Creating innovative regions:
The role of universities in local growth and productivity

University Alliance Regional Leadership Series

University Alliance
Making the difference

About University Alliance

We are universities with a common mission to make the difference to our cities and regions. We use our experience of providing high quality teaching and research with real world impact to shape higher education and research policy for the benefit of our students and business and civic partners. We innovate together, learn from each other and support every member to transform lives and deliver growth.

Front cover image: An interdisciplinary team from the University of the West of England (UWE Bristol) and the Bristol Robotics Laboratory is playing a key role in the development of Connected Autonomous Vehicles (CAVs) that have the potential to transform the lives of isolated older adults through the creation of independent travel options. The 'Flourish' project co-funded by Innovate UK involves partners from across the South West. (Image courtesy: Transport Systems Catapult)

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Foreword

This report works from two premises. First, that innovation occurs via a systemic process, not a linear one. Second, that innovation is predominantly a business activity.
It's worth being clear about our interpretation of innovation, because we want to bust a myth. The myth is that the main contribution of universities to innovation is through the commercialisation of their research.

Certainly, the advances made by university research can command significant value in the marketplace. But universities contribute so much more to innovation ecosystems, particularly in their regions. This report tells that story.

Universities have an important leadership and connecting role, as Part 1 examines. Universities like those in the Alliance are rooted in their regional economies. Many grew out of the needs of the industrial revolution and have been a stable presence ever since. They have longstanding networks of graduates in many different occupations, and close relationships with local businesses and public sector bodies. They align their research activities to regional strengths. This means they are hubs for innovation activity and are well placed to take on strategic and leadership roles to ensure the economic prosperity and productivity of their regions.

Universities also contribute four important resources that help local businesses (especially micro and small firms) to innovate and scale up, as the second part of the report investigates. This includes knowledge from around the world that can transform business process, services or products; skilled and adaptable employees to drive innovation from within businesses; routes to finance to allow businesses to take scale-up risks; and physical spaces to create disruptive innovation through people and equipment. Throughout, we explore what this all means in practice for regional economies with a 'deep dive' into the Midlands Engine area.

Innovation helps to increase productivity and economic prosperity through multiple routes. This report focuses specifically on business innovation, although other reports in this series have highlighted examples of university-led social innovation that are helping to contribute to fairer societies and healthier communities.[1] All are valuable.

As we stand at a significant juncture in national and regional policy for innovation, Government and other funders should operate from a broad understanding of the contribution of universities to the ecosystem, just as private investors do. If we take too narrow a view, we could sell ourselves short. The recommendations made throughout this report aim to optimise the full range of innovation activities driven by universities.

Professor Steve West
Vice-Chancellor, UWE Bristol
Chair, University Alliance

[1] Tom Frostick (2016) Building healthy cities: The role of universities in the health ecosystem. University Alliance; Daisy Hooper (2016) Supporting thriving communities: The role of universities in reducing inequality. University Alliance.

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Executive summary

Britain's global competitiveness rests on our capacity to support innovation. There is a high rate of return from spending on innovation. Yet overall investment in R&D as a proportion of GDP remains significantly lower in the UK than other nations in the G7.[2]

This means it is necessary to be smarter with this investment. One key way that government intends to do this is by promoting regional growth. Increasingly, funding will be devolved so it can be spent in ways better tuned to local needs. As 'anchor institutions' in local and regional economies, universities are an important part of this endeavour.

The primary way in which anchor universities make a difference is by providing **leadership**, **continuity** and **connectivity** in regional innovation ecosystems. Anchor universities are strong, established institutions that are locally rooted and globally connected. They are able to operate fluidly across administrative boundaries, which is crucial to supporting business and enterprise to be globally competitive. Universities are heavy investors in innovation and participate extensively in regional innovation structures aimed at promoting growth, such as Local Enterprise Partnerships. But there is scope for greater strategic integration in regional growth policy.

Universities are also important hubs for networks, especially for small and medium sized enterprises. These firms often do not have spare time or spare capacity, and universities can offer targeted and flexible support often through dedicated teams of people, helping firms to connect with specialist expertise or other resources inside and outside the university, and in thinking of their role in supply chains. For this to work effectively, government support and funding is required.

Universities also contribute and channel some of the resources needed for innovation. In particular, universities provide innovation ecosystems with **knowledge**, **talent**, **routes to finance** and **space.**

Businesses need transformational **knowledge** to develop new products, processes and services to keep them competitive. This knowledge could be recently discovered through cutting-edge research; equally it may be existing knowledge that is new to the business. Universities provide access to both.

Innovative businesses also need **talented people** who have the skills to apply knowledge to good effect. This means the ability to think laterally and have the ability to continue to learn and adapt. Universities that support their students to develop entrepreneurial attitudes make a significant contribution to innovative businesses and local start up environments. Likewise, universities that develop bespoke graduate, postgraduate and CPD training, co-designed with employers, help to build in-house capacity in local businesses.

Innovation is by definition a risky business. It requires **access to financial support** that is flexible and appropriate to business needs. But public finance support for business is complex, and for many small businesses, bewildering to navigate. Universities can help business by identifying sources of funding and, in some cases, acting as funnels for funding opportunities and support.

Finally, innovation needs **space** to happen. Co-location of creative organisations, clustering of talent, facilities for collaboration and connection to communities all help innovation to thrive. Universities are increasingly developing their estates to provide environments for businesses, researchers and graduates to innovate together.

This report describes the multiple contributions that universities make to regional innovation. It argues that Government institutions at both the national and regional levels must treat universities as active partners. In doing this, it makes a series of recommendations designed to maximise the innovation potential within the UK's university base, and offers some principles for smarter innovation funding.

[2] Royal Academy of Engineering (RAEng) (2015) Investing in Innovation.

Key findings and policy recommendations

Recommendation 1.

Local authorities should look to existing best practice and embed universities in strategic regional innovation policy planning.

Anchor universities contribute a large range of resources and expertise to regional innovation ecosystems. As well as their residual understanding of the regional economy, they act as hubs for networks of employees and employers, and produce human and knowledge capital for local businesses. They are also significant capital investors in the local area, a role that has historically been underutilised for developing the physical infrastructure for regional innovation. Universities are also magnets for international trade and inward investment, through their international research and enterprise links.

To ensure university contributions are fully harnessed, Government and local leaders in LEPs and emergent City Region structures, including local and combined authorities and mayors, should embed universities into regional innovation policy leadership structures, by:

a. Introducing a requirement for all LEPs and City Region structures to include university representatives on their boards. LEP and city areas without a university should make contact with nearby universities to ensure that connectivity is achieved across the country.

b. Appointing university representatives to senior advisory roles for innovation policy in Combined and Local authorities.

Recommendation 2.

Government should extend support for cross-LEP and cross-City Region working.

Both universities and regional innovation leaders must take seriously their responsibility to work collaboratively, recognising the interplay between regional, national and global contexts for innovation. Government can help this by incentivising collaborative behaviour, including working across LEPs and City Regions where Smart Specialisation and Science and Innovation Audits demonstrate alignments.

Universities are well placed to help join up activities across administrative boundaries, but report some practical barriers in the system to cross-regional working. The use of individual opt-in mechanisms for national calls of funding can leave neighbouring LEPs participating in different schemes, for example. Similarly, capital and revenue spending is unaligned and channelled through different routes, which reduces the ability for strategic planning. LEP and City Region funding calls are made individually and can be un-coordinated, which makes it difficult to get multi-party projects off the ground. Finally, some funding calls are time limited to two or three years, which can act as a barrier to longer-term partnership working (for example through joint PhDs or more sophisticated multi-partner projects). Two practical solutions are:

a. Government should help LEPs and City Region structures synchronise bid calls to allow cross-region alignment of funding for greater impact.

b. Government should encourage regional innovation funders like LEPs to consider longer-term timeframes for some funding bids to allow substantive partnerships to develop.

Recommendation 3.

Local authorities, City Region structures and LEPs should use the existing infrastructure of SME-engaged universities to reach out.

We need better tools to solve the problem of SME engagement in innovation. Small businesses have urged clarity around the roles of LEPs.[3] In defining their role, LEPs and City Regions should make use of the physical assets, space, expertise and outreach services of universities who prioritise SME engagement. One particular contribution of universities is to help micro, start up and scale up companies access finance. Government and local leaders should ensure they are able to maximise this interface role by considering anchor universities as natural partners in communicating and delivering growth and innovation funding.

Recommendation 4.

Government can help regions get the best from their universities by mandating full and inclusive participation in the Science and Innovation Audits (SIAs).

SIAs are a welcome intervention for improving our understanding of innovation strengths across the country. To achieve their full potential, the SIAs should aim to be comprehensive, taking account of excellence across the full range of research and innovation activities that contribute to productivity and growth. They should recognise that different types of higher education institutions make disproportionate contributions in knowledge exchange activities, just as in research disciplines.[4]

[3] Centre for Local Economic Strategies & Federation of Small Businesses (2014) The future of local enterprise partnerships: the small business perspective.

[4] Adrian Day and Rosa Fernandez (2015) strategies for sustaining growth of income from knowledge exchange across Higher Education Institutions (HEIs) in the UK. NCUB; King's College London and Digital Science (2015) The nature, scale and beneficiaries of research impact: An initial analysis of Research Excellence Framework (REF) 2014 impact case studies, p.36.

Principles for funding innovation

Funding Principle 1.

Knowledge exchange activities complement research impact and achieve much more than research commercialisation. They must be supported through dedicated national and regional funds.

We endorse Dame Anne Dowling's recommendation that the government should make a long-term commitment to maintaining a form of flexible public funding for knowledge exchange.[5] Conservative estimates have calculated HEIF brings a return to society of £7.30 per £1, extending to £9.70 per £1 including non-monetised benefits.[6]

Unlike other parts of the UK, Innovation and Engagement funding in Wales has been discontinued by HEFCW and the Welsh Government. It should be reinstated, in recognition of the demonstrated value it brings to the regional innovation ecosystem.

Research England, the body responsible for knowledge exchange funding in the new UK Research and Innovation structure, should continue to prioritise HEIF.

Funding Principle 2.

Excellence in research should be funded wherever it is found, and impact and multidisciplinary research given greater priority.

The creation and sharing of transformative knowledge by universities drives the innovation potential of regional businesses. Increasing funding for Research excellence is found throughout the higher education sector. To ensure the UK's continued success, quality must remain the driving principle for research funding, and must be implemented by all government funders.[7]

Impact and multidisciplinary research also remain an important priority. Both should be further recognised and incentivised by structural changes to the research funding architecture, the introduction of national, cross-cutting multidisciplinary programmes like the Global Challenges Research Fund.

[5] Dame Ann Dowling (2015) The Dowling Review of business-university research collaborations.
[6] Thomas Coates Ulrichsen (2015) Assessing the economic impacts of the Higher Education Innovation Fund: a Mixed-Method Quantitative Assessment; PACEC (2015) Evaluating the Non-Monetised Achievements of Innovation Fund, Report to HEFCE.
[7] Faye Taylor (2015) Evolve. Connect. Succeed. Funding a healthy research and innovation ecosystem, University Alliance.

Funding Principle 3.

Higher Education Innovation Funding (HEIF), and equivalent innovation and engagement funding streams in other regions, should be focussed on activity beneficial to SMEs, including bespoke employer-focused skills activities.

Anchor universities are well placed to drive innovation in local SMEs, but bespoke activities with multiple SMEs are resource intensive. In England, HEIF currently double-weights activities with SMEs, recognising that this hard work ultimately derives more meaningful productivity benefits. Future HEIF and equivalent knowledge exchange funding streams in other regions should consider the inclusion of other metrics for SME activities, for example the number of SMEs interacted with. This would be a powerful statement of intent to support this high-growth community and act as a reward and incentive for universities who are actively engaging with local growth agendas.

Funders should also consider how to reward skills activities that have been co-designed with employers such as CPD, undergraduate and postgraduate interventions. Custom-built skills activities are high-impact but resource-intensive and should be fully captured in HE-BCI survey data, in recognition of their contribution to innovation.

Funding Principle 4.

Funding bodies should remove disincentives to university-business mobility.

There exist some disincentives in the research funding system to enhancing mobility between research and industry, as recognised in the Dowling Review. Research staff who have spent a significant amount of time in industry should not be penalised in research funding allocation processes, rather funding bodies should recognise industrial and translational experience as a valuable contribution to the innovation ecosystem. The REF should account for industry experience through output thresholds for staff submissions. Research Councils should account for this through their impact acceleration and Impact Pathway assessments.

Funding Principle 5.

Innovate UK should ensure direct grant funding is maintained for talent-related programmes and for small business grants.

People-based innovation schemes may not bring immediately visible returns but are fundamental to increasing UK productivity. Moving to loans-based models for talent-linked schemes would likely hit demand and uptake. Similarly, small businesses are often risk averse and time poor. Flexible grants like those in the Open Programme respond to SME needs and should be protected.

Part 1.
Universities and regional innovation ecosystems

Britain's global competitiveness rests on our capacity to support innovation. Two-thirds of UK productivity growth between 2000 and 2007 was down to innovative businesses; firms which grow at twice the speed of non-innovators. Innovation also makes businesses more resilient during periods of economic fluctuation, more able to compete over time, and less likely to fail.[8]

There is a high rate of return from spending on innovation. Yet overall investment in R&D as a proportion of GDP remains significantly lower in the UK than other nations in the G7.[9] This means it is necessary to be smarter with this investment.

Why regional?

In England, most public growth funding is now channelled through Local Enterprise Partnerships (LEPs). This includes funds attached to the UK Growth and Devolution Deals as well as European Structural and Investment Funding. The new Smart Specialisation Hub and the Science and Innovation Audits (SIAs) will help improve understanding of strength areas across the country. In Wales, an Innovation Advisory Council brings together public and private sector stakeholders to develop strategic innovation policy.

In the years ahead, devolution deals, new combined authorities and elected mayors, and the emergence of multi-LEP areas like the Northern Powerhouse and Midlands Engine will shape the innovation landscape further along regional lines.

THE SMART SPECIALISATION HUB

Smart Specialisation links innovation and local economic growth: it is an approach to prioritising investment for growth based on evidence of real comparative strengths. It builds a picture of where regions have major assets and transferable capabilities, and where there are opportunities to collaborate to build new value chains across England, the UK and Europe, driving productivity and growth.
Set up to support and provide advice to England's Smart Specialisation efforts, the Hub is being delivered collaboratively by the Knowledge Transfer Network and the National Centre for Universities and Business.

The Hub will:

- Inform better investment decisions based on trusted expertise and insight of comparative data sources;
- Promote awareness and use of Smart Specialisation across England;
- Operate an Observatory of local innovation for translating evidence into intelligence for local decision making;
- Mobilise collaborators across geographical boundaries and sectors.

[8] NESTA (2010) Rebalancing act; Department for Business Innovation & Skills (BIS) (2012) Annual innovation report 2012: Innovation, research and growth; Nesta (2009) Business growth and innovation: The wider impact of rapidly-growing firms in UK city-regions; BIS (2014) Innovation, skills and performance in the downturn: An analysis of the UK innovation survey 2011; McKinsey (2013) Innovation matters: reviving the growth engine; Enterprise Research Centre (2014) Innovation, innovation strategy and survival.
[9] RAEng (2015) Investing in innovation.

UK and European Policy makers are supporting regions to develop strong innovation systems because they know this will make them more competitive globally. It builds on a strong evidence base for the benefits of the Regional Innovation Systems (RIS) approach.[10]

There are four main advantages – and five main risks – in following regional strategies for innovation according to the OECD (Figure 1).

As large, stable institutions embedded in their local and regional economy ('anchor' institutions), universities are key to realising each of these benefits, and for helping to mitigate the risk factors.

Benefits of regional innovation strategies

1. **The development of 'competitiveness poles'** – public-private centres of competence based around specific industries or technologies.
2. **Stimulating innovation in SMEs** via university-enterprise and business-to-business networks, and clusters, and advanced business support services.
3. **Promoting entrepreneurship and new firm creation** specialists through the exploitation of new ideas, new financial instruments and incubation facilities and developing entrepreneurial talent.
4. **Improving human capital for innovation** for management of innovation, as well as science and technology capability, developed through mobility and innovation.

Risk factors associated to regional innovation strategies

1. **Promoting inward looking approaches, confined to regional boundaries:** neglect of knowledge links with foreign firms, global value chains.
2. **Failure to apply a truly systemic view for policy interventions:** over-focus on organisations rather than functions, including evaluation of the effects of single instruments rather than macro achievements; neglect of socio-cultural regional environment, policy fragmentation.
3. A continuing dominance of a technology-led development model: neglect of new forms of innovation including: creativity potential and organisational innovation, considered across all sectors and in particular in services; difficulty moving from supply-side policies to demand-side stimulation policies.
4. **Poor strategic management of clusters and poles**: use of short-term arguments, neglecting growth and transformation potential of the poles.
5. **Path-dependency and inertia in policy systems:** emphasised by deficiencies in strategic intelligence in policy-making.

Figure 1 Opportunities and risks of regional innovation strategies.
Source: OECD (2005). Regional Innovation Strategies and Foresight.

[10] Philip Cooke (1992) Regional Innovation Systems: Competitive Regulation in the New Europe. Geoforum 23(3), pp. 365-382; Alberto Bramanti & Stefano Tarantola (2012) Regional Innovation Index. Regional champions within national innovation systems. Report for the Joint Research Centre.

Leadership, continuity and connectedness

Universities are often highly visible in local innovation ecosystems, working closely with LEPs and local authorities, Chambers of Commerce, trade and professional bodies and other public services like health, as well as individual businesses (see Figure 2). They frequently act as advisers to their local LEP with senior staff actively engaged on LEP boards and committees. Indeed, some LEPs are chaired by a vice-chancellor. In many cases, universities wrote or contributed to the innovation sections of LEP Strategic Economic Plans. Analysis illustrates significant alignment between University Alliance research strengths and LEP strategies.

The scale, local rootedness and connectivity of anchor institutions provides a foundation for economic growth strategies.[11] Whilst political systems and structures of public support for innovation are subject to short term change, anchor universities have emerged as natural leaders, retaining and sharing expertise, developing long-term partnerships, and providing the critical continuity that businesses and investors need.

To undertake this role effectively, universities are required to balance multiple interests and partners across different innovation ecosystems. Beyond the borders of LEPs, for instance, lie multi-LEP (combined authority) and regional (Midlands Engine, Northern Powerhouse) level ecosystems, as well as national and international. Sector-based innovation ecosystems do not respect regional or administrative borders, although they still have a spatial element.[12]

GOVERNMENT

National public sectors bodies charged with providing innovation typically have local and regional presence to support their national objectives. **Examples include:**

UK Trade & Industry which deploys professional advisors accross the UK to help businesses export their goods.

Innovate UK – National Contact Points which act as 'go-to' bodies for guidance on how to apply for Horizon 2020 funding and other matters.

Innovate UK – EnterpriseEurope Network which has regional offices that connect innovators with manufacturers, distributors, co-developers and suppliers overseas.

Catapult centres which provide access to expert technical capabilities, equipment, and other resources required to take innovative ideas from concept to reality.

These orgainisations sit alongside councils and Local Enterprise Partnerships at a time when local government is gaining increasing responsibility for growth, productivity and innovation policy in the regions.

INDUSTRY

Industry bodies use their regional networks to provide advice and networking opportunities to local businesses and entrepreneurs. **For example:**

The CBI and **Federation of Small Businesses** have regional offices that help businesses access information and inform policy.

Chambers of Commerce are found in various locations across the UK and provide business advice, services and skills development.

Institute of Directors has a local network offering businesses advice and resources as well as access to a national network of business leaders.

Also operating at a regional level are private sector R&D organisations. An example is Pera Consulting in Leicestershire which offers services such as innovation audits for businesses and support for the commercialisation of new technologies.

Figure 2 National organisations in regional innovation ecosystems.

[11] The Work Foundation (2010) Anchoring growth: the role of 'Anchor Institutions' in the regeneration of UK cities.
[12] Christian Binz, Bernhard Truffer, Lars Coenen (2014) Why space matters in technological innovation systems - Mapping global knowledge dynamics of membrane bioreactor technology. Research Policy 43, pp. 138-155.

As locally-rooted, globally-connected institutions, anchor universities are uniquely placed to transcend city, LEP, regional and national boundaries, collaborating flexibly depending on the needs of firms.[13] Their networks act as bridging mechanisms to overcome spatial constraints. This includes pulling national and international research through to the local business base, while developing and connecting networks of people. More than two in five Alliance university students go on to work in the same region after graduating, creating cohesiveness between the university, employers and employees and the local economy.

Universities are also increasingly working together and with partners to form flexible groupings which can respond to the different ecosystems to make sure the best opportunities are realised. These collaborations are most effective when they include a diverse range of partners with complementary strengths. Collectively, universities can help to ensure that regional innovation ecosystems avoid the first risk factor: the tendency to become inward-looking. Instead they support the identification of transformative knowledge, new technologies and market opportunities elsewhere.

Universities are well placed to help join up activities across administrative boundaries, but report some practical barriers in the system to cross-LEP working. The use of individual opt-in mechanisms for national calls of funding can leave neighbouring LEPs with different eligibility levels. Similarly, capital and revenue spending is unaligned and channelled through different routes, which reduces the ability for strategic planning. LEP funding calls are made individually and can be un-coordinated, which makes it difficult to get multi-party projects off the ground. Finally, some funding calls are time limited to two or three years, which can act as a barrier to longer-term partnership working (for example through joint PhDs or more sophisticated multi-partner projects).

Helping cities turn Smart

Cities and regions are increasingly looking to share the benefits of innovation with the whole community. Engaged civic society and public, private sector collaborations can create change around social mobility, improved environments and health and greater prosperity. Universities are significant partners in the Smart Cities agenda, for example, through their 'place-embedded research' and digital expertise. These types of projects not only have benefits for advancing scholarship, but also help to develop a sense of place and community and can solve difficult public service challenges.

The use of big data for civic development underpins TravelSpirit, for example, a Manchester Smart City Partnership aiming to revolutionise transport systems. The aim is to create a 'technical ecosystem' for transport providers and users, so that people (and things) can travel uninterrupted across many different modes of transport via one booking. Manchester Metropolitan University are partnering with Department for Transport, the Satellite Applications Catapult, BT, Accenture, Tech North, The Institution of Engineering and Technology and Transport for Greater Manchester (TfGM) to develop an open-source code to realise this vision. Manchester Metropolitan is also partnering with the University of Manchester, Manchester City Council, Cisco UK, MSP, BT, Kiltr and Future Everything on the LEP-led CityVerve Project. Its plans include talkative bus stops, which let bus operators know when commuters are waiting; and a network of sensors in parks and along commuter routes to encourage people to do more physical activity.

[13] Nesta (2010) Sourcing knowledge for innovation: the international dimension; The National Centre for Universities and Business (NCUB) (2016) State of the Relationship Report 2016 includes many examples.

Recommendation 1.

Local authorities should look to existing best practice and embed universities in strategic regional innovation policy planning.

To ensure university contributions are fully harnessed, Government and local leaders in LEPs and emergent City Region structures, including local and combined authorities and mayors, should embed universities into regional innovation policy leadership structures, by:

a. Introducing a requirement for all LEPs and City Region structures to include university representatives on their boards. LEP and city areas without a university should make contact with nearby universities to ensure that connectivity is achieved across the country.

b. Appointing university representatives to senior advisory roles for innovation policy in Combined and Local authorities.

Recommendation 2.

Government should extend support for cross-LEP and cross-City Region working.

Both universities and regional innovation leaders must take seriously their responsibility to work collaboratively, recognising the interplay between regional, national and global contexts for innovation. Government can help this by incentivising collaborative behaviour, including working across LEPs and City Regions where Smart Specialisation and Science and Innovation Audits demonstrate alignments:

a. Government should help LEPs and City Region structures synchronise bid calls to allow cross-region alignment of funding for greater impact..

b. Government should encourage regional innovation funders like LEPs to consider longer-term timeframes for some funding bids to allow substantive partnerships to develop.

OXFORD INNOVATION COLLABORATION: BEST PRACTICE

Oxford is a leading example of multi-university and LEP collaboration driving regional innovation capacity and economic growth. The LEP and the two universities of Oxford Brookes and Oxford have been working together closely for years. They were part of a consortium that together negotiated an innovation-based City Deal and have an ambitious innovation-led Strategic Economic Plan which is about to be refreshed. Both universities have representation on the LEP Board and are closely involved in the development of Venturefest, of which the Vice-Chancellor of Oxford Brookes also sits on the Board.

The first of its kind, Venturefest Oxford is a coordinated programme partly supported by finance from Innovate UK and the Oxford Trust. It supports local innovators with "Pitchfest" events throughout the year that link innovators and funders, and also runs a large summer event bringing together over 1000 people from the local innovation ecosystem. The charitable Oxford Trust, itself the product of a university innovation spin out, funds local businesses via the Oxford Centre for Innovation which occupies a prime central location in the city. Together the local innovation partners are developing a new Centre for Innovation and broadening the network of business support across the city. Oxford's highly-integrated approach to innovation provides a clear offer to local businesses.

Hubs for micro and small business support

The OECD also sets out how regional innovation strategies can benefit small and medium sized enterprises, through:

a. the creation of university-business and business to business (B2B) networks,

b. a focus for clustering of SMEs and using supply chain knowledge to link up innovative businesses, and

c. advanced business support.[14]

In each context, the anchor university role is critical, providing a one-stop shop for SMEs which can help guide and support smaller firms at very different stages of growth. Alliance universities consider broad knowledge exchange activities with SMEs as core to their mission, recognising the value they bring to the wider local economy.

This role is particularly important for unlocking potential in the micro and SME population – the driving force of innovation in our economy: 99% of UK business are SMEs, and as Sherry Coutu has shown, it is within the SME community that the firms with the greatest potential for 'scale up' reside – companies that grow their employees or turnover by 20% a year.[15]

Many SMEs are nevertheless risk averse and time poor: the opportunity costs for engaging with innovation activities through a university or otherwise are much higher than for large business.

For universities, engagement with SMEs typically requires dedicated and specialist university staff. That in turn requires a core Government funding stream – i.e. Higher Education Innovation Funding (HEIF) – which allows universities to go beyond transactional relationships for the sake of direct return to sustain resource-intensive bespoke interactions with multiple SMEs. If such activities are to be maintained, SME growth and productivity must be fundamental objectives of innovation funding policy.

TARGETED, OPEN ACCESS TO EXPERTISE FOR SMES

Alliance universities across the country have SME-focused services providing a one-stop shop for business support in their region. These are more than just 'open doors' to business, but provide tailored services and networking opportunities for SMEs.

- Sheffield Hallam University's Fix It Fridays provide drop-sessions offering local SMEs with free targeted help for their problems from academic staff and business professionals.
- Plymouth University's GAIN network provides a central point of contact for all businesses in the area via a B2B portal. The university signposts businesses to relevant help outside or inside the university.
- The Forge at Teesside University offers themed networking events responding to business needs in a rolling programme, from cyber communication to leading and working in international markets.
- Liverpool John Moores University's Open Labs help firms to develop and exploit technology based products, processes and services in partnerships with LJMU and regional knowledge partners.

Kingston University's internationally recognised Small Business Research Centre is carrying out a study looking in to the knowledge and skills needed by social entrepreneurs to successfully run community energy projects. Funded by major, global infrastructure company YTL Corporation, this research forms part of a wider project – Kingston's Audio-visual Entrepreneurship Resources and Network (KAVERN).

[14] OECD (2005) Regional innovation strategies and foresight.
[15] Sherry Coutu (2014) The scale-up report on UK economic growth.

For a number of years, Liverpool John Moores University (LJMU) has utilised monies from the European Regional Development Fund (ERDF) and HEIF in a variety of innovative ways to develop networks and clusters of SMEs that benefit from a close relationship with the University. Using a smart specialization approach LJMU has supported businesses in the Liverpool City Region in areas in which both the economy and the University has particular areas of expertise. These include digital technologies, maritime, low carbon and advanced manufacturing. These 'front doors' to the University have become well regarded and valued by both businesses and academics alike. LJMU has recognised that from an outside perspective, universities can be difficult organisations to navigate and frequently, despite best endeavors, academic-business relationships can be hard to establish and even harder to maintain.

Although accepting ERDF investment is not without its challenges, LJMU has used it to build communities of businesses that deliver mutual benefit and provide a platform from which to build larger, more impactful ventures:

- Sensor City Liverpool is a £15m world leading university enterprise zone which harnesses expertise from both LJMU and the University of Liverpool. Due for completion in Spring 2017, it will develop and implement novel sensor systems that integrate sensors, firmware programming and advanced algorithms.
- Manufacturing Technology Centre @ LJMU, an offshoot of the MTC High Value Manufacturing Catapult based in the Midlands, is an innovation hub that will enable local businesses to build and commercialise new products, access new funding streams and point them towards the potential of emerging technologies.
- "LCR 4.0" is a Liverpool City Region initiative in high value manufacturing that will drive innovation into SMEs by entering into intensive R&D programmes, transferring knowledge though the development of concept ideas to the point where they are market ready, leading to high value jobs and an increase in GVA.
- The Maritime Knowledge Hub in partnership with the cluster body, Mersey Maritime, with over 1600 member organisations, is a £15m investment to help the UK to gain a greater share of the £3000bn maritime industries market. It brings together the Liverpool City Region's key maritime assets, creating a focal point for innovation and R&D, education and training, and business support.

Teesside University graduates Bob Makin and Darren Cuthbert left their jobs working for computer games companies in order to fulfil their dream of setting up their own business. With the help of the university's DigitalCity Fellowship programme, they founded SockMonkey Studios, a mobile apps and game developer that now employs five people. This is just one example of more than 400 businesses and 300 jobs spawned to date through DigitalCity, a 'super cluster' of businesses and jobs in the North East. Developed with Middlesbrough Council, and supported by the EU and the private sector, DigitalCity is underpinned by Teesside University's expertise in digital media and technology. The University also manages Fusion Hive, the Tees Valley's newest tech hub designed to support growing digital and creative businesses, and the Teesside Launchpad, an innovative space designed to allow the free flow of ideas and the creation of new business and collaborative working opportunities for students, staff and graduates.

Recommendation 3.

Local authorities, City Region structures and LEPs should use the existing infrastructure of SME-engaged universities to reach out.

We need better tools to solve the problem of SME engagement in innovation. Government and local leaders should ensure they are able to maximise this interface role by considering anchor universities as natural partners in communicating and delivering growth and innovation funding.

Funding Principle 3.

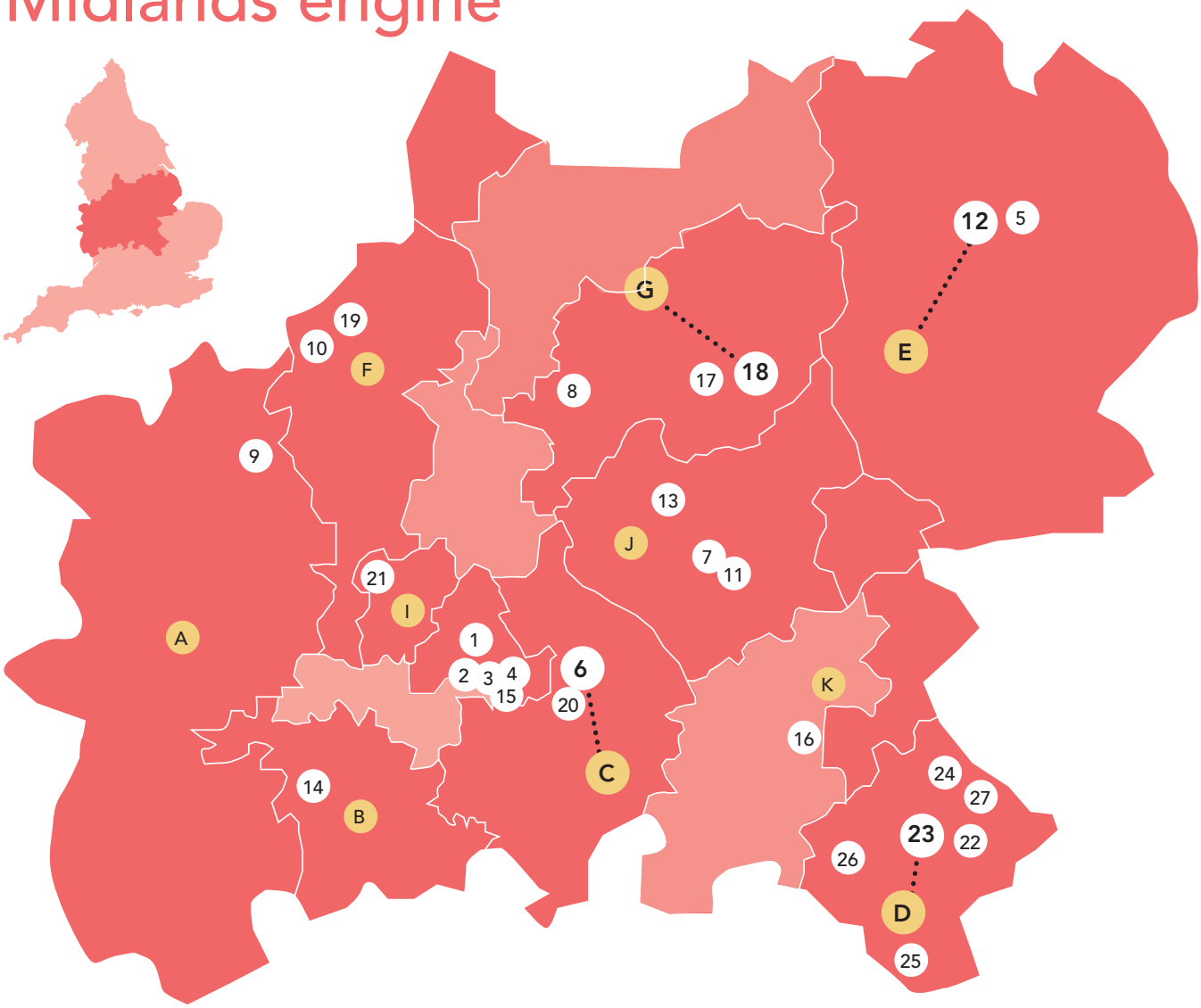
Higher Education Innovation Funding (HEIF), and equivalent innovation and engagement funding streams in other regions, should be focussed on activity beneficial to SMEs, including bespoke employer-focused skills activities.

Anchor universities are well placed to drive innovation in local SMEs, but bespoke activities with multiple SMEs are resource intensive. In England, HEIF currently double-weights activities with SMEs, recognising that this hard work ultimately derives more meaningful productivity benefits. Future HEIF and equivalent knowledge exchange funding streams in other regions should consider the inclusion of other metrics for SME activities, for example the number of SMEs interacted with. This would be a powerful statement of intent to support this high-growth community and act as a reward and incentive for universities who are actively engaging with local growth agendas.

Lincoln Science and Innovation Park is a public-private sector partnership between the University of Lincoln and Lincolnshire Co-op, establishing a new hub for education, innovation and investment in high-tech industries. The first development on the science park was the creation of the Joseph Banks Laboratories, which opened in 2014 following an initial investment of £14million. The next major addition to the Lincoln Science and Innovation Park will be the £6.8million Boole Technology Centre. Due to open in early 2017, it is the first building on the Lincoln Science and Innovation Park to be purpose-built for technology businesses and will enable firms of varying sizes and sectors to co-locate with their peers and academia.

Midlands engine

Figure 3



List of Midlands Engine universities

1. Aston University
2. Birmingham City University
3. The University of Birmingham
4. University College Birmingham
5. Bishop Grosseteste University
6. **Coventry University**
7. De Montfort University
8. University of Derby
9. Harper Adams University
10. The University of Keele
11. The University of Leicester
12. **The University of Lincoln**
13. Loughborough University
14. University of Worcester
15. Newman University
16. The University of Northampton
17. University of Nottingham
18. **Nottingham Trent University**
19. Staffordshire University
20. The University of Warwick
21. The University of Wolverhampton
22. Cranfield University
23. **The Open University**
24. University of Bedfordshire
25. Buckinghamshire New University
26. The University of Buckingham
27. University Campus Milton Keynes

11 LEPs in Midlands Engine:

A. The Marches
B. Worcestershire
C. **Coventry and Warwickshire**
D. **South East Midlands**
E. **Greater Lincolnshire**
F. Stoke-on-Trent and Staffordshire
G. **D2N2**
H. Greater Birmingham and Solihull
I. Black Country
J. Leicester and Leicestershire
K. Northamptonshire

This map is not to scale and is for illustrative purposes only

6 C

Coventry University
Coventry and Warwickshire LEP

Leadership:
Professor John Latham, Vice-Chancellor sits on the Coventry and Warwickshire LEP Board and the Midlands Engine Strategic Leadership Group; Dr Clive Winters, Associate Pro-Vice-Chancellor (Government), sits on the Midlands Engine Innovation Panel.

Research and knowledge exchange alignments to LEP innovation plans:

- Utilisation of advanced materials
- High value and high-tech manufacturing
- Advanced materials
- Robotics and autonomous systems
- Automotive R&D
- Low carbon vehicles

12 E

University of Lincoln
Greater Lincolnshire LEP

Leadership:
Professor Mary Stuart, Vice-Chancellor sits on the Greater Lincolnshire LEP Board and Chairs the LEP Innovation Council. Andrew Stevenson, Director of Research & Enterprise sits on the Midlands Engine Innovation Theme Group.

Research and knowledge exchange alignments to LEP innovation plans:

- Applied agricultural science and technology
- Manufacturing and engineering
- Low carbon economy
- Health and care

18 G

Nottingham Trent University
D2N2 LEP

Leadership:
Professor Edward Peck, Vice-Chancellor sits on the D2N2 LEP Board and the Midlands Engine Strategic Leadership Group; Michael Carr, Associate Pro Vice-Chancellor (Employer and Economic Engagement) is Chair of the Midlands Engine Economic Planning Theme Group.

Research and knowledge exchange alignments to LEP innovation plans:

- Life sciences
- Food and drink manufacturing
- Construction
- Visitor economy
- Low carbon goods and services
- Transport and logistics
- Creative industries

23 D

The Open University
South East Midlands LEP

Leadership:
Peter Horrocks, Vice-Chancellor, sits on the South East Midlands LEP Board. Dr Malcolm Stokes, Enterprise and Knowledge Exchange Manager sits on the SEMU Board.

Research and knowledge exchange alignments to LEP innovation plans:

- Information and Digital Technology
- Transport Systems

Deep dive: The Midlands Engine

The **leadership role** of universities in the Midlands Engine plays out in various ways and on different spatial levels. Taking the four Alliance universities in the region, Vice-Chancellors and other senior university staff are well represented at Midlands Engine level, on local LEP Boards and sub-Boards, and have relationships with local authorities, as well as helping to link up multi-LEP areas as Figure 3 shows. Yet the sectoral geography does not necessarily line up neatly. In the East Midlands, the University of Lincoln works with 'food and drink' innovation partners in an ecosystem that stretches across the East of England – from Suffolk and Norfolk up to Hull and the Humber. By contrast 'automotive innovation' has an east-west Midlands geography – from an aerospace focus with Rolls Royce in Derby, to Coventry University and Jaguar Land Rover's car expertise, to Siemens and the University of Lincoln's turbine technology innovation to the east. All have supply chains across the whole region, which the universities can help to link up.

Balancing these relationships at the various different levels of 'regional' innovation requires time and effort for university staff. But it can bring significant benefits, particularly when LEPs and local or combined authorities embed universities in innovation and strategy and policy formation.

For a start, universities are making **significant investments into local innovation infrastructure**. The capital investment of the universities of Coventry and Warwick in the region is £1 billion, 10 times the amount that the LEP receives. A new £32 million project between Coventry University and the Unipart Group is embedding the firm's long-term sustainable future in the West Midlands, for example. A large employer with a dependent supply chain in the area, Unipart has joined forces with the university to develop a new Engineering and Manufacturing Institute on its manufacturing site. The project has created an international centre of engineering and manufacturing excellence, at the heart of a sustained programme of innovative research activity, teaching and learning, and product development.

Involving universities in innovation strategy allows the benefits of this capital investment to be fully harnessed by the region. This has happened in Lincoln, where a recent £14 million investment in the Joseph Banks Laboratories by the University and Lincolnshire Cooperative has been supplemented by a further £6.8 million for the Boole Technology Centre, part funded through the Greater Lincolnshire LEP. The Centre will provide offices, laboratories and technical workshops for up to 20 innovative companies – right next door to the new Schools of Pharmacy and Chemistry, which are plugging STEM skills shortages for local life sciences and agricultural science businesses. Together, these two developments have placed the Lincoln Science and Innovation Park at the heart of the Lincolnshire economy by stimulating business growth, innovation and investment in high-tech industries. A separate £37.5 million joint venture by Siemens and the University of Lincoln also underpins the Greater Lincolnshire LEP's 'Engineering' priority sector. The partnership resulted in the building of a new Engineering School and turbine training and development workshop which has allowed the international engineering giant to increase its presence in the UK, secured over 1000 engineering jobs in the area and stimulated growth through the supply chain.

World-leading research is also drawing in investment from overseas and creating trade opportunities, linking Midlands businesses into global markets. The Coventry University Confucius Institute is a new collaboration with the Jiangxi University of Finance and Economics (JUFE) in Nanchang with a specific focus on fostering social and economic development and promotion of international trade. It is a hub for support of educational institutions and businesses regionally, and is helping the local community to engage with China and learn more about Chinese language and culture. The Open University are also using their expertise to connect globally, through the Regional Analysis Innovation Knowledge and Entrepreneurship Research Exchange (RAIKE) unit, which connects experts on regional transformation and development to China and India. All four Alliance universities in the Midlands are also members of the national Doctoral Training Alliances in Applied Biosciences for Health and Energy, connecting hundreds of researchers to a national network of businesses and universities, drawing expertise into the region from across the UK.

Anchor universities also act as hubs for networks of people and knowledge in the Midlands innovation ecosystem, vital for SMEs. Working together, universities can reach further and wider into regional economies and are partnering effectively across the Midlands. Coventry and Wolverhampton universities collaborate to deliver the Knowledge Exchange and Enterprise Network (KEEN) for small businesses across the West Midlands. Similarly, Nottingham Trent University is working with the other D2N2 universities of Nottingham and Derby to deliver a coordinated LEP-wide innovation scheme. The scheme aims to extend support over 3 years to 588 enterprises and 276 co-operating with research entities through 'innovation hubs'. These targeted hubs include expert focused workshops and academic knowledge exchange and asset sharing services for businesses in Materials and Engineering (including materials analysis and industrial imaging), Computer Science (including big data and sensing and smart technologies), Food and Drink Innovation, Product Design and Process Innovation, Innovation Management and Leadership, Support for Enterprise and Innovation and Talent for Innovation (for in-company innovation in SMEs). Another example is EMIN, a business support network for the East Midlands, and a partnership between the Universities of Lincoln, Nottingham Trent, De Montfort and Leicester. Now a company limited by guarantee, EMIN has been supporting and driving high levels of student and graduate start-up for over 10 years. Nottingham Trent also works with the University of Nottingham and hundreds of SMEs in the biosciences sector through BioCity, MediCity and MediLink.

Smaller businesses in the Midlands are also guided towards innovation finance by universities. In some cases the universities themselves manage innovation finance schemes, such as the University of Lincoln which manages the Grow on Growth Fund, supporting companies in business incubation environments to 'fly the nest' and prepare their next stage of growth. Supported by the government's Regional Growth Fund, the scheme awards grants of between £20,000 and £250,000, up to 40% of the project value. The University has also established the Lincolnshire Investment Network, in partnership with the Local Authority, and the University of Lincoln Investor Group matching local investment opportunities with local investors.

Universities are also using their expertise to lead innovation in cities across the Midlands Engine. MK:Smart is an Open University-led project (funded by HEFCE Catalyst) with partners including BT, ThingWorx, University Campus Milton Keynes and Milton Keynes Council, aiming to tackle barriers to economic growth in the city through deployment of 'Internet of Things' technology. The core of the project is the MK Data Hub, developed in partnership with BT and building on the world-leading digital technology research at the Open University. The Hub processes the huge amounts of information generated by smart city sensors across Milton Keynes. It also provides a purpose-built development environment offered free to SMEs taking part in MK:Smart, to develop market-ready apps, and a platform to deliver apps and services to the city. It has already trialled services designed to make it easier for residents to find parking spaces, and to make waste disposal more efficient.

In the West Midlands, Coventry University's driverless car research expertise is a core part of UK Connected Intelligent Transport Environment (UKCITE): a multi-partner project to create the most advanced environment for testing connected and autonomous vehicles. It involves equipping over 40 miles of urban roads in the Coventry area with talking car technologies to establish how this technology can improve journeys; reduce traffic congestion; and provide entertainment and safety services. Other partners include Visteon Engineering Services Limited, Jaguar Land Rover Ltd, Coventry City Council, Siemens PLC, Vodafone Group Services Ltd, Huawei Technologies (UK) Co Ltd, HORIBA MIRA Ltd, University of Warwick (WMG), and Highways England Company Ltd.

Building on 170 years of history, Nottingham Trent's School of Art & Design has driven the development of Nottingham's Creative Quarter, the city's flagship project for economic growth, enterprise and entrepreneurial spirit. NTU has acquired an FE and HE provider in the Quarter with 1500 students, helping to join up the activities of students and employers in an area of local economic tradition and current priority.

Part 2.
Resourcing a healthy regional innovation ecosystem

The case for public spending on innovation is strong.[16] Government investment is necessary because:

a. innovation is risky;
b. benefits are shared and long-term; and
c. public investment leverages additional private investment.[17]

In this section, we address the question of how best to target investment. We focus on four main forms of resource that universities contribute to regional innovation ecosystems: knowledge, human, financial and spatial. The complexity of these contributions should serve as a timely reminder that different types of higher education institutions make disproportionate contributions in knowledge exchange activities, just as in research disciplines.[18]

Recommendation 4.

Government can help regions get the best from their universities by mandating full and inclusive participation in the Science and Innovation Audits (SIAs).

SIAs are a welcome intervention for improving our understanding of innovation strengths across the country. To achieve their full potential, the SIAs should aim to be comprehensive, taking account of excellence across the full range of research and innovation activities that contribute to productivity and growth.

Funding principle 1.

Knowledge exchange activities complement research impact and achieve much more than research commercialisation. They must be supported through dedicated national and regional funds.

We endorse Dame Anne Dowling's recommendation that the government should make a long-term commitment to maintaining a form of flexible public funding for knowledge exchange.[19] Conservative estimates have calculated HEIF brings a return to society of £7.30 per £1, extending to £9.70 per £1 including non-monetised benefits.[20]

Unlike other parts of the UK, Innovation and Engagement funding in Wales has been discontinued by HEFCW and the Welsh Government. It should be reinstated, in recognition of the demonstrated value it brings to the regional innovation ecosystem.

Research England, the body responsible for knowledge exchange funding in the new UK Research and Innovation structure, should continue to prioritise HEIF.

[16] Mariana Mazzucato (2013) The entrepreneurial state: debunking public vs. private sector myths.
[17] See RAEng (2015), Investing in innovation; Economic Insight (2015) What is the relationship between public and private investment in science, research and innovation? Report for BIS.
[18] Adrian Day & Rosa Fernandez (2015) Strategies for Sustaining Growth of Income from Knowledge Exchange across Higher Education Institutions (HEIs) in the UK. National Centre for Universities and Business; King's College London and Digital Science (2015) The nature, scale and beneficiaries of research impact: An initial analysis of Research Excellence Framework (REF) 2014 impact case studies, p. 36.
[19] Dame Ann Dowling (2015) The Dowling Review of business-university research collaborations.
[20] Thomas Coates Ulrichsen (2015) Assessing the economic impacts of the Higher Education Innovation Fund: a Mixed-Method Quantitative Assessment; PACEC (2015) Evaluating the Non-Monetised Achievements of Innovation Fund, Report to HEFCE.

New and transformative knowledge (knowledge capital)

In the UK, the vast majority of research is carried out within universities.[21] Publicly-funded researchers arguably have an obligation to ensure that the knowledge they generate has a transformative effect.[22] Their research should be accessible to those that can use it including businesses.

Among Alliance universities, research projects and consultancy activities are often undertaken in response to a specific request from industry – we estimate that around 20% of research collaborations, consultancy and equipment sharing is with businesses operating in high growth areas.

Universities also exploit the commercial benefits of new knowledge through spin-outs and licensing deals. The tendency for policymakers and commentators to focus on this activity is unsurprising: the impacts are easily quantifiable in turnover and jobs created.

Yet while the creation of high-tech, high-value spin outs is valuable for growth and productivity, there are other benefits to regional economies of the knowledge residing in universities, as follows.

World-leading research attracts inward investment

First, international investment drawn in by world-leading research expertise generates supply chain activity, enhancing the regional economy.
In the Northern Powerhouse, the engineering multinational BorgWarner has partnered with the University of Huddersfield because of its expertise in turbo-charged engine technologies. Co-investment of over £8 million has financed bespoke turbocharger research and test facilities, co-developed a master's course for training the next generation of turbocharger engineers and has created and safeguarded jobs at the BorgWarner Bradford site.

In Liverpool, Liverpool John Moores University is building on its world-leading astrophysics research, constructing the world's largest robotic telescope dedicated solely to scientific work ('Liverpool Telescope 2', LT2). The £15 million project is creating jobs and driving upgrades in skills and machinery for local precision engineering SMEs in the Merseyside region.

In the South East, the University of Greenwich has collaborated with Brighton-based company Evaclite, to develop an advanced emergency signage system that builds on the university's award-winning research into evacuations. Researchers at the Fire Safety Engineering Group developed an 'intelligent' signage system that adapts to rapidly changing and potentially threatening environmental conditions, making evacuations much safer. Bringing economic benefits to the region, Evaclite is selling the technology across the world, including the USA and Australia.

A major new partnership with engineering multinational BorgWarner has led to the University of Huddersfield developing a new Institute dedicated to research into turbo-charged engine technologies.

[21] 74.3% of publicly-funded Gross Expenditure on Research and Development (GERD) and 26.5% of total GERD – significantly above the OECD average: Universities UK (2014) The funding environment for universities 2014. Research and postgraduate research training.
[22] Examples of transformative Alliance research for society are throughout Frostick, Building healthy cities, and Hooper, Supporting thriving communities, and online at www.unialliance.ac.uk/research.

Anchor universities help connect local businesses with global expertise

Improving the availability of existing knowledge can also be transformative for businesses. This includes basic insight into markets which is especially important for start-ups.

One example in the South East comes from the University of Portsmouth, which shares market intelligence with SMEs, and engages in strategic discussions about the big commercial opportunities for innovation and sales and development links to Asia. SMEs also benefit from opportunities to network and present to local business leaders at showcase events around key sector themes such as creative industries, environment, healthcare innovation, high-end manufacturing, infrastructure and logistics, and security.

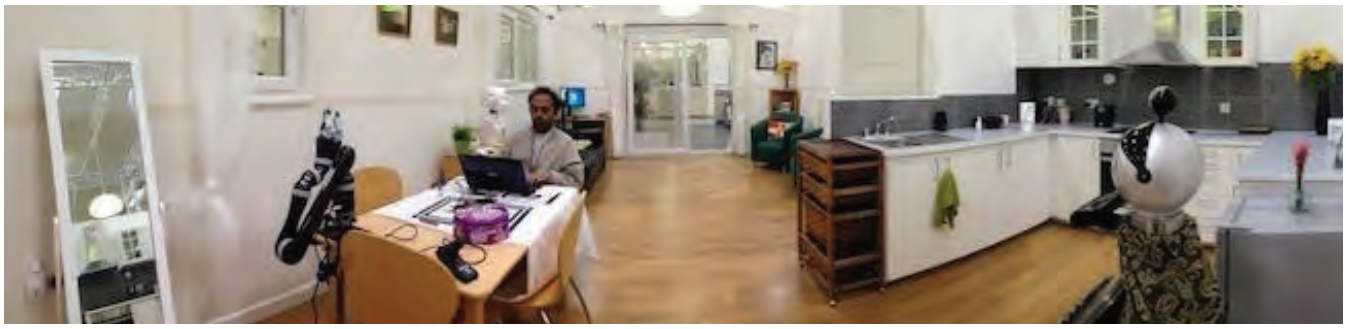
In Yorkshire, Sheffield Hallam University and the University of Sheffield jointly run the Managing Directors Club[23] bringing academics and business leaders together through a variety of events to network, collaborate and showcase innovation and its impact.

Multidisciplinary research helps to meet business innovation challenges

Business challenges usually require multidisciplinary responses. Examples such as the Bristol Robotics Laboratory based at the University of the West of England (UWE Bristol) and the work of Innovative Physical Organic Solutions at the University of Huddersfield show how important end-user access into research base can be directed through entry points into multi-disciplinary research.

Bristol Robotics Laboratory (BRL) is a unique collaborative partnership between the UWE Bristol and the University of Bristol which harnesses the collective strengths of its university partners and the best expertise from industry to spearhead Britain's efforts to be a world leader in modern advanced robotics. Home to a vibrant community of over 200 academics and industry practitioners, BRL is involved in interdisciplinary research projects addressing key areas of robot capabilities and applications. It leads a network of European Robotics Innovation Facilities, which helps organisations to develop and deploy robotic technologies. It also boasts a Technology Business Incubator, which has produced a number of award-winning enterprises and high value jobs.

In a different field, Innovative Physical Organic Solutions (IPOS) is a commercial facility based at The University of Huddersfield providing contract analytical and process development services to the chemical industry. Operating from purpose built laboratories equipped with a wide-range of state-of-the-art instrumentation, IPOS provides accurate, reliable results to meet the analytical needs of businesses in a broad range of industry sectors.



Assisted Living Lab in the Bristol Robotics Laboratory, a collaborative partnership between UWE Bristol and the University of Bristol which is the most comprehensive academic centre for multidisciplinary robotics research in the UK. Image © Bristol Robotics Laboratory

[23] http://www.mdclub.org.uk

Salford University also runs an Energy Hub, helping regional SMEs to develop new technology, products and systems that reduce the carbon emissions from existing properties through engagement with leading academics and state-of-the art world class facilities, including Salford Energy House, the only full-scale brick-built test facility in a controlled environment in the world.

Business-engaged research hubs drive local competitiveness

Universities raise the innovation potential of local SMEs directly, providing connectivity between businesses.

Teesside University's Centre for Construction, Innovation and Research, for example, operates as a high level network resource in the construction sector. The group works with clients involved across all seven RIBA Plan of Work Stages, and in doing so it is able to foster commercial opportunities and research collaborations between businesses.

A similar gravitational pull is exerted by the University of Salford's major research facility in MediaCity UK, connecting the BBC and the Digital and Creative Industries sector to international academics and industry research specialists.

Likewise, Sheffield Hallam University offers SME-focused delivery support for its Materials, Advanced Manufacturing, Digital and Computing, and Product and Packaging Design research centres. Through this connectivity, SMEs have been enabled to introduce new products, processes and ways of working, recruit more highly skilled staff and placements, enter new markets, become more resilient and profitable, and enter into new collaborative R&D partnerships.

Funding principle 2.

Excellence in research should be funded wherever it is found, and impact and multidisciplinary research given greater priority.

Research excellence is found throughout the higher education sector. To ensure the UK's continued success, quality must remain the driving principle for research funding, and must be implemented by all government funders.[24]

Impact and multidisciplinary research also remain an important priority. Both should be further recognised and incentivised by structural changes to the research funding architecture, and the introduction of national, cross-cutting multidisciplinary programmes like the Global Challenges Research Fund.

Nurturing innovative talent (human capital)

As the Dowling Review recognised, deep and broad higher education skills and mobility are the vital link between research, innovation and productivity. Yet skills are often overlooked in the UK innovation debate. This is partly because of the difficulty in measuring and quantifying the impact of talent on innovation, making it harder to identify returns on investment.

The development of innovation talent should therefore be considered an area of market failure and a priority issue for Government.

Launched in October 2015, Greenwich Bright is a university enterprise initiative that develops students' entrepreneurial and employability skills through projects with a direct benefit on local businesses and community organisations. Greenwich Bright links to short courses and training that improve students' abilities to be successful in the real world. The model has been developed to prepare students for freelance working, setting up an online and harnessing that presence effectively, and software skills development. It also enables students to develop professional practice tools such as undertaking risk assessments for filming equipment. Examples include helping local SMEs to get their businesses out into the public sphere, via student-led creative and website projects, and close working with Charlton Athletic FC and the Community Trust for whom students have developed a promotional film for a new digital campaign and marketing schemes aimed at new fans.

[24] Taylor (2015) Evolve. Connect. Succeed.

Mobility between industry and universities increases absorptive capacity

Entrepreneurial universities understand that the value in developing enterprise and innovation skills for an innovative regional workforce goes far beyond increasing the number of graduate start-ups. They understand that for micro and small businesses to grow and keep competitive, they need employees at all stages of their careers who have the ability to spot opportunities, apply knowledge and can continually adjust to fast-paced change. [25]

Alliance graduates are more likely to go on to work in their local areas.

ALLIANCE UNIVERSITIES ARE SECTOR LEADERS IN INCREASING MOBILITY AND ABSORPTIVE CAPACITY:

- **Inward mobility for industry staff to academia** – 38% of new academic staff came directly from industry (9 percentage points above the sector average). Having academic staff with direct industry experience helps academics understand the issues businesses are facing, and allows them to translate research breakthroughs for businesses.
- **Knowledge exchange placements** – deliver 20% of all UK Knowledge Transfer Partnerships (KTPs)
- **Industry experiential learning** – Alliance universities deliver 43% of UK sandwich courses. Over a third lead to permanent employment with the employer who offered the placement.

Many SMEs lack the capacity or 'organisational slack' to seek the knowledge and employ the new staff that could help them innovate. Working with university partners on placement schemes for graduates and staff allows SMEs to de-risk the recruitment of innovation talent, effectively allowing them to 'try before they buy'. For many smaller businesses, this is critical to expanding their capacity and horizons but it also benefits the university as returning staff are better able to understand, communicate and interact with the wider industry.

Similarly, short term placements for researchers can also be the most direct route for smaller businesses to access transformative knowledge. Knowledge Transfer Partnerships, which have been operating for the past 40 years, are funded in part by Innovate UK and can involve a graduate or researcher or employee (known as a KTP Associate) who spends between 12 and 36 months working within a business (or alternatively, in a university) on a specific project around new skills and knowledge. The scheme has been a resounding success, with businesses achieving an average increase in profits of more than £1 million and creating an average of two additional jobs. Furthermore around 60% of associates are offered a permanent job in the company.[26]

Recruiting in staff from universities, even for a short time, builds the absorptive capacity (the ability to identify, assimilate and apply external knowledge) of small businesses who may otherwise be unable to exploit advanced levels of research and latent knowledge.[27]

Sheffield Hallam University, for example, developed an innovative approach to super plastic forming and diffusion bonding through a Knowledge Transfer Partnership with Joseph Rhodes Ltd which led to orders worth £14 million from BAE Systems. And the University of Salford's KTPs provide many examples of university research helping businesses to innovate in processes and services as well as technology and products, including innovations in processes at Dyer Environmental Controls, Create Construction and Moneyline; and services innovations at Brook Manchester and Greater Manchester Fire and Rescue Service.[28]

[25] University Alliance (2014) Job Ready: Universities, employers and students creating success, with further examples at www.unialliance.ac.uk/ jobready2014 collects compelling evidence from employers whose graduate recruits are central to their innovation capability.
[26] www.gov.uk/guidance/knowledge-transfer-partnerships-what-they-are-and-how-to-apply jobready2014 collects compelling evidence from
[27] Ross Brown (2016) Mission impossible? Entrepreneurial universities and peripheral regional innovation systems, Industry and Innovation. employers whose graduate recruits are central to their innovation capability. employers whose graduate recruits are central to their innovation capability.
[28] www.salford.ac.uk/__data/assets/pdf_file/0008/224999/KTP-Publication-Final.pdf

The new Apprenticeship Levy will also have a key role to play in promoting this type of activity. The levy will incentivise businesses to become increasingly more involved in programmes such as Degree Apprenticeships, the Trailblazer programme and Higher Apprenticeships. These schemes involve apprentices combining both work and study at a university or further education college and many of the pilot schemes underway involve multiple education partners. These schemes are valuable to businesses as they allow them to directly train and mould new employees, ensuring they have the skills necessary to expand and grow their business.

Universities also have to work to ensure that career progression of academic staff who engage in activities with industry is not impeded. Traditional academic routes that prioritise public grant funding or scholarly outputs can act as a disincentive to working with outside partners. Some universities have changed their progression and development structures to address this. At the University of South Wales, there are three routes to a Professorial position, which have the same status: an Innovation and Enterprise route, a Research route, and a Teaching and Learning route.

Mobility schemes also need direct grant funding. They are not compatible with loan-based systems which often rest on demonstration of direct returns which are not easy to measure for talent-based interventions in innovation. Although overall demand for KTPs is currently outstripping supply, for example, some firms still struggle to fund the interaction, despite the availability of matched funding.[29]

Producing enterprising employees enhances regional innovation capacity

Many universities work closely with regional employers to ensure their undergraduate and postgraduate courses respond to industry needs, creating graduates and postgraduates who are job-ready and entrepreneurial. Examples of strategic multi-level relationships with local employers designed to target skills needs, cited elsewhere in this report, include Huddersfield's partnership with BorgWarner, Coventry University's 'Faculty on the Factory Floor' in collaboration with Unipart and the University of Lincoln's new School of Engineering, funded by Siemens.[30]

Other institutions are working to change their approach to business involvement in taught postgraduate courses, recognising the importance of high-level skills for regional economies. Pilot schemes including those run by the Universities of Greenwich, Nottingham Trent and Kingston are innovating around business/professional access, internship models and skills development as part of HEFCE's £25 million 'lifeboat fund'.

Entrepreneur Greg McClarnon set up his own photography business whilst studying for a degree at the University of Hertfordshire. Splaat Media currently employs 14 people and is growing. Greg puts his success down to the business knowledge he acquired through his degree and the university's enterprise curriculum: "I thought it was great how external businesses and business mentors came in to talk to us and it provided very good networking opportunities". As well as expert mentoring, Greg has also benefited from office space at the University campus, which has allowed him to employ staff. The university have also helped Greg access the British Library Innovation for Growth programme to help him fast track further growth.

Universities are also committing to raise the entrepreneurial capacity of businesses through graduates and staff. Many institutions have developed dedicated programmes and initiatives to encourage students to develop enterprising attitudes and behaviours: the 'entrepreneurial graduate'. These are delivered both within

[29] Ulrichsen (2014) Knowledge Exchange Performance and the Impact of HEIF.
[30] Best practice from across the sector is highlighted in University Alliance (2015) Mind the gap: engaging employers to secure the future of STEM in higher education.

courses and extra-curricular and across the institution (not just in the business school) and through sharing university resources.

UWE Bristol has for example a diversity of entrepreneurship initiatives, including embedding entrepreneurial content into new academic modules, a Team Entrepreneur degree programme, an Entrepreneur in Residence to help students and graduates create new businesses, and a Technology Business Incubator in the Bristol Robotics Laboratory to grow enterprising robotics start-ups and high-tech businesses.
University enterprise initiatives take several forms, such as modules which use industry specific projects (often based on real wold problems faced by local businesses), guest lectures from industry experts, internships within firms, and sandwich placements. When students apply their knowledge and skills to practical examples, it helps them to develop their confidence and ability to translate their university education into practice.

Alongside these in-course opportunities, universities often run extra-curricular events, such as competitions and workshops, to help their students take the first steps of exploring entrepreneurship. Even though the majority of students who get involved in these activities will not go directly on to forming a start-up and becoming full-time entrepreneurs, the knowledge and skills they gain helps to drive innovative behaviour in their later careers. For those students who do take the leap and form a start-up, universities offer additional support.

Upskilling existing staff catalyses continual in-business innovation

Continuing Professional Development (CPD) courses and programmes are crucial to enable local businesses to improve the skills of their existing staff. Although the majority of universities offer 'off-the-shelf' CPD courses, some institutions also supply bespoke courses designed in partnership with the firms involved. These courses can be particularly helpful and can involve training staff in new procedures or teaching them about new innovations in the industry.

The University of Greenwich, for example, has an interesting approach to CPD and embeds degree studies into practical, industry based studies in partnership with organisations such as the Royal School of Military Engineering. Business and management skills are particularly useful in this regard, and courses aimed at managers and project leaders often include elements of how to instil an innovation friendly culture and management structure.

Similarly, Manchester Metropolitan University (MMU) has a suite of arrangements with HMRC, building on a five year relationship. It serves the organisation's new and entry-level recruitment needs with a tax academy, and its ongoing learning needs with offers for established tax professionals. Part of the MMU offer is an undergraduate BA Hons Professional Studies and Taxation, which provides a validated graduate entry route into HMRC. This includes teaching by HMRC staff who are supported by the University, with 200 students per year based in tax offices around the country. A co-designed Masters course provides targeted learning for senior policy staff at HMRC.

The Welsh Financial Services Graduate Programme (WFSGP), with the University of South Wales as academic partner, is a collaborative 2 year full-time programme of work, training and academic study unique to Wales. Partly funded by the European Social Fund through the Welsh Government, the programme has been designed and delivered by leading financial services organisations to develop a talent pool of industry professionals.
The Financial & Professional Services sector is one of nine Welsh Government key priority sectors in Wales. In 2013, it was identified as the priority sector with the largest number of employees and the WFGSP was designed to address two key issues within the sector: high staff turnover and talent retention.

Funding principle 3.

Higher Education Innovation Funding (HEIF), and equivalent innovation and engagement funding streams in other regions, should be focused on activity beneficial to SMEs, including bespoke employer-focused skills activities.

Funders should consider how to reward skills activities that have been co-designed with employers such as CPD, undergraduate and postgraduate interventions. Custom-built skills activities are high-impact but resource-intensive and should be fully captured in HE-BCI survey data, in recognition of their contribution to innovation.

Funding principle 4.

Funding bodies should remove disincentives to university-business mobility.

There exist some disincentives in the research funding system to mobility between research and industry, as recognised in the Dowling Review. Research staff who have spent a significant amount of time in industry should not be penalised in research funding allocation processes, rather funding bodies should recognise industrial and translational experience as a valuable contribution to the innovation ecosystem. The REF should account for industry experience through output thresholds for staff submissions. Research Councils should account for this through their impact acceleration and Impact Pathway assessments.

Funding principle 5.

Innovate UK should ensure direct grant funding is maintained for talent-related programmes and for small business grants.

People-based innovation schemes may not bring immediate returns but are fundamental to increasing UK productivity. Moving to loans-based models for talent-linked schemes would likely hit demand and uptake.

Funding innovation risk (financial capital)

Innovation is a risky activity, and access to finance can allow businesses to take risks to scale-up. Public funding is particularly useful for leveraging private investment in a period of declining venture capital investment. There are also large regional variations in private investment, which public finance can help to balance.[31] Research shows that where institutions succeed in obtaining public funds for innovation-linked activity, the private sector promptly follows: every extra £1 invested in R&D by government attracts an increase in private funding of between £1.13 and £1.60.[32]

Demystifying innovation finance

Figure 4 shows the array of innovation-linked funding sources accessible to UK universities. A significant proportion of the portfolio derives from government agencies – Innovate UK, HEFCE and the Research Councils – and EU sources like Horizon 2020 and the European Regional Development Fund (ERDF). Public funding is awarded to universities and other eligible bodies by application, tender or institutional profile. As well as public sector sources, finance can be obtained from charitable sector funders like Nesta, and it can also be sourced privately. An angel investor, for example, can help start-ups to bridge periods of strain in their early growth, in exchange for equity in the business. Government supports this activity through tax incentives including the Enterprise Investment Scheme (EIS) and Seed Enterprise Investment Scheme (SEIS).[33] Crowdsourcing, a variant of angel investment, is another way that new enterprise can be helped to succeed.

[31] European Commission (2014) Innovation Union Scoreboard 2015; BCVA. (2015). BVCA Private Equity and Venture Capital Report on Investment Activity 2014. Venture Capital.
[32] Economic Insight (2015) What is the relationship between public and private investment in science, research and innovation? A report commissioned by the Department for Business, Innovation and Skills.
[33] Colin Mason & Tiago Botelho (2014) The 2014 Survey of Business Angel Investing in the UK: a changing market place.

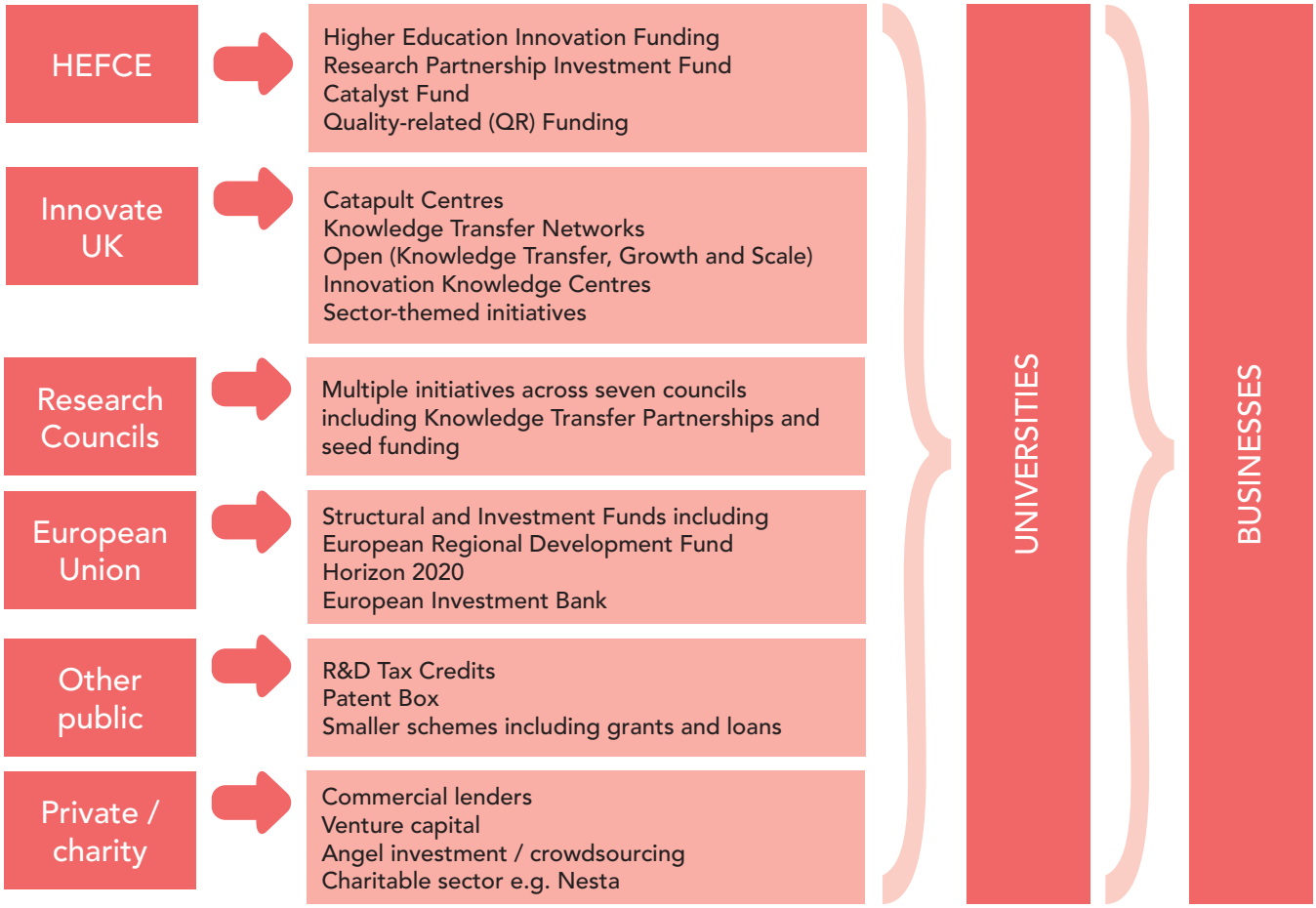


Figure 4 Different types of innovation funding that universities attract and funnel to businesses.

Universities are not the final destination of this funding. Instead, they act as channels of funding to business. Anchor universities share their expertise in this landscape with local businesses, plugging them into the network of public and private support from international, national and regional schemes. This is particularly important for small firms which are often more reliant on the revenue derived from within the region than their medium sized counterparts.[34] The role played by universities in this process is crucial, because they can facilitate finance options for businesses that might otherwise be hard for them to identify and access.

In many cases, universities operate as delivery partners for national government-funded products such as Innovation Vouchers, Regional Growth schemes and for ERDF innovation funding. They also provide advice and guidance to businesses on these schemes using core funding. These examples describe this in action. The University of Huddersfield, for example, have used HEIF to fund 14 Proof of Concept grants for student and graduate enterprises, support to enable four new businesses to begin commercially trading and support 20 Enterprise placement year students.

Over the past five years investment of £2.4 million of ERDF has leveraged significant additional funds to enable Sheffield Hallam University's Innovation Futures project to work with 220 SMEs delivering an increase in GVA of £17.2m to the City Region.

[34] Nigel Culkin (2016) Entrepreneurial universities in the region: the force awakens? International Journal of Entrepreneurial Behavior & Research, 22(1), pp. 4–16.

Manchester Metropolitan University and partners have developed a series of regional growth and innovation schemes through an ERDF grant of £4.7 million. Five hundred SMEs are predicted to benefit from the Cheshire Growth Programme, Manchester High Growth Network and SMART Cheshire.

Over the past three years, UWE Bristol has invested £120,000 into social entrepreneurs and £55,000 into entrepreneurs. An in-house crowdfunding platform has been launched to help students get their start-ups off the ground. Providing support for 300 entrepreneurs each year, it has developed partnerships with national and local organisations such as Unltd, Santander, RBS, RSA, Bristol City Council and Bedminster Town Team. The Technology Business Incubator at BRL, based at UWE's Frenchay campus, saw its first cohort of eight start-ups raise £1.5 million of research and development funding in their first 16 months. UWE Bristol's RGF funded, Innovation 4 Growth (I4G) programme, has also provided some of the South West's most innovative SMEs with funding, issuing £6.9m of grants to 67 companies under the current programme, leveraging a further £14.5m of private sector investment to create or safeguard over 750 jobs.

Universities leverage private investment in innovation through collaboration

Universities play an important role in providing routes to early stage finance, helping businesses move into higher-value and increasingly sophisticated innovation activities. Through developing longer-term relationships with small businesses that progress up the innovation chain, universities help increase SME investment in R&D. Although universities are by no means the only source of UK R&D they are better placed than most to help innovating businesses scale-up.

Collaboration with a university often catalyses new phases of growth and has been shown to increase business success, over and above any improvements in performance gained through public funding.[35]

REFORMS TO INNOVATION FUNDING

Innovate UK is to be integrated into a single body called UK Research and Innovation (UKRI) comprising the seven Research Councils and Research England.

Under plans set out in the 2015 Comprehensive Spending Review, Innovate UK has also been instructed to convert £165 million of grant support into loans and other financial products. At the time of writing, there is in insufficient information to assess the impact of these reforms. Further details will be made available through a National Innovation Plan expected in later in 2016.

In April 2016, Oxford Brookes University collaborated with the Bamboo Bicycle Club to successfully build the world's first ever bamboo and 3D printed lugs bicycle at London's Design Museum. Engineering staff and students from Oxford Brookes researched and tested different composites, and took two weeks to complete the 3D printing for the nylon reinforced carbon fibre (used on Formula 1 cars) lugs, which are used to join the bamboo frame together with special urethane adhesive glue. Oxford Brookes first found success with bamboo bikes back in 2011, developing the first-UK built mountain bike made out of bamboo. Academics Dr Shpend Gerguri and Dr James Broughton from the University's Department of Mechanical Engineering and Mathematical Sciences (MEMS), along with undergraduate and postgraduate engineering students, developed a bicycle frame that capitalises on the vibration damping and strength properties of bamboo and other natural fibres. It is a great example of Brookes' focus on sustainable engineering with a practical application.

[35] BIS (2014) Estimating the effect of UK direct public support for innovation.

Funding principle 5.

Innovate UK should ensure direct grant funding is maintained for talent-related programmes and for small business grants.

Small businesses are often risk averse and time poor. Flexible grants like those in the Open Programme respond to SME needs and should be protected.

Creating places for innovation (spatial capital)

Universities are increasingly investing in shared space with businesses through their estate development, bringing together different forms of knowledge to enable innovation.[36]

Sharing space and assets leads to disruptive innovation

Opening university research facilities to businesses is essential for integrating research and innovation ecosystems and for realising the benefits of the UK's world-leading research environment. Alliance universities are ensuring their significant capital research assets are available to a wider cohort of users, including industry of all sizes. The University of Salford's THINKlab for example is a collaboration of local government, industry and universities' researchers generating innovative digital solutions to the challenges faced by industry.[37]

One University Enterprise Zone is based in UWE Bristol and will provide business incubation and grow on space for businesses specialising in robotics and autonomous systems, biosciences, health sciences and related high tech areas. It will provide access to the sorts of facilities and expertise that would otherwise be out of reach for new and growing businesses.

Targeted innovation support zones promote innovation and collaboration

Universities are often involved in the management and running of incubator, science and innovation parks, not just in the role of landlord, but as an active partner in activities. Innovation zones come with targeted, real-time and tailored business support from the university.

Incubators, for instance, offer a variety of services and facilities for start-ups and early stage companies. Services range from networking events to courses on accounting, finance and regulatory compliance, whilst facilities include hot-desking space for a one-person service sector start up and workshops for an early stage manufacturing SME.

Alongside this, universities provide bespoke assistance and services centred on access to new knowledge, research and expert academics. Ensuring that new companies are innovating throughout their incubation period helps to develop an ingrained culture of innovation which is likely to continue throughout their lifespan.

Science and innovation parks are aimed at more established businesses and companies, and will often involve less hands-on support from the university. Most institutions will nevertheless keep track of the inhabitants with a view of developing relationships and creating further partnership opportunities such as internships, KTPs and collaborative research. In some instances, businesses may move directly from one university operated incubation centre into a university operated business park. Incubation and science parks can act to develop clusters around specific industries within a location, thus helping to attract more businesses to relocate or encourage new start-ups and spin outs.

Clustering creates economic benefits through refocusing and creating local government initiatives to support their activities. The sharing of knowledge will often help facilitate the discovering of synergies and cooperative working opportunities between different businesses. University-led knowledge clusters are therefore effective at leveraging inward investment for

[36] Accenture (2016) Incubator or respirator? Why you need to change the way you innovate. Now.
[37] www.thinklab.salford.ac.uk/

development and residents, and can bring regenerative benefits in deprived areas.[38]

Public funding often plays a crucial role. Co-location can be incentivised effectively by Government, as University Enterprise Zones (UEZs) have demonstrated, often leveraging further private and European investment. HEFCE funding through the Research Partnership Investment Funds and the Catalyst Fund have also provided essential support for getting co-investments off the ground, de-risking activity sufficiently to make ambitious estate developments possible.

UEZs have been given around £15 million in capital funding between 2014 and 2017, and allow simplified planning applications and export support from UKTI to develop different models of innovation co-location for regional and national benefit. Although evaluations will not be completed until 2017 the signs are promising with multiple private companies, LEPs and universities involved in the four pilot schemes.

Liverpool John Moores University Enterprise Zone in collaboration with the University of Liverpool will be the first UEZ in the city. It is a new innovation centre set to transform sensor applications across the world. The centre will house, support and establish high tech businesses working on sensor systems.

[38] Kat Hanna (2016) Spaces to think: innovation districts and the changing geography of London's knowledge economy. Centre for London.

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