University Alliance
Making the difference

Response to the UK Government consultation on the *Building Our Industrial Strategy* Green Paper

13th April 2017

Introduction and Summary

1. University Alliance represents a group of universities in the United Kingdom which have a commitment to excellent teaching, industrial engagement, and research with impact. We welcome the Government's new Green Paper on Industrial Strategy, and look forward to working with Government and other stakeholders to promote growth and productivity.
2. In this submission, we outline how Alliance universities support both the economy as a whole through activity that cuts across all sectors, and also particular key sectors. We then build on this to make policy recommendations in response to the questions on research and innovation (numbered 5-9) and those on advanced education and skills (numbered 11-14). These are important cross-cutting themes around which the Industrial Strategy should be constructed, and which will be critical for its success.
3. In relation to research and innovation, we strongly support the approach set out in the Green Paper. It acknowledges a major role for government in supporting innovation, and backs this with several billion pounds per annum in additional funding. We welcome the recognition that process innovation and absorption of innovation are just as important as high-tech invention and discovery. The creation of UK Research and Innovation (UKRI) as a vehicle for strategic co-ordination and leadership will be very important to ensuring delivery and value and creates an opportunity to correct inequities in previous funding mechanisms. Finally, we welcome the recognition of the importance of place in research and innovation. Universities can play a huge part in bridging administrative geographies where they don't match innovation ecosystems.
4. In relation to education and skills, the Green Paper is much less convincing. It implies that 'technical education' is primarily a non-HE sector activity, with all degrees seen as occupying a different "academic" space. This is plainly wrong. Two thirds of undergraduate degrees across the university sector could be classified as technical and/or professional in nature – they train people in technical and vocational skills to an advanced level. Several key modes of technical and professional higher education are not mentioned in the Green Paper at all, such as Degree Apprenticeships, provision at levels 4-5, and postgraduate taught provision. Advanced skills and the crucial role of universities in the skills supply line should be recognised. This makes it more likely that policy decisions will improve the skills ecosystem. Lifelong learning is a specific area where the Green Paper is stronger, and we welcome this. A culture of lifelong learning must be developed in the UK. Skills development is just as much about training the existing workforce as it is about school leavers.

The contribution of Alliance universities – to the whole economy

5. Alliance universities already make a substantial contribution to productivity and growth across the whole economy. We seek to illustrate this contribution in this section.

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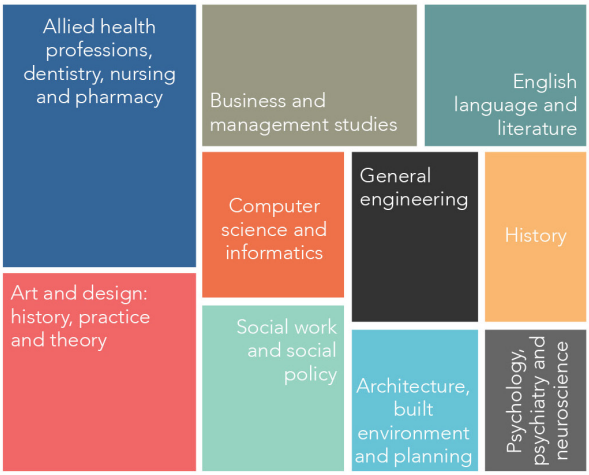
RESEARCH

Our leading fields by research power...



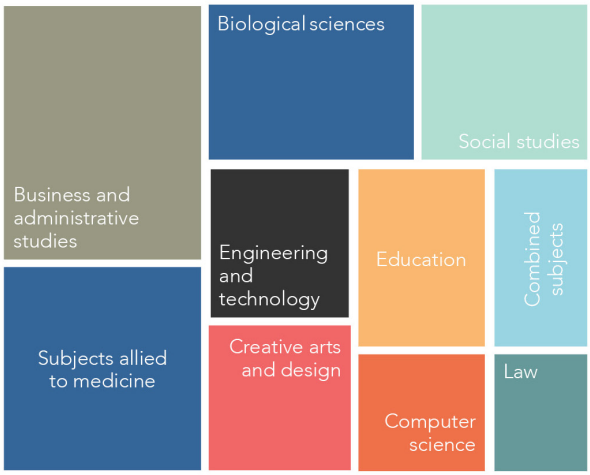
£72.9m in collaborative research in 2015/16

£22.8m in knowledge exchange funding in 2015/16

£45.6m in contract research in 2015/16

EDUCATION

...inform our major teaching areas



37% of courses are accredited by business

15% of students undertake sandwich courses

We constantly **innovate** to keep our education fit for a changing world

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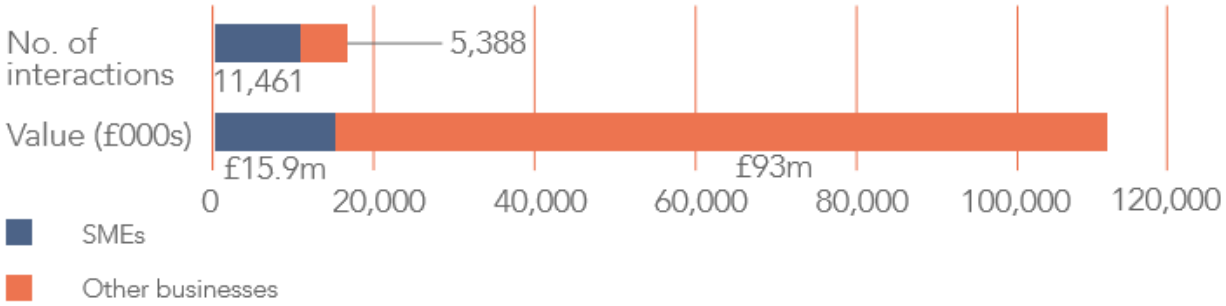
INNOVATION AND ENTERPRISE

UA institutions work closely with business, particularly SMEs



UA led the sector in delivering nearly 1 million learner days of CPD/CE courses in 2015/16

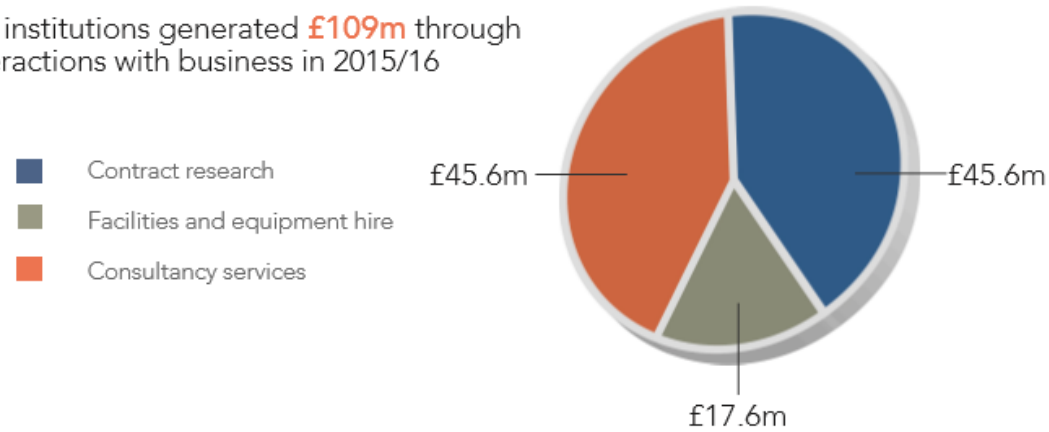
UA UNIVERSITIES CREATE BUSINESS

4,390 — 32% of sector total
Number of graduate start-ups still active

9,368
Number of people employed

£303m
And their 2015/16 annual turnover

UA institutions generated £109m through interactions with business in 2015/16



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6. All Alliance universities have business schools, and across the group we have a total of around 86,000 business students at both undergraduate and postgraduate levels. We also carry out applied research focused on improving business performance. We know that a significant component of the UK's weak productivity is rooted in business process issues and management practices, and our members use innovative learning and teaching methods to create skilled graduates who can help to address those challenges.

- **Kingston University** currently works with a wide range of companies, including Airbus, Marks and Spencer, and Telefonica O2 to offer students valuable on-the-job experience. Work placements are an important feature of the new BSc (Hons) with business experience degrees offered by the Kingston Business School since September 2016. Students in these courses will begin nine-month work placements (or six-month plus a three-month summer internship) in January 2018, after four terms of study.
- At **Coventry University**, the Coventry Business School Trading floor provides an opportunity for students to gain experience using the best finance tools in the industry. It is the biggest academic Trading Floor of its kind in Europe. Most modules taught in the Trading Floor give students the opportunity to obtain industry certifications (e.g. Bloomberg and Thomson Reuters) for free.
- At **Manchester Metropolitan University**, the Centre for Enterprise offers a wide range of programmes aimed at helping local micro, small and medium-sized enterprises grow. For example, the Centre's Managers2Leaders programme is aimed at developing leadership skills within SME management teams.
- The **University of Lincoln**'s Leadership & Management Centre offers professional development courses and qualifications for businesses, teams and individuals across a range of business-related areas. The Centre is accredited to deliver recognised qualifications such as CMI to Level 7.
- At **Sheffield Hallam University**, the Venture Matrix is a scheme that develops students' employability and enterprise skills as part of their degree. It allows students to work on real-life projects with external organisations in the business and education sectors. The scheme was awarded the National Enterprise Educator award in 2010.
- **Oxford Brookes University**'s Business School offers risk management programmes to help companies, such as the InterContinental Hotels Group, develop risk management models that can cope with complex political, economic, social and technological environments and equip managers and business leaders with best practices in crisis management and business resilience.
- **Teesside University**'s The Forge provides a single point of contact for companies looking to access the university's business services. It offers consultancy services to businesses in a wide range of expertise areas. For example, local business Guardian Marine Testing has worked with The Forge to enhance the organisation's worldwide marketing strategy and sales functions.

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- **Nottingham Trent University**'s business school is among only 5% of business schools worldwide to have received Association to Advance Collegiate Schools of Business (AACSB) accreditation. Programmes include The Big House – funded by the ESIF 2014-2020 programme - a local partnership that aims to improve the ability of 500 SMEs in Nottinghamshire and Derbyshire in the Creative Digital Industries sector to start-up and grow. Since 2011, the University and NBS has hosted the East Midlands Regional Office of the Institute of Directors – providing a further link between business and education that is important to both organisations.
- The **University of Brighton**'s Profitnet learning network is designed to enable organisations to learn from each other through expertly facilitated confidential group sessions. The programme consists of monthly meetings which include sessions on strategy development and peer to peer action learning. Programme participants have benefited from improvements to their planning and strategic skills, innovation strategy development and new product and service development.
- At the **University of Hertfordshire**, the Business Schools' Statistical Services and Consultancy Unit has provided clients such as Jaguar Land Rover and T-Mobile with statistical support for a wide range of projects as well as short course training in statistics for employees.
- In 2015 Bristol Business School launched the **UWE Bristol** Business Fellows programme. The Fellows work closely with both students and academics in the Faculty and are invited to attend exclusive workshops to help explore ideas in areas such as leadership and entrepreneurship, enhancing connectivity between the University and the regional economy.

7. Alliance universities provide leadership in ecosystems at the regional and local level, supporting skills formation, innovation, improved health and wellbeing, and opportunity creation for people from all parts of society. Our members do this by co-ordinating networks of educational institutions, businesses and voluntary sector organisations. We have recently produced four reports that explain this dimension of our work, which can be found at: http://www.unialliance.ac.uk/blog/category/all-publications/publications/.

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The contribution of Alliance universities – to key sectors of industry

8. In the context of a developing industrial strategy, it may also be helpful to see our members' contribution to skills and innovation at a sector level. We are particularly strongly engaged with several key sectors and make a major difference to their performance and growth.

Engineering and advanced manufacturing

9. University Alliance members play a significant role in developing the skills necessary to support the engineering and advanced manufacturing sectors. UA institutions educate 38,415 engineering & technology students, which accounts for 24% of the total. These sectors are particularly hands-on and the skills they require cannot be learned solely in the traditional classroom environment. Consequently, our institutions collaborate closely with industry to ensure that their courses provide students with the skills that the sector demands. This has led to 60% of UA engineering and advanced manufacturing courses receiving accreditation from industry.

10. An example of this is the **Institute for Advanced Manufacturing & Engineering (AME)** at **Coventry University**. This Institute was developed in collaboration with Unipart Group, a leading provider of manufacturing, logistics and consultancy services in the private sector. As opposed to traditional academic courses, AME offers the UK's first 'Faculty on the Factory Floor'. This allows students to gain hands-on practical experience in a real-world engineering environment and helps them be industry-ready upon graduation, accelerating their progression by 12 months when compared with traditional courses. AME is currently training over 90 graduates and is developing a degree apprenticeship program that will be delivered alongside the current Bachelors and Masters programmes using AME's facilities. Alongside its role in developing skills, AME also makes a sizeable contribution to research & development in the engineering and advanced manufacturing sectors. Its work in this area has already included over £6 million of funded projects and its close relationship with Unipart ensures that this research is commercialised and disseminated to industry. It has already helped Unipart secure a new fuel rail project for the Ford Fox engine and the start of production on a lightweight exhaust system for Aston Martin.

11. Further examples across UA institutions:

    - The **Maritime Knowledge Hub** at **Liverpool John Moores University**, which provides similar services as AME to the maritime sector. It also includes a Maritime Business & Technology Incubator to support startups and SMEs in commercialising and implementing new research and technology
    - The **Centre for Efficiency & Performance Engineering**, which is managed by the **University of Huddersfield**. It primarily undertakes applied research and development for industry and is a part of the **3M Buckley Innovation Centre**, which promoted business to academia collaborations across technological sectors.

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- **Nottingham Trent University** research into Sustainable Technologies in the Built Environment has helped SME manufacturers of building materials create more sustainable and higher-quality products whilst reducing energy consumption and carbon emissions, enhancing their competitiveness. NTU has also worked in partnership with organisations across the city to pilot new technologies that reduce the energy intensity of older houses, so they are ready for low carbon standards in 2050.
- The **School of Engineering** at the **University of Lincoln** is listed as a principal partner of Siemens Industrial Turbomachinery Ltd. Siemens transferred their R&D equipment to Lincoln's Engineering Hub and relocated their training team, making use of the University's research and directly exposing students to industry.
- The **Centre for Construction Innovation & Research (CCIR)** at **Teesside University**. The CCIR is industry led and focuses on the application of IT and virtual reality techniques to construction processes.
- The Engineering Showcase development at the **University of Salford**, will include the Morson Maker Space; a place where industry, researchers and students will collaborate to create and realise designs and ideas from live industry projects. With several key engineering projects in the North West, including HS2, these facilities will help to bridge any skills gaps by attracting the best new talent.
- The e2v Centre for Electronic Imaging at **The Open University** is a collaborative research centre between the University and e2v, producers of high-performance systems for space exploration. The Centre is creating new electronic imaging equipment for space missions which allows us to see deeper into the universe. The OU has also partnered with Babcock International Group Plc, a FTSE 100 company providing engineering support services worldwide to address a UK-wide shortage of qualified engineering staff. This highly successful apprenticeship programme is enabling Babcock to grow their own stream of qualified engineers with knowledge and skills attuned to the company's priorities.

The health and social care sector

12. University Alliance members are leading providers in the 'subjects allied to medicine' space, educating over a quarter of the sector with 71,500 students. In providing courses in this field, UA institutions collaborate heavily with the private and public health sector, with 70% of our 'allied to medicine' courses receiving accreditation from the sector. This close relationship with the sector is further demonstrated in the ongoing partnerships between UA institutions and the health sector across both training and research.

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13. The **University of the West of England (UWE)** and their involvement in the **West of England Academic Health Science Network** is a relevant example of the close collaboration between UA institutions and the sector. This Network brings together universities, industry, research bodies, the health service community and the wider public to improve health and wellbeing across the West of England. Within this, UWE plays a key role in promoting innovation in the sector by providing the research base that underpins new technological productivity enhancing development. The **100,000 Genomes Project** highlights the impact of this collaboration through efforts to implement genomic medicine into the NHS to improve the effectiveness of future treatments. By partnering with local businesses and healthcare professionals UWE is not only able to help commercialise new research, but it also ensures that evidence-led best practice is implemented across the sector as a whole. This role is further cemented by UWE's role as a training provider for its own students as well as for those who are already working in the sector. The Network's local focus also helps strengthen the local economy and the provision of local services.

14. Further examples across UA institutions:

- The **University of Portsmouth's** involvement in the **VitalPAC** mobile clinical system. Work undertaken at Portsmouth's Centre for Healthcare Modelling and Informatics was incorporated into the VitalPAC family of products. Portsmouth's contributions helped increase turnover, create new jobs and attract over £1m of investment from private investors for VitalPAC.
- The **Advanced Wellbeing Research Centre** at **Sheffield Hallam University (SHU)**. A joint venture between SHU, Sheffield City Council, and the Sheffield Teaching Hospitals NHS Foundation Trust which aims to deliver innovations in physical activity that can underpin new spinoffs and commercial partnerships. Its location and work also allows the Centre to act as a centrepiece of the Olympic Legacy Park and will help create a new economic zone in the Sheffield-Rotherham corridor.
- The **Health Design & Technology Institute** at **Coventry University**, which provides design, prototyping and user-centred product evaluation services to entrepreneurial individuals and companies developing modern and innovative technologies. It is particularly focused on the ageing population and people with disabilities and chronic health conditions.
- The **Leading Places** initiative involving the **University of Brighton**, which aims to set up and develop meaningful relationships between universities and regional ecosystems. Brighton is one of eight pilots across the UK and is trialing innovative ways to promote healthier, more independent ageing.
- The **Bristol Robotics Laboratory** at the **University of the West of England** where significant research into the use of robotics in the health sector is performed. The multidisciplinary approach to robotics research and the engagement with industry helps ensure that research is practically applicable and commercialisable.

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- **Nottingham Trent University** is one of two academic partners in the D2N2 Teaching Partnership's Social Work Academy that will help cement important collaborations between universities and councils. The Academy ensures a steady stream of high calibre social workers to the frontline, working with children, families and vulnerable adults. It will continue to "raise the quality" of trainees and teaching, whilst training social workers to government-specified standards across six regional social work employers.
- The **Open University** has developed a leadership programme for the Osteopathic Development Group (ODG) that is designed and customised specifically for the needs of the osteopathic profession. ODG is a collaborative partnership between the leading organisations in the UK osteopathic profession.

Digital industries

15. In an increasingly digitised world, UA members have responded with a distinct focus on the digital sector. UA institutions educate 28,495 students across their computer science degrees, which accounts for 31% of the sector, and incorporate digital expertise into many other subject areas. Our institutions also strengthen the digital sector through their promotion and support of entrepreneurial behaviour from their students and alumni. Accelerator and business incubation programs run by UA institutions help train and support startups and SMEs in the digital sector and allow them to leverage the university's facilities and expertise in this area.
16. **TravelSpirit** is an openly governed source code commons for collaborative open source projects supporting Mobility as a Service (MaaS) products. It originated through early collaboration with **Manchester Metropolitan University (MMU)** and the **University of Salford**. MaaS is about transitioning mobility from being 'owned' (eg; private cars, cycles etc.) to being an obtained service via ridesharing and public transport etc. The MaaS market is estimated to be worth circa $900 billion annually worldwide and there are multiple existing MaaS alliances between private and public sector organisations across the world that aim to exploit this lucrative market opportunity. TravelSpirit's work supports that of Transport for Greater Manchester and the Department for Transport in exploring the role of MaaS in providing flexible transport solutions for the Greater Manchester area, and promoting the region as a hub for MaaS research and business.
17. TravelSpirit aims to help create and support new, commercially-viable MaaS solutions. By using open source data, they create and grow a valuable public resource that can be exploited by both private and public entities. These entities can then pursue commercial or non-commercial applications that can strengthen the transport sector in the Greater Manchester region as well as boost its regional economy. Such applications are also likely to be applicable worldwide and hence offer a significant opportunity for further growth.

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18. Further examples across UA institutions:

- **LCR4.0** with **Liverpool John Moores University (LJMU)**, which helps businesses in the manufacturing space increase productivity and de-risk innovation by providing support and enabling collaborations. It connects SMEs to expertise and support from key knowledge assets in the local region such as LJMU's **Sensor City** and the Liverpool City Region LEP.
- **MK: Smart** is a collaborative initiative led by the **Open University** which is developing innovative digital solutions to support economic growth in Milton Keynes. The initiative is based around the use of data to support innovation across a range of areas. A key component of this activity is the Innovation and Incubation Centre at University Campus Milton Keynes, which provides training in data-driven business innovation and the digital economy, as well as hands-on support for business development, demonstration facilities, and an incubation space.
- **Kingston University** collaborated with an independent creative digital agency **The Other Media** on a knowledge transfer partnership. This collaboration helped support and enhance the Other Media's capabilities in developing high-end apps for use with Apple and Google products.
- The **National Cyber Security Academy** at the **University of South Wales**. The Academy involves collaboration with the Welsh Government, Innovation Point and major industry players, including: Airbus, General Dynamics UK and Alert Logic, and works to close the expected skills gap in the cyber security sector.
- The **Digital Hack Lab** at the **University of Hertfordshire**. This lab works with leading industry partners to explore the possibilities of design, 3D printing and additive manufacture in developing real-world experimental professional projects.
- The **Future Space** at the **University of the West of England (UWE)**. This accelerator/incubator space connects entrepreneurs and tech innovators with scientists, researchers, and graduates in a high tech and well equipped environment. The space is managed by Oxford Innovation, and commercial and research support is provided to resident enterprises to help them succeed.
- NEC Corporation, BT and EE will work with the **University of Salford** as a research partner to undertake the most thorough testing yet into the performance of vital mobile technology for 4G and 5G networks. Using the University as a base, the companies have created a test bed to measure the performance of the V-band radio system when exposed to inclement weather. The University has installed a radio system complete with transceivers and antennas on the Newton Science and Engineering building and the Maxwell Building at its Peel Park Campus and will monitor transmissions at the test site from now until early 2018.

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The creative industries

19. As the digital sector grows in importance with further advances in technology, so too will the creative industries. Work in the creative industries plays a strongly complementary role to the STEM sectors and there already exists a significant overlap between the digital and creative industries. Consequently, UA institutions are also influential as education providers and research hubs in the creative industries space. UA universities educate over 65,000 students across the architecture, mass communications, and creative arts & design subject areas, which accounts for 25% of the sector. As technological advancements continue, these sectors will become more important to the UK's economy and society, and accordingly their importance needs to be recognized as a part of the government's Industrial Strategy.

20. We are currently undertaking an AHRC funded project, *Hidden Story: Mapping knowledge exchange partnerships for the Creative Economy.* This research will highlight the leadership and networking opportunities universities provide to creative industries in their region, and their role as hubs for knowledge exchange activity. It will also seek to make recommendations for the best integration of national funding systems to increase the productivity of the creative industries.

21. A prime example of our work in the creative industries is the **Digital Catapult Centre**, in which the **University of Brighton** plays a lead role. This centre links with the university's School of Computing, Engineering and Mathematics to provide a space for creative and tech start-ups and SMEs to develop and share ideas. The Centre collaborates closely with industry and researchers, building partnerships in the Coast to Capital LEP area to help commercialise research and grow startups and spinoffs. It is currently focused on areas such as: media, big data, and gaming, using innovations in location-based data, 5G connectivity, and virtual reality to promote advances in these sectors. It also runs meetups, networking events and workshops for those operating in the creative industries, and offers residencies to startups, innovators and creatives, acting as a focal point for industry networks.

22. Further examples across UA institutions:

    - The **University of Salford** worked with the BBC to develop a broadcast engineering degree in response to a shortage of multi-skilled broadcast engineers during the London 2012 Olympics.

    - The **International Screen School Manchester (ISSM)** led by **Manchester Metropolitan University** is an innovative media school that will develop interdisciplinary talent in one of the fastest growth sectors across Europe. It focuses on building creative and digital skills across 'screen-based' sectors, such as film, TV, animation, games, and post-production. The ISSM will work with industry as partners in learning, research and innovation, hosting a diverse programme of apprenticeships, undergraduate, postgraduate and professional CPD provision.

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- The **Live Lab** business incubator situated in the School of Architecture at **Oxford Brookes University**. It enables interdisciplinary entrepreneurs to establish business enterprises, practice startups and product-to-market companies that are also willing to contribute in at least one service design oriented, civic engagement project. It does this by connecting students to projects with commercial companies and community partners, aiming to build and promote niche market economies.
- A purpose-built **TV studio and sound studio** at the **University of Greenwich**. This facility allows the university to give its students hands on experience in the broadcast media sector, whilst also opening opportunities to work with industry on a consultancy basis.
- **Nottingham Trent University** delivers FE provision through their wholly-owned **Confetti Media Group**. This provides education pathways for the Creative and Digital sector, including aligned pathways with the University. The University is home to 1,300 further and higher education students at the start of their careers in the fields of games, TV, film, music and live events production. The university's **Creative and Virtual Realities Lab** allows architects, artists, designers, engineers, computer scientists and human scientists to collaborate and explore the potential of new visualisation techniques and digital design models and processes.

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Question Responses

Question 5: What should be the priority areas for science, research and innovation investment?

23. We support the government's commitment to increase the volume of UK R&D expenditure by £4.7 billion and recommend a 'balanced portfolio' of investments to capture the broadest range and geographical spread of activities, and an appropriate balance of risk and returns. Within this, Alliance universities should be considered a natural delivery partner. We bring leadership, have an enduring commitment to our cities and regions and are able to connect them to national and regional ecosystems. We also have expertise that aligns to key sectors of industry. Investment should be organised into five high-level streams of activity, as follows:

24. Stream 1: Support for challenge areas from the Industrial Strategy Challenge Fund.

    - A portion of the ISCF should be targeted through open competition at sector and intersectoral challenges. For all successful bids, a track record of 'excellence' should be a prior requirement and there should be a clear path from investment to enhanced productivity. This could be managed directly within UKRI, or pushed through a combination of Innovate UK and Research Councils. See answer to Question 6 for comment on challenge areas.

    - In addition, we note that successful international examples of innovation funding use a holistic model – often called an 'innovation ladder' – to describe all parts of the journey. A similar concept for the UK could help bond the sense of common purpose and roles for different organisations working on the Industrial Strategy.

25. Stream 2: Higher Education Innovation Funding (HEIF), topped-up from the Industrial Strategy Challenge Fund.

    - Using part of the ISCF to increase core support interactions between universities and business will create an environment in which innovation can thrive. Higher Education Innovation Funding (HEIF) is high impact, but also generates reliable returns. Conservative estimates suggest it brings a return to society of £7.30 for every pound invested, extending to £9.70 including non-monetised benefits. Source: HEFCE (2015). It therefore represents an extremely good vehicle for making investments that solidly underpin a balanced portfolio.

    - In future, the government should seek greater alignment between a university's knowledge exchange ambitions and the allocation of HEIF and other dedicated funding, using the outcomes of the Knowledge Exchange Framework currently being developed by HEFCE. There should also be greater incentives for university-led activities that are not currently included in the HEIF allocation formula e.g. collaborative research.

26. Stream 3: Funding for a discrete series of capacity-building programmes designed to underpin performance and value for ISCF investments.

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- Some of the additional resource from government should be dedicated to talent and capacity building. This could include a new scheme to support Professional Doctorates in priority sectors (see response to Question 8). Capacity can also be built through investment in leadership and management training using the capabilities and expertise of university business schools.

27. Stream 4: Support for high risk, high potential return projects from the Industrial Strategy Challenge Fund.

    - The ISCF should be designed so that a top slice of funding is made available for 'high risk, high potential' ventures. There might be a wide range of possible delivery partners for this. It would largely be focused on businesses, though there would be a clear role for extensive university partnerships that bring together innovators from several environments, including universities.

    - It would be important that the funding is not unduly prescriptive, nor unduly burdensome in relation to reporting and accountability requirements. The Catapult model may be one vehicle for this but the government should consider how it can support smaller innovation units nestled within businesses.

28. Stream 5: A future flow of funds additional to the Industrial Strategy Challenge Fund for innovation-led growth and productivity in the regions.

    - If the UK loses access to European Structural and Investment Funding, a successor programme should be introduced which retains an explicit link with regional prosperity. Projects should be subject to competitive bidding, evidence-based, delivered by local partners, and carefully evaluated against the objectives of the Industrial Strategy. Priority should be given to long-term projects designed to build innovation capacity.

    - The funding should remain distinct from the Industrial Strategy Challenge Fund to ensure that the UK's net projected expenditure on innovation is not reduced as a consequence of Brexit. Universities received programme income of £52.79m from ERDF and ESF in 2015/16 (£45.7m from ERDF; £7m ESF), representing 32.4% of the total regeneration and development income that flowed through the higher education sector. Of the £52.7m, University Alliance members received £7.28m or 13.8% of the sector total.

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- ESIF is an essential complement to research funding. It draws businesses into high-value activities with universities and attracts additional investment in innovation from the private sector. That in turn supports jobs and productivity. In the North of England alone, the job creation figures for the 2007-2013 programme were 20,149 (Yorkshire and Humber), 20,602 (North East), and 29,795 (North West), while new business estimates were 2,748 (Yorkshire and Humber), 5,888 (North East) and 9,582 (North West). Source: Sheffield Political Economy Research Institute (2016). The UK has been a significant net contributor to ESIF. While we received £1.672 billion in ERDF and ESF income in 2014/15, this represents a fraction (3.2%) of the total sum distributed across the EU, and only 29% of what the UK paid in. Structural spending can therefore be maintained at present levels at a reduced cost.

Question 6: Which challenge areas should the Industrial Challenge Strategy Fund focus on to drive maximum economic impact?

29. The central theme of the Industrial Strategy Challenge Fund (ISCF) should be investing in untapped potential and place "to build on strengths and extend excellence into the future" ('Building our Industrial Strategy: Green Paper', p 5). We agree with the suggested challenge areas that are outlined in the Green Paper, although consideration should also be given to how these are aligned to the outcomes of Science and Innovation Audits. Our activity mapping suggests that Alliance Universities are well-placed to exploit to that end existing sectoral alignments in these areas.

30. Current University Alliance activities in these areas include:

- The 5G testbed backed by the University of Brighton gives digital businesses the opportunity to explore the implications of 5G technology on new and existing products. It supports collaboration with industry and provides businesses with access to the technological infrastructure and research expertise necessary for them to realise the opportunities provided by 5G.
- The University of Salford's Autonomous Systems & Robotics Research Centre links closely with manufacturing and industrial partners, particularly in the aerospace and food sectors.
- The Bristol Robotics Laboratory is a collaborative partnership between the University of the West of England and the University of Bristol that promotes research and investment in the robotics sector. The Laboratory is involved in interdisciplinary projects across the robotics sector and works closely with industry and other research institutes both nationally and internationally.
- Teesside University's The Forge collaborated with Carroll & Meynell Transformers Ltd. to develop the prototype of a new electric-vehicle charger which can charge up to 10 vehicles at a time. The Forge helped Carroll & Meynell win funding from Innovate UK and provided access to the cutting-edge facilities and expertise at Teesside University.

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- Sensor City is a technical innovation centre and University Enterprise Zone that fosters the development of cutting edge sensor technologies for use in a wide range of sectors. The centre involves a collaboration between the University of Liverpool, Liverpool John Moores University and industry to build a connected and collaborative sensor community and make Liverpool a global hub for sensor technology.

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Question 7: What else can the UK do to create an environment that supports the commercialisation of ideas?

31. There is a lack of dedicated incubation facilities in UK regions and limited coordination between existing ones. Members tell us this is leading to a loss of high quality academic staff and entrepreneurs who are looking to start their own business. Individual firms are reluctant to invest in incubators owing to the high level of business risk so we see a clear opportunity to work with local authorities, LEPs and other regional partners to establish a strong and coordinated innovation and incubation ecosystem. Other physical assets such as demonstrator facilities, University Enterprise Zones and maker spaces are also critical to the localisation of innovation and commercial success.

32. The Green Paper gives particular emphasis to increasing the volume of research commercialised through spin-outs which currently represent a small fraction of university-derived commercial activity. Although spin-outs can be an appropriate vehicle for commercialisation in some circumstances, we urge caution in prioritising the model at the expense of funding for other high impact activities.

33. The McMillan Review (2016) concluded that "focussing on spin-outs as the measure of success in knowledge exchange...gives a distorted picture as universities need to pursue the most appropriate route to impact for the particular research/technology". The House of Commons Science and Technology Committee (2017) has commented on the low levels of commercial demand for R&D which limits universities' ability to increase technology transfer.

34. Recommendations

    - Local institutions should work together to establish a strong and coordinated innovation and incubation ecosystem. There is an opportunity to create incubators and other physical assets which are challenge-focused or sector-specific based on the strengths and expertise in each region.
    - The Industrial Strategy should afford parity of esteem to the commercialisation of research through spin-outs and other high impact innovation activities such as innovation in products, processes and services for the public and private sectors.

Question 8: How can we best support the next generation of research leaders and entrepreneurs?

35. University Alliance excels at providing outward-looking training programmes for the next generation of researchers and industry professionals. Our Doctoral Training Alliances – involving 17 University Alliance members – in applied biosciences, energy and social policy are developing highly employable individuals with expertise in areas critical to the Industrial Strategy.

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36. While the Green Paper proposes an increase in the number of PhDs and research fellowships in STEM subjects, we are not convinced that this is deliverable under current funding practices. The Engineering and Physical Sciences Research Council (EPSRC), for example, funded 80 Doctoral Training Centres during the last round but only 28 institutions were involved. The 44 universities EPSRC funded for Doctoral Training Partnerships in 2015-16 were chosen according to historic research grant income rather than a competitive process underpinned by the principle of funding excellence wherever it exists.

37. There have also been multiple instances where significant industrial partners such as EDF Energy, BAE Systems, Siemens, Hydro International and Green Frog Group, plus numerous SMEs, were willing but unable to invest in Industrial Cooperative Awards in Science and Technology (iCASE) with their preferred university.

38. Recommendations:

- Under the newly formed UK Research and Innovation (UKRI), the system for awarding funds for doctoral training needs to be universally open, competitive and more responsive to the needs of business.
- Some resource from the ISCF should be dedicated to talent and capacity building including a new scheme to support Professional Doctorates. These could be structured as Engineering Doctorates (EngD) with embedded innovation and entrepreneurship skills or Doctorates of Business Administration with a focus on technology development and exploitation.
- The government should assess employer demand for Level 8 Degree Apprenticeships in STEM disciplines.

Question 9: How can we best support research and innovation strengths in local areas?

39. Support for research and innovation strengths in local areas should draw on the leadership, enduring commitment to our cities and regions and ability to provide connections to national and regional ecosystems of "anchor institutions". Alliance universities have a particularly significant role to play. First, we act as a 'hub and spoke' in business growth and innovation, maintaining industry clusters where entrepreneurs and investors meet, providing knowledge and talent for SMEs, and helping innovators navigate complex funding opportunities.

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40. Second, University Alliance networks span different economic and administrative boundaries. Our anchor institution role in national and regional ecosystems puts us in a unique position to join the dots. In the East Midlands, for instance, the University of Lincoln works with the food and drink industry in a cluster that stretches across the East of England, from Suffolk up to Hull. The automotive industry, on the other hand, has an East to West Midlands geography – from an aerospace focus at Rolls Royce in Derby, to Coventry University and Jaguar Land Rover's car expertise, to Siemens and the University of Lincoln's turbine technology in the east. Each of these industries has supply chains spanning the entire Midlands and East Anglia region which the universities are able to connect.

41. We think that more can be done to exploit the regional leadership role of universities including greater link up with LEPs, local government and other regional actors. Releasing the research and innovation strengths of local areas and regions requires investment in infrastructure. For example, the National Infrastructure Commission's interim report on the Cambridge – Milton Keynes – Oxford growth corridor suggested it 'could be the UK's Silicon Valley - a world renowned centre for science, technology and innovation'. However, the report also highlighted an urgent need for a joined-up plan and associated investment covering housing, jobs and infrastructure across the corridor.

42. Recommendations

- The UKRI operational plan should ensure that excellence in research and innovation is rewarded wherever it exists.
- National and regional funds for knowledge exchange should be maintained with particular emphasis on SME growth and productivity.
- Every LEP in England and city region structures in other parts of the UK should include a university representative. Policy should enable cross-LEP and cross-city region collaboration with universities working across complex administrative boundaries. LEPs and city regions should make use of the physical assets, space, expertise and outreach services of universities that prioritise SME engagement.

Question 11: Do you agree with the different elements of the vision for the new technical education system set out here? Are there further lessons from other countries' systems?

43. We recognise the Government's efforts to reform technical education to ensure its coherence. We welcome commitments to provide clarity to students and employers regarding the types of skills that are needed to meet the needs of the labour market and to raise aspiration. However, the vision proposed in the Green Paper does not capture the role HE institutions are already playing in providing qualifications that are designed to meet the needs of the economy.

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44. Policy should not promote a false divide between academic and technical and professional education. The pathways for progression and movement between academic and technical and professional education at all levels need to be available and clear to all who interact with the education system, particularly learners. All stakeholders involved in technical education reforms also need to ensure the value of the qualification obtained through technical and professional education is perceived the same way as a qualification obtained through a "traditional" academic route.

45. Alliance universities offer high quality and cost-effective academic and technical and professional education at Levels 4 through to 8. They have a strong history of helping students entering university with vocational qualifications succeed on academic courses and of working with employers to co-design and co-deliver courses.

46. As part of an educational offer that is well-connected with industry, Alliance universities are also important partners in the creation and delivery of Higher and Degree Apprenticeships. These apprenticeships are a concrete way in which higher education providers are delivering education that is academic and technical and professional in nature. For example, Manchester Metropolitan University is a leader in the provision of Degree Apprenticeships and was among a select group of universities to successfully launch a Degree Apprenticeship in Digital and Technology Solutions in 2015, collaborating with 11 regional and national employers. The university continues to grow their apprenticeship offer with the launch of the Chartered Manager and Chemical Science Degree Apprenticeships in 2016, the addition of new specialist pathways to the Digital and Technology Solutions Apprenticeship, and the projected introduction of new Level 6 and Level 7 Apprenticeships in subjects such as Digital Marketing, Healthcare Science and User Experience Design over the course of the next two years.

47. While universities are keen to build on their strong collaborations with employers to increase the offer of Higher and Degree Apprenticeships, there are barriers that need to be addressed to ensure the continued success of these education routes. Notably, there are challenges in meeting the demand for these types of qualifications in a timely manner, in supporting the recruitment and success of apprentices from diverse backgrounds and in maintaining clear lines of communication between higher education providers and the bodies responsible for the development and funding of apprenticeships, including the Education and Skills Funding Agency and the Institute for Apprenticeships.

48. Institutes of Technology have the potential to strengthen the system, but only if they are established as sustainable partnerships of universities, further education colleges and businesses, and resources are appropriately concentrated and not spread too thinly to make a real impact.

49. While there is no international example that offers a ready-made blueprint for successful technical education due to differing cultural and political contexts, there are elements of structures from other countries that offer helpful lessons in the development of a joined-up education system that provides the academic, technical and professional skills required for a modern economy. For example:

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- In Denmark, the system offers a range of high-quality vocational training programmes specifically aimed at low skilled and skilled adult workers to "maintain and improve [their] vocational skills and competencies" and to meet the evolving needs of the labour market.
- In Germany, the system's general focus on collaboration with small and medium sized companies has also improved personnel recruitment practices for employers and has increased lifelong learning and work-integrated learning opportunities for employees.
- In Ontario, Canada, the 45 public postsecondary institutions (colleges and universities) have established the Ontario Council on Articulation and Transfer to provide greater information, advice and guidance on learner pathways between apprenticeships, diplomas and degrees, and to collaborate on new initiatives facilitating articulation while respecting institutional autonomy. Similar collaborative initiatives have also been launched in Scotland to facilitate articulation into university.

50. Recommendations:

- Improve collaboration and communication between all FE and HE providers and employers to ensure learners have the tools to understand and navigate academic and technical and professional education pathways within the UK's education system, and to ensure newer qualifications have parity of esteem with well-established qualifications.
- Improve communication channels between HE providers and the bodies responsible for the development and funding of apprenticeships, including the Education and Skills Funding Agency and the Institute for Apprenticeships, to overcome the challenges and build upon the opportunities associated with the scaling up of Higher and Degree Apprenticeships.

Question 12: How can we make the application process for further education colleges and apprenticeships clearer and simpler, drawing lessons from the higher education sector?

51. Collaboration between FE colleges, universities and industry is essential to ensuring all tertiary education learners have access to the best information, advice and guidance they need to succeed in their education and career journeys.
52. For example, the University of South Wales has implemented strong collaborative initiatives with local employers and local FE colleges – through its Universities Heads of Valleys Institute (UHOVI) and its Strategic Alliance with 23 campuses across South Wales – to develop a coherent approach to learner information, advice and guidance, and progression.

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53. The full range of learning opportunities, courses and training within the current further education, higher education and apprenticeships systems is not readily understood by prospective learners. As such, any new access and admissions system for further education colleges and apprenticeships must be closely integrated with existing systems, including those applicable to higher education, to increase awareness of learning opportunities and of the support that may be associated with them. It must also aggregate information in user-friendly formats, allowing future FE learners and apprentices to filter their searches for learning opportunities based on factors that are important to them, such as locality. Such formats may include a responsive website, a mobile app that provides learners with course recommendations based on their interests and/or 'community learning centres' (see below).

54. Recommendations:

- Create a user-friendly system that allows prospective learners to access centralised information, advice and guidance on further education and apprenticeship opportunities based on factors that are important to them.
- Integrate FE and apprenticeship information sharing and application processes with those that already exist for HE to provide streamlined points of access for prospective learners on all learning opportunities available through the UK's tertiary education system.

Question 13: What skills shortages do we have or expect to have, in particular sectors or local areas, and how can we link the skills needs of industry to skills provision by educational institutions in local areas?

55. Universities are well placed to support the creation and development of more effective skills ecosystems in their respective regions. Alliance universities have a proven track record of working with local and regional businesses to provide formal and informal learning activities that meet industry needs, such as continuing professional development and bespoke training solutions.

56. For example, the University of Lincoln has developed new schools in STEM subjects such as engineering, mathematics, pharmacy, chemistry and physics in collaboration with multiple employers such as Siemens to meet the recruitment needs of the local and regional economy. This collaboration has also facilitated knowledge exchange activities between the university and local businesses. Coventry University's centre for Advanced Manufacturing and Engineering is a similar example, where the business partner is Unipart.

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57. Postgraduate taught programmes developed by universities in collaboration with local businesses are also playing an important role in providing learners with specific skills that meet industry demands as well as a broad set of transferable skills that will remain relevant in an evolving labour market. For example, the University of Salford has partnered with Advanced Combustion Engineering to offer a part-time distance learning MSc/PgDip/PgCert course in Industrial and Commercial Combustion Engineering. The course responds to a significant shortage of combustion engineers and allows learners to obtain a specialist qualification in a flexible manner.

58. Universities are also engaging with employers in the design, review and development of programme curricula via Industry Advisory Boards. University Alliance's August 2016 report on "Developing productive places: The role of universities in skills ecosystems" provides an overview of the bureaucratic, financial and political challenges that exist as skills systems are becoming increasingly devolved and as Local Enterprise Partnerships and 'city-regions' play a greater role in skills policy coordination in England. In linking skills needs to skills provision in local areas, universities, industry and other stakeholders that comprise a 'skills ecosystem' need to make the best use of existing institutional frameworks, improve collaboration between organisations within the same skills ecosystem and ensure that skills training and development is happening alongside efforts to support innovation.

59. There is a significant gap in the institutions for supporting the skills system. Though the related Skills Plan offers a coherent approach to skills pathways and qualifications reform, it is not apparent that there will be anything for skills to parallel the new strategic institutions we will get on the research and innovation side (i.e. UKRI and its substructures). The Green Paper indicates the government will "work towards a joined-up, authoritative view of the sector specific skills gaps the country faces" – but is silent on how or where this will happen. We do not advocate any form of 'workforce planning body', but it would make sense to consider how to improve strategic links between Local Enterprise Partnerships, newly forming Combined Authorities (in relevant localities), and sector skills bodies.

60. Recommendations:

    - Strengthen relationships between universities and LEPs, and conduct mapping exercises to better understand how local skills demand aligns with skills provision offered by educational institutions.
    - Create integrated structures, through greater alignment between combined authorities and LEPs, that will encourage collaborative skills development activities between local government, educational institutions, employers and learners. This may help us to carry out analysis of skills shortages, which are hard to understand at a national level, especially in the context of increasingly fast-moving labour markets.
    - Integrate local skills activities with wider regional economic development strategies, such as the 'Northern Powerhouse' and the 'Midlands Engine', to ensure skills provision is meeting the needs of economic activities across all regions of the UK.

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Question 14: How can we enable and encourage people to retrain and upskill throughout their working lives, particularly in places where industries are changing and declining? Are there particular sectors where this could be appropriate?

61. It is important that the UK has an education and skills system that gives people of all ages the opportunity to gain the skills they need throughout their lifetime. This is the only way to ensure employers have the skilled workforce they need. Of the adults in the UK who have not undertaken any learning since school, for out of five are unlikely to take up learning again according to a recent Foresight report. A coordinated government approach is necessary to ensure people can benefit from learning opportunities throughout their lives.

62. Hence the acknowledgement of the importance of lifelong learning in the Green paper is encouraging. A culture of lifelong learning must be developed in the UK. Skills development is just as much about training the existing workforce as it is about school leavers. An estimated two-thirds of the UK's workforce are aged 31-60 and their skills needs must not be overlooked.

63. In February 2017, University Alliance published "Lifelong Learning: Ladder and Lifeline". The report outlines the importance of lifelong learning due to an ageing population, changes to the way people enter, exit and navigate the workplace and the government's commitment to ensure that all parts of society can benefit from positive economic opportunities.

64. It highlights the commitment of Alliance universities to offer flexible, industry-relevant learning opportunities for learners at all stages of their working lives. For example, lifelong learning is at the heart of the Open University's activities. The OU's model of supported open distance learning allows a learner to study when and where they wish, at an intensity they choose themselves, through a variety of media and with a range of support options. Learners can design their own qualification to suit their personal and professional needs. This model not only makes higher education study possible for those living in areas where there is no local university (which include some of the UK's most deprived areas), but also enable learning and skills development to be tailored to the needs of employers. For example, 88% of FTSE 100 companies have sponsored staff on OU courses.

65. Sheffield Hallam University also works closely with employers to create flexible learning options to support industry needs. To meet the technical and personnel needs of the construction industry, SHU worked with Barratt Developments to offer a bespoke foundation degree in Residential Development and Construction with the option to top-up to a full BSc (Hons) degree. The course has been successful in retaining higher performing students and in attracting a diverse cohort, including mature students and school leavers.

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66. The report presents the current challenges learners – particularly mature and part-time learners – face in being able to access lifelong learning opportunities, including the introduction of fees; funding system mechanisms that favour young, full-time, first degree students; the ongoing impact of economic slowdown; the debt aversion of part-time and mature students; part-time maintenance loan restrictions; the lack of information, advice and guidance regarding employment opportunities and progression pathways within the education system; and the limits of funding available for equivalent and lower qualifications, which discourages those with a higher education qualification from re-entering the system to retrain or gain specialist skills. It also notes the importance of ensuring everyone should be able to access the education that is best for them.

67. We welcome the Government's commitment to encourage more flexible forms of provision, including accelerated degrees, through the Higher Education and Research Bill. Flexibility on fees would allow universities to run more accelerated courses, which can be more attractive for mature learners and other learners looking to enter the job market quickly.

68. Retraining and upskilling through is appropriate for all sectors as it ensures workers maintain and gain skills that are relevant to the ever-evolving economy. As noted above, collaboration between universities and LEPs to better understand alignment between skills demand and provision may be helpful in determining which sectors could benefit most from lifelong learning opportunities.

69. Recommendations:

    - Create a centralised advice and admissions service for lifelong learning courses, complemented by 'community learning centres', to provide impartial and expert information, advice and guidance to prospective students.
    - Recognise Centres of Lifelong Learning Excellence within regions to create a national network of lifelong learning excellence.
    - Reintroduce Individual Learning Accounts, expand Advanced Learner Loans and introduce a Help to Learn Bonus, as argued by the Learning and Work Institute, to provide small grants which will create stronger incentives for workers to retrain and upskill.
    - Broaden the Apprenticeship Levy to include other skills and training, providing employers with more flexibility in supporting upskilling and retraining opportunities for their employees.
    - Encourage greater collaboration between universities and public institutions, such as museums, libraries and schools, to raise attainment and aspiration.

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