New developments in the movement of ideas: from technology transfer to knowledge exchange

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The evolution of university-business links

• Mode 1: the ‘laissez faire’ model
  – Importance of chance, luck and serendipity

• Mode 2: technology transfer - the entrepreneurial university
  – Focus on a narrow range of technology transfer mechanisms

• Mode 3: knowledge exchange - the connected university
  – Focus on a wide range of interactions
  – Exchange rather than transfer
Mode 1: the laissez faire model

- Universities focussed on two missions – research and education
- Example: the ‘Cambridge Phenomenon’ initially developed when the University took little active interest in business engagement. In the past:
  - University largely ignored IP issue
  - Adopted a liberal attitude to what academics did
  - Industrial liaison merely acted as ‘window’ on what the university did – little exchange or dialogue
Survey of 22,000 Academics

Survey of 2,500 Businesses
Mode 2: technology transfer - the entrepreneurial university

- Focus on Technology Transfer
- Mechanisms: Patents, Licenses, Spin-outs
Technology Transfer in the UK: Commercialisation Activities by Academics in the previous 3 years

- Patents (7% of academics)
- Licenses (5% of academics)
- Spin-outs (4% of academics)
Taken out a patent in the last 3 years (% of respondents)

Licensed research outputs to a company in the last 3 years (% of respondents)

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.
Formed a spin out company in the last 3 years (% of respondents)

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.
Limitations of the entrepreneurial university

• Significant economic and social returns but financial and private returns were frequently over-estimated

• Metrics distorting behaviour (Goodhart’s Law: any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes)

• Model is incomplete
65% of licensing earnings came from just 3 of the 8000 inventions which have passed through the doors of the OTL at Stanford:

- Google’s improved hypertext searching: $337 million
- DNA cloning: $255 million
- Functional antibodies: $229 million

Stanford struggled to put a value on Google and opted for 2% of equity, and immediately cashed out post-IPO.

(Source: Katherine Ku, Director of Stanford University’s Office of Technology Licensing)
$150 million. Royalties received by the University of Florida from sales of Gatorade developed by inventor Dr. Robert Cade
Mode 3: knowledge exchange - the connected university

- Multiple knowledge exchange mechanisms
- Role of many disciplines (not just STEM)
- Interactions with public and third sectors as well as with business
- Public space functions (*Universities do not move!*)
  - Relatively neglected, but distinctive
  - Includes networking, social interaction, meetings, conferences etc
- Focus on ‘exchange’ not simply ‘transfer’
Other types of interactions beyond technology transfer

• People based activities
  – Training, networks, conferences etc

• Problem-solving activities
  – Contract research, joint publications, informal advice etc

• Community based activities
  – Lectures for the community, exhibitions, school projects
Commercialisation Activities in the UK

Format adapted from Ulrichsen (2009)
Abreu, Grinevich, Hughes and Kitson (2009)
All Interactions for UK

**People-based activities**
- Giving invited lectures: 65
- Participating in networks: 33
- Student placements: 67
- Standard-setting forums: 31
- Enterprise education: 28
- Attending conferences: 87
- Sitting on advisory boards: 38
- Employee training: 33

**Community-based activities**
- Lectures for the community: 38
- Public exhibitions: 30
- Schools project: 15
- Community-based sports: 3

**Commercialisation activities**
- Licensed research: 5
- Patenting: 7
- Spun-out company: 4
- Formed/run consultancy: 14

**Problem-solving activities**
- Joint research: 49
- Research consortia: 35
- Informal advice: 57
- Prototyping and testing: 10
- External secondment: 10
- Contract research: 37
- Setting of physical facilities: 9

Format adapted from Ulrichsen (2009)
Abreu, Grinevich, Hughes and Kitson (2009)
Who do academics partner with?

- Private sector companies across a range of sectors (40% of academics)
- Public sector - UK and abroad (53% of academics)
- Third sector – including charities, non-profit organisations and social enterprises (44% of academics)

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.)
UK Data Archive Study Number 6462.
Interactions with private sector companies (% of respondents)

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.
Interactions with public sector organisations (% of respondents)

- All
- Health sciences
- Social sciences
- Engineering, Materials science
- Arts and Humanities
- Physics, Mathematics
- Biology, Chemistry, Veterinary science

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.
Interactions with the third sector organisations (% of respondents)

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.
Importance of Technological Innovation
Why businesses interact with Universities?

Inbound logistics
Operations
Outbound logistics
Marketing and sales
Service
Introduction of new product and/or new process
Procurement
Technology development
Human Resource Management
Firm infrastructure

Who do businesses interact with?

Constraints
Constraints on interactions with external organisations (% of respondents – All and Engineering)

- Lack of time
- Bureaucracy / inflexibility of univ admin
- Insufficient rewards
- Insufficient resources
- Unwillingness in external org to meet full cost
- Lack of interaction resources in external organisation
- Identifying partners
- Differences in timescale
- Lack of external interest
- Lack of experience in external organisation
- Poor marketing/technical/negotiation skills in univ
- Reaching agreement on terms (incl IP)
- Cultural differences
- Other

Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462
Academic and business perceptions of constraints on interactions

Businesses (%) employing someone to liaise with HEIs

Reasons for not interacting (% of non collaborating firms)

- Not considered relevant: 70%
- No information on potential benefits: 50%
- No information on how to go about it: 50%
- Considered too time consuming: 40%
- Considered too complicated: 30%
- Considered too expensive: 20%
- Tried in the past and it did not work: 10%

Businesses (%) interacting with HEIs

Mode 2 v Mode 3

- The importance of technology transfer
- Only part of the knowledge exchange picture ignores many people-based, problem-solving and community interactions
Mode 2 v Mode 3

• Focus on university-business links
• Ignores the many and varied interactions with the public and third sectors
• Businesses connect with academia for technical innovation

• Businesses connect with academia for many reasons, many of which are NOT concerned with technical innovation
Mode 2 v
Mode 3

• Major constraints include cultural difference and disputes over IP

• Such constraints only apply to small range of interactions

• Significant constraints/problems include a lack of resources (time and people) and a lack of information
Knowledge Exchange in the UK: The State of Play

- There are significant interactions between academics and the rest of society.
- Other evidence may understate the importance of academics as they look at formal collaborations and focus on narrow innovation.
- Wide range of interactions, but people-based interactions are most frequent.
- Interactions encompass a wide range of disciplines not just STEM.
- And involve public and third sectors as well as business.
- ‘Third stream’ may be a misnomer as interactions support teaching and research.
Implications for policy and practice

• Academia is an important source of knowledge for wider innovation

• The demand-side problem
  – Lack of competences and relevant skills in business

• The size problem
  – Difficult for SMEs to connect with universities
  – The aggregation problem for knowledge exchange projects

• The information problem – lack of knowledge about what academia can offer and how to access it
Implications for policy and practice

- The importance for ‘boundary spanners’ to initiate and manage interactions
- May require new skills in existing organisations
- May require new intermediary organisations
THE MYTH OF THE ACADEMIC IVORY TOWER