1994 group

Established to promote excellence in research and teaching. To enhance student and staff experience within our universities and to set the agenda for higher education.

Policy Report
September 2010

Enterprising Universities

Using the research base to add value to business

1994 group

The 1994 Group

- The 1994 Group is established to promote excellence in university research and teaching. It represents 19 of the UK's leading research-intensive, student focused universities. Around half of the top 20 universities in UK national league tables are members of the group.
- Each member institution delivers an extremely high standard of education, demonstrating excellence in research, teaching and academic support, and provides learning in a research-rich community.
- The 1994 Group counts amongst its members 12 of the top 20 universities in the Guardian University Guide 2011 league tables published on the 8th June 2010. 7 of the top 10 universities for student experience are 1994 Group Universities (2009 National Student Survey). In 17 major subject areas 1994 Group universities are the UK leaders achieving 1st place in their field (THE RAE subject rankings 2008). 57% of the 1994 Group's research is rated 4* 'world-leading' or 3* 'internationally excellent' (RAE 2008, HEFCE).
- The 1994 Group represents: University of Bath, Birkbeck University of London, Durham University, University of East Anglia, University of Essex, University of Exeter, Goldsmiths University of London, Institute of Education University of London, Royal Holloway University of London, Lancaster University, University of Leicester, Loughborough University, Queen Mary University of London, University of Reading, University of St Andrews, School of Oriental and African Studies, University of Surrey, University of Sussex, University of York.

1994 group

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Using the research base to add value to business

This is a report by Professor Trevor McMillan, Tom Norton, Justin B Jacobs and Rosanagh Ker on behalf of the 1994 Group's Research & Enterprise Policy Group

1994 group

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Executive Summary

This summary provides:

- Introduction
- Overview of the findings
- Recommendations

Introduction

This report explores how a strong university research base adds value to businesses and the UK economy. It investigates the facilitators that encourage the most effective and lasting partnerships for knowledge exchange and makes strong recommendations to universities, businesses and the Government on how to enhance and support this area, which is of particular importance during the current period of economic uncertainty.

The past five years has seen a clear upward trend in the amount of research that UK universities have conducted in collaboration with business, along with significant increases in the income from specific research contracts, and the sharing of facilities and equipment. We believe these trends reflect a growing culture of engagement and openness between academia and business, and that they will continue as the impact agenda becomes well embedded in the system.

Although there has been considerable success in recent years, there is much opportunity to continue to enhance this area and ensure that high quality research at universities continues to add maximum value to business and the wider economy.

A breadth of partnerships between universities and businesses

While a linear model of academics recognising the potential applications of their fundamental research remains important in ensuring a culture of innovation, a large and growing number of university-led research projects include commercial partners from the outset. Collaborative research income across the university sector rose from £600m to £732m in the past five years. In this time, the 1994 Group has seen its own income from collaborative research increase by 30%.[1]

[1] Figures from 5 year period 2004/05-2008/09, '2008-09 Higher education–business and community interaction survey,' HEFCE 2010/14

It is often beneficial for multiple universities to enter into collaboration on a specific engagement with business. This can broaden the knowledge of the research base amongst businesses and increase the chances of further strategic partnerships through which to add value. Collaborations have also become increasingly international and many of the 1994 Group universities engage with businesses from abroad.

We welcome the Minister's assertion in his July 2010 speech that government should back shared facilities which private companies could not develop on their own.[2] Sharing facilities and infrastructure contributes to a culture of openness amongst universities and businesses as well as reducing duplication of expensive equipment, research space and laboratories. The amount of facility and equipment-sharing contracts entered into between 1994 Group Universities and businesses has grown by over 60% in five years.[3]

We emphasise the role of people-transfer as an excellent facilitator to building the most successful partnerships. Staff and researcher exchanges, the provision of high quality training for businesses, and student placement schemes all contribute to an ethos of engagement, which can often lead onto further long-term, high-value relationships.

Important facilitators for university-business partnerships

Knowledge Transfer Partnerships and Networks are strong catalysts in the development of longer-term strategic associations between universities and businesses, and the role of the Technology Strategy Board in facilitating these partnerships is strongly supported by the Group. At the same time Innovation Vouchers have encouraged smaller companies to engage with universities, 86% of SMEs reporting that the initial collaborations facilitated by Vouchers had led to further partnerships thereafter.[4]

With Regional Development Agencies, which have seen much success, being phased out it is essential that the higher education sector has a strong input into the development of Local Enterprise Partnerships (LEPs), due to the key role universities play in local and regional economies, and their breadth of engagement across local, national and international contexts.

[2] Rt. Hon. David Willett's speech on 'Science, innovation and the economy', Royal Institution, 9 July 2010

[3] Ibid.

[4] 'Report on Innovation Voucher Scheme,' AURIL-UUK. www.auril.org.uk/media/Report%20on%20Voucher%20Survey.pdf

Internally, universities have adopted a number of different approaches to facilitating the interaction between their staff and business. Centralised knowledge transfer offices have built up expertise that can catalyse relationships, carry out required process and evaluate the extent of commercial opportunities. A professional knowledge-exchange staff has emerged that supports a wide range of interactions at different stages in the innovation cycle, and this has been significantly supported by the Higher Education Innovation Fund (HEIF). UK universities are also performing very well, in comparison to their US counterparts, at incentivising their academic staff to engage in knowledge exchange and company creation.[5]

Commercialisation of research: Spin-outs and intellectual property

An entrepreneurial culture amongst university staff has meant that spin-out activity has grown significantly. For example, income from spin-out activity which retains some HEI ownership doubled within 1994 Group Universities in the past five years, rising from £45M to £102M, and in this time the number of staff employed by these enterprises rose from 745 to 1,200.[6]

In regards to the exploitation of university intellectual property, with the exception of occasional large windfall payments, the level of income remains lower than other business- engagement income streams for the 1994 Group. A common problem for medium-sized research-intensive universities is that although they regularly generate high-quality inventions, the level of activity at any particular institution is too low to enter into venture capital agreements with the commercial funding markets. This is why we strongly welcomed the announcement in March 2010 Budget of a £25M University Enterprise Capital Fund to provide early stage funding for the commercialisation of university innovation, and were then disappointed that this project was frozen by the new Government pending the outcome of the Comprehensive Spending Review. We urge Government to review how it can best support links between medium sized research intensive institutions and venture capital funds.

[5] 'The higher education knowledge exchange system in the United States', a report to HEFCE by PACEC and the Centre for Business Research, University of Cambridge, July 2010. http://www.pacec.co.uk/documents/USKESystem-FullReport.pdf

[6] Higher education-business and community interaction survey 2008-09', HEFCE, 2010/14.

The importance of dual support and continuing a discrete innovation fund

We strongly welcome the Minister's stated commitment to the dual support system.[7] We agree that the way forward lies in exploiting an evidently outstanding research capability with clear potential, under the right conditions, to drive sustainable economic growth. The Government has rightly shaped its funding mechanisms in recent years to incentivise and reward the economic and wider impact achieved by university research, an aspect which now forms an important element within HEFCE and Research Council funding.

HEFCE's Quality-Related funding underpins the high quality research that happens at research-intensive universities. It allows a genuine long-term and strategic view, resulting in the ability to pull cross-disciplinary teams together, which is often useful in responding rapidly to particular business needs.

In the 2009/10 allocation of QR funding, 80% of the total fund was distributed to the top 30 performing institutions in the RAE, while 8% was distributed to institutions outside the top 50. In a period of austerity and cuts to the HE budget, the Government should consider whether it would be better to further concentrate funds on the 30 or so institutions with the highest performances in the peer review process, and with the critical mass in their research teams that will mean the most useful and effective investment of research funds.

We strongly support the continuation of a discrete innovation fund. Income from HEIF has had a transformational effect on the ability of universities to respond to the needs of business. For the future of a similar discrete innovation fund, we propose that:

- The 'community' element of funding currently within the HEIF formula be removed and allocated to institutions separately, as this is currently confusing in a fund primarily focused on business engagement.
- There should be a removal or significant reduction of the weighting given to faculty numbers. The time has come for this funding to move away from capacity development toward recognition and reward for excellence.
- The formula continues to clearly take into account university engagement with SMEs, so that the funding can support areas where it is needed most.

[7] Willetts on 'Science, innovation and the economy', Royal Institution, 9 July 2010.

HEIF, and similar funds in the devolved administrations, have played a crucial role in stimulating and supporting the knowledge exchange process. Without this continued support the capability to engage with and meet business needs will significantly diminish.

Recommendations

Research-intensive universities have been extremely successful at using their research base and expertise to add value to business but there is more that can be done. We believe the following recommendations will help to foster more effective collaboration between universities and business in the years ahead:

For Universities:

- Further strengthen the growing academic culture of engagement with business.
- Support and incentivise academic staff to engage in knowledge exchange and company creation
- Nurture a long-term outlook in terms of business relations, seeking to build long-standing strategic partnerships wherever possible.
- Create clear entry points for information and enquiries from businesses to assist them in utilising research strengths and outcomes.
- Nurture a cohesive approach to enterprise across an institution, with effective communication across departments so that an institution can adapt to meet the various needs of businesses.
- Be more open in regards to intellectual property and seek to collaborate in order to best exploit commercial products, such as investigating venture capital partnerships.

For Government:

- Retain the dual support system of research funding to allow universities the autonomy to invest in new and emerging areas and in curiosity-driven research to provide answers to tomorrow's problems.
- Ensure that the funding and research councils set meaningful strategies and coherent incentives for researchers to undertake work with applications in mind.
- Consider whether it would be more efficient and effective to further concentrate quality-related funds on the 30 or so institutions with the highest performances in the RAE.
- Maintain a dedicated ring-fenced innovation fund to encourage knowledge exchange between universities and business.
- Remove the element of funding for 'community' activity within the innovation funding stream, and allocate this to institutions separately.
- Remove or significantly reduce the weighting given to faculty numbers within the innovation fund, in order to move away from capacity development toward recognition and reward for excellence.
- Retain a focus on the nature of university engagement with SMEs within the ring-fenced innovation funding formula.
- Due to the key role they play in their local and regional economies, ensure that universities have a strong input into the development of the Local Enterprise Partnerships proposal.
- Provide appropriate support for building bridges between medium-sized research intensive institutions and venture capital funds, such as the previously proposed University Enterprise Capital Fund.
- Provide incentives to boost private income streams such as the successful matched funding scheme for voluntary giving to universities.

For Businesses:

- Recognise that universities are open for business and have a wide range of potential contributions to make to their activity.
- Engage with universities and the academic community, and openly communicate their needs and interests.
- Work with universities in developing long term partnerships, and use TSB supported mechanisms such as KTPs and collaborative research programmes to foster meaningful relationships.
- Use universities' consultancy systems to develop links with academics who can help solve problems and cater to specific knowledge needs.
- Be flexible in funding and IP arrangements recognising the costs to universities and the need for them to be sustainable to support the core research base that business can utilise in the future.

1. Introduction

Universities are an integral part of the UK economy, and they produce substantial economic impact in a variety of ways. A particularly important type of impact occurs when universities transfer the knowledge, technology and expertise arising from their high-quality research to meet the demands of business. Given the current budget constraints facing both the public and private sector, at home and internationally, it is appropriate that universities and businesses continuously evaluate how to best work together.

The purpose of this report is to demonstrate how the high quality research that takes place at research-intensive universities like those in the 1994 Group adds value to business and industry, and to identify best practice to develop towards greater benefit in the future. Whilst we strongly acknowledge that high quality research makes a significant cultural and social impact, this report will focus primarily on the ways in which our Group's research strength has helped it forge important commercial partnerships and generate significant economic impact.

While it cannot give a complete picture, this report provides an insight into some of the key successful approaches and funding streams that have facilitated businesses' exploitation of world class research. This is demonstrated by identifying the effective modes of engagement that exist between universities and businesses, identifying the key knowledge-transfer funding streams available, and by providing case studies of where institutions from the 1994 Group of Universities have collaborated successfully with UK businesses to generate economic impact from their research.

Higher education staff are extremely good at initiating engagement with business, and interpreting the outcomes of their research so that it becomes applicable outside of academia. Strong research stimulates entrepreneurial thought and an excellent university research base naturally generates links with business and the transfer of knowledge. Academics commonly see the value of their research in real terms and consider the wider applications that it might have. This outward looking focus has been encouraged at organisational level, where universities have created internal structures to help facilitate knowledge exchange. As we have seen from a recent HEFCE report, UK universities are already performing very well, in comparison to their US counterparts, at incentivising their academic staff to engage in knowledge exchange and company creation.[8] This transfer of knowledge is also very much a two-way process, with universities' research programmes being nourished in unique ways by their access to results, techniques and individuals active on commercial research and development teams. There is, however, a real need to sustain and further strengthen the growing academic culture of engagement and continue to meet the challenge of combining high quality research with impact.

The inter-relationship between universities and business has been examined in several Government papers and reviews in recent years. These include the Sainsbury Review (2007) and the Higher Ambitions statement that both highlighted the need to strengthen ties between HE and business as well as enhance the environment for enterprise. Through its *Innovation Nation* white paper, the Government has also urged universities to better demonstrate how their research achieves, or has the potential to achieve, economic and other impact, an aspect which now forms an important element within HEFCE and RCUK funding stream.

Recent reports have highlighted further the need for businesses to continue working with universities in the UK and internationally. Sir James Dyson, for example, has called on universities, companies and not-for-profits to collaborate rather than compete in exploiting knowledge,[9] while Dr. Hermann Hauser has addressed the issue of commercialisation of university research by advocating the building of additional Technology and Innovation Centres across the UK.[10] The Council for Industry and Higher Education (CIHE) have also commented on the issue of university-business collaboration, suggesting that UK universities have a 'distinctive contribution' to make in 'creating value through supporting company innovation processes,' and 'contributing to economic impact.'[11]

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[8] 'The higher education knowledge exchange system in the United States', a report to HEFCE by PACEC and the Centre for Business Research, University of Cambridge, July 2010. http://www.pacec.co.uk/documents/USKESystem-FullReport.pdf

[9] 'Ingenious Britain: Making the UK the leading high tech exporter in Europe', Sir James Dyson, March 2010.

[10] 'The current and future role of technology and innovation centres in the UK', Dr. Hermann Hauser to BIS, March 2010.

[11] 'Absorbing research: The role of university research in business and market innovation', CIHE, May 2010.

The benefits of these contributions may also transcend national boundaries. Noting that universities and public research organisations contribute 35% of all research undertaken in Europe, the European Commission has highlighted the area of institutional autonomy over their research mission as a key consideration in their increasing efforts to link universities' research activities with the needs of industry and society.[12]

Directed funding streams such as the Higher Education Innovation Fund (HEIF) from HEFCE and follow-on funds from Research Councils have significantly helped to nurture a more entrepreneurial environment within universities. Likewise the establishment of organisations like the Technology Strategy Board (TSB), which is business-led and funded by BIS, and the Energy Technology Institute, a Limited Liability Partnership between international industrial companies and the UK government, have created increased opportunities for universities to respond to the needs of business. At the regional level, as the remit of the Regional Development Agencies (RDAs) passes to the newly proposed Local Enterprise Partnerships (LEPs), it will be important for the impact previously achieved by the RDAs to continue. As part of this evolution, the role of the research-intensive universities in developing LEPs will be crucial.

At the heart of the most successful interactions is an ethos of openness and partnership shared between universities, businesses and industry, and a view to form long-term partnerships wherever possible. The approaches described in this report emphasise the significance of these relationships to future economic prosperity.

Although the growing culture of engagement between universities and business is producing considerable success, there is much opportunity to enhance this further while overcoming a number of challenges to achieving the highest degree of impact. This report explores the ways in which universities, businesses and the Government can continue to enhance this increasingly important area and ensure that high quality research at universities continues to add maximum value to business and the wider economy in the future.

[12] 'The European research area: New perspectives,' EU Commission Green Paper, COM (2007) 161 Final.

2. Universities are 'Open for Business'

There is a range of different routes through which businesses can engage with university research in order to enhance what they deliver and generate additional value for themselves and the economy. UK universities are very much 'open for business' and a strong research base offers a wide array of engagement opportunities from which companies can benefit.

The nature of engagement opportunities vary according to how far the research is undertaken with applications in mind, the level and nature of user engagement and the disciplines involved. These varied engagements require a diversity of funding models and a range of partnership styles between the parties. Beyond the terms "blue skies" and "applied" research there sits a set of descriptors that stress the level of interaction between partners.

The "co-discovery" approach is often undertaken as part of a fundamental and possibly long-term strategic partnership between a university and a business. Both sides bring important contributions to the partnership including the collective research experiences, facilities and equipment, knowledge of different parts of the innovation landscape, and an understanding of medium- and long-term market pulls and technology pushes.

A "market-guided" model highlights research initiatives that are strongly influenced by business and often have potential applications or solutions in mind, but without necessarily being directed at a very specific commercial problem.

"Curiosity-driven" research may not have any immediate end-use application in mind but leads to essential discoveries and outputs that either attract the interest of businesses or are identified by the universities as being potentially marketable to business. For some industries it is not unusual for them to invest in university research at this level, but in general this type of research tends to be university led.

Critical to maximising impact through any of these avenues is the quality of communications between both sides of the relationship. It can be difficult for businesses to know exactly where to go when approaching universities with a specific enquiry or to investigate what opportunities are available, and it is wrong to expect them to know all about the internal

structures of a particular university before being able to identify where help can be found. It is incumbent upon universities to create easily locatable entry points for businesses to make enquiries about the commercialisation of research, and many universities have adopted this outlook. However, developing a greater awareness amongst research staff of the commercial benefits of their research remains an issue. As a recent report to HEFCE has shown, much of the communication barrier between universities and business could be overcome if universities helped all of their academic staff to become more 'cognisant of all the issues surrounding the commercialisation of their research' and directed them towards those staff who could help them exploit it.[13]

Similarly, there is an equally important need for businesses to communicate more effectively with universities about their needs. Often, the most effective interactions are in the form of long-term strategic partnerships, through which both businesses and universities understand more fully how they can work together and assist each other. These longer-term endeavours are increasingly important to the knowledge exchange landscape in the UK.

[13] 'The evolution of the infrastructure of the knowledge exchange system,' PACEC and the Centre for Business Research, University of Cambridge report to HEFCE, December 2009.

3. Understanding the 1994 Group's position: Summary of business-engagement income

Figure 1 (overleaf) shows the various income streams from business engagement activities at 1994 Group Universities during 2008/09.

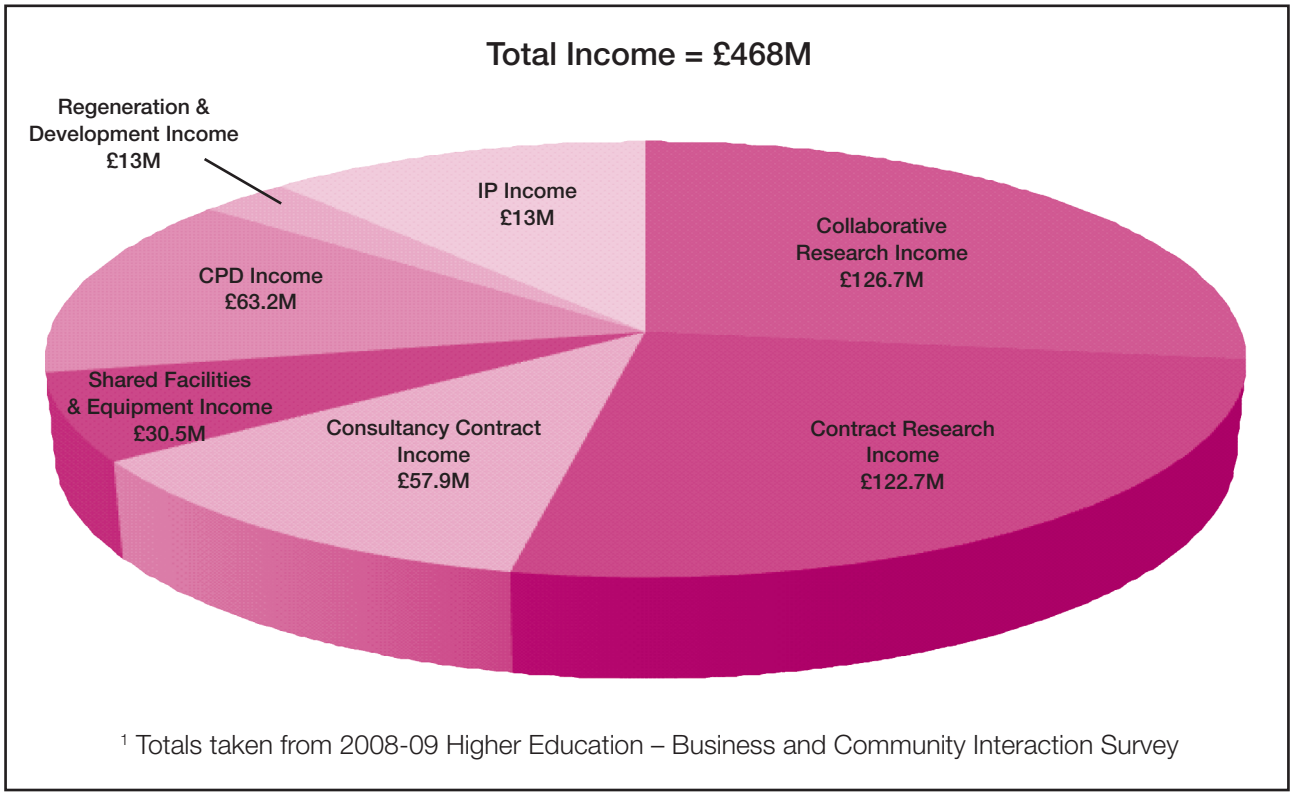
As can be expected from a group of research-intensive universities, the bulk of activity is focused on collaborative and contract research. There is also a sizeable commercialisation of research outcomes through exploitation of intellectual property, although the year presented here was unusual and the value is mainly attributable to a large windfall received from a single venture in that year (as explained in 3.4 below).

The Group also take forward their engagement with business through other marketable services such as continued professional development and consultancy work, informed by the high-quality research base. There is also a significant amount of sharing of facilities and equipment with businesses.

Figure 2 shows how the income from these activities at the 1994 Group has changed over the past five years.

There is a clear upward trend in the amount of research conducted in collaboration with business, which is a key area to enhance further to best meet the needs of the economy. Income from specific research contracts has also increased dramatically over the five year period. Income from facilities and equipment sharing has also grown significantly within this period. We believe these trends are a reflection of the growing culture of engagement and openness between academia and business, and trends that will continue to be enhanced as the impact agenda becomes more embedded within the system. Particularly important is the continued growth in collaborative research, and a focus on enhancing this will be crucial to fully utilising the research base for the benefit of businesses in the future. (Section 4 explores the various modes of partnership and facilitators to these collaborations).

Figure 1: 1994 Group Universities' Income from Business-Engagement Activities 2008-09[1]



[1] Totals taken from 2008-09 Higher Education – Business and Community Interaction Survey

Figure 2: 1994 Group Universities' Income from Business-Engagement Activities 2004/05 – 2008/09[2]

[2] Totals taken from 2008-09 Higher Education – Business and Community Interaction Survey

The sharp rise in IP income in the most recent year can be attributed to a large windfall received when the University of Surrey sold its highly successful spin-out company, Surrey Satellite Technologies Ltd. Without the occasional windfall, it is apparent that the income from IP is relatively small (see Section 6 for an exploration of this issue).

The decline in regeneration and development income is attributable to 1994 Group universities receiving various amounts of investment over the years from organisations such as the European Regional Development Fund and European Science Foundation and UK Regeneration Funds (see Section 7 below). Given the nature of these funds, usually allocated on a project- or region-specific basis, this income stream will continue to remain highly elastic.

4. Successful modes of partnership between universities and business

Successful partnerships take many forms and, while it is not possible for us to describe all of them in this report, the variety of partnership modes described here demonstrate the value that university research is able to add to UK businesses.

Collaborations on long-term strategic partnerships

One of the benefits of collaborations is that high quality research can often be developed and undertaken within a business framework, whilst strongly stimulating entrepreneurial thought. At the heart of the most successful partnerships lies an ethos of openness, an understanding of each partner's needs, an effective communication of what can be offered, and a view to nurturing longer-term strategic partnerships wherever possible.

ATX Software and the University of Leicester

An example of how a partnership can develop over time is ATX Software and the University of Leicester. Since 2002 the University of Leicester's Computer Science department has been working alongside international software company ATX Software SA, a leader in innovative financial systems, to steer the changes that society, industry and the economy require from the field of Information Technologies.

The partnership between Leicester and ATX stems from a European AGILE project. By 2004, they were able to launch the 4-year Leg2Net Project, financed by a Marie-Curie programme to foster partnerships between companies and universities across Europe. As part of the project ATX Software seconded two staff members to Leicester for four years, during which time a second generation of system development technologies were developed. As part of the partnership, ATX has made available their own state-of-the-art technologies on System Re-engineering and Generative Development with the intention of supporting teaching and research at Leicester.

Universities and businesses have been able to cultivate long-term strategic partnerships through the establishment of dedicated research-sharing facilities, such as University Technology Centres (UTCs). UTCs have played an integral role in helping universities and businesses cement long-term research-based relationships. Set up by larger companies at universities across the UK, they enable businesses to work with public entities to carry out multiple research projects simultaneously on, or close to, university campuses. Funding for these centres has come from a variety of streams, including research councils, the EU, and all sizes of private enterprise.

Rolls Royce, University Technology Centres and the 1994 Group

Rolls-Royce has taken a leading role in establishing UTCs on university campuses across the UK. At the universities of Loughborough, Surrey and Sussex, UTCs have been set up to engage in collaborative research in areas such as combustion aerodynamics, thermo-fluid systems and aero-thermal systems. As part of the overlapping nature of these universities' research, the Rolls-Royce UTCs at Surrey and Sussex are working closely together to develop and exploit their shared experience in advanced computer modelling techniques in thermal systems.

Business and University international strategic partnerships

Collaborations have become increasingly international and many of the 1994 Group universities engage with businesses from abroad. In some instances, this has involved the sharing of research space on campus, while in others it has involved significant levels of joint funding of research projects and successful spin-out activity. To help UK and other universities continue in their efforts to seek out ways of linking their research activities with the needs of industry and society, a recent European Commission report has argued that Europe must ensure that public-private partnerships and knowledge exchange opportunities are stimulated further. This is so universities and businesses across the continent can 'establish conditions which lead to a virtuous cycle of productive collaboration on a sufficient scale.'[14]

SASOL and the University of St Andrews

South Africa-based international chemicals & energy company SASOL opened its European R&D laboratories (Sasol Technology UK) in 2002 at the University of St Andrews with a remit for establishing medium to long-term research programmes and collaborative research programmes within Europe. SASOL selected St Andrews as a destination due to the University's research strengths and particularly strong expertise in catalysis. Currently occupying an entire floor in the University's School of Chemistry, the company employs around 30 of its own research staff and sponsors the research projects and equipment of various groups within the School and other departments.

SASOL's direct embedding within a University research environment presented new challenges to both the company and University; however the relationship has grown and flourished over the past eight years and both parties continue to work closely together in developing new areas of catalysis research and renewable energy.

Implementing international strategic partnerships are capital and time intensive and they require universities to have adequate and dedicated internal structures in place. While knowledge exchange may take place at all levels of the university, the cultivation and development of international business contacts will remain impossible without the senior management and the governing body committed to an international mindset.

[14] 'University-industry cooperation in the Research Framework Programme,' JRC Scientific and Technical Report, EUR 24078 EN, 2009.

Innovation China UK

Innovation China UK (ICUK) programme is the first UK-Chinese collaboration to promote joint innovation and knowledge transfer. Led by Queen Mary, University of London the programme brings together King's College London, University of Nottingham, University of Southampton and the Royal Veterinary College with over 20 Chinese HEIs. A total of £2.8m has been awarded from the ICUK collaboration development fund, attracting £1.9m of Chinese matched funding and a further £1.3m of follow-on funding from other UK-Chinese funding sources. These grants enable joint research to be conducted in the Chinese and UK markets by facilitating feasibility studies, staff exchanges, market/IP appraisals and proof-of-concept research.

Working closely with Chinese central and regional government organisations, ICUK has helped pave the way for UK companies and HEIs outside the collaboration to enter the Chinese market and access local industrial funding.

Collaboration on specific research projects

University-business collaborations may commonly take the form of directly sponsored research programmes, which may arise either from existing partnerships or from new relationships, and range in price from thousands to millions of pounds. A large number of university-led research projects include commercial partners from the outset and these have contributed large amounts of income to HEIs, with collaborative research income rising from around £600M in 2004-5 to £732M in 2008/09. As part of this upward trend, the 1994 Group has seen its own income from engaging in collaborative research increase from just over £97M to over £126M in this period, an increase of nearly 30%.[15]

One of the main drivers behind these collaborations are the UK Research Councils, which are responsible for funding everything from small, short-term projects focused on solving single and specific problems to multi-million pound, long-term research programmes focused on solving multiple problems and producing multiple solutions. The Councils encourage academic researchers to collaborate with partners in business or the public sector where this can stimulate research and innovation, and as a result an increasing number of research projects have business involvement. The Engineering and Physical Sciences Research Council (EPSRC), for example, supports over 2,000 organisations by supporting their research grants, including large companies, SMEs and the public sector.

Low Carbon Technology collaboration with E.ON and EPSRC

EO.N UK, one of the nation's leading energy suppliers, and EPSRC have come together to fund a major collaboration involving several universities from the 1994 Group. Led by the University of Bath, researchers at Surrey, Loughborough and East Anglia are participating in a project called 'Transition Pathways to a Low Carbon Economy', which combines historical and forward-looking analyses of energy system transitions alongside quantitative and qualitative research methods. The current arrangement between the participants will run until October 2011 with the aims of developing three pathways for the implementation of low carbon electricity systems by 2050.

The Technology Strategy Board (TSB) runs a very effective, industry-led, collaborative research programme via focussed funding competitions, which brings the industrial and research communities together to work on important areas of science, engineering and technology, from which successful new products, processes and services are emerging.

Major facility and infrastructure sharing

Sharing facilities and infrastructure is an important aspect of university-business interfacing, as it contributes to a culture of openness amongst universities and businesses, while reducing the duplication of expensive equipment, research space and laboratories. With the sharing of facilities and infrastructure also comes increased access and more efficient usage of equipment, which is especially beneficial in times of financial constraint. We, therefore, welcome the Minister's assertion in a recent speech at the Royal Institution that it makes sense for government to back shared facilities which private companies could not develop on their own.[16]

[15] '2008-09 Higher education–business and community interaction survey,' HEFCE 2010/14

[16] Willetts on 'Science, innovation and the economy', Royal Institution, 9 July 2010.

Lancaster University's InfoLab21 provides one example of how universities have been able to share their facilities and equipment with research-driven businesses. The building houses computer scientists and researchers together with a dedicated Knowledge Business Centre (KBC). The KBC has its own knowledge exchange team, along with a number of resident companies as well as a commonly-shared incubator. The companies in InfoLab21, a mixture of spin-outs, joint ventures and independents, are all in the related digital industry sector. This environment greatly enhances the capacity for high quality co-produced and market-guided research.

Kromek and Durham University

The Northeast Science Park, "NetPark" is host to incubator projects and spin-outs from Durham University such as the award-winning security technology company Kromek. Kromek spun out of the Physics Department of Durham University in 2003 as Durham Scientific Crystals Ltd. Its prime aim was to develop a patented technique for growth of the semiconductor CdTe for X-ray imaging detectors. Employing over 40 people in its own new building on the NETPark science park at Sedgefield, County Durham, the company has diversified into the security market. It presently has liquid explosives detectors on passenger concourses of European airports and won the Global Security challenge competition premier prize of $400,000 in 2009. The company has raised over £12M investment in the past 18 months and is currently valued at over £50M.

York Science Park Ltd, majority owned by the University of York, runs four 30,000 sq. ft incubator buildings housing over 80 companies. The University of Reading is also developing a cluster of businesses located at the University through its early development of science and technology business incubation facilities. Companies in these facilities interact with the University whether to use facilites or equipment or to gain access to research expertise and students.

The amount of facility and equipment-sharing contracts entered into between 1994 Group Universities and businesses has grown by over 60% from 2004-05 to 2008-09, in which year our members generated £30.5M of income.[17] We believe the rise in this activity is a reflection of a growing culture of engagement and openness between our universities and businesses, and is an area in which there is much opportunity to expand further.

Rapid response to business needs

Universities may also be called upon to respond quickly to the needs of businesses, applying targeted and problem-based research via specific projects, consultancy services or the training of company staff. The existence of a stable research base has demonstrated that universities are able to respond rapidly to the needs of business. This creates a significant benefit for industry, who do not need to maintain such expertise and resources in-between projects, and in many cases, are unable to quickly put together the multi-disciplinary teams often required in such situations.

Interdisciplinary Research Centre in Polymer Science and Technology

This collaboration of five global chemical industries with the universities of Durham, Leeds, Bradford and Sheffield hosted a major EPSRC Interdisciplinary Research Centre Grant during the 1990s. Locating the key UK research groups in physics, chemistry and engineering and providing a structure that joined up the previously fragmented academic map ensured faster and more efficient engagement with industry. Since 2000 the IRC has run as a mutually-subscribing knowledge-exchange platform, increasing industrial membership to 23. Major projects such as the £8M EPSRC 'Microscale Polymer Processing' consortium were built on the IRC, characteristically delivering new commercial products and design processes. An annual 'Showcase' meeting attracts international participation and nucleates new collaborations, such as imaginative co-working between materials scientists and designers in the creative arts.

One particular tool for bringing universities and businesses together are Innovation Vouchers, which the CIHE has cited as an effective means of 'bridging the barriers companies have in engaging with universities.'[18] Innovation Vouchers have greatly encouraged SMEs to approach universities about utilising their research. Fostering these initial contacts is an important step in the knowledge exchange process, as they may lead to future collaborations and longer-term strategic partnerships. The Scottish Funding Council have run an Innovation Voucher scheme for the past two academic years. In 2010-11 there will be 100 vouchers each of up to £5,000 available to bring new companies (mostly SMEs who have not worked with an HEI before) into the university-user community. In a recent report from the

[17] '2008-09 Higher education–business and community interaction survey,' HEFCE 2010/14.

[18] 'Absorbing research: The role of university research in business and market innovation,' CIHE, May 2010

Association of University Research and Industry Links (AURIL), 88% of respondents reported that Innovation Voucher collaborations had fostered new relationships with SMEs, with 86% stating that these initial collaborations had led to further ones.[19]

Knowledge Transfer Partnerships

The TSB has expanded the highly successful Knowledge Transfer Partnerships (KTPs) in recent years; further supporting academic-business relationships and training of staff ready for employment in high technology businesses (see section 4.17 below). KTPs are an important aspect of university-business engagement and a strong catalyst in the development of longer-term strategic partnerships. For example, the relationship between Loughborough University and Campbell Scientific Ltd was established in 2001 when they first collaborated through a KTP, and has become an ongoing strategic engagement between the two parties. Loughborough University's Optical Engineering Research Group worked with Campbell Scientific Ltd to develop an instrument to classify rain, sleet and snow and measure visibility. As a consequence of this collaborative work Campbell Scientific has developed a range of innovative optoelectronic sensors and measurement systems.

Knowledge Transfer Partnerships at the University of Reading

The University of Reading has been particularly successful in their KTP activities, and in 2010 Professor Rachel McCrindle was awarded the national Knowledge Transfer Partnership award for Academic Excellence in recognition of the twenty-plus KTP projects she has either led or supervised. Participating in KTPs have enabled Professor McCrindle and Reading to engage with a number of business partners, ranging from Riding for the Disabled, Softel and Gap Activity Projects, to Just Kampers and Rockwell Collins. Many of these KTP partnerships have utilised funding from ESRC, EPSRC, EU, EC Framework V1, and have drawn on the expertise of colleagues in other Schools and Departments of the University. Helping to support each of these efforts is Reading's Knowledge Transfer Centre, which has been in operation since 1994.

Universities working with intermediaries, national and regional associations to nurture best partnerships with businesses

The existence of intermediaries sufficiently high-powered to be able to work with research-intensive universities but strongly business-focused should not be under-estimated. Without the existence of such independent brokers, the gap between all but the most research-driven companies and universities is frequently too large. The University of York, for example, has found the usefulness of partnering with organisations such as the Food and Environment Research Agency, who are research-driven but who maintain a public sector applications focus and have significant experience providing professional quality services to industry.

Surrey NanoSystems

Surrey NanoSystems is an excellent example of how RDA funding added to that of Government and industry to support an area of high quality academic research and technology transfer. In 2002 £10M of HEFCE funding helped established the Advanced Technology Institute (ATI) at Surrey. In 2005 ATI's pioneering research, funded by the EPSRC, in low-temperature growth process for carbon nanotubes came to the attention of a specialist UK SME. The South East England Development Agency (SEEDA) then awarded a grant of £215k under its collaborative R&D programme for nanotechnology. This grant was crucial as it meant the R&D process could be accelerated – a key factor in such fast-paced technology. Since its formation the joint venture company, Surrey NanoSystems has gone from strength to strength, attracting orders from across the world.

Previously RDAs and universities played a joint role in driving economic growth, and reaching out to business to secure their own goals of promoting employment, enhancing development, applying skills and promoting efficiency and competitiveness. RDAs also managed and administered EU funds set out for fostering partnerships between universities and business, such as those from the European Regional Development Fund (ERDF). Lancaster University, for example, has projects that are bringing in over £9M of ERDF funding over the next 3 years covering areas such as Eco-innovation, Sustainable Manufacturing and Leadership for Business.

It has been announced that there will be an evolution away from RDAs and towards Local Enterprise Partnerships (LEPs). This new initiative proposed by

[19] 'Report on innovation voucher scheme,' AURIL-UUK. See: http://www.auril.org.uk/media/Report%20on%20Voucher%20Survey.pdf

Government in June 2010,[20] will give LEPs the role of providing strategic leadership in their areas, to set out local economic priorities, and assist in rebalancing the economy towards the private sector. We are pleased to see that the role universities play in their local and regional economies is being explicitly recognised in these proposals, and it will be essential that universities are involved in discussions and have a strong input into exactly how these new partnerships will work as the proposals are taken forward.

For example, as universities are likely to be connected to multiple LEPs, rather than to one overarching RDA, a significant concern is that a lack of coordination between LEPs could mean that universities need to cope with different, even conflicting, priorities and ways of working. This may mean that fulfilling a more local agenda will be increasingly difficult when universities are also aiming to truly be global players in their research and teaching. Also, we feel it is extremely important that LEPs are allowed the flexibility to reflect the differing needs and circumstances of particular regions in the UK.

Regional associations and York's Heslington East Campus

The University of York's close relationship with the local council and the Regional Development Agency has helped it secure the funding necessary for the new Heslington East campus development, which was supported by £15M funnelled from the EU to increase cutting-edge research. Heslington East, being developed over the next ten to fifteen years, will enhance capacity for research, knowledge exchange and spin-off companies. When a suitable conjunction of organisations can be arranged around an area of genuine research strength, there is great potential for regional intermediaries and universities to create value for business.

Multi-university collaborations with business

It is often beneficial for multiple universities to enter into collaboration on a specific engagement with business. This can broaden the knowledge of the research amongst business and increase the chances of further strategic partnerships through which to add value.

SETsquared is a collaboration between the universities of Bath, Bristol, Southampton and Surrey which partners in enterprise activities and collectively supports the growth and success of new business opportunities through spin-outs, licensing and the incubation of high-tech, high-growth ventures. SETsquared has grown over the years to include over fifty companies thanks to the DTI Science Bridges programme and the procurement of multiple HEIF grants, and it has become internationally recognised for its good practice.

iPhone MIT: Goldsmiths and Massachusetts Institute of Technology

This collaboration represents a joint-initiative by Goldsmiths, University of London and MIT to facilitate the fast development of iPhone and iPad applications by individuals with only basic programming skills, while retaining the complexity required for stimulating advanced users. In addition to Goldsmiths, the project counts MIT's Department of Comparative Media, MIT Press and the Leonardo Electronic Almanac as partners. Artists from around the world will be encouraged by MIT Press to use the templates to produce a variety of games, music, image and graphics-based interaction apps which will then be distributed in their app store. In addition, the electronic publishing platform developed as part of this programme will be made available for use by all academic journals currently published by the Press.

1994 Group members have been particularly active in the N8 Research Partnership, which brings together researchers from the Northern England Universities of Durham, Lancaster, Leeds, Liverpool, Manchester, Newcastle, Sheffield and York to build on their commonly shared areas of expertise. In 2007 N8 received £6M in initial funding from RDAs to focus on thematic areas which have a potentially large economic impact and the ability to satisfy high global demand. A Memorandum of Understanding (known as the "Angel Alliance") is also in place between Durham and Newcastle Universities and the RDA, One North East, to promote the exploitation of the science

[20] Cable-Pickles letter on local enterprise partnerships, 29 June 2010

base of the two universities for the economic benefit of the region.

Increased collaboration between universities is vital to promote efficient working, sharing of facilities and infrastructure and to spread the net as wide as possible in reaching external partners. There is also potential for multiple universities to investigate venture capital partnerships, in order to achieve the highest level of impact from their intellectual property (see Section 6, below).

People transfer: Research-based training and research staff mobility

It is often through the transfer of people that the most successful relationships are achieved. Provision of high-level training, staff and researcher exchanges, and student placement schemes can strengthen relationships between organisations, improving the mutual understanding and transfer of knowledge between them.

LEAD is a high-level leadership training programme for owner-managers of SMEs, informed by academic research and designed by Lancaster University Management School. The programme concentrates on two areas of business: the business itself and the personal development of the owner-manager, providing a framework to increase profitability, diversify and grow the business. To date the programme has worked with over 170 companies, 90% of which have seen an increase in sales turnover, employment, productivity and profits. On average, LEAD participants increase their turnover by £200,000.

Great Western Research (GWR), involving the Universities of Exeter, Bath and Bristol, is an excellent example of how a collaborative approach at PhD level can add value to business and help form sound relationships to drive innovation. GWR is a £14M research collaboration programme jointly funded by the South West RDA, business (£3.5M) and HEFCE, which focuses on using PhD programmes jointly supervised by at least two universities and hosted in a business. Over 130 PhD projects have been developed working with major companies such as Rolls Royce and Airbus as well as over 60 SMEs. In addition, GWR hosts 20 fellowships which have enabled academics to improve collaboration between institutions.

Cultural briefings at the School of Oriental & African Studies

The SOAS Research and Enterprise Directorate provides a knowledge transfer service which links the School's unique expertise about Africa, Asia and the Middle East with the needs of governments, businesses, NGOs and other organisations. It does this through bespoke briefings for business leaders, diplomats, and senior civil servants; by providing consultancy and training, for example, for the major international Chinese art and heritage auction houses; and by providing specialist courses and seminars in areas such as governance and leadership in Africa and doing business in Asia, Africa and the Middle East. SOAS provides the language and cultural awareness training.

There is also a wealth of examples of industry-sponsored Masters programmes being delivered across the sector and in 1994 Group universities,[21] and of co-curricular awards and activities helping bring students and employers together.[22] Taken together, these have helped to ensure that a strong pipeline of people and skills extends from universities to business.

[21] See: 1994 Group innovative practice report, 'Industry sponsored Master's degree programs': February 2010, http://www.1994group.ac.uk/documents/public/IPR%20Masters.pdf

[22] See: 1994 Group policy report, 'Beyond the curriculum: Opportunities to enhance employability and future life choices,' November 2009 http://www.1994group.ac.uk/documents/public/Publications/BeyondTheCurriculum_Nov09.pdf

5. Internal structures and support functions: Embedding a culture of innovation within Universities

Universities have adopted a number of different approaches to facilitating the interaction between their staff and business. Centralised knowledge transfer offices in Universities have built up expertise that can catalyse relationships, carry out required process and evaluate the extent of commercial opportunities. HEIs are beginning to adopt quality management systems and a 'professional staff' is beginning to emerge. However it is wrong to assume that these staff are only involved in commercialisation of research or technology transfer. They support a wide range of interactions at different stages in the innovation cycle.

Birkbeck College's internal structures and the demand for efficiency

As a small, multi-faculty institution, Birkbeck, University of London has needed to use its HEIF funding in a particularly cost-effective way. Their solution to this problem has been to create a team of four Business Relations Managers, each of whom are responsible for a cluster of sectors and act as dedicated points of contact for prospective clients of the College's services. This team is complemented by a range of academic Knowledge Transfer Co-ordinators and by the expert services in IP and technology outsourced from UCL Business and UCL Consultants. This highly focused and stream-lined business model has enabled Birkbeck to gain maximum benefit from its HEIF funding while helping it to win JISC funding for the development of a business-focused customer relations management (CRM) system accessible to the FE and HE sectors.

Academic staff benefit from specialist help in areas as diverse as network building, relationship management, market assessment and technical assistance. If academic staff are asked to undertake the business end of knowledge exchange and the administrative processes underpinning it then there will undoubtedly be less innovation taking place. Increased interaction and consolidation between research support and KT teams will enable both to take full advantage of the economies of scale and will help ensure that business-university engagement becomes increasingly mainstream.

University of Essex: Knowledge Transfer Innovation Fund

The Knowledge Transfer Innovation Fund (KTIF) was launched in April 2009 as part of the University of Essex's strategy to foster knowledge transfer between the University and the wider community. The KTIF provides funding to encourage academics to develop projects that contribute to the delivery of the University's Knowledge Transfer Strategy by inspiring innovation, stimulating regional prosperity and enabling enterprise.

In three rounds of the KTIF, forty-two separate projects have been launched, each receiving between £1,000 and £5,000 from the fund, along with twelve 'mini-projects' receiving between £250 and £999. The projects range across the disciplines, from history to electrical engineering, and have fostered successful engagements with a variety of businesses in the region.

Businesses are often looking for short-term applied research, consultancy and expertise. However, these needs may be incompatible with institutional requirements for academics to undertake research, publish in key journals and demonstrate impact as measured by REF.

To alleviate this tension, universities must continue to focus their attention on growing their professional KT staff and ensuring that working with businesses is recognised as a valuable part of the work plan of academic staff and becomes an integral part of determining promotion. Encouragingly, a HEFCE study demonstrates that UK universities are already performing very well, in comparison to their US counterparts, at incentivising their academic staff to engage in knowledge exchange and company creation.[23] However, it is important that we stay

[23] 'The higher education knowledge exchange system in the United States', a report to HEFCE by PACEC and the Centre for Business Research, University of Cambridge, July 2010 http://www.pacec.co.uk/documents/USKESystem-FullReport.pdf

University of Bath's Knowledge Transfer Account drives forward cultural change

The University of Bath has been awarded an EPSRC Knowledge Transfer Account (KTA) to develop innovative ways to accelerate translation of EPSRC research outputs into business opportunities. The KTA has helped design and implement flexible approaches to knowledge exchange which are creating a culture change within the University and include:

- Matched-funded collaborative projects called "Partnership Development Awards"
- KT Fellowships to second in or out expertise to help the take up research outputs by businesses.
- Proof of Concept fund to prove viability of ideas
- KT Champions to mentor and motivate other members of staff to carry out collaborative projects, to share best practices and showcase stories/examples of successful knowledge exchange

ahead of the trend, combining this with a flexible approach by the institution to those staff that need to dedicate significant time to developing research and collaborative opportunities suitable for business.

In order to further strengthen the growing academic culture of engagement and meet the challenge of combining high quality research with impact, it is important to nurture an agile and cohesive approach to enterprise across an institution, with effective communication across departments so that new opportunities can be seized upon efficiently and an institution can adapt what it offers to meet the various needs of businesses.

6. Commercialising Research

There is evidence to show that the academics who frequently engage with knowledge transfer offices are more likely to become involved in commercialisation mechanisms like patenting, spin-outs and licensing of their research.[24] Such ventures often arise from the various modes of partnership discussed above, and play a large part in generating further partnerships between universities and businesses.

Intellectual Property

Universities should nurture and demonstrate a culture of openness in regards to their intellectual property (IP), to counter a commonly held view that universities tend to be overprotective of this. In fact, most universities are open to offer their IP, but there is a diversity of views of how this might be achieved, and often successful exploitation depends on forming the appropriate relationships in each case to facilitate this.

For some universities and for some disciplines the approach has been to strongly defend their IP and they have occasionally realised significant revenue from this. For many universities there has been an increasing recognition that selling, licensing or giving away IP is often the most sensible approach when they do not have the financial resources or institutional capability to exploit it independently. There are also significant costs associated with protecting their IP and multi-million pound windfalls are rare. Levels of income achieved from exploitation of IP remain relatively modest in comparison to other income from business engagement (See Figure 2 above). In 2007-08 1994 Group universities generated a modest IP-based income of £3.2M, and this rose to £55M in 2008-09, thanks in large part to the sale of Surrey Satellite Technology Limited (see section 6 below). Given the relatively low amount of income universities' derive from the exploitation of their IP, there remains potential for future growth in this area.

The problem for medium-sized research-intensive Universities is that, although they may be capable of generating high-quality inventions that have the prospect of meaningful commercial activity, the level of activity at any individual university is often too low to

[24] 'Absorbing research: The role of university research in business and market innovation,' CIHE, May 2010

enter into venture capital agreements with the commercial funding markets because of their inability to raise the required equity or incur debt.

Without public subsidy many IP exploitation offices could not survive, and in the absence of such subsidy, no sustainable commercialisation activity would be possible. Closing or shrinking commercialisation offices would damage the overall interface with the private sector and ultimately it would reduce the research standing of each university forced to consider this action.

This is why we strongly welcomed the announcement in the March 2010 Budget of a £25M University Enterprise Capital Fund to provide early stage funding for the commercialisation of university innovation. We were therefore disappointed that this project was frozen by the new Coalition Government pending the outcome of the Comprehensive Spending Review in October 2010. We urge the Government to review how it can best support building bridges between medium sized research intensive institutions and venture capital funds. In addition to this, universities should do what they can to collaborate in order to best exploit their commercial products, such as investigating venture capital partnerships.

Spin-outs

Where the research results in products or services that have a high chance of creating wealth, HEIs may opt to 'spin out' the invention, by forming a new company. In such cases the HEI may maintain a stake in the company, depending on what is seen as being the best route for the company to succeed. Over the past five years, an entrepreneurial culture amongst university staff has meant that spin-out activity has grown significantly. For example, income from spin-out activity which retains some HEI ownership doubled within 1994 Group Universities in the past five years, rising from £45M to £102M, and in this time the number of staff employed by these enterprises rose from 745 to 1,200.[25]

The University of Surrey and Surrey Satellite Technology Limited

In December 2008 Astrium, Europe's leading Space company, acquired Surrey Satellite Technology Limited (SSTL), the University of Surrey spin-out company which is a world leader in the design and manufacture of small satellites and subsystems. SSTL joined Astrium following a decision by the University of Surrey to sell its majority stake of 85% in the small satellite manufacturer. SSTL remains an independent UK company with its individual brand and unique approach to Space, whilst benefiting from access to greater resources to support the company's growth. Just over a year later, on 7 January 2010, SSTL announced its success in winning a £212m contract for the Galileo Satellite programme. Important factors to SSTL's success were significant tactical support from EPSRC together with very strong internal support from the University, coupled with HEIF funded Tech Transfer support and intense project management support to ensure successful delivery of agreed objectives.

Queen Mary, University of London and ApaTech Limited

ApaTech is an orthobiologics company specialising in synthetic bone graft materials. It was set up in March 2001 to commercialise research and IP from Queen Mary, University of London, and Cambridge University. ApaTech's lead product Actifuse (a new class of bone graft material) is being used in Europe, the United States and Australasia, and the company generated sales of approximately $60M in the calendar year 2009. On 1 March 2010 Baxter International Inc. announced it would acquire ApaTech for a total consideration of up to $330M.

Successful spin-outs contribute significantly to the environment of enterprise that will then help in supporting other types of innovative activity, and, even if independent, can create funds that feed back into the university for further investment. A variety of models for spin-outs exist, and they can operate as mediator or the direct link between universities and business.

[25] Higher education-business and community interaction survey 2008-09', HEFCE, 2010/14

7. Funding Streams

Whilst commercialisation initiatives like patents, licenses or spin-outs are important, the key to enhancing innovation and enterprise in the future will be to achieve a culture of engagement at a fundamental level and at all stages of the research process. Key to this will be the setting of appropriate and meaningful impact targets and incentives by the various bodies involved in funding research, along with a coherent interplay between these bodies and a robust communication of a common approach.

The Government has rightly shaped its funding mechanisms in recent years to incentivise and reward the economic and wider impact achieved by university research. This aspect now forms an important element within HEFCE and RCUK funding streams. An important contribution has also been made by the Higher Education Innovation Fund (HEIF), which has undoubtedly helped to nurture a more entrepreneurial environment within universities. The benefits and future challenges of these funding streams, along with a variety of other income sources and facilitators, will be explored in this section.

Quality-Related (QR) funding

We strongly welcome the Minister's stated commitment to the dual support system, in his July 2010 speech at the Royal Institution.[26] We agree that the way forward lies in exploiting an evidently outstanding research capability with clear potential, under the right conditions, to drive sustainable economic growth. The core QR grant, channelled through the UK's funding councils, allows the flexibility for universities to invest strategically in research of all kinds, including innovative world class blue skies research, and it is an essential funding stream to maintain the research base in the UK. Universities have an obligation to society to support research that may lead to real step changes in thinking and knowledge that form the basis of societal advancement of the future, and it is largely QR that allows us to do this.

In a period of austerity and cuts to the higher education budget, a question should be raised as to whether we have the right levels of concentration of research funding, to achieve the most effective and efficient use of public funds. In the 2009/10 allocation of QR funding, 80% of the total fund was distributed to the top 30 performing institutions in the Research Assessment Exercise, while 8% was distributed to institutions outside the top 50. The Government should consider whether it would be better to further concentrate public funds on the 30 or so institutions with the highest performances in the peer review process, and with the critical mass in their research teams that will mean the most useful and effective investment of research funds.

QR underpins the high quality research that happens at research-intensive universities. It also allows the ability to pull cross-disciplinary teams together, which is often useful in responding rapidly to particular business needs. The funding stream allows a genuine long-term and strategic view, that is critical to addressing the global challenges of today and of the future, and will be essential to the UK in helping accelerate the post-recession recovery phase and retain the nation's strong international economic position. QR provides the fundamental underpinning of world-class activity at research-intensive universities, and its long-term impact should not be underestimated in terms of the value it attributes to businesses. Especially important is the need to further strengthen the growing academic culture of engagement and the challenge of combining high quality research with impact, an area in which the Research Excellence Framework and the allocation of QR funding is critical.

Research Council funding

Research Council funding is vitally important in helping universities maintain their strong research base. The different mechanisms used by the Research Councils all play a useful and complementary role in facilitating this, from the funding of collaborative grants between universities and industry, the support of industry fellowship schemes, to the provision of follow-on funds to specifically allow the exploitation of the findings from their standard research projects.

The Research Councils' Pathways to Impact strategy is a very welcome addition to the knowledge exchange policy framework and will be a useful way of helping achieve engagement from the HE research community. Although this is beginning to happen and we are now seeing significant shifts in academic staff behaviour, the sector and the Research Councils need to continue communicating this robustly, whilst building even stronger links with the TSB to build commercially relevant innovation.

[26] Willetts on 'Science, innovation and the economy', Royal Institution, 9 July 2010

We believe that the current aim of the Research Councils, to ensure that researchers recognise and implement the potential uses of their research when this is appropriate, is a reasonable approach as long as the balance between applied and blue skies research is maintained. How the Research Councils complement and interact with HEFCE and the other UK funding councils is of critical importance, particularly in the current times of constraint and large higher education budget cuts. In a period when it is of the utmost importance to convey the contribution of higher education to the wider economy, there is a need for the approach of the funding and research councils to be as coherent as possible in regards to their funding and promotion of research impact and knowledge exchange.

Higher Education Innovation Fund (HEIF)

HEIF has had a transformational effect on the abilities of universities to respond to the needs of business by creating a set of projects and support mechanisms that are not easily developed within the current core funding system. Importantly, HEIF has further enabled universities to employ staff that are particularly skilled in areas that complement the traditional skills of academics and facilitates academic engagement with business from the early stages of relationship building. The devolved administrations have equivalents to HEIF on which universities are equally dependent to respond to commercial outreach, business need and technology and knowledge exchange. In Scotland the metric-driven, formula based Knowledge Transfer Grant (KTG) has stimulated new activities and also afforded a level of stability in planning & resourcing.

Low Carbon South West and the University of Bath

HEIF funding has enabled the University of Bath to establish the Low Carbon South West network, which will make it easier for companies, entrepreneurs, investors and researchers to meet and exchange ideas and opportunities. The network also provides a showcase for low carbon technology innovation. Networks offering sector-specific expertise have helped significantly but are dependent upon HEIF funding as they are not financially self-sustaining.

The transfer of HEIF funding onto a metric-driven, formula basis has afforded stability in planning and resourcing. This has been instrumental in building momentum at the research-industry interface. It has allowed for direct allocation to encourage engagement by academics, tailored to local circumstances, the recruitment of a professional number of research-aware KT staff to develop funding propositions with a commercial focus, and the provision of matched funding for external bids, to lever additional capacity and research funding.

The current round of HEIF funding is due to expire in July 2011. As a Group, we strongly support the continuation of a discrete innovation funding stream, whether this is HEIF or a similar ring-fenced fund. Without this continued support the capability to react to business needs will significantly diminish. We are keen that in future, however, further clarity is given as to the purpose and function of the funding. In past rounds of HEIF, the incorporation of a small element of funding for 'community' activity within a funding stream that is overwhelmingly directed towards the development of links with business has caused institutions some confusion. We would prefer that this community element of funding be removed and allocated to institutions separately.

Analogue Production at Royal Holloway

HEIF funding from Royal Holloway, University of London enabled a Drama department based theatre group start-up, Analogue, to stage development (proof-of-concept) performances of a multi-media devised production, 'Mile End' and to take the show to Edinburgh, where it won The Scotsman Fringe First award as well as the Arches Brick Award for companies making contemporary work.

After the original HEIF investment in 2006, Analogue Production Ltd has attracted more than £120,000 in further funding, together with revenue from increasing ticket sales. The company has now developed and toured two major productions, co-producing with several major theatres to wide critical acclaim.

HEIF Funding at the University of York

HEIF funding has been used at York to create a central Research and Enterprise Office focused on ensuring that the research output of the University is translated to its maximum effect, through the support of expert personnel, project funding and the exploitation of IP.

We would expect that in a future ring-fenced innovation fund, the anomalies within the HEIF funding formula, which saw allocations to the majority of institutions either capped or supported through transitional funding, would be removed. We believe that this would be possible through the removal or significant reduction of the weighting given to faculty numbers within the funding algorithm. Whilst we recognise that this element was useful in the past in order to ensure that all institutions had capacity to engage with business engagement, we strongly believe that the time has come for this funding to move away from capacity development toward recognition and reward for excellence. Based on the clear evidence provided by the RAE, all 1994 Group institutions are world class centres of research excellence. They also pride themselves on the work that they do with business, multi-national, national and local. As with all other funding streams, the allocation of innovation funds in recognition of clear excellence and achievement will have a much greater impact in driving institutional strategy and behaviour.

Finally, it remains extremely important that the final formula for this discreet innovation fund clearly takes into account the nature of university engagement with SMEs. This will ensure that the funding can support the areas where it is needed most, to facilitate the relationship between smaller businesses in an appropriate way.

Technology Strategy Board

The Technology Strategy Board (TSB) invests a budget of around £100M per year in projects involving business and researchers working together to deliver successful new technology-based products and services. The role of the TSB is to 'stimulate technology-enabled innovation in the areas which offer the greatest scope for boosting UK growth and productivity.'

Working closely with universities to promote, support and invest in technology research, development and commercialisation, the TSB helps universities to diffuse knowledge by bringing them together with businesses to solve problems or advance current understanding. It also plays a central role in advising Government on how to better facilitate innovation and accelerate the exploitation of newly developed technologies. The TSB has achieved much success in collaboration with businesses and universities, and is an important part of the future landscape for encouraging and funding knowledge exchange.

There are many examples of universities successfully using TSB funded research to meet the needs of the wider business community. However, to maximise the impact of TSB funding, there is an argument that it should be opened up to enable it to be HEI-led, not just market-led. Clearly it must have commercial partners but new innovation and research does not and cannot always have the private sector partners as its owners and initiators.

Queen Mary, University of London's Metamaterials and Cobham plc

Metamaterials are a new class of artificial materials that have remarkable properties and real-world applications: they serve as the basis of 'invisibility cloaks' and negative refractive index material and can even be used to direct light around corners. In order to create new opportunities for the UK, a £2M programme of collaborative work has been funded by the TSB between Queen Mary, University of London, the National Physics Laboratory and Cobham plc, a major avionics and defence contractor, to develop new product opportunities using this research. Products being developed include masking materials to prevent the radio transmitters and receivers interfering with each other; more accurate radio directional beams for communication and radar applications and the increasing of fuel efficiency due to lowering the drag of antennas on civilian airframes. The three year programme is forecast to produce new products worth in excess of £100M in outputs to the UK economy.

Full Economic Costing and funding from business

The introduction of Full Economic Costing (FEC) has provided the opportunity for institutions to make more informed decisions about the financial consequences of managing individual research grants and contracts and has enabled the greater recovery of the cost base underpinning their research activity.

FEC has helped provide an improved understanding of costs and the real financial contribution of an institution's activities, and has provided an accurate and transparent basis for pricing research projects funded by business. However, many companies refuse to accept FEC as a reasonable price for a project, particularly where competing bidders are based in countries that do not have FEC in place.

Most Universities have policies in place to try to ensure that 100% FEC is recovered from business-funded projects, and those that are offered for less than 100% are considered on a case-by-case basis with careful consideration given to the other benefits which would be brought to the institution by a specific project (such as originality of research, freedom to publish, ownership of intellectual property or training of postdoctoral staff).

There remains the need to more effectively communicate the importance of FEC to businesses, so they can recognise the need for universities to be sustainable in order to support the core research base that business can utilise in the future. It is often difficult to achieve in the minds of investors the right balance between what it costs to undertake the research, the value of the research in terms of its economic and wider contribution, and the price that businesses are willing to pay.

Universities must identify the value of the projects to their own strategies when negotiating on contracts, and businesses need to be more flexible in funding arrangements recognising the costs to universities and the need for universities to be sustainable in the future.

The Government should look at ways to provide incentives to boost private income streams. A successful model which could be utilised is that of the matched funding scheme for voluntary giving to universities, which has seen much impact in enhancing the culture of donors and alumni engaging with universities. If such a scheme could be employed to encourage businesses to engage with and fund university research, this would be a valuable addition to the knowledge exchange landscape.

European Union funding

Many funding programmes from the EU encourage (indeed require) the inclusion of businesses on projects. Through funding streams channelled through regional development agencies, the EU has used programmes and initiatives such as the European Regional Development Fund (ERDF) and the various strands of the European Commission's Seventh Framework Programme (FP7) to foster links between UK universities and businesses.

East Anglia and the ERDF low carbon fund

The ERDF has made £250M available over seven years to support low carbon economic growth. As part of the programme, the University of East Anglia has been given £1.15M to promote Innovation in Crops (InCrops), a 'virtual enterprise hub' joining some of the East of England's world-class researchers with over 200 businesses. The aim of the programme is to foster the use of low carbon bio-renewables, drive innovation and technology transfer and develop projects for enhancing business opportunities, productivity and growth.

St Andrews and the FP7 Networks of Excellence

St Andrews is a member of three very successful FP7 Networks of Excellence consortia (Alistore, Idecat and FAME) which have resulted in forming continuation vehicles with partner European research institutions and bringing on board a range of commercial research partners who effectively club together with research subscriptions to fund pre-competitive research long before it is market-ready, but of strategic interest to the participating companies.

The amount of cooperation between UK universities and European industry is reflected in the country's overall success in securing high-value university-industry contracts (UICs). Although the percentage of UICs won by UK institutions as a total of all contracts awarded remains relatively small compared to other nations (around 22%), the average value of each contract (around €4.5m) remains amongst the top 6 nations in the EU.[27]

More broadly, the Regions of Knowledge funding stream has been used to strengthen the research potential of European regions, by encouraging and supporting the development of regional 'research-driven clusters', associating universities, research centres, enterprises and regional authorities. The programme has been earmarked a total of €126m to support university research projects, promote networking, and enhance knowledge exchange between firms, research organisations and enterprises, particularly SMEs. Together these two programmes are intended to fulfil the EU's larger desire to promote partnerships between universities and businesses and to highlight the important role that dialogue and co-operation between the two have to play in the economic recovery.[28]

[27] 'University-industry cooperation in the Research Framework Programme,' JRC Scientific and Technical Report, EUR 24078 EN, 2009

[28] 'A new partnership for the modernisation of universities: The EU Forum for University Business Dialogue,' SEC (2009) 425

8. Conclusions and Recommendations

Research-intensive universities have been extremely successful at using their research base and expertise to add value to business but there is more that can be done. We believe the following recommendations will help to foster more effective collaboration between universities and business in the years ahead:

For Universities:

- Further strengthen the growing academic culture of engagement with business.
- Support and incentivise academic staff to engage in knowledge exchange and company creation.
- Nurture a long-term outlook in terms of business relations, seeking to build long-standing strategic partnerships wherever possible.
- Create clear entry points for information and enquiries from businesses to assist them in utilising research strengths and outcomes.
- Nurture a cohesive approach to enterprise across an institution, with effective communication across departments so that an institution can adapt to meet the various needs of businesses.
- Be more open in regards to intellectual property and seek to collaborate in order to best exploit commercial products, such as investigating venture capital partnerships.

For Government:

- Retain the dual support system of research funding to allow universities the autonomy to invest in new and emerging areas and in curiosity-driven research to provide answers to tomorrow's problems.
- Ensure that the funding and research councils set meaningful strategies and coherent incentives for researchers to undertake work with applications in mind.
- Consider whether it would be more efficient and effective to further concentrate quality-related funds on the 30 or so institutions with the highest performances in the RAE.
- Maintain a dedicated ring-fenced innovation fund to encourage knowledge exchange between universities and business.
- Remove the element of funding for 'community' activity within the innovation funding stream, and allocate this to institutions separately.
- Remove or significantly reduce the weighting given to faculty numbers within the innovation fund, in order to move away from capacity development toward recognition and reward for excellence.
- Retain a focus on the nature of university engagement with SMEs within the ring-fenced innovation funding formula.
- Due to the key role they play in their local and regional economies, ensure that universities have a strong input into the development of the Local Enterprise Partnerships proposal.
- Provide appropriate support for building bridges between medium-sized research intensive institutions and venture capital funds, such as the previously proposed University Enterprise Capital Fund.
- Provide incentives to boost private income streams such as the successful matched funding scheme for voluntary giving to universities.

For Businesses:

- Recognise that universities are open for business and have a wide range of potential contributions to make to their activity.
- Engage with universities and the academic community, and openly communicate their needs and interests.
- Work with universities in developing long term partnerships, and use TSB supported mechanisms such as KTPs and collaborative research programmes to foster meaningful relationships.
- Use universities' consultancy systems to develop links with academics who can help solve problems and cater to specific knowledge needs.
- Be flexible in funding and IP arrangements recognising the costs to universities and the need for them to be sustainable to support the core research base that business can utilise in the future.

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