
Mind the Gap:

Engaging employers to secure the future of STEM in higher education



UNIVERSITY OF
LINCOLN



Making the difference

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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.

About University of Lincoln

The University of Lincoln was named among the UK's best modern universities in the Times and Sunday Times Good University Guide 2016. We have some of the most satisfied students in the UK, rating in the top 25% nationally in a number of subject areas of the National Student Survey 2015 with Psychology ranked number one. We are recognised for our pioneering approach to working with employers, winning a Lord Stafford Award and a Times Higher Education Award. Graduate prospects are strong with nine out of ten of Lincoln's most recent graduates in work or further study six months after finishing their course. In the Research Excellence Framework 2014, more than half of our submitted research was judged to be internationally excellent or world leading, with Lincoln ranked in the UK's top 10 for quality of research outputs in two major subject areas.

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Executive Summary

The purpose of this report

1. Since the industrial revolution, universities have provided skilled labour to Britain's cities and regions and solved industry problems through applied research. Most have developed sophisticated ways to help employers identify and exploit the knowledge and specialist skills that universities create – with both immediate and spillover benefits for the wider economy. The Government's Productivity Plan recognises that the UK is ranked fourth in the world for business and university collaboration¹ and that building on this strength is critical for long-term productivity and growth.
2. University-business engagement comes in many forms. There are numerous policy reports that have looked at how universities can best support collaboration with business on applied research and knowledge transfer.² These are activities where higher education's access to specialist expertise, facilities and research can directly support industrial research and development.

However, employer engagement in educational provision (course development and delivery) within the university sector is less well understood. While research and knowledge transfer activities are often managed centrally and thus highly visibly in universities, employer engagement activities tend to be managed at faculty level or below. That makes it harder to gather information about activities and assess their value.

3. This report, therefore, focuses on employer engagement in educational provision within the university sector. It is based on research commissioned by University Alliance on behalf of the University of Lincoln as part of a HEFCE Catalyst-funded project.

¹ Global Competitiveness Index (2014-15), The World Economic Forum (2014) OECD Main Science and Technology Indicators (2015)

² For example:

Ann Dowling (2015), *The Dowling Review of Business-University Research Collaborations* <http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research>

Confederation of British Industry (2015), *Best of Both Worlds. Guide to University-Industry Collaboration* <http://news.cbi.org.uk/reports/best-of-both-worlds/best-of-both-worlds-pdf/>

National Centre for Universities and Business (2014), *State of the Relationship Report 2014* <http://www.ncub.co.uk/reports/sor.html>

House of Commons Business Innovation and Skills Committee (2014), *Business-University Collaboration. Seventh Report of Session 2014-15* <http://www.publications.parliament.uk/pa/cm201415/cmselect/cmbis/249/249.pdf>

Andrew Witty (2013), *Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249720/bis-13-1241-encouraging-a-british-invention-revolution-andrew-witty-review-R1.pdf

Employer engagement in higher education provision typically falls within four categories:

- a. ensuring that the **information, advice and guidance** students are given about the knowledge and skills they will need to enter particular industries and professions is accurate and current;
- b. facilitating and supporting **work placements and internships** to provide students with valuable work experience;
- c. developing **curricula, pedagogy, learning materials and learning-related research projects**; and
- d. developing **bespoke learning and teaching facilities** aimed at providing students with the specialist skills they need in the workplace. In many cases, business may provide capital investment for these.

To understand the prevalence of these activities better, we conducted a survey, with a response from 61 universities, exploring employer engagement activities. This found that UK universities are significantly engaged with numerous employers across a range of STEM subjects. Employer engagement is particularly prevalent in the biological and physical sciences, computing and engineering – reflecting the acute skills gaps and shortages in these areas. Universities work with both global corporations and SMEs as well as with organisations in the public and not-for-profit sectors, including the NHS. Typically, this engagement will take place with organisations in close proximity to the university.

Universities state that their motivation for engaging with employers is to improve student employability, to deepen their links with industry and to enhance their reputation. In practice, they report that while benefits around improving graduate employability and the student experience are realised reasonably quickly, forging deeper links with employers and improving their reputation requires longer-term engagement. Successful and sustainable partnerships require specialist staff, on-going relationship management and significant development time.

Although many universities have structures that support employer engagement, they often exhibit distributed forms of leadership. This allows for flexibility but means that employers do not always find it easy to identify the support they need. This may be one of the reasons why the burden of funding employer engagement activities largely falls on the university. Less than half of the universities surveyed reported investment by employers in strategic engagement activities. Just under half reported employer investment in facilities and about a quarter of the institutions surveyed said they received external funding from EU or UK funding bodies to support employer engagement in education.

We also analysed five universities and a cross-institution partnership that have particularly deep and strategic relationships with employers and identified the factors that are required for success, their impact on the university and the employer, and the wider impact in their local and regional economies. These are:

- **Coventry University's** partnership with Unipart Manufacturing Group to develop the Institute for Advanced Manufacturing and Engineering (AME).
- **Liverpool John Moores University's** partnership with Barclays UK's Strategic Centre of Excellence to develop a graduate training programme.
- **Aston University's** strategic partnership with Capgemini to provide degree-level education following an apprenticeship model, which combines work and study through online learning.
- **University of Lincoln's** strategic collaboration with multiple employers to develop new Schools in STEM subjects.
- **University of Sheffield's** training centre based at the Advanced Manufacturing Research Centre (AMRC) which offers advanced apprenticeship and degree-level training for companies in the advanced manufacturing sectors.
- **The Technology Partnership's** IT Management and Business Degree, currently available at 18 different universities.

Our findings from these case studies were as follows:

- The collaboration should be designed to respond to a strategic need recognised by all partners. Typically, this need will be a shortage of graduates with the skills required by a particular company or group of companies, but it may encompass areas of research, particularly in advanced manufacturing or engineering. There may also be more specific needs such as identifying innovative delivery methods.
- It requires strong leadership from the senior teams of all the organisations involved – including recognition that developing and implementing projects of this kind will be time-consuming and that engagement will need to be sustained indefinitely to keep curricula current. It helps if there is an existing relationship and a commitment to collaboration around shared goals between the university and the company or companies.
- Co-location of staff and joint appointments can support the culture change required to work together effectively and speed-up decision-making.
- External funding streams can be important to give initial impetus to the partnership and give all organisations the confidence to release their own funds.
- Benefits to business can include: availability of graduates with relevant skills and recruitment efficiencies and access to other university-business services. Benefits to universities include the development of an up-to-date and relevant curriculum which will increase student recruitment and progression outcomes and enhance the university's reputation. These types of collaboration can also attract investment from third parties into the shared School or facility from which both business and the university benefits.

Findings from our policy review

We reviewed policy relating to employer engagement in educational provision from 1997 to the present day. This found that successive governments have recognised that greater employer engagement can support their economic growth, global competitiveness and regional development agendas and it is now seen as a core part of the university mission. Nevertheless, progress in achieving deeper collaboration between employers and universities in educational provision has been slow. Barriers include the complexity of the education system with different providers offering skills at different levels – all of which may be required by one employer. A second barrier is the challenge of incentivising employers to commit sufficient resource towards the cost of providing graduates with the skills they need. This may be compounded by the fact that educational engagement with employers (unlike research and innovation engagement) usually sits at faculty level rather than at the centre of the university, and this may make it harder for employers – particularly small and medium sized enterprises – to engage. Thirdly, given that collaborations require strong leadership and long-term commitment to succeed, universities need incentives to embed engagement activity in their organisation and not just rely on the enthusiasm of individual staff, who may move on.

The Government's Productivity Plan aspires to create a "highly skilled workforce, with employers in the driving seat"³ but most of the policy commitments, including the new Apprenticeship Levy, concern employer engagement with schools and further education colleges. In relation to employer engagement in university education, the plan restates the manifesto commitment to deliver a new Teaching Excellence Framework that will "contribute to aligning graduate skills and expectations with the needs of employers".⁴ This is likely to provide an incentive for universities to seek employer engagement in educational provision but it is noticeable that there is no attempt to incentivise employers to engage with any of the wide range of technical and professional courses offered by universities other than apprenticeships.

³ HM Treasury (July, 2015), *Fixing the Foundations*, p.8

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf

⁴ HM Treasury (July, 2015), *Fixing the Foundations*, p.28

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf

The Productivity Plan also includes a section on “Resurgent Cities”. Since the Scottish referendum and the subsequent Smith Commission, there has been greater urgency to devolve power to the English regions. The “devolution deals” that have already been agreed all include aspects of skills and apprenticeship policy. Additional turmoil in the further education policy landscape has followed the announcement of Area Reviews.⁵ The intention is to move to fewer, larger providers with the expectation that this will create greater specialisation.

All of this is against the backdrop of a comprehensive spending review that is expected to be very tough. Most of the policy interventions intended to support employer engagement in higher education provision sit within the Department for Business, Innovation and Skills (BIS), which is an unprotected department. In response to this, BIS is reviewing not only which funding streams could be discontinued, reduced or refocused but also which of the many agencies in higher education could be closed down.⁶

This all equates to a policy landscape in considerable flux, though it can, of course, also be seen as an opportunity for creative destruction. In particular, it provides opportunities for local areas to take a more holistic approach to the skills ecosystems in their areas and to engaging with national skills support for sectors that are important to their localities. This might include both greater specialisation and greater collaboration between education providers. As part of this, more employers could be incentivised to enter into deep strategic relationships of the kind described in our case studies. Similarly, perhaps through mechanisms like the TEF, universities should be incentivised to make it easier for different kinds of employers to engage in educational provision.

Recommendations

Based on the online survey findings, analysis of case studies and policy review, we make the following recommendations to government and to university and business leaders:

- a. Leadership at every level, including government, is crucial to successful strategic collaborations between employers and higher education providers. Government should signal that it sees employer engagement in university education provision – as well as in school and further education provision – as an important part of its productivity agenda. This can be achieved not only through making clear statements but also through regulatory and funding mechanisms and softer levers.
- b. Recognising that, at the local level, skills provision works as an ecosystem rather than as parallel routes, government should commit to long-term support for regional structures and to an integrated response to local requirements to allow long-term strategic planning between regional authorities, employers and universities, further education providers and schools.
- c. Local Enterprise Partnerships (LEPs) can play an important role analysing the skills needs of their region, setting a clear strategic direction and bringing together the right partners to work together on particular programmes and projects. They can also coordinate bids for external sources of income. The best LEPs already do this but, across the UK, performance is patchy. Policy aimed at improving LEP performance should include this as an indicator of quality.
- d. Because employer engagement is largely localised, it is essential that devolution of skills policy continues to protect autonomy in models and approaches. This will ensure that responses are relevant to the local context.

⁵ HM Government (2015), *Reviewing Post-16 Education and Training Institutions* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/446516/BIS-15-433-reviewing-post-16-education-policy.pdf

⁶ See Jo Johnson’s speech of 9 September 2015 <https://www.gov.uk/government/speeches/higher-education-fulfilling-our-potential>

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- e. Within universities, it is important that the senior leadership communicates the value of employer engagement activities. Where necessary, they should ensure that central support mechanisms are in place – particularly to ensure that relationships survive the departure of individual members of staff. University reward and promotion mechanisms should recognise these activities.
 - f. Business representative bodies should encourage their members to participate. For example, they could create channels through which employers who have benefitted from strategic collaborations with universities can share their experiences with peers to raise awareness of the value of these partnerships and encourage more businesses to engage in educational provision.
 - g. The development of Degree Apprenticeships, and the announcement of the Apprenticeship Levy in the 2015 Summer Budget, may help to encourage employer engagement. It makes it clear that employers, as beneficiaries of the skills supply, should also contribute towards the costs. However, it is important that funding and regulation for degree and higher apprenticeships is simplified. Many universities find it cumbersome to engage with both HEFCE and the Skills Funding Agency. It is also worth considering whether it is sensible to put so much emphasis on the apprenticeship model which may not be deliverable at the scale of the Government's ambition. Government should think about how it can incentivise employers to engage more with other kinds of technical and vocational provision within universities.
 - h. The assessment of teaching quality in universities, including the proposed Teaching Excellence Framework, should recognise, and reward, employer engagement as a key contribution to teaching excellence. This could include looking at the number of staff with industry experience in universities and the professional accreditation of courses.
 - i. Seed funding from government can also play an important role in incentivising partners to work together to improve educational provision. It is therefore desirable that government should make funding available for this purpose – perhaps building on lessons learnt from Higher Education Innovation Funding (HEIF). It is important, however, that funding allows institutions to develop models that fit their needs, missions and circumstances. Universities should consider integrating employer engagement activities within central knowledge exchange services.
 - j. Government should commission a toolkit for university-employer collaboration containing advice for businesses. Just as the Lambert toolkit has provided a standard framework on which to build intellectual property arrangements for collaborative research and innovation, a similar framework targeted at employers and universities embarking on educational collaborations would support new activities. It should focus on identifying the areas of alignment between the strategic requirements of all parties, a definition of the specific problems the collaboration seeks to address, and provide clarity around funding processes, mechanisms, milestones and deliverables. Guidance should also underline the importance of leadership and examples of best practice.

Employer engagement in UK STEM higher education: current practice

Why engage employers?

Employers in STEM industries frequently complain that they struggle to find graduates with the right skills. This can be because of a skills mismatch in particular industries – for example, biological and physical sciences, computing and engineering – or because STEM graduates are also attractive to employers in non-STEM sectors. Employers, therefore, have a clear stake in ensuring the quality and sustainability of the skills pipeline in the subject areas that are most relevant to their business.

At the same time, universities need to recruit students, many of whom, in a competitive recruitment landscape, are likely to select programmes with relevant and up-to-date curricula that will increase their employability. Programmes developed with employers, and which offer opportunities for experience of the workplace, are highly attractive to potential students. Universities are also keen to position themselves as knowledge partners with local, national and international employers.

Employer-engagement in STEM education is also valuable for the region around the university. In a globalised economy, businesses are more likely to stay in a region if they are confident they can access graduates with the skills they need. For example, in Wales, GE Aviation, which maintains and repairs commercial aircraft engines, collaborates with the University of South Wales. This partnership is considered key to the company achieving competitive advantage through nurturing its future pipeline of highly skilled employees.⁷

In what ways are employers currently engaged?

A spectrum of employer engagement models currently operates throughout UK STEM higher education. These range from looser or lighter-touch partnerships focused around careers advice, work-based learning and bespoke provision to closer forms of engagement via co-investment in facilities, or partnerships and alliances between individual or groups of employers and universities. Lighter-touch partnerships are the most visible and prevalent, although there are also many examples of deeper and more strategic engagement across the sector. A recent report by Universities UK and UKCES “Forging Futures”⁸, sets out the main types of employer engagement. These are summarised below.⁹

Lighter-touch employer engagement

- **Information, Advice and Guidance:** At the most basic level, many employers provide information, advice and guidance (IAG) to students in universities. Typically, this involves providing careers advice related to their organisation and industry. This can take the form of presentations, seminars, or guest lectures.
- **Contribution to the co-curriculum:** Employers often contribute to modules that are part of the co-curriculum such as employability modules, whether these are delivered separately or embedded within the core curriculum. For example, they might contribute workplace case studies or work-based scenarios. Staff from employers can directly contribute to such programmes or deliver content via videos.

⁷University Alliance (2014), *Job Ready: Universities, Employers and Students Creating Success*

<http://www.unialliance.ac.uk/university-of-south-wales-ge-aviation/>

⁸UKCES and Universities UK (2014), *Forging Futures – Building Higher Level Skills Through University and Employer Collaboration*

<http://www.universitiesuk.ac.uk/highereducation/Documents/2014/ForgingFutures.pdf>

⁹This provides a more detailed analysis of the different types of collaborative models that are evident in the UK HE sector

- **Work placements and internships:** Employers provide work placements for a set period of time. These can be alongside study, in the summer vacation or for a full year. They also provide internships at the end of studies or as part of a graduate training scheme. These can either be stand-alone or linked to particular programmes to provide students with clear pathways into employment in particular organisations and industries. The latter are particularly common in sandwich programmes.

More strategic forms of employer engagement:

- **Educational delivery:** Some employers are involved in the delivery of programmes through contributing to teaching, assessment and the supervision of projects, often in the workplace. In this form of engagement, employers provide their expertise and knowledge to enhance the programme, improving employability skills and developing well-prepared and work-ready graduates.
- **Curriculum design and development:** Many employers are also engaged in the design, review and development of programme curricula via Industry Advisory Boards at the subject level. These seek to ensure the continuing relevance of curricula to industry standards and skills needs. This is particularly important for accredited provision which is designed to produce skilled graduates in particular professions and is closely related to maintaining and developing professional standards. Higher (and now Degree) Apprenticeships represent a good example of this approach, although they are often perceived as overly bureaucratic.
- **Financial support for students:** Some employers also directly fund, and invest in, higher education through providing scholarships both for their staff and students to study on particular programmes. These are typically provided in fields where there is skills mismatch between industry and the number of graduates (e.g. IT and Engineering). New programmes are developed, funded by employers that are either closed and accessible only to their own staff, or which are open to other students and are motivated by a desire to increase the size of the graduate pool in their industry. Another attractive alternative for students looking for financial support is found in the Apprenticeships and Foundation Degree models which include opportunities for them to undertake paid work during study.
- **Financial investment in educational infrastructure:** Other forms of direct investment from employers in education include providing bespoke facilities such as buildings and equipment that can be used to support education, research or knowledge transfer activities involving different employer types. Typically, these facilities are accessible at a cost to local businesses and provide an environment where staff, students and academics can come into contact with each other to help foster collaboration.

What supports engagement?

Research findings:

To understand better the prevalence of these activities, we conducted a survey of universities' employer engagement activities.¹⁰ Respondents were asked questions in two sections. The first section related to all types of employer engagement in STEM education and was completed by 61 respondents. The 50 which indicated that their university was engaged in strategic forms of employer engagement activity were then asked to complete a second section containing questions about this. Respondents reflected the diversity of the UK university sector in terms of geographical distribution and institutional mission.

The survey found that UK universities are significantly engaged with a spectrum of employers across a large number of STEM subjects. Employer engagement is particularly prevalent in the biological and physical sciences, computing and engineering. This is likely to reflect the acute skills gaps and shortages in these areas. Universities work with both global corporations and SMEs as well as with organisations in the public and not-for-profit sectors including the NHS. Typically, this engagement will take place with organisations in close proximity to the university.

Most of the activity is intended to increase students' employability. Types of engagement include participation in Industry Advisory Boards (particularly for accredited programmes), providing work placements, input into careers and employability provision, and scholarships for work-based learners. There is less employer engagement in assessment activities and the co-design of teaching programmes. Where this does exist, it is often within Higher and Degree Apprenticeships and Foundation Degree programmes.

There are some examples of more strategic links that involve significant commitment, and investment of time and resources, from both partners. Analysis found that these are typically driven by employers' need to recruit work-ready graduates. Programmes generally involve

working with employers to include significant work experience or paid apprenticeships in courses, employers providing input into teaching and programme content, and employers providing materials for developing students' employability skills.

Universities state that their motivation for engaging with employers is to improve student employability, to deepen their links with industry and to enhance their reputation. In practice, they report that while benefits around improving graduate employability and the student experience are realised reasonably quickly, forging deeper links with employers and improving their reputation requires longer-term engagement.

Employer engagement in education can be complex and difficult to manage. Successful and sustainable partnerships require specialist staff, on-going relationship management and significant development time. Although many universities have structures that support employer engagement, they often exhibit distributed forms of leadership. This allows for flexibility but means that employer engagement is often not well embedded or widely understood by potential partners.

While all parties benefit from employer engagement, our survey found that the burden of funding employer engagement activities largely fell on the university. Less than half of the universities surveyed reported investment by employers in strategic engagement activities. Just under half reported employer investment in facilities and about a quarter of the institutions surveyed said they received external funding from the EU or UK funding bodies to support employer engagement in education.

¹⁰The full survey findings are in Appendix 2

We also analysed five universities and a cross-institution partnership that have particularly deep and strategic relationships with employers and identified the factors that are required for success, their impact on the university and the employer, and the wider impact in their local and regional economies. These are:

- **Coventry University's** partnership with Unipart Manufacturing Group to develop the Institute for Advanced Manufacturing and Engineering (AME).
- **Liverpool John Moores University's** partnership with Barclays UK's Strategic Centre of Excellence to develop a graduate training programme.
- **Aston University's** strategic partnership with Capgemini to provide degree-level education following an apprenticeship model, which combines work and study through online learning.
- **University of Lincoln's** strategic collaboration with multiple employers to develop new schools in STEM subjects.
- **Sheffield University's** training centre based at the Advanced Manufacturing Research Centre (AMRC) which offers apprenticeships and degree-level training for companies in the advanced manufacturing sectors.
- **The Technology Partnership's** IT Management and Business Degree currently available at 18 different universities.

Coventry University partnered with Unipart Manufacturing Group to develop the Institute for Advanced Manufacturing and Engineering. It was designed as a bespoke 'Faculty on the Factory Floor' to develop and apply energy and powertrain related technologies for the automotive, aerospace, oil and gas, rail and renewables industry sectors. It brings together experts from academia and industry in a live manufacturing environment. It also seeks to produce "industry-ready" engineering and manufacturing graduates to address skills gaps in these sectors through providing courses developed and delivered collaboratively by academics and industry experts. The partnership involved considerable investment from both sides. Unipart contributes £17.9 million towards the partnership and a further £5.6 million towards student scholarships and product research and development.

The impacts of the new facility are expected to go beyond Unipart and Coventry University and benefit the surrounding area. The West Midlands manufacturing and engineering sector suffers skills shortages with a large number of major employers attempting to recruit from a limited pool of graduates. This facility will help the Coventry and Warwickshire Local Enterprise Partnership (LEP) meet its target of 5,000 new or up-skilled engineers by 2015, and will support its goal to increase the numbers of SMEs active in research and development in the area.

Liverpool John Moores University (LJMU) has a rapidly developing partnership with Barclays UK's Strategic Centre of Excellence based in nearby Cheshire. This relationship has led to the development of a new Barclays Graduate Training Programme and a new Pre-Placement Programme for work placement students at Barclays UK. LJMU also collaborates with Barclays on school outreach activities and is looking to develop the relationship further through apprenticeship routes and research collaborations.

For LJMU, graduate employability is supported through direct engagement with a local employer. Students have become more work ready and have received expert, industry guidance on producing professional applications from engaging with Barclays' staff. The collaboration has resulted in students being recruited to prestigious graduate training schemes. LJMU academics have been given exposure to cutting edge industry practice whilst Barclays' staff have been able to influence the curriculum to ensure that it is relevant to current working practice. All this helps to ensure that Barclays has a large pool of candidates with the right skills and experience to enter the workplace.

Aston University developed a strategic partnership with the IT service management company Capgemini to provide a Degree Apprenticeship that combines work and study through online learning. For the first two years, students complete a higher apprenticeship. In the remaining three years, they complete a BSc degree in either Business Information Systems or Software Engineering. Capgemini oversees the curriculum to ensure that it is industry relevant and employs the students as they undertake their apprenticeship. They also provide case studies and support the practical assessments. Students

are given bookable study time by Capgemini to pursue their academic studies. The majority of the teaching is delivered online in a virtual learning environment. A small number of on-campus sessions are used to introduce the students to their lecturers and to cover material that is best disseminated through face-to-face contact. At the start of the Degree Apprenticeship there is an intensive seven-week module to train all students in the basics of software development and databases so that they are ready to start work on client projects. The Skills Funding Agency provides two thirds of the cost of the full degree, with Aston delivering all the educational activities.

Aston University benefits from being able to offer highly industry-relevant courses that improve student recruitment. Capgemini benefits from being able to recruit industry ready graduates. But the positive impacts go beyond the two partner organisations. Aston University is now rolling out the model to other IT companies that report problems with acute skills shortages in the UK IT industry.

The University of Lincoln developed new Schools in the STEM fields of Engineering, Pharmacy, Chemistry, and Mathematics and Physics. They use a 'co-employer led school' model designed to meet the recruitment needs of different industrial sectors. This model engages employers in developing and managing the new Schools through specialist advice, co-creating industry-focused undergraduate STEM curriculum and providing funding for scholarships and bursaries. The Schools help develop strong links with the local and regional economy and a range of local businesses, which in turn gain access to research facilities and expertise and the opportunity to benefit from research projects and knowledge exchange activities.

Our final case study is the AMRC Training Centre based at the Advanced Manufacturing Research Centre (AMRC) at the University of Sheffield. It has links with both the University of Sheffield and Sheffield Hallam University, and provides advanced apprenticeship and degree-level training for companies in the advanced manufacturing sectors. Apprentices split their time between the AMRC and employers in the Sheffield city region, including Tata Steel,

Rolls-Royce, Sheffield Forgemasters, AESSEAL, MTL Group and Newburgh Engineering. Apprentices also have a clear progression pathway to study for higher-level qualifications up to doctorate and MBA level in Engineering and Mechanical Engineering, and to undertake research. From 2015, the programme (supported by the merchant bankers Close Brothers and the Manufacturing Technologies Association) will co-fund the wages of 20 apprentices a year employed at SMEs who will then be trained by the AMRC Training Centre. The centre facilitates in-depth collaboration between research and industry by providing technology, expertise and services to the advanced manufacturing sector via collaboration with major employers. It currently hosts major collaborations in the aerospace (Boeing) and civil nuclear energy industries (Rolls-Royce) and companies in their supply-chain.

Collaboration also exists between groups of institutions for the benefit of a sector. An example is the Technology Partnership. Their IT Management and Business Degree (ITMB)¹¹ was established to improve graduate employment into entry level technology roles. The ITMB Degree is currently available at 18 different universities and teaches an employer-designed blend of IT, business, project management and interpersonal skills most in demand by graduate recruiters. It aims to increase student retention and graduate opportunities by offering an industry designed qualification. The ITMB produces graduates with the right skills and experience to enter the technology sector. In the longer term, the Technology Partnership aims to accredit over 50 higher education institutions to deliver an ITMB degree.

¹¹ <https://www.thetechpartnership.com/techfuture/TechFuture-careers/degrees/itmb/>

The case studies demonstrate that:

- a. Collaborations are most likely to work when designed to respond to a strategic need recognised by all partners. Typically, this will be a shortage of graduates with the skills required by a particular company or group of companies but it may encompass areas of research particularly in advanced manufacturing or engineering. There may also be more specific needs such as identifying innovative delivery methods.
- b. A successful collaboration requires strong leadership from the senior teams of all the organisations involved – including recognition both that developing and implementing projects of this kind will be time-consuming and that engagement will need to be sustained indefinitely to keep curricula current. It helps if there is an existing relationship and a commitment to collaboration around shared goals between the university and the company or companies.
- c. Co-location of staff and joint appointments can support the culture change required to work together effectively and speed-up decision-making.
- d. External funding streams can be important to give initial impetus to the partnership and give all organisations the confidence to release their own funds.
- e. Benefits to business can include: availability of graduates with relevant skills, recruitment efficiencies and access to other university business services. Benefits to universities include: development of an up-to-date relevant curriculum which will increase student recruitment and progression outcomes, and enhancement of the university's reputation. These types of collaboration can also attract investment from third parties into the shared school or facility from which both businesses and the university benefits.

How is engagement best achieved?

Our case studies support research by Bolden and Petrov¹² suggesting that the leadership and management of employer engagement activities within universities are often far from straightforward. Key success factors include the presence of institutional champions, personal enthusiasm, the development of key relationships, and the energy to institutionalise any partnership to help ensure continuity as people leave and change roles within the institution or elsewhere. Conversely, where supporting employer engagement is no-one's 'day job' and is not recognised within institutions in reward and progression arrangements, collaborations can wither due to a lack of professional roles and resources. Therefore, the fact that so much employer engagement collaboration is at the individual rather than at the strategic or institutional level is a real challenge.

Another major consideration is that employers do not always appreciate the full range of ways in which they can contribute to universities. Raising their awareness requires an effective approach to relationship management from university partners. In "Forging Futures", Universities UK and UKCES note the importance of both open, regular communication and understanding the needs and operating contexts of both parties. The report suggests that this is "... particularly important when the delivery considerations of university partners (governance requirements or issues around qualification delivery) and employer partners (business needs or enhancing the learning culture of an organisation) are different".¹³ For example, the cost-effectiveness of engagement is important for both parties, and they need to be clear about issues such as funding processes, mechanisms, milestones and deliverables. This complexity represents a particular challenge for the SME sector, where businesses often have limited resources to engage with universities. Consortium-based approaches and brokers can play an important role in this area.

¹² Richard Bolden and Georgy Petrov (2014), *Hybrid Configurations of Leadership in Higher Education Employer Engagement*, *Journal of Higher Education Policy and Management*, 36(1)

¹³ UKCES and Universities UK (2014), *Forging Futures – Building Higher Level Skills Through University and Employer Collaboration* <https://www.gov.uk/government/publications/forging-futures-building-higher-level-skills-through-university-and-employer-collaboration>, p.21

“Forging Futures” suggests that there is a need for effective and long-term business-university relationships that are built on clear rationale and a sound business case:

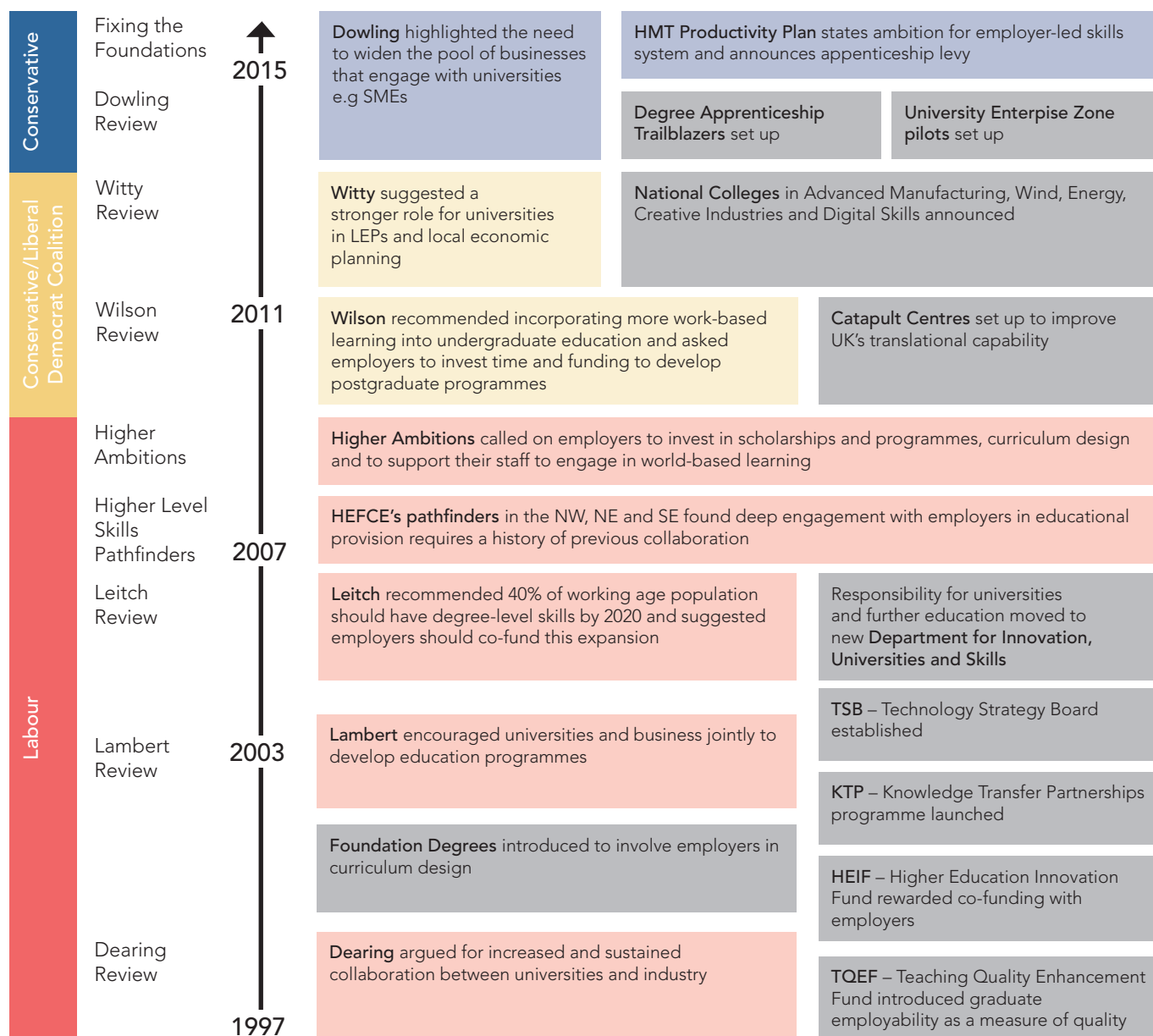
“...[Collaborations] should be seen as strategic partnerships which can help to tackle specific problems that are not currently being addressed through mainstream education, with bespoke products, programmes and services being developed as a result.”¹⁴

So both the literature and our survey and case studies suggest that collaborations need to find areas of alignment between the strategic requirements of all partners. Anything beyond the lightest engagement must be supported by strong leadership which will champion the collaboration, and ensure it is “institutionalised” and not dependent on individual members of staff that might move on. The relationship itself must be managed actively and the role of the relationship manager must be recognised and rewarded.

¹⁴ UKCES and Universities UK (2014), Forging Futures – Building Higher Level Skills Through University and Employer Collaboration <https://www.gov.uk/government/publications/forging-futures-building-higher-level-skills-through-university-and-employer-collaboration>, p.7

Employer engagement: policy review

Successive UK governments from 1997 onwards have recognised that greater employer engagement with universities can support their economic growth, global competitiveness and regional development agendas. It is now seen as a core part of the university mission. The following chart sets out the main reviews and policy interventions during this period. Alongside these, there were also several reviews looking at university business engagement in research and innovation.¹⁵



For references, see Appendix 1

¹⁵ For example:

Sainsbury (2007), *The Race to the Top – A Review of Government's Science and Innovation Policies*

http://www.rsc.org/images/sainsbury_review051007_tcm18-103118.pdf

Hermaan Hauser (2010), *The Current and Future Role of Technology and Innovation Centres in the UK*

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368416/bis-14-1085-review-of-the-catapult-network.pdf

National Centre for Universities and Business (2012), *Enhancing Value Task Force*

<http://www.ncub.co.uk/what-we-do/task-forces/enhancing-value.html>

Young (2013), *Growing Your Business*

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198165/growing-your-business-lord-young.pdf

Heseltine (2013), *No Stone Unturned*

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34648/12-1213-no-stone-untuned-in-pursuit-of-growth.pdf

House of Commons BIS Committee (2014), *Business University Collaboration*

<http://www.publications.parliament.uk/pa/cm201415/cmselect/cmbis/249/249.pdf>

By the time the current government took power, the concept of “higher education at the heart of a knowledge economy” was well established and various initiatives were underway to engage employers more directly in teaching and learning. Bodies such as the TSB (now called Innovate UK) and funds such as HEFCE’s Higher Education Innovation Fund (HEIF) were a familiar part of the landscape. If anything, as the Dowling Review pointed out, support for university business collaboration had become excessively complex.¹⁶ The higher apprenticeship programme was well established and universities and colleges were engaged in exploring how to develop – or adapt existing programmes – to create new Degree Apprenticeships.

Degree Apprenticeships

Any qualification based on either an apprenticeship standard or framework that also includes achievement of a full bachelor’s or master’s degree can be referred to as a Degree Apprenticeship. They differ from higher apprenticeships in that they are co-designed by universities and colleges, employers (including SMEs) and professional bodies and integrate a qualification at level 6 and above. They are targeted at younger learners seeking an alternative to traditional academic studies, through involving universities and high-status employers (such as BT, Ford, Fujitsu, GlaxoSmithKline, HMRC and John Lewis) working together on programme design, delivery and student selection. In the Summer Budget, the government made a surprise announcement that it would be introducing an Apprenticeship Levy on employers to help fund the apprenticeship programme.

Nevertheless, progress in achieving deeper collaboration between employers and universities in educational provision has been slow. Barriers include the complexity of the education system with different providers offering skills at different levels – all of which may be required by one employer – and is the challenge of incentivising employers to commit sufficient resource towards the cost of providing graduates with the skills they need. This may be compounded by the fact that educational engagement with employers (unlike research and innovation engagement) usually sits at faculty level rather than at the centre of the university. This may make it harder for employers – particularly small and medium sized enterprises to engage. Furthermore, given that collaborations need strong leadership and long-term commitment to succeed, universities need incentives to embed engagement activity in their organisation and not just to rely on the enthusiasm of individual staff, who may move on.

The current government launched its Productivity Plan just after the 2015 Summer Budget. This aspires to create a “highly skilled workforce, with employers in the driving seat”.¹⁷ But most of the policy commitments, including the new levy on large UK employers to fund apprenticeships, concern employer engagement with schools and further education colleges. In relation to employer engagement in university education, the plan restates the manifesto commitment to deliver a new Teaching Excellence Framework that will “contribute to aligning graduate skills and expectations with the needs of employers”.¹⁸ This is likely to provide an incentive for universities to seek employer engagement in educational provision, however there is no attempt to incentivise employers to engage with any of the wide range of technical and professional courses offered by universities other than apprenticeships.

¹⁶ Dowling (2015), *The Dowling Review of Business-University Research Collaborations*, Recommendation 1, p.4

¹⁷ HM Treasury (2015), *Fixing the Foundations* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf, p.8

¹⁸ HM Treasury (2015), *Fixing the Foundations* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf, p.28

The Productivity Plan also includes a chapter on “Resurgent Cities.” Since the Scottish referendum and subsequent Smith Commission there has been greater urgency to devolve power to the English regions. This sits alongside a desire to balance economic growth across regions and sectors both to reduce vulnerability during downturns and to ensure the benefits of growth are spread across the country. Lord Heseltine, in his 2012 report, had recommended the merging of various funding streams to provide much greater local responsibility for economic development.¹⁹ In November 2012, a “devolution deal” was announced by government and the Greater Manchester Combined Authority. Further deals followed with Sheffield (December 2014), West Yorkshire (March 2015) and Cornwall (July 2015). Additional powers for Greater Manchester were also announced in February 2015 relating to health and social care. Significantly, all of these deals include control of the Apprenticeship Grant for employers and control of some adult skills budgets and some power to reshape skills provision.²⁰

The Cities and Local Government Devolution Bill 2015-16 has now passed through the House of Lords, and received its First Reading in the House of Commons on 21 July 2015. Local areas were asked to submit any proposals for devolution to the Treasury by 4 September 2015.

Additional turmoil in the further education policy landscape has followed the announcement of Area Reviews.²¹ The intention is to move to fewer, larger providers with the expectation that this will create greater specialisation. Some providers will focus on supporting progression to a high level in professional and technical disciplines whilst others will develop excellence in teaching essential basic skills. These reviews will be led by a range of local and regional stakeholders, including the Local Enterprise Partnership. They will take into account regional economic objectives, labour market needs and national policy including the intention to expand the apprenticeship programme and create clear high quality professional and technical routes to employment.

All of this is against the backdrop of a comprehensive spending review that is expected to be very tough. Most of the policy interventions intended to support employer engagement in higher education provision sit within the Department for Business, Innovation and Skills (BIS) which is an unprotected department. In response to this, BIS is reviewing not only which funding streams could be discontinued, reduced or refocused, but also which of the many agencies in the higher education landscape could be closed down.²²

This all equates to a policy landscape in considerable flux, though it can, of course, also be seen as an opportunity for creative destruction. In particular, it provides opportunities for:

- a. Local areas taking a more holistic approach to both the skills ecosystems in their areas and engaging with national skills support for sectors that are important to their localities. This might include both greater specialisation and increased collaboration between education providers.
- b. As part of this, more employers could be incentivised to enter into deep strategic relationships of the kind described in our case studies.
- c. Similarly, perhaps through mechanisms like the TEF, universities could be incentivised to make it easier for different kinds of employers to engage in educational provision.

¹⁹ Heseltine (2012), *No Stone Unturned* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34648/12-1213-no-stone-untuned-in-pursuit-of-growth.pdf

²⁰ Details of these deals can be found in House of Commons Briefing Paper Number 07029 (4 September 2015) by Mark Sandford, Devolution to Local Government in England

²¹ HM Government (2015), Reviewing post-16 Education and Training Institutions https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/446516/BIS-15-433-reviewing-post-16-education-policy.pdf

²² See Jo Johnson's speech of 9 September 2015 <https://www.gov.uk/government/speeches/higher-education-fulfilling-our-potential>

Recommendations for the future of employer engagement

Employer engagement in STEM provision is clearly valuable not only to the employer and the university but also to the skills and productivity of the wider region. But deep strategic engagement requires long-term commitment from a wide range of partners. In this section of the report we set out how government, Local Enterprise Partnerships, universities and business can each play their part in increasing the volume and quality of employer engagement in higher education provision.

Leadership

Our research found that leadership at every level, including government, is crucial to successful strategic collaborations between employers and higher education providers. Government should continue to signal that it sees employer engagement activity as an important part of its productivity agenda. This can be achieved not only through making clear statements but also through regulatory and funding mechanisms and softer levers.

Because employer engagement is largely localised, it is essential that devolution of skills policy continues to protect autonomy in models and approaches. This will ensure that responses are relevant to the local context. Government should commit to long-term support for regional structures and to an integrated response to local requirements to allow long-term strategic planning between regional authorities, employers and universities.

At the local level, Local Enterprise Partnerships (LEPs) can play an important role analysing the skills needs of their region, setting a clear strategic direction and bringing together the right partners to work on particular programmes and projects. They can also coordinate bids for external sources of income. The best LEPs already do this but, across the UK, performance is patchy. Policy aimed at improving LEP performance across the country should include this as an indicator of quality.

Within universities, it is important that the senior leadership communicate the value of employer engagement activities. Where necessary, they should ensure that central support mechanisms are in place – particularly so that relationships survive the departure of individual members of staff. University reward and promotion mechanisms should recognise these activities.

Business representative bodies should encourage their members to participate. For example, they could create channels through which employers who have benefitted from strategic collaborations where universities can share their experiences with peers to raise awareness of the value of these partnerships.

Regulation and funding

The development of Degree Apprenticeships, and the announcement of the Apprenticeship Levy, may help to encourage employer engagement. It makes it clear that employers, as beneficiaries of the skills supply, should also contribute to the costs. However, it is important that funding and regulation for degree and higher apprenticeships is simplified. Many universities find it cumbersome to engage with both HEFCE and the Skills Funding Agency. It is also worth considering whether it is sensible to put so much emphasis on the apprenticeship model as it may not be deliverable at the scale of the Government's ambition.

The assessment of teaching quality in universities, including the proposed Teaching Excellence Framework, should recognise, and reward, employer engagement as a key contribution to teaching excellence. This might include looking at the number of staff with industry experience in universities and the professional accreditation of courses.

Seed funding from government can also play an important role in incentivising partners to work together to improve educational provision. It is therefore desirable that government should make funding available for this purpose – perhaps building on lessons learnt from Higher Education Innovation Funding (HEIF). It allows institutions to develop models that fit their needs, missions and circumstances. Universities should consider integrating employer engagement activities within central knowledge exchange services.

Soft levers

Government should commission a toolkit for university-employer collaboration containing advice for businesses. Just as the Lambert toolkit²³ has provided a standard framework on which to build intellectual property arrangements for collaborative research and innovation, a similar framework targeted at employers and universities embarking on educational collaborations would support new activities. It should focus on identifying the areas of alignment between the strategic requirements of all parties, producing a definition of the specific problems the collaboration seeks to address, and providing clarity around funding processes, mechanisms, milestones and deliverables. Guidance should also underline the importance of leadership and examples of best practice.

²³ <https://www.gov.uk/guidance/lambert-toolkit>

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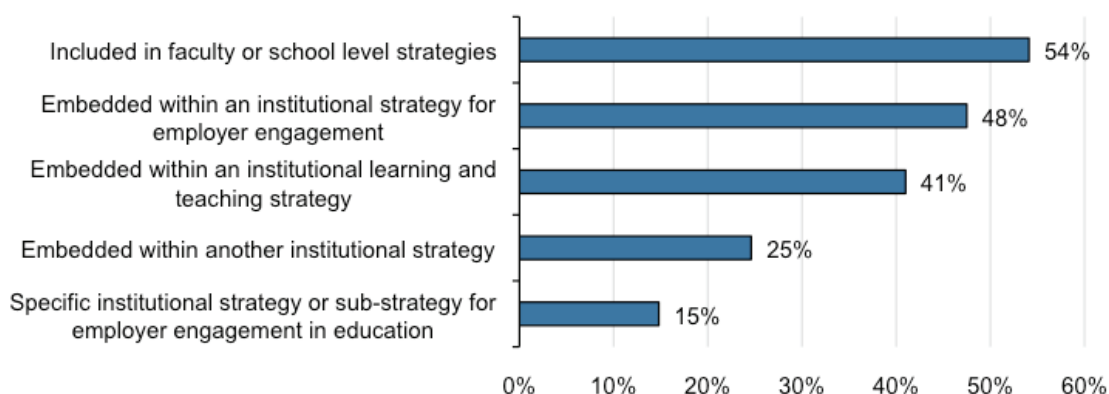
Appendix 2: Detailed findings from surveying universities

Survey respondents were asked questions in two sections. The first section related to all types of employer engagement in STEM education and was completed by 61 respondents. The 50 respondents that indicated that their university was engaged in strategic forms of employer engagement activity were then asked to complete the second section. Each figure presented is based on the responses from those who answered the relevant question. Survey respondents reflected the variety of the UK university sector in terms of both geography and institutional mission.

Institutional strategy for employer engagement in STEM

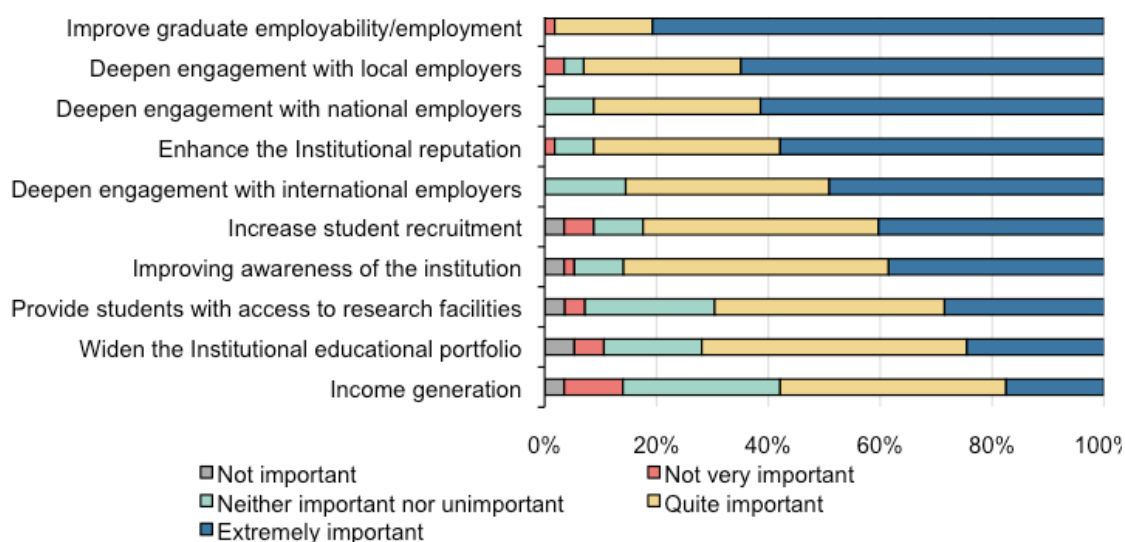
Only 15% of institutions reported they had a specific institutional strategy for employer engagement in education, but this activity was included in other strategies (Figure 1). Around half of institutions answered that it was included in a school or faculty level strategy or in overall institutional strategies for employer engagement, and 41% within a teaching and learning strategy.

Figure 1: Location of institutional strategy for employer engagement in STEM



Respondents were asked to rate a range of purposes behind their institution's strategy for employer engagement in STEM education (Figure 2). Graduate employability is clearly the prime motivation, although deepening links with all types of employers, and reputational benefits are also very important to institutions. Student recruitment and income generation, although still significant, are ranked much lower.

Figure 2: Institutional purposes for employer engagement in STEM education: Importance



Institutional roles and structures to support employer engagement

Employer engagement roles are now firmly embedded in institutional structures and senior roles (Figure 3) with most institutions having specific employer engagement roles in faculties and 38% having a director role at the institutional level. Employer engagement is also part of the portfolios of some Deputy Vice Chancellors, Deputy or Associate Deans and careers departments, although there are very few dedicated Pro-Vice Chancellor or Deputy Vice Chancellor roles in this area.

Figure 3: Institutional roles to support employer engagement in STEM education

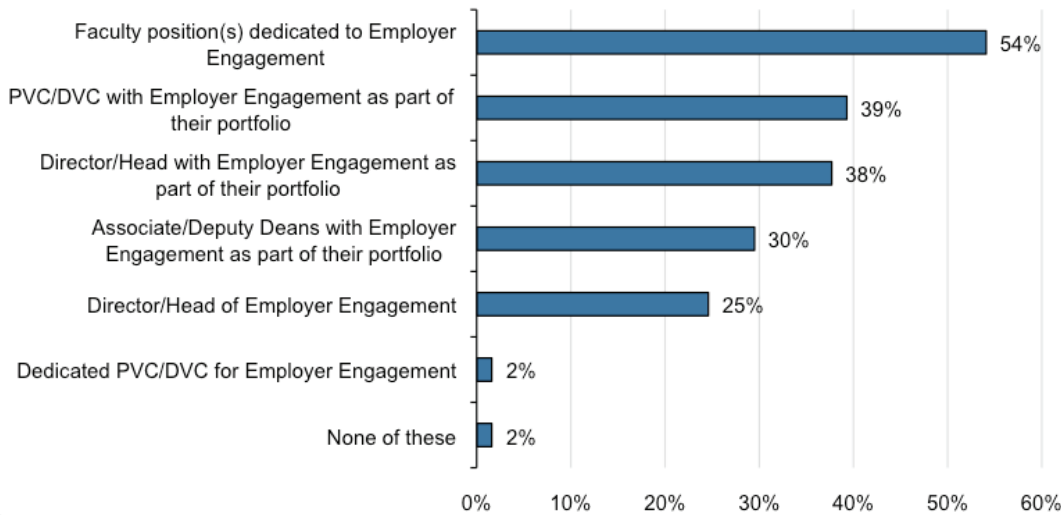
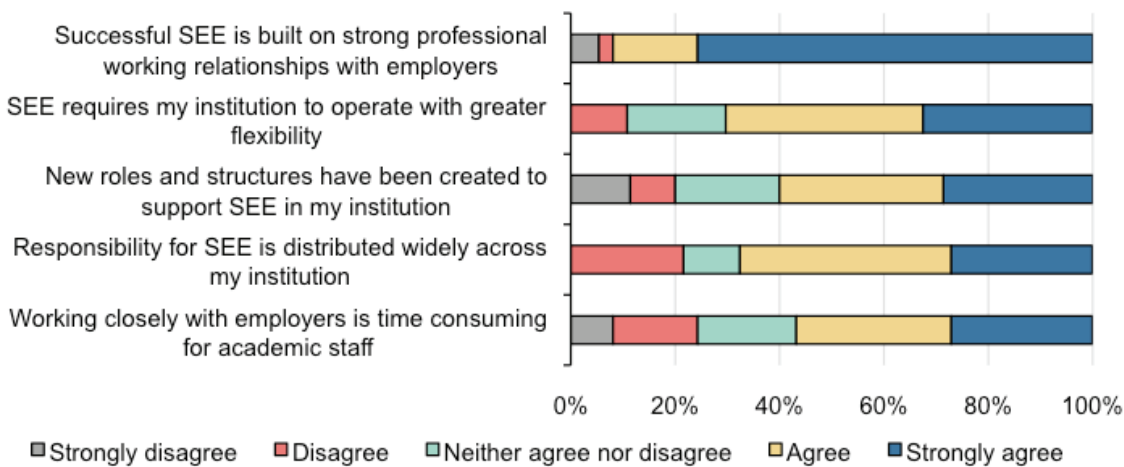


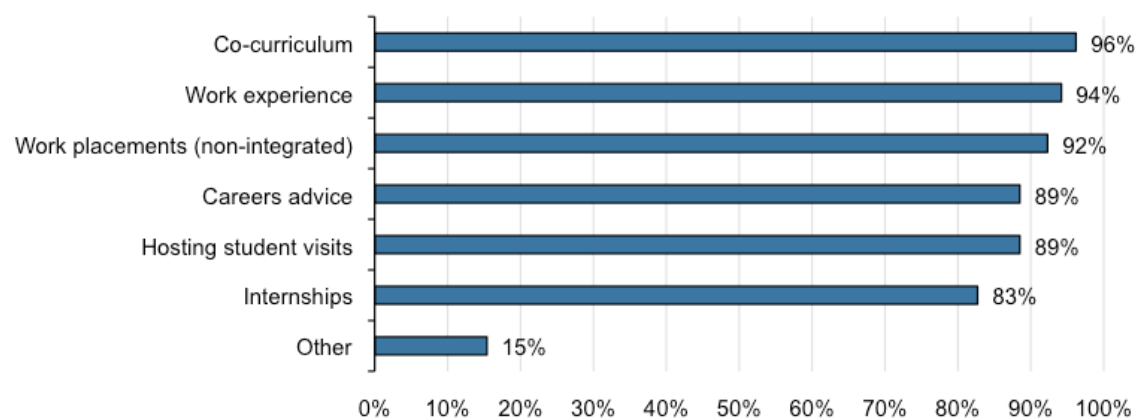
Figure 4 demonstrates how deeper forms of employer engagement have required major structural changes based on adding flexibility and the creation of new roles and structures within institutions. The need to develop effective and strong working relationships with employers is widely accepted. However, responsibility for employer engagement in universities appears highly distributed, and 57% of respondents highlighted the strong impact on academic staff time.

Figure 4: Perceptions of strategic employer engagement (SEE) in STEM education: Top 5 strongly agree



The vast majority of universities are involved in lighter-touch collaborative activities that support STEM education and directly supports the core STEM curriculum and graduate employability. Figure 5 demonstrates the high level of such engagement, which focuses around the co-curriculum (e.g. employability support), providing work experience and placements and supporting careers provision.

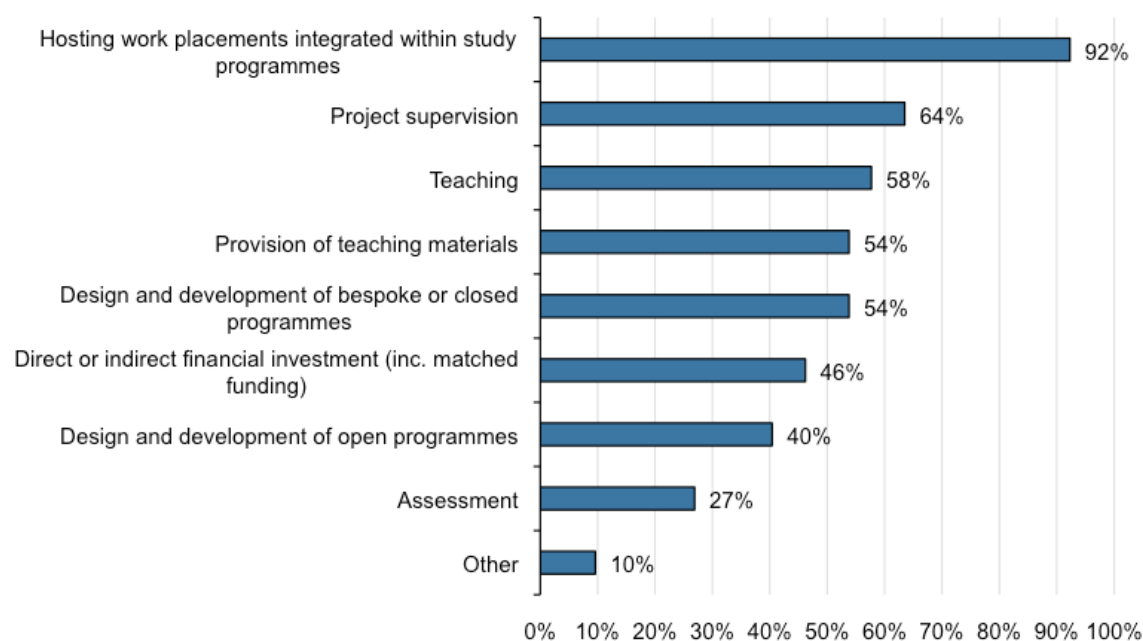
Figure 5: Employer engagement in STEM education: Other



Types of strategic employer engagement in STEM education

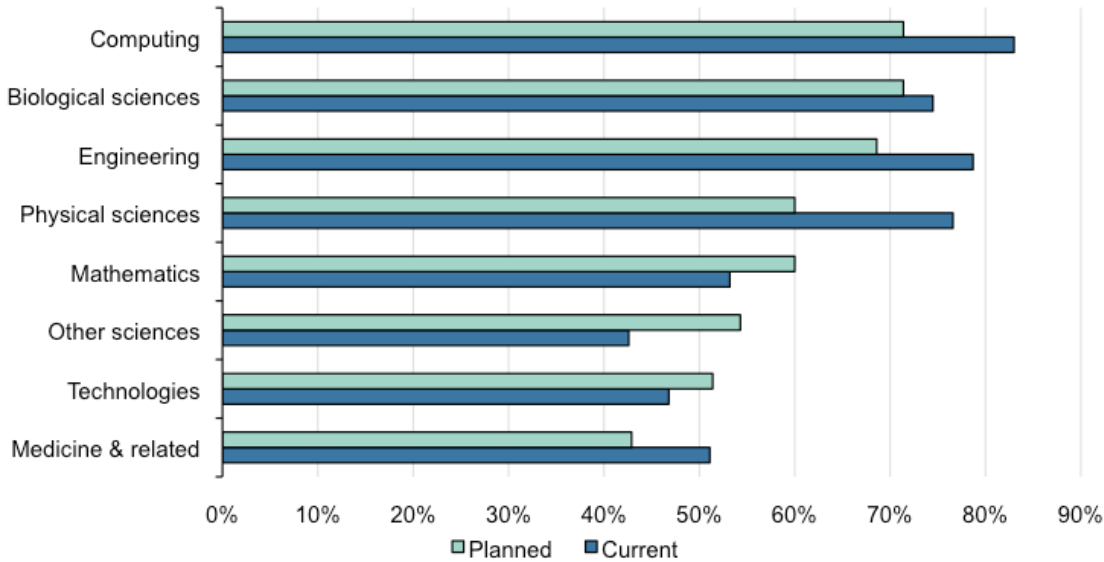
Figure 6 demonstrates the wide range of types of employer engagement in more strategic types of STEM education. Integrated work placements are almost ubiquitous in these institutions, whilst other forms of student engagement also feature strongly, including teaching and supervision. Employers are less likely to be engaged in programme design or investing in programme development, as this type of engagement is relatively new for many HE institutions.

Figure 6: Employer engagement in STEM education: Strategic



Universities are involved in strategic employer engagement activity in a range of STEM subjects, with more planned (Figure 7). Subjects with a high level of skills shortages are the most prevalent – Computing, Engineering and the Biological and Physical Sciences.

Figure 7: Subject areas for strategic employer engagement in STEM education



All institutions reported strategic employer engagement in STEM at the undergraduate level, and a significant proportion at both PGT (87%) and PGR (79%) levels. Only 22% of institutions reported engagement with employers at levels 4 - 5.

The businesses and employers that universities engage with are wide ranging (Figure 8). There are strong links with the UK business sector and SMEs but also strong links with both the public and third sector and international corporations. It is likely that the location of the business is the prevailing feature with many of these companies based in close proximity to universities with growing STEM provision.

Figure 8: Types of employers involved in strategic employer engagement in STEM education

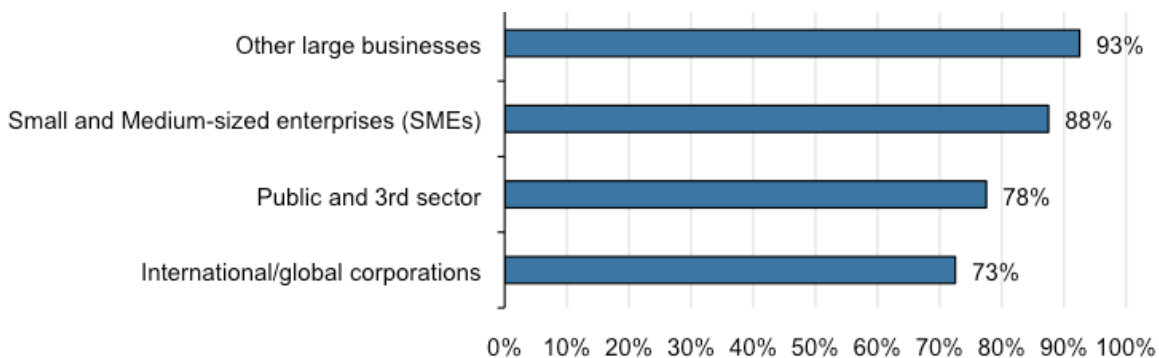
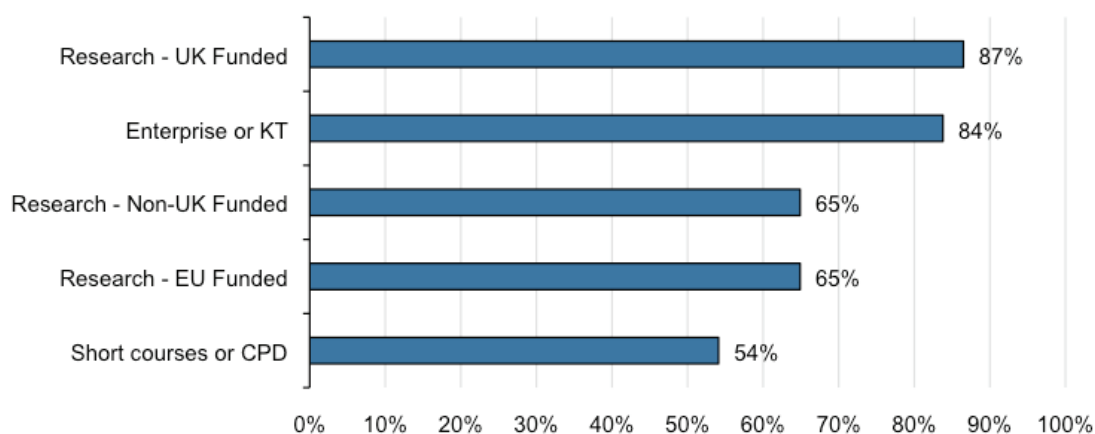


Figure 9 emphasises the other types of employer engagement reported by universities alongside their education links. These links are dominated by UK-funded research collaboration and knowledge transfer partnerships, activity which has been heavily encouraged by recent Government policy and funding streams. Internationally funded collaborative research with employers is also a strong feature of the employer engagement landscape, and over half of institutions are involved in short-courses and CPD activities with employers.

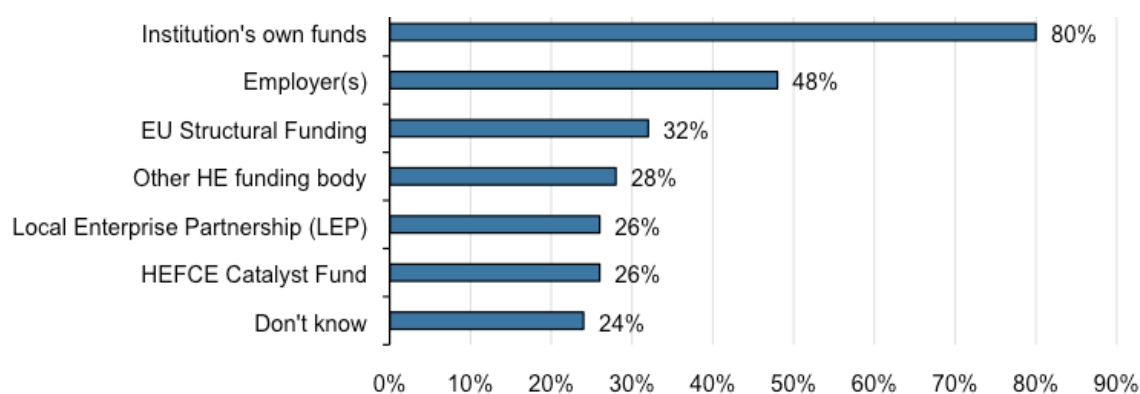
Figure 9: Other types of strategic employer engagement in STEM subjects



Funding and sustainability of strategic employer engagement in STEM education

Two of the issues related to more strategic forms of collaboration in STEM provision are how they are funded and how sustainable they are. Lighter-touch engagement requires less investment on the part of employers, although usually still requires significant resources from universities. A key question is whether the trend towards deeper employer engagement has been supported by more employer investment. Figure 10 demonstrates how survey participants reported that strategic employer engagement in STEM education was supported in their institution. Clearly, the university is viewed as the major financier for this type of provision, and less than half of respondents reported some employer funding. Higher education funding agencies, Local Enterprise Partnerships and the EU are also major supporters of STEM provision.

Figure 10: Types of employers involved in strategic employer engagement in STEM education

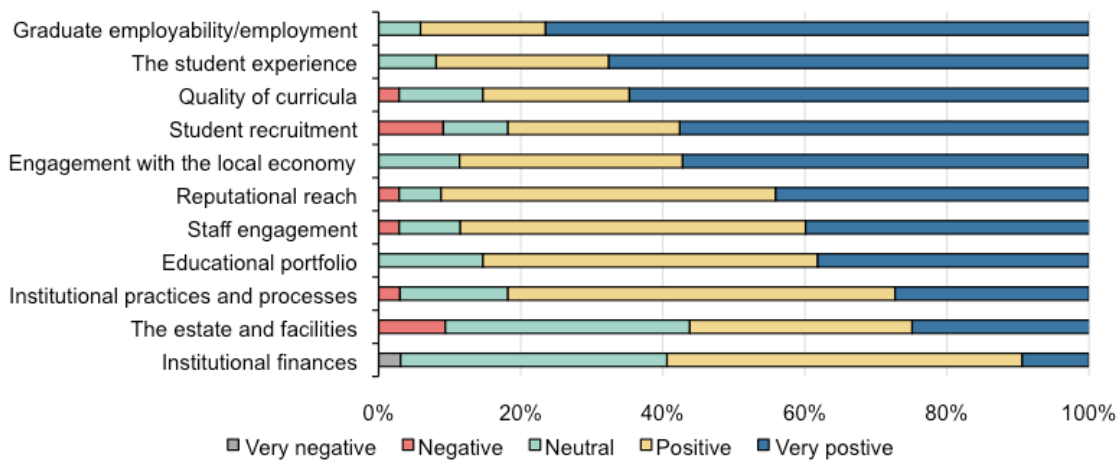


When those who had received employer funding were asked what type of employer investment their institutions had received, around 60% of institutions reported support for students - such as bursaries and scholarships, or funding to support teaching delivery. Just under half of respondents reported capital investment in equipment, buildings and facilities (46%). The nature of investment is likely to be dependant to the funding sources for collaboration and its requirements in terms of investment and matched funding.

Institutional impacts of strategic employer engagement in STEM education

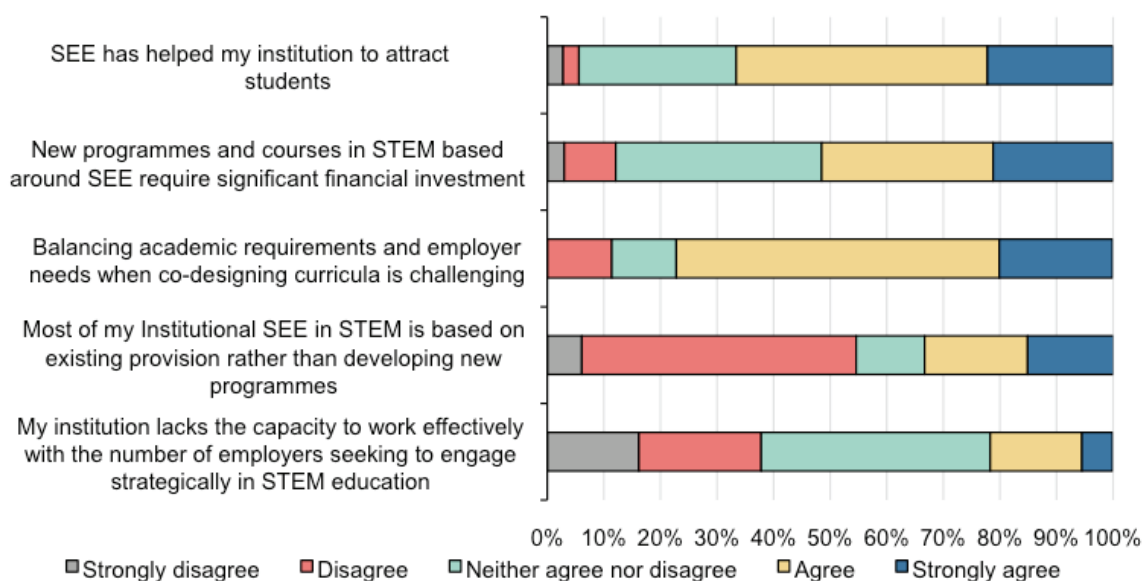
The rationales and purposes cited by respondents for employer engagement in Figure 2 centred on graduate employability, deepening engagement with employers and improving reputational reach. Responses to the list of factors presented in Figure 11 suggest that this form of provision is having a broadly positive impact – in particular the quality of the curricula, student recruitment and staff engagement.

Figure 11: Perceptions of institutional impact of strategic employer engagement in STEM education



However, as shown in Figure 12, the impact of deepening engagement on institutions can be challenging, and resource-intensive. This chart demonstrates some mixed experiences around employer engagement, suggesting that this activity can have different impacts depending on the model used, the supporting infrastructure within institutions, and the sources of funding.

Figure 12: Perceptions of institutional impact of strategic employer engagement in STEM education

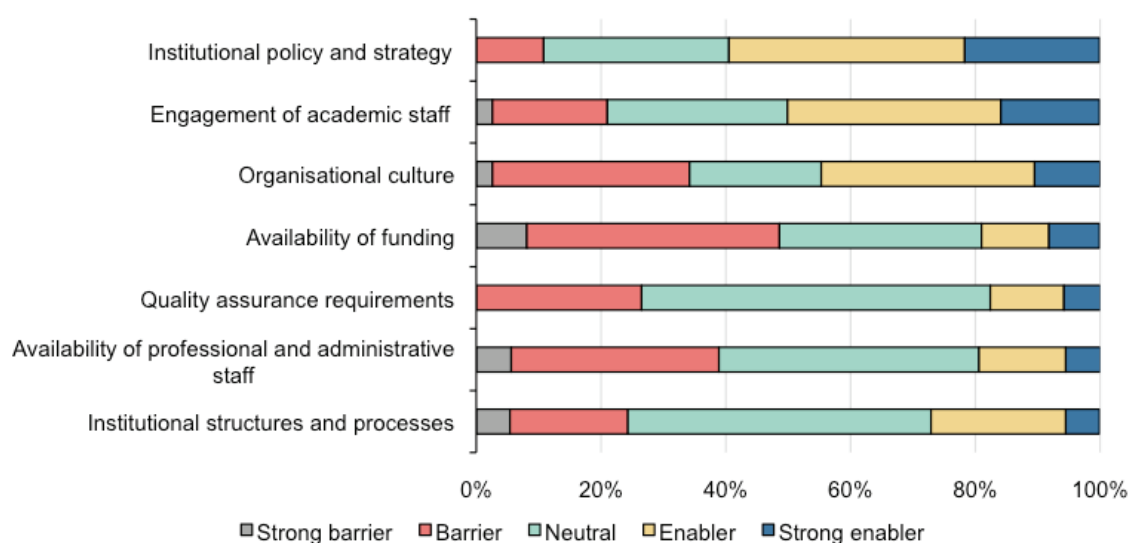


Barriers and enablers related to strategic employer engagement in STEM education

Respondents were also asked to rate the extent to which selected factors (internal and external) impacted upon effective strategic employer engagement in STEM education within their institution.

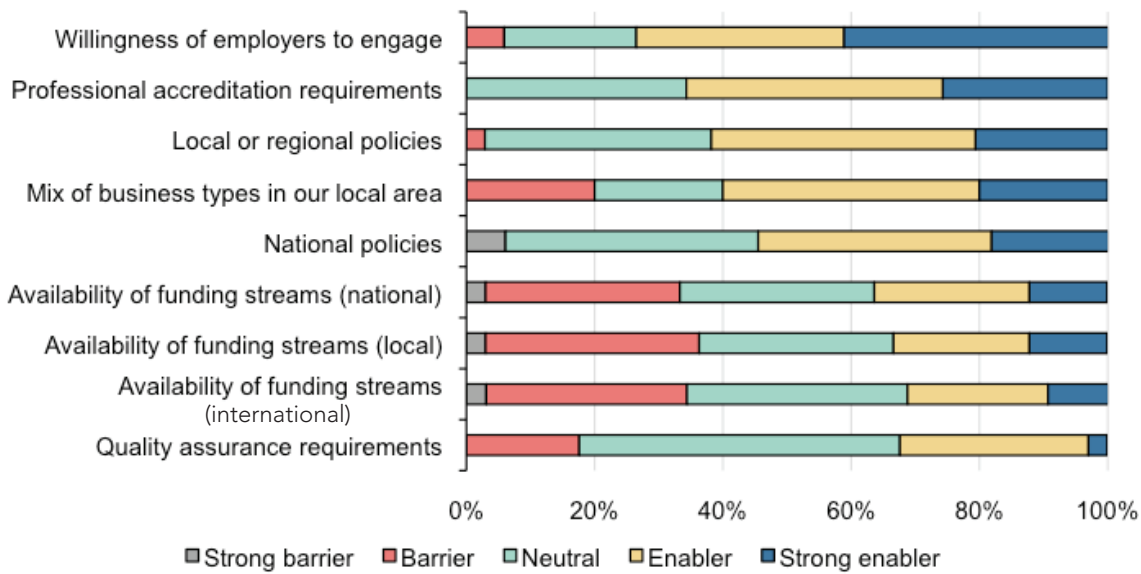
Figure 13 highlights the key institutional dimensions that support effective collaboration with employers: policy and strategy, academic staff engagement and organisational culture. Depending on the institutional context, factors such as organisational culture, funding, quality assurance and staff resources can act as both barriers and enablers. This again suggests that some institutions are finding that supporting deeper collaborations can be challenging with roles, structures and processes having to evolve and adapt.

Figure 13: Impact of internal factors on effectiveness of strategic employer engagement in STEM education



The willingness of employers to engage emerges as the most significant external enabler for effective strategic employer engagement in STEM education (Figure 14). This suggests a desire for equal commitment of academic staff and employers to form deeper collaboration. Professional accreditation is also a concern and it is clear that this needs to be flexible and adaptable enough to respond to changing forms of employer engagement. This can help to ensure the quality of programmes and also reassure students. The availability of funding and a relevant employer pool ready to engage is also important, as well as a supportive environment at both the local and national levels.

Figure 14: Impact of external factors on effectiveness of strategic employer engagement in STEM education



Appendix 3:

Case studies

Coventry University – Partnership with Unipart Manufacturing Group to develop the Institute for Advanced Manufacturing and Engineering (AME)



Summary of the partnership

AME is a large scale collaboration between Coventry University and Unipart Manufacturing Group. The AME building is a new facility supported by HEFCE's Catalyst Fund (£7.9m), located at the Unipart Powertrain Applications manufacturing site in Coventry. Designed as a bespoke 'Faculty on the Factory Floor', it is underpinned by a shared focus on teaching and skills, high-quality research and the core business of developing and applying energy and powertrain related technologies for the automotive, aerospace, oil and gas, rail and renewables industry sectors.

The partnership involved considerable investment from both sides. Unipart contributes £17.9 million towards the partnership and a further £5.6 million towards student scholarships and product research and development.

Origins and rationale

The West Midlands manufacturing and engineering sector suffers skills shortages with a large number of major employers attempting to recruit from a limited pool. To overcome this, the Coventry and Warwickshire Local Enterprise Partnership (LEP) set a target of 5,000 new or upskilled engineers by 2015. It also aimed to increase the number of local SMEs active in research and development.

To engage with this agenda, Coventry University and Unipart agreed to build a partnership that incorporated joint research and development activity, supported by a proposed new facility at Unipart.

How does it operate in practice?

The partnership is embedded in each organisation's strategy and involves teachers, trainers and researchers (from both) working

together alongside students. Coventry University's 'activity-led learning' model underpins teaching, prioritising practical, work-based learning for students. Industrial advisory boards are active in curriculum design to ensure that programmes remain relevant. The new building and manufacturing equipment has been designed to provide learning spaces and resources.

AME recruited its first cohort of over 30 students in September 2014 and it offers BEng, MEng (Hons) and MSc programmes. Selected students receive scholarships of £3,000 and access to summer placements from Unipart. Students can also access career development opportunities after graduation including management training, internships, international placements, and employment opportunities across the Unipart Group and with other leading manufacturers. AME also offers fully funded PhD studentships.

AME also supports Coventry's employment-focused initiatives such as the Add+Vantage scheme (the university's compulsory employability module based around the workplace) and the Faculty of Engineering and Computing's 'EC Futures' programmes which focus on employability and work experience for students.

What works well and why?

Strong leadership from both organisations' senior teams has been vital to success. As has shared fundamental principles such as a focus on skills development in a workplace environment, close collaboration on applied research, co-location to foster communication, and a desire to align both partners' measures of success.

External support from the Local Enterprise Partnership and the HEFCE Catalyst Fund has also been important. This gave Unipart and Coventry University sufficient confidence to release their own funds to support the initiative. Accreditation from relevant professional bodies (Institution of Engineering and Technology) and the Institution of Mechanical Engineers enhanced its reputation among potential students (particularly from outside the UK), and employers.

AME's facilities and expertise – as a University research centre – has already been used to secure funding for low-carbon technology research projects focused on aerospace, automotive, rail, oil and gas, and power generation. It has received funding for six research projects worth over £2.5m.

What were/are the key challenges and how were they addressed?

Developing new industry-focused and globally relevant programmes involving considerable employer input proved time-consuming. Meanwhile, new working practices created to fit the new 'Faculty on the Floor' approach has required time to bed in.

Senior level engagement, the co-location of staff, and joint appointments has fostered the collaboration and the culture change required to work together effectively and speed-up decision-making.

Future plans and developments

The partnership plans to increase its recruitment of staff and students over the coming years. Coventry is considering whether this model of deep engagement can be adapted for other STEM disciplines. While fundamental principles are transferrable, using this model elsewhere must recognise the specific needs of different partnerships and industries.



Aston – strategic partnership with Capgemini to offer an online Degree Apprenticeship programme in the IT sector



Summary of the partnership

Aston University developed a strategic partnership with the IT service management company Capgemini (a major national employer with several offices in Birmingham and the West Midlands) to provide degree-level education following an apprenticeship model. This combines work and study through online learning. It aimed to address acute skills shortages in the fast-changing IT industry, make Aston's curriculum more relevant and increase Aston's student recruitment (particularly focusing on widening participation).

Origins and rationale

Capgemini currently recruits around 120 graduates annually. Plans to expand graduate recruitment were hindered by the inability to find graduates - particularly in software engineering - with the skills and knowledge to immediately work in the industry.

Building on strong links at senior level – and due to the large proportion of their graduate recruits already coming from the university – Capgemini decided to team up with Aston on developing an apprenticeship-based approach that topped up level-4 Higher Apprentices to a full BSc with two stages of study.

Capgemini staff are mobile, often spending significant periods of time on client site away from their base office. A blended learning approach with the majority of teaching delivered at a distance was essential. An added benefit was that this required less physical space and capital spend.

The programme began in April 2014 and was later extended to a full level 4 - 6 integrated BSc Degree Apprenticeship delivered over four and a half years. The Degree Apprenticeship is now offered to other companies and eight businesses plan to recruit students during the 2015/16 academic year.

How does it operate in practice?

Students complete a higher apprenticeship from a training provider after two years. This is a level-4 programme equivalent to the first year of a degree. In the remaining three years, they complete a BSc degree in either Business Information Systems or Software Engineering. Capgemini, as the industrial partner, strongly influences the curriculum to ensure it is industry relevant. It also employs students during their apprenticeship, and provides case studies and input to practical assessments. In the Degree Apprenticeship model, the Skills Funding Agency provides two-thirds of the cost of the full degree, with Aston delivering all the educational activities.

Students book study time with Capgemini to pursue their academic studies. The majority of teaching is delivered online in a Virtual Learning Environment with recorded lectures, online tutorials with video links and consultation sessions. A small number of on-campus sessions are used to introduce students to their lecturers and cover material that is best done face-to-face (e.g. some elements of Human Computer Interaction). At the start of the Degree Apprenticeship there is an intensive seven-week module to train all students in the basics of software development and databases so they are ready to start work on client projects.

What works well and why?

By integrating the learning and work experience into a real employment context, the Degree Apprenticeship model helps to recruit a wider range of students. There are now around 65 students on the cohort. Many students, particularly those from low-income backgrounds, are attracted to this type of learning. The model allows them to be employed in their desired industry with a leading employer, while not paying tuition fees.

The first cohort of students performed extremely well on their exams, with two-thirds achieving a First Class mark. During the design stage, the partners gradually aligned and refreshed the curriculum to ensure it was industry relevant – which is important for practical subjects such as software engineering. Aston also drew on previous experience of online provision, particularly its MBA and MSc Professional Engineering.

The high-profile programme has helped build the university's reputation and provides a guaranteed

income stream of work-based learners supported by government and their employer. Aston staff are also motivated to engage through the prospect of recruiting more PhD students (as Graduate Teaching Assistants) and academic staff to support the programme, who can boost research capacity.

What were/are the key challenges and how were they addressed?

Work-based learning requires effort to keep students engaged and supported, particularly those students who are the first in their family to go on to higher-level study. Capgemini managers also have very busy workloads. Therefore learning and teaching needs to be built around their work commitments. However, the company's staff see it as their responsibility to support the students and to help meet the requirements of degree level study.

The move from Higher to Degree Apprenticeships has meant that the University now has control over delivery of the whole programme and can protect academic standards while delivering a fully integrated course.

Future plans and developments

Aston and Capgemini plan to continue the current enrolment level. The model works well for practical subjects such as software engineering. Aston's online approach is particularly relevant to the IT industry where staff are often required to work in many different locations on client projects.

Aston is currently rolling out the model to other companies as IT skills gaps and the move towards 'big data' require more graduates. The fact that the university delivers the programme off-campus through the use of their Virtual Learning Environment and developing special lectures and learning materials relevant to each learning context, means that it is much easier to scale up delivery compared to a traditional on-campus degree.



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University of Lincoln - strategic collaboration with employers to develop new Schools in STEM subjects.



Summary of the partnership

The University of Lincoln developed new Schools in the STEM fields of Engineering, Pharmacy, Chemistry, and Mathematics and Physics. They use a 'co-employer led School' model designed to meet the recruitment needs of different industrial sectors and address the shortage of higher-level skills in the East Midlands.

The model combines public funding with employer investment in physical infrastructure. It also engages employers in developing and managing the new Schools through specialist advice, co-creating industry-focused curriculum and providing funding for scholarships and bursaries. The Schools develop strong links within the local and regional economy, particularly with local businesses, who gain access to research facilities, knowledge transfer opportunities and staff expertise.

Origins and rationale

Lincoln places deep employer engagement at the heart of its activities, which supports its role as an 'anchor' institution bringing together education, knowledge creation and entrepreneurial activity from across the region. Strong employer collaboration underpin the Schools.

The University developed existing links with Siemens to create the first new School of Engineering in the UK for 20 years which opened in 2010. This was supported by key stakeholders such as HEFCE, the Regional Development Agency and the European Commission. Its aim was to address the urgent need to train more engineers and avoid businesses such as Siemens and their supply chains moving out of the area. Lincoln academics and Siemens training staff are co-located at the school, sharing equipment and facilities.

Many pharmacies in the region faced difficulties recruiting pharmacists. A new School of Pharmacy was opened in 2012 by the University, working in partnership with the regional Co-operative Society to increase work-ready trained pharmacists. The School is the anchor tenant on Lincoln's Science and Innovation Park, a joint venture between the two organisations. The Co-op invests in labs and teaching spaces, hosts student placements and contributes to teaching.

How does it operate in practice?

The model promotes close collaboration with employers with regular communication and face-to-face meetings and discussions on issues such as education, research and knowledge

transfer. Industrial liaison is also supported by a sophisticated customer relationship management system and specialist staff across the institution. The university also uses the Local Enterprise Partnership's labour market analysis to help shape its STEM provision.

Buildings and facilities – co-funded through bidding for external funding and employer investment – are accessible to students, employers and researchers. There is a strong emphasis on gaining as much industry experience and interaction as possible. This is built into the curriculum from an early stage, for example, networking in shared spaces, industrial placements and group-based research and development projects to solve real challenges faced by local businesses.

What works well and why?

It was important that the new Schools were built on existing links with local employers such as Siemens and the Co-op. This helped to leverage external funding (e.g. from HEFCE's Catalyst fund), which was used for infrastructure and professional specialists to liaise with industry. It was also essential to build and maintain open communication channels with employers, so that when a business need arises the university is viewed as a natural partner. Senior staff are well-networked with key local stakeholders through attending events and local committee work.

An employer co-creation group ensures the STEM curriculum is co-developed with employers, integrates students' exposure to the workplace and is flexible to meet changing sector needs. For example, locating Siemens training staff and Lincoln academics within the Engineering hub increases the University's access to employers, including SMEs and the public sector. This model – being built from scratch – required all partners to take a long-term view on commitment, impact and benefits.

What were/are the key challenges and how were they addressed?

Close liaison from employers and the recruitment of enthusiastic staff is vital to overcoming the challenge of building an industry-relevant and high quality curriculum from scratch. A balance is also needed between creating the necessary standardised policies and process and retaining

an entrepreneurial spirit as new initiatives develop and grow. Lincoln now prides itself on only taking three months to accredit a new programme.

Different STEM sectors have different needs. The Engineering School's relationship with just one employer has different needs from relationships that involve many employers, such as with the Schools of Chemistry and Pharmacy. Longer term objectives such as reputation building and research collaboration also take time and links need be allowed to develop at their own pace. It can also be a challenge to embed relationships and move beyond reliance on key individuals' enthusiasm and engagement. Therefore, it is important to engage academic and professional staff at all levels and ensure that necessary resources to build and nurture relationships are in place.

Main impacts (positive and negative)

The co-employer led school model has helped the University to increase its student recruitment and expand its STEM provision (STEM now represents 30% of provision) – helping to meet regional skills demand. The work-integrated model used in the new Schools has provided local businesses highly employable Lincoln graduates who have a growing reputation for being industry aware, entrepreneurial and courageous.

Future plans and developments

The University plans to increase its range of interactions with local employers in the local region and beyond. It plans to develop more research and knowledge transfer activities with employers - positioning Lincoln as a hub for STEM education and knowledge creation.

In 2015 the School of Mathematics and Physics opened, using the same workplace-orientated approach. Lincoln is also expanding its STEM offer by investing in new facilities in Engineering and Life Sciences and developing areas such as biological sciences and agrifood technology. This in turn offers potential for further work-based learning and CPD courses within these fields.



Partnership between Barclays UK Strategic Centre of Excellence and Liverpool John Moores University.



Summary of the partnership

Liverpool John Moores University (LJMU) has a rapidly growing partnership with Barclays UK's Strategic Centre of Excellence based in nearby Cheshire. This led to two new programmes: the Barclays Graduate Training Programme and Pre-Placement Programme for work placement students at Barclays UK. LJMU also collaborates with the company on school outreach activities and is looking to strengthen the relationship through apprenticeship routes and research collaborations.

Origins and rationale

High employability rates in the digital sector means Barclays UK had problems recruiting the right calibre of Computing and Maths graduates for their Technologist Graduate Programme. Its Strategic Centre of Excellence asked LJMU for advice and support on boosting quality applications to the scheme. The two organisations already collaborated through industrial advisory

boards and work placements, whilst Barclays staff provided careers talks to students.

An action plan was developed which provided the impetus for a deeper and more multi-dimensional collaboration between the two organisations.

How does it operate in practice?

The action plan is based on Barclays staff systematically engaging with the LJMU World of Work Careers Centre (WWCC) in its regular careers advice and employability services to students and collaborating on new initiatives to support graduates' work-readiness. In January 2015 'World of Work Uncovered' was launched where 40 students and 10 academic staff spent a day with Barclays sharing ideas about employability, industry informed curricula and leading edge industry applications.

LJMU also worked with Barclays to re-design and help to deliver the company's in-house graduate training programmes. LJMU has also developed a

new three-month pre-placement programme for students entering the new Barclays UK nine-month Placement Programme. The programme will be delivered jointly between LJMU and Barclays UK in Liverpool and will include modules on workplace culture and management.

What works well and why?

The collaboration is based around a shared commitment to a sustainable relationship that balances the immediate training and skills needs of an employer with strong career development and educational practice.

For LJMU, graduate employability is supported through direct engagement with a local employer, resulting in students being recruited to prestigious graduate training schemes. Students also become more work ready and received expert, industry guidance on producing professional applications through career advice from Barclays staff.

LJMU academics gain first hand experience of cutting edge industry practice whilst Barclays staff directly influence the curriculum to maintain its relevance to current working practice. This ensures Barclays (and the digital sector as a whole) has a large pool of candidates with the right skills and experience.

What were/are the key challenges and how were they addressed?

Bringing busy people together at the right time can be challenging and can result in a temporary loss of momentum. It is important to have key lead people on both sides who act as action-oriented brokers to weave the strands together. The professional approach and collaborative ethos adopted by both partners generated shared trust stimulating further collaboration beyond LJMU to meet Barclays' wider training needs.

Future plans and developments

The partnership is evolving. The partners have discussed how to raise the profile of the Barclays Centre of Excellence by creating a jointly branded Innovation Teaching Lab within the LJMU Department of Computer Science. This space would simulate closely the creative work environment found at the Barclays Centre providing additional work-based experiences for students. The partnership is looking at several new strands of work including collaboration on apprenticeship programmes and the development by LJMU of an online distance Masters level professional development programme for Barclays technical staff.



**Advanced Manufacturing
Research Centre**



University of Sheffield (AMRC Training Centre)



Summary of the partnership

The AMRC Training Centre based at the Advanced Manufacturing Research Centre (AMRC) at the University of Sheffield provides advanced apprenticeship and degree-level training for companies in the advanced manufacturing sectors. The Centre opened in Autumn 2013 and has a strong focus on encouraging more young people to follow careers in engineering.

Origins and rationale

First established in 2001, the AMRC with Boeing was part-funded from Yorkshire Forward (the Yorkshire and the Humber RDA) and the European Regional Development Fund (ERDF). In 2004 it moved to a new facility as anchor tenant for the Advanced Manufacturing Park within the Sheffield and Rotherham Enterprise Zone. In 2008 it received £10m to build the AMRC Rolls-Royce Factory of the Future, which was expanded in 2012. The partnership now has over 80 industrial members, from global employers through to local specialist SMEs who pay an annual fee to access the AMRC's resources and expertise.

The AMRC with Boeing sits alongside AMRC Castings (formerly Castings Technology International or Cti), the National Metals Technology Centre (Namtec), the AMRC Training Centre and the AMRC Knowledge Transfer Centre.

They form the University of Sheffield AMRC group, along with the Nuclear AMRC, which applies the same collaborative research model to the civil nuclear manufacturing supply chain. Both AMRCs form part of the Government-funded High Value Manufacturing Catapult.

How does it operate in practice?

The AMRC Training Centre provides opportunities for school-leavers to complete an employed-status advanced manufacturing apprenticeship. It has links with both the University of Sheffield and Sheffield Hallam University, providing apprentices with a clear progression pathway to study for higher-level qualifications up to doctorate and MBA level in Engineering and Mechanical Engineering.

In 2014-15 the Centre trained 410 first and second year apprentices, aged 16 and above, and at full capacity it will train 750 apprentices per year. Apprentices split their time between the AMRC Training Centre and employers in the Sheffield city region, including Tata Steel, Rolls-Royce, Sheffield Forgemasters, AESSEAL, MTL Group and Newburgh Engineering and the AMRC Group.

From 2015, a programme (supported by the merchant bankers Close Brothers and the Manufacturing Technologies Association (MTA)) will co-fund the wages of 20 apprentices a year employed at SMEs who will then be trained by the AMRC Training Centre.

The AMRC also offers CPD programmes, including an apprentice mentoring programme to help companies that are new to taking on apprentices or who wish to refresh their mentoring skills. It also hosts outreach activities with schools to provide pupils and teachers with an insight into engineering careers.

What works well and why?

The AMRC Training Centre developed its training courses so that they are adaptable to the complex and rapidly-changing needs of the advanced manufacturing sector.

Apprentices value the opportunity to combine work and high-level technical education, funded by their employer, without having to go direct from school to university. This significantly reduces the financial burden of their studies and also gives them valuable work experience, combined with access to AMRC's leading-edge research.

The Centre has also developed a collaborative environment for trainees where they have access to state-of-the-art educational facilities and training workshops that are equipped with production-class manufacturing equipment.

What were/are the key challenges and how were they addressed?

The AMRC Training Centre faced a number of challenges ahead of its launch, most notably securing funding, developing courses from scratch and recruiting relevant staff who had recent industrial and training experience.

It put significant efforts into creating a network of local businesses which played a major role

in helping to identify the course content that would develop the advanced manufacturing skills companies needed. As a result, they have become a strong advocate of the Training Centre ethos which combines filling a developing skills gap, while improving access to higher education.

Main impacts (positive and negative)

The Centre has widened access to high-level training. It is a unique model combining work-based further and higher education in an internationally-leading research centre, embedded in an advanced manufacturing workplace environment. In 2014 it won the Times Higher Education Outreach Award for its approach to bridging the manufacturing skills gap whilst promoting social mobility.

Employers value this form of collaboration as it combines innovation and knowledge transfer, with education and training for employees and potential future recruits. Graduates go on to regenerate the pool of highly-skilled workers in the advanced manufacturing sectors.

Future plans and developments

The AMRC has plans for an introductory programme that will help young people aged 16 to 25 who aren't in education, training or employment and may need to overcome a number of disadvantages to secure employment.

The AMRC also aims to expand its operations on a new Advanced Manufacturing Campus, which could result in the University building up to a million square feet of new research facilities on Sheffield Business Park (close to the Advanced Manufacturing Park). It will cover several new areas including process control engineering, polymers, and automation and robotics for food manufacturing. The AMRC group also wants to exploit opportunities presented by the High Speed Two (HS2) rail link and the Chancellor's ambitions to develop a 'Northern Powerhouse'.

The AMRC is working with the High Value Manufacturing Catapult (HVMC) and the EEF, the Manufacturing Organisation, to develop a new National College for Advanced Manufacturing involving the AMRC and the MTC Lloyds Advanced Manufacturing Training Centre in Coventry. This will be established as a network of hubs that will identify and work with the best established providers nationwide.

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