

GLOBAL EDUCATION DIALOGUES STIMULUS PAPER

**COMMERCIALISING UNIVERSITY RESEARCH:
BUILDING MULTI-FOCUS KNOWLEDGE HUBS
AND THE RISE OF STRATEGIC PARTNERSHIPS**
TOMAS COATES ULRICHSEN

ABOUT THE AUTHOR

Tomas Coates Ulrichsen joined the Centre for Science, Technology and Innovation Policy at the University of Cambridge in May 2012 as a Policy Fellow. His academic interests lie in the role and dynamics of the university research base in the innovation system, with a particular emphasis on processes of technology emergence, technology transitions, and industrial transformation.

Prior to joining CSTI, he was an Assistant Director of a leading UK economic development consultancy, Public and Corporate Economic Consultants (PACEC). Much of his work at PACEC involved research into the role of universities in the innovation system and analysing the knowledge exchange process. He directed and managed a number of high profile evaluations of innovation policies designed to strengthen the university-external user interface including the Higher Education Innovation Fund in England and the SPIRIT demand-led knowledge exchange funding programme in Scotland. Much of this work was undertaken in collaboration with colleagues at the Centre for Business Research, University of Cambridge and reports arising from these collaborations have been published in the CBR Special Report series [external link](#). In April 2012 he published a report on key developments in the English Higher Education sector targeted at strengthening knowledge exchange activities of universities.

This paper was commissioned as part of the British Council's Global Education Dialogue, From Catapults to Commercialisation: How can universities use their knowledge and research more effectively?

9, 10 March 2015, The Crawford School of Public Policy, Australian National University.

All opinions are the author's own.

© **British Council 2015**

The British Council is the United Kingdom's international organisation for cultural relations and educational opportunities.

COMMERCIALISING UNIVERSITY RESEARCH: BUILDING MULTI-FOCUS KNOWLEDGE HUBS AND THE RISE OF STRATEGIC PARTNERSHIPS

TOMAS COATES ULRICHSEN, CENTRE FOR SCIENCE, TECHNOLOGY AND INNOVATION POLICY, UNIVERSITY OF CAMBRIDGE

1. Introduction

“The full diversity of [universities] has a role to play from local SME support and supply chain creation to primary technology leadership and breakthrough invention.”

– *Encouraging a British Invention Revolution: Sir Andrew Witty’s Review of Universities and Growth, 2014*

How to strengthen the role of universities in, and contributions to, the innovation system and wider economic development has become a major imperative for UK science and innovation policy. Universities are under growing pressures to play more active and strategic roles in tackling major national and global societal challenges, addressing the technological and innovation challenges in strategically important industrial sectors, and helping to stimulate an innovation-led, export-driven economic recovery. At the same time, universities are under pressure to become the engines of local innovation and economic growth strongly anchored in their local economies.

Universities have been evolving to become increasingly strategic knowledge hubs *“deeply embedded in innovation systems, seeking to actively foster interactions and spillovers to link research with application and commercialisation, and taking on roles of catalyzing and animating economic and social development.”*¹ Their contributions are diverse and far-reaching, stretching well beyond those technology transfer activities typically associated with the ‘science push’ conceptualisation of universities developing and commercialising new technologies. Indeed they work with many types of firm and non-firm organisations in many sectors of the economy, across multiple geographies. They engage through many pathways and draw on different types and combinations of internal physical, human, intellectual and social capital developed within their institutions.

This stimulus paper explores how universities are developing their roles in the innovation system and the many routes through which university knowledge can be commercialised and exploited. It also identifies some key developments in the *system* of support for this type of activity and examines the rise and implications of strategic university-industry partnerships. It concludes by setting out key questions that should be explored to understand how universities can further exploit their knowledge and research for economic and social benefit.

2. Commercialising university research: many contributions, many routes, and the need for support

Universities’ role in the process of technological development and innovation has long been acknowledged. However, our understanding of this role has shifted from seeing

¹ Youtie, J., Shapira, P. (2008) “Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development” *Research Policy* vol. 37

universities as developers of basic scientific knowledge for industrial innovation, inventions, and human capital, to one where they are seen as active contributors in many ways to the innovation and economic development process, fully embedded in the innovation system.

Exploring the many contributions of universities in the innovation system

Universities contribute both directly to the innovation activities within firms and other organisations as well as to the development of the wider institutional framework and system within which this occurs. Key areas include: developing talent & human capital; developing & deploying knowledge/ technologies for innovation & problem solving; strengthening (spatial) conditions for innovation; facilitating access to finance for R&D and innovation; providing (physical and conceptual) spaces for open-ended conversations and entrepreneurial experimentation. More detail is provided in Table 1.

Table 1 *Diversity of functions performed by universities in the innovation system*

Category	Function
Developing talent & human capital	Developing skilled labour (both generic/domain specific skills)
	Developing entrepreneurial / enterprise skills
	Workforce development & training (generic, advanced)
Developing & deploying knowledge/ technologies for innovation & problem solving	Knowledge generation through user funded research / co-produced research
	Adding to the stock of codified knowledge e.g. through publications, patents, prototypes
	Transferring existing knowledge/know-how e.g. through consultancy, informal linkages
	Investing in & enabling access to, specialised infrastructure, instrumentation and equipment
	Providing technical assistance
	Commercialising new technologies through new venture creation & licensing
Strengthening (spatial) conditions for innovation	Providing policy leadership & expertise to inform local policies & strategies
	Strengthening local capabilities and capacity for entrepreneurship & innovation
	Supporting internationalisation activities of local firms & attracting talent, investment, resources
	Developing infrastructure supporting local innovation and economic growth
	Developing business assistance
	Strengthening other regional competitiveness conditions (e.g. quality of life)
Accessing finance	Facilitating access to finance for R&D and innovation
Providing spaces for open-ended conversations and entrepreneurial experimentation	Convening academics/industry researchers/innovators networks
	Supporting creation of industry identity
	Developing industry-responsive curricula
	Bridging disconnected actors in system
	Hosting and participating in standards setting forums
	Providing forums for potential investors
	Understanding industrial development pathways and market opportunities
Providing spaces with necessary support encouraging entrepreneurial experimentation (e.g. incubators / innovation centres)	

Source: developed from Coates Ulrichsen, 2012; Lester, 2005; Breznitz and Feldman, 2012; Gunasekara, 2006; Youtie and Shapira, 2008; Jacobsson and Vico, 2010

These contributions are, importantly, shaped by the type of industries (or other target user community) with which they seek to engage². Figure 1, for example, important differences in contributions to: emerging new industries; the transplantation of an industry that exists elsewhere into a region; the diversification of existing local industries into technologically related ones; and the upgrading of existing industries.

Figure 1 Contributions of universities in different types of industries

<p>Type 1: creating new industries</p> <ul style="list-style-type: none"> • Forefront science and engineering research • Aggressive technology licensing policies • Promote/assist entrepreneurial businesses (incubation services, etc.) • Cultivate ties between academic researchers and local entrepreneurs • Creating an industry identity <ul style="list-style-type: none"> ✓ Participate in standard-setting ✓ Evangelists ✓ Convene conferences, workshops, entrepreneurs' forums... 	<p>Type 2: importation / transplantation of industries</p> <ul style="list-style-type: none"> • Education/manpower development • Responsive curricula • Technical assistance for sub-contractors, suppliers
<p>Type 3: Diversification of existing industries into technologically related new ones</p> <ul style="list-style-type: none"> • Bridging between disconnected actors • Filling 'structural holes' • Creating an industry identity 	<p>Type 4: upgrading of existing industries</p> <ul style="list-style-type: none"> • Problem-solving for industry through contract research, faculty consulting, etc. • Education/manpower development • Global best practice scanning • Convening foresight exercises • Convening user-supplier forums

Source: Lester (2005)

These contributions are realised through many formal and informal interactions between academics and other professionals within the university, and organisations in private, public and charitable sectors³. Research has also revealed that firms engage with universities to support activities across the breadth of its value chain, supporting not just the development of new technologies but also the knowledge, capabilities and competences that address challenges associated with its subsequent exploitation and commercialisation⁴.

Exploring what constrains these university-industry interactions, the following factors frequently emerge as important⁵:

- Time pressures & incentives facing academics
- Resources to fund engagement
- Difficulties in identifying partners & access
- Differences in timescales
- Bureaucracy & internal management processes
- Capabilities of academics/firms to engage
- Alignment of, and expectations from, relationship

² Lester, R. (2005) "Universities, innovation, and the competitiveness of local economies. A summary Report from the Local Innovation Systems Project: Phase I" *Massachusetts Institute of Technology, Industrial Performance Center, Working Paper Series MIT-IPC-05-010*

³ Abreu, M., Grinevich, V., Hughes, A., and Kitson, M. (2009) *Knowledge Exchange between Academics and the Business, Public and Third Sectors*, UK Innovation Research Centre report

⁴ Hughes, A. and Kitson, M. (2014) *Connecting with the Ivory Tower: Business Perspectives on Knowledge Exchange in the UK*, UK Innovation Research Centre report

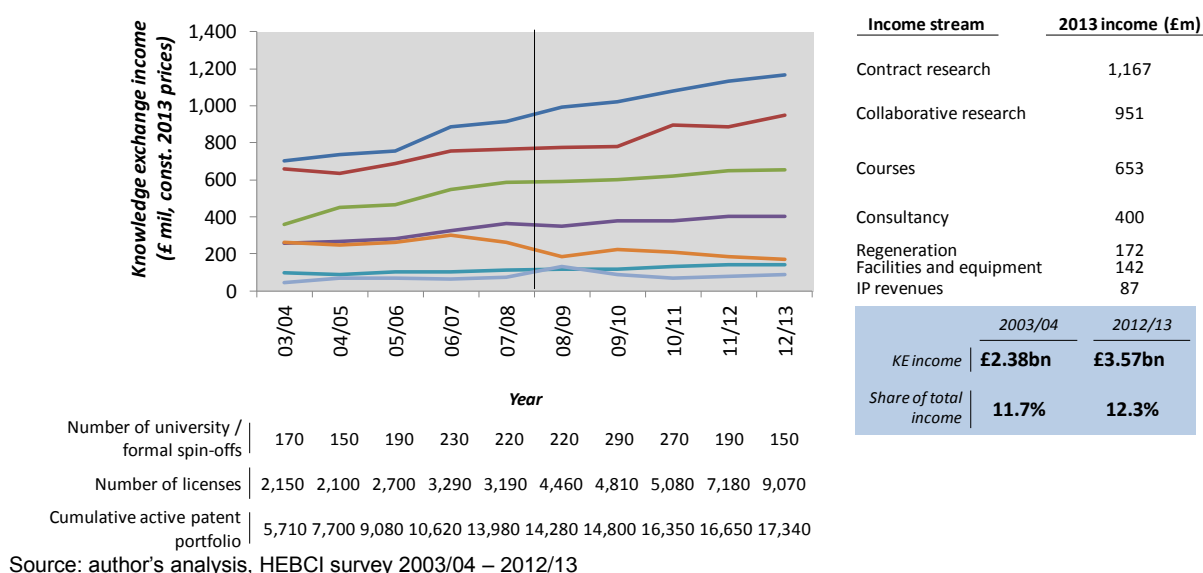
⁵ Hughes, A., Kitson, M. (2012) "Pathways to impact and the strategic role of universities: new evidence on the breadth and depth of university knowledge exchange in the UK and the factors constraining its development" *Cambridge Journal of Economics*, vol. 36; Wilson, T. (2012) *A Review of Business-University Collaboration*

- Understanding when IP becomes an issue & challenges over IP negotiations.

Trends at the UK university-industry interface

Some of these direct roles in supporting industrial R&D and innovation have a long – but perhaps less well recognised – history. However, there is strong evidence that the scale of activity amongst UK universities has grown substantially over the past few decades. Income from knowledge exchange has grown rapidly, from £2.38 billion in 2003/04 to £3.57 billion in 2012/13 (constant 2013 prices), and now represents 12.3% of total income. In addition, the expectations of large financial windfalls from licensing intellectual property have, for most, not materialised. While patenting IP may be very important (e.g. for ensuring that academics are able to continue working in particular areas or for ensuring IP is suitably protected to attract companies to commercialise it), universities generate significantly more income from undertaking contract and collaborative research, delivering workforce development courses and providing consultancy based on the knowledge they have accumulated.⁶

Figure 2 Trends in knowledge exchange activities with UK universities 2003/04 – 2012/13



The institutionalisation and support of knowledge exchange activity

What is also new is the growing *institutionalisation* of this activity⁷. Under the old model, governance of knowledge transfer activity was largely driven by an academic's personal relationships with industry and government with little involvement of the university. That began to change in the US in the 1970s and in the UK in the 1980s with the introduction of new university-based organisational structures and incentives to support knowledge transfer in the belief that the previous model was inefficient in meeting the demands of knowledge-driven industries⁸. Most recently evidence is mounting that universities are becoming more proactive and strategic in developing

⁶ For a detailed analysis of these trends, see Coates Ulrichsen, T. (2014) *Knowledge Exchange Performance and the Impact of HEIF in the English Higher Education Sector*, a report for HEFCE

⁷ Geuna, A., Muscio, A. (2009) "The governance of university knowledge transfer: A critical review of the literature" *Minerva* vol. 47

⁸ Ibid.

their innovation and economic development roles, positioning themselves as important 'knowledge hubs' in the innovation system⁹. Reflecting this are systematic attempts to enable increasingly collective and coordinated activity to emerge, convening resources, expertise and knowledge from across the university to address strategically defined innovation challenge areas.

The growth of activity in the UK has also been underpinned by a significant investment in the underlying *system* of support, incentives and capabilities aimed at enabling this type of activity to occur¹⁰. Some of these investments aim to create a more fertile environment for encouraging university-industry engagement, including:

- Developing dedicated strategies that increasingly position this type of activity as a core enabling function for realising impacts from research and teaching as well as from the wider resources and assets at the university
- Introducing new leadership roles to take forward this agenda and provide clear signals of commitment by the institution
- Strengthening incentives and rewards including incorporating such activity within promotions and assessment processes
- Investing in training and other initiatives to develop the necessary capabilities amongst academics and professional staff to develop effective linkages into the wider innovation system.

Other developments aim to put in place support functions that strengthen different parts of the university-industry interface. This extends well beyond the well-known technology transfer offices supporting university spin-outs and technology licensing, to include, for example: building and sustaining major corporate partnerships; industrial liaison; developing and delivering workforce training programmes and courses; facilitating access to the university, particularly for local SMEs; developing their innovation infrastructure e.g. incubators and innovation centres; and initiatives supporting local economic development and innovation.

In addition, UK universities are increasingly emphasising¹¹:

- The importance of building long-term relationships and strategic partnerships
- Finding new ways of working with, and supporting the needs of, SMEs
- Reflecting on how they can, as an institution, further embed themselves in their local economies and communities
- Improving the dialogue between academics and users to understand capabilities and needs of both sides and, critically, constraints
- Improving access to their institutions, both to the knowledge and expertise they hold, and to the facilities and equipment they possess

⁹ Coates Ulrichsen, T., Moore, B. and Spires, R. (2012) *Strengthening the Contribution of English Higher Education Institutions to the Innovation System: Knowledge Exchange and HEIF Funding*, a report to HEFCE; Youtie, J., Shapira, P. (2008) "Building an innovation hub: A case study of the transformation of university roles in regional technological and economic development" *Research Policy* vol. 37

¹⁰ Coates Ulrichsen, T., Hughes, A., and Moore, B. (2009) *The Evolution of the Infrastructure of the Knowledge Exchange System*, a report by PACEC to HEFCE

¹¹ Coates Ulrichsen, T. (2014) *Knowledge Exchange Performance and the Impact of HEIF in the English Higher Education Sector*, a report for HEFCE

- Developing a more holistic approach to industrial engagement helping to coordinate activity across the institution and minimise conflicting incentives that can sometimes arise.

3. Partnership models matter: exploring the rise and value of strategic university-industry partnerships

“Long-term commitments are believed to deliver results that have more impact than isolated collaborative projects, and can provide a broader range of benefits to all parties involved.”

– Key guiding principle for developing university-industry partnerships from the US President’s Council of Advisors on Science and Technology report *“University-Private Sector Research Partnerships in the Innovation Ecosystem”*

The above quote from a 2008 US report highlights the belief that long term, strategic university-industry partnerships deliver additional value, both in nature and scale, compared to what can be achieved through other types of partnership model. These types of partnerships are becoming an increasingly important feature of the university-industry landscape in both the UK and US. There is mounting evidence to suggest that large research intensive multinational firms have been rationalising their investments in universities to focus on a core set of strategic, longer-term partnerships with a selective group of universities and curtailing the number of non-core universities with which they engage. Their decisions are also becoming increasingly global as opportunities open up in key emerging economies. These types of partnerships stretch well beyond the life sciences to include an increasingly diverse range of sectors such as aerospace and defence, energy, ICT and consumer goods.

Responding to these trends, and the growing belief of additional value, UK universities have been actively looking to form strategic, deeper, and longer-term partnerships with selected external organisations built on principles of co-creation. The University of Exeter highlights this trend, *“moving to a model of co-investment or co-creation with industry where we share the costs of research and increasingly share IP, networks and know how. This holistic approach to KE, emphasizing the co-creation of knowledge and the various routes of knowledge exchange... has already proved successful in building long-term strategic partnerships with some industrial partners, evidenced by exchange of staff and students, open innovation platforms, company-owned infrastructure and resources in the University and extensive high level dialogue between university and industry management to align strategic objectives and deepen partnership for mutual benefit.”*¹².

These partnerships can be hard to secure and set up, but if successful, can unlock a range of benefits for both the firms involved as well as the universities (Figure 3).¹³ This work also found that successful partnerships were built on trust, flexibility and a culture of continuous learning, co-development and a focus on delivering mutual value. They often require dedicated resources to initiate, manage develop over time and require additional capabilities and competences to be put into place both to support the partnership and to enable effective working at the interface. This may require additional resources to be invested and as such there may well be a limit to the number of strategic partnerships a single university can host.

¹² University of Exeter institutional strategy for knowledge exchange 2011-15

¹³ Coates Ulrichsen, T. and O’Sullivan, E. (2014) *Building Long-Term Strategic University-Industry Partnerships: Lessons and Effective Practices from UK and US Experiences*, workshop executive summary

Figure 3 Benefits realised by the university and industrial partners through strategic partnerships

Benefits to the university partner	Benefits to the industrial partner
<ul style="list-style-type: none"> • Provide a focal point around which to develop and coordinate critical mass, often interdisciplinary, resources to address major innovation challenges • Work with industry to identify, and secure funding to explore, hard industrial technology and innovation challenges • Shaping research directions, not least through a greater understanding of industrial innovation needs, and the pathways to exploiting research • Access to specialised facilities, equipment, materials databases and other resources in industry • Enriching the student experience and recruitment opportunities • Strengthen capabilities of researchers and build effective routines for working effectively across the interface • Support local economic development, not least the attraction of what are often sustained, multi-million pound R&D investments. 	<ul style="list-style-type: none"> • Support technological development, particularly addressing longer term, larger scale innovation challenges too risky to undertake internally, or where critical mass activity is required • Develop technologies further along the innovation value chain • Leverage complementary research capabilities, infrastructure and, importantly additional R&D funding • Enhance the efficiency and effectiveness of identifying, accessing and absorbing knowledge from within the university base • Develop talent, workforce skills and capabilities, both in specific technical and managerial areas as well as for working effectively across the interface with universities • Enable access to specialist resources and infrastructure that would be hard in the absence of long term commitments and trust • Facilitate entry into new national or regional innovation systems where the firm has limited prior understanding of the landscape • Strengthen policy engagement and development of institutions supporting technology emergence

Source: Coates Ulrichsen (2014)

4. Conclusions and key questions for consideration

This stimulus paper has highlighted the many and varied ways through which universities exploit their knowledge, expertise and resources to support both the innovation activities within firms as well as to strengthen the wider innovation system in which this activity takes place. Importantly, UK universities have been developing increasingly strategic approaches to how they contribute to innovation and economic development, working to create a more fertile environment for activity to emerge and strengthening the university-industry interface in specific areas. Crucially, partnership models do matter. There are many instances where informal or ad-hoc transactional interactions are appropriate. However, the emergence of strategic partnerships reflects a belief on both sides that deep, long term and institution-level relationships have the potential to unlock significant value for the development, exploitation and commercialisation of knowledge that would be hard to realise through other approaches.

Key questions for consideration

1. How can universities' roles be adapted and strengthened to enhance their contributions to: (a) the innovation activities of firms, groups of firms or the wider system; and (b) to the underpinning innovation conditions and institutional framework of the innovation system?
2. How can the variety of resources, knowledge and expertise held across a university be more effectively mobilised to address major regional, industrial or other innovation challenges?
3. How can the organisational structures and capabilities of a university be strengthened to: (a) create a fertile environment for university-industry linkages to form; (b) facilitate access; and (c) work effectively across the interface?
4. What partnership models are most effective for addressing different innovation challenges?
5. What types of government policies and programmes are required to enable universities to develop the capabilities and capacity to build effective and sustain productive linkages with firms and other actors in the innovation system?