RUSSELL GROUP

Russell Group submission to the Science and Technology Committee inquiry: A new UK research funding agency

Summary

1. The Government's proposed new funding agency should focus on high-risk/high-reward projects that can deliver significant returns for the UK. The creation of a new agency, broadly modelled on the USA's DARPA, could drive the pull-through of disruptive innovations to address complex societal challenges.

2. Consideration must be given to how the new UK agency will complement the wider UK research and innovation landscape: it should aim to be agile, mission-oriented, and should build on our existing strengths. This new agency represents an important opportunity to drive engagement between academia, industry and other R&D partners.

3. Clarity over the role and responsibilities of the new agency, and how it aligns with existing funders, will also be important. The new UK agency should look and feel very different to existing funding mechanisms available through UKRI, rather than replicating Innovate UK for example. Some of the key features of the new agency should be:

    - A multi-disciplinary approach to tackling defined societal problems
    - A high tolerance for risk, with an acceptance and expectation a significant proportion of funded projects will fail
    - Mission-based programmes, targeted at specific innovation needs and with a clearly defined customer
    - Organisational independence and a flat organisational structure
    - Empowered and entrepreneurial project managers strongly engaged with the research community and their customer base
    - Grants that fully cover direct and indirect project costs for those awarded funding

4. Significant lessons can be learned from the success of DARPA in the United States, where empowered, entrepreneurial project managers help drive research forward and engaged customers for research shape the direction of programmes. For a UK ARPA to be successful, a clearly defined and fully engaged customer (or customers) for each of its work programmes must also be identified, such as a Government department, business consortium or local authority, in order to ensure demand and pull-through for its products and services.

5. The new agency will also wish to consider what steps it can take to support the development of a positive UK research culture – this is especially important given the speed with which projects funded by ARPA could be cut if they fail to meet agreed milestones.

1. Introduction

1.1 The Russell Group represents 24 leading UK universities. We believe people and ideas are the key to meeting global challenges. Through world-class research and education we are helping to create a dynamic economy, stronger communities and a better future for the UK.

1.2 We welcome the opportunity to respond to the Science and Technology Committee's inquiry. In this submission we set out some thoughts on the potential positive impact a new ARPA-style funding agency could have on the UK's research and innovation landscape.

2. What gaps in the current UK research and development system might be addressed by an ARPA-style approach?

2.1 A UK ARPA could focus on high-risk/high-reward projects that can deliver significant returns for the UK. This is an opportunity to develop and deliver transformational advances to tackle complex challenges, in areas where interdisciplinary collaboration is essential and where barriers to technology adoption need to be broken down.

2.2 Currently, the UK funding landscape can sometimes make it difficult to convene multidisciplinary research teams with the capacity to take a holistic approach toward such 'wicked' problems. A UK ARPA could address this issue by deliberately seeking to stimulate necessary multidisciplinary responses to address particular tightly defined societal challenges, bringing together scientists with leading thinkers from the social sciences, arts and humanities to work in partnership It could also work to diffuse innovation into the wider economy, creating 'demand-side pull' from business and the public sector by working closely with customers for each project it supports.

2.3 The dual funding system is a UK success story that has helped build a research ecosystem which rivals any in the world in terms of the quality and impact of its research. With just 4% of the world's researchers for example, the UK generates 14% of the most highly cited papers used most frequently by other researchers worldwide[1]. A UK ARPA would not be a replacement for current funding structures: it represents a unique opportunity to strengthen this system further. ARPA could complement existing funding streams which support high-risk, high-reward basic research, such as QR,[2] with funding for mission-led programmes which are also high-risk and potentially high-reward.

2.4 The structure of funding cycles can also act as a barrier to the development of long-term research programmes. The creation of ARPA gives the UK the opportunity to experiment with an award process which can back promising research programmes over a longer period of time, by providing sustained funding from initial concept through to translation and beyond; this would have the added benefit of reducing the bureaucracy and red tape associated with short-term grant awards. UK ARPA should expect the programmes and projects it funds to operate at pace, with ambitious goals and timescales, and well-defined and understood project milestones. Nevertheless, it should also be able to recognise that some projects will need longer timescales than others to reach their goals, and provide continuity of support, so long as these milestones are being met.

---

[1]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/815400/International_comparison_of_the_UK_research_base__2019._Accompanying_note.pdf
[2] and its equivalent in the devolved nations

3. What are the implications of the new funding agency for existing funding bodies and their approach?

3.1 It will be important for the new agency to have a dynamic and strong interface with UKRI. Routes should be developed that would allow the Research Councils to pick up and support technological developments emerging from UK ARPA projects where appropriate, and vice versa. This could include the development of a "fast track" process reducing the bureaucracy associated with transitioning to alternative funding arrangements.

3.2 Careful consideration should also be given to how the new agency will support the wider sustainability of the UK research landscape and the significant new challenges facing it due to the Covid-19 pandemic, including an expected decline in industry and charity investment in R&D.

3.3 Russell Group modelling suggests the financial crisis of 2008 resulted in a shortfall of around £1 billion in business research income across the UK, and it is highly likely this trend will be repeated on a more substantial scale as businesses react to the post-Covid-19 economic environment[3]. Given this new context, it may be prudent for Government to consider how UK ARPA will fit into this changed landscape, and to see if its creation can address the potential decline in industry and research charity engagement in R&D.

4. What should be the focus be of the new research funding agency and how should it be structured?

4.1 In terms of its focus and purpose, there would be clear benefits to replicating the mission-based approach taken by DARPA in the USA, with the UK agency focused on tackling a small number of specific challenges. These might include finding answers to questions such as how AI might be used to transform diagnosis and healthcare delivery (taking research ideas into widespread and everyday use) or how to make the switch to a genuine low carbon economy (overcoming both behavioural and technological barriers). Importantly, the new UK agency should look to build emerging technology communities within its fields of focus, play an important role in creating markets for new technologies and ensure plans to support the sustainable scale-up of technological advances are in place.

4.2 ARPA-E, the US energy innovation agency modelled on DARPA, requires award winners to not only have a technology development approach, but also a technology scale plan that is supported by a dedicated technological transition team. This is designed to overcome challenges in securing sufficient venture capital funding for energy projects in the absence of a single, dominant customer like the US Department of Defence (DoD). This is an approach which could be explored by the UK agency.

4.3 The organisational structure of the new agency should create a dynamic, entrepreneurial research culture. One of the key factors in the success of the DARPA has been its high degree of independence and the extent to which it has been able to operate autonomously. Similarly, a flat organisational structure involving highly qualified, driven programme managers empowered to pursue research teams and drive projects forward over a number of years has helped deliver significant success. The new UK agency should seek to replicate this element of organisational autonomy in the delivery of projects and programmes.

4.4 In the USA, DARPA programme manager roles are viewed as highly prestigious and valuable for individuals pursuing a career in research, within academia or industry, and their

---

[3] Based on our analysis of R&D tax credit data following the financial crisis.

leadership is considered fundamental to the success of DARPA projects. The UK will need to look closely at designing incentive structures to attract the most talented individuals from around the world to lead ARPA missions. It should also take steps to address concerns researchers may have on the impact of taking a multi-year contract in the new agency that will make it difficult for them to conduct and publish their own research, and perhaps more importantly, how they will reintegrate into industrial research or academia at the end of their period as a programme manager.

4.5 The new UK agency should consider how the nature of the grant awards can promote mobility between universities and other sectors through jointly funded fellowships and secondments, and support opportunities at all research career stages. The generation of innovative and high-risk ideas is not confined to individuals already established in academic positions. The potential contribution of early career researchers should not be overlooked. While there would be significant value for the UK in increasing support for world leading, well-established researchers, restricting awards to only individuals with extensive track records would inhibit innovation and could lead to opportunities being missed. This includes the potential for the new agency to help the UK develop new and additional cohorts of researchers comfortable working at the business/academia interface.

5. What funding should ARPA receive, and how should it distribute this funding to maximise effectiveness?

5.1 The funding envelope set out in Budget 2020 appears competitive in international terms and would enable the new UK agency to make grant awards commensurate with the scale of the specific problems or missions. As a proportion of overall research investment, it appears broadly consistent with the level of spending in the US and other countries which have created their own DARPA equivalents.

5.2 Ensuring financial support is available on a sustained basis at these levels will be important in maintaining consistent support for projects, and regular reviews of agency funding would be sensible to identify whether and to what extent existing resources continue to be appropriate.

5.3 In terms of funding awards, an approach where extended finance is available if key targets are met would allow researchers to focus on their work rather than grant applications. A "batteries included" approach where grants fully cover all research and operational costs would also help address some of the problems the structure of existing grant awards can cause.

5.4 A high tolerance for risk does not imply projects which are failing to deliver agreed objectives should continue to receive funding, and removing red tape and cutting bureaucracy should not imply a lack of accountability. As is the case with DARPA, programme managers should be expected to work closely with project teams, to understand their progress and any barriers, allowing them to take regular informed go/no go decisions on projects and introduce high thresholds for ongoing support.

5.5 It will also be important to ensure UK ARPA projects are targeted at specific innovation needs, with well-defined and fully engaged customers, if we are to maximise potential impact and complement the work of existing mission-based funding streams such as the Industrial Strategy Challenge Fund.

5.6 Identifying goals clearly and ensuring targets are sufficiently challenging will be fundamental to ensuring funding is focused squarely on projects that have the potential to advance

science and tackle societal problems. In the US, projects are often described as "DARPA hard", reflecting the scale of the technological advance required to complete research and move on to successful implementation.

5.7 There will be a tension between a funding process which can lead to support being withdrawn at short notice and providing researchers at every stage of their career with employment security. Full and frank engagement with universities, research institutes and businesses with an interest in R&D will be required to ensure these issues can be addressed sensitively.

5.8 Another issue which will need to be considered is the potential role of the new agency in supporting the UK's global role as a leader in R&D. DARPA works with researchers based outside of the United States and consideration should be given to how UK ARPA can help encourage collaboration between researchers here and partners in other countries to support the government's "Global Britain" aspirations and drive international trade.

6. What can be learned from ARPA equivalents in other countries?

6.1 A significant lesson from the US experience is the importance of building strong relationships with research customers. In the US, the close relationship between DARPA and the DoD as their primary customer has been fundamental to the sustainability of the agency and success of research projects. It is probable that Government departments will be the primary customer for any new UK agency, and the US experience would suggest it is unlikely that relying purely on market forces and private sector customers will be sufficient. However, the challenge for the UK is that no individual government department operates on the same financial scale as the US DoD. Building a diverse, highly engaged customer base will be fundamental to the success of the new agency, and co-design and partnering with private sector organisations will be important.

6.2 On the public sector side, new frameworks governing engagement between UK ARPA, research teams and bodies such as the NHS may be required. A key question which needs to be answered is how UK ARPA will engage with public sector procurement teams to secure commercial pull-through at scale. Given the potential for public procurement to help drive economic renewal as we work to address the impact of the Covid-19 pandemic, this is something that should be looked at as a matter of urgency.

6.3 The Government may also wish to explore how the new agency can interact with local authorities, regional mayors and the devolved administrations to support the levelling up agenda. This could be through the location of major research activities linked to UK ARPA programmes, but also through opportunities for large-scale demonstration projects that could help to de-risk adoption of new technologies and approaches across the country. Ensuring local stakeholders are able to feed in and help drive projects as customers will help ensure solutions are targeted effectively and fulfil specific needs. Research universities, which have expertise in delivering large-scale projects in partnership with local stakeholders and extensive understanding of regional supply chains, would be well placed to lead regional clusters of UK ARPA activity.

6.4 A recent paper[4] discussing evidence on national innovation policy practice from Finland, the Netherlands and Sweden concluded that, for innovation policy to tackle societal challenges effectively, there is a need for clear goals and effective coordination among the various actors, both public and private. Absolute clarity on the role of the new agency within the UK's

---

[4] https://link.springer.com/article/10.1007/s10842-019-00332-1

innovation landscape, and the relationship between UK ARPA, UKRI, industry and government will be fundamental to its success.

7. What benefits might be gained from basing UK ARPA outside of the 'Golden Triangle' (London, Oxford and Cambridge)?

7.1   It is important to remember that research impacts spread far beyond the specific location where research is funded. In order to support the levelling-up agenda, UK ARPA will need to establish an approach which, from the start, puts UK-wide engagement at its core, including strong engagement with regional powerhouses in England and the devolved nations.

7.2   We would expect the 'footprint' of ARPA as a funding agency to be small (it should aim to be lean and efficient), so its location will make much less of an impact than the work it funds. However, pragmatically it would make sense for ARPA to locate itself in close proximity to its key stakeholders, including universities, business and end customers, in order to facilitate close working with these partners.

July 2020