

# D6.7 Guidance on industry engagement for the public sector

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## Introduction

In this report, we provide a best practice guide for public funding bodies to engage with businesses and industry. The following guidance has been drawn from key learnings of the UK and Europe quantum funding and business landscapes. The present guidance is supported by UK examples of engaging with businesses, creating new collaborations, supporting young innovators, accelerating commercialisation of quantum technologies, enterprise and training skills for quantum engineers and scientists and last but not least on equality, diversity and inclusion measures in public funding policies.

## Working with Businesses

Since its launch in 2015, the UK national quantum programme has set a great example of industry engagement by involving industry in funding competitions and supporting its engagement with research and academia to drive innovation in quantum technologies.

The UK national quantum programme has attracted several local and international businesses working in partnership with research groups and the four main UK quantum hubs to address current challenges in communication, computing, imaging, sensing and metrology in several sectors including healthcare, transport, telecommunications, space, energy, finance, etc, ... The quantum hubs are also provided with a partnership resource funding as part of the commercialisation strategy of the UK national quantum technology programme. This funding is dedicated to early stage projects where academics and businesses work together on early applications of quantum research.

The quantum technologies special interest group at KTN has recently completed the mapping of industry and research capabilities in the UK as well as the current public funding landscape. This mapping exercise showed the involvement of over 200 UK businesses from startups, SMEs and larger international corporations. Another strong way of engaging industry showed through the industrial partnership in many of the UK skills building and training programmes for quantum engineers and scientists. There are currently about 32 active training programmes in the UK including centres for doctoral training (CDTs), doctoral training partnerships (DTPs) and training and skills hubs involving international and UK businesses. These training programmes involve large international organisations such as Google, Microsoft Research, Toshiba, Hitachi, BAE Systems, IBM, Nokia Research, Agilent Technologies, Boeing and Thales group, just to name a few.

## Engaging funding bodies with businesses

Innovate UK plays an important role in driving productivity and innovation in quantum technologies by supporting businesses in commercialising new technologies. Innovate UK's strong business focus has enabled innovation by working closely with companies to determine technology areas driving future economic growth. Other industry engagement efforts involve regular meetings with UK innovators with ideas in areas of focus in quantum technologies, funding the strongest opportunities and connecting innovators to the right partners. Startup businesses and SMEs particularly benefit from Innovate UK funding calls to enable them to

grow their businesses and bring new ideas to the market. Innovate UK is also supporting the industrialisation of quantum technologies by its Industrial Strategy Challenge Fund ISCF as detailed in section 2.1.

### How the research councils engage with businesses

The UK research councils have a collective and strategic approach to engage with businesses considering the benefits to both companies and the research councils by understanding the business needs and sharing them with the research base. The research councils also help promote collaborations between businesses and academia and making a friendly space for industry/research interactions. The research councils also facilitate access to the knowledge and capabilities base within research and academia.

### Identifying opportunities for collaboration

KTN has been closely supporting the UK national quantum programme industry engagement since its launch in 2015 via its quantum technologies special interest group. Some of the main supportive actions of the QT SIG to the national quantum programme include running regular networking and dissemination events to raise awareness about quantum technologies in the UK and speed up the industrialisation of quantum technologies. The dissemination events also aim to engage with businesses by targeting specific sectors of applications of quantum technologies. The QT SIG also supports briefing events for public funding calls and competitions and reviews specific applications.

One of the most prominent outputs of the QT SIG also include mapping the quantum capabilities across Europe and in the UK. The UK landscape map has identified around 204 businesses involved in quantum in the UK including quantum technology providers, supply chain and end users. We also count around 160 research groups and facilities in quantum in the UK and 32 active postgraduate training centres in quantum technologies including CDTs, DTPs and training hubs. The gateway portal of UKRI lists over 3000 archived projects in quantum including over 1200 active projects. Furthermore, there are currently three EPSRC multimillion research portfolios in quantum devices and components, quantum fluids and solids and quantum optics and information including around £120m of funding in the national quantum programme.

Mapping quantum capabilities across Europe was a very important deliverable of KTN within the sixth work package of QuantERA, especially for achieving a better industry engagement between quantum scientists, public funders, policy makers and industries to speed up the industrialisation of quantum technologies and to identify the market potential of quantum science and technologies. The EU landscape exercise identified about 120 EU public funding organisations, 718 active research groups and few thousands of active research projects openly accessible on EU public databanks. There are currently about 1032 active EU funded cohorts in quantum openly available on the EU Cordis website. We have also identified 68 expert contacts from 29 EU countries, all distinguished members from the quantum community, liaising national stakeholders with EU policies. In terms of industry, we listed 105 known quantum technology businesses across Europe, with 50% of them located in the UK.

The EU quantum landscape map also provided a list of 40 public databanks containing information of who and what are the local public bodies funding. Gateway to Research, a UKRI

website and a public data domain, is a one example of information resource for current funding by the Research Councils and Innovate UK and for details about technologies, processes, outputs, and impact of funded projects. The gateway portal of UKRI currently lists over 3000 archived projects in quantum including over 1200 active projects.

### Access to funding opportunities

KTN's Access to Funding and Finance team particularly supports innovative businesses to secure appropriate funding for their growth by providing a set of resources and expertise to apply for and raise finance and funding.

The Access to Funding and Finance team has developed many resources and activities aiming to increase success chances while applying for public funding or raising private investment. Some of the developed resources include a free Good Application Guide for applicants to submit high quality proposals. KTN also reviews applications for first time applicants to Innovate UK. However, the advice provided is transferable to other funding programmes. The Access to Funding and Finance team also provides a free guide on building an A grade team to ensure businesses are surrounded by the right team to reach success. Businesses and any applicant may also benefit from more free resources on preparing a good value proposition and on investment pitches.

## Industrialising quantum technologies

Quantum-enabled devices present a huge market opportunity for the UK. These technologies could transform a range of sectors including automotive, healthcare, infrastructure, telecommunications and defence. We provide in the following some of the UK public actions to accelerate the industrialisation of quantum technologies.

### Industrial Strategy Challenge Fund

The Industrial Strategy Challenge Fund or ISCF funded by Innovate UK has also launched the commercialising quantum technologies challenge by investing around £153m in quantum technologies supported by a further £205m fund from industry helping turn quantum science into quantum engineering and to provide essential support to businesses developing quantum-enabled products by removing barriers to productivity and competitiveness. industrialisation of quantum technologies, through incentivising collaborative industrial research and development, where research organisations partner with businesses, (SMEs and large enterprises) to develop quantum enabled products to the requirements of end-user applications. These are the early quantum technology supply chains. One of the beneficiaries from the ISCF fund is RSK, a UK environmental and engineering leader, to develop a quantum-enabled gravity sensor that will help infrastructure planning and works. RSK will lead a consortium of businesses and universities to develop a prototype instrument that can identify buried and forgotten pipes and assess infrastructure, enabling geoscientists and engineers to identify risks and plan work more efficiently.

## Industrialising quantum technologies case study: CyberASAP

The Cyber Academic Startup Accelerator Programme CyberASAP is one of the successful examples for converting academic and research ideas into commercial products.

Funded by DCMS in collaboration with Innovate UK & KTN, CyberASAP helps academics in UK universities commercialise their cyber security ideas. This programme provides academics with dynamic trainings, bootcamps and workshops to acquire the key milestones to take their product from the lab stage to the market stage in two different phases. The first phase of this programme allows participants to develop a value proposition and market validation. Successful teams move to the second phase of the programme where teams' prototypes are showcased to potential investors. In the current 2020/2021 Programme, 20 academic teams have successfully progressed to the market validation stage. One of the successful teams is the University of Leeds who is currently developing quantum inspired key distribution enhanced automatic fraud detection and quantum secure transactional platform to protect everyone. The University selected researcher is currently building the most secure payment card security system for finance by combining automatic fraud detection to quantum communication.

## International collaboration

At an international level, Innovate UK and the Natural Sciences and Engineering Research Council of Canada (NSERC) have recently partnered to launch a call for research proposals on quantum technologies following the 2018 global expert mission led by the UK (KTN and UKRI) to Canada. This call will allow for collaboration between leading-edge scientists and potential innovative users, from industry and/or government sectors to accelerate the development of quantum technologies.

The Emerging technologies team at KTN has previously conducted two global expert missions to the United States and Canada to meet and connect with world leaders in quantum technologies and explore further transatlantic collaboration opportunities.

## Supporting young innovators

In 2017, Innovate UK and The Prince's Trust commissioned YouGov to carry out an independent research with 18- to 30-year-olds who were not in employment, education or training or in a form of insecure or under-employment. The report explored attitudes towards innovation and entrepreneurship and found that 82% of the surveyed youngsters view the business sector as difficult to access with only 8% describing themselves as entrepreneurial.

In order to address business leadership insecurities amongst UK youth, Innovate UK has invested around £2.2 million to support young people to develop their innovative ideas. The Young Innovators programme, which includes annual awards for young people with creative and ground-breaking business ideas, is a partnership between Innovate UK and the Prince's Trust. Twenty four young innovators aged from 18 to 30 years old have already benefited from the young innovators programme.

## Enterprise and business training for quantum engineers and scientists

One big step to moving quantum technologies from the lab to the market involve providing a suitable environment for quantum engineers and scientists to evolve as future leaders of the quantum industry. In 2016, the Engineering and Physical Sciences Research Council EPSRC allocated a funding of £4.4m to the University of Bristol to create QTEC, the Quantum Technology Enterprise Centre to accelerate the industrialisation of quantum technologies and capabilities developed in the UK. Being well anchored in the UK national quantum programme, QTEC has been working with quantum researchers to successfully bring new quantum technologies to the market, by developing their entrepreneurial skills and providing tailored mentoring and coaching from experts and visiting entrepreneurs.

QTEC offers a twelve-month fellowship to provide academics with the skills they need to set up a successful technology start-up which will underpin the UK's quantum technology industry. Now in its fourth and final cohort, QTEC has supported the creation of 17 new companies based on technologies which underpin the quantum industry. These companies have raised a total of £12.4 million in equity, contract and grant funding to date. Successful startups within the fellowship include Kets Quantum Security, FluoretiQ, Nu Quantum, Qureca, SeeQC, Universal Quantum, Raycal, just to state few.

## Inclusive funding policies and driving diversity in quantum technologies

A recent study conducted by the British Business Bank (BBB) in partnership with Diversity VC and BVCA has exposed stark gender and diversity imbalances in Venture Capital investment. One of the stark gender and diversity gaps is that for every 1£ of VC investment in the UK, all female founder teams get less than 1p. All male founder teams get 89p while mixed gender teams get the remaining 10p. By contrast to that, the Alison Rose Review of Female Entrepreneurship estimated that an additional £250 billion could be contributed to the UK economy if female entrepreneurs started and scaled their businesses at the same rate as men. In order to encourage diversity and close the gender gap, Innovate UK has launched the Women In Innovation programme to encourage female led entrepreneurship by funding and supporting the UK's most promising female innovators to develop their ideas and scale up their businesses. Since the launch of The Women in Innovation programme in 2016, the number of women leading applications for grants to Innovate UK has increased by 70%. Innovate UK has recently announced a new wave of Women In Innovation awards allowing up to 10 women to benefit from £50k and benefit from a bespoke coaching, mentoring and business growth support.

In order to tackle diversity and inclusion issues, Innovate UK has recently set a requirement on its funding competitions to complete an EDI survey. This survey allows collecting data on gender, age, ethnicity and disability status. The collected data will be aggregated and analysed to inform future actions to make funding competitions more inclusive.

## Recommendations: Driving industry engagement in the European landscape

We have previously demonstrated examples of industry engagement from the UK quantum landscape from engaging businesses in funding calls and research programmes, accelerating industrialisation to training and innovation and finally on diversity and inclusion aspects. In order to boost industry engagement at a European level we provide the following recommendations:

### Developing meaningful relationships and creating an investment ecosystem for quantum in Europe

By creating an active European network of professionals from several backgrounds, sectors and career pathways in order to accelerate the development and the adoption of quantum science and technologies by end user sectors and the society. Private investors should be also included in the public sector industry engagement dialogue to identify market gaps in quantum technologies and within the supply chain and to create an investment ecosystem for quantum in Europe.

### Reorienting training in quantum technologies and nurturing young talents

With the growing number of PhD holders and students in quantum disciplines and related areas, academia and academic research can become a highly competitive field leading to professional frustrations and mental wellbeing issues. Early career academics can be encouraged to pursue industrial careers after their training by setting up internships/secondments programmes to companies and creating joined research projects involving companies and industry. Early career researchers can also take part in specific programmes to develop a value proposition, explore the commercial potential of their research and understand the risks related to taking a product/technology to the market. Bespoke business trainings can help build next generation quantum tech leaders and help more quantum businesses emerge into the market.

Another way of encouraging industry engagement is to create bespoke mentoring programmes to form a new generation of quantum leaders by setting matches between early career and senior professionals and by providing financial support to young talents to create new businesses and convert innovative ideas to products and services.

### Championing EDI in quantum technologies

Gender balance and diversity representation are an essential pillar of reaching competitiveness in quantum at an international level and accelerating the industrialisation of quantum technologies in Europe. There are currently several initiatives across Europe encouraging diversity, however stronger measures need to be implemented to make funding calls more inclusive. Another way forward is championing EDI in both research and industry for a more inclusive quantum landscape.

## Putting words into action: The QuantERA programme

Most of the above recommendations have already been followed in QuantERA. Apart from organising a joint transnational Co-funded Call for research projects, the consortium dedicated their time and efforts to stimulating networking within the research community, creating and maintaining links between academia and industry as well as building a toolkit on responsible research and innovation in quantum technology, exchanging best practices, and joining a dialogue with policy makers concerning the design of future funding instruments.

Within QuantERA, we believe that fostering interactions between all quantum technology stakeholders is a crucial activity in order to fully exploit the potential of this field of research. QuantERA is strongly committed to translating its funded research project results into socio-economic benefits. Therefore, one of the priorities of the programme is to involve the end users such as SMEs and the broader industrial sector in QuantERA strategic activities and invite industry and innovation funding organisations to discussions about future funding opportunities in quantum technologies. Building industry leadership and developing an industry connection to QT research is the goal of the specific Task 6.2. One of the objectives of this task is to deliver an industry-focused „training workshop“ for academic researchers funded through the QuantERA Co-funded Call to help them to identify the commercial applications of their research. This workshop will include talks from key individuals who have been successful in commercializing their research, private investment companies on how to put together a good business pitch, and ultimately, help for the researchers as they put together their own business pitch for a commercial idea based on their research.

The programme addresses the issues related to social balance and gender equality. The consortium strives to provide appropriate support for personnel involved in the Programme organisation with respect to their work-life balance. A conscious effort is being made to reflect gender diversity in the bodies of the project, including the SAB. Specific communications are targeted towards students and young researchers to attract and support more women in research projects funded by the QuantERA in order to alleviate equality issues among future generations of scientists.