Research, Development and Innovation (RDI) Landscape Review - Invitation for Views

Nesta Submission

About Nesta

Nesta is the UK's innovation agency for social good. We design, test and scale new solutions to society's biggest problems, changing millions of lives for the better.

Nesta's position on the RDI landscape

The UK does much to celebrate lone genius. Yet from the steam engine to the Raspberry Pi, it is the sharing of intelligence that has always been how people have solved problems quickly and at scale. To fully realise its ambition of being a science and technology superpower, the UK has to overcome three challenges in relation to Research, Development and Innovation (RDI):

- Neglect of important sectors
- Lack of data and evidence
- Insufficient collaboration

We now have the opportunity to be at the vanguard of a new approach to RDI involving Collective Intelligence, which combines people, data and networks with the aid of digital technologies. To help us better understand the RDI landscape, what works and where investment should be directed in the future, we have identified four areas for action:

- Foundational sectors
- Data
- Experimentation
- Collaboration

Foundational sectors

Frontier sectors have long been the primary focus of many policies to strengthen the UK RDI landscape. But this ignores the challenge of raising pay, dignity and quality in parts of the economy that meet our everyday needs, and risks exacerbating geographical divides. While advanced technologies can be transformational, societies and economies often continue to use existing technologies for long periods, as jobs and infrastructure are slow to change.

Significant unrealised opportunities for innovation exist in the service sector, which represents around 80% of UK economic output and employment. Many of these opportunities involve social rather than technological innovation (or a combination of both) such as new business, governance or regulatory models. For example, following research we conducted into innovation around low carbon heating, Nesta is currently exploring the need for innovative business models for this sector. Whilst the search for transformational new technologies may attract more attention, social innovation such as this will play an important part in achieving the UK's net zero ambition.

The Nesta report Love's Labour's Found describes what a new approach to RDI might look like – one that supports innovation in the currently devalued 'foundational economy' that encompasses the work that sustains our existence such as social care, education and cleaning; sectors which are fairly evenly spread across the country. The devaluation of this sector condemns a large (disproportionately female, migrant and minority ethnic) portion of the population to poverty and poor working conditions.

The aim in the short term would be to improve pay, conditions and quality through modest productivity gains. By opening up space for the creativity, imagination and autonomy of the foundational workforce, it would help to make their work more fulfilling, whilst also raising the value of what they produce. In the medium term, such a strategy would modernise foundational sectors and improve their productivity and ability to attract investment. Given foundational sectors often make up a significant share of the economy, even relatively modest improvements through RDI can produce substantial gains.

Social care is a foundational sector that is ripe for action. Approaches might include:

- Deploying new service, business and governance models that would enable better pay, better services and opportunities for fulfilling work for more people.
- Using the commissioning process to drive up the quality and dignity of care work and services. Closer collaboration between commissioners and providers is needed to move beyond the current tendency to risk aversion.
- Developing new metrics for the inspection and evaluation of social care services that move beyond the narrow focus on biomedical needs and create space for experimentation with more creative models of care.

Lessons might be learnt from the creative industries, where initiatives like UKRI's Challenge Programmes and the work of institutions like the Nesta-led Creative Industries Policy and Evidence Centre (PEC) have helped to strengthen RDI in a sector which sat outside the traditional focus of innovation policy.

Of course, innovation can have downsides, so care should be taken to ensure innovation in foundational sectors offers sustainable, long-term net benefits that are widely shared. This might be achieved through measures such as upstream public engagement and rigorous ethical review.

Data

Open up and better label, integrate and disseminate private and public data around RDI
Nesta's work on innovation mapping highlights the need for more comprehensive labelling of public datasets related to research and business activity. The labelling should reflect social challenges or missions, as well as specific technologies or innovations. This would allow easier access to timely insights about trends relevant to social challenges that might be tackled through research. It would benefit the government directly by supporting its own internal analysis (which seems likely to become more challenge-focused following the recent Innovation Strategy and the Levelling up White Paper) and indirectly by strengthening analyses undertaken by others, including Nesta, which the government could then use to inform policymaking. One immediate opportunity would be to label companies in the Gateway to Research (GtR) (a public resource of some government RDI funding data) with their Companies House number to make it easier to understand RDI being conducted by businesses.

For such labelling to be most useful, it should be granular, open-source and aligned with taxonomies used by industry, the third and public sectors, such as the emerging technology taxonomy being created by the Government Office for Science (GOS). This will require developing algorithms for automated text labelling, as well as inputs from domain experts and cross-institutional collaboration.

While existing resources like GtR are welcome, these could be strengthened through improved front-ends that enable more exploration of trends such as geography and domain. A standardised, automated methodology to detect technologies and challenge areas within text data would facilitate the joining up of public research funding information from sources that are not covered by the existing GtR such as departmental R&D funding. This would also encourage business information platforms to adopt standardised categories of technologies or challenges, thus allowing better measurement of private RDI. For example, the Dealroom business information platform is already labelling companies according to the UN Sustainable Development Goals.

Even greater value might be realised if the public sector shared and pooled more RDI data. For example, more granular data about grant-making choices could be useful to improve systems for decision-making, although this would need to be done in a manner that ensures appropriate privacy and security.

Much existing knowledge generated using public funds remains siloed behind journal paywalls, hindering its use for public benefit. The UK should therefore facilitate access to quality research by backing new tools such as Open Knowledge Maps, Connected Papers and Epistemonikos.

In addition to making open data more accessible and useful, we should encourage the private sector to make internal (sometimes even proprietary) data on innovation available. Whilst subject to commercial and other sensitivities, data on company investments in RDI would provide considerable insight into business trends that are hidden from view. Companies currently have little reason to make data on their internal innovation public. A way this could be achieved in practice is through data trusts, a type of data institution that allows individuals or groups to pool resources, tasking an independent 'trustee' to manage those resources for the benefit of the trust's members. Not only would unlocking comparable data across

companies create public value, it could also benefit industry as they could draw on intelligence from beyond their walls.

Create a new data driven emerging technologies evidence centre

To coordinate and lead efforts to better understand the RDI landscape, there is a case to create a new data driven Emerging Technologies Evidence Centre. The centre would use novel data and data science methods to build real-time monitoring systems for emerging technologies, and support policy-relevant research to analyse the resulting data in a manner similar to CSET in Georgetown. This would help researchers respond to policy priorities faster than is possible through the decentralised, bottom-up processes that often guide the behaviour of academic communities. We are aware of internal government analyses of such topics by GOS, but these cannot be used by local decision-makers, companies and investors who would benefit from access to real-time data about emerging tech.

The centre might focus on a 'General Purpose Technology', such as artificial intelligence, that cuts across many of the RDI opportunities and challenges the UK faces. It could also be mission-oriented, thereby fulfilling the needs of policymakers and practitioners such as the UK's new Advanced Research and Invention Agency. Another role for the Centre might be to lead efforts to standardise and automate research and analysis of data about RDI. This would help with the collection, enrichment and analysis of such data in a manner that would improve efficiency, enhance reproducibility and make it possible to quickly combine data and methods to triangulate results and explore new questions.

Two interesting models for the centre are the Research on Research Institute (RoRI) and the Nesta-led PEC for the creative industries.

Experimentation

Establish a Business-University Collaboration Experimentation Fund
Business-university collaboration is widely acknowledged to be an important way of translating research into benefits for society and the economy. A recurring challenge is how to identify the most promising ways to encourage collaboration and develop them into impactful programmes.

Currently there are insufficient resources to encourage, identify and test novel approaches to collaboration. To fill the gap we propose the creation of a Business-University Collaboration Experimentation Fund. This would identify and test the most promising interventions to accelerate business-university collaboration in the UK. With its bottom-up approach, this fund would crowdsource the best policy and programme ideas across the UK and provide funding to test them in the 'real world', directly benefiting society and the economy.

Funding would be conditional on rigorous evaluation, generating actionable insights for decision-makers across the UK on the impact of different types of scheme. Better evidence on what works and what doesn't would lead to better decisions about which programmes to scale, rethink, or stop.

The fund we propose could be open to pilot schemes that address any of the barriers hampering business-university collaboration and science commercialisation, or alternatively target specific areas such as improving innovation brokerage. Another option would be to focus on collaborations around social challenges such as low-carbon heating or obesity. The fund could build on the work of the Connecting Capability Fund and might be modelled on the analogous Business Basics Programme.

Help funding bodies be much more experimental
Researchers use the scientific method to advance knowledge but this approach is rarely used to test the best ways of funding RDI. Due to the lack of experimentation in this area, innovators and policymakers still don't have a solid understanding of the best support mechanisms to accelerate RDI for public good. The Experimental Research Funders handbook that Nesta recently published with RoRI showcases many examples of how experiments can help to improve the funding process. To help funding bodies be more experimental, we propose that government supports a programme that includes:

- The creation of experimentation units within funding bodies that help to diagnose problems, identify solutions, and implement experimental pilots, in collaboration with external experts.
- Training on the use of experimental approaches for RDI managers and administrators, adapted to their experience and using interactive sessions focused on their own challenges ('action learning').
- Specialised advice for organisations with responsibilities in this field to identify opportunities for experimentation and prioritise those with a higher return.

To help guarantee the success of this programme and embed an experimental culture among research funders, it will be important that there be a clear political signal that legitimises and normalises the use of experimental approaches as an instrument to improve RDI funding, as well as a minimum budget that allows departments to carry out experimental pilots.

Collaboration

Innovation brokerage
Innovation rarely happens through the actions of a single person or organisation. More often, it is the result of collaboration and the exchange of ideas across the RDI landscape. Yet the role of intermediaries that bring innovators together is frequently overlooked, despite digital technologies offering new ways of connecting.

Nesta has investigated the under-explored field of innovation brokerage, an approach that aims to connect ideas, people, organisations, and communities through digital technologies. We've found that these tools can make contributions across four brokerage phases (Prepare, Search, Align, Support) and collated case studies of these technologies and their use. Policymakers should recognise the importance of digital brokerage by publicly committing to consolidating the field, integrating digital brokerage into the policy mix, sign-posting these tools to innovators, coordinating activity and supporting professional networks.

Public funding should also be used to create tools to fill gaps in digital innovation brokerage and understand how best to use digital tools for brokerage where the market is not providing solutions. This should prioritise understanding how to combine human judgement and data-driven insights – especially in the relatively under-explored 'Align' phase, which is where innovators establish trust and align their motives, culture, and working practises so they can collaborate effectively.

Involving civil society
Decision-making around the RDI landscape can benefit from engaging a wide range of organisations that might offer different perspectives. A way to achieve this is through the new ministerial council and Office for Science and Technology Strategy (OSTS), which have been established to provide direction on how science and technology will tackle great societal challenges and transform lives. The OSTS will be reviewing the technology bets the UK should back and prioritise for strategic advantage, and as part of this, they should consider actively engaging civil society organisations with deep knowledge of the social challenges and context for the development and deployment of technologies and innovations. These institutions could help tackle knotty social problems for RDI, like the fact that only 1.5% of the UK's school population is being reached by schemes focused on getting children interested in inventing and regional imbalances in R&D spending.

If taken forward, we think that the actions in this response would signal the beginning of a step change in the UK RDI landscape, positioning the UK to pioneer a more intelligent, evidenced and comprehensive approach to RDI.

Contact

Laurie Smith, Head of Foresight Research, Nesta: laurie.smith@nesta.org.uk

The Nesta-led PEC has made its own submission focused on the creative industries, the headline messages from which are below. For further details about the PEC submission please contact Eliza Easton: eliza.easton@nesta.org.uk

Annex 1: Headline calls from the PEC response

Amend the R&D tax credit to better support research and innovation in creative industries
In the Autumn Budget and Spending Review, as well as making a commitment to increasing spending on public R&D, the Government noted that business investment in R&D, at 0.9%, was low relative to the OECD average of 1.5% and very considerably lower than leading nations like Japan, Germany and the US.

Research from the Nesta-led PEC has shown that by excluding Arts Humanities and Social Science (AHSS) R&D from its R&D definition for the purpose of tax relief, the government risks missing out on fully incentivising R&D investment in the creative industries, one of the few industrial sectors where an extensive body of evidence shows that the UK is a world leader. Dropping the AHSS exclusion would also bring the UK into line with countries like

Germany, Korea, Austria and Norway – all of whose governments recognise the strategic importance of their creative industries.

The creative industries should receive an increased investment from UKRI R&D funding in recognition of their size, growth and growth potential

Some creative industries businesses already invest heavily in R&D. For example, analysis of the Department of Business, Energy & Industrial Strategy's (BEIS) UK Innovation Survey suggests that the share of creative businesses undertaking R&D is higher than in other services sectors and comparable with manufacturing. What's more, the evidence suggests that this investment in R&D in the sector leads to better business performance, not least because - as analysis in PEC Discussion Paper 2021/07 shows - doing R&D is strongly associated with businesses introducing innovations.

However, research published by the PEC also consistently points to a market failure in R&D in the creative industries. Left to their own devices, markets will underfund R&D, whether in the creative industries or any other sector. PECs newly published paper highlights two reasons why this is the case:

- Positive knowledge externalities: Firms cannot appropriate fully the returns from their investment in R&D e.g.: due to positive knowledge spillovers to competing firms.
- Asymmetric information: Where asymmetries in information between company and investor or other imperfections in financial markets create barriers to R&D finance that would not exist if markets were perfect.

Consistent with the latter, further new research from the PEC suggests that while innovative creative companies are more likely to seek venture capital funding than their non-innovative counterparts they are no more likely to succeed in securing it. Three detailed case studies of market failures in R&D in the creative industries can be found in PEC's report.

While existing measures such as the Creative Clusters Programme and Audience for the Future are welcome, further action is needed to tackle these market failures. To realise the opportunities of the size, growth and growth potential of creative industries this sector should receive additional investment from UKRI.

A strong focus on R&D in the UK Government's upcoming Creative Industries Sector Vision

The Government has identified the Creative industries as one of four key sectors in the Plan for Growth to encourage recovery following the pandemic and as such the sector has been invited to develop a Sector Vision. This is due to be published in summer 2022, and will set out "a long-term strategy focused on promoting growth within a sector and delivering on the government's levelling up, Global Britain and net zero objectives". Given the evidence provided above, it is essential that the Sector Vision uses R&D as a vital tool to achieve its stated goals - economic and otherwise.

Research from organisations like the Digital Catapult has demonstrated how new supply chains, enabling technologies, support tools and applications are being spawned by advancement in areas like virtual production and new paradigms like the metaverse. Similarly, PEC research has shown the opportunity at the nexus of the creative industries and artificial intelligence. The Sector Vision offers an opportunity to build on these existing capabilities and develop new ones.

Annex 2: Our research

- Better Intelligence about Artificial Intelligence https://www.nesta.org.uk/blog/better-intelligence-about-artificial-intelligence/
- Business R&D in the Arts, Humanities and Social Science https://www.pec.ac.uk/assets/publications/Policy-briefing_-RD-in-the-arts-humanities-and-social-sciences.pdf
- Innovation Brokerage https://www.nesta.org.uk/report/innovation-brokerage/
- Innovation Sweet Spots https://www.nesta.org.uk/data-visualisation-and-interactive/innovation-sweet-spots/
- Love's Labour Found https://www.nesta.org.uk/report/loves-labours-found/
- The Missing £4 billion https://www.nesta.org.uk/report/the-missing-4-billion/
- Opportunity Lost https://www.nesta.org.uk/report/opportunity-lost-how-inventive-potential-squandered-and-what-do-about-it/
- R&D, Design and Innovation: Examining the Links to the Creative Industries: https://www.pec.ac.uk/discussion-papers/r-d-design-and-innovation-examining-the-links-in-the-creative-industries
- Transforming Development Cooperation through Collective Intelligence https://static.rusi.org/rusi-irc-essay-collection-essay-7-gurumurthy.pdf