

The contribution of university research to economic growth





The HE
Sector
Generated **£73** billion¹

Alliance Universities have an impact of £10bn

Universities generate
£86.6 million²
in IP revenue

£376 million
Generated from graduate start ups

Alliance Universities generated 44% of this

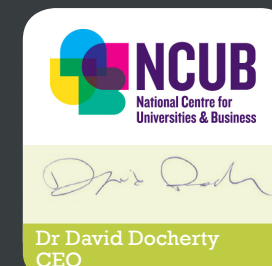
The UK's rich and diverse ecosystem of world-leading research and innovation is a key driver of growth and productivity. At the heart of this, and underpinning the Industrial Strategy, sits a world class research base.

While universities are a key sector partner to the Industrial Strategy through their education exports, there is so much more universities do to drive economic growth.

As well as the direct commercialisation of their own research, innovation generated through business-university collaboration is critical to growth in new businesses and driving efficiencies and value in existing businesses. There is clear evidence to show linking with the academic base results in greater economic impact. And, here in the UK, we are good at collaborative innovation, outperforming nearly every other country in the efficiency and productivity of our university-business activities. These strong and productive partnerships are enabled by our effective support mechanisms for getting the best out of collaboration.

The future economic success of the UK relies on the ideas, knowledge and talent of people from across the country. Universities are central to building this capacity, driving innovation and creating new industries in all our regions.

We each share a commitment to ensuring that the research base continues to contribute to economic growth by driving profits, attracting inward investment and creating jobs across the country. We show here how these efforts are succeeding, and how future policy could add even more value to the research and innovation system.



University research and innovation driving growth



"Alliance universities form a critical part of the UK's research and innovation landscape, delivering innovative industry solutions through close connections with the world around them."

Libby Hackett, CEO, University Alliance

Universities have an essential role to play in the Government's growth plans. University research and innovation encourages investment, exports and a more balanced economy, and university research environments create the highly-skilled and innovative workforce that will underpin the future success of our knowledge-based economy.

The UK has a rich and diverse ecosystem of research and innovation, at the heart of which lie our universities. They are a key driver of growth and productivity: in IP revenue alone the HE sector generated £86.6 million in 2012/13, as well as £376 million from graduate start-ups and a further £2.7 billion from working with businesses. Yet there is a persistent myth that the UK is weak when it comes to translating its scientific achievements into commercial gain.

We must maintain an environment in which excellence in research innovation across a range of activities is encouraged and supported.

Collaboration and connectedness are central to universities' contributions to the growth agenda. Sir Andrew Witty called for us to "embrace the country's density of population and institutions and drive greater collaboration wherever the idea flows", recognising that within this there are many players that have diverse strengths across discipline and approach.

A policy framework that recognises and can build on these diverse strengths, as well as establishing the right conditions for this ecosystem to flourish, is central to resolving the translation conundrum. The development of both Innovate UK and NCUB's roles in recent years have helped to establish such a framework and to provide tools that both universities and businesses can use towards this end. As anchor institutions Alliance universities have particular strengths and experience in bridging and partnering to ensure that ideas generate impact. As the examples here show, these universities combine high quality research with connectedness with businesses of all sizes - from

new spin outs grown directly from university research to strategic partnerships. The results are inward investment, job creation and increased revenues across the country.

We must maintain an environment in which excellence in research innovation across a range of activities is encouraged and supported, wherever it is found.³ This is not just about seeking further investment in universities, but realising potential where it already exists. Recognising existing investment in a significant priority area and mapping this to excellence in research and skills development across the country will unlock extra resource to help drive our knowledge economy forward.

The future success of economic growth in the UK also relies on talented and innovative people. More and more graduates are starting up their own business. Nearly half (46%) of all turnover from graduate start-ups comes from businesses started by Alliance graduates. Universities are the engines to build this innovation capacity. But there are worrying trends in postgraduate research, with falling numbers of taught postgraduate home students and limitations on support for postgraduate research, show that the future pipeline of innovators is threatened. We need to invest in our future now, and ensure that where there is high quality research, researchers are being developed, to keep the UK's economy amongst the most innovative in the world.

The University of Huddersfield's innovative physical organic solutions

University of Huddersfield research in physical organic chemistry has delivered economic, industrial and societal benefits. It has led to process improvements in chemical manufacturing, most notably in the optimisation of the synthesis of antisense oligonucleotides and in the use of liquid ammonia as a solvent. It has also led to the development of new inhibitors of bacterial β -lactamases for use as antibacterials.

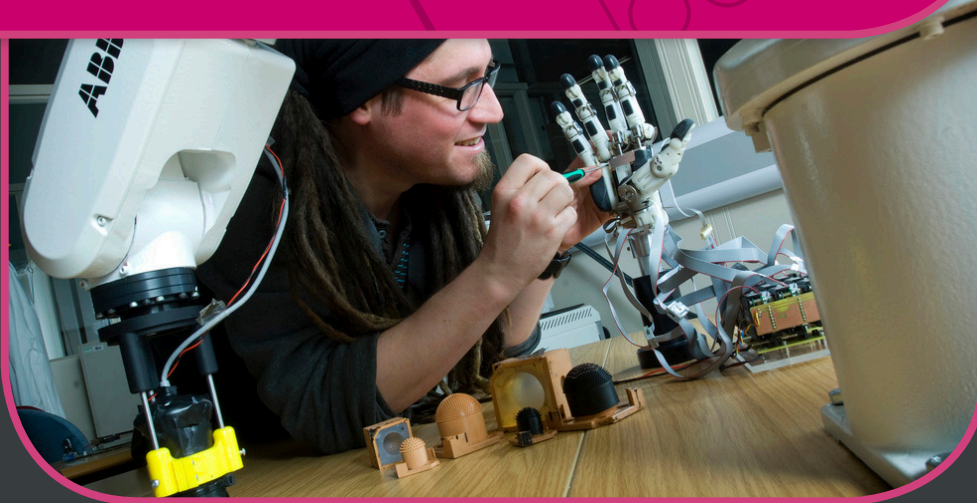
The research team's expertise has been reflected in the success of IPOS (Innovative Physical Organic Solutions), a research unit offering analytical and chemical process development services to the chemical industry, was established in 2006. IPOS expanded significantly from 2009 to 2013 and has now collaborated with more than 150 companies, many of them based in Yorkshire/Humberside where regeneration is critically dependent on the success of new, non-traditional, high-technology firms and industries. Through these collaborative projects, IPOS has contributed to the growth and prosperity of both regional and national industry.

Bristol Robotics Laboratory leading the way

Bristol Robotics Laboratory is the leading and largest academic centre for multi-disciplinary robotics research in the UK. It is a collaborative partnership between the University of the West of England (UWE, Bristol) and the University of Bristol, and home to a vibrant community of over 100 academics and industry practitioners, which lead current thinking in service robotics, intelligent autonomous systems and bio-engineering. It is a unique collaboration that harnesses the collective strengths of its university partners, and brings together the best expertise from industry and the academic community to spearhead Britain's efforts to be a world leader in modern advanced robotics.

BRL maintains strong national and international links with both industry and other research institutes, and has an enviable track record of successful research and innovation, with funding from public and private bodies such as EPSRC, NERC, DSTL, Wellcome Trust, Leverhulme Trust, the European Commission, BAE Systems, and the Gates Foundation. BRL continues to develop its industrial and outreach activity, and provide targeted support to help businesses turn ideas into new products and services.

The Laboratory is currently involved in interdisciplinary research projects addressing key areas of robot capabilities and applications including: embedded intelligence, autonomous robot systems, human-robot interaction, energy autonomy, collective locomotion, tactile sensors and haptic feedback systems, motion tracking/positioning systems, unmanned aerial vehicles, swarming behaviour, dependability, wearable and pervasive systems, medical and rehabilitation robotics, machine vision, and bio-inspired architectures. In addition to its core research activities, BRL offers PhD and Masters level research programmes. The Laboratory also offers a range of taught courses at undergraduate and postgraduate levels.



Rolls-Royce University Technology Centres

Almost 30 years ago, Rolls-Royce began formalising its key university partnerships, concentrating effort with leading groups of academics, and committing to long-standing relationships that would help deliver world-class technology, tools, processes and skills.

This became known as the Rolls-Royce University Technology Centre (UTC) network. The first two universities to join in 1990 were Oxford and Imperial College London, partnerships that remain strong to this day. Today, this network has expanded to include universities from around the world in Europe, North America, and Asia.

This global network allows Rolls-Royce to work closely with an array of talented people, bringing academics, researchers, and students together with the company's own senior engineers through a combination of regular dialogue, secondment, and shared challenges. It is an approach that has brought advantages for all parties, providing stability, engendering trust, and giving access to a wider scope of expertise and experience than might otherwise be possible. Evidence of its success can be seen in many of the Rolls-Royce products in use today. For example, the highly efficient widechord fan blade, seen at the front of the Trent 900, drew on technology developed in partnership with at least six different UTCs, covering disciplines as diverse as material properties, manufacturing capability, aerodynamic design and noise modelling.



Universities and business collaborating for growth



"The National Centre for Universities and Business (NCUB) was born out of a deep belief – based on sound evidence – that open, sustained, networked collaboration between universities and business is a key to prosperity and a good society."

David Docherty, CEO, NCUB

Most international comparators show the UK is already a success at innovation and connectivity. It is ranked third behind Switzerland and Sweden in the 2013 Global Innovation Index, and sixth on university-industry collaboration by the World Economic Forum survey. And it is second only to the US in academic research – as measured by the volume and quality of citations. This world-class performance must not result in the UK being the best contract researcher for other countries' economic growth. It must be turned into profit and jobs in the UK.

The UK's world class innovation and connectivity must be transferred into profit and jobs in the UK.

Policy-makers must focus on linkages that increase the quality and intensity of collaboration. Reflections on the golden triangle of business, university and government must be accompanied by deeper thinking about the role of infrastructure, labour markets, finance and intermediary bodies, such as Local Enterprise Partnerships, Innovate UK, the Catapult Centres and the Research Councils.

Big businesses are the major drivers of successful invention in the UK. Indeed in 2011 small independent firms contributed less than 6 per cent of R&D expenditure, as compared to 56 per cent from the top 50 funders.

Publicly-funded innovation should be a vital resource for small businesses

Commercialising research is inherently risky, and failure rates are high. Big corporations plan for dead ends, but in smaller companies these often end catastrophically. Publicly-funded innovation should be a vital resource for such businesses. Reviews of impact and the case studies of small company success in our 2014 State of the Relationship report repeatedly demonstrate that when businesses develop the capacity to absorb the research they can extract value from universities.

However, as the NCUB's Brighton Fuse and London Fusion projects exemplify, different sectors approach innovation in fundamentally different ways. Processes designed for big science or engineering are likely to be unnecessarily complex and cumbersome for creative and software companies working in product cycles that last months rather than years. Understanding and designing processes for different sectors will help secure specialized technology or business clusters around universities.

The University of Hertfordshire, Extremis Technology and Demco Europe Ltd

The University of Hertfordshire's business services team provide access to dedicated expertise, leading facilities and support from talented graduates helping businesses to grow.

One recent success story is Extremis Technology which creates robust transitional shelters for population displacements and plays a pivotal role in disaster relief. While the team at Extremis had spent significant time on designing shelters that flat-packed for easy portability and yet able to withstand hurricane force winds, they needed independent, high quality testing.

The University of Hertfordshire partnered up Extremis Technology to test and validate the performance of the hurricane shelters under simulated extreme conditions before they were delivered to market. The university carried out 'Computational Fluid Dynamics' testing which helped to determine the maximum wind speed that the shelters could withstand and suggested improvements as well as creating 3D animations to demonstrate the findings. Extremis sees this as a long-term partnership and intends to work with the team again in 2014 on their next shelter project.

The University of Hertfordshire's market research service also assisted library and education professionals Demco Europe Ltd to identify market changes, behavioural developments and the impacts of reform on procurement and financial patterns. The university conducted a two-phase study involving a pilot followed by a national study in nine regions. The research provided key insights with pragmatic values for the businesses, informing their business systems and empowered alignment with academy procurement processes, strategies and suitable routes to market.

Driving business-led innovation through partnerships with academia

Innovate UK
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'Innovate UK is the UK's Innovation Agency. Our goal is to accelerate economic growth by stimulating and supporting business-led innovation. Business-research base collaboration is an integral part of fulfilling this ambition.'

Iain Gray, CEO, Innovate UK

There is evidence to show that the performance of the UK in innovation and business–university collaboration has increased significantly in recent years. In the Global Innovation Index 2013⁴, the UK ranks as the 3rd most innovative country in the world (cf. 14th in 2009/10) and 2nd (cf. 11th in 2008/9) for Business–University collaboration. In addition, the World Economic Forum (WEF) ranks the UK fifth in the world, and second in the European Union, for university-business collaboration in R&D⁵.

Innovate UK observes the following key strengths in the UK innovation system with respect to Business–University collaboration:

- **Effective support mechanisms that enable business-university collaboration;**

We help business on the innovation journey with a range of activities and programmes, each focused on helping to solve specific innovation challenges. Many of our programmes directly enable or rely on effective business-research base collaboration (e.g. Catapults, Catalysts, Collaborative R&D, Innovation and Knowledge Centres, Innovation Vouchers, Feasibility Studies, the Knowledge Transfer Network, and Knowledge Transfer Partnerships). Approximately 30% of our total grant funding is awarded to research base partners and around two thirds of the business-led projects we invest in involve academic partners. This shows that a large proportion of the businesses we work with are choosing to work with the partners within the research base to help them innovate. A recent survey on collaborative R&D carried out by PACEC⁶ identified 'the benefit of academic involvement is clearly demonstrated by the fact that the overall business impacts in projects with two or more academic partners (£9.67) are more than double those in projects with no academics (£4.22).

- **Desire from businesses and universities to collaborate;**

Businesses large and small tell us they value interaction with the UK research base. However, while the UK's Universities are of extraordinary quality and are definitely open for business, there is a sense that we have only just started to unleash the potential. There is evidence to show that SMEs find it difficult to engage with the research base but also that SMEs are positive about the interactions that they have. We believe that more can be done to make it easier for businesses (of all sizes) to work with the research base. Innovate UK views brokerage – helping businesses make the right connections and develop the most productive relationships with the research base – as critical. We are working in partnership with the NCUB, Research Councils

and Hefce to assess how intelligent brokerage can be used to help more businesses engage successfully with the research base and enable easy access to relevant innovation assets (e.g. research expertise, projects, consultancy, IP and equipment).

- **Strong partnerships between key players working to support business-university collaboration;**

The UK research base is world-leading by any measure and it is our goal to maximise business benefit from this. We work closely with partner organisations that share our objectives and goals in this area. Innovate UK has effective relationships with the Research Councils and UK Funding Councils and we are working to further improve the national co-ordination of our strategies and investments to increase the effectiveness of business-research base collaboration.

- **Diversity within the research base;**

There is considerable diversity in the contributions that UK Universities make to facilitate innovation: knowledge generation through publications and education; direct contributions to supporting innovation; and creating and strengthening a supportive environment for innovation which leads to a competitive place that can attract and retain resources and high value added, innovation-driven, organisations.

Tinsley Bridge rises to the occasion

Getting feedback from any happy customer is rewarding. But when a customer tells you that your product has saved lives on the front line in Afghanistan, it takes job satisfaction to a new level.

Tinsley Bridge, a Sheffield steel vehicle suspension manufacturer, had been approached by BAE to help with an urgent problem, and with help from Innovate UK they were able to answer the call. The Army desperately needed to improve the suspension of its Warrior Infantry Fighting Vehicle at its increased protection weight, raise its rise height and maintain its mobility - and time was of the essence.

"They were increasing the weight of the vehicles and the suspension couldn't cope, and they came to us because we are experts in this field - but we needed funding for research and development - and we needed it fast as ongoing deployment necessitated a fast upgrade," explained Mark Webber, Managing Director of Tinsley Bridge.

The company - which now has 174 employees - has forged close links with Sheffield Hallam and Sheffield Universities and is also working with Cambridge University.

"A key reason we have been able to do what we have done is because we have found effective collaborations with universities"

Mark Webber

Making waves in the energy industry - Marine Current Turbines

Underwater windmills are the future of power generation. According to Marine Current Turbines (MCT) of Bristol they are the way forward for a type of green energy that can harness the predictability of the moon's tidal control.

They have ploughed millions of pounds worth of British investment into the concept supported by Research Council collaborations and six Innovate UK grants worth over £6m involving partnerships with a number of UK universities including Plymouth, Queen's Belfast, Exeter and Southampton.

Marine Current Turbines is now considered as a leading tidal stream turbine manufacturer with the most hours of run time on its test machine. And their results are so exciting that after an initial smaller investment leading sustainability organisation Siemens bought the company in 2012.

'Innovate UK hasn't just provided us with key funding it is an organisation that has evolved alongside us to constantly assess the innovation requirements faced by the tidal energy sector and then put out a call to see what can be devised to meet those targets. They have inspired us, funded us and supported us'
David Ainsworth, MCT's Business Development Director



For every

£1

spent by the government on R&D, private sector R&D output rises by

20p
per year in
perpetuity⁷



Businesses invested
£3.6 billion
in university knowledge⁸



The UK ranks as the...

3rd most **innovative**
country in the world

2nd for Business-University
collaboration⁹

UK = fifth
in the
world



2nd in the EU
for university-business
collaboration in R&D¹⁰

1 UUK (2014) *The Impact of Universities on the UK Economy – 2011-12 stats*

2 HEFCE (2014) HE-BCI data 2012/13

3 University Alliance (2011) *Funding research excellence: research group size, critical mass & performance*

4 (May 2013) *The Global Innovation Index 2013: The Local Dynamics of Innovation*

5 (2013) *The Global Competitiveness Report 2013–2014*

6 PACEC (September, 2011) *Evaluation of the Collaborative Research and Development Programmes*

7 J. Haskel, A. Hughes and E. Bascavusoglu-Moreau (2014) *The Economic Significance of the UK Science Base. CaSE*

8 HEFCE (2014) HE-BCI data 2012/13.

9 *The Global Innovation Index 2013: The Local Dynamics of Innovation*

10 World Economic Forum (2013) *The Global Competitiveness Report 2013–2014*

About Us

University Alliance brings together 22 leading global universities for science, technology, design and the professions. Alliance universities have over 300 research units undertaking world-leading research and over 50% of research income in STEM-based subjects. They lead the enterprise and entrepreneurship agenda with over 21,000 business links (including 14,000 SMEs) and generate 50% of all turnover and 40% of all jobs from graduate start-ups, as well as educating nearly 1/4 of all undergraduate and postgraduate students in the UK. Together our aim is to help build a strong future for UK universities by creating a positive and constructive space for debate and new ideas. In doing so we hope to tackle the big issues facing universities, people and the economy.



University Alliance

The National Centre for Universities and Business (NCUB) is an independent not-for-profit business that launched in April 2013, following the Sir Tim Wilson review of university-business collaboration, building on the 25 year history of predecessor body the Council for Industry and Higher Education (CIHE). We are part member funded (comprising universities and businesses) and part funded by the 4 UK higher education funding councils, Innovate UK and the Research Councils. Our vision is to increase prosperity and well-being of the UK, through world-leading business-university collaboration.



NCUB

Innovate UK is the UK's innovation agency. Our goal: to accelerate economic growth by stimulating and supporting business-led innovation.

Innovate UK helps business to innovate faster and more effectively than would otherwise be possible. Bringing together business, research and the public sector, we support and accelerate the development of innovative products and services to meet market needs, tackle major societal challenges and help build the economy of tomorrow.

Innovate UK offers innovation support, through a variety of competitions and programmes, for companies of all sizes. These include Smart grants for prototype or proof of concept work; Knowledge Transfer Partnerships enabling businesses to work with universities on innovation projects; SBRI, which is a pathway to developing innovative products and services for the public sector, and other competitions for funding to enable small and large businesses to work together on collaborative research and development projects. We also offer a range of dynamic Knowledge Transfer Networks where business can find advice, information and collaborators.

In everything it does, Innovate UK seeks to help move ideas for innovative products and services more rapidly towards commercialisation.

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