STATE OF THE RELATIONSHIP
REPORT 2019

CHANGEMAKERS: BUILDING THE FUTURE THROUGH PARTNERSHIP
Where the excellence of our research base and businesses coalesce, we see the greatest expression of what they are capable of together – and that, put simply, is setting the direction of our future economic ambitions.

This State of the Relationship Report is more than a statistical barometer of the health of partnerships between industry and academia. Through its intellectual curiosity, it approaches many of the key issues at the heart of the Government's aspirations for university-business collaboration.

Indeed, achieving these stated ambitions will require deep and intrinsic linkage with the higher education and industrial communities. The demands of our modern Industrial Strategy permit no less.

And with UKRI taking root over this past year and beginning to unlock the opportunities of closer association between its component parts, we see how bringing together the ideals of knowledge creation and economic and social impact can realise immense benefits.

As the Minister chiefly accountable for delivering on our commitment to increase investment in R&D to 2.4% of GDP by 2027, I am deeply aware that there are many moving parts to this aim. But amongst the most critical is the excellent research emerging from our institutions and innovative businesses, and the agility with which each can cross-pollinate and fully realise these ideas. Supporting this activity – and ensuring a free flow of talent and investment – is a responsibility I feel keenly.

We will also continue to support the international collaborations which we, as a nation, have led from the front: not just ensuring the flow of funding to support excellent, internationally mobile research and development; but continuing to create the conditions which make such partnerships fruitful and rewarding in their own right.

And we are committed to doing all we can to uplift productivity across the country; as we see modelled in the deeply civic engagement set out in so many of the case studies in this report: universities, local actors and business communities coming together to align priorities and create opportunities for widespread success.

This Report is a valuable piece of the puzzle for those of us tasked with the responsibility of creating the conditions for fruitful collaboration. But more than that – it animates what those collaborations really mean, what they produce, and how they come to be. It is in this insight that this State of the Relationship Report comes to life, and through the valuable work it captures that the future of our economy will be shaped.
Introduction

This is our sixth annual assessment of the health of collaborative partnerships. The State of the Relationship is an exploration and celebration of the achievements made when universities and business come together to innovate and provide social and economic benefits.

The 2019 State of the Relationship report looks to the future. As we work towards ambitious targets, under reformed frameworks, and with new partners and agencies, we have a vital role as changemakers. Individuals within our member businesses and universities are working to build a post-Brexit UK which is sustainable; both in what we achieve, and the skills needed.

The winds of change are not new to 2019 but bring with them many challenges and opportunities. The overall statistics around the percentage of income received by universities from business, and the number of graduates employed in innovation active sectors, signal a note of caution. Our business and universities members are working together to drive change: spark ideas and envision a brighter future. But clearly we need to do more.

The case-studies, evidence, analysis and thought leadership within this report all consider how to do things differently. How the role of higher education is adapting to the new realities. How to understand the value of an idea and to use it to leverage investment. How to best balance geographies and sectors to achieve more for all.

By working differently and exploring the ways in which universities and business work together, their commonalities outweighing their differences, we can better understand the direction of travel for the UK and steer its course.

Relationships and partnerships are crucial. They are the currency on which our sectors operate and are vital for Britain’s competitiveness in a globalised world. The changemakers who collaborate are building a more innovative, productive and inclusive future for the UK.

Sam Laidlaw
Chairman

Joe Marshall
Chief Executive
If there was ever a year that exemplified the expression – the only constant is change – perhaps 2019 lives up to that billing. Political norms are being re-written. Economic models are being upturned. Societal expectations are changing profoundly.

The new normal is one of disruptive change.

As we take our annual litmus test of the State of the Relationship – we see across our membership universities and businesses evolving to meet and get ahead of these changes. Throughout this report we see exemplars of our members pushing boundaries, challenging established practices and rising to the challenge to do things differently: meeting the challenges of tomorrow, not of yesterday.

Our network is committed to working collaboratively with others and maximising the opportunities this provides. Individually of course many could do much of this on their own. Our universities have a global reputation for excellence in both teaching and research, and our businesses are leading contributors of innovation, people and culture. But they recognise that a collective approach brings strengths and expertise from outside any one organisation, inside, realising true value and benefit. Our members recognise that they are stronger, together.

In an environment of such disruptive change, assuming that the answers and solutions can be found inside any one organisation limits both opportunity and success. Collaboration brings new insights, new perspectives, new approaches. And it brings these to both parties. We can do measure the economic value of interactions between universities and both big business and SMEs. But the partnerships represented through this report demonstrate the mutual benefits of collaborative practices and the strength of working together which go beyond quantifiable returns.

Commitments made by the Government in the Industrial Strategy, especially around uplifting spend on research and development (R&D) in the UK to 2.4% as a percentage of GDP, sets out a direction of travel. It is a call to action to reimagine a future UK economy in which R&D is more deeply integrated. It needs to be driven by industry pull as much as by research push. And this activity should not simply be the preserve of the already research-intensive organisations but one which must pervade all business. From SMEs to international corporates, devising,
developing and implementing new ideas and solutions must become the norm, not the exception. As we set out in this report – the UK has the opportunity to become a genuine ideas economy.

Nurturing and developing that ideas economy is in the DNA of all of our universities.

From cutting-edge research and discoveries through to the training and development of crucial higher-level skills – our universities are critical partners in realising the ambition of an ideas economy. Universities work seamlessly and don’t delineate between or separate out their activities in research, teaching and enterprise. It is all part of what they do and why they make for ideal partners to the businesses who take an equally holistic view of developing and implementing new ideas.

Universities are not immune to challenge. The world around them is profoundly changing and with it they must adapt and evolve to stay relevant. Universities must not only recognise the changes and know how they will respond and develop, but also acknowledge how the partnerships they forge with others are the powerful calling card for the value and worth they offer. And in many ways, they help to insulate them from some of the most pressing challenges.

It is a question of shifting the narrative away from the critics’ favourite of self-interest, to a demonstration of breadth and depth of value. Universities offer benefits locally, nationally and internationally through partnerships and collaborations with others. They must not be afraid to levy their voices as employers, as well as educators. As knowledge-banks and experts in business-critical issues. As innovators and trendsetters as we move into a future UK. To use industrial terminology, universities must articulate the critical role they play in the supply and value chains of their partner organisations.

The opportunity resides in being an integral, indispensable, part of the ecosystem and demonstrating a collective strength.

But for all the positives we know and see of collaborative, partnership working, the uncertainty caused by disruptive changes makes it difficult to get ahead of the curve. Perhaps one of the consequences of the Brexit impasse has been the holding back of decisions; certainly on the business side but to an extent with universities as well. And of course, why wouldn’t it have that impact?
Our university and business members are global, not national. And so their partnerships are global and their working culture is global. Asking them to think nationally is not simple, nor fair. Similarly, we cannot expect our nation’s major employers to launch new talent strategies when they do not know how their recruitment and retention might be affected by changes to migration laws. And what of the partnerships which rely so heavily on funds from Horizon 2020, the European Regional Development Fund and other EU programmes? You’ll see many ERDF logos scattered across the coming pages, but without knowing if that will continue, or how a proposed Shared Prosperity Fund might replace it, then how can they move forwards?

With all the machinations in Westminster over Brexit, there has not been a ground swell of detail from the Government in a number of policy areas. Some of this impasse will eventually lift but the absence of an active partner in Government is keenly felt. It leaves key national institutions such as businesses and universities to fill the void and take the lead. And so they have.

Picking up this mantle is perhaps best seen locally. Collaborations between our industry and university partners are helping to shape local decision making. From capital investments in new facilities through to shared approaches to skills pipelines – partnerships are recognising the role that collaborative practices can bring, and the nascent Local Industrial Strategies bear the hallmarks of this. And with this comes a significant rise in the involvement of SMEs. Year on year we hear greater quantity and quality of interactions with SMEs who are finding the capacity to work with local universities and bigger businesses, recognising the importance of such partnerships.

We’re doing our bit to support this. With konfer, our online innovation brokerage tool, and Placer, our work experience app, businesses – small and large – have easier, streamlined access to knowledge, expertise, funding, equipment and willing partners in the universities open for collaboration.

Collaboration operates across skills as much as it does across research and innovation. And the two are not mutually exclusive in the way policy offerings often suggest. Meeting ambitious targets, being an innovative knowledge-based economy, raising productivity; these challenges all require a talented and skilled workforce.

Embedding the skills needed for future jobs, without knowing exactly what they will be, is one of the greatest challenges that we face. But it is a challenge that businesses and universities are rising to meet. From rethinking technical education, embedding it into different subjects and levels; to developing new pathways at Level 3 which recognise the importance of flexible, steady learning; to blazing trails of new teaching models and a collaborative, employer-led apprenticeship system.

These adaptations all mark an evolution in our understanding of ‘the learner’, which will continue to grow in the coming years. No longer can we see higher education as the beginning of an adult journey which occurs at the age of 18. And as we see recommendations emerge for sector-altering reform, we must take support from the security of our relationships. University-business, provider or employer, higher-education and industry - whichever terms are used should be read correctly. As a link, not an opposition.

We are partners in our delivery of talent and skills for a brighter tomorrow.

As an organisation we are solely dedicated to furthering the quantity and quality of these partnerships. As we enter a new chapter in the organisation’s story, working hand-in-hand with our network of 130 universities and businesses, with the support of our funders, and of our colleagues across the UK Government and the devolved administrations, our mission is renewed afresh. To build a more prosperous, more innovative and more inclusive UK economy. Because we are stronger together.
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The National Centre monitors progress in UK university-business collaboration, tracking annual changes and long-term trends.

All of the data in this year’s Collaboration Progress Monitor covers the 2016-17 academic year, the first academic year to follow the result of the 2016 Brexit referendum result. For the most part, the number of interactions has increased across the board. However, the opposite is true with regards to the value of the interactions, with most averages falling when compared with the previous year.

- Foreign investment in UK universities increased from 2016 to 2017, whereas business investment decreased over the same period.
- With respect to domestic businesses, university interactions with SMEs decreased significantly in the same time, though the average value of the deals did increase. The opposite is true when looking at interactions with large businesses, with an observed growth in the number of interactions but a fall in the average deal size.
- Graduate employment in innovative sectors fell, whereas postgraduate employment rose.

University business partnerships 2017

A decrease in the number of interactions with SMEs by 13% from the previous year was registered by universities. However, there was a significant increase of 21.8% in the size of the average deal. In last year’s Monitor, we reflected on possible early Brexit impacts on the number and size of deals with large businesses; this year, we see a slight increase of 1.6% in the number of deals, but a decrease of 4.5% in the size of the average deal.

In the context of the increasingly diverse nature of knowledge exchange and multifaceted strategic relationships with large firms, an increase in interactions – and attendant reduction in value – is perhaps to be expected.

Universities reported a 33.8% increase in the number of Innovate UK grants from 2016 to 2017. A significant decrease in the size of the average grant - 72.3% from 2016 – was observed. This significant decrease is effected by eight grants for large-scale projects awarded in 2016 above £25m. In 2017, no academic grants awarded by Innovate UK in 2017 were above £8m. Fluctuations in Innovate grants are affected by singular large
Specifically, we look at DLHE data on a share of graduate employment in the following sectors: wholesale and retail; real estate and research; financial activities; manufacturing; construction; electricity; gas and water supply; mining and quarrying.

**Commercialisation in UK universities 2017**

Universities issued 38.4% more licenses compared to the previous year. However, income from licencing activity fell from £125.8m to £101.7m from 2016 to 2017, a fall of 22.0%.

Universities registered an increase of 16.1% in granted patents from the previous year. The total of 1416 patents exceeded the 5-year average, as did the previous year’s total of 1219. The number of spin-off companies that have survived for at least 3 years grew to 1072, a growth of 4.0% from 2016. Taken in sum, these changes suggest a steady increase in the ability of universities to capture and sustain the value of interactions leading to IP, and fewer early exits. An increase in the sustainable stock of high-technology firms in the UK should be supported by emerging policy direction.

**Resources for university business collaboration 2017**

A slight decrease of 1.1% in industry income from knowledge exchange activities (excluding licencing) was reported by universities, falling from £956m to £954m. This contraction is a continuation of that observed in 2016. There was an increase of 8.1% in the share of investment in R&D from overseas sources - taking the total to £1.46bn - with a 2.3% increase in the share of investment from business sources.

Foreign investment trends speak to the continuing attraction of the UK as a place to realise R&D ambitions, at least in the immediate aftermath of the EU referendum. But the overall decrease in business investment is potentially concerning from the perspective of plans to increase investment in R&D to 2.4% of GDP by 2027.

**Knowledge flows between universities and business 2017**

The share of graduates employed in innovative sectors3 fell to 37.5%, falling both by 0.4% and below the 5-year average; though this is a gentle deceleration it is representative of a continuing trend. However, there was an increase of 1.6% in the total numbers of graduates employed in innovative sectors and an increase of 2.7% in the total number of graduates in employment. Post-graduate employment, defined as either in work or in work and study, rose to 74%. This is an increase of 0.63% compared with 2016 and markedly above the 5-year average.
Devolved monitors display 12 indicators tracking collaboration in England, Scotland, Wales and Northern Ireland. For consistency with previous reporting a 4-year average is used.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>England 2017</th>
<th>2017 Average*</th>
<th>2017 Average*</th>
<th>Northern Ireland 2017</th>
<th>Scotland 2017</th>
<th>2017 Average*</th>
<th>Wales 2017</th>
<th>2017 Average*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry income for KE (excluding licencing)</td>
<td>38.2%</td>
<td>36.7%</td>
<td>28.6%</td>
<td>26.8%</td>
<td>51.0%</td>
<td>45.8%</td>
<td>27.8%</td>
<td>26.1%</td>
</tr>
<tr>
<td>Graduate employment in innovative sector</td>
<td>38.1%</td>
<td>37.6%</td>
<td>42.5%</td>
<td>34.3%</td>
<td>38.1%</td>
<td>37.5%</td>
<td>33.4%</td>
<td>34.3%</td>
</tr>
<tr>
<td>HEI deals with SMEs</td>
<td>62,705</td>
<td>54,332</td>
<td>1,419</td>
<td>1,349</td>
<td>12,698</td>
<td>19,433</td>
<td>1,277</td>
<td>1,061</td>
</tr>
<tr>
<td>£ per deal with SME</td>
<td>£2,561</td>
<td>£3,165</td>
<td>£3,221</td>
<td>£3,141</td>
<td>£1,951</td>
<td>£1,811</td>
<td>£4,498</td>
<td>£5,480</td>
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<tr>
<td>HEI deals with large business</td>
<td>19,426</td>
<td>19,895</td>
<td>574</td>
<td>430</td>
<td>4,044</td>
<td>4,992</td>
<td>1,115</td>
<td>894</td>
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<tr>
<td>£ per deal with large business</td>
<td>£27,010</td>
<td>£26,770</td>
<td>£13,115</td>
<td>£16,886</td>
<td>£20,570</td>
<td>£14,743</td>
<td>£10,674</td>
<td>£11,931</td>
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<tr>
<td>Innovate UK academic grants</td>
<td>516</td>
<td>607</td>
<td>28</td>
<td>25</td>
<td>65</td>
<td>66</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>£ per Innovate UK academic grant</td>
<td>£385,950</td>
<td>£234,322</td>
<td>£162,194</td>
<td>£140,801</td>
<td>£282,370</td>
<td>£240,667</td>
<td>£139,092</td>
<td>£126,879</td>
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<tr>
<td>Licences granted</td>
<td>5045</td>
<td>7487</td>
<td>82</td>
<td>87</td>
<td>443</td>
<td>538</td>
<td>357</td>
<td>405</td>
</tr>
<tr>
<td>Income from licencing (£m)</td>
<td>£83.3</td>
<td>£81.3</td>
<td>£8.6</td>
<td>£9.2</td>
<td>£7.5</td>
<td>£9.1</td>
<td>£1.6</td>
<td>£2.1</td>
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<tr>
<td>Patents granted</td>
<td>967</td>
<td>1179</td>
<td>40</td>
<td>46</td>
<td>113</td>
<td>171</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>Spin-offs</td>
<td>698</td>
<td>732</td>
<td>53</td>
<td>53</td>
<td>178</td>
<td>189</td>
<td>94</td>
<td>98</td>
</tr>
</tbody>
</table>

* 4 year average.

**English universities** observed an increase of 0.4% in industry income from knowledge exchange activities (excluding licencing) and a decrease of 0.3% in graduate employment in innovative sectors from 2016.

The number of interactions with SMEs reported by English universities decreased by 19.4%, while the number of interactions with large businesses increased by 1.1%. The reverse was the case with regards to the size of the average deal, with the size of the average deal with SMEs increasing by 30.4% and the size of the average deal with large businesses decreasing by 2.7%.

English universities experienced an increase of 40.5% from 2016 in the number of Innovate UK grants awarded to them for participating in collaborative projects. The value of the average grant offer saw a significant decrease of 74.6%, due to the seven grants in 2016 that had a grant offer of above £25,000,000. There were also increases in the number of active spin-offs in the last 3 years, the number of patents granted, and the number of licenses granted, though there was a decrease in the income from licencing activity.
Northern Irish universities saw a decrease in both industry income from knowledge exchange activities (1.3%) and graduate employment in innovative sectors (8.3%) from 2016.

A significant increase of 62.1% in the number of deals with SMEs was reported by Northern Irish universities. However, the size of the average deal fell by 31.8%. The reverse was true with regards to large businesses, with a decrease reported in terms of the number of deals (20.2%) and an increase reported in terms of the size of the average deal (30.3%).

Northern Irish universities observed a decrease in both the number and the average grant size of Innovate UK grants from 2016 (19.4% and a striking 51.4% respectively). The number of licenses granted as well as the income from licencing activity both increased (42.6% and 14.7% respectively), while the number of patents granted more than doubled. The number of spin-offs active by at least 3 years remained unchanged from 2016.

Scottish universities experienced slight decreases in both industry income from knowledge exchange and graduate employment in innovative sectors.

Increases were reported in both the number of deals with SMEs and the average size per deal with SMEs from 2016, and an increase was also reported in the number of deals with large businesses. However, there was a decrease in the average size per deal with large businesses.

The number of Innovate UK grants increased by 22.2% from 2016, with the significant drop of 61% in the average grant offer due to the value of one academic grant being over £25,000,000. There was increases in the number of patents granted, the number of spin-offs active at least 3 years, the number of licenses granted and the income from licencing activity.
**Welsh universities** reported an increase of 1.1% in industry income from knowledge exchange activities from 2016, with a decrease observed in the percentage of graduates employed in innovative sectors.

While the number of deals with both SMEs and large businesses both decreasing (10.1% and 24.5% respectively), the value of the average deal with both SMEs and large businesses both increased (22.3% and 27.9% respectively).

The number of Innovate UK grants increased by 13.3% compared to 2016, with the average size of the grant falling by 32%. A decrease in number of patents and licenses granted by Welsh universities was reported, though there was an increase in the income from licencing activity. Spin-offs active for at least 3 years increased to 98 from 2016, an increase of 2.1%.

**Progress over time**

As noted, this iteration of the Collaboration Progress Monitor is the first to capture an academic year after the June 2016 EU referendum result. As could be expected, this data does not indicate a swathe of decisions being taken in the immediate aftermath of the result with significant impacts for university-business collaboration – the context of Brexit and other macro influences may be more keenly felt in future versions of the Monitor.

In some cases we see continuations of existing trends. Reduced business investment in R&D and declining value of interactions present challenges for Government. However, the UK’s continued success in attracting FDI speaks to the value of the UK’s research base and structural comparative advantages that will be key to sustaining our innovative economy. And confidence in commercialisation continues to demonstrably grow, with licences and patents continuing to increase in number (though the contraction in income from licencing activity is an interesting development worthy of further investigation).

Going forward, as we see the impact of not just Brexit, but structural and financial changes to support for innovation and collaboration, a more complex picture is likely to emerge. For example, the contraction in number of interactions with SMEs – but continued increase in their value – could accelerate as higher-value interactions are selected.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Definition</th>
<th>5 Year Average 2012-17</th>
<th>2017 Actual</th>
<th>5 Year Average 2011-16</th>
<th>2016 Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry income from KE (excluding licencing)</td>
<td>Income received by universities from large and small business as a share total external income.</td>
<td>38.9%</td>
<td>35.9%</td>
<td>39.4%</td>
<td>37.0%</td>
</tr>
<tr>
<td>Business funds in HE</td>
<td>R&amp;D funded by business and performed by HE as a share of all R&amp;D performed in HE.</td>
<td>4.4%</td>
<td>4.4%</td>
<td>4.4%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Foreign funds in HE</td>
<td>R&amp;D funded by foreign sources and performed by HE as a share of all R&amp;D performed in HE.</td>
<td>16.8%</td>
<td>17.8%</td>
<td>16.4%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Graduate employment</td>
<td>Share of employed (full-time) first degree leavers that are employed in innovation active sectors (as defined in the UK Innovation Survey).</td>
<td>38.2%</td>
<td>37.5%</td>
<td>38.8%</td>
<td>37.9%</td>
</tr>
<tr>
<td>Postgraduate employment</td>
<td>Share of postgraduates in work, or combination of work and study.</td>
<td>71.4%</td>
<td>74.0%</td>
<td>68.8%</td>
<td>73.4%</td>
</tr>
<tr>
<td>HEI deals with SMEs</td>
<td>Number of deals with SMEs reported by UK universities.</td>
<td>73,385</td>
<td>76,165</td>
<td>76,201</td>
<td>87,559</td>
</tr>
<tr>
<td>£ per deal with SME</td>
<td>Average size of deal with SME.</td>
<td>£2,449</td>
<td>£2,852</td>
<td>£2,374</td>
<td>£2,342</td>
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<tr>
<td>HEI deals with large business</td>
<td>Number of deals with large businesses reported by UK universities.</td>
<td>25,042</td>
<td>26,211</td>
<td>24,667</td>
<td>25,794</td>
</tr>
<tr>
<td>£ per deal with large business</td>
<td>Average size of deal with large business.</td>
<td>£24,565</td>
<td>£23,811</td>
<td>£24,213</td>
<td>£24,943</td>
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<tr>
<td>Innovate UK academic grants</td>
<td>Number of grants with academic partners awarded by Innovate UK.</td>
<td>627.2</td>
<td>732</td>
<td>567.8</td>
<td>547</td>
</tr>
<tr>
<td>£ per Innovate UK academic grant</td>
<td>Average size of grants with academic partners awarded by Innovate UK.</td>
<td>£314,211</td>
<td>£226,710</td>
<td>£321,776</td>
<td>£817,478</td>
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<td>Licenses granted</td>
<td>Number of non-software and software licenses issued by UK universities.</td>
<td>5555</td>
<td>8517</td>
<td>4504</td>
<td>6152</td>
</tr>
<tr>
<td>Income from licencing (£m)</td>
<td>University income from licencing.</td>
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<td>£101.68</td>
<td>£87.02</td>
<td>£130.31</td>
</tr>
<tr>
<td>Patents granted</td>
<td>Number of patents granted to UK universities.</td>
<td>1104</td>
<td>1416</td>
<td>986</td>
<td>1219</td>
</tr>
<tr>
<td>Spin-offs</td>
<td>Number of spin-offs still active after three years of their creation by UK universities.</td>
<td>1012</td>
<td>1072</td>
<td>998</td>
<td>1031</td>
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</table>
An economy built on ideas

The UK currently invests significant funds into the innovation and realisation of ideas, largely thanks to our high-quality research expertise. But as we move towards a new international outlook, the UK's place in the world will undoubtably shift and adapt. The rules for the innovation game are changing.

So how can we ensure that our ideas still bring value to regional and national economies? Should we still be focusing on leveraging investment to innovate products and services, or can ideas alone drive the economy? And what does this mean for university-business collaboration?

This section of the State of the Relationship report imagines a world in which ideas are the currency of economies, markets and relationships. We asked our members to tell us about collaborations which focused on; developing ideas; gathering investment; innovating a product or service; or creating an income stream.

Each of the case studies in this section has focused on one of these areas, creating a vision for a future UK. Some have worked through the ecosystem of idea – investment – innovation - income. Others have taken an idea and turned it directly into income. Some have created products: others, services or facilities. In the case of the London School of Economics, they have examined how an idea can impact the income of others by affecting their investment.

We look at all of these against the backdrop of investment in R&D. NCUB analysis considers whether the target to increase spending on R&D a proportion of GDP to 2.4% of GDP by 2027 is challenging, or unambitious. We also evaluate the role of developing the skills base to meet this target, while Sarah Main, Director of CaSE, talks us through the role of 2.4% as a counter-point to Brexit: an investment in UK strength in turbulent times.

Meeting this target must involve looking oversees. Graeme Reid, Strategic Advisor to NCUB, discusses the role of international partnerships and his work with Sir Adrian Smith's review to ensure that the UK retains its global position. Collaborative partnerships usually require funding and support. Colin Cooper, Head of Commercialisation and Collaboration from Innovate UK explains how his organisation works to provide funding excellence for ideas, driving forwards the Industrial Strategy.
An economy built on ideas

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The Government has set a course to double the UK’s research capability over ten years, which has the potential to create a more scientifically-enabled economy, drive productivity across the UK and make the UK a partner of choice among the world’s knowledge economies. This long-term strategy can be seen as a counterpoint to Brexit, an investment in UK strength that will see us through turbulent times.

The referendum on leaving the European Union, and elections since, have shone a light on differences in society. For the Government, investment in the UK’s research capability is linked with an attempt to tackle differences in prosperity across the country through the Government’s Industrial Strategy, whose central objective is, ‘to increase living standards and economic growth across the UK’. As the Prime Minister said in her foreword the strategy aims, “to make our United Kingdom a country that truly works for everyone” or, to borrow a phrase from across the dispatch box, “for the many, not the few”.

At the heart of the Industrial Strategy is a manifesto commitment to raise spending on research and development (R&D) as a proportion of GDP to 2.4% across the economy by 2027. The Labour Party and the Liberal Democrats made similar manifesto commitments at the last election, with similar intent.

Science has therefore become part of a social justice agenda which is likely to persist as a priority through transitions in political power.
According to calculations by the Campaign for Science and Engineering, reaching this goal will require doubling R&D spend from £35bn to £65bn over ten years. If achieved, this would represent the most significant shift in the contribution of science and innovation to our economy in decades. It would require not only multi-billions from the public purse, £7bn of which has already been committed, but tens of billions of new investment in the UK from research-intensive industry, large and small. In a time of uncertainty, that is no mean feat, as research-led industry often values long-term stability for innovation to bear fruit.

It seems to me that the input and the output are held in tension. Raising investment in R&D across the economy is an input. Improving living standards and economic growth is an output. There are many strategies one can consider to raise R&D investment in the UK, and Government and UKRI are indeed doing so. Which you choose might depend on whether your priority is the input goal or the output goal.

“For me it is not enough to see growth in the national economy if your local economy is shrinking.”

Theresa May, Prime Minister

A step-change of this scale will, and should, create an effect. What difference do you want to notice in ten years’ time as a result of this effort? Perhaps it might be better career opportunities, discoveries that improve health, wellbeing or the environment, or ingenuity in services delivered well.

Science has value for society in enabling discovery, exploration and innovation that can improve individual wellbeing and national competitiveness. I wonder, though, if there is a risk that while those with the agency to do so will benefit from a more scientifically-enabled economy, others may feel yet more detached from an accelerating frontier of research and innovation. Therefore, the most important challenge I see is to ensure that everyone is equipped to participate: in research and innovation itself, in debate about how it is used, and as users of innovation. In order to accomplish this:

We need a ten-year education mission to complement the R&D investment mission to truly transform the UK’s economy and future.

A mission on education would, quite rightly, supply the talent to deliver and sustain a newly-elevated level of research and innovation in the UK. As Sir John Kingman, Chair of UK Research and Innovation, has said, fifty per cent more research will require fifty per cent more researchers. But another important civic goal of the education mission would be to enable everyone to participate in an accelerating knowledge and innovation economy, as citizens and commentators as well as researchers. This would avoid the widening of perceived or real divisions and may make it more likely that the benefits of research and innovation are felt across society.

For example, Foreign Direct Investment into a location of existing research and innovation excellence might yield large gains in reaching the input goal of attracting billions of additional pounds of private R&D. But it might fail the Prime Minister’s social reform challenge in the opening paragraphs of the industrial strategy.

This characterises the challenge of funding research in a way that supports both excellence and prosperity in different places. In an environment of a rising budget for research and innovation, we should be able to accommodate these various needs in a conscious and purposeful way.

A transformation of the nature of the UK economy of this scale will require political commitment. Cross-party consensus on its importance for UK society needs to be backed by cross-Government consensus. Trade, immigration, education, business and Treasury need to be united in their ambition to deliver it, and all departments could adopt new research and innovation into their own work. This is a challenge for those hoping to lead the next administration to embrace.
Turning ideas into £36million with the University of Sussex

Enterprise Therapeutics, a biopharmaceutical company dedicated to the development of novel therapies to improve the lives of patients suffering with respiratory disease, is working with the University of Sussex to build research and expertise in the UK’s increasingly vibrant biotechnology sector.

“When we started Enterprise Therapeutics, we just had ideas about what we would do. We had no assets and no drugs – just a blank sheet of paper.”

Professor Martin Gosling, Chief Scientific Officer, Enterprise Therapeutics.

Those ideas have resulted in a pipeline of therapeutic assets, and have proven powerful at securing venture capital funding. Enterprise raised £1.6 million in 2014, £2.4 million in 2015, another £4 million in 2016 and then £29 million from five venture capitalists in 2018.

The university already had a successful drug discovery group, the Sussex Drug Discovery Centre, within the School of Life Sciences. Enterprise Therapeutics has helped diversify the group’s focus to include respiratory disease, and helped it grow. The University of Sussex holds shares in the company and has four post-doctoral researchers fully funded by the company carrying out research in its labs. Enterprise has been able to focus its efforts on executing the drug discovery programs rather than building scientific infrastructure, allowing rapid progression. This benefits both partners – Sussex, a leading UK university, is now affiliated with a successful UK respiratory biotech company.

Enterprise Therapeutics launched in 2014 with the aim of developing new therapies to regulate mucus congestion to treat respiratory diseases, with a primary focus on cystic fibrosis (CF). People living with CF have a gene mutation which leads to a protein not working correctly to move chloride to the surface of the lung. Chloride is important because it attracts water through osmosis. Without water, the lungs build-up thick, sticky mucus filled with pathogens, leading to chronic infections. More than 70,000 people around the world are living with CF; the median age of death of a CF patient is around 31. New medicines could bring relief and prolong patients’ lives. They could also benefit millions of people living with Chronic Obstructive Pulmonary Disease, chronic bronchitis and severe asthma.

“Enterprise Therapeutics is a spin-in rather than a spin-out,” Gosling said speaking from his office at the Sussex Innovation Centre. “The company was founded before I joined the University of Sussex, so it’s not the traditional trajectory. We had a company with ideas and have found a synergistic interaction with the University of Sussex.”

Enterprise Therapeutics’ research is focussed on two complementary therapeutic strategies. The first targets specific ion channels found in a cell’s membrane, to allow ions to pass in and out of the cell in order to hydrate and thin the mucus. The second reduces the number of cells creating mucus in the airways from the offset. The company plans to begin testing the medicines modulating ion channels on patients next year.
Cleared for take off: Innovation soaring at Cranfield’s AvTech hub

The Cranfield University Eagle Lab is a dedicated aviation and aerospace technology incubator, building cross-industry relationships with the support of Barclays.

Cranfield’s Eagle Lab is a specialist business incubator, located in the heart of the University campus. One of the first cross-industry collaborations to accelerate the development of AvTech, entrepreneurs are benefiting from advice, mentoring and equipment from Barclays’ experts and world-class specialists at Cranfield University. The Eagle Lab forms part of Cranfield’s broader aviation, innovation and entrepreneurship initiative.

“The Lab marks the first step in helping SMEs develop the industry’s technologies of the future. We have secured significant leveraged funding from the Garfield Weston foundation to support the creation of the Eagle Lab and the wider innovation and entrepreneurial ecosystem across the university.”

Professor Tom Stephenson, Pro-Vice-Chancellor for Research and Innovation, Cranfield University

Cranfield’s Eagle Lab includes hot desks, private offices, meeting rooms and breakout spaces. It has a fully-stocked Maker Space, supporting rapid prototyping and product development - facilitated by dedicated staff, including Ecosystem Manager, Elizabeth Boadi, who explains “We already have a number of tenants and are holding around three events every week to raise awareness, offer support and one-to-one advice for individuals and businesses to innovate and grow. We are also working closely with South East Midlands Local Enterprise Partnership and local Chambers of Commerce to support businesses in the region realise their ambitions.”

Robin Gojon of HEROTECH8, is one of the first tenants at Cranfield’s Lab. “Cranfield’s Eagle Lab has already given us huge support, in particular, connecting us with global businesses and government organisations to help us develop our automated drone service platforms.” The opening of the Lab - one of 20 across the UK - follows Barclays’ launch of a £370m investment fund for small businesses in the Midlands to help generate economic growth. The fund is working in tandem with the government’s Midlands Engine Investment Fund to boost targets of supporting over 1,400 smaller businesses and creating around 3,800 new jobs.

Benjamin Storey, Head of South and East Eagle Labs, said, “Cranfield Eagle Lab is perfectly placed - both in terms of its AvTech industry focus at a world-class University, and in terms of location - to support innovation and growth of businesses across the South East Midlands. We are focused on creating jobs, securing funding and helping businesses scale. Together we offer connectivity and a wrapper of support for entrepreneurs looking to succeed.”

Cranfield is one of the leading aerospace universities in the world and home to the UK’s first digital air traffic control centre. Here, with unparalleled access to globally renowned facilities and a network of potential clients, investors and mentors, the Eagle Lab is helping entrepreneurs turn AvTech ideas - from automated drone servicing to artificial intelligence for engineering and autonomous vehicles - into thriving businesses.
The 2.4% target: challenging or unambitious?

‘2.4%’ is a frequently-referenced number in this report. Government’s target to increase R&D spending to this figure as a percentage of GDP by 2027 has taken on considerable weight – and right now, everything is seen in the context of this commitment.

As the present OECD average, 2.4% is a serviceable aim. The UK sat on 1.7% in 2016, with South Korea surging ahead well past 4%; the EU28 average was 1.9%. Dependent on your point of view, 2.4% is either a challenging target requiring concerted effort to achieve, or in a global context, the unambitious treading of water. It seems fair to say that whilst the UK economy may not be optimised to create and absorb R&D in the same way as South Korea’s, we can certainly do more than we are.

The scale of the challenge – and opportunity – is considerable. Around a third of R&D is publicly funded with two-thirds funded by domestic and overseas business. We’ve already seen increases in public sector spending in recent years alongside the Industrial Strategy; most models anticipate that this will help crowd in private sector spending, alongside other ecosystem-related incentives which will encourage business to invest further.

The prize is potentially great. Investment in R&D activity, properly stimulated and allowed to flourish, brings with it increases in productivity – addressing an historic problem for the UK. And improving the diffusion and absorption of R&D across the country can help to address regional economic imbalances. This cannot be done without greater business investment.

That isn’t to say that businesses will blithely follow this ambition. Their own strategic drivers will take precedence over an abstract policy goal; Government has to do their part to create favourable conditions. Fortunately, the UK has some embedded advantages to leverage, and this needs to happen quickly to act against environmental deterrents such as Brexit uncertainty.

The excellence of our research base, and the rich rewards of university-business interaction, are a cornerstone. Mutual sharing of insights, processes and cultures which sharpen collaborative R&D and promote its diffusion are all indispensable parts of the national arsenal. The UK is already a magnet for foreign direct investment in R&D in part due to these structural comparative advantages.

We know Government and UK Research and Innovation (UKRI) are working on a roadmap to 2.4%. Instruments like the Industrial Strategy Challenge Fund will continue to move the dial and Sir Adrian Smith’s review of future frameworks for international collaboration in research and innovation will no doubt identify key opportunities to blend excellence with impact. But we also require a clear articulation of the role such investment can play in improving a private firm’s outlook and broadening its perspectives, and a sense of the potential which public and private funds and measures can unlock together for the innovation environment at large.

Government must also pull policy levers to maximise investment in R&D both from domestic high-growth innovative firms, and large-scale FDI. Creating an ecosystem favourable to each – encouraging a channel of public and private capital into domestic high-growth propositions, whilst being compellingly attractive to overseas investors – is the circle Government needs to square to sustain our reputation as an attractive and welcoming place for global ideas, people and capital.

R&D is changing and our definitions of it – and approach to it – need to keep pace. To do that, we have to think big. We need to take a progressive approach to improving our collective understanding of what modern R&D really is and where it takes place. Together, these measures can help to realise a new vision for the UK.
PhD Research Develops into Start-up Company

Severn Trent supports University of Exeter EngD researcher to develop his research into a business that provides sustainable water management solutions.

The Centre for Water Systems (CWS) at the University of Exeter is an internationally leading centre for water engineering research. The strength of the Centre is research into hydroinformatics and urban water management, and Centre staff have been key players in the initiation and on-going development of these topics. Severn Trent have been working with the CWS over the last 10 years and have supported several PhD and EngD students.

David Butler, Director of the Centre for Water Systems, said “It’s vital for us to work with leading players in the water sector, such as Severn Trent, as it helps us to co-create our research and enhance its applicability for the real world”.

Severn Trent is the UK’s second biggest water company. It serves 4.1m homes and business delivering almost two billion litres of water every day through 46,000km of pipes. A further 94,000km of sewer pipes take wastewater away to almost 1,000 sewage treatment works. Since 2013 Severn Trent have brought this expertise to Safe & SuRe, a £1.5 Engineering and Physical Sciences Research Council funded fellowship project led by the CWS. The project aimed to develop sustainable and resilient solutions for urban water management at a time of global uncertainty. Severn Trent played an important role in the steering group and was instrumental in working with academics to identify knowledge gaps and potential applications of the research.

One application is in the development of OTA Analytics, a Safe & SuRe spin out company, which provides real time control solutions for utilities, commercial customers and domestic installations. The company facilitates development of novel predictive analytics tools and hardware which can support water companies to remotely monitor and control decentralised rainwater and stormwater assets.

“We need innovative ways to help solve the issues that we face today. Collaborating with a leading academic centre, such as the Centre for Water Systems, helps us be at the centre of new research and places us in a strong position to collaborate. We want our work with universities to create impact and are proud to have supported Pete and now OTA as we trial new approaches to industry wide challenges.”

John Brewington, Innovation Manager, Severn Trent

Founder and Managing Director Dr Peter Melville-Shreeve worked on the Safe & SuRe project and undertook his Engineering Doctorate in collaboration with Severn Trent. Dr Melville-Shreeve explains how having the support from Severn Trent helped to build the company. “The sheer scale of the Severn Trent network, along with the go-forwards attitude of the Innovation team helped OTA build a business plan and identify an investor partner. Since then, we’ve gone from strength to strength building a specialist team of experts whilst continuing to pursue innovative solutions to help build resilience in the water sector.”
Exploring corporate climate risk: the Transition Pathway Initiative

In response to climate change, the world is starting to transition to low-carbon economies. Institutional investors are considering the implications on their portfolios, worth in aggregate over £60 trillion. The Transition Pathway Initiative and the Grantham Research Institute at LSE are providing valuable information to investors to guide their investment decisions.

The Transition Pathway Initiative (TPI) was established in January 2017 by the National Investing Bodies of the Church of England and the Environment Agency Pension Fund in the UK, and is backed by institutional investors, pension funds and asset managers. Their collaboration with LSE’s Grantham Research Institute mobilises cutting edge research on how different sectors and companies are responding to the challenges of transitioning to a low carbon economy, and their preparedness for the risks and opportunities the transition brings.

“Businesses should be able to explain to investors how they plan to manage climate change risks, invest and innovate on the way to the future zero-carbon economy. With the launch of the TPI, asset owners from around the world are sending a strong signal that portfolios will align in the future with companies that are taking the transition to a low-carbon economy seriously.”

Emma Howard Boyd, Chair, Environment Agency (UK)

Researchers at LSE devised a bespoke methodology evaluating how companies respond to climate risk using data provided by FTSE Russell. LSE researchers worked with asset owners to produce a free and publicly available online tool assessing companies’ preparedness as well as sectoral analyses. “We’re analysing how comprehensively companies are reporting on climate risks, whether those risks are being strategically recognised and managed and, if they are, whether performance is at a level which matches international ambition in terms of emissions reductions,” says Professor Simon Dietz who leads LSE’s engagement with TPI. This includes evaluating performance against both national and international climate change pledges under the Paris Agreement.

274 companies across 14 high carbon sectors have been analysed and the results reveal stark variations in progress in addressing climate risks. Analysis of a broad range of companies – from airlines to aluminium; from automobile to paper – has generated considerable global media coverage in both mainstream and specialist press. Since the TPI’s inception the number of supporting institutional investors and asset managers has doubled: more than 40 investors with £10.3 trillion assets under management. One such investor, Bruce Duguid of Hermes Investment Management says, “The TPI provides a useful framework for setting stretching but feasible corporate engagement objectives on climate change. We have already piloted this approach in our engagement with coal-exposed companies.”

The TPI has received recognition from the finance sector, winning the Driving Change Through Education, Training & Academia award at the Finance for the Future Awards in 2018. These international accolades are designed to share global best practice as well as create and develop a community of finance leaders committed to drive sustainable outcomes. It has also gained official recognition from the Principles for Responsible Investment, the leading proponent of responsible investment worldwide, supported by the United Nations. TPI is fast becoming the go-to benchmark for assessing corporate climate risk preparedness.
Commercialising Environmental DNA (eDNA)

Successful collaboration between SureScreen Scientifics Ltd and the University of Derby paves the way for research excellence in eDNA to be shared with commercial partners. Developing new ecological surveying services and a new revenue stream for SureScreen and delivering research impact and outputs for the University of Derby.

SureScreen Scientifics Ltd, based in Derby, specialises in forensic analysis, providing expertise in material failure investigation. The collaboration with University of Derby enabled SureScreen to diversify into the ecological surveying markets. As a result, SureScreen now offer eDNA analysis for rare species such as Great Crested Newts and Crayfish, with the potential to detect and monitor invasive species with a detrimental impact on native populations.

The research collaboration between the University and SureScreen has consisted of:

- Contract research for several eDNA projects
- Industry sponsored research PhDs and technical support
- Student and graduate talent supporting SureScreen’s analytical workload
- Research on SureScreen’s enhancing industrial eDNA services

Recognising the growth opportunity related to eDNA, SureScreen required capital investment in a new facility. University of Derby was able to provide access to financial support via their Invest to Grow (ITG) programme. The funding provided the company with the confidence to invest in new facilities for its eDNA work. The ITG award formed part of an overall investment of £228,000 allowing SureScreen to offer enhanced services to customers, increasing the capacity and breadth of its market offer.

David Campbell, Director at SureScreen, commented: “This led to a significant increase in both our sales and profitability over the first year, with both increasing by double-figure percentages”.

This relationship is an excellent example of how developing synergies between industry and Higher Education can lead to the adoption of innovative techniques and approaches in an industry setting.

“We are working with a lot of companies that we did not work with previously. The project has enabled us to diversify our offer. We would be keen to consider employing graduates and post graduates from the University of Derby moving forward.”

David Campbell, Director, SureScreen

These innovations, driven by regulatory need and demands on clients to have a more reliable surveying technique, provide SureScreen with an opportunity to respond with an appropriate service, whilst being directly connected to the research base and informing the teaching of the University.

The collaboration between SureScreen and the University shows how sustainable interaction between industry and a university can act as a catalyst for social and economic benefit to the city of Derby through the commercialisation of research with local partners.
Skills for leading innovation

The UK is a global leader in research: our business and universities are producing world-class innovation, particularly when they work together. But behind the organisations lies a workforce comprised of individuals with innovation skills and attitudes.

A great deal of this report in reference to the 2.4% target requiring different levers to be pulled to increase domestic and foreign investment. But the target also needs a skilled workforce. Does the UK have the innovation skills it needs; and if not, how can we develop both the capabilities and the capacity? Generally, there are three ways an economy or individual organisation can meet its skills needs: build, buy or borrow.

Build

In the aftermath of the Industrial Strategy the UK is substantially increasing its capacity in innovation skills - the 2018 Autumn Budget increased the National Productivity Investment Fund (NPIF) to £37bn. Further funding initiatives include:

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<th>Fund</th>
<th>Amount</th>
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<tr>
<td>Future Leaders Fellowship (part of NPIF)</td>
<td>£900m</td>
</tr>
<tr>
<td>Doctoral Training</td>
<td>£100m</td>
</tr>
<tr>
<td>Turing AI Fellowships</td>
<td>£8.5m</td>
</tr>
<tr>
<td>Rutherford Fund</td>
<td>£100m</td>
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</table>

Buy

Buying skills in the labour market usually involves graduate recruitment. Our Collaboration Progress Monitor demonstrates that graduate employability in innovative sectors fell by 0.4% this year, bringing it below the five-year average. This deceleration is the continuation of an existing trend as you can see below. However, there was an increase of 1.6% in the total number of graduates entering sectors of innovative employment. A lack of supply makes the ‘build’ initiatives ever more crucial.

<table>
<thead>
<tr>
<th>Share of graduates employed in innovative sectors</th>
</tr>
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<tbody>
<tr>
<td>39.1%</td>
</tr>
<tr>
<td>2017</td>
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</tbody>
</table>

Borrow

The mobility of researchers is, and will continue to be, crucial to UK economic success through innovation. The greatest barriers to this are:

1. Funding is insufficient, particularly for researchers to gain experience outside of academia.
   To tackle this, a new Innovation Scholarship scheme from UKRI will fund secondment between sectors, with a focus on university-business mobility. This supports organisations to fill skills gaps while strengthening relationships and facilitating wider knowledge exchange.

2. Awareness is low and sectoral differences of language, expectations and function create information gaps around opportunities.
   konfer, the NCUB intelligent brokerage platform, allows users to search for subject-specific expertise from over 100,000 individual profiles across the UK, streamlining the borrowing of skills procurement.

Key to providing the skills needed to retain the UK’s global reputation for excellence will be increasing the talented and innovative researchers from a diverse range of backgrounds, specialisms, experience and sectors. It is encouraging to see the emergence of long-term talent strategies allowing universities and business to build, buy or borrow required skills, and the investment to realise such efforts.
Partnerships: The life blood of business innovation

Digital leader Cisco sits at the forefront of the technology revolution with innovations in self-sufficient buildings, digital campuses and AI Research while investing in people and nurturing future experts.

Cisco's Country Digital Acceleration (CDA) programme is committed to UK digital projects and investments that both align to the Government Digital and Industrial Strategies and encourage economic growth. And many of these exciting initiatives are taking shape in our universities.

Cisco is demonstrating that academic-commercial partnerships and student mentorship aren’t simply the meeting point for great ideas; these reciprocal relationships offer valuable opportunities to solve major challenges together, exploring the leading edges of technology, benefiting the economy, business and communities - and improving people’s quality of life. Which is what digital innovation and skills development should ultimately be about.

Cisco and Coventry University

Technology should of course, ultimately be about improving people’s day-to-day lives, which is the impetus behind Coventry University's digital campus environment. With Cisco's technology platform already in place, the university is creating a frictionless environment that enhances student experiences and aids staff productivity.

Cisco and The Open University

Nurturing future experts is as important as investing in digital innovation; after all, who will drive technology evolution in 20, 30 or even 40 years’ time? Cisco works directly with students through its International Internship Programme while its Networking Academy has trained over 9 million people worldwide and aims to enhance the digital skills of 2 million students each year by 2020. It also supports teachers with the Open University Cisco Academy, helping tutors train around 600 students each year.

Cisco and UCL

In 2018, Cisco consolidated this 30-year partnership with the announcement of a new AI Research Centre which is one of the world’s largest AI post-graduate training facilities and it aligns to the Government’s Sector Deal for AI. Housing 200+ students, researchers and academic leading lights, it brings together today’s experts and tomorrow's talent to tackle real global problems.

Cisco and Swansea University

A different type of productivity drives Swansea University’s CDA-supported SPECIFIC initiative. With the building sector globally responsible for 30% of energy consumption and over 55% of electricity demand, SPECIFIC is using next-generation technologies to develop self-sufficient buildings that produce, store and release their own energy. This minimises environmental impact and offers greater control over energy, while also supporting future industry advancement.

Cisco and Imperial College London

Student hackathons are not only great fun; they also give young people an opportunity to demonstrate their creative engineering flair and solve problems, giving them confidence in their abilities. In January 2019, Cisco participated in the UK’s largest ever student-run event organised by Imperial College’s Department of Computing Society. The 24-hour IC Hack offered hundreds of participants access to Cisco development tools, including Cisco’s global DevNet platform.
Transport for London: Imagine better advertising

A Bournemouth University research team sparks university to business collaboration and increases advertising revenue throughout the Transport for London network using pioneering research technology.

‘The Engagement Zone’ is the world’s largest study into audience’s mind-sets and responses to ‘Out-of-Home’ (OOH) advertising. In collaboration with COG Research and Exterion Media, Bournemouth University (BU) have designed and carried out this study using innovative technology to determine engagement statistics leading to increased advertising revenues on the Transport for London network (TfL).

Exterion Media is a leading OOH media owner in the UK which offers marketing space to advertisers. In 2015, the company were preparing to bid for the TfL estate, the world’s largest OOH advertising contract, spanning 8.5 years and worth over £1 billion. BU teamed up with Exterion Media and COG Research to develop an idea; how could a large study of audience engagement on the London Underground digitally measure physiological responses to advertising.

The research for the study was carried out at BU’s Promotional Cultures and Communication Centre by: Dr Rebecca Jenkins, Dr Janice Denegri-Knott, Stuart Armon, Dr Christopher Miles, Shenel McLawrence and Dr Jill Nash.

BU research supplied an innovative concept to understand how and why consumers engage with advertising. Unlike other metrics commonly used to measure attention and engagement, which rely on survey feedback, the academic research foundation was based on the unique concept of consumer imagination. This generated insights into why consumers choose to engage with advertising and the conditions which make advertising more appealing to travellers. Research showed, for example, high advertising engagement scores when digital panels were used in place of traditional advertising formats.

Physiological responses to advertising were measured using eye tracking glasses and skin conductance recorders with 100 passengers during a typical tube journey, before follow-up interviews were conducted.

This fresh approach is what distinguished the project, as consumers’ response to advertising is generally measured via surveys exploring attitude change. Shared study findings are now enabling advertising companies to better use TfL to more effectively target their audiences, increasing business income.

“Our research demonstrated the important role that digital media and advertising can play in stimulating consumer’s imaginations - this has transformed advertising in TfL and ‘Out Of Home’ advertising.”

Dr Denegri-Knott, Promotional Cultures and Communication Centre, Bournemouth University

The joint research project led to Exterion Media being awarded the £1.2 billion contract from TfL to manage its entire advertising estate including the Tube, Overground and Crossrail. As part of this contract, TfL and Exterion Media worked together with the original architects of Canary Wharf station to install the largest advertising screens ever used on the London Underground network. The screens have dynamic data-driven capabilities which allow for tailored content based on real-time information. Creative initiatives such as these will help to increase advertising revenues for TfL from £114.9m in 2015/16 to £1.1bn by 2023.
Predicting purchasing behaviour of the future

A Knowledge Transfer Partnership to develop an adaptive web analytics framework for predicting future purchasing behaviours and recommended marketing strategies based on attributed visitor history and interaction data.

The successful two year Knowledge Transfer Partnership (KTP) between Cardiff Metropolitan University and the independent, no-nonsense technical marketing agency Yard Associates Ltd was top rated by Innovate UK, receiving a Grade A, and was part funded by the Welsh Government.

The partnership capitalised on the knowledge within the company and the expertise of Cardiff Met academics from the Cardiff School of Technologies to develop and test an adaptive web analytics framework. The initial KTP proposal set out an ambitious plan with high targets for sales, profit and company growth and the project surpassed the grandest expectations. The technological, process and cultural changes embedded during the project have left a legacy of significant influence on how the business now operates.

“We are delighted this partnership was recognised as a Grade A top rated KTP. Bringing our expertise in data science from our School of Technologies to work on a challenging real-world project ensures the content of degree programmes is highly relevant to modern business needs. We look forward to further developing our relationship with Yard Associates Ltd, with a number of projects already in the pipeline.”

Matthew Taylor, Director of Innovation at Cardiff Metropolitan University

“This KTP was a huge springboard to the start of my career. By allowing me not just to gain experience in industry related skill sets, but to also spend time improving my management, planning, and researching skills”.

Max Cheetham, KTP Associate now employed by Yard Associates Ltd

Yard has benefited from the fundamental changes seen in the business, notably the eagerness to gain the knowledge sharing provided by the KTP scheme. This has resulted in the business undertaking a number of new projects with Cardiff Met and a number of the Company’s staff are undertaking new and more stretching courses of training and development.

This partnership grew substantially since starting the KTP, with a number of high-profile streams of work now being undertaken, including a new KTP, two KESS2 PhD projects and other projects focusing on digital marketing for inclusive SMART cities. These will be exciting collaborations between Yard, Cardiff Met and a number of other local organisations.
The world is changing, and changing fast. Our population is growing, people are living longer, our climate is changing, and our energy supplies and food resource are running low.

The Government’s modern Industrial Strategy\(^1\) is helping to bring us together in a coordinated and concerted effort to tackle these global challenges. Individuals, communities and companies all have a role to play in tackling these issues, but we will not solve them by working in silos and doing things the way we always have. As the pace of scientific discovery and innovation increases rapidly across the world, the UK’s world-leading research and innovation community is beginning to recognise the necessity of working across scientific disciplines, and across all sectors of our industry so there is a seamless progression from lab bench to the marketplace to meet these challenges. Turning ideas into investment, innovation and, ultimately, income.

**Why does collaboration matter in innovation?**

The UK government has set a target to raise R&D investment from 1.7% to 2.4% by 2027 in order to outpace the global competition. To do this, it’s essential that the UK increase both its public and its private investment in R&D – and the best way of doing this is to build and maintain fruitful collaborative relationships with others.

Collaboration is at the heart of great innovation, and partnerships between businesses and academia are now more important than ever. At Innovate UK we commercialise the brilliant ideas that come from our research base and ensure entrepreneurs and innovators can find the latest knowledge and research to help them solve the intractable problems of today. The benefits are clear: studies show that firms that persistently invest in R&D have higher productivity – 13% higher than those with no R&D spending and 9% more than firms who occasionally invest in R&D, with better value added per employee and more exports\(^2\).

**Innovate UK: Tackling national challenges**

Innovate UK wants the UK to be the best place in the world for businesses to innovate and grow, maximising the economic and societal benefits of innovation over the long term. We’re already leading the
charge in areas like AI and data, an energy revolution, mobility and healthy ageing. But there's room for growth, and that's where innovative new ideas and collaborations with great thinkers, innovators and pioneers are essential.

An innovative mindset is essential in tackling the largest challenges we face across the world, and our Industrial Strategy aims to rise to the challenges with new innovations. We are already seeing the benefit of bringing researchers and innovators together through the Industrial Strategy Challenge Fund. Whether it's creating the next generation of batteries to power electric vehicles or delivering new technologies that could revolutionise how we construct our homes, offices and factories of the future. These are very different challenges, but they share the goal of radically altering how our industries operate.

None of this could have happened without the input of partner organisations and a functioning ideas-sharing network. It's vital that we build strong relationships in order to safely and openly discuss new innovations.

Building a culture of collaborative innovation

Recognising the importance of bringing together ideas and application, we fund programmes to foster highly productive working partnerships between business and academics. Knowledge Transfer Partnerships (KTPs) bridge the gap between academic experts and businesses. At this year's KTP Best of the Best awards ceremony, we celebrated the success of Bemrose-Booth Paragon and a research post-graduate from the University of Hull, who worked together to reformulate the magnetic strip on the back of train tickets. As a result of their partnership, a billion people worldwide have access to this new and more reliable technology and they are now using this unique technology to safeguard bank notes in Brazil.

Similarly, Innovation to Commercialisation of University Research (ICURe) is a 12-week programme that addresses the problem of siloed academic research. Taking experts out of the laboratory and into the marketplace, ICURe schemes can take place across any department and are open to all UK universities. Recently, a research post-graduate from the University of Hertfordshire developed a model for a 3D human lung, enabling laboratory testing to measure the damage of certain substances and chemicals. Through the scheme, her research has been showcased in eight different countries, collaborating on a global scale.

Interdisciplinary collaboration is one of the most important factors in driving business growth. Our schemes are open to academics and experts from all areas, not just technology and the sciences. After all, we need to think differently about how we collaborate - why, how and with whom. Some of the most impactful innovations have come from conversations between people from different backgrounds and with conflicting points of view.

Call to action

Innovate UK is committed to ensuring we have strong foundations to encourage a culture of constant innovation.

We believe that good ideas can come from anyone and we know that diversity unlocks innovation and drives market growth. As business leaders, we need to be surrounded by, and encourage, a diverse workforce to drive innovation and give us a competitive advantage.

Agencies and public bodies can invest in up-and-coming innovators, with the help of successful innovators who have been there and done it before. Through the Industrial Strategy, we could boost the economy by £80 billion over the next decade.

We may need to look at the competition to find inspiration to set ourselves apart. As a nation we need to drive collaboration – through government, through industry, through universities and local communities – so that we can become the world's most innovative economy. The outcome focus should be to build distinct partnerships that lead to sustainable relationships to drive economic growth locally to “deliver a punch both nationally and internationally”.

Through the Industrial Strategy, we could boost the economy by...
Collaborative investment for university commercialisation

The UCL Technology Fund has invested in spinout companies with record success in the past 12 months. The Fund is managed by AlbionVC in collaboration with UCL Business.

The UCL Technology Fund is a collaborative and innovative approach to university commercialisation – with a £53 million total investment fund made up of commitments from EU-owned European Investment Fund and Touchstone Innovations (the commercialisation firm spun out of Imperial College London) and fund manager Albion Capital.

The UCL Technology Fund is dedicated to investing in intellectual property commercialisation opportunities arising from UCL’s world-class research base, focusing in particular on the physical and life sciences. The Fund supports UCL in achieving the full potential of innovations that have prospects for outstanding societal and market impact, right through the development journey from initial proof of concept to practical commercial application.

The Fund invests in three ways:

1. **Funding for licencing up to £1 million** - e.g. when a novel drug is licensed to a pharma company which takes it through clinical trials.
2. **Funding for spinouts** – up to £2.5 million to support the commercialisation journey.
3. **Proof of concept**, where ideas and IP show potential but are not yet ready for licencing or spinout funding – up to £100,000 can be invested, normally over a period of up to 12 months.

The fund has invested in several companies who have achieved unprecedented success in the past year:

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Orchard Therapeutics</strong></td>
<td>Orchard Therapeutics, a biotechnology company transforming lives for patients with rare disorders using innovative gene therapies. Based on research from the groups of Prof. Bobby Gaspar and Prof. Adrian Thrasher at the UCL Institute of Child Health. In November 2018, Orchard raised $225.5 million in an initial public offering on the NASDAQ.</td>
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<tr>
<td><strong>MeiraGTx</strong></td>
<td>MeiraGTx, a clinical stage company developing gene therapies for diseases of the eye, salivary gland and central nervous system. Its expertise in viral vector design and optimisation, advanced gene therapy manufacturing, and technology providing temporal control of gene treatments, is transforming the gene therapy landscape. MeiraGTx raised $75 million at an IPO in June 2018.</td>
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<tr>
<td><strong>Hazy</strong></td>
<td>Hazy, a platform allowing developers and data scientists to share data in a GDPR compliant fashion by automating the data anonymisation process. Hazy raised $1.8 million in a funding round led by the UCL Technology Fund and was also awarded the Innovate AI Award by Microsoft’s venture fund M12 with a $1 million investment from M12 in partnership with Notion. A top 10 listing on the 2018 Forbes ‘15 Machine Learning Companies to Watch in Europe’</td>
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The spark that started the Oxford Boom

How creating the world’s largest venture fund turned the world’s number one university into one of the world’s top innovators.

Oxford University is the UK leader in turning research into reality, holding both the record for most spinouts created in a single year - 24 in 2018; and most spinouts created overall - 177 since 1987. There are numerous forces driving what we call the Oxford Boom, but the main catalyst is Oxford Sciences Innovation (OSI).

Created in 2015, OSI manages a £611m university venture fund – the largest of its kind worldwide. The fund has allowed the University to create companies on a scale previously unseen at a UK institution. Of the 177 spinouts created by the University, over a third have been created since 2015.

To date, OSI has invested £150m into its 70 portfolio companies, which has been matched by £230m in external investment. Since 2011, Oxford spinouts have raised a collective £2bn in external funding, over half a billion of that was in 2018 alone.

On partners, Jim Wilkinson, OSI’s CFO and recently named the number one university venture in the world by Global University Venturing, said: “OSI has brought over 65 shareholders into the Oxford ecosystem, with most being leading global corporations or investment funds. Many of them have invested into the University Venturing scene for the first time ever.”

Products in the OSI portfolio include: universal flu vaccines, AI security products, personalised entertainment channels, regenerative medicine, robotics inspired by nature, VR for mental health, quantum computing technologies, and more.

The companies driving these products to market are increasingly a major economic force, already with a market value of over £100m with an estimated GVA of £1bn and creating 1,500 high-tech well-paying jobs to date. To ensure that pipeline stays well stocked, OSI is actively involved in ensuring the next generation of both innovative ideas and innovators, such as the Student Entrepreneurs Programme. Taking place in July, the programme will invite 40 students to take university ideas and embark on an intense month-long training course to develop both the ideas and their entrepreneur skillset. At the end of the programme, the winner will receive a £25,000 seed investment. The company is also covering the costs of a £1,500 stipend for every student involved.

It is also one of the partners in LAB282, a £13m drug discovery programme with Oxford and Evotec. LAB282 provides funding and commercial expertise to researchers with an idea that could be scaled up, and accelerates it towards the commercialisation stage. The programme is now being replicated around the world in Canada, France, the US and Germany, with a second similar fund planned for Oxford. In short, OSI has proven itself as the spark for the Oxford Boom, and is a key partner in ensuring its impact will be felt for decades to come.

Student Entrepreneurs Programme. Taking place in July, the programme will invite 40 students to take university ideas and embark on an intense month-long training course to develop both the ideas and their entrepreneur skillset. At the end of the programme, the winner will receive a £25,000 seed investment. The company is also covering the costs of a £1,500 stipend for every student involved.

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Global relationships in research and innovation are more important than ever. Many of the world’s greatest economic and social challenges can be addressed only through international partnerships.

Just in this section of the State of the Relationship report we see world-leading universities Oxford and UCL building their relationships with international Venture Capitalists to create funds supporting innovation, harnessing talent and commercialising research. The UK’s blend of research excellence and R&D intensive firms makes it an attractive place to do collaboration. But in an increasingly competitive global marketplace, we must not take our present position for granted.

The UK Government is committed to raising total UK investment in R&D to 2.4% of GDP by 2027, and to 3% in the longer term. International partnerships and collaboration will play an important part in achieving these ambitions and securing crucial foreign direct investment.

In the UK, around half of all business investment in R&D comes from firms headquartered overseas.

Encouragingly, NCUB’s Collaboration Progress Monitor at the beginning of this report measured foreign investment in UK universities and found that this has grown once again in the 2016/17 academic year. This is the first academic year to follow the result of the 2016 referendum and while growth was lower than previous years, it still continues a positive trend (see Table 1).

But international collaboration is about more than foreign investment in UK universities. The UK Government is committed unequivocally to collaboration in research and innovation with partners across Europe and internationally. Government would like the option to associate to Horizon Europe and is continuing to shape the development of that programme. In parallel, it is also exploring credible and ambitious alternatives to deliver positive outcomes for science, research and innovation in the event that the UK does not associate.
Whether we achieve Horizon association or not, UK universities can benefit from a resetting in how they approach partnerships.

We often think of ‘international’ as being outside of Europe, and historically have treated the two fundamentally differently. But what can we learn from approaches, relationships and frameworks with international partners which can be applied to those within the EU regardless of Horizon outcomes?

By ensuring continuity through a robust approach we can drive collaboration, attracting investment and research talent to maximise the impact of our higher education institutions and their global success.

In May 2019 the Minister for Universities, Science, Research and Innovation announced a new International Research and Innovation Strategy, highlighting countries both within and outside of the EU as strategically important for future partnerships.

New approaches to partnerships will not be about international vs European partners, but about broadening UK horizons and strengthening the ecosystem through diversity. This will be vital to ensure that science and innovation are still able to transcend borders, and help to leverage international investment key to meeting the 2.4% R&D target.

To support these aims, Professor Sir Adrian Smith has been commissioned by the Secretary of State for Business, Energy and Industrial Strategy (BEIS) and the Minister of State for Universities, Science, Research and Innovation to provide independent advice on the design of future UK funding schemes for international collaboration, innovation and curiosity-driven blue-skies research.

I will work with Sir Adrian during the preparation of this advice to help the Government to ensure that the UK continues to be a global leader in science, research and innovation, and an attractive country for individuals to study and work.
As we move through the pilot process towards a Knowledge Exchange Framework (KEF), it is timely to challenge the misunderstandings that exist around the exchange of knowledge – that it is dry, complicated and the privilege of large businesses and research-intensive universities. In reality, knowledge exchange is far more creative and dynamic, and differs depending on the type, size and aims of the partners involved. It can be anything from shared spaces, to people, to priorities. And its impacts are just as wide-ranging.

We asked our members to consider the way that they approach partnerships, and tell us about collaborations: which included ‘unusual’ forms or topics of knowledge exchange; which involved working with SMEs and how that was different from big business; which included partners of different sizes or from different sectors or areas.

The case studies we have included are far-ranging in their breadth or topic and relationship. Looking at topics from dance, to cricket, to Ancient Egypt. Working with the National Trust, local SMEs, and breweries. Predicting behaviours, tackling homelessness and supporting weight loss. Using agile methodology for aero-propulsion and studying the social value of art galleries. Nothing is outside the scope of knowledge exchange, and our members are revolutionising how collaborations can work.

The examples in this section are well supported by a substantial exploration of the KEF and its potential impacts on the future of knowledge exchange. Alice Frost, Director of Knowledge Exchange Policy at Research England, examines the current acceleration of funding for knowledge exchange - from Higher Education Innovation Funding (HEIF) to the Connecting Capability Fund – and its historical comparisons, considering what we might expect for the future of knowledge exchange. Tamsin Mann, Head of Policy at PraxisAuril, talks us through how knowledge exchange professionals support ideas to have impact, looking beyond the traditional spin-out method to the collaborative activity of world-class knowledge exchange. NCUB analysis supports this through a refreshing take on the Higher Education Business Interaction Survey (HE-BCI), and the updates to the data collection which informs sector policymakers across the UK.
Creative exchanges of knowledge

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The past and present...

We live in unprecedented times for knowledge exchange.

For Research England (building on the experience of HEFCE), our funding for university knowledge exchange (KE) is increasing at its greatest pace since the Higher Education Innovation Fund (HEIF) began in 2003. This is at a faster rate than the increase to deliver Lord Sainsbury’s “Race to the Top” review from 2008. Our institutional allocations have grown from £160 million in 2016-17, to £225 million in 2018-19 through HEIF, with an additional £25 million through the Connecting Capability Fund (CCF). And the Government’s Industrial Strategy committed to HEIF rising to £250 million by 2020-21.

The current period has some common features with past accelerations in public investment in KE. Like the early 2000s, increased funding for KE is linked with an overall Government commitment to increase levels of expenditure on research and development – then the Science and Innovation Framework, now the 2.4% R&D target. The increases in 2008-11, and in the current period, also follow strong endorsement from business leaders of the importance of investing in university capabilities to engage – previously from Richard Lambert, and currently from Sir Andrew Witty.

We can be sure that the future of KE will be shaped by these increasing resources in the hands of universities. This should enable significant increases in innovations in KE, identification of best practices to world leading standards and their widespread adoption (supported, as an example, by our CCF programme) – and overall higher levels of real-world impact and university KE sustainability. We need to be ambitious.

It is critically important then that the scale of the opportunity is backed by appropriate tools and resources to ensure that we maximise impacts, and for the long term.

Our development of the Knowledge Exchange Framework (KEF) is one key enabler. It should provide a sophisticated system to understand university KE performance in greater depth. This moves beyond higher education sector aggregate evidence that we provide in Higher Education Business
and Community Inter-action (HEBCI) survey reports or in various HEIF evaluations. It should also provide means for universities to identify their key institutional peers and comparators and reach to partners.

The KEF is very powerful when combined with the KE Concordat, currently in consultation, providing universities with insights on leading edge practitioners – and on leading edge practices. The development of the Concordat has been led from university leadership, responding to the Government’s challenges to universities in the Industrial Strategy. But funders including Research England need to back it with investment in best practices, and with help to engage economic and societal partners in its value, with independent scrutiny of its effectiveness.

With greater resources comes the need to provide this greater transparency, information and assurance - for policy makers, funders and critical external partners.

Systems pulling together in a 2.4% world

The current increase in investment in KE sits in the context of a much larger and more ambitious package of support for research and innovation, with an additional £4.7 billion investment to deliver the Industrial Strategy announced by Government at Autumn Budget 2016. This comes at the same time as - and is linked with - the creation of UK Research and Innovation (UKRI), to foster the research and innovation system.

Notably, the Industrial Strategy uplift supports both supply and demand side interventions - in research, knowledge exchange and business innovation. This includes increases to HEIF and CCF, as well as programmes such as the Industrial Strategy Challenge Fund, Strength in Places and Future Leaders Fellowships – different programmes, but seeking to operate in concert on universities, businesses and investors, places and partnerships.

In order to understand the dynamics to achieving the 2.4% target, we have commissioned Tomas Coates Ulrichsen of the Centre for Science, Technology and Innovation (CSTI) at the University of Cambridge to advise us on how KE and commercialisation need to look in a 2.4% world. Diagram 1 describes the different KE levers.

Different ways to achieve the 2.4% target will have different KE outcomes. More emphasis on expanding the public research base will likely lead to the need to support more university spin-off companies. More emphasis on business R&D will likely require more activity on consultancies, training and use of testing or other equipment and facilities.

As one example of the 2.4% world, if the target was achieved in line with the current public-private mix of R&D, trends suggest that this would produce another 100 spin-out companies, needing over £600 million additional private investment. Trends also suggest this might generate another £0.5bn in contract research activity and similar levels in continuing professional development.

Achieving the target is likely only feasible by using systems approaches. Research England, and UKRI more generally, will be an important part of the overall framework to achieve the target. However, we are part of a much wider network, and the target is likely only achievable by creating wide and deep connections with many other critical partners across many different types of systems.

I describe below how universities naturally form part of the many complex systems that are needed to achieve the 2.4% target.

At Research England, we have begun to increase our understanding of the different types of systems at play in the 2.4% world – the partners, cultures and drivers to different system players. One example of this is working with Mike Rees, the former deputy group CEO of Standard Chartered and current Angel investor, on deepening our understanding of the linkages needed between universities and private sector investors. Another is our support of a pilot research study with Professor Andrew Jones at City University to improve our understanding of the eco-system needed to underpin a knowledge/tech start-up economy – comparing London with, as example, New York.
As described in the Industrial Strategy, universities provide the foundations of ecosystems of various sorts:

- Attracting R&D intensive international companies to co-locate and cluster near to them.
- creating ecosystems that provide conditions for new companies – spin-offs and start-ups.
- working with local partnership formations on scaling up companies.
- providing R&D services and skills to companies, communities and local people in civic connections.
- and acting as overall system connectors and public spaces.

Universities are the heart...

The Universities Minister recently described the important systems role played by universities:

“We must never lose sight of the fact that our universities provide the magnetic field that attracts people, business and investment into the UK”

While we need to learn how to put in place frameworks and systems to pull toward 2.4%, universities have long been embedded in these on the ground.

Diagram 1

**R&D ACTIVITY IN UNIVERSITIES**

- University Leadership
- Students
- Academics
- RESEARCH: Pure-basic
  - User Inspired
  - Applied
- PHYSICAL ASSETS
- EDUCATING PEOPLE

**KE SUPPORT SYSTEM**

- Funding to support the ‘push’ of specific knowledge and technologies into the innovation system.
- Funding for specific KE projects initiated by private sector firms.
- Funding for specific KE co-developed by private sector firms and HEIs.
- Funding to advance specific research outputs towards commercial application.
- Incentives to legitimise KE and make KE strategic priority strongly integrated with research and teaching.
- Funding to enable Higher Education Institution’s to build the capacity and capability to engage in KE.

**PRIVATE SECTOR R&D ACTIVITY IN INNOVATION SYSTEM**

- Type of Innovation System
  - SECTORAL
  - TECHNOLOGICAL
  - REGIONAL
  - AGENTS
    - Firms, research institutes, universities, consultancies, regulatory bodies, trade associations etc.
  - INSTITUTIONS
    - Common habits, norms, routines, practices and laws that regulate the relations and interactions between individuals, groups and organisations.
  - INTERACTIONS
    - Market and non market linkages for diffusing knowledge, political networks (lobbying, advocacy etc. designed to influence political agenda).

**CONTRIBUTING TO:**

- Developing and developing knowledge / technologies for innovation and problem solving.
- Building resources, capabilities and linkages to innovate and compete.
- Strengthening system institutions and conditions for innovation.
- Funding to strengthen internal capabilities of organisations to innovate and collaborate.

Public funding and incentive systems enabling knowledge exchange

T Coates Ulrichsen “The requirement for public funding for knowledge exchange and commercialisation in universities to deliver the 2.4% target – making the case for HEIP”, CSTI 2019 (forthcoming).
The Minister’s description of universities as central to ecosystems is reflected in evidence we gained from universities on how they were using HEIF to deliver the Industrial Strategy2 - described in Diagram 2.

Universities are using HEIF to begin to put in place infrastructures and capabilities needed to get systems to pull together toward the target:

- Using the university’s footprint and co-working capacity in shared R&D facilities, technology and innovation centres and science parks.
- Strengthening industrial and technology sector networks, through road-mapping and the like.
- Enhancing the technology transfer system – such as in licensing and new company formation and entrepreneurial ecosystem development (access to finance, acceleration/mentorship and incubation).
- Supporting local industrial systems - R&D, enterprise and skills pipelines and marketing the city or region for inward investment or international trade.
- International partnering – R&D, technology and IP showcasing.
- And, critically, developing a wide range of KE professional competence, skills and best practices to support all of the above.

The future of KE – strengthening systems leadership

I envisage that the future of KE will be shaped by the forces I have described - of increased expectations, additional resources and the need to dig deeper into more complex systems.

One of the important facets of the future of KE flagged by Professor Trevor McMillan, Vice-Chancellor of Keele University, is leadership. This is reflected by Professor McMillan in both his review of technology transfer and now in his development of the KE concordat. This includes national leadership through UKRI, but also, vitally, university leadership on the ground. KE leadership requires strong skills in collaboration – the ability to get actors with very different drivers to find common purposes, such as to pull toward 2.4%. The KE Concordat suggests many of the requirements for good KE leadership – clarity of mission, accurate representation of strengths to partners, clear indicators of performance improvement, and giving broad confidence to governing bodies and government.

Finally, I see a bright future for the National Centre for Universities and Business as well placed as a critical connector of both leaders and systems. We look forward to continuing our partnership with NCUB, and with their members, in our 2.4% quest.

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2 Research England, Universities delivering the Industrial Strategy, (February 2019); accessible at www.re.ukri.org/news-events-publications/publications/re-universities-delivering-industrial-strategy
Scaling up collaboration in immersive tech

Brunel Design collaborates with industry to develop solutions for inclusive design of the immersive reality—in the areas of broadcast content, gaming and education.

co-innovate

co-innovate is an innovation support programme for SMEs within the Greater London area, jointly funded by Brunel University London and European Regional Development Fund (ERDF). In its now second cycle, Co-Innovate is run by the Department of Design at Brunel, and consists of two parallel projects: Co-Innovate Journeys and Bridging the Gap.

In the spring of 2018 Brunel Design initiated a collaboration with Open Inclusion, a London-based consultants specialising in inclusion research. The preliminary work included scoping the opportunities and building a network of partners to attract funding for longer-term projects focusing on the inclusive design of the immersive reality - with the view of enabling Open Inclusion to build the relevant consultancy capacity and expand their business platform.

Despite the development of immersive technologies being a priority of the Industrial Strategy, inclusive design is a largely underexplored area. Brunel Design and Open Inclusion are changing this with a ground-breaking partnership.

£60,000 was granted for a 6-month project to develop inclusive design solutions to improve access to 360° videos for users with motor, perceptual and cognitive impairments and disabilities and older users.

Following the Innovate UK call, another funding application was made to the Engineering and Physical Sciences Research Council's (EPSRC) Digital Economy Investigator-led Research Projects fund. For this call the partnership between Brunel Design and Open Inclusion was expanded to include Cambridge Engineering Design Centre, Games London, To Play For, Virti Health and RNIB. The successful application generated a grant of ca. £600,000, which will see the consortium work on a 3-year research project to develop the Inclusive Design Toolkit for the Immersive Realty.

The project will improve the levels of inclusion across the disability and age spectrum for broadcast, gaming and education content in VR, AR and MR. As such, considering that the population of people with disabilities in the UK amounts to more than 11 million and those over the age of 65 to more than 11.5 million, the project has the potential to make a significant contribution to enlarging the immersive tech sector of the UK economy. The collaboration between Brunel Design and Open Inclusion and the related project work have been managed by Dr Vanja Garaj, Head of Brunel Design and Project Leader for Co-Innovate.
Supporting high-tech innovation in rural Shropshire and Telford & Wrekin

The Centre for Research into Environmental Science and Technology at University Centre Shrewsbury has been working alongside local small and medium sized enterprises to foster innovation and growth in what many may view as an unlikely location.

With a £1.9 million grant from the European Regional Development Fund (ERDF), the Centre for Research into Environmental Science (CREST) provides research support, development and advice to SMEs in Shropshire and Telford & Wrekin to increase productivity, up-skilling and innovative product development. One of the SMEs that CREST has developed a more extensive relationship with is Wolf Logic.

The collaboration between CREST and Wolf Logic began as a discussion at a CREST workshop on open data and open-source geospatial tools between Dr. Andrew Miles, Senior Researcher at CREST and Chris Greenhalgh, Director at Wolf Logic, a software development company based in Shropshire. As a programmer, Mr. Greenhalgh has worked on a range of projects involving spatial data and had ideas for developing a web-based platform to assist housing developers in quickly identifying or disregarding potential building sites. It quickly became evident that in developing a geospatial product for market, Wolf Logic would benefit greatly from CREST’s expertise in environmental geospatial analysis.

Over the next year, CREST helped Wolf Logic develop their product ideas by providing technical support and advice to complement their specialisms. The collaboration led to a successful project launch in 2019 called Geopoints. The product enables users to search any location, using either a postcode or map co-ordinates, to find land and property details including boundaries, title information, solar suitability, terrain and other environmental information.

“CREST support has enabled us to accelerate product development and the advice given by Dr. Andrew Miles has been invaluable.”

Glyn Jonathan Davies, Wolf Logic

Inspired by their work with CREST, Wolf Logic have also created a spin out – Geopoints, expanding opportunities in the region linked to innovation. Wolf Logic have broadened this collaboration further by becoming part of the delivery panel for the CREST initiative to develop training provision in computer science and programming. With funding from the Institute of Coding, this initiative is designed to reduce the technical skills gap in the Mid Marches region.

Looking to extend and develop such collaborations more extensively, CREST have also developed a number of research initiatives to support and develop local SMEs in the environmental geospatial area. One such initiative is the creation of a CREST Geospatial Special Interest Group (SIG). The SIG brings together academics, individuals and SMEs with an interest in mapping, surveying and geospatial technology. The SIG, including Wolf Logic, are working alongside Shropshire Council to seek future funding for improved adult social care. By employing the skills and expertise in the areas of software development, artificial intelligence and virtual reality the aim is to address this critical issue within the ageing population of Shropshire and Telford & Wrekin.
Refreshing how we think about interaction through HE-BCI

This year's State of the Relationship boasts an array of case studies capturing all kinds of fine work between higher education and business, civic society and local leaders. Of course this isn't just showcased here. Through Research Excellence Framework (REF) impact case studies, through the developing Knowledge Exchange Framework (KEF), to the Higher Education – Business Community Interaction survey (HE-BCI); all this activity should be reported somewhere.

That's what helps institutions understand where their strengths are; helps businesses find suitable academic partners; and helps Government and agencies understand the diversity of collaborations out there in order to better encourage them. However, that doesn't necessarily mean that everything actually is reported somewhere – or at least not as effectively as it could be.

It's HE-BCI we'll focus on here. It is a critical data collection, under the direction of the Higher Education Statistics Agency (HESA), in which information on knowledge exchange is collected in the UK. It's one of the foundational datasets for decision-making in the sector – and it informs policymakers and strategic leads across the country.

HE-BCI is a dataset which traces its consolidated origin back to 1999 – it's the longest-running longitudinal data collection of its type in the world.

But has it kept pace with the changing nature of knowledge exchange? KE is a maturing and expanding discipline. Universities and their partners are finding evolving approaches and new activities less than completely measured – most notably in the community partnerships and place arenas, where the plurality of activity is harder to measure with current tools. KEF narrative statements will permit some opportunity to reflect this; but KEF and HE-BCI will need to interact well for the former to fulfil its potential.

So HE-BCI can do more to reflect what is actually going on. Government and agencies need to understand what works, what needs support, and how to exploit the rich potential of interaction to achieve economic goals, and leverage universities’ civic engagement to empower and uplift places.

HE-BCI should be seen in the context of Government’s aim to increase investment in R&D to 2.4% of GDP by 2027; uplifts to the Higher Education Innovation Fund (HEIF); and the ambitions of the Industrial Strategy.

In that spirit, HESA has committed to refresh HE-BCI – and create a single, UK-wide data infrastructure for consistency and comparability, which works for all stakeholder groups, allowing them to better deliver on their priorities, such as the Industrial Strategy and (for England), the KEF.

In doing this, HE-BCI could help to capture more of the place-based impacts collaborations have in their localities. It could help to surface the unique characteristics of civicly-rooted KE. And perhaps it will find more ways to recognise the work going on that makes the case studies in this section such good examples of balancing the UK economy through knowledge exchange.
Dancing to success

UCL is bringing different creative organisations together to collaborate on projects, including innovative choreography, monitoring dancers’ health, and the benefits of dance for Parkinson’s disease.

Building on UCL’s existing academic connections with creative industries, UCL Innovation & Enterprise started to explore the possibility of growing these relationships into something wider, cross-disciplinary and long-lasting. What formed was the multifaceted UCL Dance Network, which has so far gathered partners including the English National Ballet (ENB), Sadler’s Wells, Studio Wayne McGregor and The Place – working alongside various departments across UCL.

The arts and creative industries are the fastest growing part of the UK economy, contributing £101 billion in value in 2017 – an increase of 53% from 2010. Yet, perhaps surprisingly, deep collaborations between the arts and the UK’s well-established scientific sector are relatively rare.

The Network is starting to inspire new areas, such as a project to develop a remote sensor solution to monitor dancers’ performance and rehabilitation. Another project is pioneering novel, collaborative approaches to choreography. Projects in the pipeline include an exploration of the potential benefits of dance for people with Parkinson’s disease and workshops combining dance and coding to inspire young people into the arts or computer science.

Dr Robert Thompson (Impact Fellow, UCL Institute of Communications and Connected Systems) and Professor Sally Day (Professor of Photonics, UCL Electrical Engineering) took part in a three month secondment to the ENB, supported by UCL Innovation & Enterprise’s EPSRC secondment funding. Realising that adding health monitoring sensors to the dancers or their clothes might hinder creative expression and movement, they considered a solution for adding sensors to the environment instead. As a result, a UCL student project is now developing the idea of creating specialist dance flooring supported by accelerometers and gyroscopes. These can monitor dancers’ health over the course of each performance, as well as over entire seasons.

The English National Ballet was recently successful in securing a £1 million capital grant from the Good Growth Fund (the Mayor’s main regeneration fund). This acknowledged ENB’s collaborative work, including with UCL, and its potential to grow these partnerships in the future.

The UCL Dance Network is also actively engaged in collaborations with Studio Wayne McGregor – which has a world-leading reputation at the forefront of tech-arts innovation. The QuestLab project, funded by the Arts Council, is connecting choreographers from across the country, shortlisted by the Studio, to meet with academics with expertise in human-computer interaction, neuroscience, computer science, architecture, art, psychology and more. The project is stimulating new ideas, disrupting traditional ways of working and creating new relationships and networks.

The Network is supporting 6 work experience positions created, 4 further collaborations as a result, 3 apprenticeships created, and 2 other relationships fostered.
Enduring partnership benefits cricket

The multi-faceted 15-year partnership between the England and Wales Cricket Board (ECB) and Loughborough University has effected wide-ranging positive impact within cricket. The knowledge also benefits other sports, sports manufacturers and has the potential to deliver benefit outside the world of sport.

15 years ago, Loughborough's researchers helped the ECB to establish a clear understanding of the link between technique, performance and the likelihood of injury in fast bowling. More than a decade later and collaborative research is changing talent identification, coach education and practice, helping players increase performance and extend their career, and developing a world-leading coaching tool improve fast bowling technique. This collaboration underpinned the ECB's Pace Programme international pathway as well as the Interactive Coach app, enabling global access to technical analysis.

The partnership is also benefiting junior cricket by exploring the causes of spinal stress fractures in fast bowlers to minimise the occurrence of injuries. The findings have resulted in ECB recommendations for shorter pitch lengths for a variety of ages, now adopted by over 106 leagues.

“There is no question that the collaboration between the ECB and Loughborough University has been ground breaking in the sport, and undoubtedly made a contribution to the success of the England Team in recent years,” said David Parsons, Performance Director, ECB.

Collaborations with Loughborough's engineers are having a positive impact on performance, with a unique real-time range hitting feedback system helping the England senior men's team prepare for the 2019 World Cup. The partnership has also improved helmet safety, together with Cricket Australia, the International Cricket Council, the British Standards Institute and leading manufacturers. All helmets used in international cricket must now be certified to standard with more than 100 models approved for use. The new standard has eliminated facial injury, with no incidents recorded by players wearing a certified helmet.

“Since the introduction of the new standard, we have not had a single career-threatening facial injury with someone wearing the new helmets,” said Dr Nicholas Peirce, the Chief Medical Officer at ECB. He continued “The sea change has been fantastic, but we continue to work with Loughborough in order to minimise any injury.” Research has continued with a second revision to the standard – published ahead of the 2019 UK cricket season – including provision for a neck guard in response to the tragic death of Australian international Phillip Hughes in 2014.

The partnership provides a rich seam of industrially relevant opportunities for students, funding 10 PhDs to date, supporting a further 9 and hosting many more internships. Its wide-reaching impact underpins Loughborough's position for the third consecutive year as the world's best university for sports-related subjects in the global QS league. The expertise has also attracted several knowledge-based startups to Loughborough's Science and Enterprise Park.

Further collaborations are underway to test protective headgear with a range of sports bodies including the Federation of International Hockey. There are also applications beyond sport within the emergency services and for military personnel.
The University of Oxford and the National Trust: a creative partnership

A flagship partnership connecting cutting-edge Oxford University research with the National Trust's inspiring places and collections.

Launched in 2018, the National Trust Partnership is a collaboration between Oxford University and the National Trust, creating opportunities for interdisciplinary research, knowledge exchange, public engagement and training across a range of academic disciplines and career levels at both institutions.

The partnership is founded upon mutual benefit and two-way knowledge exchange: it facilitates new research into the Trust's rich portfolio of places and collections, which in turn is embedded into public-facing programming. Meanwhile, access to the National Trust’s buildings, collections and landscapes is opened up to researchers alongside opportunities to learn from the organisation’s staff, engage with its vast public audiences, and to develop further research projects. Activities take place through a range of engagements including research placements and consultancy, conferences, workshops, public events, staff training, PhD projects and student internships.

At Oxford, the Partnership is demonstrating the wider benefits that collaboration with cultural partners can bring, supporting the creation of the Open-Oxford-Cambridge AHRC Doctoral Training Partnership within which the NT is one of three strategic Cultural Partners, and the development of the Oxford University Heritage Network.

The new collaboration has grown out of a number of earlier collaborations including the Thames Valley Country House Partnership (TVCHP) established by Dr Oliver Cox in 2013 and the Trusted Source Knowledge Transfer Partnership (KTP) led by Alice Purkiss from 2016-18. Trusted Source piloted a means to bring academic research into the National Trust, and resulted in the creation of new public web content and training opportunities for students and staff at both institutions. Engaging over 60 researchers at ten universities, Trusted Source was featured as a case study in a UK Government Select Committee and Mendoza Review (DCMS, 2017), and was graded ‘A: Outstanding’ by InnovateUK.

The Partnership has demonstrated that innovation is not reserved to science and engineering, and that closer internal, interdisciplinary working can be supported through collaboration with external partners.

Following the initial KTP investment by InnovateUK and the National Trust, the collaboration has subsequently leveraged over £1.73 million to date, has created 25 student placement opportunities, and has generated 1.8 FTE at Oxford, with the new partnership fully funded by the National Trust for an initial three-year period. Now one year in, the collaboration continues to develop and test new methods for successful, sustained and mutually-beneficial collaboration between academia and the heritage sector which is being shared with other heritage organisations and HEIs. The cultural change driven by the Partnership is opening-up new opportunities for impactful research, knowledge exchange and cross-sector training, and provides new ways of exploring the commercial value of research to the UK economy.
Cardiff Met students learn through Richard Parks’ Antarctica Expedition

Extreme athlete Richard Parks attempted to ski solo from the coast of Antarctica to the South Pole - an ambitious project entitled Team Quest. A partnership with Cardiff Metropolitan University identified a range of learning opportunities in support of the expedition - aiming to inspire young people to have the courage to think beyond boundaries.

As part of Team Quest, students and staff from across Cardiff Metropolitan University worked with Richard Parks on a range of projects across five schools. Students designed a number of products in support of the expedition and a whole range of genuine learning opportunities were created throughout the project.

A group of undergraduate Product Design students designed, tested and produced a polar sled and canopy, which accompanied Richard to Antarctica. Students from the Food Science Technology Undergraduate programme devised a food plan which would support Richard’s nutritional needs throughout the Teamquest expedition. Various recipes were tested and 25 days’ worth of food rations were produced, dehydrated and packaged to cover Richard’s daily requirement of 7,000 calories.

Richard worked with Primary Education students to feed into the development of a wellbeing app and visited local primary schools to share his experiences of mental resilience, health and wellbeing, exploration, previous expeditions and changes in the environment. Robotics interns from Cardiff School of Technologies programmed robot NAO, which accompanied Richard on his trip to Antarctica and collected data throughout the journey. Sports Broadcast Masters students documented Richard’s interactions at the University and the gruelling preparation leading up to his expedition.

“This live brief has been a fantastic opportunity for our students. As designers, it is so important that we constantly strive to meet users’ needs and this unique expedition presents a scenario that very few of us would have direct experience of. The emphasis on listening to the user and using design knowledge to come up with creative and effective solutions, is something that our students have done incredibly well. They have thoroughly enjoyed being a part of this project and have had to foster a whole new range of skills.”

Claire Andrews, Product Design Lecturer, Cardiff Metropolitan University

This project encouraged collaboration across disciplines and departments within Cardiff Metropolitan University - something which is easy to talk about, but hard to achieve.
Creative partnership boosts local economies through art

A partnership between Canterbury Christ Church University and Turner Contemporary in Margate has delivered a series of major knowledge-exchange projects since 2011. By creating bold new research and widening participation in the arts, the collaboration is supporting Kent’s five years of creative business growth.

The UK’s creative industries are booming. Research by innovation foundation Nesta and the Creative Industries Council indicates they are a key driver of economic growth, contributing more than £100bn a year to the national economy. Since 2016, the number of creative jobs within local economies has grown by an average of 11 per cent; twice as fast as other sectors. Thanet, in Kent, is outperforming creative business growth in part thanks to a partnership between Canterbury Christ Church University and one of the UK’s most successful art galleries, Turner Contemporary in Margate.

“Our projects have been about raising aspirations and understanding our impact more deeply. Arts and culture are absolutely vital to the success of Kent and Medway, and the research and wider work we’ve jointly undertaken illustrates their significant contribution to the economy and community.”

Karen Eslea, Head of Learning and Visitor Experience, Turner Contemporary

The University’s Business School led a pioneering Social Value study to mark Turner Contemporary’s fifth anniversary, detailing the gallery’s leading role in the regeneration and reinvigoration of Margate. To date the gallery has attracted 3.1 million visitors and generated £70m in additional visitor spend for the economy, supporting 164 jobs. The study also highlights the gallery’s social impact, with successful outreach programmes, delivered in partnership with the University, encouraging participants to be more active in society.

Examples include Turner Contemporary and Canterbury Christ Church University’s Portfolio art competition, giving thousands of people in Kent and Medway the chance to exhibit their work at the gallery. Christ Church is evaluating the impact of Pioneering Places project, where primary school children create art installations as part of the region’s place-making schemes. And in summer 2019, Turner Contemporary will offer its first-ever photographic exhibition; Seaside: Photographed, co-curated by Dr Karen Shepherdson of the University’s Centre for Research on Communities and Culture.

Research by the Tourism and Events Research Hub at the University is also helping to provide Turner Contemporary with insight about its audience and reveals the broader impacts of cultural tourism in Kent. The organisations delivered a two-year Culture Kent research project exploring how cultural and tourist organisations could attract more visitors by creating new ‘cultural destinations.’

The University’s creative impact extends beyond Margate and its partnership with the Turner Contemporary. It is long-term Partner and Principal Sponsor of the Canterbury Festival; it hosts the award-winning annual Canterbury Animation Festival, Anifest; and it partners with a visionary arts charity, Creative Folkestone. New specialist facilities to support innovation in the creative arts are offered in the multi-million-pound Daphne Oram creative arts building which opened in early 2019.
Taking ancient Egypt on tour

The University of Cambridge Museum Consortium is working with partners to develop innovative ways to share its research and engage new audiences.

The Fitzwilliam Museum, along with the other eight museums and Botanical Garden that make up the University of Cambridge Museum (UCM) consortium, finds creative ways to share its knowledge, particularly with some of the region’s underserved communities. It works with a range of organisations including local authorities, social enterprises, SMEs and other regional museums to engage the kinds of audiences that might otherwise never set foot inside a museum or have contact with the University.

Although Cambridge is thriving economically, Wisbech and the surrounding Fenland districts face some of the biggest economic, social and educational challenges in the UK. To find new ways to engage its residents, and as part of a partnership between UCM and the Wisbech and Fenland Museum, made possible by the Arts Council’s investment in the UCM as a National Portfolio Organisation, the Fitzwilliam is taking its latest research on ancient Egyptian coffins out to the people of Wisbech.

The Fitzwilliam’s coffins project has been ‘popping up’ in different Wisbech venues, showing off real ancient Egyptian objects from the Museum’s collection, coffin visualisations in 3D created by ThinkSee3D and Museum staff, joints and a reconstructed coffin made in cedarwood by Geoffrey Killen and giving people the chance to speak to researchers. One month into its four-month programme, the team has chatted with more than 140 Wisbech residents in places such as their local Wetherspoons and outside Costa Coffee, with some of the conversations lasting a good 20 minutes. The Wetherspoons manager said: “I enjoyed the exhibition and I know a lot of my customers and staff did too.” A BBC radio interview and online report resulted in news coverage in France and Germany.

Although relatively small scale, the project is having multiple benefits. As well as sharing the Museum’s knowledge with the people of Wisbech, the work is part of a project that received £200k funding from the Arts and Humanities Research Council for four Creative Economy Engagement Fellowships. The work with ThinkSee3D has also sparked a new collaboration with the Fitzwilliam Museum to create best practice guidelines for how museums across the country should use 3D technologies to help increase audience engagement.

The Fitzwilliam's Egyptian coffins and artefacts are some of the Museum's best loved and most visited treasures. They are also the subject of recent research, combining advanced imaging techniques with detailed analysis of the text and imagery to find out more about the lives of the people who made them and were buried in them. To help people engage with the new findings, the team has been working with SME, ThinkSee3D, to create 3D virtual models of artefacts and Dr Geoffrey Killen, an expert in recreating the woodworking techniques used by the Egyptians.
Making STEAM by adding arts to STEM

Launched in May 2018, STEAMhouse is Birmingham City University’s newly created innovation centre aimed at encouraging collaboration between science, technology, arts, engineering and maths (STEAM) sectors as a platform for supporting long-term growth across the West Midlands.

STEAMhouse represents the culmination of ten years research, outreach and international engagement around Cross Innovation, Design Thinking and Open Innovation. Created in collaboration with local arts organisation Eastside Projects, and supported by the ERDF and Arts Council England, STEAMhouse realises BCU’s STEAM vision of creating an innovation centre with production workshops to facilitate business growth and productivity.

Alongside collaboration opportunities with fellow innovators and BCU academics, STEAMhouse members receive guidance from industry experts skilled in everything from manufacturing to marketing. Members also have access to wood, metal, digital and print workshop facilities, expert support to develop new skills, networking events, and grant funding access.

STEAMhouse has already distributed over £50,000 in grants and provided 6,500 hours of support to small, new and emerging businesses. The innovative project has seen 26 new research collaborations launched, and welcomes around 1,000 visitors per month accessing workshops, networking events and making use of its facilities and expertise.

One of the many innovative approaches introduced by STEAMhouse is the STEAMlabs programme - two-day hack-style events bringing together combinations of individuals to address challenges faced by all kinds of organisations.

The first STEAMlab attracted a wealth of creative minds including health professionals, coders, entrepreneurs, academics and artists to tackle challenges set by the health sector. Key stakeholders included South Birmingham Clinical Commissioning Group, West Midlands Respiratory Health team, and NHS England. Presented with their challenge and formed into mixed expertise teams the innovators set to work finding ways to tackle the issues, presenting their thoughts to a panel of judges at the end of the event, with the opportunity to receive development funding for the best idea.

Sam German from PocZero, a Community Interest Company promoting active wellbeing and lifelong learning was a STEAMlab participant and endorses the project: “We came to the first STEAMlab event, and from the moment we walked through the door felt like we had found our spiritual home. Where STEAMhouse really helped was with careful shaping of some of intricate details of the approach, such as the psychological and human experience aspects of the new service, and gave us an opportunity to test the early thinking with real service users. We also benefitted from being in the same space with a lot of creative minds who were looking at solutions from all sorts of different angles.”

“STEAMhouse is an endorsement of our approach to learning by doing. One of our strengths has been our willingness to adopt iterative learning – taking time to reflect on what we’ve done and what we’ve learned through the first year of STEAMhouse before moving on.”

Dr Steve Harding, Director, Institute for Creative Innovation at BCU
Fighting homelessness in Greater Manchester

Academics at the University of Salford are working with politicians, policy makers, businesses, third sector and other partners to help Mayor Andy Burnham meet his pledge to end rough sleeping in the city region by 2020.

Innovation in the economy will be critical to addressing regional inequalities, but so too will innovation in social policy. In Greater Manchester, directly elected Mayor Andy Burnham has made ending rough sleeping by 2020 one of his main priorities for his first term in office and the University of Salford is at the heart of the city region’s innovative approach.

With over 40 years’ experience in housing and homelessness, the University’s Sustainable Housing and Urban Studies Unit (SHUSU) is collaborating across the Greater Manchester city region to guide policy making and interventions in this area.

With the elected Mayor holding no direct power in relation to homelessness, Greater Manchester has taken an innovative approach using Andy Burnham’s soft power and his ability to bring together key actors, creating the Greater Manchester Homelessness Action Network. This is a forum for convening relevant stakeholders and provides space where people can share ideas and resources and develop collaborative commitments around tackling rough sleeping.

The University has been involved in this Network since its inception in 2017, with the SHUSU team supporting the ongoing development of this novel ‘whole-society’ response to homelessness. This includes supporting its development, hosting meetings, mapping the changes made and developing informed practice and the evidence base for decision making. The approach is the first of its kind in England. At the heart of this approach is the appointment of a new Knowledge Exchange Fellow, a former local councillor and member of the Mayor’s Homelessness Team, to deliver this project, working jointly between the University and the Greater Manchester Combined Authority (GMCA).

The flagship programme for the Mayor is A Bed Every Night. This scheme, launched in November 2018, supports the provision of shelter and support for people who are sleeping rough across Greater Manchester. As of February, the programme had helped around 1,400 people, with more than 400 now in their own accommodation and off the streets.

Professor Phil Brown, lead researcher at SHUSU, said: “Tackling homelessness is very complex and there are many examples where the authorities, albeit with good intentions, implement measures that don’t tackle some of the underlying issues and can even make matters worse.

“Mr Burnham’s approach to embedding co-production of solutions is innovative in the UK and puts people with the experience and knowledge in the front seat of policy development and implementation in the Greater Manchester area.”

CASE STUDY BY UNIVERSITY OF SALFORD

1,423 number of people the programme has helped with more than 480 now off the streets
Speeding the pace of change

Evolving long term partnerships to address global challenges – rethinking collaboration, delivering impact, and training the next generation.

For 50 years the Whittle Laboratory at the University of Cambridge has focused on improving the aero-thermal performance of turbomachines. These machines are the principle technology for the world's energy conversion processes and improving their efficiency is crucial for reducing the environmental impact of power generation. Research projects cover virtually all types of turbomachinery technology, from aerospace, land-based power, and even domestic products.

This year the Whittle laboratory was awarded a Royal Aeronautical Society Heritage Award for ‘fundamental contributions in aeroengine and turbomachinery research, design tools and education. Recognising it globally as a leader in this field’.

The Lab, in partnership with Rolls-Royce, has pioneered a novel method of ‘agile’ technology development to radically transform the UK aero-propulsion technology transfer process to make it faster and cheaper. A formalised trial of the new ‘agile’ technology development process was undertaken, supported by the UK Aerospace Technology Institute. Small, ‘Formula 1 style’ autonomous co-located teams were formed.

Manufacture, test times and costs have been reduced by more than 100x. What used to take 2 years in 2005 now takes a week.

The outcome was a merging of the digital and physical systems involved in the technology transfer process to ‘tighten the circle’ between design, manufacture and testing in the Lab. Design times have been reduced by more than 100x by developing tools running on graphics cards and using this to underpin augmented design systems based on machine learning. Using rapid prototyping and directly linking the design system with in-house machine tools, designers can realise physical blades in around a day direct from the design system.

At the same time, the Whittle Laboratory has pioneered the development of training and education. In 2013 the laboratory launched the EPSRC Centre for Doctoral Training in Gas Turbine Aerodynamics, an exciting joint-venture between the universities of Cambridge, Oxford, Loughborough, and Rolls-Royce, Mitsubishi Heavy Industries, Siemens, Dyson and EPSRC. The Centre trains the next generation of leaders in both academia and industry, and over 80 PhD students have graduated to date and have gone on to successful jobs.

Over the first three years the Centre doubled the number of post graduate applicants, helping to make the UK the most attractive country in the world for students seeking education in the field. Over the next 5 years the Centre will broaden its remit, becoming the EPSRC Centre for Doctoral Training in Future Propulsion and Power.

A multi-partner £50m investment is now planned to develop a new National Centre in Propulsion and Power based in Cambridge. By building on long-term successful collaborations the UK can remain globally competitive in the aerospace sector.
Knowledge Exchange is so much more than its stereotyped model of large, science-industry specific projects between large corporates and research-intensive universities.

It’s methods and impacts are varied in both scale and nature, as are the people who drive the collaboration. Ultimately, knowledge exchange is based on relationships between diverse stakeholders who are likely to have differing expectations and work under different business cultures.

NCUB’s annual ‘State of the Relationship’ report is a welcome celebration of successful university-business collaborations. It is inspiring to read about the range of research breakthroughs and industry innovation happening in the UK with partners at home and overseas, funded by the public and private sectors, for economic, social and creative impact.

But how do these collaborations come about in the first place? How does an individual researcher or academic group identify a market for their research breakthrough? How does a company find just the right expertise within the thousands of academics working in the UK research base? How do partners decide what is the best way to pursue a mutual interest? And how do the projects exhibited here come to fruition with all the funding, project management and commercial considerations they require? This is where an often overlooked cohort of people working in almost all UK universities come in: the knowledge exchange professional.

Who are KE professionals?

The role of the KE professional is to reconcile those differences and work towards the best outcome for all concerned within constraints that have to be recognised and worked through, for example: conditions required by a university’s charitable status or imposed by a particular funder.

KE professionals help researchers to take their work, as individuals or teams, to external audiences: activity known broadly as knowledge exchange (KE). There are many ways to do this, many pros and cons to the various methods, many rewards and benefits for getting it right but also a certain amount of risk attached to some KE routes. Because of this variety of options, added to the complexity of funding routes and
organisational bureaucracy (a rather taboo word, but it’s true) the KE professionals has specialist skills – in contracting, licensing and IP management – to advise, guide and inform collaboration partners and academic entrepreneurs.

But the people who look to PraxisAuril for training also need people skills; in stakeholder and relationship management, and business development and our research has found that these types of skills are often more sought after by recruiters. Why? Because KE is, above all a people business. It is about meeting people, seeing links, bringing them together, suggesting ways of working. It’s about finding opportunities for research application, persuading investors to see the potential of a piece of IP, of building a community of stakeholders who want to support enterprise for the long-term. It’s about signposting, seeking expert advice and project management. And sometimes it’s about bring a project to a close, helping stakeholders to retain value from the experience and want to do more.

KE as a profession

PraxisAuril campaigns for the sharing of good practice in the sector and is working towards increasing the professionalisation of the KE function. We are interested in the extent to which this is encouraged at an institutional level by supporting professional development via training and ‘RTTP accreditation’ which provides recognition of global professional standards awarded by the Alliance of Technology Transfer Professionals, of which PraxisAuril is a founder-member. This is KE reflected on the international stage.

One of the striking things about the profession is the very diverse nature of job roles and responsibilities (a quick look at our jobs notice board is also a good indicator of this). Most of our members work in relatively small teams – no more than 10 people - which gives a low KE staff: academic ratio per institution. That also means that individuals in that team are less likely to be specialised – they will need a broad range of knowledge to serve a broad academic, internal, and external audience base. What is very pleasing to note is that our member surveys show KE professionals are highly motivated by their jobs and the position they have to help academics make an impact.

It’s not just about spin-outs.

Knowledge Exchange describes a range of activities that enable researchers to work with external partners or take research outcomes into external contexts for economic and social impact. Aspects of KE are referred to as ‘technology transfer’ and ‘research commercialisation’ – these tend to be the more transactional focused activities based around identified and protected IP. Because they are relatively easy to quantify these are the activities that tend to make headlines when numbers go up, or down.
involved will need to get to know each other and build trust over time. They may need to disclose background IP and agree how to share any IP arising from the collaboration. There may be funding bodies to consider and investment to secure. It can be a combination of any of these elements.

One of our core messages is about this diversity. There is something to suit every university type and every potential partner. One of the issues that we tackle through policy and advocacy activities is the persistent focus on spin-outs as a measure of success. Spin-outs are important but represent a small amount of activity for a few, very research intensive universities. We are excited about the potential of the KEF to add nuance to the measurement of success in KE across the UK by using a novel cluster methodology.

The clusters demonstrate that within diversity there are also specialisms. Should every university try to do everything? Some do, of course, but that takes a large amount of resource and commitment and so also tends to be the domain of large institutions. Smaller and more specialised universities know what works for them and will build expertise in that particular KE method. But that's not to say that they shouldn't be encouraged to try other things, to have the knowledge to advise on a suitable KE pathway even if it's not an ‘in-house’ expertise. Part of the point of being a PraxisAuril member is that you can ask for advice from people who've done it before and find help on the way to trying something new. This is part of our effort to support the exchange of good practice and raise the level of service for internal and external customers across the sector.

**World-class KE**

“The UK is renowned and respected for the maturity of its KE profession. We want the UK to be proud of what it achieves through KE – not just for the outcomes but for the diversity of approach that enables thousands of academics to reach audiences locally and around the globe.”

Sean Fielding, Chair, PraxisAuril

We do this by welcoming non-UK delegates to our scheduled training courses, by delivering training overseas and by working with sister organisations in the USA – AUTM – and in Europe – ASTP-Proton.

**Why should we pay more attention to KE professionals?**

UK government industrial and innovation policies emphasise the role of universities in driving economic development, particularly at a local and regional level as so-called ‘anchor institutions’. Many are playing a vital role in developing Local Industrial Strategies and taking an active role in discussions about more devolution in England.

The Industrial Strategy White Paper set out the part that universities should play in helping to raise the level of R&D in the UK. It is a big role with high expectations; it relates to a university’s mission, to its internal resources and to its external environment. With high expectations has come increased funding – notably the Connecting Capabilities Fund and Strength in Places Fund which relate directly to knowledge exchange – but also a need for universities to be much more transparent about how they are working with business and to do more. This is another key purpose of the KEF and one in which our relationship with the NCUB plays a key part.

Our network and training are not just for universities; they are open to any organisation interested in KE and that wants to engage in a practical and professional way to inform this important, but often unsung, work that is such a vital part of every success story and amply demonstrated in this report.
Delivering unique SME growth service

Birmingham City University supports local and regional SME growth through a unique online diagnostic tool and workshop programme. Designed by experienced academics, providing businesses with a personalised report, tailored workshops and one-on-one sessions to identify business challenges and opportunities for growth.

Birmingham City University (BCU) is making a significant contribution to supporting SME business growth in the West Midlands through its ‘Growing You’ workshop programme, and unique on-line business diagnostic tool as part of the University’s SME Growth Service.

The Growing You workshop programme is delivered through BCU’s Centre for Enterprise, Innovation and Growth (CEIG), set up in 2016 to help businesses develop and grow their business.

“I realised there was a need to start researching what growth means for small companies. That didn’t just mean sending out surveys but actually talking to businesses. We started to think about how to shape that research into a practical tool so businesses could benefit.”

Mark Gilman, Professor of SME Growth and Development, Birmingham City University

The BCU programme found that small businesses can often struggle to find time to work on the areas that are essential to growth. They need to address things like strategy, marketing, value proposition, etc. These are key issues they need to get right so they can be efficient and proactive. Business owners are passionate, skilled and experienced, but once their business takes off, they need a wider set of skills. Mark Gilman added “Just because you are knowledgeable in your area it doesn't mean you know how to grow a business. The SME Growth Service is here to help with that.”

Following their engagement with the bespoke online tool to help diagnose overall business performance, businesses receive a free report outlining key areas to focus on, and that supports the identification of opportunities for business growth or areas which require a step change. Over 170 businesses have so far used the Growing You diagnostic tool, with a further 50 engaged on other support activity through BCU.

In addition to the online tool the Growing You programme includes workshops, focused on specific areas of business including business strategy, leadership and people engagement. The analysis from the report is often the starting point for a growth journey which businesses can further explore throughout the workshops as well as with their appointed business mentor.

Growing You is one of the support services delivered as part of the Growth Hub initiative - a single point of contact for support, signposting funding opportunities across Birmingham, Solihull and South Staffordshire. The Growth Hub is funded by the European Regional Development Fund (ERDF) and led by the Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP). Launched in 2015 the number of businesses supported through the GBSLEP Growth Hub has already reached the 1,000 milestone.
Taking the weight off the big health challenge

Creative collaboration between University of Hull and East Riding of Yorkshire Council leads the way in reducing weight through innovative ‘Live Well’ programme.

Obesity and unhealthy lifestyles continue to be major concerns for individuals, the NHS and the economy as a whole. They harm people’s lives, relationships and careers. They result in health complications and premature deaths. They cost billions in lost working days and productivity. As fad diets come and go, and exercise programmes prove difficult to maintain, a pioneering partnership between the University of Hull and East Riding of Yorkshire Council (ERYC) is leading the way in delivering sustainable healthy behaviour change in the UK.

‘Live Well’ is an individualised 12-month healthy lifestyle programme addressing weight management and physical activity specifically for those over 18 with a BMI of 45 and over. The programme has been developed by Dr Caroline Douglas and Dr Sam Nabb, from the Department of Sport, Health & Exercise Science (SHES) at the University of Hull, and working with GPs, more than 1,000 patients have been referred. Live Well is delivered in ERYC leisure centres and has achieved a 75% completion rate in patients referred with 84% losing weight. All completers significantly improved their BMI, waist and hip circumferences and lowered their resting heart rate and blood pressure. Research indicates Live Well is beating National Institute for Health and Care Excellence (NICE) guidelines for participant completions in weight management programmes and in weight loss.

Live Well participants have significantly increased their daily fruit and vegetable intake, reduced sugary drinks and decreased their consumption of foods high in salt, fat and sugar, within six months. This success saw East Riding of Yorkshire Council win the Public Health category at the Local Government Chronicle Awards at Grosvenor House in March 2019.

“The University of Hull plays a fundamental and pivotal role in our award-winning Leisure and Public Health programmes offered to East Riding residents. We have in place a range of specialist offers to support people to turn their lives around through the unique personalised approach and we are achieving fantastic outcomes for people.”

John Skidmore, Director of Adults, Health & Social Services for East Riding Council

Caroline and Sam were nominated for the 2019 UK MadeAtUni Health Pioneer Awards and disseminated their findings at the World Health Organisation European network for the promotion of health-enhancing physical activity (HEPA), and to the Association for Public Service Excellence (APSE). They also won the Enterprise & Innovation category at the University’s Staff Excellence Awards. They are now assisting ERYC to develop an electronic infrastructure to shape Live Well as a Special Weight Management Service at the forefront of community-based obesity management.

The relationship between ERYC and the University will deliver significant patient benefits and enhance impactful knowledge exchange in a region where 1 in 7 people are obese or overweight.
An unusual brew

4T2 Technologies invented a real-time fluid sensor to water usage in the brewing industry. With no experience in running a wet lab – a necessary step in prototype validation, University of Birmingham Enterprise devised a novel method of knowledge exchange – a mini-apprenticeship, delivered in the laboratories at the University’s bioincubator.

Business partners Max Swinbourne and Alex Smith already had a market in mind – the brewing industry, which uses bleach to stop fermentation in beer production lines. However the bleach has to be washed out with water using up to five pints of water for each pint of beer produced. The business partners designed and patented a low-cost sensor to show when production lines are free of bleach.

Both partners had design engineering experience, and were working on building a prototype when they came to the University’s business incubator, the BizziInn, for advice on funding and investment strategy. To get investment, the prototype had to be validated, requiring testing in a wet lab – something neither Max nor Alex had any experience in. BizziInn mentors conceived a novel method of knowledge exchange – a mini-laboratory apprenticeship at the University’s bioincubator, the BioHub Birmingham®, delivered through the Birmingham Knowledge Exchange Business Incubation Partnership (BKEBIP).

Over nine months, BioHub laboratory staff delivered the A to Z of how to specify, set up and run a laboratory. As the product was still under development, the knowledge exchange had to be both dynamic and flexible. BizziInn mentors ensured the investment strategy developed in parallel with the prototype. The innovators were encouraged to apply for Climate KIC funding, which supported the company through the early stages of prototype development, and brought investors to the BioHub to demonstrate their technology.

After a year at the BioHub, 4T2 Technologies moved on and built their own laboratory at the Innovation Campus in Aston. With six international investors they launched their flagship product, the Diemetric Sensor, targeted at a variety of sectors including food and beverage, oil and gas, biofuels, and plant machinery, where the ability to monitor fluid quality and composition provides real-time process information. Max Swinbourne is now a sponsor and mentor for MBA students at the Birmingham Business School. More information about 4T2 Sensors is available at: www.4T2sensors.com.

“The knowledge exchange took us from idea to prototype to launch in a short space of time.”
Max Swinbourne, co-founder, 4T2 Sensors

About the BizziInn The BizziInn business incubator provides mentoring and one-to-one assistance in business planning to entrepreneurs of all types (academics, graduates and local business people). Since it opened in 2013, it has assisted 330 companies and created 141 jobs, mostly in hi-tech industries. The BizziInn is managed by University of Birmingham Enterprise, located on the University campus, and membership is by application.
The relationship between productivity and place is co-dependent and complicated. The Government has committed to boosting productivity through addressing regional differences, but do the two go hand in hand? Does a rising tide lift all boats? If not, then what would balancing, or re-balancing, the UK look like? Different areas have different expertise and a one size fits all model does not work. So how can university-business collaboration address the variation of investment, capital, people, resources, equipment, capacity and capability?

We asked our members to consider how they both relied on and supported their local areas and sectors. Case-studies were encouraged on partnerships: which benefited specific sectors, people or places; which were successful due to their geographical place; which have had a specific place-based impact; which are supporting Local Industrial Strategies.

The collaborations in this section speak volumes about the pride that universities and businesses have in their locale. Every case study supports and develops its region or community, celebrating the aspects which make them unique. From science parks and cyber-security across Wales, to diversity and graduate prospects in the Midlands, to the farming landscape of Cambridgeshire and the South West. We’ve got universities who looked to support their local gin distilleries, and businesses which sought the expertise of a nearby university. There are projects focusing on the local expertise of oil and gas, or of sustainable power, and projects seeking to establish expertise in precision medicine.

These case studies are supported by analysis from NCUB about the evolution of Local Industrial Strategies (LISs) in supporting a better-balanced UK which produces with collective rewards. We also consider the hotspots – and the ‘notspots’ – of higher education provision and graduate skills. Better balancing the UK through both skills and economies will be paramount to solving the weak productivity growth of the UK.

Richard Jones from the University of Sheffield ties together the disparities in regional economic performance with overarching UK narrative around increasing research and development intensity. For Scotland, this connection between economic growth and collaboration will be considered by Anton Muscatelli, Vice-Chancellor of Glasgow University, as he embarks on a review commissioned by the Scottish Government Finance and Economy Secretary. Anton discusses the intentions of this report, due to be published later this year, and the crucial role of partnerships in maximising economic benefit.
Building a better-balanced UK

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Amongst the UK’s most pressing economic problems are the very weak productivity growth we’ve seen since the global financial crisis, and the profound disparities in economic performance between different regions.

Our productivity problem has a number of causes, but one key factor is a relative failure to innovate. There has been a general collapse in total factor productivity growth – the economy is less able to create higher value products and services from the same inputs than in previous decades. This is a problem of declining innovation in its broadest sense – and the disparities in productivity between the different regions of the UK mean that this innovation problem has a strong regional dimension.

It’s not as though the opportunities for innovation aren’t there: there are exciting developments in machine learning, the “internet of things” and “Industrie 4.0”, in biotechnology, synthetic biology and nanotechnology, in new technologies for generating and storing energy. But the productivity data shows that UK companies are not taking enough advantage of these opportunities.

The UK economy is not able to harness innovation at a sufficient scale to generate the economic growth we need.

The UK has a research and development intensity – especially in the private sector and for translational research – that is low compared to competitors. There is now widespread recognition of this, reflected in the adoption by the government of a target to raise R&D intensity from its current value of around 1.7%, to 2.4% by 2027. We will not be able to reach this target without rebuilding the innovation systems of those parts of the country outside the prosperous South East of England.
There is much to be proud of in the UK’s science base. As measured by the Nobel prizes won by UK-based scientists and the impact of their publications, our academic science base is internationally leading. But despite these successes, the UK’s wider research and development base suffers from three faults:

**TOO SMALL**
for the size of our economy, as measured by R&D intensity

**PARTICULARLY WEAK**
in translational research and industrial R&D

**TOO GEOGRAPHICALLY CONCENTRATED**
in the already prosperous parts of the country

There are very wide disparities in public investment between the regions of the UK, with significant underinvestment in the poorer regions, and a mismatch between where the public and private sectors invest.

Currently, just three sub-regions of the UK - Oxford and its environs, Cambridge and its sub-region, and inner West London – account for 31 per cent of all R&D spending in the UK. Public sector R&D is even more concentrated – 41 per cent takes place in these three regions. The strong science base of these regions has been a major contribution to their economic success, which now needs to be spread out to the rest of the country.

**WE CAN MAKE A ROUGH, FOURFOLD DIVISION OF THE REGIONS OF THE UK BASED ON THE RELATIVE STRENGTH OF THEIR PUBLIC AND PRIVATE SECTOR R&D:**

- **WEST MIDLANDS**
- **NORTH WEST**
- **NORTHERN IRELAND**
- **NORTH EAST**
- **SOUTH WEST**
- **EAST MIDLANDS**
- **YORKSHIRE & HUMBER**

Have relatively low public spending on R&D, but disproportionately high private sector R&D investment. Government investment should support & grow existing private sector innovation capacity and productivity.

Have a combination of low public spending on R&D and low private sector R&D investment. As the economically weakest regions of the UK, there is a compelling case to increase public investment, but this must be carefully targeted to those areas that are most likely to grow business R&D capacity and lead to increases in productivity.
The University of Sheffield's Advanced Manufacturing Research Centre (AMRC) gives us one model for how a new translational research facility can drive innovation and productivity growth in an economically lagging region. The subject of a case-study in the 2018 State of the Relationship report, the AMRC is now part of the High Value Catapult Network, though its establishment predated the introduction of the Catapult centres. The AMRC began with a strong aerospace sector focus, and was built around strong core partnerships with large companies - Boeing and Rolls-Royce. One measure of its success has been the way it has attracted new, high value, manufacturing facilities (from Boeing and McLaren) into an economically lagging, deindustrialised region.

This kind of inward investment from international companies at the technology frontier has both direct and indirect benefits. The direct effect is to introduce new, higher productivity, economic activity to the region. The indirect benefits are to raise the productivity of the indigenous business base. This happens through engagement of local firms in the supply chains of the incoming businesses, and by raising the level of skills in the region – including the quality of management.

In short, the AMRC has served as a nucleus to recreate what US researchers Pisano & Shih call the ‘industrial commons’ - the set of collective resources and knowledge that a successful regional cluster in all types of manufacturing industry must draw on. It has created new networks to promote innovation, to diffuse new technologies, and to raise skills levels, both directly and indirectly. It has helped create more demand for higher levels of skills, suggesting a route by which lagging regions can break out of the low-skills/low-productivity equilibrium many find themselves in.

Science and innovation policy needs to develop a much stronger regional dimension, to correct the current imbalances in R&D spending, to create the new innovation capacity that will be needed if the 2.4% R&D intensity target is to be met, and to drive productivity growth in currently economically lagging regions. A big part of this policy should be the creation and strengthening of research centres in the regions with the conscious goal of rebuilding those places’ ‘industrial commons’.

In addition to its role as a research centre, AMRC has become more directly involved in skills at all levels, including developing high-quality intermediate level skills through apprentice programmes.
Innovation through partnership: The National Decommissioning Centre

The University of Aberdeen is the recognised leader in oil and gas decommissioning and is home to the National Decommissioning Centre. Established with government support through the Oil and Gas Technology Centre, this multi-million-pound centre of excellence works in partnership with government, industry and research organisations to deliver high impact research and training that will transform the decommissioning sector.

The Aberdeen City region’s economic and research strengths have long been within the Oil & Gas sector. The recent focus upon the burgeoning decommissioning market has resulted in innovative, collaborative and novel partnerships that contribute to a positive future for that sector within the Aberdeen region.

The National Decommissioning Centre (NDC) officially launched in January 2019. It is an ambitious £38m collaborative partnership between the University of Aberdeen and the Oil & Gas Technology Centre (OGTC) developed as part of the Aberdeen City Region Deal, and hosted by the University of Aberdeen. The NDC will be a leader in tackling current and future challenges in decommissioning in the oil and gas sector, creating competitive advantage through world-class research focused on reducing costs, extending field and asset life, and transforming traditional approaches to decommissioning.

For example, 100 offshore platforms and 7,500km of pipeline are forecast to be decommissioned or reused in the next decade on the UK Continental Shelf with costs estimated to reach £60bn by 2050. The NDC will help deliver the £21bn savings target set by industry regulators, and build on research expertise to support all levels of academia and industry. The University of Aberdeen is a well-placed partner with the world’s first MSc in Decommissioning and a breadth of decommissioning-relevant expertise, skills and capability in Biological Sciences, Business, Engineering, Geosciences, Law and Natural & Computing Sciences. Additionally, industry’s priority challenges in decommissioning are also reflected in the establishment of a Centre for Doctoral Training (CDT) at NDC with cohorts of the brightest and best University of Aberdeen PhD students working on industry driven research, ensuring the next generation of skilled professionals.

NDC will be a busy, active and innovative space with up to 50 residents and diverse high impact research being undertaken where both MSc and PhD students engage directly with Oil and Gas Technology Centre, University and NDC staff, other academic partners, research organisations and industry partners.

To undertake this work, the NDC is now home to the most powerful industrial laser at any UK academic institution, a hyperbaric testing vessel which can simulate ocean conditions at 6,500m, an indoor freshwater immersion tank, environmental chambers for temperature testing from -40C to +180C, hangar space for the design and construction of decommissioning technology, a state-of-the-art digital visualisation and collaboration suite, and a supercomputer cluster. This is a real example of University-industry collaboration between productivity and place that addresses investment, capital, people, resources, equipment, capability, skills, and learning and teaching that will future-proof the region for the benefit of all stakeholders on a local, national and global basis.
The Scottish Ginaissance

When you think of Scotland, you think of whisky. But with 70% of the UK’s gin production taking place in Scotland, is gin becoming the uisge-beatha, or water of life?

Scotland accounts for 70 percent of the UK’s total gin production, largely driven by the growth in craft distilleries, 35 of which have opened in Scotland in less than three years, offering over 100 gin variations.

There is a vast array of botanicals grown in Scotland and a wide palette of flavours and aromas that can be incorporated into Scotland's distilled products. Many distillers produce gin while they wait for whisky to mature and over a third of Scotland’s 149 distilleries are now producing gin, with the number of Scottish gin brands believed to have climbed to around 140.

The recipe development process can be very complex, particularly when working with novel or large numbers of botanicals. Distillation experts from the International Centre for Brewing and Distilling (ICBD) at Heriot-Watt University have created a Botanicals Library, spending three years individually distilling and cataloguing 72 botanicals that can be grown in Scotland, are commercially available and from a sustainable source. The library includes everything from nettles and lavender to dandelion and the chagga fungus, which grows on birch trees.

Initially funded by Interface to help create unique and new products, the library has been further developed and is now being used to ensure Scottish gin meets the import standards of countries like the USA, to help Scotland’s gin producers increase their exports. With sales expected to hit £1.5 billion by 2020, according to Scotland Food and Drink, the library is good news for producers who are eyeing the domestic and international markets.

Several members of the Scottish Distillers Association (SDA) have already worked with ICBD, experimenting with botanicals that can be sourced close to their distilling operations, and using the library to create new gins with a unique selling point. One business which benefited from using the Botanicals Library is Highland Boundary, a craft distillery based in Alyth.

“By accessing the expertise at Heriot-Watt University we were able to try out different botanicals to produce new flavours of spirit with distinct Scottish flavours reflecting Perthshire’s “big tree country”. Now that we have launched our first product, Birch and Elderflower Wild Scottish Spirit, we want to build the company and create employment in an area where manufacturing jobs are few and far between.”

Marian Bruce, Co-Founder, Highland Boundary Distillery

Now, over 30 distilling MSc projects have been incorporated that utilise the Botanicals Library and the team has also gone on to win the Multiparty Collaboration category of the Scottish Knowledge Exchange Awards 2019 run by Interface. Scotland's long heritage and Heriot-Watt's expertise in distilling, combined with focused collaboration with local and national distillers has certainly proved to be a recipe for success.

Slàinte to that!
A partnership in Nottingham between researchers and a sustainable housing development has created a unique new model for renewable energy in the UK.

Meeting the UK’s growing energy needs is a significant and complex challenge. University of Nottingham scientists are helping to create a future where communities generate enough renewable energy to meet their needs with a surplus flowing into the national grid.

At Nottingham’s Trent Basin housing development, a £6m community energy project has been recognised as a model for UK cities to address this challenge. Project SCENe (Sustainable Community Energy Networks) is a partnership between University of Nottingham academics with technologists, housing developers, industry, the energy supply chain, the city council and residents. The University’s partners in Project SCENe include SmartKlub, which supports the delivery of integrated community energy projects and runs the Trent Basin ESCO community energy company.

“The project will enable us to evolve a community energy model that will both lower customers’ energy costs and reduce carbon.”

Nick Ebbs, Chief Executive, Blueprint Housing Development

The project, funded by Innovate UK and the Energy Research Accelerator, harnesses new technologies to increase supplies of sustainable energy. The project ensures energy is efficiently distributed across resilient systems to reduce waste and promote shared responsibility. It’s been featured as a case study in major government policy consultations and sustainability reports. Professor Mark Gillott, who leads the University’s research at Trent Basin, said:

“Nottingham and all UK cities can become much more energy self-sufficient. Community energy schemes like Project SCENe show how this can be accomplished.”

The Trent Basin development will eventually number 500 low-carbon homes. It includes Europe’s largest community battery allowing renewable energy - generated by solar panels throughout the neighbourhood - to be stored on site, while still connected to the National Grid. Householders are invited to join the community energy company, with shared profits helping offset energy costs, and the prospect of eventually reducing bills.

“The project will enable us to evolve a subsidy-free business model with the potential to revolutionise sustainable housing development all over the UK.”

Charles Bradshaw-Smith, Chief Executive, SmartKlub

This data informs the project team’s studies of attitudes towards energy consumption and how to most effectively influence these practices. Data is being generated on consumer energy that will influence the roll out of similar community energy schemes across the UK. And at Trent Basin, by involving residents and through interactive technologies, the University is demonstrating how a socialised sense of responsibility can influence individual attitudes to energy use and sustainability.

CASE STUDY BY UNIVERSITY OF NOTTINGHAM
The true value of university business collaboration

In last year’s report, HSBC assessed the opportunities presented by the establishment of its new ring-fenced bank headquarters in Birmingham. In 2019 there’s scope to share the impact of the move in more detail including new and strengthened relationships with local universities Birmingham, Aston and Warwick.

A combination of increased visibility in the West Midlands – both through the physical presence of a landmark building and community activity – and a refreshed graduate attraction approach has massively increased applications for the bank’s graduate and undergraduate internship programmes from the region’s universities.

Alongside the traditional focus on recruitment the bank has built a co-ordinated relationship with universities in research, community engagement, skills development and qualification creation. The partnership is developing graduates with the key skills needed for the future world of work and delivering a strong talent pipeline for local businesses to drive regional economic growth and prosperity.

Previously, Birmingham, Warwick and Aston did not feature in the top 10 for graduate applications to HSBC’s UK programmes. Since 2017 HSBC has been engaging with each university on a multi-level basis, from personal branding employability sessions and careers insight days for students to technical events and academic expertise for industry. As a result the bank was able to attract far more applications during the 2018-19 graduate recruitment campaign, with all three universities placing in the UK top 10 and Warwick and Birmingham taking first and second place respectively.

Now the universities are positioned high in the global rankings at HSBC. Birmingham and Warwick placed in the top 5 globally for number of applications to the Commercial and Retail banks and Aston featured in the top 5 for the Retail bank. Birmingham received the highest number of offers within the Retail bank globally and along with Warwick managed a top 5 application-to-offer rate.

This new approach helped HSBC win the Best Graduate Attraction Strategy Award at the Institute of Student Employers Awards and was named 2018 Graduate Employer of Choice by The Times / High Fliers.

The universities themselves have offered their views on the partnership, with Warwick saying that:

“We recently collaborated to deliver a ‘Personal Branding Employability Session’ resulting in an NUE Award nomination for Best Collaboration between a University and Employer. At the new HSBC HQ University facility we participated in a Careers Insight Day. It was a great chance to gain a more in-depth understanding about the bank’s programmes and vision.”

Aston also identified the benefits of a richer partnership:

“Aston University and HSBC are developing a multi-level partnership that has evolved beyond student and graduate recruitment and leadership development. We have piloted the HSBC Placement year for the past two years with students from a range of degree disciplines completing their industrial placement at the Birmingham HQ. HSBC staff are now working with Aston academics co-designing a new cybersecurity undergraduate degree to launch in September 2019. We have also co-delivered events covering cybercrime, block chain and AI to a business audience.”

“It has been fantastic to demonstrate the value of a business and a university working together to address these critical national challenges.”

We are hugely encouraged by the success of our West Midlands partnerships to date, forming an important part of a UK-wide university engagement programme. We look forward to continuing to work with Birmingham, Warwick and Aston Universities in increasingly innovative ways during 2019.
In 2014, the Higher Education Funding Council for England (HEFCE) published data on the hot spots and cold spots of higher education\(^1\). Since then, much in the landscape has changed – the roles of HEFCE are now carried out by Research England as part of UK Research and Innovation (UKRI) and the Office for Students (OfS) – but has the spread of higher education provision improved?

Areas of concern included: the England/Wales border, the Cumbrian coast, Humberside and North Yorkshire, a stretch from Kent to the Wash, and large portions of the South West. Of course, there are some fantastic institutions in these areas delivering high-quality education and research to their local communities and beyond – as you will see throughout this report.

And more institutions are announced each year; four new universities have been recognised since this HEFCE data was published alone. In 2016, a government white paper on ‘Success as a Knowledge Economy’ outlined reforms to encourage the establishment of ‘new high-quality universities to raise standards and give students more choice’\(^2\). We see evidence of this in the case-study from newcomer the New Model in Technology and Engineering (NMiTE) as they explain how they are tackling the delivery of higher technical education and meeting an important need in previous cold-spot Hereford.

This awareness of regional need, and the subsequent meeting of it, will be critical for the future of the UK as a knowledge economy, global leader in higher-education, economy built on ideas and many other aspirations. A lack of higher education in some areas could hamper local economic growth, contributing to the long tail of productivity that the government is focused on correcting.

Distance is a significant factor in the choice of institution – in 2017 69% of the graduating cohort entered into employment in their home region. But 45% of those had also studied there; just 18% of graduates were working in an area they had no prior connection to\(^3\). It therefore follows that areas with low provision are less likely to realise or capitalise on the higher skills of their population, as those students either leave for opportunities elsewhere, or have their choices limited by availability.

Not only is this heavily counter-intuitive to a skills landscape which is so focused on widening participation, increasing opportunity and signposting pathways, but it has ramifications for productivity. The Smart Specialisation Hub has completed significant analysis on this issue in their report ‘Benchmarking Skills and Productivity’ which finds a clear correlation between tertiary (NVQ 4+) qualifications and productivity\(^4\). However, it is interesting that as the level of qualification rises above Level 4 to the more familiar Level 6+, productivity does not increase as an effect.

Of course, the value of a university to its locality is not just in its contribution to the graduate market. Universities also offer opportunity for mature learning, re-skilling and upskilling. They are providers of higher and degree level apprenticeship training, forging partnerships with businesses. They are also the undertakers and collaborators of research and innovation, and large-scale employers in their own right.

Nationally the higher-education sector supports over 1 million jobs and contributes £21.5 billion to UK GDP\(^5\).

The difficulty is in balancing the value of these economic contributions and enabling systems and frameworks which allow growth to be better shared across both regions and industries. Universities - and the businesses they partner with - have extraordinary impact on their local communities and economies and investing in a better-balanced geographic spread would be a strong signal of our faith in, and appreciation of, their role.

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\(^1\) HEFCE, What difference does having a university in your area make?, (2016).
\(^2\) BIS, Success as a Knowledge Economy, (2016).
Addressing the West Midlands productivity gap

The University of Birmingham reviewed the Business, Professional and Financial Services (BPFS) in the West Midlands Combined Authority area.

The BPFS sector is a significant contributor to West Midlands Gross Value Added (GVA) with total BPFS GVA forecast to double between 2015 and 2030. The sector employs over 400,000 people and contributes over £24 billion of GVA regionally. However, GVA per BPFS employee in the West Midlands is £16,072 less than the UK average.

The Productivity and Skills Commission, part of the West Midlands Combined Authority (WMCA), commissioned the City Region Economic Development Institute (City-REDI) to create the research from design through to post publication collaboration, with regional players:

- BPS Birmingham (the regional sector body for BPFS) provided access to senior business leaders and supported review of national and local data sources
- Deloitte - the sector lead champion and business voice
- The Black Country Consortium - providing detailed analysis

The research followed a mixed-methodology and included mapping questions to national research for benchmarking and using the UK Industrial Strategy criteria for maximum transferability. The sector was defined to focus on those BPFS businesses that had the most impact on driving GVA with senior leaders from larger businesses interviewed.

The findings provide a case for greater intervention than before. This is a sector that has looked after itself in the region but is approaching a tipping point. Complacency around skills and employment opportunities, combined with continuing low intervention could result in an imported workforce and non-inclusive growth. The BPFS sector has a ‘male, pale and stale’ image but to fill future skills requirements - including for innovation in developing new products and services - diversification of the workforce is necessary. There is also a need for locally-sensitive differentiated policy interventions.

“A key part of the work-stream has been validating the regional size of the sector and the opportunities. The findings are unequivocal. The BPFS sector has reached a critical mass with a full service offering and is able to compete on the global stage. We should be more confident moving forward to a better skilled, more productive professional sector.”

Ian Barnes, Partner, Deloitte and BPFS Sector Lead on Productivity and Skills Commission, WMGA

Furthermore, BPS is working with employers to expand activities, raising awareness of employment opportunities for non-traditional recruits. By engaging stakeholders such as Deloitte, Wesleyan, HSBC and BNP Paribus through events, BPS has been able to share findings and help employers look beyond traditional ‘elite’ recruitment methods.

The research has supported changes in how policymakers target the West Midlands. The West Midlands Investment Prospectus now explicitly highlights the BPFS cluster. The research has also informed the development of the West Midlands Local Industrial Strategy (LIS). In the previous Strategic Economic Plan, no service sector elements were mentioned explicitly. The 2019 LIS identifies BPFS as one of four regional ‘major market opportunities’.

“BUSINESS, PROFESSIONAL AND FINANCIAL SERVICES SECTOR

400k EMPLOYED IN SECTOR

£24BN GVA REGIONALLY

CASE STUDY BY UNIVERSITY OF BIRMINGHAM
Opportunity for 100 women to retrain in tech

One hundred women across the north and midlands will have the chance to retrain in the digital sector thanks to a new online programme.

Durham University, together with a group of 15 recruitment companies and industry partners - including Capital One and Experian - has received over £500,000 from the Institute of Coding (IoC) to launch a new programme to retrain women in technology.

Currently, only 17% of the tech workforce is women and, out of the top 16 tech companies in the FTSE 100, there is only one ethnic minority woman who holds a board position. The TechUP programme is addressing this shortage of women, especially those from under-represented groups.

The programme, led by Durham in partnership with Edge Hill, Nottingham and York universities, is open to women with degrees in any subject area across the North of England and the Midlands who want to retrain for a career in the technology sector. The driving force from Durham University is Sue Black, Professor of Computer Science and Technology Evangelist and Computer Scientist, Professor Alexandra Cristea. Sue’s own career had an unconventional start after leaving school at 16 and becoming a single mum of three by the age of 25. She returned to education at 26 and graduated with a degree in computing, followed by a PhD leading to her academic career. She has since gone on to be a pioneer of women in technology and founder of #techmums and BCSWomen: the UK’s first online network for women in tech.

Professor Black’s motivation is clear. “Education and technology have changed my life. Thirty years ago, I was living in poverty as a single parent with three small children. Going back into education at the age of 26, ten years after I left school, completely changed all of our lives.”

“Technology is a massive field that offers job opportunities in so many areas. We want to show that it’s a great career for women and kick start a revolution creating awesome female tech role models. In the 1960s, 50 percent of the technology workforce were women and we would love to get back towards this level.”

Sue Black, Professor of Computer Science, Durham University

The programme provides:

Flexible learning
This six-month, online programme allows participants to fit studying around current commitments. Level 6 and 7 (bachelors and masters) modules include coding, data science and cyber security as well as public speaking, clear communication and working as a team, combining the hard and soft skills needed in the industry.

Study support
Industry mentors provide course participants with support and guidance while they complete the programme. There are four residential weekends where learners can network with course peers and listen to industry-led talks from the partners.

Employability
On completion of the programme successful participants are fast-tracked to interview with a partner company for a full-time role and encouraged to become ambassadors for TechUp to ensure sustainability of the programme.
Crop-harvesting robots to revolutionise UK horticulture

The University of Plymouth is working with Cornish SMEs, large UK fruit producers and Chinese researchers to tackle pressures on the UK’s horticultural sector. Increasing demand for home-grown produce and post-Brexit workforce shortage concerns led to projects on selective harvesting robots resulting in the progression and creation of one spin-out and three start-up companies to help the UK be a world leader in agricultural technology and sustainability.

In an effort to develop ground-breaking robotics technology, and to support fruit and vegetable growers with the challenges they face in harvesting, the University of Plymouth has adopted a collaborative approach. The University team, led by Lecturer in Robotics Dr Martin Stoelen, received funding to develop applications for selective harvesting, and created a spin-out company, Fieldwork Robotics Ltd, to help commercialise them.

Dr Martin Stoelen said: “There are a lot of small producers in the UK and they shouldn’t be excluded from taking advantage of technology because it has the power to transform their lives, just as it can for larger producers. We’d like to prove that robotic technology that can work in rural environments is not only possible, but affordable, viable and can help increase productivity on farms.”

While most robot arms are rigid, the ability to be “soft” to survive impacts and physical interaction is important in the complex and dynamic agricultural environment. This is achieved with the variable-stiffness GummiArm robot arm technology, developed by Dr. Stoelen as part of the EU Marie Curie IEF project “DeCoRo”.

The ABC project focuses on developing the soft robot arm technology for selective harvesting of brassicas. Here the University is collaborating with Cornish businesses: Teagle Machinery Ltd, Rivieria Produce and CNC Design Ltd., to create robots to harvest cauliflower, broccoli, kale and cabbage, all of which are grown extensively in Cornwall. The robots may in the future work alongside existing workforces and fill gaps in productivity. Other projects have focused on tomato picking with the same technology, working with Chinese partners in Shanghai, and funded by the Agri-Tech in China: Newton Network + (ATCNN) mechanism through Rothamsted Research.

Dr Martin Stoelen said: “Manual harvesting represents a large portion of producers’ total costs, often it can be up to 50 per cent, so addressing that – especially against a backdrop of Brexit – is very important. There will always be jobs for people associated with agriculture – but it might be that in a decade’s time, instead of spending hours in the cab of a tractor, your role is managing and maintaining robots such as these.”

The overall effort has resulted in the creation of a University of Plymouth spin-out and three start-up companies. The first, Fieldwork Robotics, was recently also awarded almost £550,000 from the Innovate UK Industry Strategy Challenge Fund to create a multi-armed mobile robot prototype for automating raspberry picking. Fieldwork Robotics has signed a collaboration with the Hall Hunter Partnership, a leading soft-fruit grower supplying Marks & Spencer, Tesco and Waitrose. ABC is funded through the three-year £10million Agri-Tech Cornwall project, part-funded by the European Regional Development Fund.
The rich, flat, well-drained fields of the Fens account for around half of England's most productive farmland. Improving agricultural productivity in a sustainable way is, therefore, key to economic growth in the region. Cambridge is a place where innovation thrives. In any one area, there is likely to be a multiplicity of projects going on - and agri-tech is no exception. Whether it's automating repetitive tasks or creating multimillion crop science centres, University researchers are collaborating with farmers and businesses across the region to increase productivity and profitability.

G's Growers is one of the largest producers of salad and vegetables in Europe. It has worked with the University on a number of projects including supply chain management and using computer vision to detect the maturity of crops. Lettuces have been the particular focus of recent collaborations with the Department of Engineering's Machine Intelligence Laboratory.

Robots are very adept at dealing with rigid objects like car components but are less good at handling soft objects of variable shapes, like lettuces, in unstructured environments, like fields. The Cambridge team has been working with G's on two 'soft robot' projects: one on 'peeling' lettuces (removing their outer leaves) and the other on harvesting them, in both cases without damaging the crop.

"We are tackling a crucial problem in agriculture which is a skills shortage in robotics, AI and autonomous learning, areas we believe will be fundamental to improving productivity while managing our environmental stewardship so we can farm safely and productively in the future."

Jacob Kirwan, Innovation Manager, G's Growers

Advances in biotechnology and plant breeding brought about by genome sequencing will also play a vital role in meeting future food demands. Cambridge, in collaboration with the National Institute of Agricultural Botany (NIAB), is creating a new Cambridge Centre for Crop Sciences (3CS) which will work with business to translate fundamental research into practice. A new Professor in Crop Sciences will lead this facility, currently under construction on the outskirts of Cambridge. Its aim is to further agricultural innovation and productivity, benefiting farmers in the eastern region and elsewhere, including smallholder farmers in the developing world.

Collaboration will be the key to success here. Professor Howard Griffiths, Co-Chair of the Cambridge Global Food Security Interdisciplinary Research Centre, explained that 3CS aims to: "Get the various stakeholders to work together as an ‘innovation community’, to identify and tackle the key challenges and help the UK government’s agri-tech strategy. The eastern region is rich in agricultural research facilities and in end-users for agri-tech innovation, with arable farming and horticulture as major industries. 3CS provides a real opportunity for the Cambridge partnership to sustain the East of England as the global centre for agricultural innovation."
Firing the starting gun on Local Industrial Strategies

Local areas have been given greater agency in their own economic futures through the development of Local Industrial Strategies (LIS) – and universities and businesses are in the vanguard of creating these documents and will take much responsibility for delivering on their ambitions.

Better balancing the UK economy is a collective effort with collective rewards. Done carefully, it stands to unlock capacity for growth in productivity, jobs and absorptive capacity across the country. Just as different collaborations draw on different strengths and produce different outcomes, so places have distinct parts to play in the economic growth story.

Partnership between higher education and industry has been part of the local growth conversation for decades.

In recent years, even as Sir Andrew Witty recommended that universities sit on Local Enterprise Partnership innovation boards, this joint involvement has been increasingly formalised. Universities are hefty local economic actors in their own right of course. But it’s at the junction between their activity and that of regionally embedded firms that so many multipliers can be unlocked.

Government is supporting the development of Local Industrial Strategies across England’s LEPs and Combined Authorities. These were initially rolled out over a number of trailblazers which are being published now - but the starting gun has been fired for local leaders across the country to draw up their LIS in the coming months.

Following the example set by the Science and Innovation Audit programme, LIS are a clear policy expression of Government’s commitment to decentralisation of economic and growth-related planning. They are expected to be evidence-based assertions of real capability and opportunity - and to roadmap activities and interventions to maximally leverage these assets. This reflection of real capacity is key. Places are unique and their opportunities and challenges are too; on closer inspection, points of competition can sometimes be complementarities; and apparent limitations can lead to virtuous specialism.

As a name, perhaps ‘Local Industrial Strategies' does not quite capture the crucial importance of engaging the research base.

But we see it happening everywhere. Universities are working with their business-led LEPs to identify mutual goals and integrated activity. Teaching, research and knowledge exchange are all taking place with some relation to the needs and capabilities of places. And interactions being nurtured and their value captured regionally. We are seeing real co-authorship and real co-ownership.

Government and agencies are offering valuable explicit and implicit steers to sustain this effort. The Strength in Places Fund has funded 24 consortia – from an original applicant list of around 100 – to develop final bids bringing together research organisations, businesses, and local leadership on projects that can deliver real growth and productivity gains across the UK. These seedcorn applications will be narrowed down to between 4-8 sizeable interventions which can leverage quality research and innovation partnerships.

The importance of this is clear. Understanding how collaboration can make places more successful – and therefore more attractive to more investment and growth – can unblock years of sluggish growth and productivity to national benefit. And higher education and industry are at the heart of the architecture that can make it happen.
Tackling global cyber security: Cardiff University and Airbus

Pioneering collaboration leads to the Airbus Centre of Excellence in Cyber Security Analytics – the first centre of its kind in Europe. Working across industry, academia and government to provide a focus for cybersecurity analytics

Cyber Security (CS) is a global issue affecting every organisation and requiring solutions on a global platform. Cardiff University is part of a growing and vibrant CS ecosystem in Wales. Led by Professor Pete Burnap, world leading interdisciplinary and industry research into cyber analytics is being undertaken, in partnership with Airbus.

The collaboration was initially enabled via funding from EPSRC, Airbus, and Endeavr - a joint funding initiative between Airbus and Welsh Government to support innovation in Wales. The relationship has since accumulated over £7.8m in grants awarded from RCUK, Industry and Government. Cardiff are leading the safety-critical systems stream in the new £14m EPSRC investment in security of the Internet of Things (IoT) – the PETRAS National Research Centre.

“The Centre is an enabler for the rapid transfer of research into operational activities and ensures that researchers are able to access the latest techniques and data, supported by Airbus experts.”

Professor Kevin Jones, Head of Cyber Security Architecture, Innovation and Scouting, Airbus

Located between the Cardiff Schools of Computer Science and Informatics, Psychology, and Social Sciences the Centre is mutually beneficial. Cardiff delivers global impact from its research and Airbus have commercialised University led ideas, including a new spin out which has transformed risk assessment in the UK and globally; and AI driven ‘DNA profiles’ of malware behaviours, which has also seen advanced methods for tackling malware integrated into Airbus front-line defences.

The University was also recently recognised as an Academic Centre of Excellence in Cyber Security Research (ACE-CSR) by EPSRC and NCSC – the public facing arm of GCHQ. Cardiff were the first institution in Wales to receive this recognition and one of only 17 in the UK. In this respect Cardiff is a go-to place for data-science and AI insights on cyber threats, supporting the AI sector deal in the UK industrial strategy and the National Cyber Security Centre's focus on Active Cyber Defence.

The partnership’s achievements continue to receive national and international recognition, with wide ranging impacts on a global scale and a newly convened external industry advisory board has the MSC in cybersecurity recently revamped to imbue the research excellence in future graduates Professor Pete Burnap, Professor of Data Science & Cybersecurity

“Our work supports UK Government’s Industrial Strategy, which aims to put the UK at the forefront of the Artificial Intelligence and data revolution. The centre is interdisciplinary by design and is drawing together expertise in cyber security from across the whole University.”
AstraZeneca has a long history in the North West and the proximity of its Macclesfield campus to the University of Manchester facilitates strong collaborations, such as the North West Centre for Advanced Drug Delivery (NoWCADD) and the Centre for Biocatalytic Manufacture of New Modalities, and exemplifies AstraZeneca's science-led approach. NoWCADD, which opened in 2015, has become an internationally recognised centre of excellence. Based at the University's School of Pharmacy and Optometry, the Centre focuses on creating collaborative R&D programmes with other groups in the Manchester academic and NHS network, and beyond. It aims to transform emerging drug delivery science into potentially valuable medicines while also identifying and stimulating talented students in early career pharmaceutical science roles.

The team comprises of more than 30 contributors from both the University and AstraZeneca, with three research roles linked to the Centre. The proximity of the two organisations increases interactions and knowledge sharing. “The formation of NoWCADD has provided academics from across the Faculties of Biology, Medicine & Health and Science & Engineering the opportunity to co-develop novel projects and push scientific boundaries. Equally important it has increased the exposure of our students to the fantastic opportunities that the pharmaceutical industry offers,” said Professor Kay Marshall, Head of School of Health Sciences, University of Manchester.

2018 saw AstraZeneca, the University of Manchester and Prozomix be awarded a Prosperity Partnerships grant by the EPSRC and BBSRC to establish the Centre for Biocatalytic Manufacture of New Modalities. The five-year grant, which aims to build links between UK researchers and industry partners, will fund 13 researchers, including six PhD students and five post-doctoral positions. The collaboration brings together the organisations’ collective expertise to design and develop novel chemical manufacturing technologies, based upon engineered biocatalysis, with the aim of producing new complex therapeutic molecules.

“The Centre will push the boundaries of what can be achieved with engineered biocatalysts in the manufacture of emerging medicines and therapies. The proximity of the Manchester and Macclesfield laboratories will ensure the rapid and seamless transfer of skills and technologies between the two sites.”

Professor Nicholas Turner, Professor of Chemical Biology, University of Manchester

The new centre addresses a clear challenge facing the pharmaceutical manufacturing community. New modalities are incredibly important as novel drug solutions but difficult and expensive to produce given their complexity compared to traditional small molecules. The technologies the Centre will develop represent a new chapter in what’s possible in medicines manufacturing, developing more sustainable manufacturing processes that reduce the impact on the environment, and with the potential to bring new medicines to patients.
Creating a global centre of excellence for Precision Medicine

Precision Medicine – an approach which identifies and develops treatments that can be tailored to the individual characteristics of each patient – is an area of significant strength in Scotland.

“Precision Medicine undertaken at the University of Glasgow and the ecosystem centred around the Queen Elizabeth University Hospital are key assets for Scotland’s Precision Medicine ambitions and will be vital as we seek to capitalise on our current position and cement ourselves as international leaders in the field.”

Nicola Sturgeon, MSP, First Minister of Scotland

The BEIS Science and Innovation Audit ‘Precision Medicine Innovation in Scotland’ identified that precision medicine has the potential to be transformative for Scotland and the UK’s life science clusters. The global precision medicine market value is expected to grow to $134bn by 2025, creating a huge opportunity for Scotland to; attract inward investment, and develop expertise to export globally through new technologies and services.

The University of Glasgow is leading the way in precision medicine, with collaboration at the heart of its success. The £1bn Queen Elizabeth University Hospital campus houses the Clinical Innovation Zone (CIZ), the first clinical-academic industry campus worldwide designed around the clinical implementation of precision medicine. The campus is one of the jewels in Scotland's wider precision medicine ecosystem and delivers clinical and economic benefit to Scotland and the UK.

The campus includes the University’s £32m Imaging Centre of Excellence (ICE), which includes the UK’s first 7T-MRI scanner in an acute clinical setting alongside a range of state-of-the-art imaging modalities. ICE supports industry, academic and NHS collaboration by bringing imaging specialists together with researchers and clinicians to develop treatments for patients with chronic disease.

The University also leads the Stratified Medicine Scotland Innovation Centre (soon to be renamed ‘Precision Medicine Scotland’), a Scottish Funding Council funded consortium comprising four universities, NHS Scotland, the global biotechnology company Thermo Fisher Scientific, and Scottish bioinformatics company, Aridhia Informatics.

In 2019, the Industrial Centre for Artificial Intelligence Research in Digital Diagnostics (iCAIRD), opened at CIZ. This University of Glasgow-led, £15.8m pan-Scotland collaboration of partners from academia, NHS, and industry promises to drive better patient diagnosis, treatment and outcomes.

Glasgow is one of the foremost locations in the world to pursue advances in precision medicine and the pioneering research undertaken at the University underpins Scotland’s international profile in this emerging industry.

CASE STUDY BY UNIVERSITY OF GLASGOW
Menai Science Park - 12 months of impact

An overview of the impact of the first 12 months of operations of Bangor University’s Menai Science Park and its contribution to the region’s economic development by both providing high quality facilities for high tech companies linked to placed base innovation priorities; and through encouraging and anchoring entrepreneurship.

The Menai Science Park (trading as M-SParc Ltd.) is Wales’ first dedicated Science Park located on Anglesey in North Wales and opened in March 2018. Developed by Bangor University (a short drive away on the mainland), M-SParc’s purpose is to ‘Ignite Ambition’ and drive growth in knowledge based science and technology linked to research expertise in the region and promote entrepreneurship linked to innovation in key sectors by providing high quality premises, excellent business support, leadership and encouragement.

To date it has achieved a 67% occupancy level, well ahead of plan. M-Sparc has 31,200 sq ft of lettable space for businesses of all sizes and facilities including offices, laboratories, workshops, incubation and grow on spaces as well as an Open Innovation area. M-Sparc has a key role in develop the region’s high economy by bringing together hi-tech industry and scientific research partnerships (particularly in the low carbon, energy, environment and ICT sectors). Built on time and to budget M-Sparc received support from European Regional Development Funding and Welsh Government. Based on an 8 hectare site there is ample room for future expansion and additional buildings.

Businesses located at M-SParc are leading the way in innovation and economic development. Since the Park opened, the 24 businesses there have created 24 new jobs, 6 student placements, 4 graduate employment opportunities, and increased their company turnover for the benefit of the region. Of those jobs, M-SParc Ltd has directly created seven jobs, and 3 of these are new posts created over the last 12 months. Work experience has been provided to students from local schools, inspiring them for the future. 16 key events have taken place at M-SParc since opening, engaging with 1,300 people, of which 5 were events targeting young people.

Located in the Anglesey Enterprise Zone, M-SParc has strong links with Bangor University and builds on this relationship for the benefit of the tenants. Of the 6 work placements provided to 2 will become full time jobs once the students graduate, with a third student looking to return after graduation to be employed by their placement company. M-SParc is also home to a Santander Universities supported incubation space for graduates and a shared office for those starting their first business. M-SParc has won a £1m contract from Welsh Government to support entrepreneurs across North Wales, in partnership with Menter Môn. The Enterprise Hub, of which there are 6 in Wales, is being set up in order to support new business starting up in the region.

Going forward the Science Park will build on its progress to date, providing additional focus for place-based innovation and capitalising on emerging developments such as the North Wales Growth Deal.

THE 24 BUSINESSES AT M-SPARC HAVE CREATED...

24 NEW JOBS
6 STUDENT PLACEMENTS
4 GRADUATE EMPLOYMENT OPPORTUNITIES
Scotland’s universities are among the best in the world, with four of our major institutions represented in the Times Higher Education World Top 200 – punching well above our relatively modest size weight and enjoying a well-deserved reputation for academic excellence right across the world. And the impact of our work – relative to our size – stands up to comparison with the very best in the world.

The research of our universities is leading the way in helping to meet some of the major social, economic and environmental challenges facing the international community in the 21st century. At the University of Glasgow, even just in the last few years, we've spearheaded global efforts to combat the Zika virus, played a central role in the detection of Gravitational Waves and are undertaking world-changing work to address inequalities both at home and abroad. And institutions right across Scotland have similar success stories.

But our impact is not only social. Our universities are already major driving forces of Scotland's economy – referred to by Scottish Government Finance and Economy Secretary Derek Mackay “engines of knowledge and growth”. And while our economic impact is already very clear – I firmly believe that we are only seeing the tip of the iceberg.

Our potential as a sector and as a nation is so great, that I think there is so much more we can achieve if we work together as a sector and as a country to take the right policy decisions and create the right environment to allow that great potential to be fulfilled.

That's why I was delighted to be asked by the Finance and Economy Secretary to undertake a major new report focused on how Scotland's universities can improve our engagement with industry and boost our contribution to economic growth.
The fact that the report has been commissioned at all is deeply heartening – showing the level of emphasis the Scottish Government is placing on the role of universities in delivering inclusive economic growth. This is a role our sector must be willing to embrace.

We can and should be the driving force of Scotland’s economy - the quality of our institutions and our research is a competitive economic advantage we simply must capitalise on in the coming years. And we should not forget that we have an obligation to the communities we serve to ensure that they see the economic benefits of the often world-changing work we undertake.

The notion of demonstrating economic, social and cultural impact is now central to our Universities. As academic institutions we have a duty to ensure the benefits of our work are felt in our communities.

The report – which should be published by September of this year - will consider how the immense strengths of Scotland’s universities can be channelled to the maximum economic benefit for our country by enhancing industrial partnerships and promoting greater collaboration across the sector.

This is a topic where much research and evidence is already available on an international basis, and I don’t want to see Scotland re-invent the wheel in this space. That’s why I’m determined to learn from and build on international best practice and to advise on how Scotland can learn from and build on the work being done by other innovative European economies.

Already, I have undertaken a major programme of engagement on the report, hearing the views of colleagues from industry, economic development agencies, funding bodies and, of course, representatives from other Scottish universities. Over the coming months, I will continue to meet and hear the views of many more people – I am determined that the report will hear from representatives of all actors in the space at as high a level as possible.

What is also heartening has been the enthusiasm of the response from those I have already spoken to, and those who are keen to give me the benefit of their thoughts. Already, I’ve been inundated with fascinating insights and ideas which have given me much to consider as the report begins to take shape.

My aim in producing the report is to develop a small number of headline recommendations for all actors in the space – government, universities, industry and economic development agencies. I have no intention to simply produce a shopping list of demands on government: if we are to meet our potential in this space, government will just be one of a number of organisations who have a major role to play.

But of course, as we take forward the report, we have to recognise that we are starting from a very strong position. Already across the country, exciting partnerships with major industry, SMEs, spin-outs and social enterprises are already underway, with many success stories to be celebrated.

Using my own institution as an example, Glasgow leads the world-renowned Clinical Innovation Zone which offers a unique opportunity for industry to work together with academics and clinicians within the Queen Elizabeth University Hospital in the growing field of Precision Medicine – just one of the many in which Scotland has the genuine potential to lead the world. Already, the Clinical Innovation Zone is creating an eco-system unparalleled anywhere else in the world and is delivering real results – seeing industrial partners relocate to and invest in Scotland from Europe and as far afield as California.

We also have plans to build a new Clyde Waterfront Innovation Campus in the southside of Glasgow specifically to allow for greater industrial collaboration in areas like quantum technology, nanofabrication and photonics – as well as enhancing our offer to industry in Precision Medicine. The impact in terms of job-creation, inclusive economic growth and regeneration in the City is huge – and already dozens of industrial partners have signed up to the project.
Both of these successes in Glasgow are examples which are replicated right across Scotland.

If the right infrastructure, the world-leading research and an effective innovation eco-system is available, industry will make use of it – to our mutual benefit. These are the type of successes we want to build upon – and to see become the norm in the years to come.

In recent years we have developed very successful policy interventions, such as the Innovation Centres which were initiated by the Scottish Funding Council and which are receiving re-investment by SFC and Scottish Enterprise. The report by Graeme Reid on Scotland’s Innovation Centres shows that we have been able to begin to address some of the market failures which pervade the space between university research and business innovation.

A number of our universities have developed close relationships with business focused on innovation. City Deals in Scotland, such as the Edinburgh City Deal where the University of Edinburgh played a key role, together with other HE institutions in the City, have increasingly focused on the important role of innovation and skills. Many of these innovation successes are based on the foundations of research successes which were fuelled by earlier public investment and the ingenuity and entrepreneurial spirit of our Universities.

But of course, we know that there must be room for improvement.

We know that more could be achieved through better co-ordination and collaboration between our institutions and funding agencies. It would be surprising if we did not have major lessons to learn. We know that Scotland suffers from very low levels of business R&D compared to its levels of R&D in Higher Education. We know that there are opportunities to leverage more funding into Scotland, from international business, from the UK industrial strategy, from UKRI, from international agencies. The funding landscape for innovation is changing so it would be surprising that we might not be able to do better, to respond to external incentives, to play an even greater role in driving economic prosperity for Scotland.

Our universities only succeed when Scotland succeeds – and Scotland will only meet its full economic and social potential with a thriving university sector, working with industry and other partners and translating our world-leading work into tangible economic benefits for our country.

Our goal as a nation must be to make Scotland the best place in the world for industry to partner with universities in the common good – linking social impact with tangible economic growth and job creation.

I have every confidence that the fundamentals are there to make this a reality for Scotland. And I am very much looking forward to playing my part with colleagues from the Scottish Government, industry and across our university sector in helping make this happen.
Every major government ambition or new piece of economic policy relies on one core resource – a ‘well-educated’ workforce. It is now more widely accepted that the high-quality development of a graduate is not determined in a single period or environment but is achieved through a collaborative approach to a ‘graduate journey’; from leaving school to joining the workforce as a productive and valuable member.

But what does this look like, and whose responsibility is it to ensure that successful graduate journeys exist? A graduate journey begins with the stereotypical school leaver at 18, selecting their course based on passion or prospects. But it might also be a mature learner, coming into higher education for the first time. Or a returner, looking to top-up previous qualifications. A route through higher education might take the form of remote learning, a degree apprenticeship, or part-time study.

With this in mind, we welcomed submissions from members which: the provision of work experience, paid employment or insights into work; support student or graduate well-being and resilience; focus on building business presence and exposure on campus; or which demonstrate employer involvement in course design and production.

The case studies in this section are diverse in their subject, and their target learner. Many members told us of their work with partners on delivering learning based on employability; from industry designed projects to business hubs and student consultancies. We have case-studies which look at the reskilling of under-represented groups in technology and policing, and those which take early-career researchers and embed workplace skills, facilitating mobility. We look at the different part of the degree apprenticeship system, from collaborative hubs through to alternative models of delivery.

The overarching theme in both the case studies, and in the supporting work, is the uncertainty of the future. Both our universities and businesses are going to great lengths to ensure that the students of today – and the students of tomorrow – are prepared as best they can be for a changing world of work.

Julia Buckingham, Vice-Chancellor of the Brunel University and President-elect of Universities UK, considers the role of a higher-education institution as a place of growth, as well as learning. The educational offering of a university must adapt as the world of work evolves, both in its teaching provision and in its support services. Analysis by NCUB looks at how this concept of student support for wellbeing and mental health interacts with the concept of graduate resilience and a productive workforce.
Future proofing the graduate journey

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As I take up the role of President of Universities UK this summer, I face an in-tray dominated by significant and profound societal issues – Brexit and the skills gap to name but two.

But with challenges come opportunities and I will be working with colleagues to continue to emphasise the critical role universities have solving these issues and the many benefits our world leading higher education has and will continue to bring to society.

Universities have done much in recent years to demonstrate the impact of their research, how their teaching is transforming the lives of their students and where their civic contributions are bringing benefit. They are a force for good and have remained steadfast in a climate of uncertainty, criticism and doubt. But we mustn't rest on our laurels.

We must look forward and think how best we can respond and rise to the challenges of our rapidly changing world.

Developing the future workforce is key part of our business. Our educational offering must adapt and evolve as technology drives changes in working practices and career paths are fundamentally rewritten. Young people are already staying in education for longer as the demand for higher level skills grows and increasingly they will return to higher education, or enter for the first time, to up-skill or re-skill as their careers develop. We must equip our young graduates and our mature learners with the skills - and perhaps more importantly the attributes – they need to survive and thrive in a world of constant change.

Employers consistently tell me that the need for higher level, technical skills will continue to grow. And of course, universities are well placed to deliver these skills.

But even today, technical expertise and knowledge and understanding of a discipline alone are no longer enough. Our graduates need a broad spectrum of skills, knowledge and behaviours to adapt and thrive in the changing world where new jobs and professions will emerge, evolve and replace current practice.
Of course, we cannot prepare every student for every eventuality. However, we can ensure that our students are equipped with the critical and analytical skills needed to interrogate and challenge the evidence base, to develop logical evidence-based arguments and to solve problems. And that our graduates can work independently and collaboratively; can listen, facilitate and mediate; can work effectively in the business environment, adapt to new challenges and think creatively to grow to new opportunities.

Many of these attributes are key products of a degree. But industry is well positioned to help and increasingly we recognise that business partnerships are a key ingredient in preparing our graduates for life beyond the university.

University-business collaborations open the door to a myriad of opportunities for our students while also enhancing the impact of our research base, so clearly demonstrated in the Collaboration Progress Monitor at the beginning of this report. They increase understanding and impact, drive efficiency and bring benefits to all parties - universities, businesses, students and graduates alike.

There are some fantastic examples of such collaborations in this report. From embedding work-experience and work-based learning, to developing entrepreneurship skills to match-making with local businesses - the benefits to students and graduates are immense. But still we must ask ourselves, ‘are we doing everything we can to capitalise on these partnerships? How best can we recognise gaps and future opportunities and strengthen our relationships to achieve better outcomes for our students and for employers?

That period of development to, through and beyond higher education - at any age and in any situation - is not simply an intervention at the beginning of a career. It is part of a journey of life-long learning, a journey that requires support at all stages from both employers and universities.

As universities we must build on emerging practices and adapt our approach by, for example, recognising prior learning and experience and offering more flexible approaches to enable students to ‘learn as they earn’, acquire credits over time and reskill or upskill as they progress through their careers. The traditional three or four year undergraduate degree or one year master’s does not work for everyone, particularly not for mature learners.

Accessibility and inclusivity must be at the heart of our ethos. We must address inequalities and enable individuals to benefit from our offering and thrive whatever their background and position industry and society to reap the benefit of the totality of our rich talent pool.

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**Professor Julia Buckingham CBE, Vice-Chancellor and President of Brunel University London, has been elected as the next President of Universities UK.**

She will succeed the current President, Professor Dame Janet Beer DBE, Vice-Chancellor of the University of Liverpool, from 1 August 2019 and will hold the post for two years.

Professor Buckingham has been a member of the Board of the National Centre for Universities and Business for three years, providing tremendous support and guidance during this time.

In addition, she is currently a Director of Imperial College Health Partners, a member of the All-Party Parliamentary University Group Council, a member of the Heathrow Skills Taskforce, Chair of The Concordat Strategy Group, supporting the career development of researchers, and Chair of the Athena SWAN Review Steering Group.
A degree apprenticeship model that guarantees a job

For the last 20 years Network75 has seen students graduating into 100% employment after studying part-time whilst working, graduating with zero debt from fees and having ‘earned while they learned’.

To date, the Network75 initiative has engaged with 147 employers across a diverse sector range and currently has 143 undergraduate trainees. As part of the scheme, which takes 5 years to complete, students spend two days a week at the university and the remaining time with their host companies.

Primed initially with an £860,000 European Social Fund (ESF) grant, Network75 has evolved into a self-sustaining programme, funded entirely by employers who are willing to support students in exchange for talented individuals who will ‘grow’ with the company.

Network75’s research shows that over 70% of companies who engaged with the scheme believe the students provide knowledge, expertise and qualities that non-graduate employees could not.

“Network75 addresses the engineering and technology skills shortage. This combined work and study route helps to create industry ready graduates. Our involvement with the scheme has been invaluable in providing a straightforward, cost effective means of accessing high quality graduate employees”.

Debbie Precious, Development & Training Manager, Morgan Sindall

Network75 reaches more than 60 schools and colleges each year to recruit students with a good academic record and a desire to gain invaluable industrial experience alongside their academic studies. With applications increasing 34% from 2015 to 2017, this is a competitive scheme attracting extremely capable students.

To date every student completing the programme has gained employment, which, according to project lead Steve Thomas, “speaks volumes for its success”. Former Network75 student Stephanie Lewis (MEng Civil Engineering at Capita) added, “I was offered a permanent position with my host company a year before graduating”.

Over its lifetime the scheme has helped create 112 full time jobs, and been supported by almost £9million in private sector funding. Jordan Thomas (BA Accounting at GE Aviation Wales) credits the scheme with developing “great business acumen, experience and a first class honours degree”.

Whilst funding for degree apprenticeships remains in a pilot phase in Wales, Network 75 offers employers and learners a flexible and convenient way for significant numbers of learners to gain a degree whilst working in industry. It currently it supports degrees in: Engineering, Business, Computing, Law and Science.
Flipping the degree apprenticeship model with PwC and Vodafone

The University of Birmingham level 6 Digital and Technology Solutions Professional degree apprenticeships with PwC and Vodafone are challenging the structure of 80% work and 20% off-the-job training. Instead they combine university life with practical work-based technology projects at the companies to address the skills gaps identified within their businesses.

The degree apprenticeship programmes offered by the University of Birmingham, in conjunction with PwC and Vodafone, are some of the first and largest examples of this kind in action. These programmes use the Apprenticeship Levy as part of the companies’ wider technical skills strategies.

Degree apprentices have to spend a minimum of 20% of their time off the job, but there’s no maximum. On this programme students are employees from day one and paid a salary throughout their course. But, rather than just 20% of time, they attend lectures throughout term time. They then work on specific projects within the business during a 10-week summer placement and undertake a 15-month placement around their third year.

For a degree apprenticeship programme to be successful, it must be a genuine collaboration with senior level employer buy-in. The apprenticeship programme is a journey, often over several years, where apprentices will develop in their role. To do this they have line managers providing support and managing the “off-the-job” training. In addition to their line manager, Digital Degree Apprenticeship students have a ‘Business Point of Contact’ to support and provide answers to technical queries, or offer insight into digital and technology roles.

At the end of the programme the students earn a bachelor’s degree in Computer Science and will continue their careers with the employer in roles such as software testers, front or back end developers, data analysts and artificial intelligence specialists.

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Kevin Ellis, Chairman PwC

“I’m the first person in my family to go to university. The financial support from PwC in paying for university fees and receiving a salary meant going to university was a real option and motivation to do well in my exams and get on to the course.”

Tom Hough, Degree Apprentice, PwC

“Digital sectors like artificial intelligence, cloud services and the internet of things represent exciting opportunities for the UK economy. The education programme we have created will help us to make the most of these opportunities, enabling university students to develop new skills and prepare for a digital future.”

Adam Parsons, HR Director, Vodafone

“I didn’t want to miss the opportunity to study computer science while getting experience using technology in a real-world business. University has stretched my skills and programming range and Vodafone understand how important having a good university experience is.”

Heather Essex, Degree Apprentice, Vodafone

“The students at the University of Birmingham are a new wave of talent that will bring crucial skills, ideas and perspectives to UK business. We need to invest to create a vibrant tech sector right across the country and ensure

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The Passmore Centre: opportunities for all

Since its establishment 125 years ago, London South Bank University has strived to provide vocational and professional opportunities to all those who can benefit from them. Central to this has been providing employer-sponsored education and we are one of the largest providers of employer-funded degrees in the UK with over 1000 employer partners supporting around 7000 students.

Since the introduction of the Apprenticeship Levy we have a valuable opportunity to further expand our work with employers and, as a result, we have committed to delivering 2000 higher and degree apprenticeships by 2020. In November 2018 the university opened the Passmore Centre - the UK's first dedicated university centre for higher and degree apprenticeships and technical and vocational education. The Centre serves the local Southwark community and working with committed businesses such as Unilever, Lidl, TfL and the Foreign Office allows us to widen access to higher education.

With the Centre we can develop deeper and more meaningful relationships with our employer partners across the whole university. Employers have a point of contact in our employment and training team to discuss how best to upskill existing staff and in our dedicated apprenticeship team for support in apprenticeship recruitment and development. They can also interact with academics to match course content to the needs of their workplaces. In addition, having a physical space for employers means we engage in new and novel ways; in January 2019 we able to host an evening with Unilever for learners interested in their Digital Marketing Degree apprenticeship.

The creation of the Centre would not have been possible without the support of Southwark Council, which invested £5 million towards the building’s restoration. London is full of career opportunities and by working in partnership with the Council and local employers we help ensure those opportunities are accessible to the whole community.

The Passmore Centre now provides:

- A base for our 1000 apprentices
- Support for the provision of CPD and vocational upskilling from levels 2-7
- A platform for recruiting apprentices
- Information, advice and guidance to prospective apprentices
- Specialist teaching facilities for the core skills
- Inspiration for young people at schools and colleges to explore vocational education
- A place for the wider community to learn more about employer-sponsored education
- Housing for the largest dedicated university apprenticeship support team in the country
- A modern work and study environment, within a formerly-derelict building that retains its Victorian character while meeting modern standards of accessibility and sustainability
Real-life student learning benefits local business

At the University of Portsmouth, students are prepared for the realities of working by undertaking real-world challenges set by 60 local businesses through the Business Consultancy Project (BCP).

The BCP, which has been running for five years, supports student learning by providing valuable opportunities to use their analysis and consultancy skills to investigate specific business challenges or opportunities on behalf of clients.

Every year, 60 local businesses get real value by engaging with the University, giving them access to talented students, supported by academics. Projects are delivered by final-year undergraduates experiencing a live consultancy brief. By enriching their teaching with real-world projects, students learn the skills they will use in their career to make them more employable. This approach is innovative and directly supports both the student learning and the growth of the local business community through the delivery of ‘outside the box’ thinking from the next generation of business leaders.

The BCP involves small teams of 5 to 6 students from various business studies courses. The teams work with local organisations for about five months from mid-October to mid-March. Projects deliver outputs, such as primary and secondary research findings, and their analysis and recommendations. Examples from past years include: setting up social media accounts, an analysis of competitor products, a draft business plan, improvements to internal processes based on interviews with staff, creating a report summarising customer views, based on primary research.

Students provide their clients with a final project presentation and written report, which are key elements of their assessed work for the unit. The findings and final reports are of great value to the businesses and effect a real change in thinking as well as business operation. Sometimes, the students’ work has been of such high quality that the client can use the final report to persuade the board to make a major strategic decision.

One BCP team worked with Landau UK, leaders in the marine service sector providing award winning installations and retro-fits of all equipment and systems to luxury yachts. The team assessed the effectiveness and costs of their current sales and marketing activity, and helped develop a sales and marketing strategy for the next five years.

“BCP will benefit us going forward. It gave us resources we did not have to look at problems we did not have time to look at. It gave us a big business opportunity for a small business environment. It brings in fresh thinking and also a lot of people might consider the fact that they’re so young as a disadvantage, but absolutely not. It brought in new energy and ideas that we hadn’t even considered before so it offered many advantages really.”

Ben Metcalfe, CEO of Landau

60
SMES ENGAGED
300
WORK EXPERIENCE POSITIONS CREATED
Engineering You’re Hired! Developing problem-solving for the workplace

Multi-disciplinary teams with industry mentors work together in the University of Sheffield’s Engineering You’re Hired challenge giving students vital skills for the workplace.

In industry, engineers from different backgrounds with mixed skill sets work on projects in groups. The University of Sheffield’s annual Engineering You’re Hired (EYH) challenge, gets students from across the Faculty of Engineering to work in groups to solve industrial projects where a single discipline approach would not be as effective. The process highlights the commonalities between the ways real engineers work, by concentrating on the design process and a variety of professional skills needed for both accreditation and practice.

“I used Engineering Your Hired in many job interviews as an example of working within a team and problem-solving.”
Katie Atkins, Process Development Chemist, Johnson Matthey

In 2018 almost 40 companies took part in Engineering You’re Hired, setting challenges, mentoring students and judging final presentations. Many choose to participate every year, such as Rolls-Royce plc, Siemens, Yorkshire Water, Tribosonics and BT. This industry contact has the potential to lead onto future placement or employment opportunities for the students.

“I was in the first generation of students to take part in Engineering You’re Hired! It was an excellent opportunity to work on projects with students from various engineering fields, which helped me greatly to develop my team work and communication skills. I am now part of a big IT team, where I engage daily with product owners, graphic designers, testers, software developers, operations and sales departments, and I could not have done it without the EYH experience.”
Laura Craciun, Software Developer, Property Information Exchange Limited

“Engineering You’re Hired was one of the first events that allowed me to work in a team on a real engineering project. This has helped me gain key team work skills that have helped me in many ways including here at my current job. It is an excellent experience to have on your CV and is a definite conversation starter at an interview with employers showing keen interest in it as it is unique to only Sheffield University students.”
Yashwant Garbani, Materials and Process Modelling Engineering Intern, Rolls Royce PLC

During the week-long EYH challenge, students work to collaboratively design a solution and a plan to take it to the “proof of concept” stage. Supported by academics, postgraduate staff, alumni and industry mentors, the students are guided through the design process to solve problems. The module is only marked as a pass or a distinction, allowing students to take risks, really engage and learn from the experience. Industry participants have the chance to strengthen university ties, encouraging students to continue developing vital skills needed by industry today. The students’ experience makes them highly employable engineers, learning about teamwork, leadership and working across discipline boundaries.
Product design students support Welsh business

Cardiff School of Art & Design's Product Design students tackled a live brief that has significantly broadened the market segment of local food brand, The Parsnipship.

With the support of two of Cardiff Metropolitan Universities' research centres, ZERO2FIVE Food Industry Centre and UCD-Research, second year Cardiff School of Art & Design students have developed and designed sustainable packaging for successful Welsh food brand The Parsnipship. This work forms part of their coursework and will be seen soon on retailer shelves.

The live design brief from the Bridgend-based vegetarian and vegan food manufacturer specified that the product packaging should incorporate sustainable and recyclable materials to align with the company's eco-friendly ethos.

“This has been a great experience for our students. The uniqueness of The Parsnipship and the challenges of the live brief encouraged students to think outside the box and resulted in a truly rich student learning experience.”

Dr Clara Watkins, Programme Director, Cardiff Metropolitan University Product Design Department

The Parsnipship has won Great Taste awards for their Glamorgan Crumble and Tandoori Mash-Up and regularly calls on the University's ZERO2FIVE Food Industry Centre for support, including employing a sales and marketing affiliate through the EU-funded Project HELIX. On this occasion, ZERO2FIVE referred The Parsnipship to Cardiff School of Art & Design for assistance.

The winning design included a window enabling potential purchasers to see the product inside, considered the sustainability of the materials used and suggested local packaging suppliers. Neave Thorne, India Wynn, Mariam Hesham Aly Abdellatif and Jordan Hewlett were on the winning team and were selected for their quirky design which reflected The Parsnipship brand. Neave said: “Working with The Parsnipship has given me an insight into working for a real product design company and their clients. Learning about such an original company has opened my eyes to the materials we use as product designers and the options which are available to help the environment.”

The Parsnipship team has incorporated a number of elements from the winning design into their new packaging which they launched at last week's Taste Wales event, the Welsh Government's international food and drink trade showcase. Flo Ticehurst, co-owner of The Parsnipship said: “The quality of work was really impressive and it was exciting to see all the designs the teams had come up with. We can't wait to show the winning team how their design has been developed into our new retail packaging. Hopefully they will be pleased to see the results of their hard work on the shelves in the near future.”

Twelve teams of students worked on the six-week project, which included investigating the current packaging market, selecting appropriate sustainable materials and developing a range of suitable concepts. As part of their research, the students used the University's high-tech Perceptual Experience Laboratory to visualise how their designs would look in a retail environment and then professionally pitched their final costed designs to the company.
Being the employer of choice for the next generation

Two teams of students from the Vienna University of Economics and Business were tasked with researching and developing detailed business cases for two corrugated packaging solutions for Mondi.

### The Products

The first product was a corrugated waste bin developed to respond to the recent trend for sustainable solutions in waste management. The bin has been designed for household and commercial use e.g. festivals, and is a replacement for less environmentally friendly alternatives such as plastic or metal waste bins.

The second product was a corrugated bicycle compartment, designed to be an affordable solution compared to metal baskets and plastic bags. The compartment is designed to fit neatly onto a bicycle and is ideal for consumers looking to transport shopping.

### The Challenge

The students began with in-depth research into target groups which included calculating the economic value to customers and potential returns for the business. Mondi Corrugated experts were involved throughout the project to offer support and guidance as well as provide a realistic experience of working in a commercial environment.

Being an ‘employer of choice’

After the students had given their presentations and final project feedback, there was an opportunity to meet with Mondi HR colleagues to explore areas of interest and career options within the business. Afterwards the students engaged in a Q&A session with the COO of Corrugated Packaging to gain career insights and advice.

The project demonstrated Mondi’s commitment to be an employer of choice and provided a platform to show young people that their desire for ongoing education and development is understood and is important to the sustainability of the group in the long-term.

This focus on employee development and young people is relevant to a recent study showing that students rate an employer’s attractiveness based on:

- Professional training and development
- Leaders who will support my development

The challenge for companies therefore is not only how to ensure they attract top talent, but how to keep employees happy and engaged during their careers.

Mondi wants to be consistently high on the list of desirable places to work and has been dedicated to this for a number of years. To meet the attributes above and the long-term aspirations of young professionals, Mondi has developed, among other initiatives, the ‘The Mondi Academy’. It offers globally seminars to all Mondi colleagues - in addition to local seminars and academies - with 126 seminars and modules attended globally by 1,200 participants in 2018.

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1 Global Talent Insight Report for Young Professionals - Business and Engineering (conducted on behalf of Mondi by the independent institute Universum Global, 2015)
Strengthening partnerships & planning for future technology trends with Northumbria University

Sage & Newcastle Business School perfectly aligned, future-proofing the graduate journey with a business lead focus.

Sage and Northumbria have a deep rooted respect for each other, so it made sense that we would work with their Business Clinic to produce a report that investigated the relationship within Sage’s partner channel.

The Business Clinic at Newcastle Business School, Northumbria University, is an education scheme whereby groups of business students form a ‘consultancy firm’ to provide advice to clients. Final year undergraduate and Master’s students can undertake a consultancy project as an alternative to a dissertation, providing services for external clients and supported by highly experienced Business Clinic staff. The students analyse the problem they are presented with, consider possible solutions and provide a detailed report with fully justified recommendations and make a presentation of their recommendations to their client.

Since 2013 the Business Clinic has supported more than 300 businesses and organisations, with an estimated value to the clients in excess of £1.6m. Over 1,200 students have had their learning experience and career prospects enhanced by working in the Business Clinic.

To capitalise on this function, Sage commissioned the Business Clinic to compile a report investigating the relationship Sage holds with its partner channel; one of Sage's main business operations is its partner community, boasting over 400 partners, some of which have been selling our products for over 30 years.

The brief given to the students was: ‘Investigating and presenting an understanding of Sage’s Partner Channel, focusing on the selection and motivation strategies of independent distributors. The aim was to develop a series of recommendations and a plan of action of how Sage can further increase the engagement of different participants in the Partner Channel. Auditing the effectiveness of the current strategies in the Partner Channel. Objectives were as follows:

- Researching the needs and motivations of the Sage product end-users
- Considering organisational buying behaviour in the UK SME space
- Understanding the way in which Business Partners operate in the Partner Channel
- Analysing the internal strategies of the Partner Channel and Business Plans
- Defining recommendations on how Sage can help their Business Partners in achieving continued growth and maximising opportunities

Not only does this project offer sound commercial advice for Sage, it has also been a valuable learning experience for the students. It has significantly boosted their employability by allowing them to gain and develop a huge range of skills important to graduate employers, including research, analytical, critical thinking, team work, report writing and presentation skills, all achieved through working collaboratively with a FTSE 100 company.

The project demonstrated how working closely with universities was a real benefit to a commercial partner and greatly improves employability for students. Sage are excited to review the recommendations from the business clinic and look forward to working together on many more commercial projects.

Left to right: Norbert Durko, Sergej Ponomarenko, Gabi Simon, Kai Kinsman
NCUB has been working with thought leaders, universities and businesses to determine how a good transition from education to employment supports mental health, wellbeing and develops graduate resilience.

The concerns we often hear around skills – technical gaps, the importance of soft skills, levels of education – are often accompanied by a question on the ‘resilience’ of graduates. Different employers will, by their nature, have different concepts of resilience. For some it’s about the ability to cope with change, to work in an agile framework, to zig or to zag as needed. For graduates, resilience can be seen as a code for ‘willing to have no work/life balance without complaining’.

So how do we embed the mindset to ensure a productive workforce without reinforcing a sometimes-held belief that graduates are ‘snowflakes’? Or, worse, suggesting that graduates need to protect a perception of coping at the expense of their mental health. And what role can universities play in working with businesses to ensure that students today become well-adjusted workers tomorrow?

At the end of 2018 we worked with our members – both university and business – to discuss the concept of transition. We explored how great a role universities had in preparing students for the world of work, what a good transition could look like, and what makes a resilient graduate.

What makes a successful transition, and whose job is it?

Mental health and resilience is not just a welfare issue, but an economic one – work-related to stress, depression or anxiety accounts for 50% of all working days lost due to ill health, which is an estimated annual shortfall of 15.4 million days1. Does, therefore, the onus lie on the business to ensure that its graduates are resilient and mentally well? Certainly, some of our business members think they have a responsibility to ensure this, and collectives such as the City Mental Health Alliance demonstrated effort to collaborate, rather than compete, amongst industries dealing with large graduate intakes.

But to what extent should resilience be simply another attribute of a ‘work-ready graduate’, prepared by their higher education experience?

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2 University of Birmingham Jubilee Centre for Characters and Virtues. www.birmingham.ac.uk/research/activity/education/jubilee-centre
5 Student Minds, Graduate Wellbeing in the Workforce, (2017).
Is this about work skills, a growth mindset and personal agility, and will these attributes soon be required in the same way as technical skills and knowledge? Certainly, we’re seeing an increasing interest in the concept of ‘character education’, with a whole centre developed to the study of character at the University of Birmingham. A policy note from HEPI in May of this year revealed the metrics being used to track graduate well-being in the Longitudinal Destination of Leavers from Higher Education (Longitudinal DLHE). The findings showed that recent graduates tended to rate lower than the general population in both happiness and life satisfaction. Given that this data is collected just 3.5 years after graduation, it shines a spotlight on the importance of ensuring good transitions to work.

The better the university service, the harder the transition?

An interesting observation that emerged was the concept of over-support. Neil Mackenzie from Sheffield Hallam wrote a fascinating piece earlier this year in WonkHE on the concept of building resilient communities rather than individuals. Yet we know that while student services are incredibly stretched, and that support for mental health is not easy to come by, organisations are reporting an awareness that the graduates who seem to struggle the most are those who have had access to constant support in the form of 24/7 helplines and drop in sessions. These services are reasonably unique to a higher education setting, and as such the loss of access upon entering the workforce can be detrimental to the wellbeing of graduates. There was a suggestion that universities could provide support services that better align with the post-university world, although there are also pressures on universities to do more to prevent serious incidents.

Is it about the unknown?

Interestingly, a Student Minds’ report on Graduate Wellbeing in the Workplace concluded that graduates on a defined graduate scheme identified as having more positive transition than those who weren’t.

Despite their reputation as highly competitive and stressful environments, graduate schemes can provide defined structure, clear processes and vital peer support to temper the nerve-wracking foray into the working world. In a similar vein, our business members relayed feedback from their own graduate intakes, who highlighted ‘the unknown’ as one of the greatest causes of stress. Organisations are taking different approaches to tackle this, from apps which prepare a graduate starter for each stage of their training, including a checklist for the first weeks, to peer-support systems and mentoring schemes.

 Unrealistic expectations of early graduate careers?

With such a strong focus on employment prospects and securing ‘graduate jobs’, is there a role to be played in managing expectations? Realistically, not everyone can, or will, reach senior positions, and the most recent ONS Graduate Labour Market report highlights that only 49% of graduates are working in defined graduate roles. With more students accessing higher education than ever before alongside rapid workplace transformations in response to new technologies, aspirations held now may not be easily achievable or available in the future.

Even for those graduates who undertake education in degrees which industry is crying out for, employment is never a certainty. Not to mention they are now in competition for roles with a wider pool of peers. The changes to higher education pathways which are discussed in this report are a welcome response to cries for help from both universities and businesses but imagine being a graduate now. Not only are you entering a marketplace with continued restriction in wage growth, but graduate roles are under a perceived and sometimes real threat from a rise in degree apprenticeship provision. NCUB research has shown that as some Levy-paying employers strive to recoup their funds, the ratios of degree apprentice to graduate recruitment is increasing.

So, what’s next?

There is a growing awareness of student and graduate mental health and wellbeing; what is needed is support to help people develop mental health and wellbeing literacy. How can we enable conversations to take place, and enable appropriate cultures and provision of support to be developed? In 2018 the OFS launched a £1.5million challenge competition for projects in universities and colleges, working with partners such as the NHS and mental health charities, to find new ways of combating the rise in student mental health issues. This call addresses a need for strategic leadership in universities alongside priorities for developing an evidence base and collaborative working. Supporting this strategic need is a collaborative project between Student Minds, UUK, NUS and AMOSSE, funded by OfS, to develop a University Mental Health Charter.

For more information, visit www.studentminds.org.uk/charter

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1. ONS, Graduates in the UK labour market, (2017).
5. ONS, Graduates in the UK labour market, (2017).
The Aldridge Institute: a solution to the uncertain world of work

The Aldridge Institute for Enterprise and Entrepreneurship is a pioneering institute launched as a partnership between the Aldridge Foundation and UWE Bristol. The institute prepares learners for an uncertain world of work and shapes national education policy using enterprise skills and entrepreneurship.

The Aldridge Institute for Enterprise and Entrepreneurship is developing innovative approaches to the teaching and learning of enterprise skills and acting as a national think tank, lobbying government on how enterprise and entrepreneurship education can transform students’ futures, meet the skills requirement of employers and boost the economy.

Sir Rod Aldridge, founder of the Aldridge Foundation, said: “Aldridge and UWE Bristol share very similar vision and values. We have a collective focus on employability and tackling the issues around social exclusion. I believe this is a really exciting development for UK students, educators and UK PLC.”

The institute has been established with an investment of £1.5 million and is based at the University’s new £55 million Bristol Business School building, allowing a team of researchers and lecturers from across the University to collaborate with the institute to strengthen its impact. Professor Gurpreet Jagpal, Director of the Institute, states that the Institute will change the face of education in the UK by transforming thinking on teaching and learning across schools, colleges and universities.

“To solve the biggest challenges the world is facing, we need to think about educating our young people differently and breaking away from traditional teaching models.”

Professor Gurpreet Jagpal, Director of the Aldridge Institute for Enterprise and Entrepreneurship

“Enterprise education isn’t simply about creating the entrepreneurs of the future; it is focused on developing an enterprising mindset which gives students exposure to problem solving, risk taking and lateral thinking” he added. “This approach can equip the next generation of students with an enterprising mindset for life, for careers that don’t yet exist. The institute is truly ambitious in it’s goals and has the potential to have an enormous impact on education, communities and industry.”

The institute will cement UWE Bristol’s position as a leading university for enterprise and entrepreneurship, building on the success of innovative degree programmes, its focus on employability, and investment in initiatives and facilities to support start-ups and SMEs. It will see enterprise embedded in the curriculum of all the University’s programmes by 2021, students encouraged to start their own business ventures on campus and world-class research produced to demonstrate the positive impact of enterprise education on young people.

Donna Whitehead, Pro Vice-Chancellor and Executive Dean of Bristol Business School and Bristol Law School, said: “The institute will not only shape the future of education policy by changing thinking on how people teach and learn, but will bring huge benefits to our students and graduates by supporting our student entrepreneurs to launch their own business enterprises. We believe the institute will become the voice of enterprise and entrepreneurship in the UK, influencing national policy and leading the way in its approach.”

CASE STUDY BY UNIVERSITY OF THE WEST OF ENGLAND
Creating the future-ready graduate

Teesside University has transformed its approach to graduate employability and entrepreneurship through the implementation of a bold Student Futures strategy, to give its students and graduates the best possible prospects of achieving their career ambitions.

An inspiring employability and entrepreneurship strategy is central to the University’s mission to “transform lives and economies”. We are committed to broadening horizons, and ensuring graduates are equipped with the knowledge, skills and experience for success in their chosen careers. Supporting local businesses, involving them in curricular and co-curricular activities, and giving them access to student talent, is a key part of our economic anchor role.

The Student Futures strategy has developed deep, sustained relationship with large employers including: Nissan, Cummins, PwC, Accenture, NHS, EY, Policy, FujiFilm, Quorn, BBC, Armed Forces, GSK, Enterprise-Rent-A-Car; as well as many local SMEs. The strategy brings together careers, volunteering, enterprise and graduate recruitment within the University’s business services department, co-locating business and student engagement to maximise employer links and opportunities.

A large and successful graduate internship scheme has been developed, and a graduate recruitment team is in place, providing hundreds of additional opportunities. A refreshed curriculum provides access to new work-related learning opportunities while a new graduate attributes framework, including an online employability skills assessment, is tracking over 200 students through their degree. Finally, an Employability Award Scheme has been introduced.

The strategic focus, coupled with £800,000 of additional investment, has substantially raised the profile and influence of the service. This greatly increased levels of engagement from students and employers, and contributes to a growing range of new initiatives and with KPI successes:

- Improved graduate outcomes in 2017-18, with 93.6% of graduates in employment/further study (against 90% target) and 57.7% entering professional-level employment (against 54% target);
- >100 employers on campus contributing to 150 employability workshops, producing 94% student and 90% employer satisfaction;
- 120 graduate internships, with >30% directly securing graduate outcomes;
- New careers platform, TARGETconnect, allowing analysis of service use, improved student communications and management of significant growth in appointments and event attendance;
- New ‘Launchpad Fuel’ funding programme for graduates with a promising business idea, supporting >100 start-ups over five years and contributed to a rise from 34th to 7th in HEBCIS rankings for estimated start-up turnover;
- New volunteering platform achieving >700 student registrations, up 26% on the previous year;
- A lifetime support offer to graduates, with 15% more alumni accessing services.

Our approach has improved students’ knowledge and understanding of the graduate labour market and prompting the University’s success in an OfS Industry Challenge competition with Advantage Tees Valley - a 3-year initiative increasing the number of students from under-represented groups going into local graduate jobs. The strategy’s success will culminate in an imaginative, student-orientated Student Life Building at the heart of the campus in autumn 2019.
Equipping early-career researchers with key workplace skills

Oxford University’s Researcher Strategy Consultancy programme equips 400 early-career researchers each year with the skills for analytical, business or policy contributing to diversity of thought.

Since its launch in 2008, Oxford University’s innovative Student Consultancy programme has equipped around 400 students each year with important employability skills, helping more than 250 local businesses, charities and community organisations solve tangible problems in the process.

In 2017, the University identified a similar appetite among PhD students and postdoctoral researchers for an initiative working at a higher analytical level. A sister programme, the Researcher Strategy Consultancy, was designed and piloted with 30 early-career researchers from a diverse range of academic disciplines. Experienced consultants in the University’s Careers Service provided initial training before grouping participants into teams to work with local organisations on specific challenges spanning topics as varied as accident risk analytics in the automotive insurance industry to public perceptions of a flood alleviation scheme.

“The Student Consultancy and Researcher Strategy Consultancy provides students and early-career researchers with an opportunity to develop the core employability skills required for a transition into analytical, business or policy roles in the public and private sectors. The unique value of these programmes is the client-oriented approach and the hands-on learning. The participants’ confidence grows alongside their ideas about rewarding career paths in businesses of all sizes and orientations.”

Rachel Bray, Oxford University’s Careers Service

The businesses gain access to a diverse range of thoughts and outputs and the participants experienced an observable rise in confidence, as well as the development of core skills such as communication, teamwork and leadership, achieved via the opportunity to apply research skills successfully to an immediate and real problem.

Jason R. Rolles is the Founder of RedOptima, a local business who worked with the Universities student consultancy. Of the collaboration, he said “I am very pleased with the scope, depth and quality of the analysis conducted. It is abundantly clear from the report that the team has come to grips with an entirely new subject matter very well indeed. The presentation and quality of the writing is better than a number of commercial consulting engagements that I have seen. I have made clear to members of the team that I would very gladly recommend any of them to a potential employer.”

Since the pilot round, the Researcher Strategy Consultancy has developed into a core programme in Oxford’s Careers Service, running three times a year, including a sector-specific round (initially, health and life sciences). In 2019, 114 researchers are participating across 19 client projects with no charge to the client: only benefits.
Building a Diverse Workforce through Degree Apprenticeships

The University of Derby and Nottinghamshire Police have led their sectors in developing the first UK Police Constable Degree Apprenticeship to engage with hard to reach communities for police recruitment.

Nottinghamshire Police and the University Policing Department had a clear vision to be the market leaders and set the standards for the Police Constable Degree Apprenticeship (PCDA). Working in partnership and drawing on their respective skills, a vocationally focussed, work integrated learning degree programme was developed. This programme embeds practical police training, delivered by experienced police trainers, within an academic framework, delivered by policing academics with operational policing experience and academic expertise. The emphasis is on partnership, valuing equally the development of professional competence and the problem solving, critical appraisal and evaluative skills expected of graduates.

The partnership used the degree apprenticeships to target recruitment within specific communities traditionally under represented within policing, but significant in the local population. Recruitment was set against a history of reluctance from some communities to consider policing as a career, added to the belief that they would be unable access Higher Education, particularly where there was no family history of university level learning. A focussed campaign provided the opportunity for meaningful engagement with potential recruits, breaking down myths and stereotypes related to ethnicity and gender, whilst addressing concerns about HE study. Those who expressed an interest were actively supported through workshops to prepare for the national police recruitment process.

The apprentices cite a variety of reasons for undertaking the programme:

“I want a long term career serving the community and to provide a public service.”

“I want to do something purposeful and meaningful in life.”

“Something that I have wanted to do for a long time, but didn't see it as achievable for me”.

The development has upskilled the existing police workforce by providing mentorship training for the police constables and sergeants supporting the apprentices in the workplace and a formal HE training programme for police trainers in preparation to support academic learning in an HE environment.

CASE STUDY BY UNIVERSITY OF DERBY

21.8% of applications are from BAME communities compared with 10% for the previous recruitment and 4.63% within the police service

16% of recruits are from BAME communities compared with 7-10% previously

50% of recruits are female compared with 30% in previous cohorts and 31.45% in service

92% of the cohort have recognised the value of combining vocational training and studying for a degree in policing, enabling them to align theory and practice

More than 50% of the cohort are the first in their family to access higher education
Co-creating transformational value to both industry and academia

Coventry University have partnered with global technology company KPIT Technologies to co-create and co-deliver a Master’s programme to build a workforce able to adapt.

KPIT

Building a new world of mobility has created a changing market increasingly dominated by electric vehicles and autonomous driving, marking a paradigm shift, something that has not been witnessed in the last 100 years. With a sharp focus on technology solutions, KPIT, a $200+ million global niche software solutions provider, specialises in embedded software, AI and digital solutions to help mobility leapfrog towards an autonomous, clean, smart and connected future.

The partnership with Coventry University provides a glimpse into the future of how higher education can be delivered with the use of an agile model. At the heart of the partnership is a tailored postgraduate degree programme that reflects KPIT’s global presence, industry focus and domain area of automotive engineering and mobility. Using state of the art immersive video technology, the partners co-created and co-deliver an MBA Strategic Engineering Management and an MTech Automotive Electronics to KPIT employees using a blended learning approach.

“This collaboration is vitally important for Coventry University. KPIT are a world-class organisation sitting at the heart of the automotive industry. They are forward-thinking, revolutionary and do things in a different way – similar attributes to those of Coventry University.”

Paul Noon, Pro-Vice- Chancellor for Enterprise & Innovation, Coventry University

The cross-functional teams from both organizations use asynchronous cloud technology and synchronous virtual interactive classroom delivery to maximise the student experience. This includes the use of multiple lecturers and guest speakers from Coventry University and KPIT, case studies, and online materials to ensure the programme content stays valid and contemporary. All masters projects offered within the programmes are linked to KPIT business challenges, with each student being assigned both a KPIT subject matter expert and a Coventry University supervisor. This is designed to cement student learning and provide a return on investment in areas such as employee retention (<5% turnover in the last two years for employees on the program), business outcomes from the Masters’ projects, coaching and mentoring of younger employees, employee progression to the next level and responsibilities. The joint team work tirelessly to ensure the principles of enhancing knowledge, innovation and sustainability remain paramount.

“KPIT and Coventry University have come together to offer unique, best-in-class academic programmes for working professionals in the automotive engineering domain. Unlike many other similar programmes in the academic world, with the Coventry-KPIT collaborative programmes students learn and get to apply immediately, creating tremendous value for our customers” Abhishek Sinha, Chief People and Operations Officer, KPIT.

191 students have enrolled and progressed through the two programmes; the first 52 students will graduate in July 2019 and further research collaborations are being aligned. This is an exciting growth phase for a fast-paced partnership with a promising future ahead.
Skills matching local businesses with graduate talent

Birmingham City University is working in collaboration with local councils, business and universities on a Higher Level Skills Match. Supporting local business growth and enhancing the graduate journey into employment, Higher Level Skills Match tackles the gap between future business skills needs and those of the current and future workforce.

Higher Level Skills Match (HLSM) is a collaboration between Birmingham City University (BCU), Aston and Newman Universities with local authorities in Cannock Chase, Lichfield, Tamworth, and North Worcestershire Economic Development and Regeneration. Part funded by the European Social Fund, HLSM focuses on small and medium sized enterprises (SMEs), providing a single point of contact through which businesses can access graduate talent alongside a range of business support services delivered through one of the partner universities.

SMEs receive 1-2-1 account management to ensure they access the most appropriate skills and business support services. In return, companies involved with HLSM contribute to the design of HE skills provision, ensuring it responds effectively to business needs, and have the opportunity to share their insights on current and future demand for skills within the region. A series of employer-led, work readiness events also supports students with subjects including goal setting, communication skills, diversity and careers.

Since HLSM’s launch in 2017, BCU has worked with over 200 businesses and organisations, and supported more than 500 students through paid employment, internships, work experience and mentoring.

A rewarding partnership for HLSM was with Suited for Success, a Birmingham charity supporting employment by providing interview skills and a suitable outfit to the unemployed. The charity partnered with HLSM to recruit graduate skills to develop its support offering and move local Ladywood residents back into work. At 11.9% Ladywood has the highest number of people per capita claiming unemployment benefit in the country. A Graduate Internship was recommended with the free HLSM recruitment service ensuring the search and hire process was managed efficiently from start to finish. BCU Psychology Graduate Fazeela Mahreen was recruited as Project Developer and Research Intern.

Fazeela conducted research to understand the best way to engage unemployed mothers for whom English was a second language, and was instrumental in helping develop the ‘English as Second or Foreign Language’ (ESOL) programme that was established to help increase their chances of finding employment. Fazeela says: “The internship experience really helped me develop my professional skills and knowledge, giving me the experience of co-ordinating and managing the teaching programme. I learnt how to reach out to our target audience, engage their interest and support the running of the programme. These skills really improved my employment chances”.

The internship was so successful in delivering the additional skills the charity needed it has applied for further funding to extend the programme, and employs Fazeela on a permanent basis so she can continue supporting the initiative and develop additional products and services.
Embedding a technical route

40% of technical skills learned in the first year of a four-year degree are out-dated by graduation. The UK is facing a shortfall of 20,000 skilled engineers by 2020. 85% of employers say technical skills are a bare necessity. When compared internationally, the UK is vastly under-skilled to Levels 2 and 3.

The government has made technical education a clear priority, but what does a streamlined route look like, and what is it working to achieve? Where is the university-business engagement around the skilling, upskilling and reskilling of the workforce? How does provision compare to demand, and lessons can we learn?

NCUB members were asked to explore their collaborations working on: use of the Apprenticeship Levy as part of a wider technical skill strategy; the improvement of higher technical education in full-time courses; collaborations which consider using T-Levels as entry requirements to both university and work; partnerships which embedded technical learning across provision.

Case studies in this section all fall under the broad umbrella of technical skills, but with a diversity of approaches, sectors and results. From building a pipeline of BTECs and T-Levels to using degree apprenticeships to address the skills shortages of organisations and their supply chains. From health informatics to data science to cyber security and software. There are brand new universities rethinking how to teach technical degrees, and established universities embedding technology into the university-wide experience.

Higher-level technical skills will be vital for approaching the jobs, businesses and industries of the future. But they aren’t created in isolation. Much discussion has been had recently over the suitability of Level 3 education, and the absence of Levels 4 and 5. Dave Phoenix, Vice Chancellor of London South Bank University, offers a robust examination of this absence and argues for the need to pull together the whole system: from secondary to further education to higher education.

NCUB analysis looks at what the proposed changes to Level 3 technical qualifications – T Levels – means for that system, while Malcolm Skingle, Chair of the Science Industry Partnership Board and Academic Liaison at GSK, explains the role of sector-specific skills groups in generating innovation and growth.
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The pipeline is technically flawed

To truly address skills shortages, we need to pull together the whole system: from secondary to further education to higher education.

There is an acknowledged shortfall in the number of people educated to Levels 4 and 5 in England. The principle cause of this shortage is the significant number of learners who are failing to progress from lower levels.

Levels 4 and 5 are represented by HNCs and HNDs, amongst other qualifications, and are equivalent to the first two years of a degree. Last year I wrote about the importance of Levels 4 and 5 in a paper for HEPI entitled, “Filling in the biggest skills gap: Increasing learning at Levels 4 and 5”.

It highlighted both the importance of ensuring competency in English and maths and that too many learners are completing compulsory education without the necessary qualifications, limiting their access not only to HE, but also to work and apprenticeships. It also drew attention to the importance of providing greater access to high quality Level 4 and Level 5; treating this as higher education, as it is officially designated, and resourcing it accordingly to ensure that it has both the facilities and staff it needs to attract the esteem it merits.

With government plans to introduce T Levels well advanced, and a review of vocational qualifications at Levels 2 and 3 underway, I believe it is time for employers, universities, FE Colleges and others to come together to examine the role of prior education and qualifications in our Level 4 and 5 problems.

A Levels (defined as Level 3 qualifications) were devised by universities to prepare learners for higher education; and GCSEs (Level 2) to prepare learners for A Levels. This works, to a large extent, but only for those for whom this is the most appropriate pathway. In 2017, 39.4 per cent of 19-year-olds had not achieved a Level 3 qualification. A further 28.6 per cent did not even achieve a Level 2 in English and maths. This amounts to a significant pool of learners who cannot progress to Level 4 or above.

To solve our skills shortages at Level 4 and 5, we must turn out attention to Levels 2 and 3.
There is a hope that the new T Levels - described as substantial and rigorous job based qualifications at Level 3 – will offer a route into “higher technical” Levels 4 and 5, by both supporting some of those currently taking the more academic routes to progress using different delivery frameworks and by providing a new pathway for those not currently progressing at all to Level 3 and beyond.

Whilst there are outstanding issues around how these will operate there is potential for them to make a valuable contribution to enhancing, for some, the pathway from Level 3 to 4 if the systems are joined up and do not fall into the English tendency of creating artificial divides between what is seen as disparate FE and HE systems.

Indeed, there is common consensus that, to achieve widespread acceptance and credibility, T Levels must, like A Levels, offer a route to Higher education. However, these qualifications have been largely designed by employers; and whilst they may ultimately prepare learners very well for particular jobs, there are serious questions over whether they will prepare them for higher level study.

If T Levels are to offer a route into Higher education, including Level 4 and 5, then universities must be invited to play a much greater role in developing and designing these qualifications. If T Level learners end up having to supplement their T Levels with A Levels or other learning, then any sense of “parity” with A Levels will be lost. Furthermore, the number of teaching hours (and available funding) required for T Levels are likely to make such additional study impractical.

Whilst T Levels might provide an opportunity to expand entry into Level 4 and 5, the current approach simultaneously risks substantial collateral damage to another, well established and largely successful, route into higher technical education and vocational degrees. In recent years, Applied Generals have increasingly become a pathway for university admission. In 2017, 19 per cent of 18-year-old applicants to HE held one or more BTECs (the most common form of Applied General).

Historically, some of these learners have struggled to make the transition to HE; however, user research by York Consulting on behalf of Ofqual suggests that the new revised BTEC Nationals, with “must-pass” external assessments, may be providing a stronger grounding for HE progression. It also suggests that applicants with Applied Generals for courses in the creative arts, ICT,
sports related subjects and areas of health and social care, may be preferred to their A Level counterparts.

The Government is consulting on the withdrawal of funding for Applied Generals, in part with a view to clearing the way for the untested T Levels. Such a step would remove an existing pathway without a proven replacement, potentially exacerbating the shortage of learner supply at Levels 4 and 5. Furthermore, there are substantial questions around the suitability of T Levels for older learners, for those with Special Educational Needs, and those too geographically distant from a suitable placement in their subject of interest.

The current system of allowing students to select an academic A Level track, a more vocational (Applied General) track, or a mix of the two – to keep future work and study routes open – has led to an increase in learners progressing to Level 3 qualifications. Without BTECs and other qualifications that offer a mixture of applied technical and academic learning, there is a genuine risk of imposing a rigid binary choice on learners at 16 and reversing these improvements and strengthening a silo-based approach between so-called academic and vocational routes. I believe this would be a failure.

Alongside its review of Level 3 qualifications the Government appears to be considering a further reduction of vocational qualifications at Level 2. At Level 2, some support the Level 2 apprenticeship as a first step on the upskilling ladder. However, only 25% of those achieving a Level 2 apprenticeship are progressing to Level 3, suggesting that this ladder is not working as it should. Level 2 apprenticeships are often very job specific and many offer neither a clear onward pathway nor an embedded, recognized qualification, leaving the learner with little basis for progression.

Apprenticeships, though originally designed to deliver productivity gains, are now often characterised principally as a potential booster to social mobility. A recent report by the Social Market Foundation helpfully addresses this potential dichotomy. It highlights that only by delivering productivity can we deliver effective social mobility – the higher wages that underpin social mobility are only made possible through higher productivity. Sadly, the SMF report shows that “on average, Level 2 apprenticeships do not produce a statistically significant increase in wages upon completion”.

Some Level 2 apprenticeships are contributing little or nothing to increasing either social mobility or UK productivity.

The conclusion therefore is that. Understandably then the Social Market Foundation sees the recent fall in Level 2

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**Figure 2**  
FE Skills Index by type of provision (2012/13 =100).
apprenticeships as a positive sign – contributing to a shift in investment to higher level programmes. Advanced/higher level apprenticeships accounted for just under three in ten (29 per cent) of apprenticeship starts in 2002/03, a proportion which increased to 57 per cent in 2017/18. However, although the percentage shifts are substantial, there are still relatively low numbers of Level 4+ apprenticeships. The Social Market Foundation says “This trend is positive but the large volume and proportion of Level 2 apprenticeships remains very concerning.”

Of course, it is wrong to dismiss all Level 2 apprenticeships; earnings vary significantly by occupation. A study by the Centre for Vocational Education Research (CVER) found men on engineering apprenticeships can expect very high returns. And in some cases where productivity returns are low we may wish to make strategic decisions, for example in health and social care. Productivity and wage outcomes from Level 3 are also highly variable. In 2017, only a third those undertaking Level 3 apprenticeships in education reported a pay rise; however, for those in construction the figure was over 70 per cent.

When exploring the reasons why productivity outcomes from Level 2 apprenticeships can be so poor, it is worth going back to the descriptions of Levels 2, 3 and 4 within the Regulated Qualifications Framework (RQF). Learners at Level 2 are defined as having the “practical skills to complete well-defined, generally routine tasks and address straightforward problems”. By Level 4 these learners are able to “address problems that are complex and non-routine”.

It could therefore be that for employers, Level 2 apprenticeships are simply not adding enough value to justify the cost and effort. The recent withdrawal from Level 2 apprenticeships by Halfords suggests that the cost and return of them simply do not add up for them.

If employers are not willing, or able, to upskill those who have been failed by the education system, then we must go back to looking at that system.

The Department for Education’s Skills Index, which measures the impact of further education and skills on productivity, has dropped by over 25 per cent in five years (see figure 1). According to the DfE report: “The overall FE skills index has decreased each year since 2012-13, largely driven by a reduction in learners achieving classroom-based qualifications”.

With that in mind, perhaps it is time to review the current emphasis on skills over education and to provide vocational qualifications, which focus more on knowledge and application. Perhaps we can create Level 2 and 3 qualifications which have the educational underpinning to ensure they apply not only to the learners’ current job and current employer but also in other jobs with other employers; and which lead to genuine progression in employment, in higher-level training or in education.

The London South Bank Group comprises South Bank Academies (South Bank Engineering UTC and University Academy of Engineering, South Bank), South Bank Colleges (Lambeth College), South Bank Enterprises and London South Bank University. These organisations work to shared outcomes and use a shared educational framework.

This shared educational framework comprises:

- **Knowledge** - in its applied context
- **Currency** - the latest insights informed by employers, professional bodies and researchers
- **Competency** - the skills to apply that knowledge
- **Confidence** - the personal attributes to put those skills and knowledge into practice in the workplace and beyond.

The successful application of this framework has delivered a dramatic increase in graduate employability which now sees LSBU ranked 4th in the UK for graduate outcomes, joint 7th for graduate staring salaries and being named University of the Year for Graduate Employment, for the second consecutive year, in the Times and Sunday Times Good University Guide.

Alongside the shared educational framework, the group members are working to integrate operational services where this makes sense. In South Bank Academies, the ability to integrate funding at Multi Academy Trust level ensures that learners can make a genuine choice based on the learning style and outcome that is right for them - either focusing on a route through the Engineering Academy or the Technical College.

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2 Both this quote and Figure 2 are taken from the Department for Education, Further education Skills Index: England, (April 2019).
It also enables flexibility between institutions, allowing learners to transfer, to take courses at different institutions and I would like in the future to explore options to enable students to defer selected exams until the time that is right for them i.e. breaking down the need to compartmentalise learning pathways by level.

This facilitates more flexibility for the learner than the very age-based linear system that pervades education generally. I believe we need a more holistic and integrated education and qualifications structure that offers some flexibility based on the needs of individuals and doesn’t make people see variations as inferior to conventional linear routes.

In any re-examination of Levels 2 and 3 and the skills pipeline, we must be mindful not only of those who have been failed by school but by the millions of potential adult learners who are being denied the opportunity of later advancement.

Since 2005, there has been a 45 per cent decrease in adults participating in FE and skills. Given there are currently around 20 million working-age adults without any higher education qualifications (compared to only around three-quarters of a million 18 year-olds in total), reviving access to higher education for mature, principally part-time, learners could be a key path to delivering more Level 4 and 5 learners and should be an educational priority for the government. Given the weakness of some Level 2 and 3 apprenticeships and some of the limitations of T Levels, we need to look at what pathways at Level 2 and 3 there are into Level 4 and 5 for the millions of working age adults.

In summary, much of the discussion around the UK’s future education and skills needs is framed by the context of skills shortage, the growing impact of Artificial Intelligence and other technology, and the UK’s poor productivity. There is constant talk of the need to upskill to Levels 4 and 5; but politicians and others are unduly focused on lower level apprenticeships some of which have little educational value, limited transferability and no productivity gains.

Our ability to deliver the requisite Level 4 and 5 qualified technicians is limited principally by the failure of our secondary and Further education systems to create the pipeline. We are failing to get 28.6 per cent of young people to Level 2 and a further 39.4 per cent to Level 3. Without addressing this, we have no hope of addressing our gaps at Level 4 and 5. It is time to look at alternatives to GCSEs and consider the below recommendations.

**DELIVERING LEVEL 4 AND 5 QUALIFIED TECHNICIANS**

- Identify an educationally robust vocational Level 2 pathway to Level 3 that meets the needs of younger and older learners and which does not create silos that limit future opportunities.
- Avoid a binary option of academic or vocational study at 16 by providing earlier opportunities for learners to experience both, enabling them then to exercise real choice.
- Refocus on the foundations of English and Maths in schools rather than focusing on GCSE as the only option.
- Ensure that learners are future proofed by rooting T-Levels and other vocational qualifications in education that prepares for a career, rather just in skills that limit them to a job - as some of the developments in BTECs are indicating.
- Provide more access to high quality Level 4 and 5 and increase our aspiration as a country that should be seen as a global leader.
The future is BTECs

BTECs are long established and well recognised career-focused qualifications that support students of all ages to progress to skilled work and to higher technical education. They are developed in partnership with employers and HEIs to ensure they give students the knowledge, skills and behaviours they need to progress.

Pearson worked with eleven employer and employer representatives, ten partner providers and seven higher education institutions (HEIs) from across the country to develop career-focused BTECs in Advanced Manufacturing Engineering. Employer partnerships ensure the BTECs qualify students for skilled work, and give them the transferable skills they need to succeed and progress in a broad range of roles.

The BTEC also forms part of the Engineering Technician Apprenticeship. It supports apprentices, where a place is available, and counts towards an apprenticeship where a student secures a place after qualifying. The partnerships are ongoing to ensure the qualification evolves to meet future technology and job requirements.

Higher education partnerships ensure the BTECs provide students with a foundation for further study should they wish to develop their knowledge and skills via HE. Pearson have worked with UCAS to secure tariff points for the qualifications, and partner providers have worked with their respective HEIs to secure agreements that allow students to progress. Birmingham Metropolitan College for example worked with BMW and Oxford Brookes University to secure a pathway to higher technical education in mechanical, electrical, electronic or automotive engineering.

Almost 2,500 students have started this suite of qualifications in the last two years. 350 have completed so far and have progressed into employment, higher and degree apprenticeships within their companies, or higher education programmes such as HNCs, foundation and undergraduate degrees in a variety of engineering subjects such as mechanical, electrical, electronic and automotive engineering.

“As a qualification it has excellent pathways that have sufficient content to meet the requirements of all the employers we work with. It is us all working together to get what the employers need that makes the qualification good.”

James McCartney, IPS International, a private training provider

A current student on the BTEC in Advanced Manufacturing Engineering said: “The course is helping me to plan out my future career in an informed way. The first year is general engineering and not specific to electrical or mechanical. This has taught me that I am better at the mechanical engineering and prefer it to electrical. Visits to a variety of different universities and employers has allowed me to investigate different routes and where they would lead to in the future.”

Universities and businesses collaborating:

- Toyota Manufacturing UK
- Jaguar Land Rover
- Rolls Royce
- BMW UK
- Cranfield University
- Kingston University
- Airbus
- Leonardo Helicopters
- BAE Systems
- GKN Aerospace
- University of West England
- Coventry University
- Harrods Aviation
- The Ministry of Defence
- GTA England
- Birmingham City University
- Sheffield University
- Wolverhampton University
Bespoke high-level skills solution for Industry 4.0

The University of Salford has partnered with Siemens to deliver a bespoke workforce development solution addressing skills deficits in manufacturing automation.

Siemens, like many engineering companies, is facing a skills shortage and has experienced challenges in attracting new, young talent into the business. The company’s own research found that offering a degree through an apprenticeship route would be an attractive recruitment option. In 2015, Siemens approached the University of Salford to explore a collaborative approach addressing identified skills gaps within their business and customer base.

“The Fourth Industrial Revolution is upon us and digitalisation is transforming manufacturing and engineering. We need to attract and retain talent in our business and providing bespoke training solutions is the ideal way to do this.”

Jason Phinn, Training Solutions Manager, Siemens

As Siemens had already developed a strong higher apprenticeship programme, the University of Salford worked with Trafford College and Siemens to design a level 6 top-up year. This enables Siemens apprentices to continue obtain their HNC and HND & Higher Apprenticeship with Trafford College and subsequently progress to the University to complete their degree (BEng Control and Automation).

The innovative skills solution has the benefit of being co-designed and co-delivered with industry, so it directly addresses a sector core skill requirement, and it provides a single employer solution from Level 4 to Level 6 through an FE / HE partnership. The programme is designed to provide apprentices with the utmost flexibility through a block delivery model which meets the needs of the business and their customers. In September 2018, the first cohort of “top-up” degree students graduated, with 12 first-class degrees and one upper second-class degrees, or 2:1s.

Jason Phin, Siemens’ Training Solutions Manager, has described the course as a “fantastic success”. Speaking about collaborating with the University of Salford, he said: “Working with an FE and a HE partner, we are able to provide a single route from Level 4 to Level 6, covering the range of practical skills and technical understanding that is needed in our workforce to fully capitalise on the opportunities of Industry 4.0. We’re really lucky to have found such an engaging and innovative partner in the University of Salford.”

The subsequent change to Siemens Higher Apprenticeship programme has now become a fully-fledged degree apprenticeship and is offered to Siemens employees as well as those of their customers, such as Amazon. From Siemens’ perspective, the degree apprenticeship and top-up solutions enable the firm to upskill and develop people at different points in their careers internally, but also within their customer base. The ‘top-up degree’ solution has also been rolled out as a separate CPD initiative enabling others to benefit from an academic upgrade without needing to undertake the formal multi-year, day-release degree apprenticeship.
Meeting the cyber security challenge

The National Cyber Security Academy (NCSA) addresses the UK cyber security skill shortage, supporting the growth of local businesses and developing next generation industry experts.

A Cyber Village at the University of South Wales’ campus in Newport provides a home for companies wanting to be part of a dynamic community promoting collaboration between industry and academia. The successful partnership between HE, local and national government and business is underpinned by the NCSA, creating a rich environment for business start-ups, research and commercial opportunities. The NCSA frequently hosts Welsh Government visitors to promote inward investment opportunities, and plays a crucial role in the cyber business ecosystem, delivering a skilled workforce that meets specific industry requirements. Large employers are provided with a pool of work-ready graduates, whilst SMEs benefit from unique opportunities to rapidly increase their workforce for short periods with the right skills, helping them to increase revenues.

NCSA students engage in real world projects in direct contact with businesses, and develop their team working skills and professionalism in a truly hands-on way. Employers access industry ready graduates and are assured that the content of the course mirrors their requirements. The NCSA expects to enrol around 65 new students in September 2019, bringing the total number of students in the Academy to almost 130.

Feedback from the first intake indicates students value the contact with employers “Having met with many industry experts, not only are my technical abilities constantly improving but my soft skills have also improved a considerable amount” (student, 2017 cohort). In addition, the wider population has benefited from a range of upskilling events, in line with the aspirations of the Welsh Government’s “Wellbeing of future generations act”, which sets out to make Wales one of the safest places to live and work. Other activities include outreach projects for local schools, where the regional organised crime unit, industry and NCSA staff and students can come together with school pupils to raise awareness of digital and online safety.

We work with students on real life projects where they as individuals can have an impact. At the end of their course they have the skills that the industry needs and are ready to hit the deck running.”

Damon Rands, CEO Wolfberry Cyber

The benefits of the collaborative approach that we have pioneered are best summarised by the CEO of one of the resident companies. Damon Rands of Wolfberry Cyber said, “For both my company and the cluster to have a focal point, for anyone to be able to access information, is an amazing opportunity... providing an environment for new ideas to develop and businesses to flourish. The industry in which we work moves very quickly, technology is continually evolving, and as a business we must keep up with this change. Being part of the Cyber Village in Newport really transforms the way that we as businesses can interact with the students.”

WINNER
OF
CYBER UNIVERSITY OF THE YEAR in the National Cyber Awards 2019

22 JOBS CREATED
20+ SMEs ENGAGED
A new horizon for vocational and technical education

T Levels are being designed to feed the skills revolution and meet the needs of the future economy. But for some, there is confusion over their role in the wider skills system, particularly one whose vocation-education is so commonly associated with apprenticeships and their recent reforms. So, what do T Levels mean for universities, businesses, and collaboration?

The first three T levels - covering digital production, design and development; design, surveying and planning; and education - will be available at selected schools and colleges in September 2020, and a further seven subject areas are due to be rolled out in 2021. T levels will be based on the same standards as apprenticeships, mapped against the same 15 occupations, but with a larger proportion of the student’s time spent in the classroom.

This will provide three clear pathways at Level 3

- The academic route studying A-Levels at a Further Education or Sixth Form College
- The learning-based technical route studying T Levels at a Further Education College
- The work-based technical route studying an apprenticeship through an employer

Understandably, there has been some concern over these proposals. Chiefly that: not all learners will be suited to one of these pathways but would prefer a combination route as currently offered by a suite of Applied Generals; that funding for overlapping qualifications at Level 3 will be cut, reducing options for learners; and a fear over separating learners at 16 into academic or vocational routes.

However, whilst T levels are being designed primarily to prepare young people to enter skilled employment, the government has been clear from the outset that they must also provide a pathway to a higher or degree apprenticeship, or to further study at level 4 and above, either at age 18 or beyond.

In addition to strengthening the technical education offer, T levels have the potential to play a significant role in meeting several of the other key recommendations in the recent review of post-18 education and funding (the Augar review).

Whilst the Augar review was surprisingly light on its reference to T-Levels, it did consider the streamlining to higher vocational and technical education. Perhaps the greatest signal of intention was the recommendation to inject a £1bn lump sum into further education to
‘rebalance the scales’, followed by an annual increase of £3bn for vocational education providers. This financial investment coupled with wider provision and recognition of Levels 4 and 5 has, if acted upon, the potential to effect a revolutionary change for learners keen to progress from beyond Level 3 whilst maintaining a clear pathway to university. T-Levels will be crucial to widening this access.

We know that universities have a wide range of views on the role of qualifications other than the traditional A-level as preparation for degree level study, and there remains some confusion about how T Levels will fit into that landscape. More students are now entering university with non-academic qualifications; since 2012 the number of students has steadily increased, and they now account for 24% of all higher learners.

We are pleased that DfE has set up industry and higher-education stakeholder groups to consider these issues, and that NCUB and several of our members are a part of these groups.

Whilst work is at an early stage, it is already clear that T Levels are very different from the applied and technical qualifications currently offered. Firstly, they will require longer teaching hours, on a par with A Levels, and considerably more than is offered at present. In addition, students will be expected to achieve at least a Level 2 in English and maths, which should put them in a better position to progress to the rigours of higher-level study. But perhaps most significant change is that T-level students will be required to complete an industry placement.

**Structure of a T Level**

<table>
<thead>
<tr>
<th>Technical qualification</th>
<th>Core theory, concepts and skills for an industry area. Specialist skills and knowledge for an occupation or career.</th>
</tr>
</thead>
<tbody>
<tr>
<td>An industry placement with an employer</td>
<td>Minimum of 315 hours (approximately 45 days) offered as a block, on day release, or a mix.</td>
</tr>
<tr>
<td>Minimum standards in Maths and English</td>
<td>GCSE and functional skills for learners who haven’t yet achieved Level 2.</td>
</tr>
</tbody>
</table>

Embedding industry placements into T Levels will offer learners the opportunity to apply their knowledge and make connections in industry. For businesses they create yet more links to education; offering earlier access to talent with the technical skills needed, cementing relationships with FE colleges, and offering an alternative to the apprenticeship model whilst retaining the on-the-job experience.

This level of business-education collaboration is one that we must applaud and which should ensure that 18-year olds who wish to continue their study have a clear understanding of the occupation they have chosen and the educational opportunities available to them both immediately and throughout their working life.

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A university curriculum to shape our future

**NMiTE (the New Model in Technology & Engineering)** is the project to create a new engineering university in Hereford. We will be opening our doors to our initial students in the coming months.

There is a demand for universities to ensure their intake is as diverse as possible. Nowhere is this more needed than engineering, where just 15% of undergraduates are female, despite a skills shortage in the UK and much of the world for engineers.

**NMiTE’s aspirations include addressing this gender imbalance in engineering, and they also go much further.**

Many other excellent people are excluded from the profession. For instance, there are many people coming out of the armed forces who have considerable experience maintaining some of the most sophisticated ships, planes, radars and vehicles in the world.

Such talent should be nurtured rather than wasted, and we’ve already won an award for our work encouraging ex-Forces personnel to pursue an engineering career, including creating specific CPD programmes.

Attracting new people to engineering is not just about good intentions, it’s also about teaching engineering differently. After all, despite all the advances in engineering and our understanding of how best to learn it, teaching methods have changed little since the 1950s.

**NMiTE is doing things differently. It is creating the most radical and innovative engineering curriculum using proven innovations from around the world, particularly from our US-based partner, the highly-rated Olin College of Engineering.**

Rather than sitting in lectures, our Learners will step inside an NMiTE Studio from 9am till 5pm to work on projects. Academic staff will be in the studio with Learners throughout the three-and-a-half-week lifecycle of the project. There are no lectures, just constant interaction.

For example, a Hereford business leader presents a real-world challenge to a group of 25 future engineers. They split into teams of five. Where once they had hated maths, now they don’t even notice they are doing it. They love engineering – because it is all about helping people, including working with the community of Hereford.

**The projects will be provided by employers.**

The students have a keen eye on the outside world. They know that when they leave the university they will be part of a generation that does engineering differently, that fixes the engineering skills gap, and that knows upon graduating how to function in real-world industry.

NMiTE is responding to what industry is calling for: graduates who are work-ready, creative, passionate, curious and inspired. It is also re-engineering the whole approach to learning to make engineering more relevant to a wider range of talented people who want to change the world for the better.

NMiTE will simulate the modern workplace to such an extent that when students leave and go to work, the only real difference they’ll notice is the location.
The Siemens MindSphere Lounge at the University of Sheffield provides employers with graduates to drive industries of the future.

The MindSphere Lounge is the global pilot of a new kind of collaboration. Located in the iconic Diamond Building at the heart of campus, designed to be easily accessible and visible to students, it is a library, interactive e-resource, training tool and research asset combined.

Industrial Digital Technologies (IDTs) and the Internet of Things (IoT) are key to the UK’s industrial strategy. But the new technologies on which they rely are a radical departure from previous manufacturing processes presenting a lack of graduates to exploit them. The MindSphere Lounge engages students with unique and stimulating opportunities to develop skills in data visualisation, cybersecurity and data analytics and showcase them to sector leaders.

The emphasis is on hands-on experience, and the hub provides unparalleled access to cutting-edge facilities with a team of Siemens staff permanently on hand to support and advise. The Lounge hosts the Festo cyber-physical laboratory - a fully-fledged learning system that represents the technologies underpinning smart factories and future industrial control systems. The largest fully student-led maker space in the UK, iForge, is in the same building and Siemens has become a sponsor. The Diamond building itself is a learning tool, providing data to MindSphere through its 16,000 sensors. Almost 30 businesses have substantially engaged with the MindSphere Lounge, creating 10 collaborative projects in water, energy and manufacturing.

These training resources are also accessible to teachers, and already underpin undergraduate and postgraduate IoT modules across the engineering disciplines, with others shortly to follow suit. Students showcase their newly gained skills to Siemens and its partners through the annual MindSphere Live Hackathon where teams of students have 48 hours to build a mechanical or electrical device which brings to life data collected from the network. 150 students from 8 universities have participated so far, and Siemens use the event to spot talent; over 30 placements have been offered to participants. In addition, Siemens uses the Lounge’s event spaces to meet with suppliers and customers, giving students the opportunity to develop PhD projects of direct relevance to industry.

The University of Sheffield is now one of Siemens’ leading UK suppliers of graduates, largely thanks to the MindSphere Lounge.

Over the next year, other research assets in the Diamond will be linked, including the Diamond Production Plant (DiPP) containing £8m worth of pilot scale, high value product manufacturing equipment representing future pharmaceutical production. The data generated allows students to optimise system performance and explore new control methodologies. Pharma companies will be involved in designing a ‘digital twin’ of the DiPP on which students can experiment with the techniques and processes the future pharma industry will need. This facility will be unique to Europe.
Employability and diversity at the heart of a software degree

The University of the Highlands and Islands is collaborating with IBM to deliver an industry focused degree that places team work and employability at its heart, attracting a diverse student population and equipping them with the highest potential of employment.

The digital skills gap is a widely recognised problem; recent reports suggest the talent shortage in technology could cost the UK £141 billion in GDP growth if not addressed. Despite this, UK computer science graduates have had the lowest employment rates of any subject for at least five years in a row.

To investigate, the university consulted with software companies operating throughout Scotland. The message from industry was that graduates often lacked the appropriate communication and team skills to be effective in modern software development. Listening to this, the university has developed a software degree addressing key industry concerns over diversity and meta skills development within technical degrees.

Starting from 2020, the students will operate in teams using standard practices such as Agile project management to simulate their future working environment in the industry. They will work on a portfolio of topical projects that will be attractive to employers. The development of team work and leadership skills will be accelerated by an annual boot camp run in collaboration with the Management School.

Working alongside IBM has allowed the development of a programme which gives students access to world leading technologies such as the IBM Cloud, Quantum and Blockchain. Industry experts will mentor students, providing the insight required for a diverse set of career possibilities. To encourage both men and women to apply for the course, the development team worked with Toni Scullion, an award-winning teacher and the founder of dressCode praised for her work with motivating young girls into computing and cybersecurity. Toni was consulted during the planning process. Her input on the core interests of the girls she has worked with, such as social interaction, a focus on employability and a desire to work on projects relevant to them, has helped to shape the delivery and aims of the course.

The programme has had a very positive response from companies of all sizes across a range of sectors and the university has a dedicated industry liaison team helping to develop relationships across all sectors of the Scottish economy. Businesses have several entry points to the programme, such as mentoring or providing sector specific projects. In return, they get early access to diverse and well-equipped talent with the option for new recruits to finish their degree while they work. Joining academic excellence with industry experience is the best way to develop talent for the future and is essential for the rapidly changing technical sector.
Wales Institute of Digital Information

A strategic partnership between The University of Wales Trinity Saint David and the NHS Wales Informatics Service to create a pipeline of appropriately qualified staff.

Health Informatics has been an emerging workforce within the NHS in Wales. The NHS Wales Informatics Service (NWIS) has therefore been developing a range of initiatives to professionalise and stabilise their workforce. Job roles have evolved creating a need to develop a paradigm shift in the way the profession is perceived by itself and others.

Currently the profession is a broad church with many different entry points; there were around 3000 direct and associated staff at the end of 2016. One area, Health Informatics, is fundamental to the safe delivery of patient care and to maintain public trust in the secure handling of personal health and care information. To support this, a strategic partnership between NWIS and the University of Wales Trinity Saint David (UWTSD) has created the Wales Institute of Digital Information (WIDI).

Formally launched on March 30th 2017, WIDI has developed 4 part-time BSc (Hons) degrees in: Data & Information Systems; Business and Information Systems; Computer Networks & Cyber Security and Software Engineering. All streams are accredited by the British Computer Society giving graduates Chartered IT Professional (CITP) status. Additionally, the software engineering programmes gained partial Chartered Engineer (CEng) status.

Three of these degrees will operate as level 6 Digital Degree Apprenticeships in Wales and 58 students enrolled for the first operational year with an expected further 60 apprentices starting in September 2019. The level 4 apprenticeship in Health Informatics has been created with significant help from the Work-based learning team at Coleg Sir Gâr and will be the only programme of its type in the UK. Around 100 students have started this apprenticeship with Coleg Sir Gar - part of the dual sector University group – with a distance learning version being created for delivery across Wales, the UK and internationally.

The project is having a profound impact on NWIS’s workforce development and is having a very positive impact on the morale of the whole workforce; NWIS has now moved all 120 of its staff in the West Wales region into a University building. The relationship is becoming an organic process with new benefits emerging on a weekly basis. Masterclasses have been delivered by NWIS staff for UWTSD students and Degree Apprentices; in return UWTSD Academics have delivered short, specific CPD programmes for NWIS staff. Four NWIS senior staff are now engaged in PhD research in business focussed areas and presented their initial findings at the Wales-Chongqing health conference in 2018.

As a result, the project is being looked as a positive model by the rest of the UK NHS and has even developed significant links with China. The team are now in conversation with Fuji Film and Microsoft about collaborating on wider research projects through WIDI.
The Science Industry Partnership (SIP) is an alliance of employers who have taken ownership of the skills needed to generate innovation and growth and increase productivity in the science-based sector of the UK economy.

I’m delighted to have chaired the SIP Board since its inception in 2014. Thanks to our members, we’ve progressed the SIP from a Government seed-funded entity with an ambitious sector vision for skills, to an employer funded and led member organisation focused on building a scientific talent pipeline. Companies involved with the SIP come from a range of science driven industries including life sciences, pharmaceuticals, chemicals, coatings, polymers, medtech and biotechnology – and we are seeking more to join us on our mission to get the skills we need.

Our current Skills Strategy Research1 has estimated that the sector will need to fill 260,000 jobs by 2025, and it also identified that many of those entering our companies will need skills in occupational shortage areas such as informatics, synthetic biology and biotechnology, advanced manufacturing, formulation technology and materials science. Our continued ambition is therefore to ensure we are producing home grown talent to meet the sector demand.

We’ve just embarked upon a major piece of work to update this Strategy, which will focus out to 2030 – particularly looking at the skills that will be required in the space where life science and data science meet.

Employer Ownership of skills

The SIP acts as the expert skills partner to Government working to ensure there is a clear connection to what employers need in the Industrial Strategy – for which a key component is People. We have a

role as a delivery partner in the Industrial Strategy via the Life Science Sector Deal\(^2\) - a set of joint Industry Government commitments, including those which support and deliver the skills we need for the jobs now and in the future. I represent the SIP on the Life Science Industrial Strategy Implementation Board (LSISIB) which is taking this work forward.

The Chemistry Ministerial Council has also published its Strategy, ‘Sustainable Innovation for a Better World’. A key focus is vocational skills for industry; in the same way, the Chemistry Council has set about agreeing skills priorities and is working with the SIP to take this forward via a similar Sector Deal.

We recognise that such industry skills are a combination of both the academic and the practical. We increasingly want individuals who can manage and analyse data and use this to make decisions. We also want them to have key leadership and management skills, to be able to solve problems, work through challenges and manage projects. Apprenticeships and particularly Degree Apprenticeships can deliver all of this.

The SIP is working to drive the development of such specialist apprenticeships; this means identifying the job roles where an apprenticeship represents the ideal solution to closing a skills gap. The SIP facilitated employer-led Life Sciences and Industrial Science Trailblazer Group (LSIS) is driving forward the development of such Standards.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Education Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioinformatic Scientist</td>
<td>7</td>
</tr>
<tr>
<td>Research Scientist</td>
<td>7</td>
</tr>
<tr>
<td>Regulatory Affairs Specialist</td>
<td>7</td>
</tr>
<tr>
<td>Health Economist (underway)</td>
<td>7</td>
</tr>
<tr>
<td>Quality Manager (underway)</td>
<td>7</td>
</tr>
<tr>
<td>Clinical Pharmacology Scientist</td>
<td>7</td>
</tr>
<tr>
<td>Clinical Trials Specialist</td>
<td>6</td>
</tr>
<tr>
<td>Science Industry Process/Plant Engineer</td>
<td>6</td>
</tr>
<tr>
<td>Laboratory Scientist</td>
<td>6</td>
</tr>
<tr>
<td>Technician Scientist</td>
<td>5</td>
</tr>
<tr>
<td>Maintenance Engineer Technician</td>
<td>4</td>
</tr>
<tr>
<td>Laboratory Technician</td>
<td>3</td>
</tr>
<tr>
<td>Science Manufacturing Technician</td>
<td>3</td>
</tr>
<tr>
<td>Science Industry Maintenance Technician</td>
<td>3</td>
</tr>
<tr>
<td>Science Manufacturing Process Operator</td>
<td>2</td>
</tr>
</tbody>
</table>

*Level 5, 6 and 7 are HND, Foundation Degree/Degree Level. All standards can be found at: [www.instituteforapprenticeships.org/apprenticeship-standards](http://www.instituteforapprenticeships.org/apprenticeship-standards)

And, of course, the Apprenticeship Levy is now in place, giving employers an added incentive to develop home-grown talent – albeit SIP members continue to push for further flexibility around its use. We undertook an in-depth apprenticeship levy survey\(^3\) last year, which revealed that the majority of science employers’ levy contribution remains unrecovered: only 13% of the levy raised had been recovered for training apprentices.

However, the sector is still bucking the trend on apprenticeship uptake compared with others in the economy, albeit from a much lower starting point (see Figure 1).

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**Responding to industry 4.0**

The SIP’s work to develop its Skills Strategy 2025 evidenced that science sector employers are concerned that in the future we will not have enough data scientists to service our respective industries. The sector recognises that it needs to respond to Industry 4.0 (the Fourth Industrial Revolution) and be more prepared for new and emerging technologies which are set to revolutionise the way we innovate and ultimately deliver new therapies and treatments.

Data science in all its forms is increasingly important to science employers. Our own members now want to take their own understanding and analysis of skills required to the next stage, and, equally importantly, develop an action plan to close what has the potential to be a serious skills gap. The Life Sciences 2030 Skills Strategy will build a clear evidence base of the status of life science skills to 2030, focusing on R&D and medicines manufacturing as well as other emerging technologies such as Artificial Intelligence, to identify what is needed in addition to current available training provision. Underpinning this work is 3 cross cutting themes which sit across the entire life science workforce (see Figure 2).

On a final note, the “M” in STEM is not simply a functional skill for us. It increasingly underpins the individual’s ability to undertake occupations in our industries. Data handling, statistical analysis, problem solving and computational skills are critical to many well paid jobs in our sector, and our message to young people is that studying maths provides all of this and more. Indeed more Universities are also demanding A Level maths as a pre-requisite to being accepted on a scientific Degree course such as Chemistry – a sign that Higher Education is also taking this issue seriously.

Ultimately, if educational institutions, employers, and individuals aren’t keeping up with these dramatic changes, our workforce will be left behind. Our 2030 Research Strategy makes it a priority to better understand these gaps and the next task will be to deliver solutions and approaches that close them.

To find out more about joining the SIP go to https://scienceindustrypartnership.com
Minding the gap: filling skills shortages through industry-focused Science Academies

How Cardiff University’s Data Science and National Software Academies are producing work-ready students with the skills and minds to shape innovation.

The UK aspires to be a leader in a digital world worth billions of pounds. For tech industries, and those who educate tomorrow’s digital specialists, it’s an exciting time. To stay ahead of fierce global competition, we must match demand for products and services with a constant supply of hands-on, work-ready young innovators.

The UK alone needs an estimated 1.2 million more people with specialist digital skills by 2022 and the Welsh Government predicts industries in Wales demand around 3,000 IT professionals each year. Cardiff University is working to bridge the skills gap by linking directly with industry to align degrees with workplace requirements – bringing industry into lecture rooms to help students solve real-world problems as part of their studies.

A new Data Science Academy (DSA) is scheduled to open in September 2019. Sitting inside Cardiff’s School of Computer Science and Informatics, the Academy is home to a suite of Master’s programmes focusing on areas such as artificial intelligence, data science and analytics and cyber security. The School has seen exceptionally strong demand for its PGT courses both from home and overseas markets. By taking an agile approach to student recruitment, the School has more than doubled applications over the past three years.

Cardiff’s success in developing industry-led, project-based learning is modelled on the award-winning National Software Academy (NSA), launched in 2015. Based at the Information Station in Newport, the NSA delivers a three-year BSc Applied Software Engineering as well as a 1 year MSc Software Engineering, informed by industry working practices and working in collaboration with business from Natural Resources Wales, Fujitsu and Cardiff City Council. Students deliver real-life software projects in a vibrant start-up atmosphere, applying cloud, mobile and web technologies. NSA’s emphasis on ‘real life’ projects brings benefits for industrial partners including guest seminars, summer placements and sponsorship opportunities.

Co-founded with Welsh Government and industry partners, the NSA teaches the skills required to be effective as commercial software engineers. The first graduates emerged from the NSA in July 2018 with 14 of the 16 graduates going into graduate positions or further study. Gareth Livermore secured a position with Admiral Group.

“I definitely feel the course has helped prepare me for the workplace. It has provided me with the experience of understanding and meeting clients’ needs as well as the surrounding responsibilities of a development team, such as managing expectations and estimating workloads.”

Gareth Livermore, Analyst Programmer, Admiral Group Plc

For those who have already studied to degree level, the NSA launched an MSc in Software Engineering in September 2018. This conversion course targets applicants with a first degree in a STEM-related subject who wish to pursue a career in a software-related role, offering even greater access to talent.
IBM wanted to make the most of the Apprenticeship Levy and chose The Open University to deliver three of its degree apprenticeship programmes to upskill employees. The Open University’s support, flexibility and innovative learning model means the apprenticeship programmes are ideal for employees fitting study around their day-to-day roles.

IBM has evolved from a small business to a globally integrated enterprise with more than 400,000 employees. As a Levy-paying employer, it set up a strategic partnership with The Open University to provide flexible learning to employees based in different locations. This advantage was crucial, alongside a need to balance the benefits of apprenticeships with the requirements of the business.

The Open University has a pre-existing relationship with IBM, developed over a number of years through partnership on digital and management programmes. Degree Apprenticeships were a natural next step and Elizabeth Hanway, Senior Corporate Development Manager at the Open University, helped IBM to look at its skills strategy – particularly at the digital arena, but also leadership and management skills development. Elizabeth heard from IBM that the attraction to The Open University was their flexibility. Rigid delivery would be too problematic in the long run and the company needed a provider who were easy to work with.

“The Open University has got a proven track record in delivering skills and knowledge to a business environment. We see a kindred spirit in how it uses technology. “The most heartening thing about this programme is to see the benefit it has on people – particularly those who didn’t think they’d go to university and get a degree. That’s life-changing.”

Paul Milner, Senior Early Professionals Manager, IBM.

Three IBM employees are currently on the Chartered Manager Degree Apprenticeship programme, with a further two starting in May. Six employees have begun the Senior Leader Master’s Degree Apprenticeship with two more starting in May, and four employees are on the Digital and Technology Solutions Professional Degree Apprenticeship.

Lee Webb, Talent Acquisition Partner in IBM UK Human Resources is enjoying the Chartered Manager Degree Apprenticeship so far. He explained: “I just did not have credibility, or the experience at a management level, so when I was approached about an apprenticeship I thought this would be a very good opportunity. The delivery model is flexible, adaptable and you learn at your own pace. I’ve seen immediate benefits and I’m looking at work scenarios and day-to-day activities from a different perspective.”

Security Bid Excellence Consultant, Laurie Gibbett said of the Senior Leader Master’s Degree Apprenticeship: “The apprenticeship will give me the knowledge and credibility to move forward into my next role and ensure I have a better understanding of the organisation’s business functions. The Open University is a good fit with IBM.”

IT Architect, Thomas Robinson-Williams, is on the Digital and Technology Solutions Professional Degree Apprenticeship. He said: “I joined IBM straight from school at 18 and have worked for the company for eight years. The apprenticeship will give me crucial industry skills and knowledge to help me develop my career. My graduation will be a special moment and gaining a degree will give me a real sense of achievement.”
Addressing the technical skills shortage with Degree Apprenticeships

Large engineering organisations are upskilling the workforce through a University of Exeter Civil Engineering degree apprenticeship.

International engineering company Laing O'Rourke have in excess of 300 apprentices across their organisation and were a member of the Trailblazer group that developed the Civil Engineering Degree Apprenticeship. Their apprentices are studying with the University of Exeter working on the construction of the new Nuclear Power station, Hinkley Point C, in Somerset.

The partnership between Laing O'Rourke and the University of Exeter began in 2017 with the development and launch of Civil Engineering Degree Apprenticeship with a site management pathway. This pathway was developed in collaboration with the University’s engineering partner consortium and develops the skills required of a site-based civil engineer.

Adel Harden, Senior Learning and Development Advisor at Laing O'Rourke, explained the motivation for the collaboration was to support the long-term success of the industry, which is dependent on capacity to attract new talent. So it is vital to take steps today to build enthusiasm among young people, while raising the prestige of the profession. Laing O'Rourke have developed a 10-point plan to bridge the skills gap within the engineering sector and to widen the number of routes into the industry. Adel said that “Developing the apprenticeship model with University of Exeter gave the unique opportunity to study a part-time engineering degree at a prestigious establishment.”

Laing O'Rourke's intention is to continue to grow, taking in new cohort of apprentices each year. They want to place all early talent recruits onto a degree apprenticeship and, if they have the entry requirements, the University of Exeter is the preferred route. Adel explained that this is because “As a company we have always placed the needs of the apprentice at the forefront of any programme design and we were pleased to see that the University shared the same philosophy. The University are extremely professional and have a wealth of subject and education knowledge.” The two partners will continue to collaborate to further reduce the skills gap in the sector whilst also remaining responsive to any new projects that arise.

The Civil Engineering Degree apprenticeship developed with Laing O'Rourke also attracted the attention of world-leading engineering firm WSP who developed an additional consultancy pathway to meet WSP's need for engineers working primarily in consultancy. Both Civil Engineering pathways are offered to all eight partner employers who are currently delivering the Civil Engineering Degree Apprenticeship with the University of Exeter. Almost 40 apprentices are currently enrolled on the programme.

“Being part of the apprenticeship standard development proved invaluable. Ultimately the apprenticeship is producing an ‘all round’ employee educated to a degree level with industry experience and professionally accredited.”

Adel Harden, Senior Learning and Development Advisor, Laing O'Rourke
NCUB Funders

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