

Future Frameworks for international collaboration on research and innovation: Sir Adrian Smith Review

A response from the Royal Society of Chemistry to the Department for Business, Energy & Industrial Strategy.

Summary & recommendations

New funding mechanisms need to be developed to both secure UK participation in Horizon Europe and support the UK research and innovation community to step up wider international collaboration, building on the UK's reputation as an important global research partner. There is not a binary choice between collaborating with the EU and collaborating with the rest of the world. When it comes to maintaining the UK's status as a global research leader, it must embrace links with the whole world.

The UK must secure association to Horizon Europe - access to EU research and innovation funding is more than just the value of the funding itself. Participation in EU framework programmes brings access to global networks, facilities and collaborations that are proven to bring benefits not just to UK science, but to the UK's economy and society more widely. Access to Horizon Europe means that the UK will continue to be seen as a hub for global collaboration, making it more attractive for researchers and investors from outside of Europe.

We propose 3 overarching principles for new funding arrangements to meet the requirements of supporting research discovery and attracting talent and R&D investment to the UK:

- **International:** new funding streams for collaboration must enable UK association to Horizon Europe and support UK researchers to build global partnerships. Funding streams must also recognise the importance of a two-way flow of knowledge and expertise into and out of the UK.
- **Independent and long-term:** funding streams must be independent of political agendas and timescales, with grants that run for five years and longer, as scientific discovery and breakthroughs can be long-term endeavours.
- **Interpretable:** a simple format for showing how funding streams fit together, what they are for and how to apply will support researchers in navigating and applying for the right funding.

Support for discovery research in the UK must be sustained, alongside securing access to Horizon Europe. Discovery research is vital as whilst its impacts are often long-term, the history of science demonstrates that curiosity-driven research delivers the ground-breaking discoveries that open completely new avenues for research and for innovation, enabling the delivery of solutions to the grand challenges outlined in the government's industrial strategy.

Support for small businesses to be part of the international research and innovation community enables them to create jobs and facilitate growth. Support for small and medium enterprises (SMEs) needs to be multifaceted;

- **funding to share the risks of early stage innovation means that SMEs can develop their offerings with confidence**
- **access to international networks is vital to support their ability to access knowledge and talented workers, but also so they can navigate international markets to boost UK trade and exports**
- **support and mentorship is key to encouraging their growth – this is particularly the case for researchers running spin-out companies who may have little or no prior business experience**
- **easy access to the right talent to grow a research and development-intensive science business, often from a small, international group of people with very specific knowledge.**

In this response, we cite evidence from our Survey (February 2019),¹ which almost 5800 chemical scientists responded to, and our case studies and report on [International Collaborations Create Chemistry](#) (December 2018).²

Main text

1. Methods by which new funding arrangements can:

- support research discovery of outstanding quality in all disciplines through international partnerships;
- attract to the UK researchers of outstanding capability from around the world; and
- attract further R&D investment to the UK, thereby contributing to the Government's 2.4% agenda

We propose 3 overarching principles by which new funding arrangements can meet the requirements of supporting research discovery and attracting talent and R&D investment to the UK:

1. **International: new funding streams for collaboration must enable UK association to Horizon Europe and support UK researchers to build global partnerships. Funding should be open to countries within and beyond the EU, and should focus on both attracting international talent to the UK and enabling UK researchers to share and develop their skills in the EU and beyond, in other words, they need to be portable.** UK chemists we surveyed in both academia and industry identified access to collaborative networks spanning different countries, sectors or disciplines and access to international knowledge and expertise as two of their top three most important factors for public R&D funding.³ Bringing together people with specialist skills not found in any one country and accessing global collaborative networks is particularly important in addressing global challenges. One EU mechanism that support this is public-private partnerships. These enable actors from multiple nations, sectors and disciplines to work together. For example, the Innovative Medicines Initiative is a public private partnership that engages stakeholders from North America, South America and Africa, alongside European partners, in its goal to speed up access to innovative medicines.

There is a crucial interdependence between attracting talent and R&D investment to the UK and immigration policy. For investments in international collaboration on research and innovation to deliver their potential, the UK immigration system needs to attract rather than deter scientists and innovators – this means both welcoming messaging and streamlined rules. Funding streams must also recognise the importance of a two-way flow of knowledge and expertise into and out of the UK. UK chemical scientists feel EU freedom of movement has been positive for their career: in our survey, over 80% of academics and 56% of those in industry felt that freedom of movement had a very positive or slightly positive impact on their career (See Figure 1).⁴

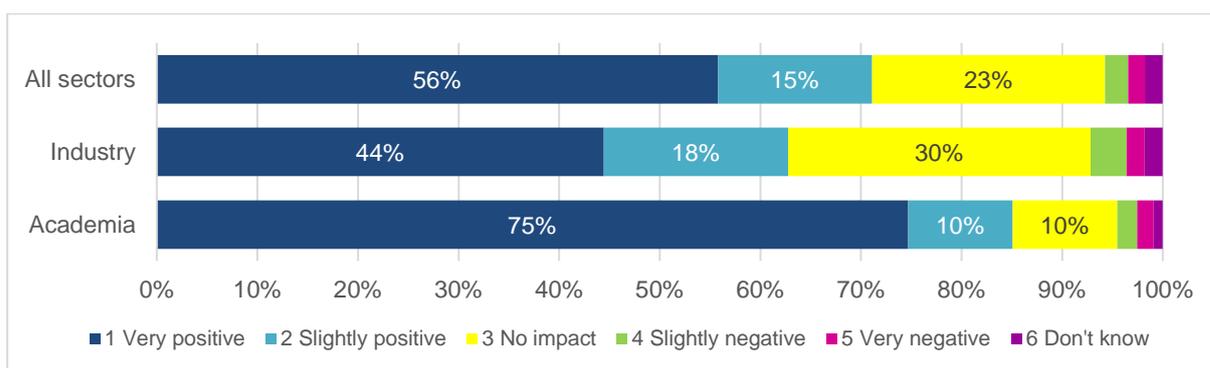


Figure 1 Academia and industry views of the impact of freedom of movement on personal careers

Easy movement of talented researchers and entrepreneurs enables growth and investment; a third of UK start-ups were founded by non-UK nationals whilst 51% of UK start-up employees come from outside the UK.⁵ We welcome the commitment in the government's International Research and Innovation Strategy to *'ensuring our visa arrangements support international researchers, innovators, their teams and their families'*.⁶ For those from overseas who receive research funding, rapid, simple access to the right visas must be part of the funding offer, not a separate process that can add unnecessary barriers to the government's goal of *'bringing together the best talent from around the world'*.⁷ There must also be opportunities for UK researchers to work in other nations. This supports both international collaboration and the strengthening of UK research capacity. Portable funding streams are needed to facilitate this.

- 2. Independent and long-term: funding streams should be independent of political agendas and timescales, with grants that run for five years and longer, as scientific discovery and breakthroughs can be long-term endeavours.** EU Framework programmes are seen as an important source of long-term funding that is independent of political agendas and timescales. 60% of UK chemical scientists we surveyed felt this independence would be difficult or very difficult to replicate in UK-only funding streams.⁸
- 3. Interpretable: a simple format for showing how funding streams fit together will support researchers in navigating and applying for the right funding.** An easy-to-use system or 'dashboard' would mean that researchers and innovators can easily navigate the funding landscape and it would support engagement with hard-to-reach, time-poor groups like SMEs. This should bring together all funding schemes, to show clearly their value, criteria, availability etc and all new policy announcements of funds should feature.

2. The optimum balance of emphasis for any new funding arrangements in each of the following dimensions:

- **European collaboration, Overseas Development Assistance and global collaboration;**
- **support for: outstanding individuals; blue-skies research; business innovation and research impact; and research facilities and infrastructure; and**
- **research and innovation domains (research disciplines, business sectors etc.).**

The UK already has strong collaborative research links with the EU. In considering the UK's role in the international research and innovation community, maintaining and strengthening links with the EU by securing association to Horizon Europe must be a priority. As the UK charts a new course in the international research and innovation community, we can and should maintain existing strong relationships, as well as building new ones. Participation in EU framework programmes not only enables collaboration with European countries but multilateral collaborations involving nations from across the world.

The benefits of EU collaboration are felt across different sectors. For example, in our survey, 75% of chemical scientists based in SMEs said EU framework programmes had a positive impact on UK science and innovation, compared to only 2% who thought the impact had been negative (See Figure 2).⁹ These benefits include access to cutting-edge knowledge from international experts, mentorship to support entry into international markets and access to the best talent (see also answer to question 3 below). Some of the respondents to our survey from SMEs shared the benefits that they had accrued from access to EU funding:

"It is the free movement of scientists and ideas that brings the real benefits of participation in the EU frameworks. We will also be losing our ability to influence calls in areas of interest to the UK."

"The ease of working with institutes and companies allowed by these frameworks has facilitated development of new technology."

"We have participated in European consortiums for several years. As a small company they provide valuable funding. We are concerned about the continuing funding for our current endeavour post-Brexit."

The government has outlined its ambition to *'encourage our most promising SMEs to develop international research and innovation partnerships'*;¹⁰ SMEs in our community believe that access to EU framework programmes must be part of this.

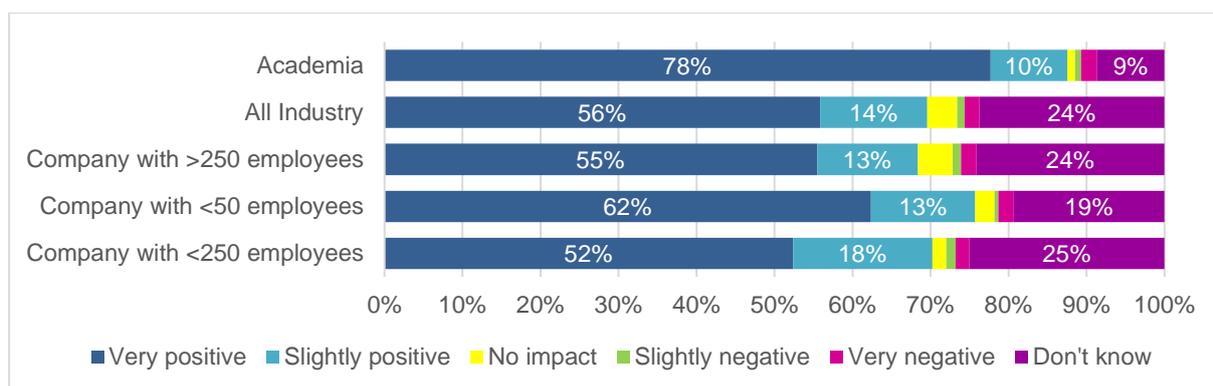


Figure 2 Academia and industry views of impact of UK involvement in EU framework programmes on UK science and innovation.

Support for discovery or curiosity-driven research must be sustained. Sustained UK funding for discovery research is needed as well as access to Horizon Europe, not solely as a substitute. Discovery research is vital as whilst its impacts are often long-term, the history of science demonstrates that curiosity-driven research delivers the ground-breaking discoveries that open completely new avenues for research and for innovation, enabling the delivery of solutions to the grand challenges outlined in the government's industrial strategy.¹¹

The UK already has a history of delivering breakthroughs in applications that stem from curiosity-driven research. Our report, *Inspirational Chemistry For a Modern Economy*, provides examples of fundamental research in the UK that has supported the development of applications that are used globally.¹² Without adequate UK funding for discovery research, finding solutions to the Industrial Strategy Grand Challenges will be difficult.

Alongside this, the UK has a strong track record in competing for funding for discovery research in the international arena: the UK has received over €1.5bn in European Research Council grant through Horizon 2020 so far, more than any other country.¹³ In our survey, funding for discovery research was identified as one of the most important areas of public R&D funding. It was also seen to be one of the most difficult to replicate within the UK if the UK no longer has access to EU funding.¹⁴

RSC research, alongside other sources, has found a shift in global research agendas whereby research and innovation is being increasingly called upon to provide solutions to societal challenges and to drive economic growth. However, for research and innovation to achieve these goals, investment in discovery research is essential. A 2015 report by UNESCO into the future of basic science found that *"the focus of scientific discovery has shifted from basic research to 'relevant' or big science, in order to solve pressing developmental challenges, many of which have been identified as SDGs by the United Nations. The irony is that an adequate investment in both basic sciences and applied R&D will be critical to reaching the goals of Agenda 2030"*.¹⁵

Support for infrastructure and facilities is a vital part of the research ecosystem that operates at both UK and international level. In the UK context, it is important to provide long-term investment for UK infrastructure that takes account of the continuous cost of running and staffing infrastructure, not just providing funding for its initial set-up. As identified in the government's *International Research and Innovation Strategy*, a strong network of research infrastructure can be part of the UK's 'offer' to international partners and help to attract talent and inward investment. For example, two UK cloud chambers bring unique, specialist facilities and knowledge to the Eurochamp-2020 network, an international research network which is working to improve our understanding of air quality and the impacts on human health.¹⁶

It is also clear that it is neither practical nor cost-effective for the UK to host all of the infrastructure that it requires. Access to international infrastructure is vital – alongside access to the facilities themselves, the movement required by researchers to use it leads to increased collaboration through the opportunity to interact with other scientists based in the places where infrastructure is hosted.

3. Methods and timescales for introducing any new funding arrangements for international collaboration, including those that

- reflect the ambitions of small and large businesses
- foster new systems of international peer review and funding

Support for small businesses to be part of international research and innovation community enables them to create jobs and facilitate growth. Support for small and medium enterprises (SMEs) needs to be multifaceted;

- **funding to share the risks of early stage innovation means that SMEs can develop their offering with confidence**
- **access to international networks is vital to support their ability to access knowledge and talented workers, but also so they can navigate international markets to boost UK trade and exports**
- **support and mentorship is key to encouraging their growth – this is particularly the case for researchers running spin-out companies who may have little or no prior business experience**
- **easy access to the right talent to grow a research and development-intensive science business, often from a small, international group of people with very specific knowledge.**

Funding to share the risks of early stage innovation in small companies is vital for their growth. Within our community, we have been made aware of examples of both UK and EU funding that has helped small businesses to develop their business plans or set up pilot facilities that have ultimately led to further investments. A key requirement for SMEs is upfront grant funding. Larger companies might be able to arrange cash-flow to accommodate grants paid in arrears but many SMEs cannot do this. One respondent from our February 2019 survey commented:

“EU funding pays in advance whereas the British Government normally pays in arrears, which is most unsatisfactory for innovative SMEs.”

Funding to support SMEs to either access or to invest in equipment is important. Equipment costs can be prohibitively expensive for SMEs, particularly if they are still at an early pre-profitable stage. Access to equipment enables scale up production or piloting of new processes. Another respondent to our survey told us:

“As a business access to equipment/knowledge can always be paid for up to a point. However as an SME this extra spend would have to be factored into any new projects potentially stifling innovation and new product development.”

Funding is not the only thing that SMEs require. Access to advice, mentorship and international networks is essential to small businesses that may be navigating a complex global commercial landscape. Easy links into international networks are vital to realise the UK’s global trading ambitions. Smart Separations is an SME that develops ceramic filters with controllable pore sizes for applications as diverse as air filtration and antibody production. Their founder, Dr Hugo Macedo told us how the EU’s SME instrument supported entry into new overseas markets:¹⁷

“It provided access to the EU mentorship programme. We had access to, in this case, an Austrian mentor, and he helped us immensely by opening up the door to Austria, as well as other countries, where we could tap into different expertise. I think that is something we are slowly forgetting in the UK. Since I started in 2013 I’ve had the chance to be part of the Growth Accelerator programme that InnovateUK had but somewhere down the line they killed off that programme. Even though in the past we used to have that support from mentors, now we don’t have it anymore, we just have the grant. This is something the SME instrument does bring.”

Small businesses also need to make sure that they are able to recruit the talent that they need with ease. For those businesses with a research component, this means accessing specialist skills and knowledge. The CEO of the SME Econic, Dr Rowena Sellens told us:¹⁸

“We currently have 30 employees from across the EU and the wider world and there is very much a diverse mix of male and female. I think, like many specialist companies, you look for people that have relevant experience in the types of tech you are doing and our employees have been working in groups inside and outside the UK on particularly strong research that just made them good candidates.”

4. The roles of Government, UKRI, National Academies and other organisations in defining the agenda for European and international collaboration and administering any new funding arrangements for such activities.

Building and maintaining relationships with international research and innovation counterparts in the EU and beyond will be vital to the success of the UK’s proposed international research and innovation strategy. The full breadth of the scientific community must engage in this in a coordinated fashion.

The UK should leverage the strong relationships and existing research links it has with the EU to continue to the part of discussions that define the agenda for the EU and other international collaborations. Through government, UKRI, National Academies, Learned Societies and individual researchers, the UK has a vast network of relationships that will be essential to the success of future UK research collaborations internally. Leveraging these connections during the design phase of the UK’s new funding mechanisms for international collaboration is vital to bring in international perspectives. Engaging sincerely with international perceptions of the UK research and innovation community, our frameworks and programmes will help to make sure that these mechanisms can achieve the international prestige that will position the UK as a global research leader.

These same actors will need to work in a coordinated fashion to develop ways for UK research and innovation expertise to feed into EU and wider global fora. UK researchers are recognised internationally for their expertise in a range of different areas. The UK must capitalise on this reputation as it is part of the global system of exchange that feeds into agendas for international research and collaboration. For example, the European Commission hosts a number of expert groups which they draw on for specialist advice to support their policy making. Experts can be appointed to these groups in a personal capacity as experts in a given field. Similarly, UK scientific expertise already does, and must continue to make valued contributions to fora, such as the UN and OECD.

5. Existing evidence on the efficiency and effectiveness of funding for international collaborations.

A key element of effectiveness in international collaboration is bringing together partners that have complementary expertise to address a research problem. In some cases, the expertise required can be niche and so accessing it through collaboration can be more effective and efficient than attempting to build such capacity domestically. For example the PharmaSea consortium brought together researchers 24 partner institutions, from 14 countries to find new compounds from marine sources that can potentially fight diseases such as Alzheimer’s. One of the researchers involved in the consortium, Professor Marcel Jaspars from the University of Aberdeen explained to us how the collaboration brought together complementary expertise and skills:¹⁹

“We had everything from the beginning to the end of a drug discovery project so we decided to treat things as a pipeline – we had groups with expertise in isolating bacteria, which was done in Ireland, Norway and also in Italy. Then we had the building of the extract libraries, mainly done in Spain and Norway, but also in China and some work in Costa Rica.

“Next was the biological screening of the libraries: this was done in Leuven, Spain and Norway as well as at partner companies. We had scale-up and downstream testing which was done in part at a company in Austria and in a veterinary school in Spain. Finally we had a big partnership on governance and policy of the oceans, which resulted in us getting involved on a UN process that’s still going on.

“In terms of skills brought by the international nature of the project group, much was complementary with specialist areas of science, policy, administration and publicity, so it ended up working really well – it was a very productive consortium, and very positive in terms of outcomes.”

Efficiency and effectiveness in international research collaborations can sometimes be hampered by administrative burdens that come about from the complexity of several partners being involved in collaborative research. Avoiding these is vital to ensure that researchers can focus on their research. For large multilateral international projects, funding for expert project management must form part of the grant allocation. In addition to this, common frameworks for bilateral or multilateral international collaborations can ensure that administrative and reporting requirements for research are aligned across partners and duplication can be avoided. These kinds of features need to be built into funding to ensure that researchers can focus on their research and associated administration is handled effectively.

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- ¹ - RSC Survey of our chemical sciences community on their views of European framework programmes February 2019.
 - ² - [International Collaborations Create Chemistry](#), Royal Society of Chemistry, October 2018
 - ³ - RSC Survey of our chemical sciences community on their views of European framework programmes, February 2019.
 - ⁴ - RSC Survey of our chemical sciences community on their views of European framework programmes, February 2019.
 - ⁵ - [Science priorities for Brexit – Evidence Report](#), House of Commons Science and Technology Committee, July 2017
 - ⁶ - [UK International Research and Innovation Strategy](#), Department for Business, Energy & Industrial Strategy, May 2019
 - ⁷ - [UK International Research and Innovation Strategy](#), Department for Business, Energy & Industrial Strategy, May 2019
 - ⁸ - RSC Survey of our chemical sciences community on their views of European framework programmes, February 2019.
 - ⁹ - RSC Survey of our chemical sciences community on their views of European framework programmes, February 2019.
 - ¹⁰ - [UK International Research and Innovation Strategy](#), Department for Business, Energy & Industrial Strategy, May 2019
 - ¹¹ - [Response to the House of Commons Science & Technology Select Committee inquiry into the Balance and Effectiveness of Research and Innovation Spending](#), Royal Society of Chemistry, September 2018.
 - ¹² - [Inspirational Chemistry For a Modern Economy](#), Royal Society of Chemistry, June 2015
 - ¹³ [Vinnova](#), signed grants from eCORDA, September 2018
 - ¹⁴ - RSC Survey of our chemical sciences community on their views of European framework programmes, February 2019.
 - ¹⁵ - [What is the optimal balance between basic and applied research?](#) UNESCO Media Services, February 2017, accessed 23/05/19
 - ¹⁶ - [International Collaborations Create Chemistry](#), Royal Society of Chemistry, October 2018
 - ¹⁷ - [International Collaborations Create Chemistry](#), Royal Society of Chemistry, October 2018
 - ¹⁸ - [International Collaborations Create Chemistry](#), Royal Society of Chemistry, October 2018
 - ¹⁹ - [International Collaborations Create Chemistry](#), Royal Society of Chemistry, October 2018