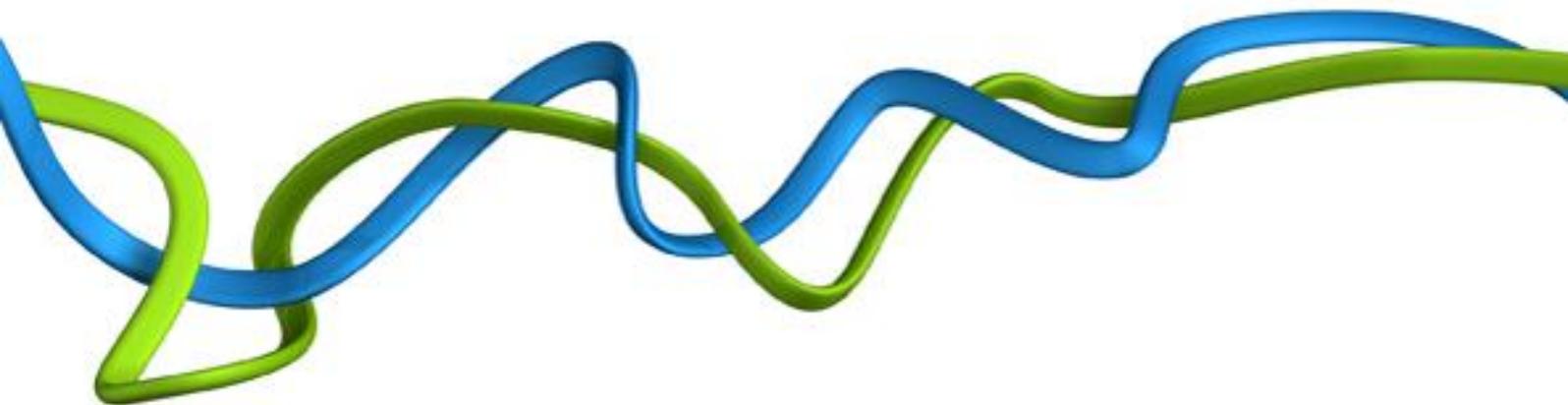


Brexit: science and innovation summit

House of Commons Science and Technology Committee

Submission from the Royal Academy of Engineering

February 2018



About the Royal Academy of Engineering

As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

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Key Messages

- The UK should seek the closest achievable association with future EU research and innovation programmes. A future UK-EU partnership should seek to build on existing strengths, mutual successes, established relationships and shared history. A future partnership should continue to support collaboration and partnership at many different levels, at a range of scales, and across the research and innovation pipeline. The partnership should provide stability and certainty for all partners involved.
- The Academy seeks to ensure that the involvement of UK businesses and the role of innovation, as well as the involvement of universities and the role of research, are recognised and well represented in discussions regarding the UK's future research and innovation relationship with the EU.
- The research and innovation framework programmes are the core EU platform for research and innovation. However, the reach of the research and innovation system stretches beyond the framework programmes and its success is impacted by numerous other factors, for example regulations, access to markets and immigration. It will be essential that a coherent approach is taken to the negotiations when considering research and innovation.

Introduction

1.1. The Royal Academy of Engineering welcomes the opportunity to submit evidence to inform the House of Commons Science and Technology Committee Brexit: science and innovation summit. The Academy is working closely with the engineering profession to provide evidence-based advice to government and ensure that the needs of all sectors that have a dependence on engineering, and the value of existing partnerships and collaborations, are understood and represented in the negotiations. The alliance of the 38 UK professional engineering organisations, known as Engineering the Future, led by the Academy, published the report *Engineering a Future Outside the EU* in October 2016.¹ The Academy is also working closely with its sister national academies to explore how best to support government on issues related to research and innovation. In May 2017, the Academies published *The role of EU funding in UK research and innovation*.²

1.2. The UK has world-class universities, an excellent and highly productive research base, an extraordinary history of invention and innovation and many world-leading science and engineering-based companies, to which EU support, both financial and non-financial, has contributed. Engineering is instrumental to delivering the economic and productivity gains associated with investment in research and provides the means to convert excellent research into new and improved products and services that can and do make a substantial contribution to the UK economy. With engineering contributing

¹ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

² [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

at least 20% of the UK's gross value added, accounting for half of the UK's exports, and underpinning much innovation activity, it is essential that the negotiations for leaving the EU are fully informed by an understanding of the risks and opportunities for UK research, innovation and engineering.

1.3. This submission draws from previous Academy's work, including the Academy's submission to the House of Commons Science and Technology Committee *Leaving the EU: implications and opportunities for science and research* inquiry and the Academy's submission to the Royal Society and Wellcome Trust's *Future Partnership Project*.

2. Future research and innovation partnership

2.1. The Academy believes the UK should seek the closest achievable association with future EU research and innovation programmes. While Higher Education Institutions represent the greatest share of UK participations in EU research and innovation programmes, accounting for 58% of UK participations in Horizon 2020, it is also important to recognise the significant involvement of UK businesses, with businesses accounting for 27% of UK participations in Horizon 2020 at September 2017.³ For FP7, the UK was the third most successful country, behind France and Germany, when assessed by both financial contribution to businesses, with UK businesses receiving €1,257 million, and by the number of business participations, at 4544.⁴ UK SMEs are particularly successful at securing EU research and innovation funding. For FP7, UK SMEs received around £660 million, accounting for around 17% of UK BERD carried out by SMEs.⁵

2.2. Underpinning the success of the EU research and innovation programmes is the comprehensive provision of support for international collaboration. There is widespread agreement across the engineering community that international collaboration brings huge benefits to engineering research and innovation in the UK. Collaboration facilitates innovation as new ideas are generated, shared, refined and challenged. Collaboration also gives UK businesses and organisations that specialise in innovation access to a broader range of knowledge, people and facilities than could be obtained in the UK alone. Collaboration is often a requirement of EU research and innovation funding instruments. For example, for Pillar 2, Industrial Leadership, of Horizon 2020, the average number of project partners is just over four, rising to more than 10 for Pillar 3, Societal Challenges.⁶ Such programmes have made collaboration with other EU member states relatively easy, much more so in comparison to collaboration with non-EU countries, where a lack of dedicated funding and frameworks hinder engagement.⁷

2.3. A key element of success of the EU research and innovation programmes is that they enable a diverse range of international research and innovation collaborations at multiple levels, for different purposes. From the Marie Skłodowska-Curie Action grants which enable individual researchers to experience training in different countries, starting at the PhD level; right up to large and complex consortia projects.

³ [UK Participations in Horizon 2020](#), Department for Business, Energy and Industrial Strategy, November 2017

⁴ [Seventh FP7 Monitoring Report 2013](#), European Commission, March 2015

⁵ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

⁶ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

⁷ [RAEng submission to House of Lords Science and Technology Committee Leaving the EU: implications and opportunities for science and research inquiry](#), September 2016

- 2.4. EU research and innovation programmes can facilitate collaborations between multiple businesses, increasing the ease with which businesses can collaborate, scale-up and work towards shared missions, often for societal benefit. One such example is the Clean Sky aeronautical research programme, which was established in 2008 as a Joint Technology Initiative (JTI), and is now receiving support from Horizon 2020.⁸ It addresses the key societal challenge of developing smart, green and integrated transport. Such initiatives involve very large budget commitments from the EU, as well as other partners, which run into the billions collectively, and dwarf the great majority of national collaborations in the UK or elsewhere.⁹ In addition, the example of the Clean Sky JTI illustrates the importance of being able to coordinate large-scale national initiatives across borders in an industry where supply chains are very internationalised.¹⁰ Many of the activities facilitated by JTIs, such as creating large-scale demonstrators, are often inherently international activities and may be considered too risky for one country to embark on alone.¹¹ The amount of funding provided by the EU, and the leverage this achieves, combined with its ability as a neutral convener to bring together industrial competitors to collaborate and work towards common goals is a key element of its success.
- 2.5. Stability and certainty are key elements of success for the future relationship. The seven-year funding cycles characterised by the Multiannual Financial Frameworks, such as FP7 and Horizon 2020, provide stable, long-term funding with accompanying long-term strategies. This stability, combined with policy consistency, has enabled UK and EU researchers, institutions and businesses to deliver research and innovation excellence with long-term planning, and can have a positive impact upon leverage as the long-term visibility can give investors confidence.
- 2.6. Ensuring that international research and innovation partnerships complement national funding streams is crucial for success. As a member state of the EU, to date, the UK has had the opportunity to shape the EU research and innovation agenda to maximise alignment with the UK's outlook and priorities. Consequently, EU research and innovation programmes have largely provided support for activities beyond those supported by the UK's research and innovation portfolio. For example, an assessment of the motivations for SME engagement in FP7 concluded that 'access to financial assistance not available nationally or regionally' was rated particularly highly as a motivation for UK SMEs, emphasising the fact that SMEs do not have ready access to support of this nature within the UK.¹² In terms of share of overall SME participation in FP7, SMEs from the UK represented 12%, the second highest proportion behind Germany; the UK's SME participation in Horizon 2020 so far is slightly above its level of engagement in FP7.¹³
- 2.7. The whole research and innovation system should continue to be involved in a future partnership. This includes research and technology organisations such as Catapults, and businesses of all sizes, from large corporations to SMEs, innovators and entrepreneurs, as well as researchers and universities. Support should continue to be

⁸ [Appendix: Case studies](#), The role of EU funding in UK research and innovation, Technopolis, May 2017

⁹ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

¹⁰ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

¹¹ [Engineering a future outside the EU](#), Royal Academy of Engineering and EtF, October 2016

¹² [Performance of SMEs within FP7, An interim Evaluation of FP7 components, Vol 1. Main report](#), May 2014

¹³ [Evaluation of UK involvement with the research framework programme and other European research and innovation programmes](#), March 2017

targeted at collaboration and partnership at many different levels, at a range of scales, and across the research and innovation pipeline.

- 2.8. As a member state of the EU, the UK has had the opportunity to shape the EU research and innovation agenda to maximise alignment with the UK's priorities and strengths. A future partnership should seek to maintain dialogue between EU and UK partners. Ideally, the UK should have the opportunity to shape decisions relevant to the UK's research and innovation landscape, so that the UK's ability to capitalise on its own public research and innovation investments is maintained.
- 2.9. Developing a new research and innovation relationship with the EU provides an opportunity to evaluate and re-assess priorities of mutual benefit for all partners. With the development of the UK government's Industrial Strategy and the establishment of UK Research and Innovation (UKRI), there is the opportunity to better align priorities and collaborations in areas of strategic importance to the UK, and to ensure efforts continue to complement the UK's research and innovation portfolio.

3. Beyond Research and Innovation Framework programmes

- 3.1. The research and innovation framework programmes are the core EU platform for research and innovation. However, the reach of the research and innovation system stretches beyond the framework programmes and its success is impacted by numerous other factors, for example regulations, access to markets and immigration. It will be essential that a coherent approach is taken to the negotiations when considering research and innovation.

Other funding mechanisms

- 3.2. The European Research and Development Fund (ERDF), part of the European Structural and Investment Funds (ESIF), has played a significant role in enabling regional investments in support of research, innovation and associated activities. Of particular relevance, is the role ERDF has played in supporting UK SMEs, through one of its key priority areas 'competitiveness for SMEs'. Over the period 2014 to 2020, the planned EU spend for the UK of ERDF for 'competitiveness of SMEs' is €1.9 billion.¹⁴ These sources of funding have played a crucial role in helping innovative UK SMEs grow to the stage where they require equity investment. As the UK proceeds with the negotiations to leave the EU, it will be essential that measures are put in place to ensure continuity and that UK funding streams are introduced to support this type of regional development in the future.
- 3.3. From 2011 to 2015, the European Investment Fund (EIF) supported 144 venture capital and private equity funds in the UK and had a total of €2.3 billion in commitments in the UK, leveraging a further €13.8 billion of additional funds.¹⁵ If the UK is unable to continue to maintain a relationship with the EIF, it will be crucial to ensure that no gaps are created in the UK's equity investment landscape by its absence.
- 3.4. The European Investment Bank (EIB) has also supported UK research and innovation through the provision of loans. It is estimated that the EIB has provided loans for

¹⁴ Data from European Structural and Investment Funds Data, <https://cohesiondata.ec.europa.eu/countries/UK> accessed 12 April 2017

¹⁵ [EIF in the United Kingdom Fact Sheet](#), European Investment Fund

research and innovation related activities to UK organisations to the value of €5.9 billion in the period 2007-2016, including €2.8 billion for UK universities and knowledge transfer services.¹⁶

People

3.5. People are integral to the success of engineering, research, innovation and collaboration. To date, free movement has allowed UK researchers and innovators to achieve more than they would alone and to build lasting relationships with researchers and innovators across the EU, often through participation in EU research and innovation programmes. The recent reassurance on EU citizens' rights in the UK¹⁷ and the agreement on continued participation for the UK in Horizon 2020¹⁸ signals a positive step forward in the first phase of negotiations.

3.6. Engineering business, research and innovation is a global endeavour. The UK faces an engineering skills crisis, with an estimated 182,000 new engineers and engineering technicians needed per year until 2022. Engineering in the UK is highly dependent on non-UK nationals. The pace of technology development combined with the length of time it takes to fully train qualified engineers means that it is impossible to fill all engineering skills gaps and shortages in the near term by increasing the UK pipeline, although that clearly must be part of the response to future restrictions on access to EU labour.

3.7. It will be essential that the UK's future immigration system is designed to allow the realisation of the ambitious and close partnership for research and innovation that the UK is seeking with the EU. This should include ensuring that talented engineers, researchers and innovators from non-UK EU countries have certainty, both near-term and long-term, about the opportunities to work in the UK and likewise for UK researchers to work in other EU countries.

Regulation

3.8. As a member of the EU, the UK has been involved in the development of regulations; in doing so the UK has had the potential to ensure that regulations do not adversely affect the development and delivery of UK products and services. A priority of the future research and innovation relationship should be to enable the UK to engage with EU discussions on regulation of new technologies and changes to existing regulatory frameworks, and to seek harmonisation where this is desirable, as well as allowing for input of UK expertise on technical matters.

¹⁶ [The role of EU funding in UK research and innovation](#), Technopolis, May 2017

¹⁷ [Technical note: citizens' rights, administrative procedures in the UK](#), Government, November 2017

¹⁸ [Joint report from the negotiators of the European Union and the United Kingdom government](#), December 2017