

**Written Evidence Submitted by
Dr Jon Hunt, Executive Director of Research & Enterprise, University of Bristol
(RFA0105)**

The University of Bristol is ranked among the world's leading research-intensive universities, ranked within the top 10 universities in the UK and top 60 in the world (QS World University Rankings 2021); it is also ranked among the top five institutions in the UK for its research, according to analysis of the Research Excellence Framework (REF) 2014; and is the 4th most targeted university by top UK employers.

As a research-intensive institution, we already tackle some of the world's most pressing issues in areas as diverse as infection and immunity, human rights, climate change, and cryptography and information security, and we are equally committed to research excellence and realising the impact of our research on society.

Summary of recommendations:

- A new agency should champion and focus on funding long-term, visionary research. It should define and articulate a fundamental purpose or vision of a future state that it is working towards.
- A new research funding agency should establish a method for assessing funding proposals that does not rely on a trajectory of prior research, is agile, and rapidly responsive.
- A new research funding agency should invest in longer term research funding (possibly milestone-driven funding).
- High quality, high risk fundamental research should continue to be fully supported via existing institutions and mechanisms.
- Learning should be shared between existing and new funding agencies, with a UK ARPA drawing on existing practices to ensure research excellence, and UKRI adopting simplified/streamlined practices from a new agency. All agencies should share learning on ways to improve Equality, Diversity and Inclusion.
- The alignment of a UK ARPA with other initiatives such as Catapults or ISCF programmes should also be considered.
- A new research agency should have a clearly communicated and distinct governance model and way of operating, linked to its key mission(s).
- The new funding agency should focus on major societal challenges such as net zero, biosphere-related Sustainable Development Goals, digital and AI, or healthcare and aging.
- Diversity should be a fundamental principle that is 'designed in' to a UK ARPA from the outset.
- A UK ARPA should distribute funding to fewer, larger, long term and high-risk projects.
- Some funding should be available for partnership development and collaborations, where outcomes can be accelerated.

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

1. A new funding agency (UK 'ARPA') should have a distinct, complementary role to the current UK R&D system, recognising its strengths and weaknesses. It should focus on funding visionary, high-risk high reward, and long-term applied R&D programmes that disrupt traditional research pathways, and fund fewer, larger projects. Specific gaps that could be addressed are outlined below.
2. Alongside specific, finite goals – 'moon shots' – a UK ARPA should also define and articulate a fundamental purpose or vision of a future state that it is working towards (and which may be unachievable). This could be based on the Sustainable Development Goals, for example, ending poverty in all its forms everywhere.
3. Current funding mechanisms work well in supporting 'developmental' proposals that build on prior research. Proposals are focused on the research project itself, rather than the individual or team running it. There are few funding mechanisms that are vision or outcome driven, allowing for visionary, long-term research projects that disrupt traditional research pathways. Such funding mechanisms are needed for both fundamental and applied research.
4. Achieving excellent fundamental and applied research, and translation of that research into a societal or economic gain, marketable innovation or policy change, are intrinsically linked but distinct goals requiring explicit support across the R&D system.
5. The peer review method used by UKRI under the current funding system supports the production of high-quality disciplinary research, by using experts to assess proposals based on their in-depth knowledge of a specific field. Experts are also able to evaluate what represents 'fair value' and an acceptable degree of risk for an investment of taxpayers' money, but the peer review process is lengthy and time-consuming. This method of assessment is less likely to fund high risk projects, and works less well for interdisciplinary research, where experts may not recognise the transformational potential of a proposal applied to a different field.
6. A UK ARPA might assess proposals based on excellence and alignment of projects through the value chain from academic, government, community groups, Research Technology Organisations and industry. Interdisciplinarity should be the norm rather than the exception.
7. Existing UKRI funding is predominantly 2-5 years, and the processes of applying for, and reviewing applications, are resource intensive. Productivity is reduced on large, long term projects where there is a need to continually reapply for funds. Longer term investments would allow industry and other stakeholders to align their investment with research funding to a greater extent.

Recommendation 1: A new agency should champion and focus on funding long-term, visionary research. It should define and articulate a fundamental purpose or vision of a future state that it is working towards.

Recommendation 2: A new research funding agency should establish a method for assessing funding proposals that does not rely on a trajectory of prior research, is agile, and rapidly responsive.

Recommendation 3: A new research funding agency should invest in longer term research funding (possibly milestone-driven funding).

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

8. High quality fundamental research, including high risk research, remains essential to the UK, and a UK ARPA must leverage the UK's research base to maximise success. It is vital that existing funding mechanisms support academic freedom to pursue curiosity-led research, with unknown impacts, alongside any new funding agency. Processes and institutions that promote interdisciplinary working, and fund longer term projects, are also vital to the production of excellent, breakthrough fundamental research.
9. UKRI's operating model works well to produce high quality, progressive disciplinary research. A new funding agency should seek to complement existing bodies and their ways of working and establish processes and an approach that support its distinct aims; the processes needed to produce transformative high-risk/high-yield research will be different to those needed to sustain excellent quality research on a more traditional trajectory. As such, the purpose of current and future funding agencies must be clearly articulated, alongside effective channels of communication.
10. Mechanisms for collaborative, synergistic working should be designed in to a new (and existing) funding agency. Specific areas for close working could include:
 - Any new agency will need to ensure the rigor, quality, and excellence of its research, drawing on the practices of UKRI.
 - UKRI may be able to learn from and adopt simplified/streamlined processes of funding established by a new agency.
 - Current systems of funding favour established, well-known researchers. A new agency will need to design mechanisms that encourage a far wider, more diverse representation, to ensure novel research and innovation. The most successful methods could be adapted by UKRI to improve diversity and funding opportunities for underrepresented groups and Early Career Researchers (ECRs).

Recommendation 4: High quality, high risk fundamental research should continue to be fully supported via existing institutions and mechanisms.

Recommendation 5: Learning should be shared between existing and new funding agencies, with a UK ARPA drawing on existing practices to ensure research excellence, and UKRI adopting simplified/streamlined practices from a new agency. All agencies should share learning on ways to improve Equality, Diversity and Inclusion.

Recommendation 6: The alignment of a UK ARPA with other initiatives such as Catapults or ISCF programmes should also be considered.

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

11. Creating an additional agency risks increasing bureaucracy, and it must be designed as truly cross-disciplinary from the outset to maximise the transformational potential of interdisciplinary collaboration and avoid silos.
12. Funding directed towards high risk R&D and ‘bigger breakthroughs’ will need a fundamentally different research governance model that balances autonomy with appropriate direction and management controls, whether the function sits within a new or existing agency.
13. A new research agency should have a distinct way of operating, facilitated by its structure, and closely linked to its mission. This should include:
 - Investment cycles on a 10-15-year horizon.
 - Funding high risk, high yield projects.
 - Non-bureaucratic, agile methods for funding application and assessment.
 - Applied research and innovation support, with processes for commercial pull through.
 - An emphasis on partnership working that engages other sectors including industry and philanthropy, but also civil society. Clear articulation of longer-term ambitions (such as “beyond 2050”) would be a useful way to frame this.
14. The focus (or mission(s)) of the new funding agency should be on major societal challenges and the large-scale transformations needed for societies be able to live in the second half of this century, such as net zero, biosphere-related Sustainable Development Goals, digital and AI, or healthcare and aging.
15. Having established the overall mission/challenges, a future funding agency should be non-directive and open to any proposals with the potential for high yield. Specific projects funded under these missions should include broad teams from the widest possible range of disciplines and research organisations, to go beyond the technological to create the conditions for truly transformative solutions.
16. It will also be important to have appropriate processes, such as stage-gating, to ensure that projects are progressing appropriately and means to address this if not.
17. Developing the foresight mechanism to identify what outcome to focus on is likely to be the most significant challenge. A formal review or research on the success of such funding agencies in other countries would support this, as would learning from other sectors.
18. The US DARPA model of highly autonomous project managers is useful, provided appropriate scrutiny and accountability measures are deployed. The need for minimal bureaucracy and high levels of autonomy for project managers must be balanced against this need to avoid a ‘contact-driven’ approach to funding distribution. Selecting the most capable project managers will be

vital, and appointments should be made by non-partisan boards. These individuals must be 'considered risk takers', willing to support new and innovative proposals.

19. Mechanisms must be designed to ensure the most diverse representation of funded researchers possible is achieved, including diversity of career stage, discipline, type of research organisation, as well as 'EDI' characteristics.

Recommendation 7: A new research agency should have a clearly communicated and distinct governance model and way of operating, linked to its key mission(s).

Recommendation 8: The new funding agency should focus on major societal challenges such as net zero, biosphere-related Sustainable Development Goals, digital and AI, or healthcare and aging.

Recommendation 9: Diversity should be a fundamental principle that is 'designed in' to a UK ARPA from the outset.

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

20. Any funding for a new agency should be additional to that allocated to UKRI. It should fund long term, high risk projects, aligned to major societal challenges that require transformational change. Excellence needs to remain a key criterion, whilst bureaucracy is minimised.
21. A UK ARPA should design from the outset a process to distribute funding to address and remove inequality, to promote the widest range of viewpoints and research inputs. The need for minimal bureaucracy and high levels of autonomy for project managers must be balanced against this need to avoid a 'contact-driven' approach to distribution.
 - Funding should be at 100% with no requirement for research organisations to contribute, as this inhibits the range of researchers able to access funding.
22. In addition to the project managers and project funding, the agency should provide development support to researchers who have ideas of merit that are not yet strong proposals. (drawing on the National Science Foundation approach of champions to support bid development).
23. Innovation or transformation occurs when excellent R&D is implemented. This implementation requires effective collaborations across research disciplines and sectors, diverse representation, and civic engagement. Time and resources are needed to share knowledge, develop understanding, and build trusting relationships.

Recommendation 10: A UK ARPA should distribute funding to fewer, larger, long term and high-risk projects.

Recommendation 11: Some funding should be available for partnership development and collaborations, where outcomes can be accelerated.

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

24. A UK ARPA must be mandated to source the best people – wherever they are located – to achieve its mission. Co-location with UKRI (Swindon) would allow synergistic working between funding agencies, but regardless of location, it must engage devolved administrations, regional “hubs”, and combined authorities.
25. Although it should not detract from an overall mission of a UK ARPA, funding projects based outside of the 'Golden Triangle' could have additional benefits including driving regional economic growth and 'levelling up', and supporting:
 - A diversity of talent by ensuring the brightest and best minds are involved irrespective of where they are in the country.
 - Existing clusters of excellence and more effective collaborations with industry.
 - Different opportunities to address inequality.

(September 2020)