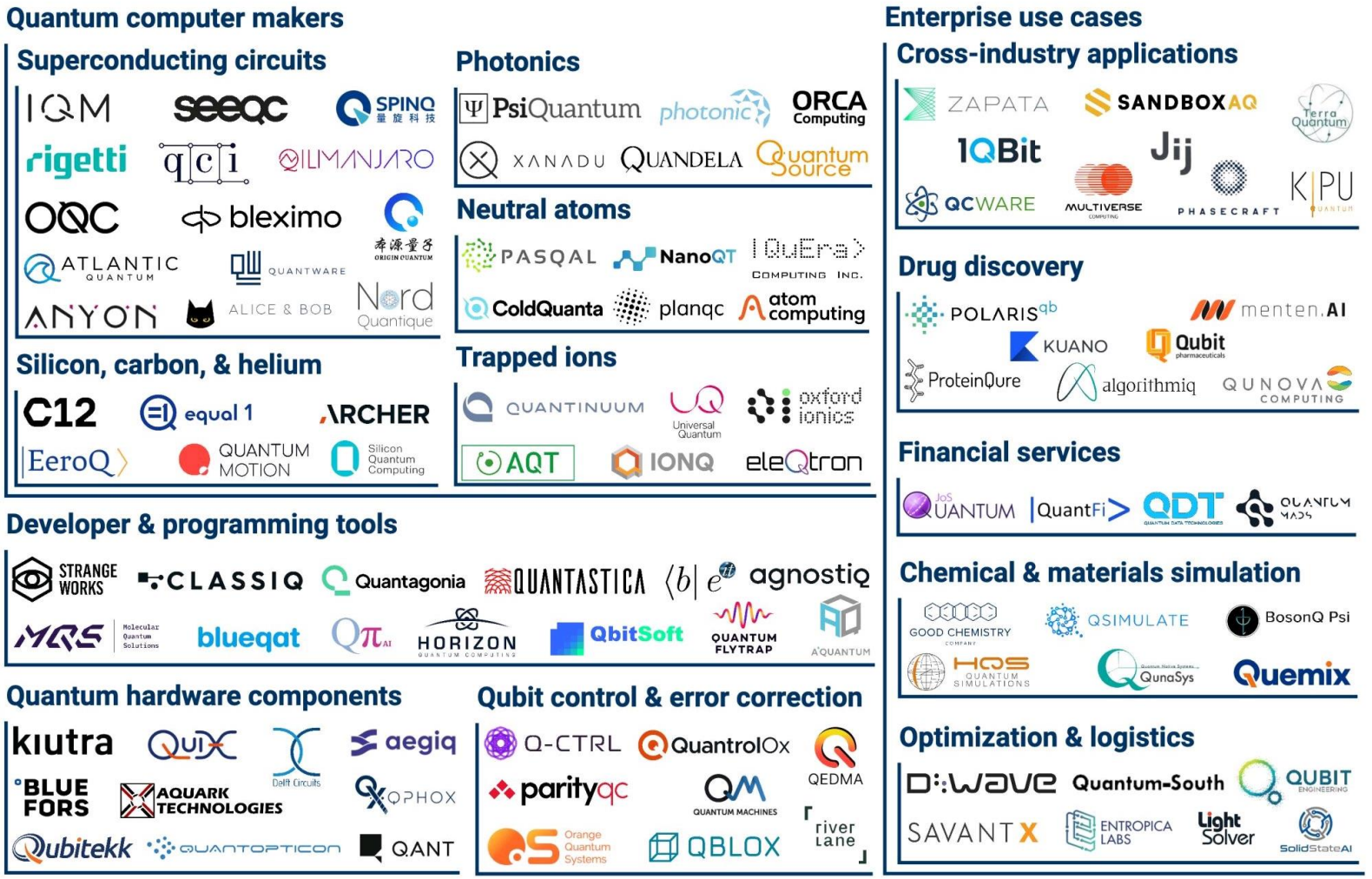
- **EUR 100.0 million**
- At least 30% of this budget will be allocated to the Quantum Technology Components and at least 30% to the Semiconductor Chip Development areas.
- The remaining will be flexibly allocated to either area in function of the successful submissions

EIC WP2023. IV2.5

A. Quantum Technology Components



Global Surge of Quantum Start-Ups



Source: cbinsights.com

Scaling to large-scale quantum computers remains an outstanding challenge!

International Quantum Start-Up Landscape

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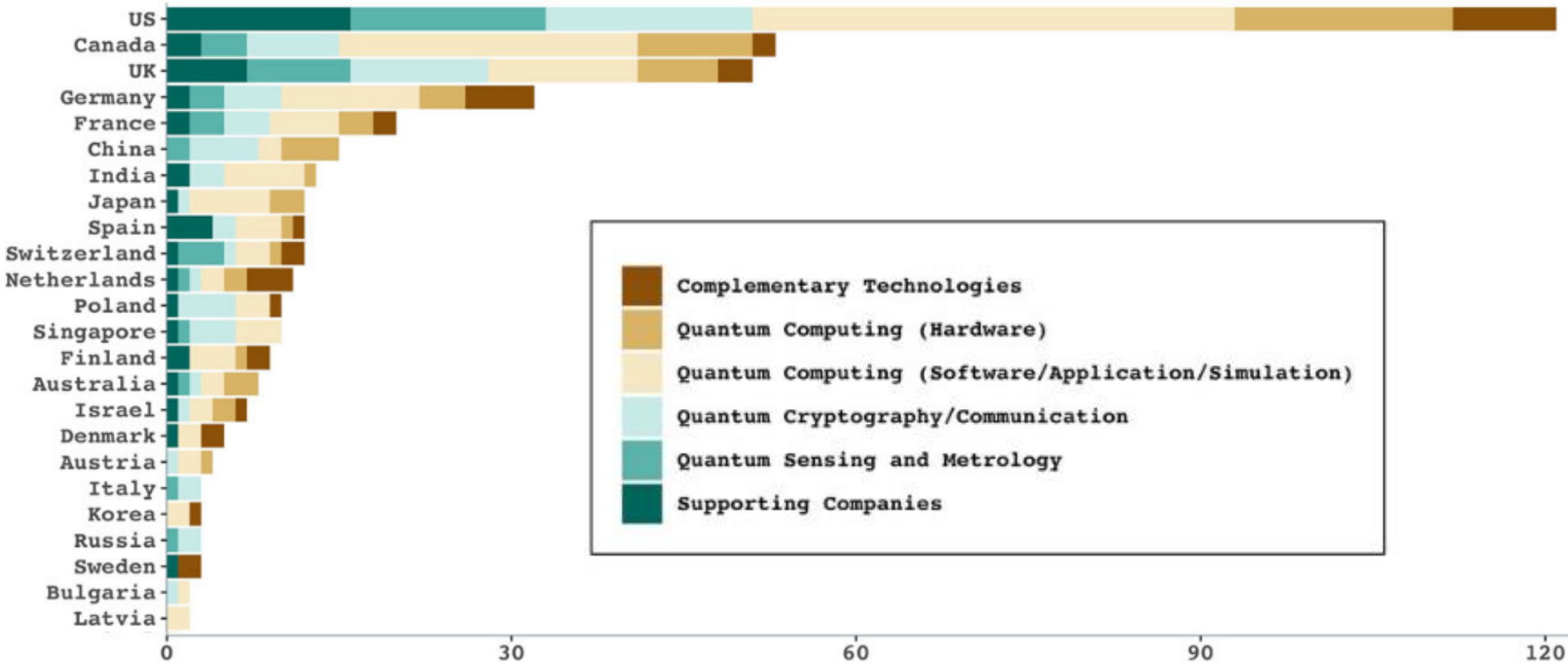
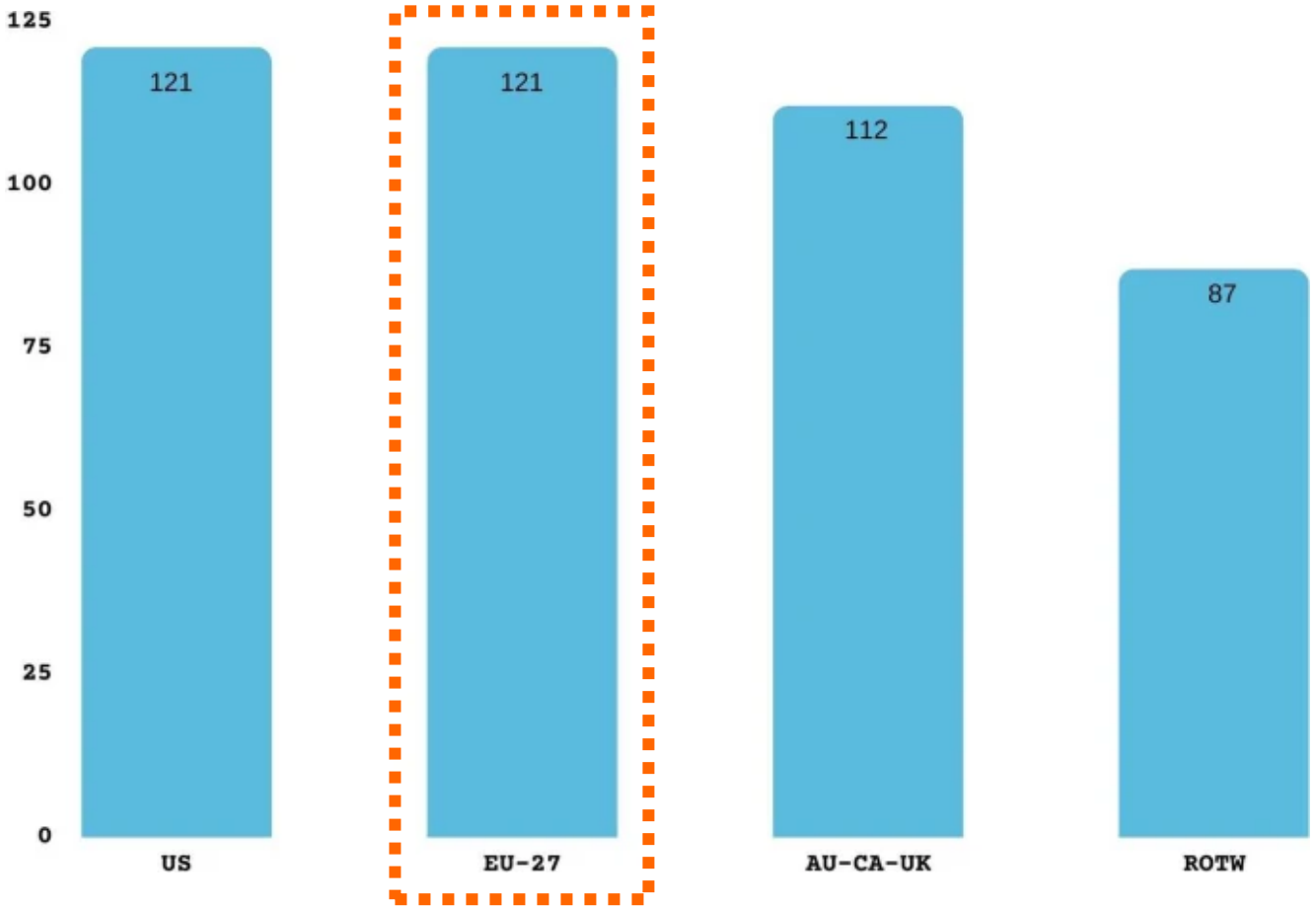
- 441 start-ups in 42 countries (2022)
- 50% of them in US, Canada, and UK



Seskir et al. EPJ Quantum Technology (2022)

International Quantum Start-Up Landscape

European Innovation Council



Seskir et al. EPJ Quantum Technology (2022)

Challenges Identification

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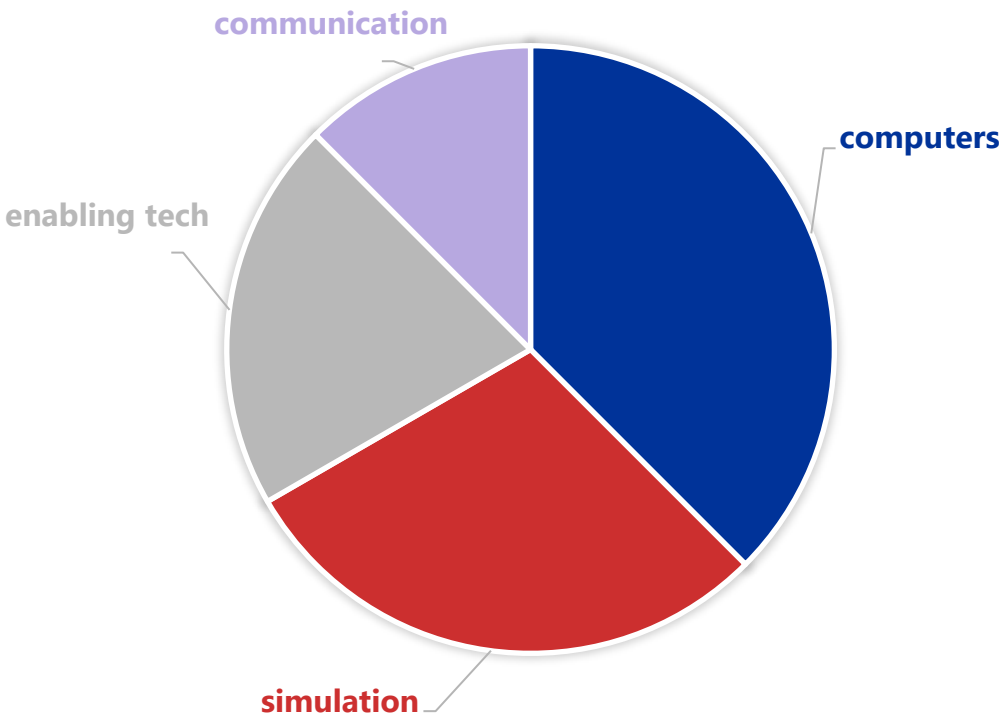
EIC Accelerator Quantum Portfolio



- Identify shortcomings and **potential** of European quantum ecosystem
- Ensure complementarity to **Quantum Flagship**
- Evaluate signals identified by **international experts**

Why Quantum Technology Components?

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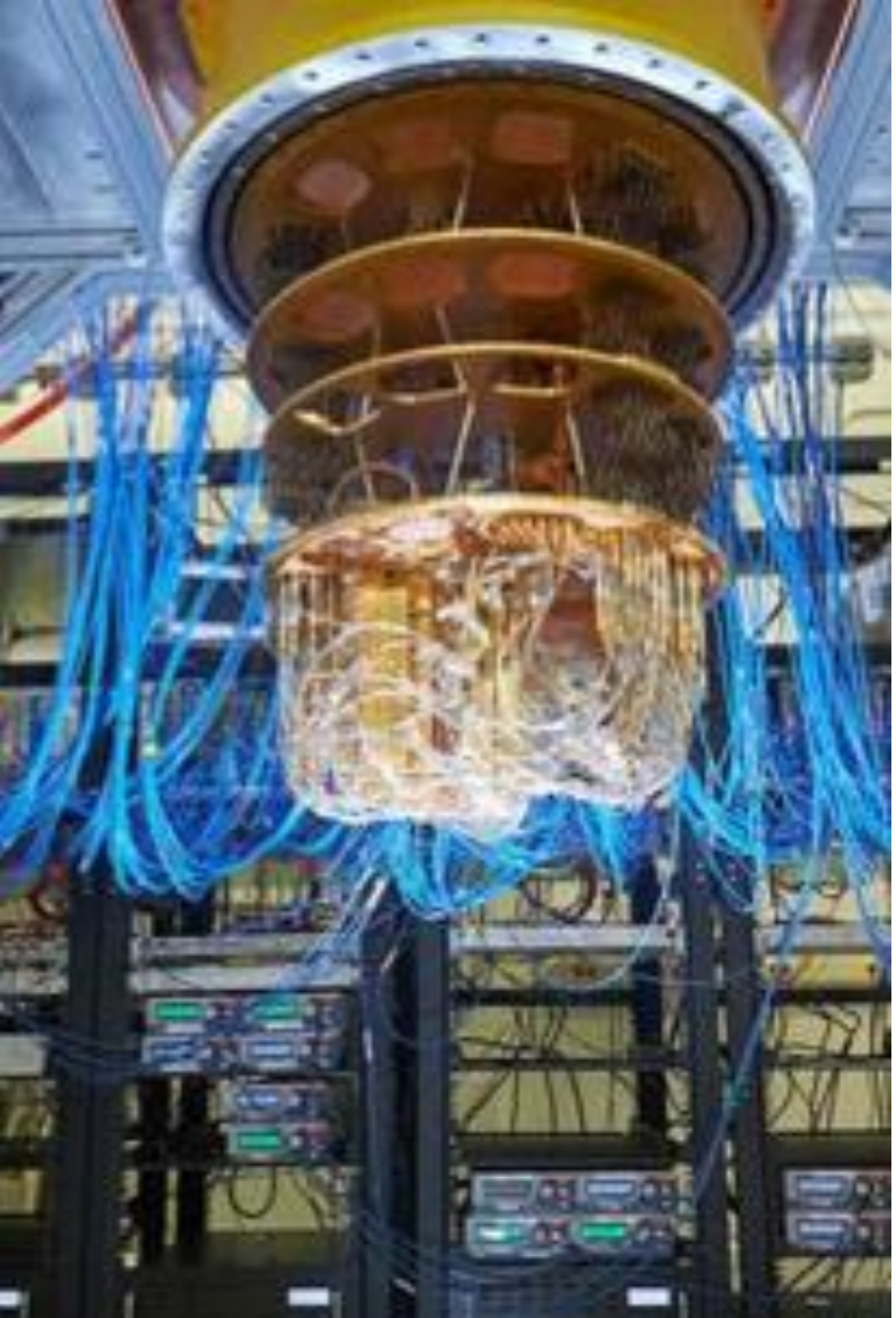
- **Europe is a global leader in research in quantum technologies**. Translating this level of R&D excellence into market innovation is a strategic priority, but companies set up to do that mostly struggle to get the necessary funding to scale-up
- **Enabling European companies to take a leading role in a market,** which is expected to grow from EUR 1.7 billion in 2021 to EUR 89 billion by 2040 in an aggressive disruption scenario.
- The objective of this Challenge is to **support ground-breaking innovations that have a high potential to develop the three following areas**:



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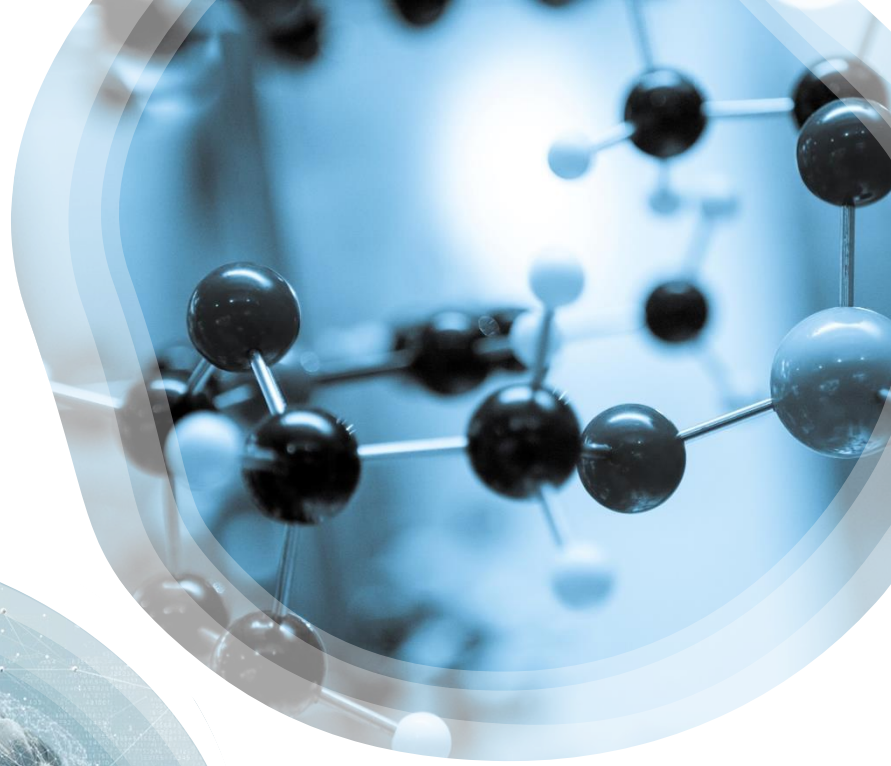
I. Fault-tolerant quantum computing

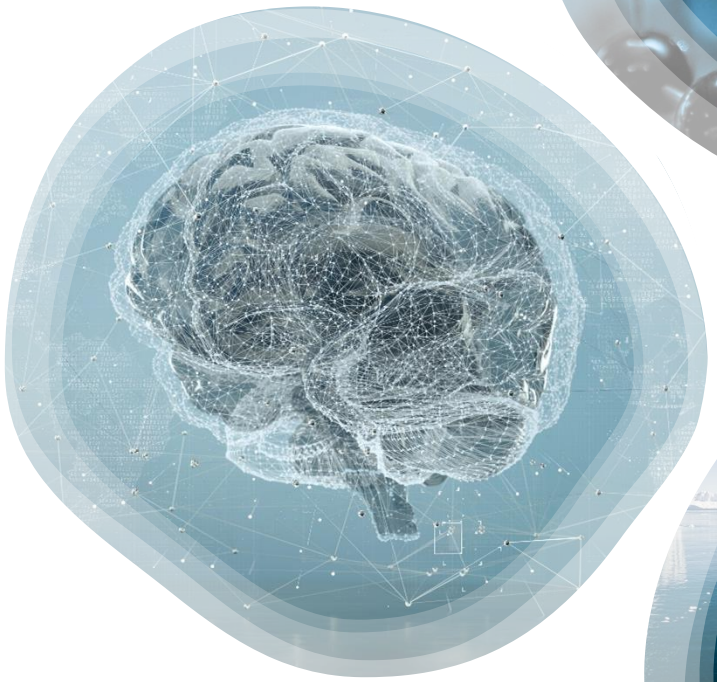
- Quantum computing (QC) has already attracted investments from large multinational companies and governmental research and innovation programmes.
- QC hardware still suffers from large error rates during computation.
- None of today's solutions (and even proposed solutions and those demonstrated on a small scale), come close to the need for a control system that scales to many thousands of qubits

Picture: Google QC

Quantum Computer Applications

- Artificial Intelligence & Machine Learning
- Computational Chemistry
- Drug Design & Development
- Cybersecurity & Cryptography
- Financial Modelling
- Logistics Optimization
- Climate Change





Euroepan Quantum Computing Landscape

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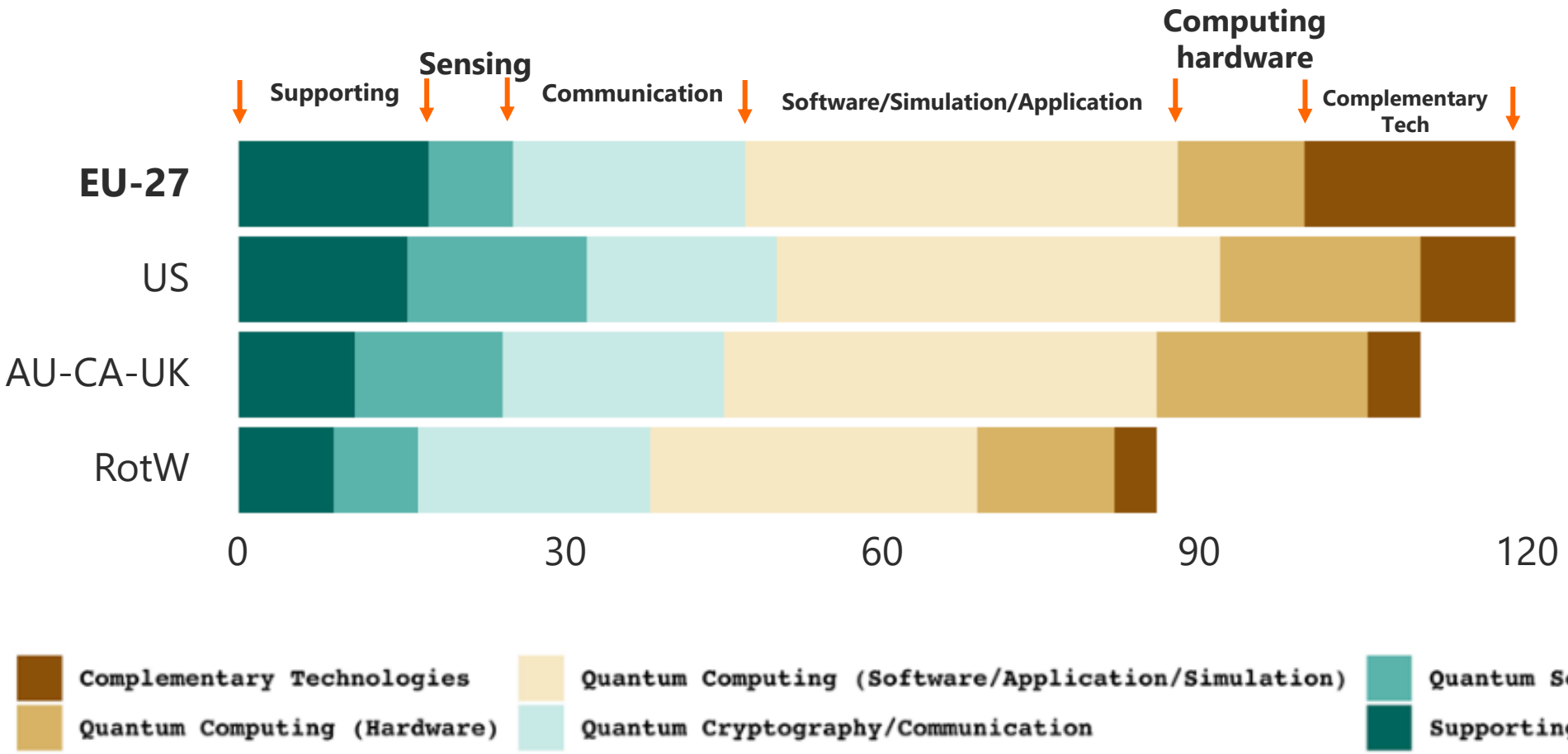

Seskir et al. EPJ Quantum Technology (2022)

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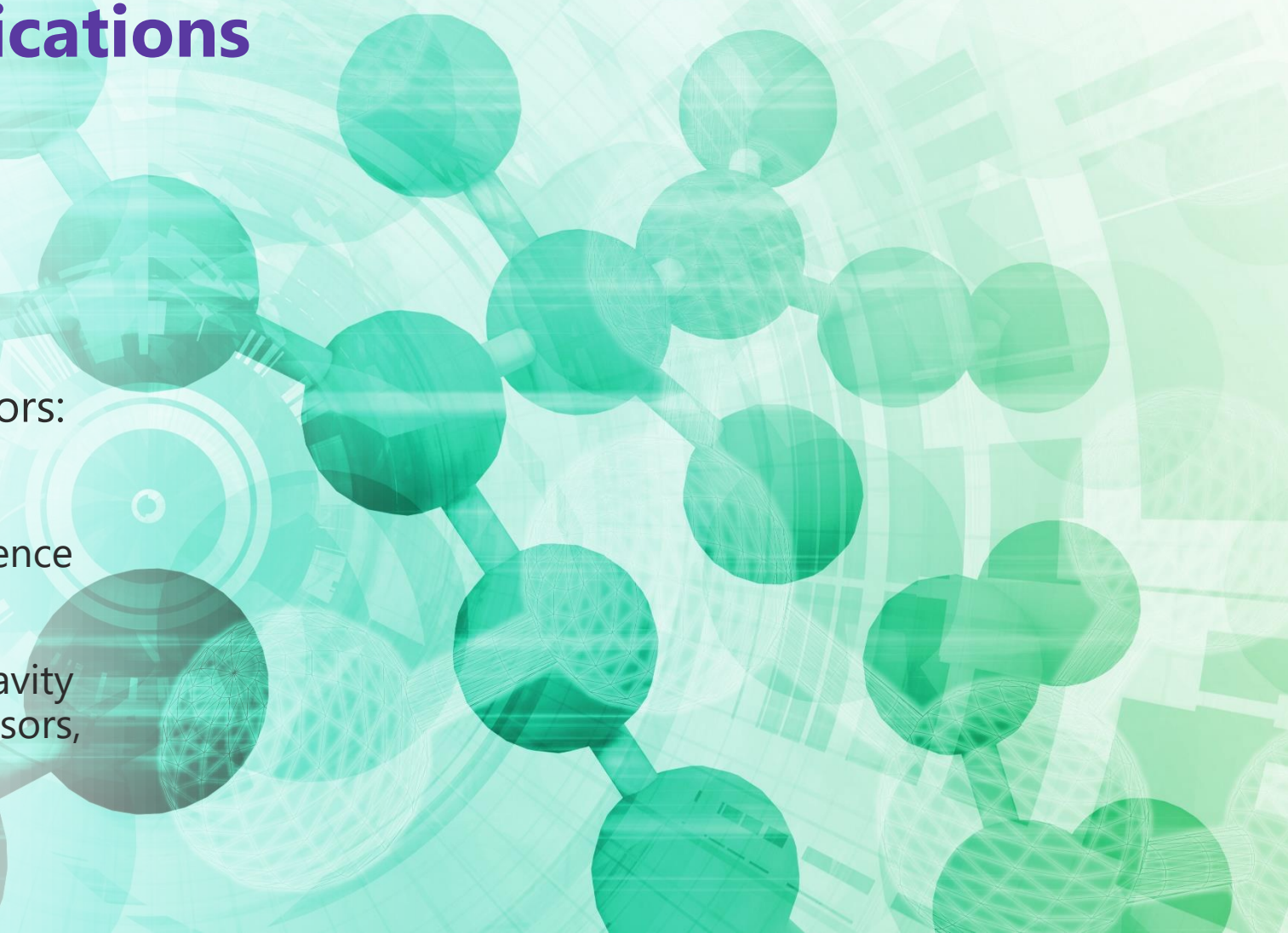
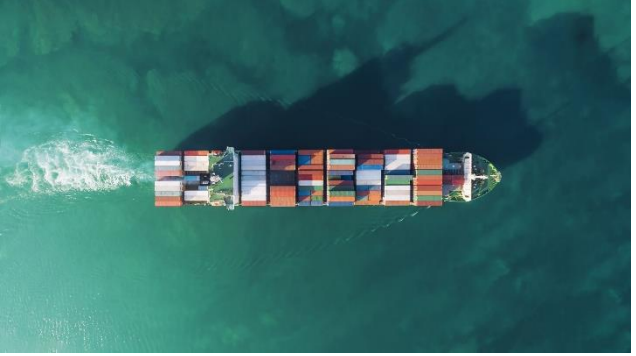
Specific Objectives

- Improved performance;
- Significantly simplified QPU (Quantum Processing Units) integration with control electronics;
- Scalable control systems (scalable to tens of thousands of qubits, needed for meaningful practical applications)

II. Quantum sensing components for real-environment applications

- Measuring different physical properties, including temperature, magnetic field, and rotation, with extreme sensitivity.
- Two generations of quantum sensors:
  - The first includes devices such as microwave atomic clocks and superconducting quantum interference devices (SQUIDs), etc.
  - The second generation includes gravity sensors, nitrogen-vacancy (NV) sensors, and other innovations



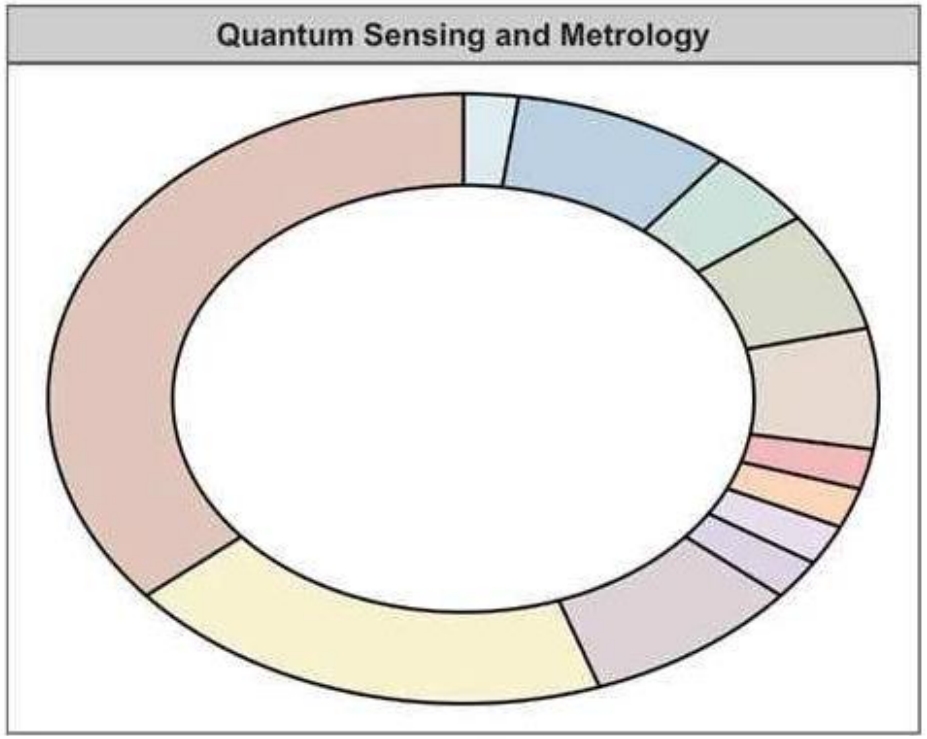


Quantum Sensing Application Areas

- Faster, more accurate, more reliable geolocation than today's GPS devices
- More detailed and accurate medical diagnostic images at lower cost and with fewer potential side effects for patients
- Better, safer autonomous navigation of vehicles on the ground, in the air, and at sea
- More accurate and less vulnerable guidance systems in space, under water
- Reliable detection, imaging, and mapping of underground environments
- Deeper, more active sensing of gravitational changes and tectonic shifts

European Quantum Sensing Landscape

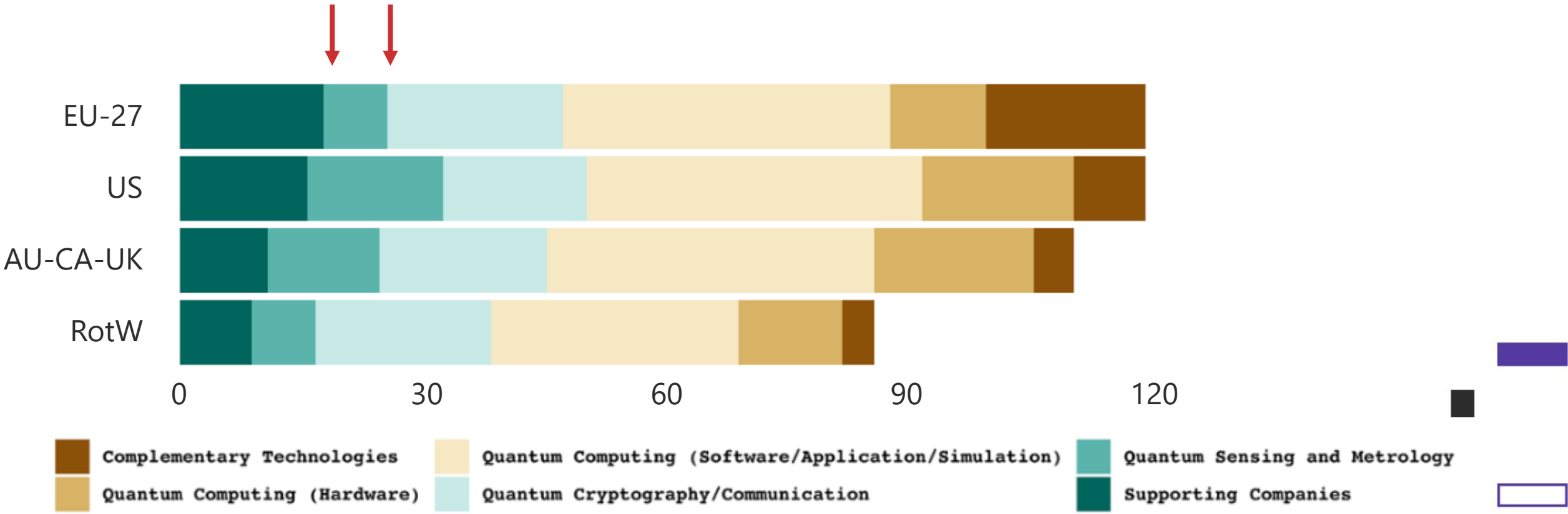
- The quantum sensing and metrology field includes companies:
  - that are developing quantum sensors
  - the ones that utilize quantum sensors for sector specific solutions



Seskir et al. EPJ Quantum Technology (2022)

European Quantum Sensing Landscape

- Quantum sensing and metrology underrepresented in EU ecosystem



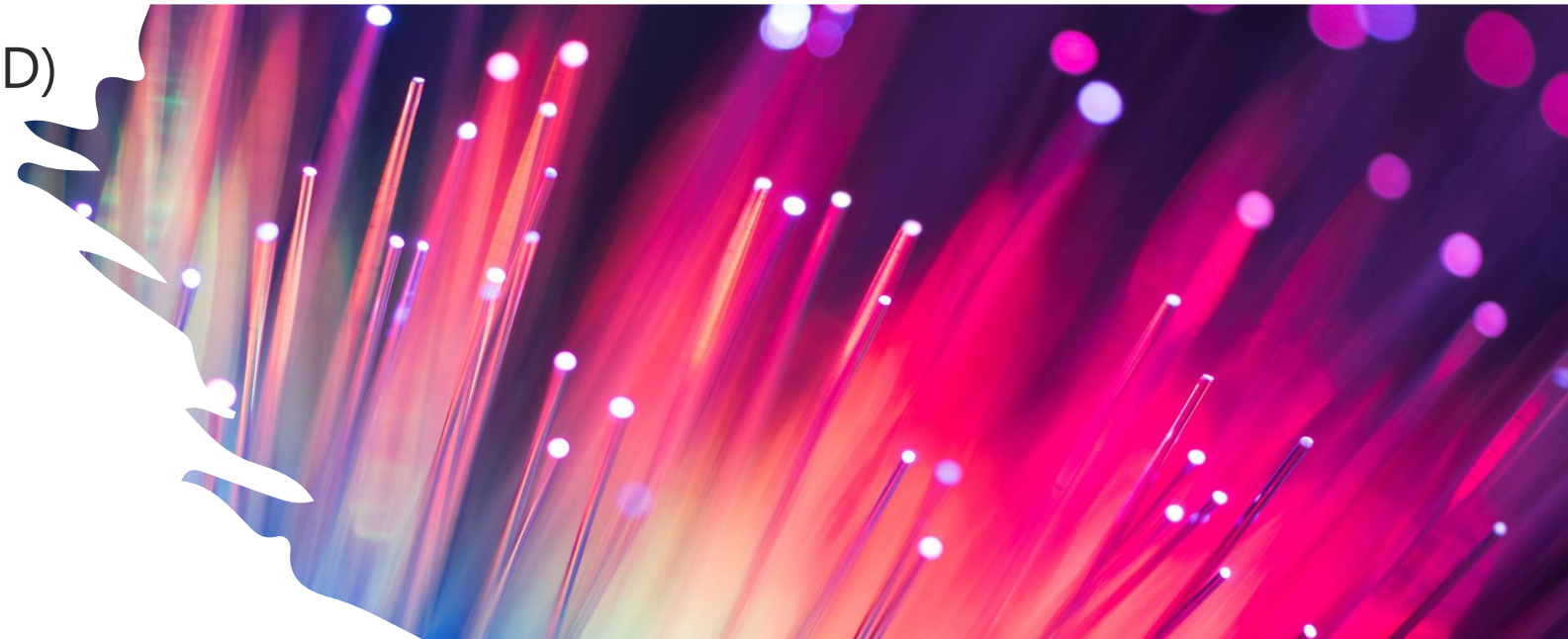
Seskir et al. EPJ Quantum Technology (2022)

Specific Objectives

- **Quantum sensing components to function in real/harsh environment for various application areas**, such as:
  - Ecotoxicology
  - Pharmaceuticals
  - Biomedical
  - Space
  - Corrosion detection in power plants, gas/oil tanks
  - Raw material detection
  - Medical imaging
  - Automotive
  - and many more

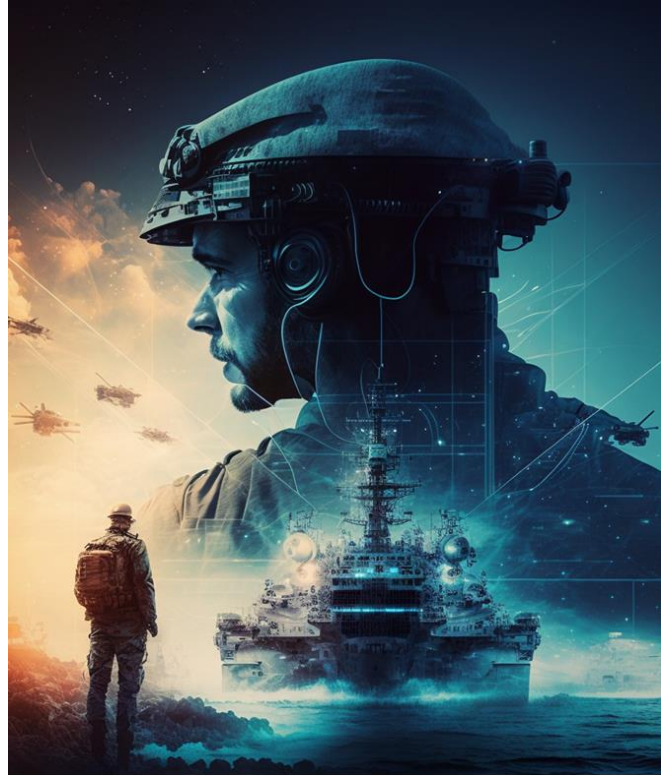
III. Quantum Communication Devices

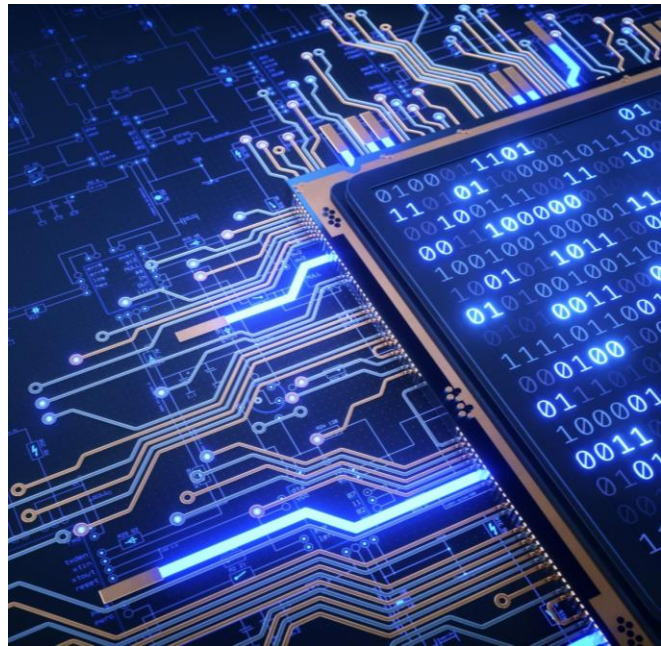
- Quantum communication takes advantage of the laws of quantum physics to protect data. It includes:
  - Quantum Key Distribution (QKD)
  - Quantum Repeater
  - Quantum Teleportation
  - Quantum Internet



Quantum Communication Application areas

- Government
- Defense
- Space communication
- Cybersecurity
- Banking and financial Industry

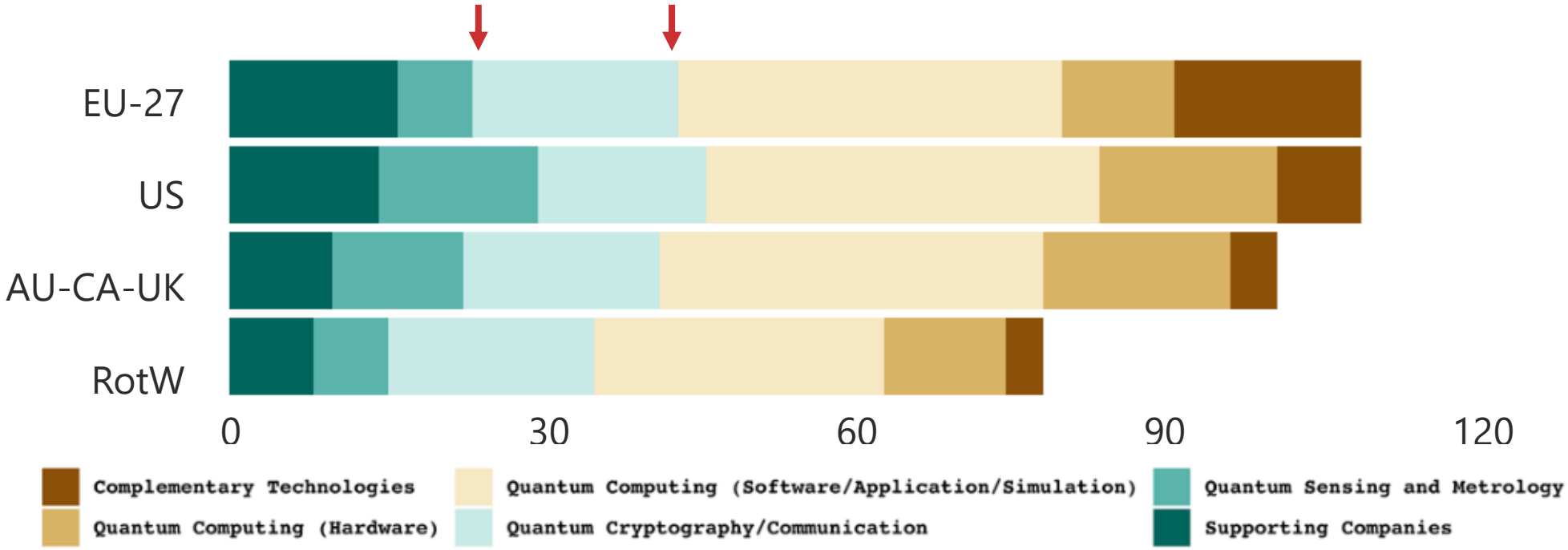




European Quantum Communication Landscape

- Europe has outstanding number of quantum communication start-ups
- The European Quantum Communication Infrastructure (EuroQCI) Initiative

The EC is working with all 27 EU Member States, and the European Space Agency (ESA), to design, develop and deploy the EuroQCI, which will be composed of a terrestrial segment relying on fibre communications networks linking strategic sites at national and cross-border level, and a space segment based on satellites



Seskir et al. EPJ Quantum Technology (2022)

Specific Objectives

- **Quantum communication devices that can be deployed in a real environment** such as:
  - Quantum repeaters
  - Devices for quantum-based encryption, etc.

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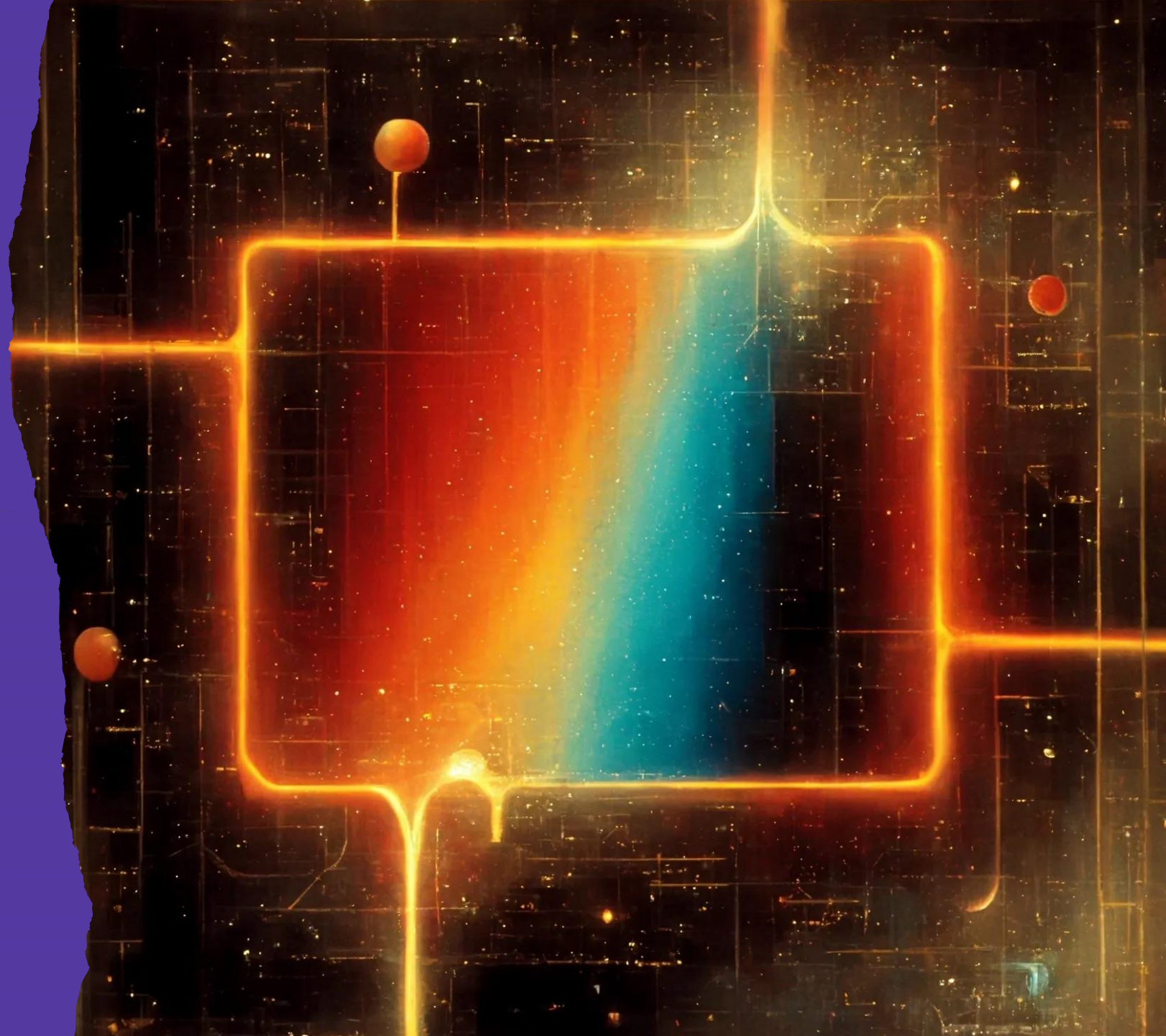
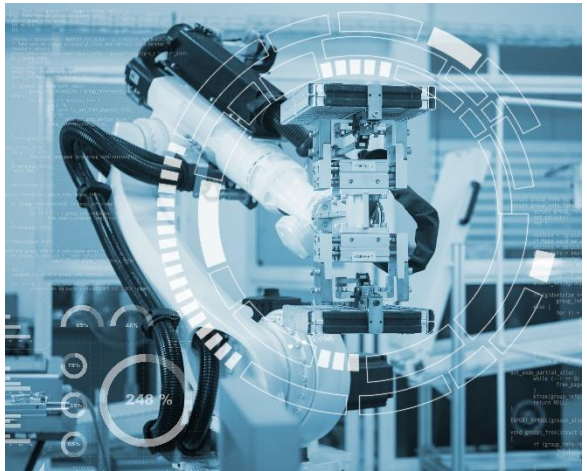
B. Semiconductor Chip Development



Semiconductors play a key role in our modern life

- The recent chips shortage had a severe impact on key industrial sectors, exposing Europe's dependency on supply from other regions.
- Such reliance on imports jeopardises EU's industrial production, affecting European sovereignty



Europe share in global market

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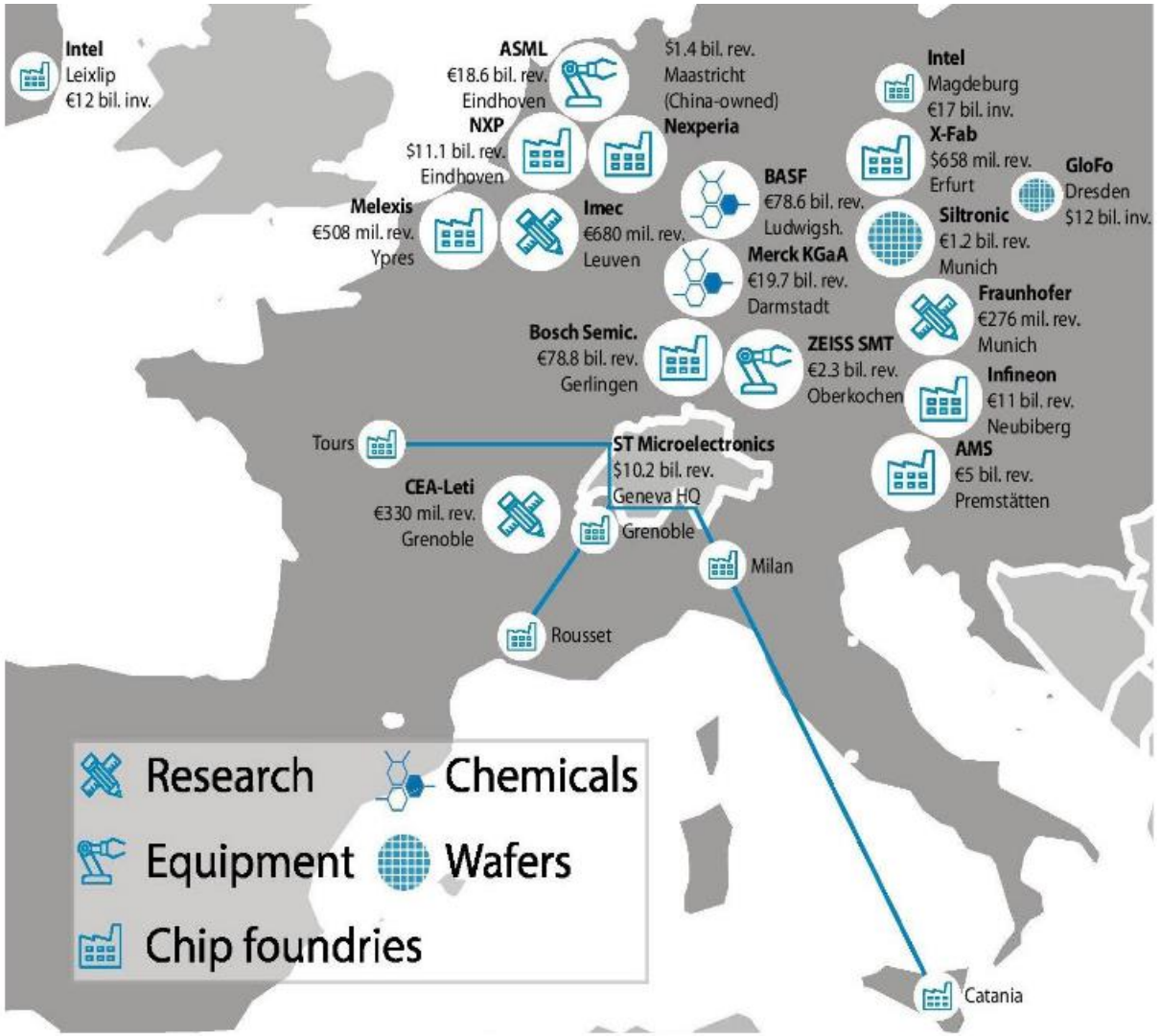
- Chips are **strategic assets** in key emerging industries such as mobility, cloud, IoT, space, defence, supercomputing, etc.

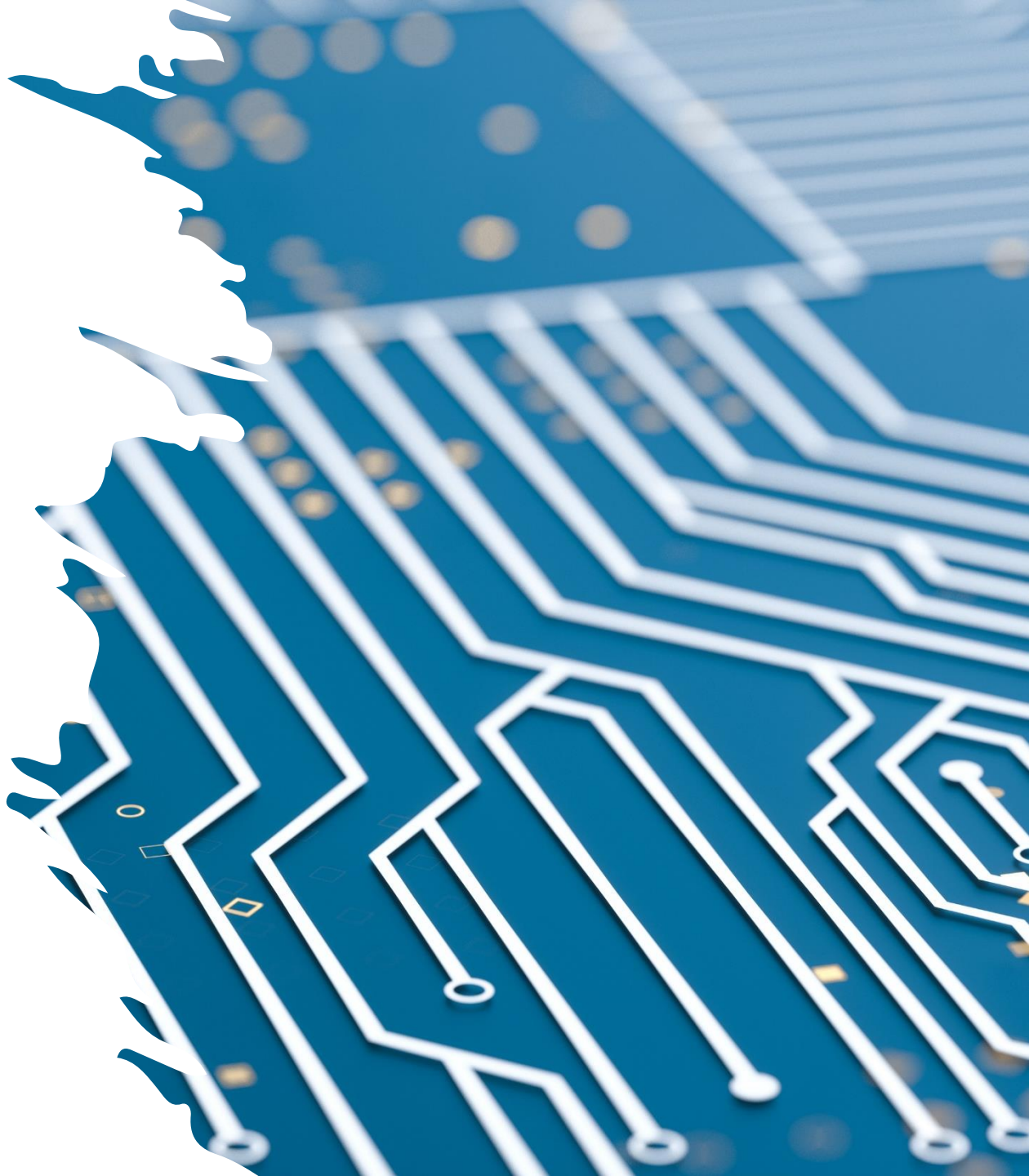
- **EU's global market share is only 10%**



Source: ESPAS report 'Global Semiconductor Trends and the Future of EU Chip Capabilities'

Semiconductor Chip Design

- The semiconductor value chain is complex, but **overall chip design is the stage with the highest value added**
- Fabless companies that focus on chip design invest the highest share of sales revenues in creating **Intellectual Property** that generates long-term income
- Designing chips involves high tool and IP licensing costs, **long development cycles** and **very steep production expenditures**, therefore dedicated patient capital is required for semiconductor fabless companies in their early stages



Valley of Death

- Only a few companies worldwide can design and manufacturing the most advanced chips at leading node sizes
  - because of the skills and large investment required for design, R&D, scaling, and IP protection.
- Demand for these chips in some major market segments,
  - including artificial intelligence and machine learning is surging as they combine strong performance with lower power consumption.
- Because of the lack of deep-tech financing for long-term investments in high-risk, high-return ventures, innovative semiconductor **start-ups in the EU struggle to get funding to scale up and overcome the so-called "valley of death**".

Design in EU
Problem statement

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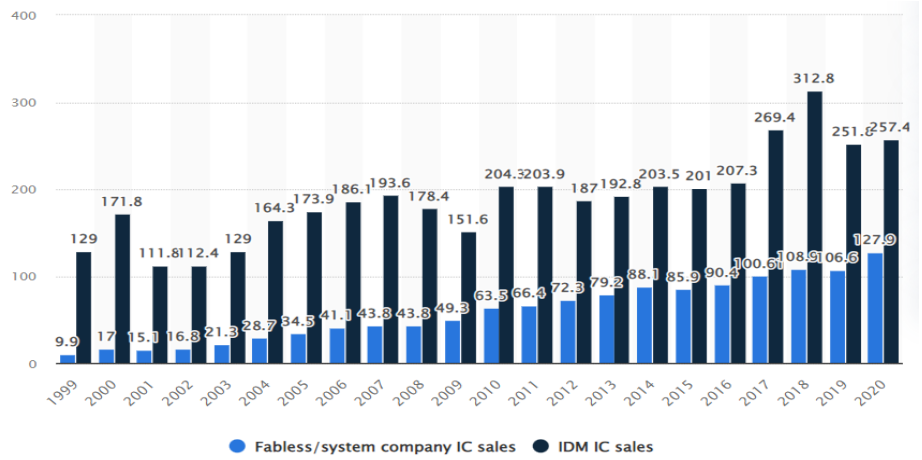
The market

- Design represents nearly **1/3 of the market** of semiconductor value chain
- Fabless companies grow fast: 2.7x in 10 years - **now 35% of the market**
- Large system companies engage in design to capture value by verticalization



In Europe

- Design capacity mostly with IDMs, **no EU fabless company in the top 40**
- Share of European fabless declined in 10y from **4% to 1%**
- High entry/scaling barriers, limited funding => valley of death
- Limited skills on advanced nodes
- Low level of engagement by system companies in chip design

This Challenge aims to

- Support the **expansion of design capabilities** and **the growth of fabless start-ups and SMEs in Europe** is of critical importance for the competitiveness, resilience and sovereignty of the Union.

- **Promote Europe's chip design ecosystem**, which could be **a cost-efficient way to climb the semiconductor value chain**, diversify EU economy and earn a strong position at the technological frontier

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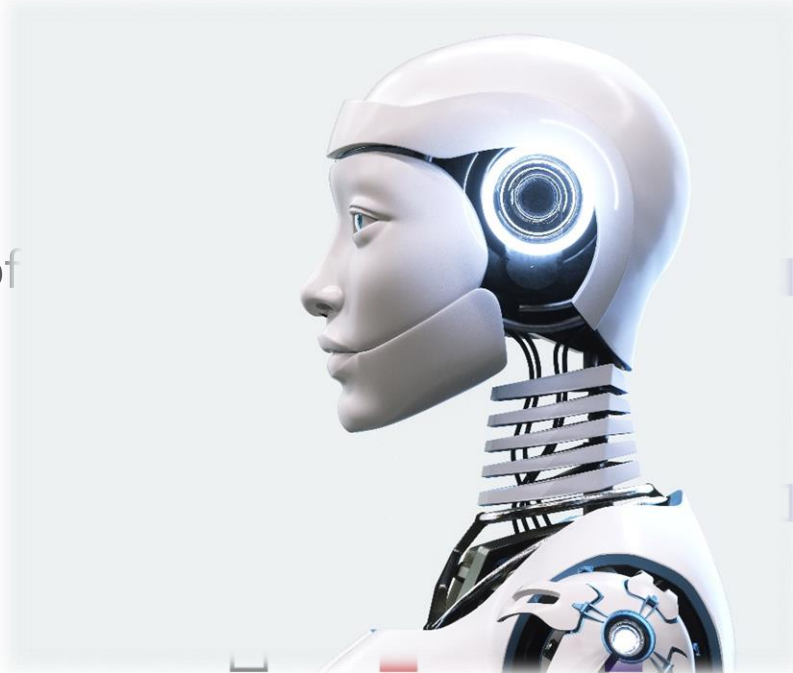
Specific Objectives

- The aim of this Challenge is to support the **design and development of innovative semiconductor components and intellectual property for analogue and digital integrated circuits and systems including:**
  - Memory
  - Logic
  - Optical components
  - Sensors

Application areas: Artificial Intelligence, edge computing, Internet of Things, electric and autonomous vehicles, 5G/6G communication, cybersecurity, health and wellness, environmental sustainability



Specific Objectives

- The scope also includes **innovative design approaches** that address combination of different functionalities such as **computing, RF, power, memory** and **sensing**.
- Proposals on **Software Development** for semiconductor chip design will also be considered in this challenge
- The proposing entities should demonstrate ground-breaking innovation in the respective applications fields and high potential for commercial deployment in important EU industry sectors such **as automotive, industry automation, information and communication, healthcare, aerospace, security and energy.**

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Expected outcomes and impacts

- In the mid to long term, this Challenge is expected to foster
  - the development of the semiconductor chip design ecosystem in Europe by **increasing the number of innovative fabless start-ups** and **semiconductor IP companies in the EU**,
  - **2030 Digital Compass** target of doubling EU's production of **advanced sustainable chips and Europe's digital autonomy**

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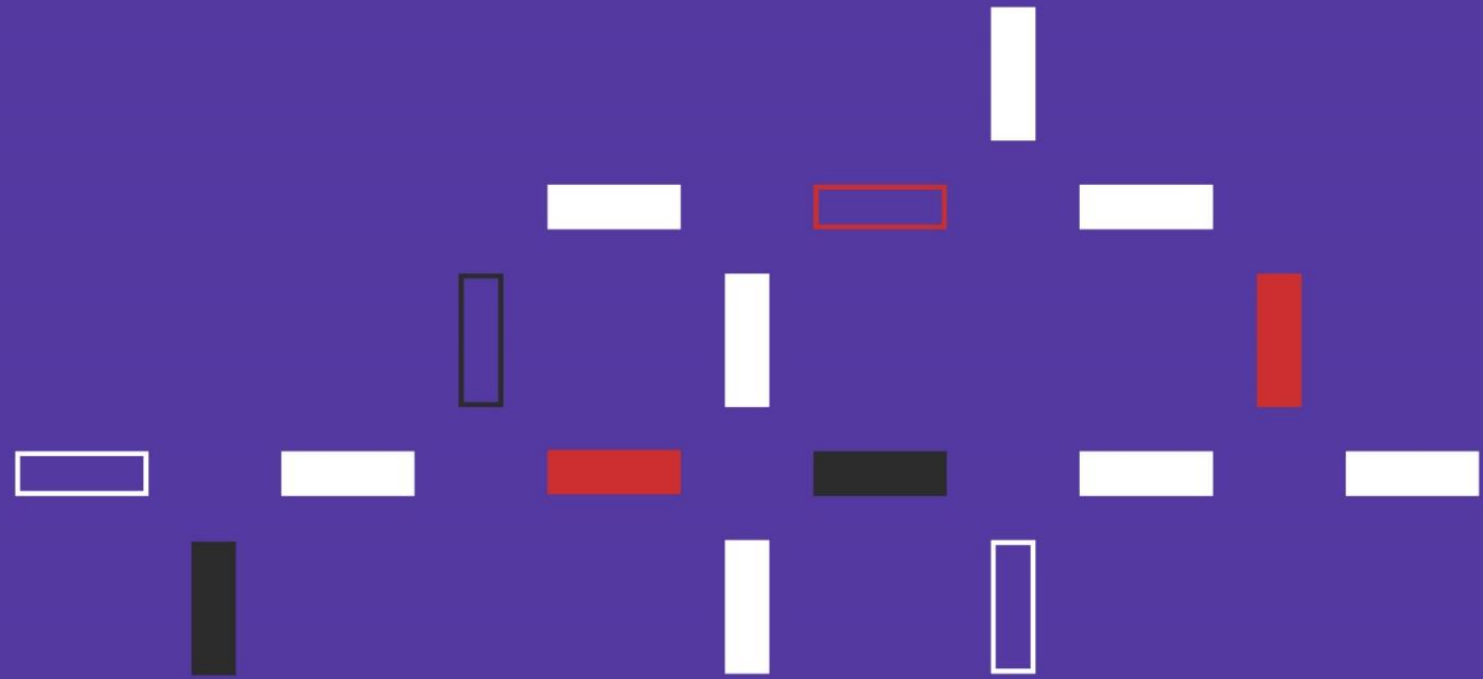
Q&A

Samira Nik
Cristina Boto



Q&A, Discussion

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