

KTN Responses to UK Research & Development Roadmap consultation

This document outlines KTN's response to the Government's Research and Development (R&D) Roadmap.

Introduction:

The government's Research and Development (R&D) Roadmap - published on July 1st 2020 - sets out the UK's vision and ambition for science, research and innovation.

The government's long-term objectives for research and development (R&D) are clear: to be a science superpower and invest in the science and research that will deliver economic growth and societal benefits across the UK for decades to come, and to build the foundations for the new industries of tomorrow. This was supported by the unprecedented commitment at the Budget to increase public investment in R&D to £22 billion by 2024 to 2025.

Accompanying the Roadmap was an online consultation, which asked the following, high-level questions:

- How can we best increase knowledge and understanding through research, including by achieving bigger breakthroughs?
- How can we maximise the economic, environmental and societal impact of research through effective application of new knowledge?
- How can we encourage innovation and ensure it is used to greatest effect, not just in our cutting-edge industries, but right across the economy and throughout our public services?
- How can we attract, retain and develop talented and diverse people to R&D roles? How can we make R&D for everyone?
- How should we ensure that R&D plays its fullest role in levelling up all over the UK?
- How should we strengthen our research infrastructure and institutions in support of our vision?
- How should we most effectively and safely collaborate with partners and networks around the globe?
- How can we harness excitement about this vision, listen to a wider range of voices to ensure R&D is delivering for society, and inspire a whole new generation of scientists, researchers, technicians, engineers, and innovators?

Executive Summary of KTN Recommendations:

KTN welcomes many of the areas considered by the R&D Roadmap. What follows is a summary of our recommendations, with the full response to the survey below.

Recommendations:

1. UKRI acts to protect existing R&D projects to ensure there is no loss of UK research capability.
2. UKRI balances its curiosity-driven research and challenge/industry driven research to give more equal weighting to innovation.
3. Any UK ARPA mechanism established should employ the distinctive success factors that have been proven to deliver bigger breakthroughs from US research.
4. An increase in Innovate UK “open” grant funding to support later-stage business innovation
5. Greater scale of interdisciplinary research strongly linked to business involvement
6. Scale up the use of KTP programme to a level of parity across Innovate UK and our Research Councils
7. Scale up the use of existing, successful academic/industry programmes, such as CyberASAP
8. Broaden the scope of R&D tax credits to include capital expenditure, data-driven R&D and sub-contracted R&D
9. Scale up the SBRI programme to stimulate public-sector adoption of innovation and provide much-needed customers for smaller, innovative businesses
10. UKRI invests more in the development of ways for early-stage leaders
11. Early years education that recognises innovation, diversity and risk-taking.
12. Promotion of the many favourable cultural and employment benefits to working and living in the UK.
13. Attract innovation skills to the UK through an easy-to-use talent visa scheme, such as Canada's Global Talent Stream.
14. Adjusting the Shortage Occupation lists to enable smaller organisations to attract talented people.

15. The establishment of a national co-ordinating body for England to stimulate regional innovation and increase connectivity between regions and aligned with other UK organisations.
16. Greater use of co-investment funds to stimulate private investment in R&D beyond London and the South-East.
17. Strengthen business connectivity with our partners internationally to ensure the UK retains its important R&D links post-Brexit. Europe is a particularly important priority.
18. Strengthen the capacity of SIN, UKRI and DIT to focus more on innovation and not just research. Build upon academic partnerships to help facilitate and build partnerships for business communities
19. Inspire businesses to 'Go Global' through coherent international innovation and trade policies backed by bridging commercialisation grants, active business support and establishing overseas soft-landing mechanisms.
20. Take a holistic and agile approach to simplifying the funding landscape. A toolbox approach should be taken, building on existing funding structures and, where necessary, further mobilise public, private, philanthropic and direct foreign investment capital for global R&I activities.
21. Government to provide vision and clarity on the UK's key strategic R&D priorities for the medium-long term to increase business and investor confidence.
22. We welcome the Innovators Expert Group, and this should have strong representation from both business (CBI) and others such as KTN, who represent wider societal and environmental concerns.
23. Government leverages its considerable communications capability to develop and publish strong stories (case studies) of successful research and innovation, to inspire today's and tomorrow's generation of scientists, engineers and innovators. Online content and distribution are essential.

Survey Responses in full:

1. How can we best increase knowledge and understanding through research, including by achieving bigger breakthroughs?

The Covid-19 pandemic has significantly disrupted R&D activities, both for independent research centres and for universities, causing loss of both revenue and productivity. It is vital that the UK's capacity for world-class research is not depleted over the medium-long term.

KTN welcomes the recent increase R&D funding provided by continuity grants via UKRI and recommends that these be extended to fully protect existing projects which may otherwise be cancelled.

New connections are critical for breakthroughs. Research is at its most potent when it includes equal focus on curiosity-driven and industrially led activities. Pull from industry or business, and application to known challenges and problems is critically important.

The ARPA concept of moon-shot style challenges is known to be effective, and these could play an exciting role in amplifying the UK's R&D effectiveness, as well as providing vision that will give fresh energy and a new approach. Suitably chosen challenges will provide a lens through which many research proposals can be viewed and tested for alignment. Bringing in new connections and different perspectives can elevate ideas towards more significant breakthroughs.

In any large-scale project it is easy to keep the exploitation focus on the headline aims but, inevitably, there is much "along-the-way". It is essential that there are powerful connections with a diverse range of organisations, including strong links with business.

The US (D)ARPA model succeeds on the basis that it:

- Inspires scientists to build upon scientific/technology inflection points to solve ambitious goals
- Is sufficiently independent from interference, both in the setting of challenges and from Government intervention
- Establishes short-term project teams (3-5 years), to work in a focused way on bigger breakthroughs
- Has an important lead customer in the form of Government procurement

Any new UK organisation following an ARPA model should embody these characteristics. It is also important to note that other, existing UK research organisations (for instance, UKRI), could be adjusted to work along similar lines.

Summary of KTN recommendations:

24. UKRI acts to protect existing R&D projects to ensure there is no loss of UK research capability.
25. UKRI balances its curiosity-driven research and challenge/industry driven research to give more equal weighting to innovation.
26. Any UK ARPA mechanism established should employ the distinctive success factors that have been proven to deliver bigger breakthroughs from US research.

2. How can we maximise the economic, environmental and societal impact of research through effective application of new knowledge?

Supporting Business Innovation

To maximise the economic, environmental and societal impact of research, there needs to be effective support for the development and commercialisation of new knowledge. Businesses consistently highlight this as a key barrier to their R&D activities.

It is essential that the majority of the proposed uplift in UK R&D public spending is targeted towards later-stage innovation. KTN recommends an increase in Innovate UK funding for R&D at higher technology readiness levels, scaling up existing Innovate UK programmes.

KTN also proposes targeting the following, specific types of research and development programmes which would stimulate greater engagement between research and business:

1. Developing new technology and research frameworks, especially those aligned to societal and environmental “missions” to achieve positive change.
2. Increasing access to facilities, knowledge and data.
3. Commercialising and realising value from research.

Mission-led research funding

While our UK research base is world-leading, current public research development and innovation funding is not sufficiently aligned to ‘mission’ led impacts. The Industrial Strategy Challenge Funds are a step in the right direction - closely aligned to business and recognising the role that industry will play in their eventual adoption.

KTN recommends that greater research council funding is reserved for mission-led research, with assessment and selection criteria focused on the potential for its application - especially with named industry/business partners (of all sizes), committed to act as potential “lead customers”.

Increasing access to facilities, knowledge and data

The Knowledge Transfer Partnership (KTP) model is a tried and tested way of providing businesses with access to university facilities, knowledge and data and placing this within an R&D-focused context to help businesses bring new products, services and processes to market.

Currently, the KTP programme is unequally funded across the various UKRI Councils which KTN believes limits the potential for commercialisation.

KTN recommends that this programme is scaled up, such that all research councils contribute - at a pro-rata level, equal to that currently funded by Innovate UK. This measure would enable universities and businesses to apply knowledge much more rapidly into the private sector.

The KTP programme is well-known and acknowledged as successful by the research base and businesses alike.

Programmes to commercialise research

KTN runs a highly successful programme of development to equip academics with tools to transform their research into viable businesses. This programme, CyberASAP, delivered in conjunction with GCHQ, DCMS and Innovate UK was highlighted in the UK R&D Roadmap document that accompanies this consultation.

We recommend that the tried and tested CyberASAP programme is scaled up to be run across a range of key sectors (AI, Robotics, Quantum, Healthcare) to deliver a significant and targeted commercialisation programme.

Summary of KTN recommendations:

- An increase in Innovate UK “open” grant funding to support later-stage business innovation
- Greater scale of interdisciplinary research strongly linked to business involvement
- Scale up the use of KTP programme to a level of parity across Innovate UK and our Research Councils
- Scale up the use of existing, successful academic/industry programmes, such as CyberASAP

3. How can we encourage innovation and ensure it is used to greatest effect, not just in our cutting-edge industries, but right across the economy and throughout our public services?

Accelerating and broadening the adoption of innovation

A successful, long-term innovation strategy for the UK would be to focus on the benefits of wider adoption of new technologies and practices by industry. Narrowing the gap between the most innovative businesses and the rest would bring a significant increase in GVA to our economy.

KTN works across industrial sectors, using its deep expertise to make diverse connections to enable wider innovation adoption. As such, it is well-placed to help the diffusion of innovation across geographies, supply chains and different industries.

The Covid-19 pandemic has provided an unprecedented impetus for businesses to (digitally) transform their operations, but without Government support, many are likely to reduce their medium to long-term investment in innovation.

Broaden scope of R&D Tax Credits

R&D tax credits are one useful mechanism that stimulates business innovation. KTN recommends that the current HMT consultation on R&D tax credits reviews the scope of the credit system, acknowledging that innovators undertake R&D in a variety of different ways and that tax credits need to be internationally competitive to ensure the UK remains attractive to Innovation.

Public Service innovation

KTN recognises that the public sector can play a significant role in stimulating and supporting innovation across the UK, especially acting as a lead customer to smaller, highly innovative firms. However, the SBRI programme remains under-used by central and local government.

KTN recommends that scaling up the SBRI programme, by broadening its use across central, regional and local government, would stimulate significant SME innovation activity, as well as enable much greater adoption of innovation by the public sector.

Leadership

Incentivising leadership is a key driver to broadening the impact of innovation. Providing early-stage researchers opportunities to work closely with both business and the public sector is key to helping to stimulate the adoption of new ideas. This process is helped by matchmaking, facilitation and mentoring to inspire development of leadership capability.

KTN recommends that UKRI invests more in the development of ways for early-stage leaders to work with the public sector and industry.

Summary of KTN recommendations:

- Broaden the scope of R&D tax credits to include capital expenditure, data-driven R&D and sub-contracted R&D
- Scale up the SBRI programme to stimulate public-sector adoption of innovation and provide much-needed customers for smaller, innovative businesses
- UKRI invests more in the development of ways for early-stage leaders

4. How can we attract, retain and develop talented and diverse people to R&D roles? How can we make R&D for everyone?

To achieve our ambitions for UK science, research and innovation, we must be world-leading in the way that we inspire and enable talented people.

A cultural shift may be required in some research disciplines to recognise the role of applied and basic research on an equal footing, and career paths in research should reflect the importance of both endeavours.

Inspiring early years education

KTN recommends early years education that:

- Encourages a diverse spectrum of career options and pathways at school
- Advises of the benefits of an R&D career outside of the typical university route - for instance STEM apprenticeships
- Highlights what R&D has to offer using social media tools to showcase, inspire and inform
- Highlights that R&D for the future takes many forms, and should bring in art & humanities alongside STEM – (STEAM)
- Inspires future talent with campaigns that excite and encourage learning and that promotes innovation risk-taking
- Creates diverse role models - their existence and celebrated profile will help to erode established counter-diversity bias.

Providing early-stage career access to R&D

Currently, those from disadvantaged backgrounds are unlikely to be able to consider an unpaid internship, resulting in unequal progression opportunities.

KTN recommends extending the scope of the Apprenticeship Levy to encompass paid internships. This would enhance social mobility and open up opportunities for all.

Targeted programmes have proven effective in engaging with diverse audiences. Evidence suggest that BAME, disabled and younger generations place a higher importance on societal benefit and achieving positive change. Leveraging this to highlight the importance of R&D would help to attract more diverse talent.

Offering flexible working as standard would ensure that R&D is an attractive prospect, and open and inclusive to all. Flexible working is particularly attractive to those with caring responsibilities, ensuring greater retention in R&D roles, as personal commitments change.

KTN recommends that the UK promotes its cultural and cognitive diversity and favourable working legislation as key selling points for both home-grown and international talent.

Attracting diverse international talent to the UK

Getting the new immigration system right is a top priority to ensure the UK can access and attract the skills it needs, whilst the UK builds up its domestic pipeline. Making the process easier for talented people is a must.

KTN recommends focusing on skills and expertise rather than salary. Adjusting the Shortage Occupation Lists in all nations to accommodate this would ensure that smaller organisations can still attract world class talent.

Summary of KTN recommendations:

- Early years education that recognises innovation, diversity and risk-taking.
- Promotion of the many favourable cultural and employment benefits to working and living in the UK.
- Attract innovation skills to the UK through an easy-to-use talent visa scheme, such as Canada's Global Talent Stream.
- Adjusting the Shortage Occupation lists to enable smaller organisations to attract talented people.

Levelling up R&D across the UK

5. How should we ensure that R&D plays its fullest role in levelling up all over the UK? Please comment here (500 words max)

KTN welcomes the commitment to a place-based innovation strategy.

As a national innovation organisation that connects businesses to drive innovation across the UK, we are well aware of the differences between local areas in R&D strengths, sectoral concentrations, infrastructure, and local priorities and capabilities.

An increase in place-based R&D funding should focus on the specific characteristics and strengths of individual regions and cities. This approach, often called "smart specialisation", has been adopted within the EU, and is also part of a wider trend among countries as diverse as Australia and South Korea.

Despite Brexit, the policy trend towards smart specialisation is important and should be developed further across the UK.

KTN's evidence shows that, while the Devolved Administrations have capacity to develop local strategies and administer R&D funds effectively, the situation within England is more complicated. LEPs were not set up for the purpose of managing devolved funds, so while some of the better resourced and organised Combined Authorities and LEPs have

succeeded, others require support in this activity as well as coordination between each other.

KTN recommends a national co-ordinating body for England to join up innovation capacity across Combined Authorities, LEPs and universities. Any re-balancing should acknowledge and include the importance of strongly connected networks, to increase absorptive capacity in areas where innovation is more nascent. This organisation should be aligned with and highly connected to other UK national innovation organisations to ensure lessons are shared.

Stimulating private regional investment

One driver of innovation is access to finance. Equity capital and specialised finance is significantly more difficult to access for businesses which are located outside of London, the South-East and some specialised investment in the East of England.

We should not suppose that the market for business investment works adequately to support re-balancing – business investors are also disproportionately based in the South East of the country and make their investments in the same region.

Building on the good work by the British Business Bank, KTN recommends that more regional, publicly funded co-investment funds are established to stimulate private investment. Where possible, these should be strongly connected to enterprise zones and university enterprise zones to provide easier access to capital to innovative businesses.

Summary of KTN recommendations:

- The establishment of a national co-ordinating body for England to stimulate regional innovation and increase connectivity between regions and aligned with other UK organisations.
- Greater use of co-investment funds to stimulate private investment in R&D beyond London and the South-East.

6. How should we strengthen our research infrastructure and institutions in support of our vision?

The UK network of national labs has historically produced significant advances in science for the benefit of society. In recent years however, there has been a disconnect with these centres of excellence and industry. KTN recommends that there is a far greater role for these labs and institutions to engage in moon-shots.

The network of catapults has proved to be a useful infrastructure resource for bridging the commercialisation “valley of death” by access to equipment and skills. The catapults are very focused, which is a strength, but this is also a potential weakness when thinking about innovation diffusion. Some individual elements of the Catapult Network have been slow to

establish and are capital heavy, meaning that opportunities which require cross-sectoral connectivity fall through the cracks.

KTN recommends a more agile approach to Catapult R&D, whereby “pop-up” Catapults (or Catapult consortia), could be established to engage in task-and-finish methodologies on industrial sectors of immediate and evolving relevance. These could be located within universities, science parks or other sites of national infrastructure, to avoid unnecessary start-up costs.

Many valuable infrastructure investments are physical spaces for people to meet rather than conduct research. For instance, the Isaac Newton Institute in Cambridge is the UK national infrastructure for the mathematical science research and regularly engages a wide range of scientists in pure, and applied mathematics for the benefit of mathematical science and society.

Summary of KTN recommendations:

- National labs are utilised to a greater extent than now through the use of moon-shot programmes.
- The Catapults identify opportunities to work in more agile and targeted ways – drawing on regional engagement in task-and-finish projects.
- Catapults make more use of cross-industry networking organisations (such as KTN) to ensure that innovation diffusion is enhanced from one sector to another.
- Despite Covid-19, Government should recognise the use of dedicated physical spaces to bring researchers and innovators together to share and develop new ideas.

7. How should we most effectively and safely collaborate with partners and networks around the globe?

Innovation is increasingly global. Implementing a vibrant ‘Global Britain’, open to international businesses, investors, researchers and innovation partners must be at the forefront of the UK R&D Roadmap.

EU Horizon Programme

KTN evidence suggest that since Brexit, applications to European R&D projects have reduced significantly. We welcome the Government commitment to participating in the upcoming Horizon programme. Nevertheless, even with financial support, much will need to be done to sign-post UK businesses to this funding and also to broker strong relationships with EU country innovators.

KTN recommends that the current limited activity to establish strong links with European organisations is scaled up to ensure that the UK remains a healthy and valued partner post-Brexit.

KTN is soon to be launching a Global Alliance to develop diverse business connections to connect innovators internationally.

A more coherent UK

The UK has historically been good at international research collaborations, but less so at establishing innovation/business collaborations. We have seen how countries such as Germany and Singapore are pushing the frontiers of innovation through international collaboration with clear and coherent national strategies, driven and shared by Government-Business partnerships.

The Department for Business, Energy and Industrial Strategy (BEIS), Department for International Trade (DIT), UKRI and Science Innovation Network (SIN) are fundamental to achieving this ambition for the UK through wider global innovation cooperation, whilst the imminent Foreign Commonwealth and Development Office (FCDO), provides a new direction for overseas development assistance (ODA) spend.

Scaling up public spending on bi-lateral and multi-lateral funding programmes (for instance Eureka), would increase the UK's international credibility as a nation looking to collaborate in R&D.

Protecting our collaboration

KTN recommends stronger measures of protection for Intellectual Property (IP) to ensure effective and safe global collaboration. We have learned how R&I IP rights (IPR) are considered a national property in shaping academic spin-out models in Canada, and how the Israel Innovation Agency implemented a commercial repayment scheme on foreign ownership of public-funded IP.

Summary of KTN recommendations:

- Strengthen business connectivity with our partners internationally to ensure the UK retains its important R&D links post-Brexit. Europe is a particularly important priority.
- Strengthen the capacity of SIN, UKRI and DIT to focus more on innovation and not just research. Build upon academic partnerships to help facilitate and build partnerships for business communities
- Inspire businesses to 'Go Global' through coherent international innovation and trade policies backed by bridging commercialisation grants, active business support and establishing overseas soft-landing mechanisms.

- Take a holistic and agile approach to simplifying the funding landscape. A toolbox approach should be taken, building on existing funding structures and, where necessary, further mobilise public, private, philanthropic and direct foreign investment capital for global R&I activities. Such use of innovative financing tools maximises return on investment for public and private finance.
- Increase public funding for bi-lateral/multi-lateral R&D funding.
- Establish bilateral/multilateral IP Deals with strategic economies on key sectors, which set out a framework agreement on common IP sharing and protection across academic research, innovation collaboration and commercial exploitation.

8. How can we harness excitement about this vision, listen to a wider range of voices to ensure R&D is delivering for society, and inspire a whole new generation of scientists, researchers, technicians, engineers, and innovators?

Government clarity on innovation priorities

Government has a significant capacity to inspire researchers and innovators by signalling its national R&D priorities clearly. We have seen that Industrial Strategy commitments provide the private sector and investors with confidence about where and when to invest in innovation. Longer-term goals further enhance this confidence, for instance with the 2050 commitment to NetZero.

Clarity and vision in these areas inspire not just researchers and businesses but also new generations of innovators.

A wider range of voices

The proposed Innovation Expert Group (IEG) to bring cohesion to UK priorities is to be welcomed.

KTN, as a UK-wide innovation network, can contribute to the IEG by bringing its deep knowledge of innovation across the R&D landscape.

KTN also recommends having strong business involvement within this group and proposes that the CBI would be the ideal representative of business.

In addition, KTN recommends that this Group includes appropriate representatives from our broader society – both to help inform research priorities and also to ensure that societal and environmental considerations are not outweighed by technology-push. Candidates here might be charitable organisations such as Cancer Research; Help the Aged; and the Committee on Climate Change.

Harnessing excitement

Excitement, like any mood, is contagious and is driven by the prospect of tangible positive change in peoples' lives. For too many, R&D is something that happens behind closed doors by people in white coats. We need to bring science alive and show not only how it makes our lives better now, but how it will make our world cleaner, safer and more prosperous in the future.

KTN welcomes the excellent work undertaken by the Science Media Centre and the Wellcome Trust in promoting the stories and benefits of scientific discovery and application. We recommend that others follow the best practices of these organisations in capturing and sharing stories to inspire new generations of innovators.

KTN also recommends using the Government's considerable communications capability to fund and create high quality, meaningful, easily- sharable online content by harnessing the expertise of scientists and innovators.

There is lots to be learned from success stories, such as the plastic bag charging scheme which largely won over the public because the campaign had clear messages with obvious benefits, delivered at low cost.

Summary of KTN recommendations:

- Government to provide vision and clarity on the UK's key strategic R&D priorities for the medium-long term to increase business and investor confidence.
- We welcome the Innovators Expert Group, and this should have strong representation from both business (CBI) and others such as KTN, who represent wider societal and environmental concerns.
- Government leverages its considerable communications capability to develop and publish strong stories (case studies) of successful research and innovation, to inspire today's and tomorrow's generation of scientists, engineers and innovators. Online content and distribution are essential.