



Engineering Professors' Council response to the Science, Innovation and Technology Select Committee inquiry into Innovation, growth and the regions

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About the Engineering Professors' Council

The Engineering Professors' Council (EPC) is the representative body for engineering academics in higher education. Our primary purpose is to provide a forum within which engineers working in UK higher education can exchange ideas about engineering education, research and other matters of common interest and to come together to provide an influential voice and authoritative conduit through which engineering departments' interests can be represented to key audiences such as funders, influencers, employers, professional bodies and Government.

We are a unique network: all branches of engineering are represented within the membership: Aeronautical, Civil, Chemical, Electrical, Electronic, Manufacturing and Mechanical Engineering, as well as Minerals, Metallurgy and Marine Engineering and the broad areas of general engineering studies and those in which engineering is combined with a range of other topics. In some universities, frequently those where computing forms part of an Engineering School or Faculty, academic staff in Computer Science are also members.

There are currently 82 institutional members encompassing over 7,500 academic staff (permanent FTE) from all UK nations. There are also Partners, including Royal Academy of Engineering.

The EPC's Research, Innovation and Knowledge Transfer (RIKT) Committee exists to oversee the EPC's work relating to engineering research, enterprise, innovation and knowledge transfer activities and policies at national, EU and international levels. The committee has a specific interest in R&D growth and the regions and offers the following evidence to the inquiry.

Summary

Universities play a pivotal role in a healthy and thriving innovation ecosystem. They are essential for a successful transition of research into industry and for regional growth and economic development. The role of universities as drivers for growth is well documented. Many universities are place-based anchor institutions, critical to the sustainability and growth of their whole region. While significant investments have been made in research and development (R&D), there are more opportunities to enhance these efforts further, ensuring that they are more inclusive and supportive of regional diversity.

EPC has identified a number of challenges that are limiting regional development:

- i. Balancing investment between established excellence and supporting growth:** Finding the right balance between funding world-leading established centres of excellence and investing in regional and local R&D new entities. The UK education system is in an excellent channel to deliver growth, providing world class graduates with a long-standing track record. However, regional development requires engagement with local stakeholders, understanding of regional priorities, and aligning resources with local economic development goals. Effective local leadership and collaboration with national government initiatives is critical in ensuring that region-specific policies contribute to both local prosperity and national economic growth.
- ii. Uneven regional distribution:** While the UK has an excellent start-up ecosystem that ensures a smooth transfer of research results into the commercial world, its geographical spread is concentrated in the South-East and a few large urban areas. More tailored regional strategies could further support local innovation ecosystems and the current devolution plans offer promise in this area. Engineering, which is less prone to gravitating towards urban and financial hubs than certain other sectors, offers particular opportunities for creating regional growth through anchoring activities in higher education institutions.
- iii. Attracting and retaining local and global talent:** The skills deficit in STEM disciplines is significant and has been well established by many studies. The long tradition and strong reputation of British universities all translate into a significant ability to attract top talent from all over the world, especially in critical areas such as engineering. This is essential for a thriving and competitive R&D ecosystem and should be accompanied by the right ways to make maximum use of that talent in all research areas. However, growing local talent is essential, so mechanisms, such as the Degree Apprenticeship scheme, are ideal for addressing demand at a larger scale.
- iv. An insufficiently modernised engineering curriculum:** The skills deficit isn't only quantitative – a skills 'shortage' where we need more engineers, data scientists or project managers, but also qualitative – a skills 'gap' where employees have the capacity to explore, innovate, prototype, test and scale up at an order of magnitude higher speed. Most British universities have been actively reappraising and refocusing their Engineering education for some time and many are progressing well in this process. However, there still is a long way to go for the

sector. The engineering professional associations, Engineering Council and the Royal Academy of Engineering are playing a key role in this process.

v. Limited collaboration between universities, business and local government:

Even where such collaboration exists, there are many missed opportunities especially in using and combining funding coming from various sources (e.g. UKRI, central and local government, Innovate UK, private) to boost innovation and R&D.

1. How does the Government drive research and innovation in our regions?

The Government's role in driving research and innovation across the UK's regions is fundamental to building a balanced and effective innovation ecosystem. Impactful research that contributes to regional development needs to be founded in a deep understanding of the region and in collaboration with business.

Government policies and organisations, such as Innovate UK and Catapults, have played a vital role in bridging the gap between research and market needs by connecting businesses, academia, and government. However, current government support is fragmented and complex, making it difficult for start-ups to navigate. Simplifying these processes and ensuring consistent funding availability, particularly for proof-of-concept projects, would support smoother commercialisation. The current focus on central hubs and centres of excellence can sometimes overlook the opportunities and needs of regional clusters that may not be located in major metropolitan areas but still possess significant innovation potential. By tailoring these initiatives to support regional strengths – whether through sector-specific strategies or targeted funding schemes – government can enhance their reach and effectiveness. This could involve establishing local innovation hubs, promoting cross-sector collaboration, and providing resources and incentives that are specific to the needs of regional businesses and researchers.

1.1 Harnessing devolution

Devolution represents an opportunity to tailor innovation policies to align better with regional circumstances. It allows research and innovation to adapt to the local ecosystem, ensuring that tailored solutions can reach businesses and organisations in a way that works for them and the place they are based. It is not the only solution, but an important component that has often been overlooked over recent years for a more centralised national approach.

However, funding place-based research needs further consideration. The short term, competition-based funding models have resulted in regional disparities in levels of research and innovation. The current focus on 'excellence wherever it may be found' runs the risk of deepening geographical divides, both socially and economically, particularly when excellence is interpreted in terms of scale or critical mass.

By granting more power to local governments, it becomes possible to craft strategies that address the distinct economic and social challenges faced by each area. Local authorities can play a key role as facilitators rather than direct drivers of innovation,

providing the necessary infrastructure, access to markets, and incentives that encourage innovation.

1.2 Tax and regulatory frameworks

A complicated regulatory environment and IP issues can impede progress. The success of innovation-driven businesses depends significantly on a favourable tax system and regulatory environment. Simplifying tax policies, particularly those governing intellectual property rights and market access, can reduce administrative burdens and enable businesses to concentrate on innovation.

1.3 Funding gaps and scaling-up challenges

There is insufficient early-stage investment and a complex funding landscape (e.g., multiple programmes, different requirements and processes), especially outside of the Greater South-East, where over 90% of investors are based. Regional imbalances in funding hinder R&D commercialisation in other regions. A more seamless transition from early-stage research funding to later-stage venture capital investment is also required, with government playing a key role in de-risking investments.

1.4 Skills and understanding

Besides the well-known STEM skills deficit, there is also a shortage of skilled personnel to commercialise R&D effectively. SMEs and entrepreneurs need to understand competitive behaviour, strategy design, and analytical techniques to recognise opportunities and generate organic growth. Spinning out and scaling up opportunities is traditionally difficult. Long-term cultural development is needed. The desire and ambition to spin out needs to be there as well as the infrastructure to support it.

1.5 Research funding

It should be noted that government-sourced research funding (ie. through the funding councils or ARIA) is not usually designed to meet the full cost of the research. Overheads of 20% or more are generally expected to be subsidised by the university. In resource-intensive research areas such as engineering, this can preclude many universities from maximising their research potential, because it would necessitate a cross-subsidy from teaching activities which are themselves generally loss-making or an increased reliance on international student income.

The reliance on international revenue means that certain types of institution become better able to expand their research. This has particular consequences on a regional basis as certain regions and institutions are more attractive to international students.

2. How does research and innovation in our regions drive growth and prosperity in those regions?

2.1 Effectiveness of regional innovation hubs and clusters

Regional innovation hubs and clusters are vital in supporting local communities by providing a collaborative ecosystem where businesses, universities, and local governments can work together. They facilitate innovation by allowing companies to share knowledge, resources, and market access, and by creating opportunities for

networking and collaboration that might not otherwise exist. These clusters bring together a critical mass of expertise and resources that drive job creation, stimulate local economies, and enhance competitiveness. They also enable businesses to access new markets and technologies, reduce the time to market for new innovations, and cultivate a sustainable culture of innovation that can benefit local communities over the long term.

2.2 Measuring, mapping, and monitoring regional cluster growth

To monitor and evaluate the Industrial Strategy effectively, it is crucial to establish a clear set of long-term metrics at the outset which can help drive the priorities within the strategy and create the basis for demonstrating change. Success metrics could include key performance indicators such as job creation, patent filings, business start-ups, venture capital attracted, revenue growth, collaborations between academia and industry, and reductions in carbon emissions. Equally important are measures of collaboration and social impact.

However, alongside these impact metrics, there should be clear shorter-term measures built around the theory of change to support real-time evaluation and a strong focus on the non-quantitative evaluation to ensure that the qualitative aspects of the research and innovation are being successfully achieved.

2.3 Unlocking investment at scale for innovative science and technology companies

Investment at scale is crucial for the growth of innovative science and technology companies in the regions. Large investments can enable businesses to scale their operations, access new markets, and leverage economies of scale, which are essential for sustained growth. To unlock this investment, a multifaceted approach is needed, including creating an attractive investment climate through streamlined regulatory processes, tax incentives, and targeted support for high-risk, high-reward ventures. Local authorities play a central role in facilitating these investments by providing the necessary infrastructure, such as research facilities, business incubators, and co-working spaces, and by fostering a supportive policy environment that encourages private sector investment. By aligning local policies with national economic objectives, local governments can enhance the impact of regional innovation initiatives and ensure they contribute to both local prosperity and national growth.

2.4 Region-specific innovation and growth policies

The diversity of the UK's economic and industrial landscapes calls for region-specific innovation and growth policies. These policies should be tailored to the unique strengths and challenges of each region. Success metrics should also reflect the unique context of each region, as some regions may experience significant growth in industrial investment and high-value job creation, but with lower financial returns due to factors like lower wages. Blunt metrics could obscure these regional variations, so a more nuanced approach is needed. University regional centres could play a key role in developing metrics and supporting longitudinal evaluation of outcomes and impacts.

3. How is research and innovation diffused or supported to drive productivity and growth in the regions, wherever it may come from?

Research and innovation diffusion is essential for driving productivity and growth across regions. The effective dissemination of new ideas, technologies, and business models can significantly enhance economic performance, both locally and nationally. Fostering a dynamic innovation ecosystem that supports the diffusion of research and technology requires strategic investment, collaboration, and ongoing assessment is essential. Innovation thrives on cross-cluster collaboration and interdisciplinary research. Clusters vary depending on their location, level of maturity and infrastructure. Flexible policies for inter-regional or cross-cluster collaboration support local growth while maintaining national capacity. The Offshore Wind Sector Deal is an effective model that could be replicated in other sectors. This initiative identified six key clusters, each supported to build on their distinctive strengths with national coordination, involving government agencies and investors to leverage investment based on their strengths and opportunities.

3.1 Role of Catapults in technology diffusion

Catapults play a pivotal role in supporting technology diffusion and driving both national and regional growth but have traditionally focused too much on centralised models. Innovation opportunities that have reached regions have been short term and limited in size. Catapults not only have the opportunity for national leadership and co-ordination but also horizon scanning and future markets activity to support clusters across the UK. As innovation centres that bridge the gap between research and market, Catapults provide essential infrastructure and expertise to facilitate the adoption and scaling of new technologies. They offer a platform for businesses to prototype, test, and commercialise innovations, helping to accelerate their development and integration into the market. Catapults support technology diffusion by working closely with industry to understand their needs, facilitating access to cutting-edge technologies, and providing the resources needed to transition from research to market. They act as catalysts for innovation by enabling businesses to connect with the right networks, resources, and funding opportunities. This collaborative approach not only drives regional growth by fostering local business ecosystems but also contributes to national economic objectives by enhancing competitiveness and positioning the UK as a global leader in innovation.

3.2 Ensuring tangible outcomes from innovation investments

To ensure that innovation investments deliver tangible outcomes for both local and national economies, it is crucial to focus on targeted support that aligns with economic development goals. One effective approach involves establishing clear metrics for evaluating the impact of innovation investments. These metrics could include indicators such as job creation, productivity gains, increased revenue, market share, and export growth. They should also consider longer-term outcomes like sustainability and resilience of businesses in the face of economic changes. Regular assessments and reviews of these indicators will be necessary to ensure that investments are meeting their objectives and to identify areas for improvement. This will allow for adaptive strategies that can more effectively support regional and national growth.

3.3 Assessing the impact

To accurately assess the impact of Catapults and other innovation investments, a combination of qualitative and quantitative measures should be used. Metrics could include the number of businesses engaged, the value of partnerships formed, the scale of technology adoption, and improvements in productivity and efficiency. Economic impact assessments should also consider broader social and environmental benefits, such as job creation, skills development, and sustainability. These assessments should be updated regularly to reflect changing economic conditions and technological advancements, allowing for adaptive strategies that can better support regional and national growth.

4. How well are universities and businesses coordinating efforts to develop and commercialise research, including the role of spin-outs and collaborative R&D projects?

Universities play a central role in innovation and skills development, fostering international partnerships. By leveraging their global R&D, student, and alumni networks, they can attract investment to the UK and promote regional strengths. These networks serve as platforms for soft power and international collaborations, showcasing UK capabilities and creating pathways for overseas businesses and investors. They also play a crucial role in coordinating efforts to develop and commercialise research, leveraging each other's strengths to translate innovative ideas into marketable products and services. The coordination between universities and businesses in developing and commercialising research is improving, but many challenges remain. Effective collaboration – centred around clear agreements on intellectual property, funding, and shared goals – can significantly enhance the impact of these partnerships. Differences in timelines and priorities between universities and businesses can lead to friction, as universities may focus on long-term research objectives while businesses prioritise immediate commercial returns. Access to venture capital and funding also remains a challenge, particularly for early-stage projects without a proven track record.

4.1 Role of Spin-Outs

Spin-out companies are new ventures created around university research, taking high-risk, high-reward opportunities that established firms may not pursue. Spin-outs enable universities to extend their impact beyond traditional academia by fostering an entrepreneurial environment. However, innovation-based growth from universities shouldn't rely solely on spin-outs. Students at all levels should be encouraged to undertake entrepreneurial activities and stay in the region to develop start-ups. Currently, this isn't happening at scale, and those who do start businesses lack sufficient support and monitoring. There are a number of example of good practice in some universities.

4.2 Collaborative R&D Projects

Collaborative R&D projects are another key aspect of university-business coordination. These initiatives involve pooling resources, risks and rewards, and often focus on joint

development projects that benefit from both academic and commercial input. They enable businesses to access cutting-edge research findings and technologies, while universities gain insights into market demands and commercial viability. Collaborative projects can take various forms, including co-funded research, joint ventures, and strategic alliances, and they are especially effective for developing prototypes, testing new ideas, and advancing technology readiness levels. These collaborations are crucial for translating fundamental research into tangible products and services that can reach the market more rapidly.

5. What is the relationship between investment in innovation and economic growth, both regionally and nationally?

5.1 Role of funding bodies

Funding bodies such as UK Research and Innovation (UKRI) and the Advanced Research and Invention Agency (ARIA) play crucial roles in the UK's innovation ecosystem. UKRI supports R&D across various disciplines, aligning funding with national strategic priorities and addressing market gaps. It fosters collaboration between universities, businesses, and public sector organisations, thereby enhancing the commercialisation of research and technology diffusion.

ARIA, on the other hand, focuses on high-risk, high-reward innovation projects that may not fit neatly within traditional funding streams. It provides flexible funding to drive breakthrough innovations, encouraging creativity and experimentation. By targeting nascent technologies and early-stage ventures, ARIA aims to unlock new markets and technologies that have the potential to transform industries and create economic value.

Good practices like the Innovate UK's KTP programme link applied research to economic growth. The KTP programme, from 2010 to 2020, showed a net economic benefit of £1.7-£2.3 billion, with a return of £4.20-£5.50 for every pound invested.

5.2 Contribution to growth missions

Both UKRI and ARIA are instrumental in delivering the government's growth mission. UKRI's investments in strategic sectors such as advanced manufacturing, artificial intelligence, and clean energy aim to align with national economic priorities and drive sectoral growth. ARIA's focus on high-risk, transformative research supports long-term economic goals by enabling the exploration of innovative solutions to societal challenges. Their roles complement each other - UKRI fostering collaboration and alignment with industry needs, and ARIA taking risks to fund ground-breaking ideas that have the potential to create new industries and markets.

5.3 Measuring effectiveness

To effectively measure the impact of these funding bodies, it is essential to track key performance indicators such as the commercial success of funded projects, the creation of high-quality jobs, and the contribution to regional economic development. Additionally, longitudinal studies assessing the long-term impact of funded research can provide insights into the sustainability and scalability of innovation outcomes.

Evaluating the effectiveness of these organisations also involves understanding their contribution to international competitiveness and their role in positioning the UK as a global leader in innovation.

6. How does the UK's innovation ecosystem compare to those of other countries, and what lessons can the UK learn from international models in terms of commercialising research and innovation to benefit both regional and national economies?

The UK has a well-developed innovation ecosystem characterised by a strong research base, a vibrant start-up culture, and globally recognised universities. It excels in certain high-tech sectors, such as financial technology (fintech), artificial intelligence (AI), and life sciences, which contribute significantly to its economic growth. However, the UK faces challenges in translating research into commercially viable products and services at scale, which can limit the economic impact of its R&D efforts.

The UK's innovation ecosystem lags behind countries like the US, China and Germany on some aspects. Some of the differences are institutional – a much closer collaboration between universities and industry in Germany, others are cultural – a stronger risk-taking culture in USA. The Fraunhofer network of institutes in Germany is also instrumental for the success of knowledge transfer.

In the US and China, a well-developed venture capital ecosystem provides crucial funding for high-risk, high-reward innovations. The UK could benefit from policies that attract more venture capital and private investment into early-stage companies, particularly those in emerging tech sectors. This could include tax incentives for investors, improved access to seed funding, and support for angel investors. The US and China have regulatory environments that facilitate rapid technology adoption. The UK can learn from these models by streamlining regulations and making them more agile to accommodate new business models and technologies. A more adaptive regulatory framework can help businesses scale up quickly and respond to market demands.

The predominantly risk-averse culture in British universities could be addressed with:

- More flexible career pathways accepted and embraced by the universities and funding bodies.
- Embedding innovation and creativity in the curricula.
- Entrepreneurship training and networking opportunities targeting early career researchers.
- Stronger connections between universities and the entrepreneurial ecosystem to open seed-funding opportunities for researchers.

The government, regulators and funding bodies should explore opportunities to facilitate and encourage the above steps through changes to regulation and funding incentives.

The UK's innovation ecosystem could be further strengthened by improving physical infrastructure, such as R&D facilities, business incubators, and technology parks.

Lessons from other countries highlight the importance of creating spaces that facilitate collaboration between start-ups, established businesses, universities, and research institutions. This can help speed up the commercialisation process and increase the success rate of spin-outs and scale-ups.