policy connect

higher education Commission

EMPOWERING INNOVATION

THE ROLE OF UNIVERSITIES IN BOOSTING REGIONAL ECONOMIES

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Co-chairs' foreword

The UK is a world-leading economy, but not all regions experience the benefits of this success. With some of the highest levels of regional economic inequality, change is required to bring greater prosperity to struggling areas. On 2nd February the Government published the ***Levelling Up White Paper***, which seeks to provide an agenda for tackling these issues. A welcome announcement in the ***Levelling Up White Paper*** was the commitment to spend at least 55% of total domestic research and development (R&D) funding outside the Greater South East by 2024-25[1].

This inquiry aims to provide a policy platform for how to achieve and take further this ambition in a way that empowers regions to take control of their own innovation development. We believe a bottom-up approach – based on leadership from regional authorities, the higher education sector and industry – is crucial to attaining the ***Levelling Up White Paper's*** objectives. The inquiry focusses on how universities, regional authorities and businesses can work effectively with central funders to achieve these objectives.

During the inquiry we have heard from experts in the higher education sector, business, applied research, charity and many more. Several themes were prominent in the discussions we had, with participants highlighting them as important avenues to increasing regional economic development. These themes helped form the four key areas we believe will enable the UK to improve its innovation output and work towards regional levelling up – empowering local decision making, increasing collaboration, supporting business led innovation and developing an innovation ready workforce.

First, empowering regional decision making has been identified as an important determinant in creating regional growth. To facilitate growth that is locally led, we recommend establishing regional Innovation Deals – in all parts of the country – to build on emergent industrial clusters or innovation initiatives. These will provide local leaders with the tools they need to improve the innovation performance of their local area.

In all our discussions, greater collaboration in all corners of the UK was highlighted as a critical element in achieving higher rates of R&D activity. To enable the building of new collaborative networks, funding programmes must work for all nations of the UK and use well-established methods for generating collaboration.

Supporting business-led innovation is another core element in achieving the inquiry's objectives. Industry innovation currently makes up the majority of R&D spend, and this is not going to change. Therefore, the UK must implement strategies to help increase the amount of private-sector innovation spend. We call for improving regional financial eco-systems, so that start-ups, spin-outs and SMEs have greater access to private capital. The government's plans for the British Business Bank should build on this.

To make innovation part of the country's DNA, the UK will need to create a workforce ready for the future. Our discussions indicated that innovation should be put at the heart of education provision, so that individuals are prepared for the technologies and industries of tomorrow. The education sector, applied research centres and local leaders will be pivotal in enabling this to happen.

Our recommendations are aimed at a range of organisations, not just central Government. They include universities, skills providers, regional government and innovation funders. Their implementation will substantially boost innovation activity and regional economic development across the country. We believe the recommendations will be integral to making sure the increased spending on innovation throughout the UK's regions is a success which brings prosperity to these communities.

We would like to thank the expert panel of Higher Education Commissioners who have provided support and advice to this inquiry and Jisc, ACCA, UPP and the University of Salford. Without our sponsors this inquiry would not have been possible.

Lord Philip Norton
(Co-chair)

Rt. Hon Chris Skidmore MP
(Co-chair)

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[1] HM Government (2022) Levelling Up the United Kingdom.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052060/Levelling_Up_White_Paper.pdf. (Accessed: 3 February 2022).

Recommendations

RECOMMENDATION 1:

The government should empower regional leaders to build capacity by using devolved funding programmes to deliver innovation projects. These projects should form the basis of regional Innovation Deals to help grow innovation initiatives.

RECOMMENDATION 2:

In order to boost regional development and increase commercialisation, the government should extend the geographical spread of existing Catapults, to target lower R&D intensive areas. The government should also be ready to set up new sector-specific Catapults to take advantage of emerging technological and industrial opportunities. Promoting innovation capabilities in economically lagging regions should be added to the Catapult Network's formal mission.

RECOMMENDATION 3:

In order to increase pan-national collaboration, Research England should work with the devolved nations' funding councils to expand the Connecting Capability Fund throughout the UK.

RECOMMENDATION 4:

Universities should work together to develop investment companies and research pooling initiatives which can attract greater private investment in innovation activity.

RECOMMENDATION 5:

The British Business Bank should establish new programmes to promote SME innovation loans and the financing of university spin-outs as part of its new Regional Investment Funds announced in the *Levelling Up White Paper*.

RECOMMENDATION 6:

In order to boost productivity through knowledge exchange, Research England should expand and reform HEIF, and Innovate UK should expand the successful KTP programme, in both total number and geographical spread across the UK.

RECOMMENDATION 7:

UKRI should improve the accessibility of their funding streams to non-STEM innovation projects – with a particular focus on promoting STEAM initiatives. HMRC should assess expanding the R&D Tax Credits scheme to include innovation emerging from non-STEM sectors.

RECOMMENDATION 8:

The government should establish new regional innovation support services and enhance the existing R&D Tax Credit Scheme to foster SME and university innovation activity, and implement a Quality Research premium to build university research capacity.

RECOMMENDATION 9:

In order to deliver an innovation-ready workforce, universities should aim to build greater partnerships with further education colleges and Catapults on the delivery of skills. Short courses should be more widely available to help prepare an innovation-focussed labour force.

RECOMMENDATION 10:

In order to develop an R&D-driven economy, universities should support greater transitions between academia and industry. This should be done by increasing industrial fellowships, ICASE Studentships, industrial secondments and doctorate opportunities. Universities should review their employment practices so that career flexibility is increased for academics and PhD students.

Executive summary

Context

This inquiry by the Higher Education Commission took the Government's commitment to levelling up as its starting point. In its ***Levelling Up White Paper*** published on 2nd February, the Government describes levelling up as a broad programme that gives everyone the opportunity to flourish. In this inquiry we have focussed on removing regional inequalities and spreading opportunity by means of increasing investment in education, economic development, infrastructure and urban regeneration.

The Higher Education Commission acknowledges that, to achieve these productivity-related levelling-up objectives, the UK will need to tackle many ingrained challenges. These challenges have been growing over the last forty years as a result of deindustrialisation, which saw many regions lose their primary industries. Economically, the UK has some of the wealthiest and most productive areas in Europe, as well as some low-productivity regions. The slowdown in productivity growth since the global financial crisis in 2008 has seen a stagnation in living standards and incomes. Solving the productivity challenge will therefore be fundamental to enabling regional development and levelling up, and it is for this reason that the inquiry looks through the lens of productivity.

The Higher Education Commission welcomes the ambition in the ***Levelling Up White Paper*** to increase R&D activity outside of the South East, by creating new targets for innovation expenditure and establishing three new 'Innovation Accelerators'. ***The Levelling Up White Paper*** has much to say about 'Devolution', and this was also an important topic of discussion in our inquiry. Throughout this report we use the term 'devolved' to represent both the system in place in the devolved nations of Scotland, Wales and Northern Ireland, as well as the regional authority structures in place in parts of England. We recognise the asymmetry present between the devolution systems and aim to adapt our recommendations to fit the different systems and decision-making structures.

To provide practical solutions to the challenges of regional development, levelling up and productivity growth, the inquiry reviewed how the UK can improve its regional economic performance through research and innovation. In particular, it focussed on the core role of the higher education sector in improving the UK's performance on innovation, productivity growth and economic growth.

This report sets out productivity-focussed findings and recommendations, which, if implemented in full, will deliver on the following objectives, to:

- Achieve innovation beyond the Golden Triangle, helping to deliver regional economic growth;
- Enable increased innovation activity across the whole United Kingdom and throughout the UK economy;
- Unlock private sector funding for R&D and generate greater SME innovation;
- Increase collaboration on innovation between the public sector, the private sector and the higher education sector;
- Through careful targeting, get the most levelling up impact from existing additional funding provided by the government;
- Produce an innovation-focussed workforce, ready for the future economy and technology; and
- Enable greater transitions between academia and industry, to help promote knowledge transfer and interconnectedness.

Key Findings

The inquiry's research provides extensive evidence of an innovation system which fails to maximise its collective strengths and create a joined-up system. The evidence reveals the ongoing issue of the 'valley of death' between academia and industry, which prevents consistent success in achieving the commercialisation of new world-leading research. Recognising the importance of collaboration in achieving innovation is universal and participants in the inquiry felt developing new networks and enhancing existing ones was paramount to building innovation capacity and activity across the country.

The inquiry also revealed a wide-spread belief that the UK is not effectively harnessing local economic expertise or regional leadership. In its current form, the system is seen as overly centralised and reinforcing the economic imbalances prevalent in the UK through its highly concentrated distribution of research and innovation funding. The Commission is pleased that the government, in the ***Levelling Up White Paper***, is proposing to enable stronger local leadership; our findings indicate promoting new innovation initiatives at the regional level, through Innovation Deals, will be an effective way of developing genuinely place-based approaches to levelling up.

Evolution not revolution was a key message which emerged from the inquiry. Participants highlighted a funding infrastructure which is effective in awarding excellence but often does not go far enough to build capacity or spread innovative practices. The evidence demonstrates a need to bolster and enhance existing funding programmes and make the most of the new replacements for the European Structural Funds, with local leaders – to quote the ***Levelling Up White Paper*** – empowered to direct funding towards their own, locally identified priorities.

The system also needs to be more accessible; it is currently complex to navigate and difficult to engage with. This acts as a disincentive for SMEs, start-ups and other organisations to take part in innovation activity or seek funding to undertake R&D. Certain sectors and higher education institutions are marginalised entirely by the current funding system – thereby preventing them from becoming more innovative and helping the UK achieve the 2.4% of GDP spending on R&D target. Our inquiry suggests this needs more than moving away from the bureaucracy of the EU funds, as the government has undertaken to do.

Finally, developing an effective skills provision to help create an innovation-ready workforce was identified as a key requirement to building capacity for innovation. More integration between the higher education sector and further education sector is viewed as fundamental to achieving this ambition.

Key Recommendations

The Higher Education Commission's recommendations are focussed on the existing innovation system – and aim to strengthen and enhance the system so that its reach is throughout the entire country.

First, and building on the government's strategy in the ***Levelling Up White Paper***, regional leaders should be empowered specifically to develop new innovation initiatives – such as new industrial clusters or innovation districts – through Innovation Deals. While the government has proposed three new Innovation Accelerators, our recommendation would work in parallel, would reach more widely across the country, and would allow local leaders to join-up funding streams, another ambition of the ***Levelling Up White Paper***.

Innovation initiatives would initially be supported by expanding existing funding programmes before being developed by devolved Innovation Deals. Greater innovation capacity building throughout the UK would be facilitated by an expanded Catapult Network which would target low R&D intensive regions, including for example the South West, an area currently not included in the ***Levelling Up White Paper*** for a new Innovation Accelerator.

Second, the inquiry recommends the UK increase collaboration and achieve a more joined up innovation system between the UK's nations by making the Connecting Capability Fund a UK-wide programme.

Third, in order to improve funding accessibility, the inquiry proposes universities establish new investment companies and research pooling schemes to attract greater investment into university affiliated innovation and spin-outs.

This should be assisted by the British Business Bank creating new funding programmes for innovative SMEs and spin-outs which offer accessible, flexible funding arrangements. We strongly advise the government directs its proposed next generation of British Business Bank Regional Investment Funds in this way, as part of the promised improved access to finance for SMEs.

The inquiry also proposes that two of the most successful knowledge exchange programmes, the Higher Education Innovation Fund and the Knowledge Transfer Fund be expanded to help spread innovative practices throughout regional economies. Marginalised sectors should be brought into the innovation system by widening the accessibility of R&D Tax Credits for R&D initiatives emerging from these sectors.

In order to help develop an R&D ready workforce, the inquiry proposes greater collaboration between the higher education sector, the further education sector and Catapults on delivering skills provision. This should be in addition to the proposed increase in the number of Institutes of Technology set out in the ***Levelling Up White Paper***. Universities should also encourage a greater movement of staff between careers in academia and industry, helping to integrate the two more closely on innovation and economic collaboration.

The UK's universities have a central role to play in the economic and social recovery of the UK, and in driving regional economic prosperity. They generate and translate world-class research, drive innovation, and educate the future workforce – factors that are all essential to the UK's productivity performance and long-term economic recovery and growth.

In partnership with businesses, colleges, the NHS, and the cultural and voluntary sectors, universities are ready to accelerate the economic and social recovery from the pandemic and increase opportunities across the UK. The economic aftershock of the Covid-19 pandemic has hit communities hard, making the levelling up agenda more challenging, but even more vital. As the UK looks to rebuild the economy and address long-standing structural issues facing our society – from health inequalities to the climate emergency – the UK's universities need to be at the forefront of the response.

(Universities UK)

Regional development and levelling up

Empowering regional decision making through Innovation Deals

The UK's regional inequalities are prevalent across all economic indicators – from living standards and economic growth to productivity and wage growth. In 2020, Nesta's report *The Missing £4 Billion* revealed the degree to which innovation activity in the UK suffers the same inequality problem, demonstrating how the current system perpetuates and heightens the issues which are already present.

Innovation is vitally important to economic performance, enabling productivity increases which lead to economic growth. If we are to level-up the UK, regional economies will need to become more innovative. This means tackling the reasons why some UK regions have low innovation activity in both the public and private sector. *The Missing £4 Billion* reveals that South West England, Northern Ireland, Wales, and the North of England all suffer from both low private and low public investment in R&D, leading to sustained economic underperformance over many years[2].

A major theme emerging from the evidence the HEC received was the need to empower regional and local decision making. This was not a particular surprise as it had been identified in previous Policy Connect research such as *Level Up Industry* published 26th February 2020[3]. The new published *Levelling Up White Paper* committed the Government to offering devolution opportunities to all English regions. The Higher Education Commission believes this is a major opportunity to empower regional leadership, and this chapter sets out the case for providing specific innovation capacity building powers to regional authorities.

Participants in our inquiry reiterated that the current system of funding and decision making is overly centralised and has led to the maintenance of a status quo which prevented regional levelling up.

> ***Notwithstanding the need for a UK-wide approach through UKRI, the levelling up agenda will be severely limited if it is over-centralised. The history of research and decision-making in the United Kingdom is one of heavy centralisation of funding and the allocation of resources, the legacy of which can still be seen today – partly evidenced by the Government's new commitment to level up the country and address this very concern.***
>
> **(MillionPlus)**

> ***There is a strong case for giving local and regional government a more significant role in directing research funding and aligning this with regional development priorities. Clearly a balance needs to be found between national direction and oversight and regional focus and engagement. But regional and local governments tend to have a better understanding than national level organisations of the economic potentialities and challenges faced by their area and are well placed to bring universities, businesses, public services and civil society together to make the most of regional and local opportunities.***
>
> **(University of London)**

[2] Jones, R.A.L. & Forth, T. (2020) The Missing £4 Billion. Nesta
[3] Carpenter Merritt, B. (2020) Levelling Up Industry. Policy Connect

The inquiry received evidence which made the case for the importance of local leadership in building innovation capacity and developing new industrial clusters. Participants pointed to the role of local leaders in targeting public investment to achieve maximum impact.

> *There is a strong case for a greater proportion of the national innovation funding to be deployed through routes which draw on (regional authorities) expertise during inception and decision-making, and fit with wider strategic plans. This would enable the creation and strengthening of clusters; a more systemic view of the local innovation ecosystems and for a more joined up local skills ecosystem.*
>
> **(N8 / Yorkshire Universities)**

> *Government should work in partnership with... Combined Authorities to grant them greater autonomy to prioritise resources towards the strengths identified in Local Industrial Strategies and Economic Plans. Building on their role in understanding their local economies and supporting local businesses, LEPs and Combined Authorities are ideally placed to lead a place-based approach to identifying and scaling up future industries.*
>
> **(LEP Network)**

> *MillionPlus has called for funding through the Shared Prosperity Fund to be devolved where possible. Some argue that for the full potential of the UK Shared Prosperity Fund to be realised, the Treasury should not have complete control over the allocation process. In addition to this, MillionPlus has argued that the SPF should foster "long-term, flexible local approaches to investment". Key to the success of European regional funds were the longer funding cycles that enabled organisations to plan strategically and be flexible in developing broader long-term plans. This will be a critical factor if the Government is to achieve its goal of levelling up targeted areas of the UK, by unlocking new possibilities and allowing local economies to redefine themselves for the better.*
>
> **(MillionPlus)**

Regionally led investment in innovation to support a local strategic vision, supported by public investment, can help to create a 'crowding in' effect – stimulating further investment from the private sector. Generating a 'crowding-in' of investment will be essential to kick-start the establishment of new innovation and industrial clusters.

> *The role of the public purse in this case is to support the "crowding-in" of research and innovation funding, to kick-start private investment, build the collaboration networks and support places to leverage their assets and create a healthy, growing innovation eco-systems.*
>
> **(N8 / Yorkshire Universities)**

> ***Both the public and private sector need to work closely in partnership to create transformative R&D&I activity in the UK. Public sector stimulus is critical in stimulating private sector co-investment – and in creating the foundations of vibrant ecosystems and research intensive, high value clusters.***
>
> **(Centre for Process Innovation)**

Participants in the Higher Education Commission's inquiry provided examples of where these types of public funding initiatives led by regional leaders have been successful in increasing innovation capacity. In particular, they demonstrated the importance of using money effectively to leverage and build on a region's comparative advantage and existing assets. The success of the Advanced Manufacturing Research Centre (AMRC), a member of the Catapult Network, is a case in point, where material and metal working expertise has been exploited to develop an innovation hub[4]. The South Wales semiconductor cluster is another example – set out in the case study below.

CASE STUDY: The South Wales Semiconductor Cluster

The development of a new compound semiconductor innovation cluster in South Wales was the product of a large-scale collaborative effort which brought together a range of organisations. By advancing the ambition of establishing Wales as a global centre in the development and manufacture of compound semiconductors, a consortium was established which included Cardiff University, Swansea University, the Cardiff City Region (CCR), the Welsh Government and other core industrial partners.

The initial beginnings of the semiconductor industry began in Wales in the 1980s, with the establishment of Imnos in 1982 and IQE in 1988[5]. This emergent industry received a major boost in 2015 when Cardiff University began the development of a new Institute for Semiconductors, which was quickly followed by a joint venture with IQE.

The UK Government supported the emergent cluster by establishing the Compound Semiconductor Applications (CSA) Catapult in 2018. This was followed by backing from the Cardiff City Region in developing state of the art facilities to assist the cluster's ongoing expansion. In October 2020, UKRI announced a £43 million investment into the cluster through the Strength in Places Fund – demonstrating the cluster's potential to become a world-leading innovation hub[6]. In order to bid for the Strength in Places Fund, the cluster's individual organisations collaborated to establish CSConnected, an umbrella organisation for the cluster.

The funding of CSConnected will be used to increase the research, development and innovation throughout the cluster – building on existing strengths and reinforcing advantages. CSConnected will also use the funds to develop educational and skills capabilities in the South Wales region, so that the local populace will have greater access to jobs within the cluster. Several education providers have now established courses tailored toward semiconductors, including the University of Cardiff, the University of South Wales and Cardiff & Vale College. CSConnected currently employs 1,500 and aims to expand the workforce exponentially in the years to come thanks to the fast growth of the global semiconductors sector.

[4] Ridgway, K (2021). Higher Education Commission Inquiry Submission.
[5] Business News Wales (2020) A New World of 'Everything' Powered by a Welsh Catapult.
Available at: https://businessnewswales.com/a-new-world-of-everything-powered-by-a-welsh-catapult/. (Accessed: 12 January 2022)
[6] CSA Catapult (2020) Cardiff-Led Consortium Wins £44m Bid to Develop CS Chip Cluster.
Available at: https://csa.catapult.org.uk/blog/2020/06/26/cardiff-led-consortium-wins-44m-bid-to-develop-cs-chip-cluster/. (Accessed: 12 January 2022)

The South Wales Semiconductor Cluster provides a great example of the power of regional leadership, collaboration and targeted investment in delivering a new high-growth industrial innovation cluster. The existing industrial strengths of the region were enhanced, using capacity building investment in assets which are utilised by a variety of collaborative partners. With the cluster emerging, the organisations involved developed an umbrella organisation with the collective clout to 'crowd in' greater investment and to win major funding bids.

Many regional authorities already have the tools to develop similar successful innovation initiatives, due to the analysis done as part of developing Local Industrial Strategies (LIS). The collaborative work undertaken by regional authorities, LEPs, higher education institutions and local businesses on the Strategies mean they should have a strong starting point for developing major innovation proposals. Regional authorities and their collaborative partners should use this pre-existing work and their local expertise to identify local sectors with high-growth potential which can be scaled up with the right interventions.

Targeted innovation proposals, led by regional authorities and backed by initial public investment could help create new innovation centres – such as city centre innovation districts or industrial clusters – which could help to deliver new jobs, higher wages, technology diffusion and productivity improvements to a region. Bringing together different partners under one group, in a similar model to CSConnected, should enable regional authorities and their strategic partners to develop innovation proposals which can be used to attract additional funding and resources to help sustain growth. The ***Levelling Up White Paper's*** announcement of three Innovation Accelerators, which bring together central funders and regional consortia to build clusters in Glasgow, Manchester and Birmingham is recognition of this successful collaborative model of development[7]. However, and as others have commented, this approach needs to be everywhere.

In order to facilitate the development of innovation proposals and help identify pre-existing strengths, regional authorities should be included in the UK Government's national R&D asset mapping initiative, which was announced in the ***Innovation Strategy***[8]. Led by Sir Paul Nurse of the Francis Crick Institute, the asset mapping review will look into the UK's entire research and innovation eco-system – assessing strengths and existing assets across the UK. Currently, the Review is only mandated to engage directly with the devolved national administrations. The Review should be extended to include regional asset mapping in conjunction with regional authorities in England, drawing on their expertise and knowledge to provide a picture of all the regions as the start point for R&D investment.

[7] HM Government (2022) Levelling Up the United Kingdom.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052060/Levelling_Up_White_Paper.pdf. (Accessed: 3 February 2022).
[8] Department for Business, Energy and Industrial Strategy (2021) UK Innovation Strategy.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf (Accessed: 12 January 2022).

The Higher Education Commission recommends the Government should empower regional decision making on innovation through two mechanisms. Firstly, by using both the Strength in Places Fund and the Shared Prosperity Fund to support the inception of innovation initiatives as priorities, beginning this year. Secondly, as the next step, to 'bulk up' on the resulting innovation developments to create all-encompassing 'Innovation Deals' with regional authorities. This would be in line with the government's recognition, in the ***Levelling Up White Paper***, that the local growth funds need to be simplified and stop-start funding ended so that local leaders can better support economic growth.Our two-stage approach will mean new initiatives can be reinforced with Innovation Deals that will include wider empowerment, for example allowing regional authorities to direct funding to skills provision. The Innovation Deals are designed to go further than the Innovation Accelerators in enabling regional leaders and consortia to lead innovation initiatives directly, using the new devolved powers announced in the ***Levelling Up White Paper***. The Innovation Deals are grounded in a bottom-up approach which aims to boost the supply of R&D from the UK's regions. For the three Innovation Accelerator regions, Innovation Deals could be established alongside the Accelerators in order to allow local leaders to spend funding more broadly in accordance with local priorities to develop industrial clusters, such as skills provision. The rationale for both recommended mechanisms is laid out below.

For the first stage, the UK Government should encourage regional authorities to develop innovation proposals for the Strength in Places Fund, and should create an innovation specific fund within the forthcoming Shared Prosperity Fund.

The evidence the Higher Education Commission has received suggests that both these funds would be good vehicles for enabling new innovation initiatives, as they have devolved funding arrangements. Empowering regional leaders to target the funds will give a greater 'bang for buck' – getting more innovation impact from existing funding.

> ***Policy programmes such as the Strength in Places Fund (SIPF), which aims to support promising research and innovation projects that will drive local economic growth, is a welcome initiative that builds on the Government's Levelling Up agenda. Projects funded through SIPF will receive a share of £186 million of government investment, backed by a further £230 million from private firms and research institutions. Further funding initiatives that can build on existing strengths and infrastructure in places across the UK are welcome.***
>
> **(NCUB)**

> ***The Strength in Places Fund has looked to help areas of the UK build on existing strengths to deliver benefits across local economies. In particular, the programme sought bids from local consortiums with proposals to support innovation-led regional growth which would enhance local collaborations. This and other similar programmes are positive steps and should be encouraged moving forwards.***
>
> **(MTC)**

The Strength in Places Fund should continue to be expanded in order to facilitate further regional innovation bids and initiatives. The Government should commission bids from the fund by regional authorities and their collaborative partners, which could be based on the analysis of strengths and opportunities they have undertaken as part of the Local Industrial Strategies work.

The forthcoming Shared Prosperity Fund will be the replacement to the European Structural Funds. The European funds have been influential in building capacity in many regional areas with long-term, multi-year funding settlements enabling regional leaders to undertake strategic initiatives.

> ***Being located within a less developed region has meant that Falmouth has benefited from over £100m of European Structural funding. This regionally ringfenced allocation over four programmes has enabled the University to create the urgently required infrastructure needed to establish an R&I base in the county.***
>
> **(Falmouth University)**

The Higher Education Commission recommends this multi-year, devolved funding structure be made a core long-term feature of the Shared Prosperity Fund. The Government can achieve this by creating a new ringfenced innovation fund within the Shared Prosperity Fund, to provide multi-year funding specifically to help build innovation capacity in regional areas.

> ***The new Shared Prosperity Fund should have an explicit mandate to support R&D infrastructure projects, particularly in cities and city regions.***
>
> **(University of Strathclyde)**

Establishing new innovation initiatives through the two funds would be an important, high priority first step in increasing regional innovation capacity and activity. Implementing Innovation Deals would go further in enabling regional economic transformation, and should be the next phase, building up from individual innovation initiatives to create innovation 'clusters' in a holistic way, including development of infrastructure, supply chains, and skills.

During the course of the inquiry, the Higher Education Commission heard extensive evidence on the need for greater regional decision making to drive place-based regional development strategies.

> [There are] ***persuasive arguments for regional R&D funding decisions to be undertaken alongside investments in education and skills, human capital, infrastructure and connectivity.***
>
> **(UCL)**

> ***Local leaders would be able to align R&D investment with socioeconomic need in communities across Greater Manchester to a greater degree than civil servants in Whitehall or in arm's length funding bodies such as UKRI ever could.***
>
> **(University of Salford)**

> ***The current primarily top-down national approach needs to be combined with bottom-up locally driven strategies to create meaningful regional innovation strategies that will deliver effective place-based innovation.***
>
> **(LEP Network)**

Establishing Innovation Deals would enable regional authorities to develop these more broad-ranging approaches to economic development. The concept of Innovation Deals, initially developed by Richard Jones and Tom Forth in Nesta's *The Missing £4 Billion* report, would provide scope for greater empowerment of regional authorities on skills, infrastructure and capacity building[9]. In the devolved administrations of England, the Adult Education Budgets (AEBs) could be utilised as part of the Innovation Deals to help develop the skills required to ensure the success of new innovation initiatives.

Expanding on the Innovation Deal concept, regional authorities should convene representatives from higher education institutions, further education colleges and business representative bodies, such as chambers of commerce and local enterprise partnerships (LEPs), when developing the new strategies. By collaborating with these organisations, regional authorities will be able to have greater knowledge of the local academic strengths and the business community, enhancing the place-based approach of the Innovation Deals. The coalitions established during the development of the Local Industrial Strategies could form the basis of this collaborative work.

> ***It is important that regional bodies and groups with particular expertise such as Local Enterprise Partnerships, industrial clusters, Catapult Centres and other research or innovation experts are involved in the decisions. This will help to ensure that funding is streamlined and directed to the right places and does not result in duplication across the region.***
>
> **(MTC)**

> ***Ensuring that specific research and innovation priorities could be addressed in alignment with other priorities such as capital projects, skills, inward investment, informed by local knowledge of the context (avoiding duplication, ensuring complementarity with other initiatives, for example) would support regional growth.***
>
> **(Teesside University)**

The evidence the inquiry has received indicates this two-stage approach to regional capacity building would be the most effective way of levelling up regional innovation eco-systems. This recommendation utilises existing funding streams to help deliver initial R&D developments, before consolidating gains by empowering regional authorities through Innovation Deals. This should create a broad-ranging approach to capacity building which utilises the expertise of collaborative partners to deliver innovation assets, skills provision and infrastructure. This should help to incentivise wider private investment into new innovation developments or emerging industrial clusters.

RECOMMENDATION 1:

The government should empower regional leaders to build capacity by using devolved funding programmes to deliver innovation projects. These projects should form the basis of regional Innovation Deals to help grow innovation initiatives.

[9] Jones, R.A.L. & Forth, T. (2020) The Missing £4 Billion. Nesta.

Expand the Catapult Network to cover the whole UK

As we've set out above, the UK faces the considerable challenge of levelling-up several regional economies which have low-R&D investment, a lack of R&D intensive companies and an absence of innovation capacity. Starting from a low base impedes capacity building and makes the task of incentivising external capital investment more difficult. Without having pre-existing assets or an innovation eco-system, it can be very hard to develop collaborative networks and agglomeration – which tend to emerge from localised innovation clusters or districts. Economic clusters were identified by the ***Levelling Up White Paper*** as key 'drivers of skilled jobs, productivity and GDP', as such they will be critical to levelling up regional economies[10].

In circumstances of low-R&D activity, 'research translation centres' - such the Catapult Network - can be a focal point for building innovation capacity in a particular locality. Research translation centres work as an intermediary between the research base and industry to deliver research commercialisation, a process that transforms new research into a marketable product. These centres of research translation attract external businesses partners to participate in the R&D process.

Innovation clusters often develop in close proximity to a research translation centre, making them an effective mechanism for improving regional R&D output, local job growth and productivity growth. Research translation centres can therefore play a key role in regional economic development.

> ***Initiatives like the UK's Catapult Network... have played an important part in building critical mass by creating and attracting businesses and encouraging collaboration with academic partners. But the UK has an opportunity to go further.***
>
> **(NCUB)**

> ***Institutions such as the Catapult network, British Business Bank and UKRI through Innovate UK all play a valuable role in the business innovation support system and have made progress in recent years towards tailoring their support for local economies.***
>
> **(LEP Network)**

Since the launch of the first Catapult Network centre in October 2011, the network has gone on to make a big impact in the UK's innovation landscape and Catapult have become the UK's premier research translation centres. Beginning with the opening of the High Value Manufacturing Catapult, the network has spread across the country and now covers 40 locations. The centres have played a major role in increasing the commercialisation of the UK's world-leading science research output. The 2021 independent Catapult Review described them as *"a critical part of the UK's innovation eco-system"*, serving to *"bridge the gap between research and business"*.

[10] HM Government (2022) Levelling Up the United Kingdom.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052060/Levelling_Up_White_Paper.pdf. (Accessed: 3 February 2022).

CASE STUDY: Catapult Network

The idea of the Catapult Network emerged from the 2010 review of the UK's innovation landscape undertaken by industrial entrepreneur Hermann Hauser. The review identified that the UK was failing to effectively convert its exceptional research output into commercialised results. To overcome this issue, the Hauser Review recommended that the UK establish 'Technology and Innovation Centres' which "can deliver a step change in the UK's ability to commercialise its research".

The Business Secretary, Lord Mandelson, called for the new Technology and Innovation Centres to be established – which became the Catapult Network. The new network's primary objectives were to increase business access to world-leading research and technology, boost collaboration on innovation between academia and industry and develop and diffuse skills at all levels. Through this ambition it was hoped that the UK would attain a critical mass in commercialisation work – which would aim to halt the loss of commercialisation opportunities to competitor economies.

Since the High Value Manufacturing Catapult (HVMC) opened in 2011, the network has grown to include:

- Cell and Gene Therapy Catapult
- Compound Semiconductor Catapult
- Connected Places Catapult
- Digital Catapult
- Energy Systems Catapult
- Medical Discoveries Catapult
- Offshore Renewable Energy Catapult
- Satellite Applications Catapult

The largest and most successful centre is the High Value Manufacturing Catapult, which is comprised of seven individual centres, including two which predate the establishment of the HVMC – the University of Sheffield's Advanced Manufacturing Research Centre (AMRC) and the University of Warwick's WMG.

Over the last ten years, the Catapult Network has helped to produce a wide array of benefits to national, regional and local economies. They have helped to create and foster the development of new industrial clusters, such as the compound semiconductors cluster in Wales. They have attracted inward and foreign direct investment into disadvantaged and deindustrialised areas, such as Sheffield's AMRC. Finally, they have helped to scale up SMEs and create new jobs, unlocking higher wages in innovative sectors. This has allowed them to become embedded into the innovation eco-system – a core part in bridging the gap between academia and industry which will be essential for developing the future economy and levelling-up the UK.

While the Higher Education Commission inquiry's evidence and that of the 2021 Catapult Review has been highly positive about the role of Catapults, there are areas such as geographical spread and funding which have been highlighted for improvement if they are to play an important part in levelling up the UK economy.

> ***What I believed we were creating (UK Catapult Network) was a UK Fraunhofer model. But what we got quickly grew into something that was different in several ways... geographic spread – inadequate to drive significant improvements in national productivity; Inadequate level of funding - not the self-sustaining levels of funding of the Fraunhofer network which has more than €2.8 bn funding per year, or the "sufficient funding to reach critical mass" recommended by Hauser.***
>
> **(Keith Ridgway, University of Strathclyde)**

> ***Feedback from all manufacturers, including SMEs, is that catapults have a key role in the government levelling up agenda. But landscape of Catapults had to be reconsidered to be more effective to have a greater reach within their regions, particularly in terms of where the Catapults were geographically based. Better distribution would enhance engagement with relevant businesses.***
>
> **(Make UK)**

> ***Collaboration between Universities and the Catapult network, in particular, can be scaled further.***
>
> **(University of Strathclyde)**

Hermann Hauser's 2010 report provided a clear rationale for increasing the UK's current 'technology and innovation centres', to make them comparative to the systems found in other leading advanced economies[11]. In his foreword, Hauser states *"other countries benefit greatly from a translational infrastructure that bridges this (research commercialisation) gap – for example, the Fraunhofer Gesellschaft in Germany... In this report I propose that the UK develops an equivalent capability"*[12]. The Fraunhofer Society, along with several other leading international applied research centres, is widely regarded as the prototype for successful bridging of the gap between academia and industry – and was a primary inspiration for the UK's Catapult Network.

[11] Hauser, H. (2010) The Current & Future Role of Technology and Innovation Centres in the UK. Available at: https://catapult.org.uk/wp-content/uploads/2020/12/Hauser-Report-of-Technology-and-Innovation-Centres-in-the-UK-2010.pdf. (Accessed: 12 January 2022).

[12] Hauser, H. (2010) The Current & Future Role of Technology and Innovation Centres in the UK. Available at: https://catapult.org.uk/wp-content/uploads/2020/12/Hauser-Report-of-Technology-and-Innovation-Centres-in-the-UK-2010.pdf. (Accessed: 12 January 2022).

CASE STUDY: The Fraunhofer Society

The Fraunhofer Society was established after the Second World War in 1949 by the Federal Republic of Germany. Named after the great German scientist Joseph von Fraunhofer, the Society has developed its role from a small industry support body to one of the world's leading applied research organisations.

The Society is particularly known for its 'Fraunhofer Model', which has public funding increase in proportion to the success of achieving private sector contracts. As a result, the growth of the Fraunhofer Society has been driven through their successful work with industry – which has expanded their budget and operations on two fronts. The funding model applies to both the overall Fraunhofer Society and the individual institutes which make it up – embedding a business centric ethos. The results driven 'Fraunhofer Model' was created in 1972 and has led to the expansion of the Society to over 70 institutes with 29,000 employees[13].

The 70 Fraunhofer Institutes cover an extensive array of applied research areas – including computing, physics, life sciences, medical technology and advanced manufacturing. These institutes have led to consistent breakthroughs in innovation, with the most famous being the invention of MP3 technology.

The geographical spread of Fraunhofer has been very important to the organisation's success. In particular, the Fraunhofer Society has played a crucial role in levelling-up the economy of East Germany since reunification in 1990. The new federal states of East Germany and Berlin now have 50 Fraunhofer institutes, which have been epicentres of innovation and competitiveness which has helped to improve the productivity of surrounding economies. This has helped generate sustained economic growth for the East German economy since 1990 and narrowed the gap with the former West Germany[14].

While the Catapult Network has been both positively received and a success in delivering innovation with industry, it has not reached the critical mass of the Fraunhofer Society and has areas for improvement. Several areas of improvement were laid out in the recent 2021 Catapult Review, and our report builds on those recommendations.

Over the last ten years, the Catapult Network has become an integral part of driving innovation, but not every Catapult centre has yet been individually successful. The recent review concluded *"it may take more than 10 years for a Catapult to 'mature'"*[15]. Part of the problem is that they have yet to reach 'critical mass' stage, in both funding and operations and it is important that they are enabled to expand and are maintained for the long term.

> ***History tells us that sooner or later government funding stops, and that would be really wrong. If we look at the RTOs that were set up after the war, the MIRAs, the TWIs, and the ARAs, they were set up at the same time that the Fraunhofers were set up, but in the 1970s the UK stopped funding its RTOs, but the Fraunhofers have continued. Look at what that has done for Germany, and conversely, what has happened in the UK.***
>
> **(Clive Hickman, MTC)**

[13] Fraunhofer Gesellschaft (2021) Profile / Structure. Available at: https://www.fraunhofer.de/en/about-fraunhofer/profile-structure.html. (Accessed: 12 January 2022).
[14] Fraunhofer Gesellschaft (2017) Success story: Fraunhofer celebrates 25 years of applied research in the new federal states of Germany. Available at: https://www.fraunhofer.de/en/press/research-news/2017/may/fraunhofer-celebrates-25-years-of-applied-research-in-the-new-federal-states-of-germany.html. (Accessed: 12 January 2022).
[14] Department for Business, Energy and Industrial Strategy (2021) Catapult Network Review. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/975595/catapult-network-review-april-2021.pdf. (Accessed 12 January 2022).

Despite serving as a bridge between academia and industry, the Catapult centres have been more successful in delivering commercialisation through their collaboration with industry than with academia. The Chief Executive of the Manufacturing Technology Centre (MTC), Clive Hickman, attributes the failure to create a strong enduring relationship to academia with the current UKRI rules on funding[16]. In the current format, UKRI places a maximum limit of 30% public funding for projects between Catapults and universities.

> ***We really have created a strong bridgehead into industry, 45% of the income coming directly from industry. But the reason we're not able to create a strong bridgehead with academia is the funding mechanisms. For example, where Catapults and universities want to bid for projects together, we can usually only seek a combined total of 30% of the work in any single project, but often the work that we're trying to do is quite early stage and needs more University and Catapult input, especially where we are working to support SMEs or working on riskier technologies. This 30% limit is self-imposed by the UK, and we really need to change that. We're actually constraining ourselves, and without that limit we would really be able to have significant impact, taking the great research that comes out of the universities, moving it through the transition via the Catapults, and pushing it into industry.***
>
> **(Clive Hickman, MTC)**

Consequently, where there is no industrial partner, the current funding rules impose a barrier on Catapult and academia collaboration. The rules particularly affect early stage applied research that is too early in development to attract substantial private sector investment. This has led to commercialisation opportunities leaking to other countries which are not bound by the same constraints as the UK's Catapult Network. The UK's history of failing to exploit commercialisation opportunities indicates a systemic problem between where the research emerges and the translation centres. In order to rectify this, the Higher Education Commission recommends UKRI should review how these funding rules can be altered to increase Catapult to academia collaboration. The review should include a particular focus on achieving results in fostering early stage applied research commercialisation results between Catapults and universities.

In addition to improving the operational aspects of the Catapult Network, the UK Government must use the centres to help drive regional economic development across the whole nation. At present, the Catapult Network consists of nine centres operating across 40 locations in the UK [17]. This is significantly below the scale of the Fraunhofer Institutes – which have 70 institutes throughout Germany. Capacity building and the development of innovation capabilities in economically lagging regions should be added to the formal mission and goals of the Catapult Network and should be included in the criteria for establishing new centres.

In order to match the scale of competitor nations, the UK Government should develop a strategy for the expansion of the Catapult Network – with a primary focus on expanding into low-R&D intensive regions. The expansion strategy should be based around three principles – expanding existing excellence, exploiting comparative advantage and seizing new technological opportunities.

[16] Hickman, C. (2021) Policy Connect Consultation: Research funding – driving regional economic prosperity.
[17] Catapult Network (2020) About the Catapult Network. Available at: https://catapult.org.uk/about-us/why-the-catapult-network/. (Accessed: 12 January 2022).

> ***When the Catapults were created, the idea was that there would be more of those, and the number of those would increase year on year. But it's stopped. We only have nine Catapults now, over fourteen locations, but I think there's a need for more Catapults.***
>
> **(Chinara Rustamova, FSB)**

The UK Government should commission Innovate UK and the Catapult Network to assess where existing centres can be expanded to wider locations in low-R&D intensive areas. Currently, there is only one Catapult in Northern Ireland, which was highlighted as having low-R&D activity in both the public and private sphere. Increasing the penetration of the Catapult Network in Northern Ireland and other low-R&D intensive areas will help to deliver new opportunities for innovation and commercialisation. Collaboration between Catapult centres has already begun the process of developing new capabilities and this should be formalised to help regional expansion progress.

Building on current excellence will help transfer expert knowledge, practices and skills to new facilities – enabling innovation capacity to be built quickly and reducing likelihood of failure. This method of expansion has already been used by the Catapult Network's centres - for example, the highly successful AMRC – originally based solely in Sheffield – has recently grown to include the AMRC Cymru in Broughton, Wales[18].

In regions without a Catapult centre or with low-R&D activity, the work of the Government and Catapult Network should be to identify areas of industrial comparative advantage – which can be built upon and enhanced. This approach has previously been used to develop the Catapult centres and can be built around either a pre-existing industrial strength or via geographical advantage. The former enabled the creation of the AMRC, building on Sheffield's traditional strengths in metal working, while the latter provided the opportunity to create a section of the Offshore Renewable Energy Catapult, based on the Port of Blyth, which is geographically suited to renewable energy operations.

Finally, in order to achieve the UK's ambition of becoming a 'science superpower' the government should keep under review the need to enable existing Catapults to extend their capabilities or for new Catapults in emergent technologies and industries where no coverage exists. As part of the Catapult Network's annual report, the Network and Innovate UK should assess opportunities for expansion into new technologies or industries, with a preference for establishing 'spoke' centres in areas which are currently underserved by the Network to leverage the learning gained over the last 10 years. The ongoing expansion of the Catapult Network was recommended by the Hauser Review in 2014 and the Higher Education Commission reinforces this recommendation as new technological or industrial opportunities emerge19.

RECOMMENDATION 2:

In order to boost regional development and increase commercialisation, the government should extend the geographical spread of existing Catapults, to target lower R&D intensive areas. The government should also be ready to set up new sector-specific Catapults to take advantage of emerging technological and industrial opportunities. Promoting innovation capabilities in economically lagging regions should be added to the Catapult Network's formal mission.

[18] Advanced Manufacturing Research Centre (2019) AMRC Cymru opens for business in North Wales. Available at: https://www.amrc.co.uk/news/amrc-cymru-opens-for-business-in-north-wales. (Accessed: 12 January 2022).
[19] Hauser, H. (2014) Review of the Catapult Network. Available at: https://catapult.org.uk/wp-content/uploads/2020/12/Hauser-Review-of-the-Catapult-network-2014.pdf. (Accessed: 12 January 2022).

Encourage devolved nations to adopt the 'Connecting Capability Fund' model

As with England's regions, the devolved nations face challenges to their disparate economies – with inequalities, strengths and weaknesses all being apparent. Pockets of economic success are often found in close proximity to areas of real deprivation. Many of the challenges they face are the same as those of certain English regions – low growth, low investment and low productivity. Improving these outcomes will be paramount to future levelling up. Delivering a more innovative economy will be a vital part of tackling these issues and should be a priority for decision-makers.

The current R&D situation is different in all three devolved nations. In Scotland, the Government has already taken steps to increase public expenditure on R&D, with above average levels of state investment compared to the rest of the UK[20]. Gross expenditure on R&D has been growing at a faster rate in Scotland than the UK overall, with expenditure increasing from 1.2% to just under 1.7% between 2007 and 2018[21]. The SNP administration of Nicola Sturgeon stated its ambitions to double business R&D investment in Scotland between 2015 and 2025 in its Innovation Action Plan, using increased grants of £15m a year for business R&D. In recent years, Scotland has also seen the establishment of the UK's first Fraunhofer Institute in Glasgow and the development of the National Manufacturing Institute Scotland.

In Wales, there have been individual innovation success stories such as the semiconductors cluster around the Cardiff City Region. More broadly, however, Nesta's ***The Missing £4 Billion*** describes Welsh innovation activity as suffering from both low public and private investment in R&D. Higher education sector innovation in Wales is currently in the process of recovering and building capacity, following the loss of innovation funding between 2014 and 2020[22]. Funding has now been restored through the Higher Education Funding Council for Wales (HEFCW)'s Research Wales Innovation Fund (RWIF), but more resources will be required to generate transformative innovation activity in Welsh regions, as laid out in the Reid Review recommendations.

Northern Ireland also suffers from low private and public innovation spending. The Northern Ireland Statistics & Research Agency (NISRA) states that the total R&D spend in Northern Ireland was £912.6m in 2020, with about 72% coming from business investment and 25% from higher education[23]. This is one of the lowest totals of any region in the UK, with South East England comparatively on £7.5bn spending on R&D in 2019, through recent years have seen significant increases in business R&D in Northern Ireland[24].

The UK-wide system of Government funding for research and innovation is highly divergent, with England, Scotland, Wales and Northern Ireland all having different funding bodies and priorities for spending. Certain funding streams are present in some areas, which are not present in other regions.

The evidence received by the Higher Education Commission indicates that organisations across the UK, and particularly from devolved nations, would like to see funding programmes that incentivise and support greater collaboration across the geographical boundaries of the regions and nations of the UK.

[20] Jones, R.A.L. & Forth, T. (2020) The Missing £4 Billion. Nesta.
[21] Scottish Government (2021) Business Enterprise Research and Development Scotland 2020. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2020/10/gross-expenditure-on-research-and-development-scotland-2018/documents/gerd-scotland-2018-report/gerd-scotland-2018-report/govscot%3Adocument/GERD%2BScotland%2B2018%2B-%2BReport%2Bv3.pdf. (Accessed: 13 January 2022).
[22] Cardiff Metropolitan University (2021) Submission to Higher Education Commission inquiry.
[23] NISRA (2021) Research & Development. Available at: https://www.nisra.gov.uk/statistics/business-statistics/research-and-development. (Accessed: 13 January 2022).
[24] House of Commons Library (2021) Research & Development Spending. Available at: https://commonslibrary.parliament.uk/research-briefings/sn04223/. (Accessed: 13 January 2022).

> *Investment in regional research could be accompanied by support for collaboration between institutions in different regions. Established research capabilities could then be better connected to local needs. Islands of research excellence could be brought together in larger archipelagos that have the critical mass to compete globally.*
>
> **(University College London)**

> *To maximise the appeal of Wales for future investment, the Welsh Government should facilitate a collaborative and coherent offering from Welsh Higher Education Institutions (HEIs) to make R&D partnerships in Wales more attractive to private investment.*
>
> **(Physiological Society)**

The Connecting Capability Fund (CCF) provides a ready-made opportunity to increase innovation collaboration across national borders and has a strong track record of generating collaboration and incentivising the creation of collaborative networks. The CCF is currently only provided solely through Research England, with only two out of 60 participant universities being based in devolved nations[25]. The Higher Education Commission recommends Research England should invite the research councils of the devolved nations to participate in the Connecting Capability Fund.

The CCF is a widely respected programme – with our evidence indicating that organisations and institutions across the UK's devolved nations want to see the programme expanded nationwide.

> *Research England's Connecting Capability Fund... allows partners from outside the region to contribute key capabilities, which is important as cutting edge applied research can be highly specialised. This fund is only available to English universities, and a UK-wide version of this scheme allowing connection of capabilities across the UK as well as pan-regional schemes would be welcomed.*
>
> **(University of Strathclyde)**

> *The aims of CCF [to share good practice and capacity internally across the higher education sector, forge external technological, industrial and regional partnerships] align well with 'Research and Innovation: The Vision for Wales'. HEFCW is already encouraging collaborative activity through its Research Wales Innovation Fund (RWIF), however, the independent panel that reviewed Welsh HEI RWIF strategies encouraged HEFCW to consider developing a similar scheme to Research England's CCF or aligning to the existing scheme if sufficient funding became available in future.*
>
> **(HEFCW)**

> *The Connecting Capability Fund has already exemplified what can be achieved when universities collaborate with one another, and we would support a continuation and expansion of this scheme.*
>
> **(NCUB)**

[25] UKRI (2021) Connecting Capability Fund. Available at: https://re.ukri.org/knowledge-exchange/the-connecting-capability-fund-ccf/. (Accessed: 13 January 2022).

CASE STUDY: Connecting Capability Fund

The CCF was announced in the 2016 Autumn Budget as a complementary funding programme to the HEIF. The stated aim of the CCF is to increase collaboration and capacity sharing between higher education institutions to deliver increased commercialisation of research. CCF incentivises higher education institutions to work with external industrial partners in the creation of commercialisation partnerships.

The CCF funding is granted to competitive collaborative projects between universities and their industrial partners. All CCF projects have a lead institution, which acts as the strategic coordinator for the project. A total of 18 CCF projects have attained funding so far – with 60 higher education institutions taking part in the collaborative projects. While most of the projects have brought together universities from the same region – several have created pan-regional collaborative partnerships. This includes the SPace Research & Innovation Network for Technology (SPRINT), which brought together the University of Leicester, the Open University, the University of Surrey, the University of Edinburgh and the University of Southampton[26].

The success of CCF has been recognised by the Government, with new funding being announced in the *Innovation Strategy*[27]. An additional £25m will be made available to CCF projects, signalling their achievements in driving regional commercialisation and collaboration.

The current purely-England based format of the CCF is a missed opportunity for generating greater collaboration between higher education institutions across the UK. With the uplift in funding, the research councils should take the opportunity to broaden the scope and scale of the CCF to enable all devolved nation universities to participate to the fullest degree. Funding to enable the participation of Scottish, Welsh and Northern Irish universities should come from their devolved administrations.

An enlarged Connecting Capabilities Fund should enable a major step forward in incentivising collaboration between universities across all UK nations. A more interconnected and joined-up approach to pan-regional university research commercialisation will be an important aspect in attracting inward and foreign direct investment into UK R&D. Pan-regional and cross-nation collaboration will heighten the collective strength of the higher education sector's offer and should help to build private investment in R&D – a core requirement for getting to the Government's 2.4% target.

RECOMMENDATION 3:

In order to increase pan-national collaboration, Research England should work with the devolved nations' funding councils to expand the Connecting Capability Fund throughout the UK.

[26] UKRI (2021) Connecting Capability Fund. Available at: https://re.ukri.org/knowledge-exchange/the-connecting-capability-fund-ccf/#Table. (Accessed: 13 January 2022).
[27] Department for Business, Energy and Industrial Strategy (2021) UK Innovation Strategy.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf (Accessed: 12 January 2022).

Supporting business innovation and productivity

Increasing regional financial eco-systems

A key aspect in developing regional innovation eco-systems will be increasing the private investment throughout the UK. Improving R&D performance will be difficult without a commensurate uplift in private capital flows given that private sector investment makes up about two thirds of the investment in overall R&D.

> ***If we are to capitalize on the potential of our research universities in the levelling up agenda a key factor will be early and ambitious access to capital to grow knowledge intensive companies in their regions.***
>
> **(Cambridge Enterprise Partnership)**

In the UK, private investment in innovation – like public spending – is geographically patchy. Numerous areas of the UK have low private financial investment – often due to the absence of R&D assets, ongoing public investment or existing innovation activity. In the absence of public spending to help 'crowd in' private investment, it can be hard to attract external funding streams individually to new start-ups or university spin-outs. Failure to invest in R&D intensive start-ups or spin-outs has often meant that commercialisation opportunities are lost to competitors, including Germany and the Far East. British universities should work to increase their spin-out and commercialisation of research success rate by aiming to build up networks of private capital investment into their region and institution.

> ***Regions outside the South East hit the bigger second block – access to capital. British Venture Capital data on investment in venture capital shows an even greater regional disparity than the Business Enterprise Research and Development (BERD) data. This makes it very difficult to "build your own cluster" by spinning out the research outside the Greater South East.***
>
> **(Cambridge Enterprise Partnership)**

University collaboration is one of the most effective ways of attracting greater private investment into research and development. Individual universities outside of the Golden Triangle have often been at a disadvantage in attracting private capital, but new collaborative ways of working have begun to change this. Multi-institution bodies – which often pool together collective resources and research assets – have led to greater inflows from private investors. Among the two stand-out examples are the Northern Gritstone initiative and the Scottish Research Pooling system.

CASE STUDY: Northern Gritstone

Northern Gritstone is an investment company which brings together three of the North of England's leading Russell Group universities, the University of Manchester, the University of Leeds and the University of Sheffield.

The new initiative, established in spring 2021, builds on the three universities' previous project, the Northern Triangle, which came together to win funding from the Connecting Capability Fund. After three years and 20 successful commercialisation projects, the new Northern Gritstone investment company seeks to take over from the Northern Triangle as a long-term, sustainable investor for university spin-out companies[28].

The focus will be on promoting the intellectual property developed at the three universities, with the ambition to deliver a consistent pipeline of start-up and follow-on funding which is vital to helping deliver commercialisation and growth. Northern Gritstone aims to raise approximately £500 million in funding via strategic financial partners, institutional investors and select high-net wealth individuals. If Northern Gritstone are successful in their ambitions, the new investment company would become the single biggest investor in the commercialisation of university spin-outs and intellectual property.

While Northern Gritstone provides an ambitious model for major research-intensive university institutions, not all universities will have the scale of innovation activity to be able to engage in this type of project.

Another route to raising private capital is by engaging with pre-existing venture and seed capital firms with a history of university-related investment. Several such firms exist in the UK financial eco-system, offering specific funds targeting new start-ups emerging from the UK's research base. Midven, a venture capital firm based in Solihull, operates the UK Innovation & Science Seed Fund (UKI2S), which has a track-record of raising funding for innovative university spin-outs. In recent times, this has included the Oxford University spin-out Quantum Dice and the University of Birmingham spin-out Linear Diagnostics29. Developing relationships with these investment firms may be a preferable route for smaller higher education institutions, which do not have a pre-existing investment vehicle to deploy capital quickly to exploit new intellectual property and commercialisation opportunities.

The British Business Bank provides a similar option for raising finance for commercialisation activity and is well placed to play a greater role in financing the development of innovative and high-growth SMEs. The Bank was established to provide access to capital for small and medium-sized businesses across the UK. Regional development and equitable funding distribution is a core goal of the Bank, which operates several regional funds and works with over 180 private finance partners to deliver investment. ***The Levelling Up White Paper*** announced the Government is investing in the ***'next generation of British Business Bank Regional Investment Funds'***[30]. The Higher Education Commission supports this initiative and recommends the British Business Bank should establish two new funding streams within the new Regional Investment Funds to help grow SMEs in the UK's regions. The first should be a new SME innovation loans scheme, which helps to finance innovative SMEs to undertake R&D projects without the bureaucratic process of applying for grants. The second should be a dedicated funding programme specifically for university spin-outs and university-affiliated start-ups with high-growth potential. Developing a dedicated funding programme will be important to improving the UK higher education sector's track-record of successfully commercialising research – particularly outside the 'Golden Triangle'.

[28] Northern Gritstone (2021) About Northern Gritstone. Available at: https://northern-gritstone.com/about-northern-gritstone/. (Accessed: 13 January 2022).
[29] UK Innovation & Science Seed Fund (2022) Portfolio. Available at: https://ukinnovationscienceseedfund.co.uk/portfolio/. (Accessed: 13 January 2022).
[29] HM Government (2022) Levelling Up the United Kingdom.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052060/Levelling_Up_White_Paper.pdf. (Accessed: 3 February 2022).

CASE STUDY: Scottish Research Pooling Initiative

Established in 2004 by the Scottish Funding Council (SFC), the Scottish Research Pooling system aims to bring together higher education institutions, to foster the sharing of resources and assets to deliver greater collective research excellence.

The SFC now operates ten separate research pools, including ScotChem and the Energy Transfer Partnership[31]. The ten pools bring together Scotland's elite research universities, including the University of Edinburgh, the University of Strathclyde and Heriot-Watt University. The collaborative initiative has been instrumental in developing collective strength and establishing international science leadership in Scotland.

An independent review of the system in 2018 concluded that the initiative had: *"built critical mass and research excellence in a number of disciplines important to Scotland's research base and continued global science leadership"*[32].

While the Research Pooling Initiative does not operate as an investment mechanism, it works to attract industry engagement and collaboration via its attractive offer of pooled resources and expertise. The overall package offers incentivised collaboration between industry and the pool's member institutions, leading to the development of commercialisation and innovation opportunities. The Research Pooling Initiative has also helped underpin several successful spinout companies, including Mode Diagnostics[33].

> ***Many of the businesses engaged in the work of the R&D Taskforce suggested that competition between universities made it harder to benefit from their collective expertise. A joined-up offer that draws on the combined strengths of universities could enable the UK to compete more successfully on the global stage.***
>
> **(NCUB)**

For regions with low existing levels of innovation activity and low levels of private sector investment, the Research Pooling model could serve as a vehicle to increase university collaboration and achieve critical mass in research excellence. By developing these areas, a region's universities could foster an attractive collaborative package which can incentivise participation from industry and investors.

RECOMMENDATION 4:

Universities should work together to develop investment companies and research pooling initiatives which can attract greater private investment in innovation activity.

RECOMMENDATION 5:

The British Business Bank should establish new programmes to promote SME innovation loans and the financing of university spin-outs as part of its new Regional Investment Funds announced in the *Levelling Up White Paper*.

[31] Scottish Funding Council (2022) Research Pooling. Available at: https://www.sfc.ac.uk/research/research-pooling/research-pooling.aspx. (Accessed: 13 January 2022).
[32] Heathwaite, L. (2019) Independent Review of the Scottish Funding Council's Research Pooling Initiative. Available at: https://www.sfc.ac.uk/research/research-pooling/research-pooling-review.aspx. (Accessed: 13 January 2022).
[33] SRPe (2019) Response to the: Independent Review of SFC's Research Pooling Initiative.

Utilising knowledge exchange to boost productivity

Productivity is one of the key determinants of a nation's economic growth and prosperity. The slowdown in productivity growth - especially since 2008[34] - has meant real wages in many parts of the UK have become stagnant and firms low in innovation. The productivity challenge must be solved if the Government's levelling up ambitions are to be achieved: unless productivity is increased, investment in regions could be squandered.

The knowledge exchange work which the higher education sector undertakes is an integral driver of productivity growth in the UK economy. Through its engagement with business, university graduates and academics help to provide industrial partners with new skills, practices, knowledge and technologies which can help to facilitate innovation and productivity growth within the business. The diffusion of these practices, ideas, skills and technologies into businesses help to create the incremental innovation which is the lifeblood of productivity growth.

> ***The underrated backbone of productivity growth is the relentless incremental improvement of existing products and processes. Some of this is visible, in the form of better aeroplanes and new car models, or mobile phones with better cameras and brighter screens. Some is less obvious: new household products, higher performance medical equipment, the re-engineering of existing products to meet higher environmental standards. And much of this kind of innovation is totally invisible to the outsider, such as better ways of organising production or service provision, reducing costs and improving quality.***
>
> **(Richard Jones, University of Manchester)**

Knowledge exchange is one of the most effective ways universities can increase their impact on their local and regional economy. A leading programme for the delivery of knowledge exchange is Research England's Higher Education Innovation Fund (HEIF) and its devolved nation equivalents. The fund has helped build up collaborative networks, increased innovation within the business community and delivered productivity gains. Going forward HEIF will be an important tool in increasing skills, technology and research diffusion between higher education institutions and their external partners. This will be vital in helping the UK to unlock productivity gains.

A version of the HEIF is present in all constituent nations of the UK. In England, the fund was established in 2006 and is currently administered by Research England. A flagship knowledge exchange programme – the total fund is now worth £250 million per annum[35]. HEIF aims to sustain knowledge exchange across England by supporting higher education institutions to work collaboratively with external partners including the business community, the public sector and the non-profit sector. HEIF's current funding allocation is performance based – using data from the Higher Education Business & Community Interaction (HE-BCI) survey.

[35] JUKRI (2021) Research and knowledge exchange funding for 2021-2.
Available at: https://www.ukri.org/wp-content/uploads/2021/10/RE-191021-ResearchKnowledgeExchangeFunding-2021-22.pdf. (Accessed: 13 January 2022).

Scotland's equivalent of the programme is the University Innovation Fund (UIF) which is delivered by the Scottish Funding Council (SFC). The system in Scotland operates differently, with all 15 Scottish universities submitting a UIF plan as part of their outcome agreements[36]. Funding is then allocated based on the plans submitted. In Wales, the Higher Education Funding Council for Wales (HEFCW) operates the Research Wales Innovation Fund (RWIF), with funding allocated based on three-year strategies submitted by each of the eight Welsh universities[37]. Finally in Northern Ireland, in the absence of a UKRI-affiliated research council NI HEIF is directly allocated by the Department for the Economy.

During the Higher Education Commission inquiry, the evidence we received regarding the HEIF was positive – with the programme being well regarded for its effectiveness in delivering innovation activity and knowledge exchange.

> ***The benefits of HEIF are significant given that it has been automatic funding without ties and which individual universities can use to strengthen their capacity to manage industrial links and target their individual strengths and local opportunities.***
>
> **(David Charles, iNCITE, Northumbria University)**

> ***HEIF remains the most valuable, and most important source of underpinning funding.***
>
> **(Middlesex University)**

> ***One existing initiative that is particularly effective and that is worth drawing attention to in relation to levelling up regional economies is the Higher Education Investment Fund (HEIF). HEIF has a strong track record in underpinning the innovation and knowledge exchange activities of universities. This support has been crucial for a range of universities, large and small, in supporting some of the baseline costs of innovation and technology transfer.***
>
> **(MillionPlus)**

While evidence presented to the Inquiry demonstrates the value of HEIF, there were several areas which were highlighted for improvement and evolution, so that the benefits of the programme could become more widely spread.

In its current form, Research England's HEIF allocation system has meant that smaller and specialist institutions across the UK have been unable to access HEIF funding – this has significantly constrained their ability to undertake innovation activity and knowledge exchange with external partners.

> ***We don't have HEIF... and many of our institutions in GuildHE do not have HEIF, or very low HEIF.***
>
> **(John Strachan, Bath Spa University)**

[36] Scottish Funding Council (2022) University Innovation Fund.
Available at: https://www.sfc.ac.uk/funding/university-funding/university-funding-innovation/university-innovation-funding.aspx. (Accessed: 13 January 2022).
[37] HEFCW (2022) Research Wales Innovation Fund (RWIF).
Available at: https://www.hefcw.ac.uk/en/our-responsibilities/research-innovation-and-engagement/research-and-innovation-initiatives/. (Accessed: 13 January 2022).

> ***We assume that everybody gets HEIF in England, they don't. A number of small specialist institutions don't get HEIF, and I think if we really want to encourage growth, development, collaboration, especially with some of those small businesses that were discussed earlier, and that's very prevalent in the London economy, for example. I think we need to remove the lower allocation threshold for smaller institutions for HEIF. It was removed in Scotland, and in terms of creative industry collaborations, they have rocketed. So I think we would see benefits here in England, were that to happen.***
>
> **(Maria Delgado, Royal Central School of Speech & Drama)**

> ***The current eligibility criteria for HEIF acts as a disincentive to encourage new forms of innovation by smaller institutions.***
>
> **(N8 & Yorkshire Universities)**

The inability of certain higher education institutions to qualify for HEIF has meant their locality has missed out on opportunities for knowledge exchange and collaborative innovation partnerships. As knowledge exchange is important for productivity growth, this is a particular problem in areas lacking in innovation activity in either the public or private sector. One such example would be in south west Cornwall, where Falmouth University have worked to build up innovation activity but stated *"a lack of HEIF funding has been an impediment"*[38]. In GuildHE's recent 'Response to the 2021 Spending Review', the university mission group demonstrated the vital impact small and specialist higher education providers have on disadvantaged areas – particular areas which are coastal or rural[39]. The report found small and specialist universities are *"agile and can maximise impact from smaller investments due to simpler infrastructure and closer-to-market research"*. These institutions' closeness to their community means they are well placed to drive local economic growth, demonstrated by their work in towns such as Worcester and in coastal areas like Falmouth.

If we are to have meaningful levelling-up, UKRI and Research England will need to ensure that higher education institutions throughout the country have the opportunity to pursue vital knowledge exchange work through the flagship HEIF programme. The programme can be transformative for a university's research and innovation work as well as for the external partners involved. Increasing the accessibility of the programme should consequently be a priority change for the funding programme, as it can help to deliver greater innovation activity and productivity growth in areas of economic disadvantage.

In order to effectively reform HEIF and continue to promote its success, there are several changes which should be enacted. Aligning HEIF to the Knowledge Exchange Framework (KEF), which was launched last year, could help to increase eligibility while retaining the important performance-based allocation system. This could be successfully done by designing the KEF's performance based formula to include regional economic capability building as a funding criteria, to enable funding to be directed to smaller institutions who have previously missed out.

[38] Falmouth University (2021) Submission to the Higher Education Commission inquiry.
[39] GuildHE (2021) GuildHE response to UK Government Spending Review 2021.
Available at: https://guildhe.ac.uk/wp-content/uploads/2021/09/GuildHE-Spending-Review-2021-Final-Response-.pdf. (Accessed: 13 January 2022).

Increasing overall funding of the HEIF programme would make enacting this reform easier and prevent other institutions from seeing a decrease in their HEIF allocation, due to its wider distribution. The current HEIF allocation system has a cap on the amount of HEIF funding an institution can receive. This puts an upper limit on the amount of knowledge exchange work which can be delivered by an institution through HEIF funding. Research England should assess the merits of raising the cap, so both small and large institutions can undertake greater HEIF assisted knowledge exchange work going forward. HEIF's successful track record at increasing knowledge exchange and its high rate of return on investment mean further expansion of funding would be a low-risk, sound investment which is likely to yield positive results for regional economies.

Knowledge Transfer Partnerships (KTPs) are the other cornerstone of the higher education sector's knowledge exchange work. Established in 1975 as the Teaching Company Scheme (TCS) and now run by Innovate UK, KTPs have been in operation far longer than the HEIF and have assisted businesses throughout the UK. Since its inception, KTPs have supported 12,000 businesses to innovate for growth and have provided meaningful career opportunities to participant graduates and academics[40].

KTPs work by having a graduate or academic undertake a project on behalf of a business, being jointly employed by the company and a higher education institution for a 12or 36-month programme. The graduate or academic will be tasked with delivering an innovation project which aims to deliver lasting change and growth to the company. Academics and graduates will have the chance to use their ideas in a commercial setting, helping to diffuse new concepts, practices, skills or technologies into the business. KTPs are funded by Innovate UK, other Government co-funders and the participant businesses, while the university provides support and academic input. Throughout the Higher Education Commission's inquiry, we have received positive evidence on the impact of KTPs on all participants – the university, the business and the academic or graduate.

> ***KTPs constitute a "gold standard" approach to SME innovation because of their lasting impact on skills, productivity, the bottom line, and enduring HE-company relationships.***
>
> **(Teesside University)**

> ***We would also welcome more funding for Knowledge Transfer Partnerships. In 1975, we were one of three pilot universities for the Department of Industry's newly launched Teaching Company Scheme, which are now Knowledge Transfer Partnerships, and they've been a vital tool for academics to engage with industry ever since. Greater investment in funding to focus on SME support and the lower end of innovation is needed – while not always ground breaking in a particular sector, these initiatives can be transformative for individual SMEs involved.***
>
> **(University of Salford)**

[40] Knowledge Transfer Partnerships (2022) About KTPs. Available at: https://www.ktp-uk.org/about-ktp/. (Accessed: 13 January 2022).

> *Knowledge Transfer Partnerships... are long-standing and successful schemes.*
>
> (University of Strathclyde)

While the majority of evidence the Higher Education Commission has received on KTPs has been very positive, higher education institutions expressed a desire to see the system improved and enhanced to help the levelling up process. There was belief that the system must be made more flexible in order to attract a greater number of SMEs to take part in the programme.

> *While (KTPs) are the perfect vehicle for many innovative SMEs, they are difficult for others to engage with because of rigorous eligibility requirements... A nationally funded shorter KTP model would help to increase SME engagement on a much larger scale.*
>
> (Teesside University)

> *KTP application process and form seems suited to some sectors and not others. This should be reviewed to make sure certain sectors are not missing out.*
>
> (Anne Kiem)

In order to increase the flexibility of the KTP programme, Innovate UK should introduce a new six-month programme, which provides a more limited version of the programme for SMEs – reducing costs and enabling them to use KTPs to complete shorter projects. A more flexible and rapid KTP programme should incentivise the uptake of the programme by SMEs which are short on time, resources and funding.

> *More funding for shorter term industrial projects between Universities, industry, and RTOs, enabling project scientists to be employed to work between the organisations. A lot of industry related interactions with Universities are directed towards 3-year PhD routes, which isn't suitable for many industries led projects which require short turnaround time frames.*
>
> (Centre for Process Innovation)

The KTP application form should also be reviewed by Innovate UK to make sure all sectors are readily able to engage with the KTP programme across the UK. A more user-friendly system for all participants should help the expansion of the programme – particularly into new geographical areas and business sectors.

Widening the spread of KTPs throughout the UK will be an important factor in enhancing the programme. Innovate UK should work with higher education institutions to make sure all institutions have an active and growing KTP programme – which engages academics, graduates and local businesses in order to help drive up uptake of the programme. Currently, not all universities are participating in KTPs and there are significant geographical gaps where there is no participant academic institution or KTP adviser. The gaps are often found in areas with low R&D activity – such as Cornwall and mid-Wales. Increasing the spread and penetration of KTPs is an effective way of spreading innovative practices to businesses which have traditionally been hard to reach for innovation funders. Innovate UK should assess how best to increase the penetration and geographical distribution of KTPs, with a plan to make sure low R&D intensive areas have access to and awareness of a KTP programme.

With their strong track record of success, KTPs will be vital in the ambition to generate more innovation output from the UK's SME population. Well-known by the market and the academic community, KTPs are a well-established programme which provides the perfect platform to expand operations to help benefit the UK's SMEs. In order to achieve this, the Government should establish a new commitment to increase KTPs by 5% a year until 2027. In total, this would be a 30% increase in KTPs across the UK over the next five years. As stated, the delivery of this increase should incorporate a strategy to expand the geographical distribution of KTPs and facilitate easier access for SMEs into the programme.

RECOMMENDATION 6:

In order to boost productivity through knowledge exchange, Research England should expand and reform HEIF, and Innovate UK should expand the successful KTP programme, in both total number and geographical spread across the UK.

Extending the scope of UK innovation to the creative industries

The UK has long-maintained a traditional view of research and innovation – which focusses extensively on developments emerging from science, technology, engineering and mathematics (STEM). The UK Government and its research funding structures have historically been geared towards helping the public and private sector undertake innovation in these specific fields. For example, the Government has set a narrow definition of research and development in its R&D Tax Credits system, which states eligible work *"must be part of a specific project to make an advance in science or technology"*[41]. In the recently published *Innovation Strategy*, the Government highlighted seven priority technology families – all emerging from STEM.

While STEM innovation is undoubtedly critical and should continue to make up the nucleus of UK innovation in the future, the UK must be careful not to overlook other opportunities for innovation in the wider economy. The evidence the Higher Education Commission received indicated that several sectors are being overlooked and underfunded in their pursuit of innovation due to their non-STEM classification.

[41] HM Revenue & Customs (2020) Claiming Research and Development tax reliefs. Available at: https://www.gov.uk/guidance/corporation-tax-research-and-development-rd-relief. (Accessed: 13 January 2022).

> ***The allocation of funding also needs to be reflective of the enormous potential that certain sectors can have to drive innovation and economic growth in the capital – addressing any current shortcomings in investment in these areas. As it stands, the creative industries are largely excluded from R&D funding and tax credits, yet they contributed £117.7 billion to the UK economy in 2018, up 7.4 per cent from the previous year and with a growth rate five times larger than that of the UK economy as a whole.***
>
> **(London Higher)**

> ***Mechanisms should support our creative economy by reviewing R&D definitions to ensure that these are not narrower than those of competitors, and do not neglect R&D in the UK's internationally strong creative industries.***
>
> **(Universities UK)**

> ***Government needs to take a broader approach to research and innovation, which does not only occur in traditional STEM subjects and is increasingly interdisciplinary. R&D tax credits are not currently permitted for research in the social sciences, humanities, or creative arts; this issue requires urgent reform. Interdisciplinary and social innovation initiatives should also be incentivised and nurtured.***
>
> **(University Alliance)**

There is a substantial danger that the UK may underinvest in high-growth industries and could weaken them internationally by locking them out of innovation funding streams. Nesta's *'Hidden Innovations in the Creative Industries'* report demonstrated that many of the innovations produced by the arts and creative sectors go relatively unrecognised in the UK's R&D system[42]. This includes innovation in the videogame industry, the product design industry, advertising and the broadcast industry.

A new area of rapid innovation growth is the CreaTech sector – bringing together new technology and the creative industries. The UK's CreaTech sector is expanding quickly, driven by recent innovations in Artificial Intelligence (AI), Augmented Reality (AR) and Virtual Reality (VR). Tech Nation's CreaTech Report 2021 found that the UK sector received £1bn in venture capital investment in 2020 and was the third largest recipient of CreaTech investment in the world after the US and China[43]. This high-performing sector should be supported to grow further and enhance innovation in order to maintain its position as a world-leader. *The Levelling Up White Paper* recognised the importance of the creative industries to regional levelling up, with the expansion of the Creative Scale-up Programme[44]. The Higher Education Commission believes this is a significant step in the right direction, but the Government could do more to facilitate this sector's innovation activity.

[42] Miles, I. & Green, L. (2008) Hidden innovation in the creative industries. Available at: https://media.nesta.org.uk/documents/hidden_innovation_creative_industries_report.pdf. Accessed: 13 January 2022).
[43] Tech Nation (2021) The Createch Report 2021. Available at: https://technation.io/the-createch-report-2021/. (Accessed: 13 January 2022).
[44] HM Government (2022) Levelling Up the United Kingdom.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052060/Levelling_Up_White_Paper.pdf. (Accessed: 3 February 2022).

> ***We have a lot of research in the arts and creative sector, where the impact is often long-term, especially when you're looking at societal impact such as wellbeing and social cohesion. That tends to be fairly undervalued by the current funding systems. We need to get better at recognising the broad-range of impact of arts and humanities research.***
>
> **(Jean-Noël Ezingeard, University of Roehampton)**

The UK should support innovation in these and other, emerging non-STEM sectors by increasing the scope of research and development. The higher education sector could begin this process by increasing the volume of 'STEAM' initiatives. STEAM incorporates the arts into the traditional STEM subjects, providing new opportunities for researchers and entrepreneurs which are not from a STEM background. Several higher education institutions have pioneered STEAM work, as it provides greater scope for interdisciplinary work and invites more input for creativity, artistic practices and imagination. A major new initiative is STEAM Inc., an international collaborative partnership between six British and European universities, including Birmingham City University, Central St. Martins of the University of Arts London and Trinity College Dublin[45]. Part of the Erasmus+ programme, STEAM Inc. aims to demonstrate the importance of interdisciplinary work and the creative practices to delivering transformative innovation for the future economy.

CASE STUDY: STEAMHouse

Birmingham City University have been an early adopter of a wider approach to research and innovation. In 2018, the University established STEAMHouse, a new innovation initiative which brings together the five STEAM disciplines of Science, Technology, Engineering, Arts, and Mathematics. The project has received funding from the Arts Council England, UKRI, the European Regional Development Fund, the Greater Birmingham LEP and the Midlands Engine[46].

Since its inception in 2018, STEAMHouse has assisted businesses throughout the midlands to grow and innovate. The initiative has also helped artists and designers become more innovative and work with state-of-the-art technologies. Within the first two years, STEAMHouse has supported 257 businesses with prototyping new products and had over 18,000 visitors for events and workshops.

> ***It is anticipated STEAMHouse will help create up to 10,000 jobs across the West Midlands region and help support the growth of the Midlands Engine.***
>
> **(University Alliance)**

STEAMHouse has a particular focus on using virtual and augmented reality technologies to help sectors not traditionally considered to be major innovators – including real estate, journalism, architecture and retail.

STEAMHouse will continue to grow in 2021, when it moves into a new £70m refurbished facility in order to expand operations.

[45] STEAM Inc. (2022) STEAM Innovation and Curriculum an Erasmus+ Strategic Partnership Project. Available at: https://www.steaminnovation.org/. (Accessed: 13 January 2022).
[46] STEAMHouse (2022) STEAMHouse Partners. Available at: https://steamhouse.org.uk/our-partners/. (Accessed: 13 January 2022).

To assist the growth of STEAM projects in the UK innovation eco-system, greater funding should be made available within UKRI funding programmes for collaborative work between the creative industries, arts, humanities and social sciences and the technology sector. In the higher education sector, universities should encourage greater interdisciplinary work on innovation between STEAM subjects. Knowledge exchange work could be used to transfer innovative practices and technologies to traditionally non-innovative businesses – as seen in the knowledge exchange work of STEAMHouse.

> ***Another important step in enabling more collaboration between universities and industry is the widening of the scope of R&D tax credits to incentivise development in new creative ideas. The broadening of this definition can catalyse innovation and will go some way to encourage interdisciplinary collaboration.***
>
> **(London Higher)**

As part of the Government's review of the R&D Tax Credit programme, HM Revenue & Customs should assess the merit of expanding the tax credits to innovation emerging from the creative industries, arts humanities and social sciences. Little of this activity currently qualifies for R&D Tax Credits, which reduces the incentives for collaboration on innovation emerging from these sectors.

RECOMMENDATION 7:

UKRI should improve the accessibility of their funding streams to non-STEM innovation projects – with a particular focus on promoting STEAM initiatives. HMRC should assess expanding the R&D Tax Credits scheme to include innovation emerging from non-STEM sectors.

Generating greater SME and university innovation activity

Small businesses and universities will play an integral part in the mission to achieve a more innovative economy. Small and medium-sized enterprises (SMEs) make up the backbone of the UK economy, forming the overwhelming majority of the UK's business population. As of 2021, there were 5.5 million small businesses in the UK, accounting for 99.9% of the business community in Britain[47]. They account for three fifths of employment in the UK economy and 52% of the private sector's revenue.

Despite their crucial contribution to the UK's economy, the SME population does not engage in innovation activity proportional to its contribution to national income; this needs to be changed to achieve levelling-up. During the current inquiry, the Higher Education Commission has looked extensively into the issue of increasing SME R&D and has received evidence which indicates the causes of low SME innovation and points towards solutions.

[47] Federation of Small Businesses (2021) UK Small Business Statistics 2021. Available at: https://www.fsb.org.uk/uk-small-business-statistics.html. (Accessed: 13 January 2022).

> *For many SMEs (and often many corporates too) knowing about, and being able to connect to, research and innovation opportunities are limited (awareness, time, proximity to opportunities).*
>
> (NCUB)

> *The landscape is really complex for (SME) innovation. I mean, we work with universities and the catapults and finding a labyrinth of support, let alone finding your way through the labyrinth of support, is really tricky.*
>
> (Mandy Ridyard, Produmax)

The Inquiry evidence shows that the core of the issue is that SMEs are very often time and cash poor, with limited resources to be able to take part in innovation activity. Even when they can find the resources to undertake innovation, the complexity of the system is overwhelming, undermining efforts to find collaborative partners from industry or the higher education sector. The evidence the inquiry has received suggests the UK's innovation system requires more effective signposting and support for SMEs trying to navigate the complexity.

> *There are advantages to this complexity, in that there are many different types of fund, however this complexity could be better managed through harmonisation of some schemes and by more effective central signposting towards specific mechanisms which can benefit individual companies of different sizes and stages.*
>
> (Centre for Process Innovation)

> *Regional SME advisory services must be strengthened to include technical, process and change management expertise linked to industrial digitalisation. SMEs will not engage unless they have confidence that they are receiving expert and impartial advice.*
>
> (Make UK)

> *From FSB's point of view, I can summarise the discussions, and what SMEs need, in five points. (1) A simplified and user-friendly funding system, (2) more funding that will replace EU funding, for example, (3) collaborations, networks, and connections, (4) better signposting, and (5) skill support, including upskilling, reskilling, retraining, and immigration.*
>
> (Chinara Rustamova, FSB)

An enhanced support and signposting system should be aligned with the ambition to empower local decision-making to help drive regional economic growth. Regional support systems need to be set up in order to harness local knowledge – of the innovation eco-system and the collaborative opportunities which are available. To enable this, the UK Government and Innovate UK should work initially with Metro Mayors and the devolved nation administrations to develop new joined-up support services which can assist SMEs in navigating the complexity of the innovation and funding systems in their regions. These support services should include a user-friendly online service which provides clear information on funding, potential academic partners and support programmes. To utilise expert local economic knowledge, the Metro Mayors and devolved administrations should work with local business representative bodies, such as LEPs and chambers of commerce, to understand the pre-existing business and innovation environment. Higher education institutions should be consulted in order to provide a comprehensive overview of their offer in terms of innovation collaboration programmes, innovation assets and potential academic partners. Combined, this could help to create a system which is highly-tailored to the region – helping to highlight pre-existing strengths and identify opportunities for growth which may be missed by a national support service.

To ensure there is a connection between national and regional support services, Innovate UK could direct businesses to relevant regional support services through its central website. Businesses would then have the opportunity to look into innovation opportunities at either a national or regional level – so they can find what is right for them. This recommendation builds on the recent ***Innovation Strategy***, which highlights the need to simplify Innovate UK's institutional structure and create a more user-friendly system. Working on and connecting effectively to new regional services should be part of this initiative.

"UKRI, including Innovate UK, will develop a simpler way for businesses to understand and interact with the UKRI institutional structure. This will include developing tailored web content and guidance, and exploring development of a digital portal to provide a gateway to all relevant support across the ecosystem for innovative businesses."[48]

The recent R&D Tax Credits Consultation conducted by HM Treasury identified several areas of improvement for the programme. While the Higher Education Commission agrees with the Consultation's recommendations, we believe more could be done specifically to incentivise greater uptake of the programme by SMEs and promote place-based levelling up by supporting businesses in economically lagging regions. The Government has recently reaffirmed its commitment to use the tax system more effectively to 'incentivise private sector investment' in the ***Levelling Up White Paper***[49]. During the inquiry, the R&D Tax Credit programme was praised by participants, but accessibility and excessive bureaucracy were identified as key areas which could enable greater SME participation.

> ***The current system is too complex for many SMEs with relatively little administrative capacity. Reducing complexity in the system would help SMEs to have to rely less on intermediaries to navigate the tax relief system. The government should improve clarity and understanding of the scope of what is covered through R&D tax credits.***
>
> **(NCUB)**

[48] Department for Business, Energy and Industrial Strategy (2021) UK Innovation Strategy.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf (Accessed: 12 January 2022).
[49] HM Government (2022) Levelling Up the United Kingdom.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1052060/Levelling_Up_White_Paper.pdf. (Accessed: 3 February 2022).

> *Promote and simplify the excellent R&D tax credit scheme, which helps small and medium sized businesses, by introducing automatic eligibility for collaborative research activities with universities. This would encourage SMEs to collaborate with universities on innovative R&D and universities could help local businesses find the best partner for them through their own networks if they can't help locally.*
>
> (Russell Group)

> *While R&D tax credits are widely used, it is not perfect. Manufacturers want to see the system simplified and more accessible to SMEs. Most manufacturers use agents to support them in accessing the scheme and such agents were seen and are seen as extremely valuable. That said, there was also some frustration that the scheme was complex and therefore using an agent was the only option.*
>
> (Make UK)

Building on the recommendations of the R&D Tax Credit Consultation, HM Treasury and HM Revenue & Customs (HMRC) should work with some SMEs to co-design an application process that is more user-friendly and less time consuming.

In order to promote the uptake of R&D Tax Credits in regions outside of the 'Golden Triangle', HMRC should establish an enhanced tax credit premium for businesses undertaking R&D in areas with low innovation activity. The tax credit premium should be an additional increase in the rate a business can claim and should apply to both profit making firms, which receive a Corporate Tax reduction, and loss-making firms, which receive a cash credit. The Government should advertise this change to businesses in English regions and devolved nations to incentivise greater uptake of R&D Tax Credits across the UK.

Finally, to help achieve the ambition of increasing SME R&D activity, the UK Government should review the current SME innovation match funding rules.

> *In the Tees Valley and the wider North East, where business density is significantly lower than the UK average and SME absorptive capacity for innovation is limited, we need strong financial and other incentives for SMEs to engage. Greater relaxation of requirements for participation in both research and innovation funding programmes, in the form of both match funding and administration, is needed to enable and encourage more companies to pursue innovation opportunities.*
>
> (Teesside University)

> *Companies always weigh-up the costs and benefits of funding schemes, and therefore such opportunities are lost on a regular basis because the funding scheme does not suit the particular circumstances of the company. As the UK economy recovers from Covid there are concerns that existing funding schemes can be less easily supported by companies at this time, than pre-pandemic.*
>
> (University of Strathclyde)

The current match funding rules can be unachievable for SMEs that want to take part in innovation. The rules can prevent innovative start-ups from taking part in academic research and development programmes as they are unable to raise the capital required to take part. The reforms to SME match funding rules should apply to Innovate UK funding programmes and should take advantage of the transition from European Structural Funds to the new Shared Prosperity Fund by implementing new flexible rules on match funding. These reforms should help to enable a greater number of start-ups and SMEs to take part in R&D activity.

To achieve greater regional innovation, universities will need to be incentivised to deliver additional research which underpins the innovation process. High-quality academic research is an integral component of the R&D system, which helps to provide opportunities for commercialisation, new products and new markets. The quality-related funding system (QR) for research is currently distributed by the Research Excellence Framework (REF), which is administered by Research England, HEFCW, the SFC and the Department for the Economy in Northern Ireland. The REF determines funding allocation based on a formula which measures research excellence and impact, with this reviewed every few years.

Participants in the Higher Education Commission were complimentary of QR funding's track record of promoting research excellence and generating innovation opportunities. Additional QR funding was identified as an effective method of promoting further R&D opportunities which could help to increase innovation in the UK.

> ***QR ensures there is a sustainable pipeline of new ideas and talent to underpin innovation in areas which may not yet have emerged as the global challenges of the future.***
> **(Yorkshire / N8)**

Despite its track record of successfully promoting research excellence, participants in the inquiry felt that more can be done to use QR funding to help increase research capacity in low R&D intensive regions.

> ***QR is a potentially quicker/easier means of injecting money into the regions – and therefore an approach in keeping with the wider government demand for "efficiency" in research funding administration.***
> **(Teesside University)**

> ***QR funding remains a key lever by which Government can play a role in levelling up investment across the country, particularly if levels of public and private investment in R&D across the different regions of the UK are harmonised.***
> **(MillionPlus)**

The evidence the Higher Education Commission received indicates that simply increasing QR funding in its current form would only increase the inequalities present within the higher education system. To be truly effective in boosting regional research capacity and reducing inequalities, the QR funding system would need to be reformed to rectify this imbalance.

> *Modern universities make up 47% of the institutions that receive QR funding in the UK. However… "pre-92" institutions have collectively received more than ten times the amount of QR funding than all the modern universities combined.*
>
> (MillionPlus)

> *It would be a mistake for the Government to solely increase the funding available through QR, without addressing some of the problems caused by the hyper-concentration of this funding stream. A simple increase in funding using the same framework applied currently is likely to produce similar results or even exacerbate the over-concentration of funding, doing nothing to address the levelling up challenge. Revisiting the funding rules and allocation formula provides the Government with an attractive opportunity to both reward individuals over projects, and to consider how to use its research investment to level up economies outside of London and the South East.*
>
> (MillionPlus)

In order to help reduce disparities in regional research funding and increase research capacity across the UK, the Higher Education Commission recommends establishing a QR funding premium for institutions aiming to increase their research capacity. This would be an additional weighting to be included in the REF, so that institutions can build their research capacity to help deliver greater output on research and innovation. The new weighting must be designed so that the central importance of 'quality-related' research remains – in order to promote world-leading research and prevent a reduction in quality.

RECOMMENDATION 8:

The government should establish new regional innovation support services and enhance the existing R&D Tax Credit Scheme to foster SME and university innovation activity, and implement a Quality Research premium to build university research capacity.

Creating an innovation-ready workforce

Putting innovation at the heart of education provision

A future-facing skills provision will be an integral part of enabling the UK, its devolved nations and regions to become R&D intensive. Investment in facilities, equipment and innovation assets is crucial, but it will require a workforce capable of utilising this in order to help generate regional economic growth. Aligning skills provision with innovation policy will be vital at a national, regional and local level.

The UK currently faces numerous skill-related challenges – which pose a major threat to the Government's levelling-up ambitions. Whilst the public eye focusses on the skills shortages which have emerged from the Covid pandemic and Brexit, there are underlying structural issues which pose significant challenges at all levels. These include adult learning provision, to help reskill workers; the gap between level three and level six educational attainment and the disconnect between employer needs and training provision.

> ***The number of degrees we provide within England and the UK is not out of kilter with other countries, and I would argue we need more people getting to degree level, and post-graduate level study. But, we also have a very significant gap at that level four point, and, in addition, there's another level of complexity. Because, whilst engagement with full time study in general, as part of degree programmes, has been maintained, more flexible provision such as part time study, entry of more mature learners, re-skilling, stand alone level four qualifications, and smaller qualifications has fallen off a cliff over the last ten years. And, those are exactly the types of qualifications, when we're talking about skills, that we need to reinitiate and engage with.***
>
> **(Dave Phoenix, LSBU)**

The recently released *Skills for Jobs White Paper* aimed to provide solutions to several of these challenges. Most notably, *Skills for Jobs* recommended greater employer input in skills provision, a lifetime skills guarantee and further investment in higher technical qualifications[50]. This report aims to align with *Skills for Jobs* recommendations, with a primary focus on establishing a skills provision which is innovation oriented and prepared for future technologies.

Promoting collaboration has been a common theme during the Higher Education Commission inquiry, and throughout the inquiry's evidence sessions and public call for evidence, the desire to see greater collaboration between skills providers was evident.

> ***Better integration of the skills pipeline in places is needed, from further education, apprenticeships, graduate, Masters and Doctoral levels, to produce the skilled workforces within clusters that will make the UK an attractive place to locate and grow businesses, contributing to the Government's ambition of a Global Britain.***
>
> **(Yorkshire Universities / N8)**

[50] Department for Education (2021) Skills for Jobs: Lifelong Learning for Opportunity and Growth. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957856/Skills_for_jobs_lifelong_learning_for_opportunity_and_growth__web_version_.pdf. (Accessed: 13 January 2022).

> ***Building partnerships... I think this is absolutely critical from the point of view of connecting across educational levels, building partnerships and networks in regions. This is the way we'll actually be able to have the impact. Central to that will be the whole idea that we need to have industry involved, of course, but again emphasising the point that the educational professionals have to have a voice at the table as well. I think as we knit those elements together, I think we'll then be able to offer what the community needs, that society needs, and hopefully with that we'll then be able to see a transformative change to the education and the meeting of the needs of industry as we go forward.***
>
> **(Robin Clark, WMG)**

> ***Further education has an important role as very locally rooted institutions with strong connections to their local business base. As such we must think of mechanisms to draw these further education colleges into the collaborative coalitions being developed between business and higher education institutions.***
>
> **(Richard Jones, University of Manchester)**

Evidence provided to the Higher Education Commission shows more could be done to increase the integration of the disparate parts of the skills system – from apprenticeships, through to postgraduate degrees. In particular, collaboration between higher education institutions, further education colleges and businesses will be paramount to developing an innovation-ready workforce. These coalitions will need to work together to identify skills gaps, future skills needs and highlight the requirements of local industry.

The new Institutes of Technology (IoTs) provide the opportunity to develop these coalitions in a formalised way – with further education providers, higher education providers and businesses working together to deliver industry-led higher technical qualifications. The new IoTs will focus primarily on delivering level four and five technical qualifications, which are currently low in uptake at present. The new IoTs should provide the opportunity to have innovative businesses help develop the skills they need to increase R&D activity in their locality. The Commission supports the intent in the ***Levelling Up White Paper*** to establish another nine Institutes of Technology. The locations of the IoTs needs to be carefully focussed and they should engage with new innovation initiatives, particularly Innovation Deals or Innovation Accelerators.

Going forward, Catapults should play a major role in these skills coalitions between further education, higher education and industry. Catapults are uniquely placed to help develop innovation-ready skills provision, due to their consistent engagement with cutting-edge technology, practices and industrial expertise as research translation centres. While some Catapult centres have training centres, such as the AMRC Training Centre in Sheffield, more could be done to engage with existing training providers ranging from universities to further education colleges.

The need for Catapults to play a greater role in shaping future training provision and reacting to help solve skills gaps was identified in the recent 2021 Catapult Review.

"During this review, stakeholders have said that Catapults could have a greater focus on skills, particularly as part of their local offer. Stakeholders have pointed to emerging skills gaps and the role Catapults could play in working with industry to relay skills directly into the workforce. They have highlighted that undertaking business R&D in a particular location depends on the availability of a skilled local workforce."[51]

[50] Department for Business, Energy and Industrial Strategy (2021) Catapult Network Review.
Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/975595/catapult-network-review-april-2021.pdf. (Accessed 12 January 2022).

This recommendation was reinforced by the evidence the Higher Education Commission received as part of the inquiry.

> ***Skills and training have always been at the top of the agenda for any policy discussions with manufacturers. Catapults can support to ensure we have a labour market that can move into the job roles we have immediately. It is equally important that we ensure they are equipped with the skills needed for the future, in particular digital and green skills.***
>
> **(Make UK)**

As discussed above, Catapults should become important members of the collaborative networks providing the skills required for innovation. The Catapult Network should develop its links to higher education and further education providers by establishing secondment and studentship programmes for higher education students and apprenticeships for further education students. The engagement between Catapults and colleges should also incorporate training courses tailored for existing workers, which can enable the upskilling and reskilling of the workforce to deal with the substantial technological shifts which will emerge as a result of the Fourth Industrial Revolution. This would enable direct innovation-oriented educational training to be provided to students and existing workers, helping to raise the innovation capacity of the local workforce. In conjunction with the expansion of the Catapult Network, this should help to reduce the skills gaps which exist in many parts of the country and which prevent capacity building for innovation.

The Catapult Network's primary role on skills will however be to adopt a 'Skills Value Chain' approach which assists in identifying future skills gaps and helps to develop the skills provision for future technologies and industries. As part of the Skills Value Chain process, Catapults will initially engage in foresighting and assess ***"future skills needs, standards and qualifications associated with emerging technologies"***[52]. The insight attained will be used to develop curriculum and modular learning which prepares students for these future technologies, skills and practices. The final stage will be to convey this knowledge to early-adopters and teachers, who will pass on this knowledge to students. The Catapult Network's Skills Value Chain approach should become an integral part of their work with higher education and further education providers, to help deliver a curriculum for students which is future facing and innovation oriented.

In keeping with the inquiry's ambition to empower local decision making, the Higher Education Commission recommends aligning the devolved Adult Education Budgets (AEBs) more closely with innovation strategies and initiatives. The delegated powers give devolved administrations in England the opportunity to set priorities for funding, meaning they can prioritise local economic objectives such as boosting overall R&D or developing a new industrial cluster. This would go very much with the grain of the ***Levelling Up White Paper's*** aim to put power in local hands, armed with the right information and embedded in strong civic institutions.

> ***It's important to connect policies for innovation and skills. If a region decides that its strategy is to grow a particular industry – for example Semiconductors in South Wales – then part of the strategy should be to develop the skills pathways to support that industry, so that people at all levels can benefit from the new employment opportunities that arise.***
>
> **(Richard Jones, University of Manchester)**

[52] HVM Catapult (2020) Manufacturing the Future Workforce. Available at: https://hvm.catapult.org.uk/mtfw/MTFWExecutiveSummary.pdf. (Accessed: 13 January 2022).

In order to successfully build innovation capacity, devolved administrations should make sure any new major innovation initiatives – such as the creation of an innovation district – are matched with the appropriate funding from AEBs. This will help to upskill and reskill workers ready to seek employment opportunities at all levels in these new initiatives.

Short courses which enable workers to reskill and upskill without undertaking full qualifications should also be eligible for AEB funding. Short courses enable workers to quickly level up their skills, becoming both more employable and able to partake in highly skilled work. This is particularly important for high growth and innovative businesses, which require a wide range of skills within their workforce to enable successful R&D output. Credit bearing short courses should in particular be promoted , as they enable workers to build up qualifications, making them more attractive to employers which require a variety of skills. Short courses, which focus on new core skills, such as digital skills, would also enable a greater diffusion of technologies into SMEs. Improving the digital capabilities of employees will be vital for preparing the UK economy to be ready for the Fourth Industrial Revolution and improving productivity growth going forward. As such, the rules on funding allocation should change to allow short courses to be funded by devolved Adult Education Budgets.

RECOMMENDATION 9:

In order to deliver an innovation-ready workforce, universities should aim to build greater partnerships with further education colleges and Catapults on the delivery of skills. Short courses should be more widely available to help prepare an innovation-focussed labour force.

Encourage greater career transitions between academia and industry

Creating the conditions to become a 'Science Superpower' will rely on maintaining the UK's world-leading research base and establishing an R&D driven economy. Achieving this will depend on collaboration between academia and industry becoming common-place and easy to establish. This has historically been a difficult task, with the process known as bridging the 'Valley of Death'.

> ***Have we bridged the gap between universities and industry? In some cases, we have, but that is still a problem area.***
>
> **(Keith Ridgway, University of Strathclyde)**

While the work of senior leaders is often the focus in establishing collaborative practices, the importance of academic and early-career researchers in driving innovation collaboration should not be overlooked. The movement of academics and researchers between university employment and industry is an important driver of knowledge exchange, which helps to make businesses more innovative, productive and research-led.

> ***R&D driven economy will require a workforce capable of working seamlessly in both academia and industry. As the Dowling Review highlighted, encouraging the mobility of researchers will enable them to become critical translators of the excellent knowledge created within the UK research base into economic growth and productivity.***
>
> **(NCUB)**

> ***A key element of improving collaboration on innovation and increasing the absorptive capacity of businesses is through efforts to increase the porosity between academia and industry.***
>
> **(University Alliance)**

Transitions between industry and academia should be encouraged both ways, with workers being able to move consistently between the two throughout their careers. This should help to generate a two-way knowledge exchange which helps develop academic excellence and business success. The Fraunhofer Society in Germany provides a good model for how the UK could encourage transitions between industry and academia during a worker's career. The Fraunhofer's approach to the development of their applied researchers' careers is mission-oriented and industry-led, creating an environment which exposes researchers to industrial demands.

> ***Fraunhofer researchers develop their skills through exposure to the reality of industrial demands – not just academic papers.***
>
> **(Simon Andrews, Fraunhofer UK)**

> ***Fraunhofer states that it has a "mission oriented approach of knowledge transfer, in which a career with Fraunhofer prepares scientists for future roles in industry or business, unless they choose to remain in research.***
>
> **(University of Strathclyde)**

The Fraunhofer system helps set up researchers for careers in industry due to its proximity to business, creating a work culture which is difficult to recreate in academia alone. Researchers with the Fraunhofer thus have their priorities more oriented towards business, having an industrial supervisor as well as the conventional academic advisor. This helps to create a workforce of applied researchers whose first instinct is a career in industry rather than academia.

The UK currently has programmes which aim to deliver a similar result to the Fraunhofers. The main programmes are Industrial Doctorates and Industrial Cooperative Awards in Science & Technology (ICASE) Studentships. Industrial Doctorates provide the opportunity for a current business employee to undertake an industrially-focussed doctorate programme centred on a research project which hopes to solve a business challenge. An Industrial Doctorate enables the researcher to stay in employment throughout the period of study, being co-supervised by an academic supervisor. The benefits of Industrial Doctorates are three-fold, in that they provide a researcher with a highly valued qualification, the business with significant knowledge exchange and the university with an industrial partner to collaborate on innovation.

Industrial Doctorates and Engineering Doctorates could be used as levers for regional economic development – particularly if a new regionally focussed version of the programmes is introduced. Regional Common Industrial and Engineering Doctorate programmes could bring together higher education institutions, regional authorities and regional businesses to establish Industrial Doctorates and Engineering Doctorates that would be tailored to the existing or future industrial requirements of the region[53]. This would help to increase the amount of highly-qualified applied researchers within a region, focussed on the sectors in which their area has a pre-existing or emerging strength – helping to build capacity for innovation.

> ***You could imagine a consortium of local businesses and local universities coming together to create a more regionally specific industrial doctorate programme. I have been talking to businesses who have stated a significant interest in the concept.***
>
> **(Richard Jones, University of Manchester)**

ICASE Studentships provide another opportunity for integrating doctoral studies with industry. The programme facilitates collaboration between an academic institution and an industrial partner to develop a four-year course, with three to eighteen months spent with the industrial partner organisation. The ICASE Studentships are driven by the collaboration of the academic institution and industrial partner, as the outline of the programme is agreed upon and awarded a grant prior to the recruitment of the researcher. Two thirds of funding for a programme comes through a Research Council, with the remaining third being provided by the industrial partner.

The requirement for ICASEs to be developed by academic and industrial partners prior to the recruitment of students places the onus on the higher education institutions to develop links with prospective industrial partners. The Higher Education Commission inquiry encourages universities to develop their ICASE offer, by engaging with new prospective collaborative partners in their region and nationally. This could be done by raising awareness of the programme through university engagement with local business representative bodies, such as chambers of commerce, LEPs and regional authorities. University leadership teams should set targets for growth of the institution's ICASE Studentships, as part of their work to deliver regional economic development and levelling-up.

For mid-career academics and industry workers, industrial fellowships offer the opportunity to bridge the gap between academia and industry. National academies, including the Royal Academy of Engineering and the Royal Society, currently provide notable industrial fellowships which provide the opportunity for mid-career academics or industry workers to work on a collaborative research project in either a business or academic setting. This model of industrial fellowship enables industry professionals with extensive experience working in a business environment to return to academic research. This helps to bring knowledge of industry's challenges and priorities into academic institutions, helping to shape research which is practical and tailored towards real-world applications.

> ***We miss that practitioner expertise that comes in (to a university from an industry professional joining the faculty). It enriches the educational experience, and it also allows more relevance in terms of the research and education.***
>
> **(Richard Dashwood, Coventry University)**

[53] Jones, R.A.L. (2021). Interview with Higher Education Commission.

The Higher Education Commission recommends national academies, including the Royal Academy of Engineering and the Royal Society, should aim into increase the number of industrial fellowships available each year. Universities should also seek to develop comparable fellowship programmes, which encourage industry research practitioners to return to academic research for a period of time. The funding method for the proposed new university industrial fellowships should emulate the funding systems in place for ICASE studentships, relying on a combination of university, research council and industry funding.

As demonstrated, knowledge exchange from industry to academia is a two-way process. Businesses benefit from new knowledge and practices while researchers receiving important business and entrepreneurial skills as part of their engagement with industry. If the UK is to become an R&D driven economy then it will need to continue to develop and promote these vital skills within its research base, in order to help deliver increased commercialisation.

> *If researchers were to develop broader skills and knowledge such as IP, contract negotiations and entrepreneurship, it would improve university and business collaboration and encourage them to commercialise their research. Specifically, we recommend greater strategic investment in entrepreneurship/business development training for PhD students and early career researchers.*
>
> **(NCUB)**

> *Providing more options of innovation and entrepreneurship training in undergraduate and taught postgraduate courses would help increase overall innovation.*
>
> **(University of Bristol)**

> *To achieve this cultural change, we again need to look outside the UK at Germany and the USA. In both these countries there is great encouragement for academics to hold industrial posts to start-up companies, take risks and even fail. Academics having dual roles in industry and academia would be a good step. Academics should also encourage students and researchers to take the step to form their own company and perhaps support as Exec or Non-Exec Directors.*
>
> **(Keith Ridgway, University of Strathclyde)**

Enhanced and expanded Industrial Doctorates, Engineering Doctorates and ICASE Studentships will go some way to further promoting these skills. Support from universities should be given to PhD students so that they can develop these skills, whether through industrial engagement or support schemes such as Liverpool Prosper[54]. Academic institutions should encourage researchers to undertake commercialisation of their research work and should implement mentor or support programmes to assist this endeavour. Cambridge Enterprise is an effective example of a university-backed support body which assists its academics and PhD students to commercialise their research through spin-outs. Cambridge Enterprise provides support for identifying market potential, creating a commercialisation strategy, protecting intellectual property and negotiating contracts with external partners. The crucial professional advice provided by Cambridge Enterprise helps to support partner organisation in their early stage business development and financial planning, increasing the viability of new ventures. An effective support system has helped assist the University of Cambridge to become one of the world's leading centres of academic spin-outs.

[54] National Centre for Universities & Business (2021) Submission to the Higher Education Commission inquiry.

> *The University [of Cambridge] is the leading university globally for investment raised by its spin-outs, ahead of Stanford and MIT, with its spin-outs raising nearly £350m in 2019. The Cambridge ecosystem has been ranked third behind Stanford and MIT as the most successful university technology innovation ecosystems globally with the number of high tech start-ups matching the whole of the famous "Enterprise Nation", Israel.*
>
> (Cambridge University Enterprise)

Supporting academics and researchers to establish spin-outs and commercialise their research should be implemented in conjunction with Recommendation 4, which encourages universities to develop new private finance streams. Establishing investment companies and working with pre-existing venture and seed capital firms will help to boost the survival rate of university spin-out companies. Increased access to capital will be essential to improving the number of successful spin-outs emerging from the UK higher education sector.

> *If we are to capitalize on the potential of our research universities in the levelling up agenda, a key factor will be early and ambitious access to capital to grow knowledge intensive companies in their regions.*
>
> (Cambridge University Enterprise)

Finally, universities can enable greater transitions between academia and industry by reviewing the terms and conditions of their employment practices. The terms and conditions of employment implemented by higher education institutions can often be inflexible and rigid, thereby preventing people from moving backwards and forwards between academia and business. Universities should not force employees to make a binary career decision but should rather facilitate their ability to move between roles, bringing their accumulated knowledge and expertise with them. The Higher Education Commission recommends universities should review their current employment terms and conditions to enable greater career transitions to be possible and encouraged.

RECOMMENDATION 10:

In order to develop an R&D-driven economy, universities should support greater transitions between academia and industry. This should be done by increasing industrial fellowships, ICASE Studentships, industrial secondments and doctorate opportunities. Universities should review their employment practices so that career flexibility is increased for academics and PhD students.

Methodology and contributions

Methodology

To collect evidence for this inquiry, we initially held two roundtable sessions specifically to understand the views of higher education institutions on their role in the R&D eco-system and the levelling up agenda. These roundtables were facilitated by six university mission groups – London Higher, University Alliance, Universities UK, GuildHE, MillionPlus and the Russell Group – which represent a broad spectrum of the higher education sector.

The first evidence session of the inquiry focussed on improving the UK's research commercialisation output and featured several leading representatives from the field of applied research and research translation. This included the High Value Manufacturing Catapult (HVMC), the Advanced Forming Research Centre (AFRC) and the National Centre for Universities & Business (NCUB). The following evidence session engaged with the business community, specifically looking at the challenge of raising innovation output within the UK's SME population. The third evidence session sought to investigate the challenge of regional development, bringing together figures from major businesses, research funding organisations and innovation centres. The final evidence session concentrated on the skills requirement for an R&D driven economy and brought together leading skills providers and education representative bodies.

To enable a great array of organisations to take part in the inquiry, we published a public call for evidence, which posed a series of questions on the main themes and challenges of the inquiry. We received over 30 responses from major organisations in industry, higher education and business representation.

Finally, we conducted interviews with leading figures from a variety of fields, including industry, academia, parliament and applied research. The interviewees provided the inquiry with expert evidence on a wider range of issues and helped to inform the inquiry's recommendations.

The recommendations we propose in this report are aimed at higher education providers, the Government, devolved nation administrations, regional authorities, the UK's Research Councils and central innovation funders. We have aimed to provide recommendations for the whole of the UK and encourage the devolved national administrations and their Research Councils to make use of our recommendations where appropriate.

Evidence Session One

Dr Clive Hickman	Chief Executive, Manufacturing Technology Centre (MTC)
Professor Chris White	Director Industrial Policy, MTC
Dr Joe Marshall	Chief Executive, National Centre for Universities and Business (NCUB)
Professor Keith Ridgway	Executive Chair, Advanced Forming Research Centre (AFRC)
Dick Elsy	Chief Executive, High Value Manufacturing Catapult

Evidence Session Two

Chinara Rustamova	Senior Policy Adviser, Federation of Small Business (FSB)
Henri Murison	Director, Northern Powerhouse Partnership
Mandy Ridyard	Financial Director, Produmax
Darin Tudor	Chief Executive, Defence & Aerospace Innovation Cluster
Dr Beenish Siddique	CEO and Founder, AEH Innovative Hydrogel

Evidence Session Three

Steve Foxley	Chief Executive, AMRC
David Sweeney	Executive Chair, Research England
Jessica Bowles	Director of Strategy, Bruntwood
Dr Victoria Moody	Director of Research & Innovation Sector Strategy, Jisc
Professor Richard Jones	Materials Physics & Innovation Policy, University of Manchester
Dr Jonathan Hague	Vice President Science & Technology, Unilever

Evidence Session Four

David Hughes	Chief Executive, Association of Colleges
Dr Sally Ann Forsyth	Chief Executive, Stevenage Bioscience Catalyst
Professor David Phoenix	Vice-Chancellor, London South Bank University
Professor Robin Clark	Dean of WMG & Director of Education

University Roundtables

Professor Verity Brown	University of East London
Professor Geoffrey Rodgers	Brunel University
Professor David Price	University College London
Professor Maria Delgado	The Royal Central School of Speech & Drama
Professor John Rowan	University of Dundee
Professor Kim Graham	Cardiff University
Professor Richard Dashwood	Coventry University
Professor Paul Ivey	London South Bank University
Professor Karl Dayson	University of Salford
Professor Anthony Hollander	University of Liverpool
Professor Emma Flynn	Queens's University Belfast
Professor Jonathan Seckl	University of Edinburgh
Professor Neil Gow	University of Exeter
Professor Simon Hodgson	Teesside University
Professor Taraneh (Tara) Dean	University of Brighton
Professor Julian Beer	Birmingham City University
Professor Yvonne Barnett	Anglia Ruskin University
Professor Michelle Jones	Plymouth Marjon University
Professor John Strachan	Bath Spa University
Professor Patric Eriksson	Falmouth University
Professor John-Paul Wilson	University of Worcester
Professor StJohn Crean	University of Central Lancashire
Professor Neil Simco	University of Highlands and Island
Professor Jon Timmis	University of Sunderland

Written submissions to the inquiry

Professor Keith Ridgway, Advanced Forming Research Centre (AFRC)
Association of Medical Research Charities
Cambridge University Enterprise
Cardiff Metropolitan University
Derry University Group
Eastern Arc
Engineering Professor's Council
Falmouth University
Professor David Charles, iNCITE, Northumbria University
Jisc
Local Enterprise Partnership (LEP) Network
London Higher
London South Bank University (LSBU)
Make UK
Middlesex University
Midlands Innovation
MillionPlus
Manufacturing Technology Centre (MTC)
National Centre for Universities & Business (NCUB)
Physiological Society
Plymouth Business School, Plymouth University
Salford University
Strathclyde University
Teesside University
University College London (UCL)
Universities UK
University Alliance
University of Bristol
University of London
University of South Wales
Yorkshire Universities / N8 Partnership

Interviews

Sir Jim McDonald	President of the Royal Academy of Engineering
Fleur Anderson MP	Labour Member of Parliament for Putney with
Professor Jean-Noël Ezingeard	Vice-Chancellor of Roehampton University
Barry Sheerman MP	Labour Member of Parliament for Huddersfield
Hetti Barkworth-Nanton	Chief Executive, Ploughshare Innovations
Duncan Engeham	Research & Development Director, Cummins Inc.

Inquiry Co-Chairs

Lord Philip Norton of Louth
The Rt. Hon. Chris Skidmore MP

Academic Adviser

Professor Richard A.L. Jones	Professor of Materials Physics & Innovation Policy, University of Manchester

Higher Education Commissioners

Anne Kiem OBE	Chief Executive of the Chartered Association of Business Schools
Barry Sheerman MP	Labour Member of Parliament for Huddersfield
Professor Sir David Melville CBE	Chair of Pearson Education Ltd, former Vice Chancellor of University of Kent and Middlesex University
Professor Sir Jim McDonald	President of the Royal Academy of Engineering and Vice-Chancellor of the University of Strathclyde
Professor Sir Deian Hopkin	Former Vice Chancellor of London South Bank University
Dr Paul Feldman	Former CEO of Jisc
Heidi Fraser-Krauss	CEO of Jisc
Dr Roberta Blackman-Woods	Former Labour Member of Parliament for City of Durham
Smita Jamdar	Partner and Head of Education at Shakespeare Martineau
Richard Brabner	Director of the UPP Foundation
Professor Karl Dayson	Pro-Vice Chancellor of Research, University of Salford
Lilly Aaron	Policy Manager for Europe, ACCA Global
Jon Wakeford	Director of Engagement at University Partnerships Programme
Professor Rama Thirunamachandran	Vice-Chancellor of Canterbury Christchurch University
Professor Kathryn Mitchell	Vice-Chancellor of University of Derby
Frank Millar	CEO of the Centre for Process Innovation
Rosa Wilkinson	Director of Communications for the High Value Manufacturing Catapult
Tim Bowles	Former Mayor of the West of England
Jayne Brady	Digital Innovation Commissioner, Belfast City Council
Peter Horrocks CBE	Chair of the South East Midlands LEP
Bhavina Bharkhada	Head of Policy & Campaigns for Make UK
Laura Gilmore	Director of Government Relations, Cummins Inc.

About this report

About Policy Connect

Policy Connect is a cross-party think tank. We specialise in supporting parliamentary groups, forums and commissions, delivering impactful policy research and event programmes and bringing together parliamentarians and government in collaboration with academia, business and civil society to help shape public policy in Westminster and Whitehall, so as to improve people's lives.

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About the Higher Education Commission

Policy Connect's Education and Skills team run the Higher Education Commission. The Commission is made up of leaders from the education sector, the business community and the major political parties. Established in response to demand from Parliamentarians for a more informed and reflective discourse on higher education policy; the Commission examines higher education policy, holds evidence-based inquiries and produces written reports with recommendations for policymakers. The Commission is chaired by Professor the Lord Norton of Louth, a Conservative peer and academic and is generously supported by University Partnerships Programme, ACCA, and Jisc.

Acknowledgements

Sponsors

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About University Partnerships Programme

The University Partnerships Programme (UPP) was established in 1998 and specialises in funding, developing and operating academic and residential infrastructure for universities across the UK. To date, UPP has raised more than £3bn of investment in its long-term partnerships with 15 leading institutions. UPP is committed to the long-term success of what is a world class sector and as a consequence is delighted to work with bodies such as the HE Commission to find potential solutions to issues facing a changing sector.

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About the University of Salford

The University of Salford traces its history back to 1896, when the Royal Technical Institute, Salford was established. The university is now a leading higher education provider in the North West region, serving the needs of industry, commerce and education. The University of Salford is renowned for its industry focussed research which seeks to harness the opportunities of the Fourth Industrial revolution.

Find out more at www.salford.ac.uk

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