Institution: University of Nottingham

Unit of Assessment: 19 Business and Management Studies

Title of case study: Enhancing the entrepreneurial capabilities of academics

1. Summary of the impact

Research at the University of Nottingham has augmented the aspirations and entrepreneurial capabilities of academic researchers through participation in the Biotechnology Young Entrepreneurs Scheme (YES) business plan competition.

The content and pedagogy of the competition are built upon research pioneered by the University of Nottingham Institute for Enterprise and Innovation (UNIEI), delivered together with research councils and industry. Since 2008, more than 2,000 researchers have participated in the scheme and an independent evaluation demonstrated that it has enhanced their entrepreneurial skills, augmented their career aspirations and increased their engagement in the process of commercialising academic research.

2. Underpinning research

In 2005 the UK research councils approached UNIEI with the challenge of how to expand the scale and scope of the Biotechnology YES competition without compromising its positive impact upon participants. Three strands of research activity were drawn upon to design, implement and refine Biotechnology YES.

First, a series of theoretical and empirical studies of academic entrepreneurship led by Simon Mosey and Mike Wright revealed insights regarding human capital gaps that appear to constrain academic entrepreneurship (published in 2004) [1]. Conceptual models were developed and tested that revealed generic constraints such as a lack of opportunity identification skills and a lack of appreciation of the needs of industry and equity financiers. More specifically, in the case of academic scientists, it was found that the communication and negotiation skills developed within the research community were not sufficient to articulate the latent value of academic research to the industrial community [2].

Second, a body of work led by Simon Mosey and published in 2007 revealed social capital gaps that limited the ability of academics to develop the requisite entrepreneurial and management skills [3]. Here a typical academic scientist was found to be embedded within a network of peer academics that limited access to the new insights and knowledge they required to develop the commercial potential of their research. It was argued that by building new relationships with industry practitioners and financiers outside the academic network, nascent academic entrepreneurs could develop entrepreneurial skills and iteratively grow their fledgling businesses by attracting experienced managers and equity finance [4].

Third, a long tradition of work within entrepreneurship education led by Martin Binks and published in 2006 revealed that the most effective pedagogic models for developing such entrepreneurial skills involved integrative learning [5]. Only through a combination of theoretical instruction from academics, practical coaching from industry experts and reflection upon entrepreneurial activity could such skills be effectively developed and delivered on a scalable basis. Work by Bart Clarysse and Mosey (published 2009) considered how best to deliver such integrative learning for scientists and technologists. They concluded that entrepreneurial `boot camps' where participants enact the process of identifying, evaluating and presenting a novel idea to potential investors constituted a highly effective educational method [6].

The combination of these research insights has been central to the design and delivery of Biotechnology YES. Research identifying human and social capital gaps has directly informed learning objectives which are met by a delivery method developed from pedagogical research to provide scalable integrative learning specifically tailored to the needs of academic scientists.

Key researchers:
Simon Mosey (UoN from 1998 to current, now Professor of Entrepreneurship & Innovation)
Mike Wright (UoN from 1985 to 2011, Professor of Entrepreneurship)
Martin Binks (UoN from 1979 to current, now Professor of Entrepreneurial Development)
Bart Clarysse (UoN from 2006 to 2008), Professor of Entrepreneurship)

3. References to the research (indicative maximum of six references)

Wright, M.; Birley, S.; Mosey, S.(2004)., "Entrepreneurship and University Technology Transfer", Journal of Technology Transfer, Vol.29 (3-4), pp.235-246. Available on request. 1*
http://link.springer.com/article/10.1023%2FB%3AJOTT.0000034121.02507.f3#

Mosey, S.; Lockett, A.; Westhead, P.(2006)., "Creating Network Bridges for University Technology Transfer", Technology Analysis and Strategic Management, Vol.18 (1), pp. 71-91. Available on request. 2*
DOI:10.1080/09537320500520635
http://www.tandfonline.com/doi/pdf/10.1080/09537320500520635

Mosey, S.; Wright, M.(2007)., "From Human Capital to Social Capital: A Longitudinal Study of Technology Based Academic Entrepreneurs", Entrepreneurship Theory and Practice, Vol.31, pp.909-935. Available on request. DOI: 10.1111/j.1540-6520.2007.00203.x.
4* http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6520.2007.00203.x/pdf

Mosey, S.; Westhead, P.; Lockett, A.(2007)., "University Technology Transfer: Network Bridge Promotion by the Medici Fellowship Scheme", Journal of Small Business and Enterprise Development, Vol.14 (3), pp. 360-384. DOI: 10.1108/14626000710773493. 2*
http://dx.doi.org/10.1108/14626000710773493.

Binks, M., Starkey, K., & Mahon, C. (2006)., “Entrepreneurship Education and the Business School”, Technology Analysis & Strategic Management, Vol.18(1), pp. 1-18. Available on request. DOI: 10.1080/09537320500520411. 2*
http://www.tandfonline.com/doi/pdf/10.1080/09537320500520411

Clarysse, B.; Mosey, S.; Lambrecht, I.(2009)., "New Trends in Technology Management Education: A View from Europe", Academy of Management Learning and Education, Vol.8(3) Sept 2009. Available on request. 3*

4. Details of the impact

The University of Nottingham Institute for Enterprise and Innovation (UNIEI) within the Business School has worked closely with the Biotechnology and Biological Sciences Research Council BBSRC) since 1995 to manage and deliver Biotechnology YES. In response to the challenge of growing the scheme, Simon Mosey and Tracey Hassall Jones (UNIEI) worked with Simon Cutler (Senior Innovation and Skills Manager, BBSRC) to develop and deliver the Biotechnology YES growth plan in 2005 that introduced content and pedagogical additions based upon UNIEI research. This allowed for the scheme to grow and yet retain the rich learning experience enjoyed through small cohorts. The scheme pioneered the use of opportunity identification training [2], introduced peer reviewed investment pitches for all participants [6] and provided interaction on a large scale with industrialists and equity financiers as mentors and judges across the whole cohort [3, 4].

As a result, participation in the scheme grew from under 200 in 2005 to more than 400 in 2011. In total, more than 2500 academic researchers took part between 2005 and 2011 [A, page 7]. Expansion into other academic disciplines ensued with a variant for environmental scientists initiated in 2006 (with the Natural Environment Research Council) and two further schemes launched in 2009 to bring this unique delivery model to the engineering and sustainability research communities (with the Engineering and Physical Sciences Research Council).

This growth was further accelerated through wider (industry) partnerships: a bespoke competition was held for microbial and plant scientists at Syngenta's Jealotts Hill research site in 2011 [A, page 12]. Similarly, a competition for biomedical scientists was launched at GlaxoSmithKline's Bio incubator in Stevenage in 2012, together with the Medical Research Council and Wellcome Trust. The CEO of the Bio incubator explained the added value hosting the competition on industrial sites:

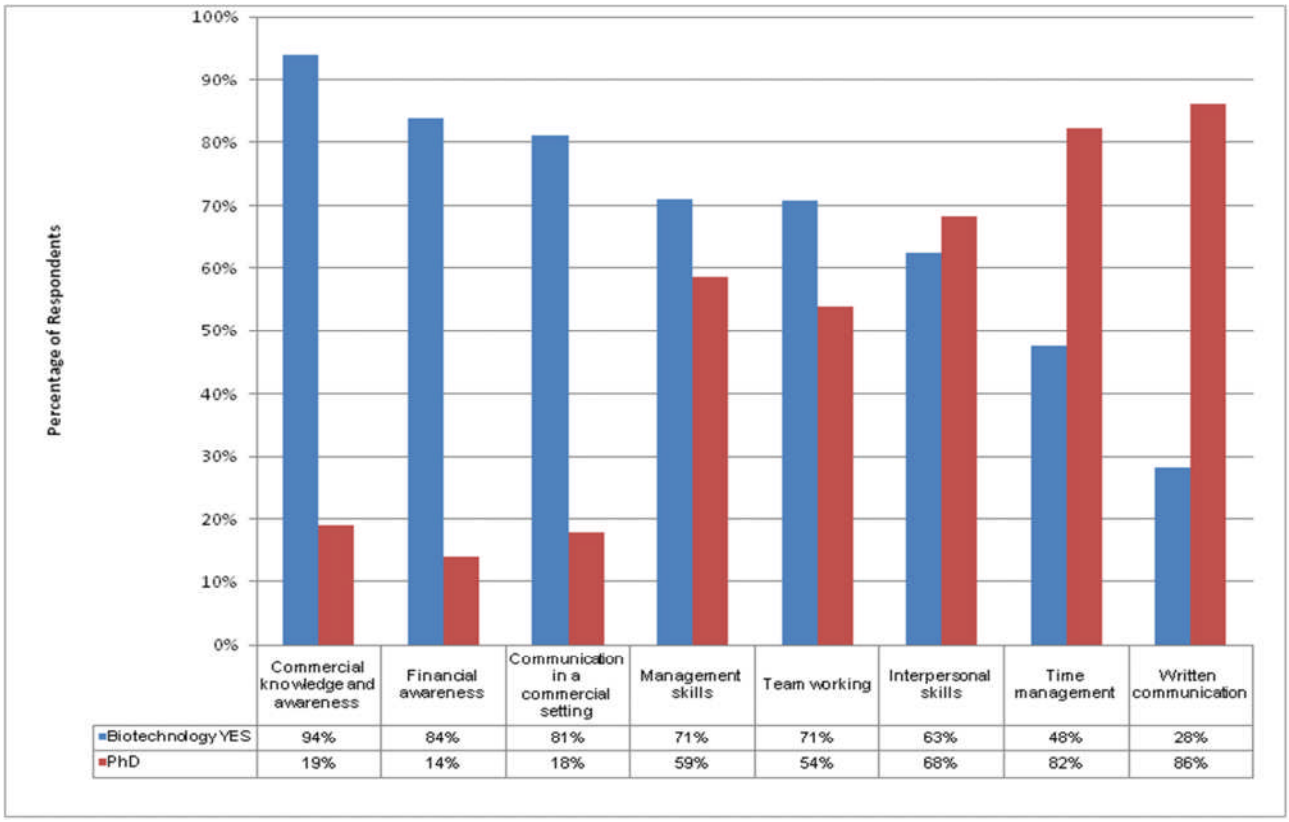
> *"I've seen many times the value and benefit young entrepreneurs can derive from being exposed to an incubator and seeing for themselves what can be achieved away from academic research. It is a highly networked atmosphere they are not traditionally exposed to early in their careers – a space where early start-ups develop and grow. It's a whole new world which provides a real-life focus."*
> *Martino Picardo, CEO of GSK Bio Incubator, 2012 [B, page 2]*

This continued expansion has been highly endorsed by the UK Government:

> *'I would like to congratulate all the participants of the Biotechnology and Environment YES competitions on their success. Scientists who are able to combine their expertise with an understanding of business are a very precious resource. By learning how to translate research into wider successes, they can help ensure their work delivers the maximum benefits to society and the economy. I am impressed that the participants are taking the opportunity to develop their skills and knowledge at this early stage of their careers - it suggests a bright future for the commercialisation of UK research.'*
> *David Willetts, Minister for Universities and Science, 2011 [A, page 1]*

In 2010, an independent review of the scheme, commissioned by the BBSRC reported [C] that:

i. Biotechnology YES participants were found to develop a different set of skills than those developed through taking a PhD. Specifically commercialisation knowledge, financial awareness and the ability to communicate in a commercial setting were all increased as illustrated below:



	Commercial knowledge and awareness	Financial awareness	Communication in a commercial setting	Management skills	Team working	Interpersonal skills	Time management	Written communication
Biotechnology YES	94%	84%	81%	71%	71%	63%	48%	28%
PhD	19%	14%	18%	59%	54%	68%	82%	86%

ii. Biotechnology YES was found to have a significant impact upon the career aspirations of participants by developing a greater awareness of employment opportunities outside

academia and enhancing the propensity to set up their own business.

iii. A higher proportion of participants were employed within industry than those researchers that did not participate.

iv. Biotechnology YES had a strong fit with entrepreneurship and innovation policy regionally, nationally and internationally.

The evaluation also found that case studies of former participants highlighted substantial impact from business start-ups or enhanced careers attributed partly to YES. These ranged from salary uplifts of up to 25% and 5-60% of business success being attributed to YES. The financial benefits ranged from £5k p.a. of self-employed turnover to £200k of investment funding and, from one business alone, potential licensing income of £3M. [C, page 62]

From the participant feedback on completion of the programme, a common consensus emerged regarding their view of skills developed as a result of participation. They stated that they developed skills in financial awareness, team working, management, verbal communication, and time management within a commercial context [C]. For example:

> *"I thought the YES experience was excellent. Perhaps my opinion of the course is slightly biased because our team performed well in the competition, but I have taken many varied skills away from the course. The commercial aspect of science is still one that is poorly understood within my faculty and this course gives a great insight into the business world for an emerging scientist/manager/entrepreneur."*
>
> *Participant, 2009 [C,* page 37*]*

Resources invested by the scheme partners (research councils, industry and regional development agency) have demonstrated a deep, ongoing commitment to YES and realisation of the value of the scheme. Between 2008 and 2012, a total of £938 000 was committed by these partners and sponsors, both in terms of cash and staff time, recognising the benefits they saw in nurturing creating academic researchers with the skills to identify new commercial opportunities and exploit these fully:

> *"Biotechnology YES offers research scientists opportunities outside of academia and shows them the skills needed to move their science forward, including marketing, finance, IP etc." Regional Development Agency Representative [C, page 28*]

Finally, the knowledge generated from managing this growth has been widely shared with a range of policy-makers and key sector organisations. Martin Binks and Simon Mosey have communicated the pedagogical implications through presentations, workshops and publications to institutions such as Science in Parliament, the Institute of Directors, the Design Council, the NHS and the Royal Academy of Engineering [D].

5. Sources to corroborate the impact (indicative maximum of 10 references)

A. Biotechnology YES Annual Report (2011) available on request.
B. Biomedical YES press release (2012) available on request.
C. Webb, D. (2010), "Evaluation of Biotechnology YES", DTZ. Available at http://www.bbsrc.ac.uk/web/FILES/Reviews/1007-biotechnology-yes-review.pdf (accessed 26/09/13 and also available on file)
D. Royal Academy of Engineering (2012), "Educating Engineers to Drive the Innovation Economy." Available at http://www.raeng.org.uk/news/publications/list/reports/Innovation_Economy_2012.pdf (accessed 26/09/13 and also available on file)

The following can be contacted to corroborate the impact:

- Director, Business Development, MRC T
- Director, Academic Liaison, GlaxoSmithKline
- Visits & Outreach Manager, Syngenta
- ASOP, Science Programme, Natural Environment Research Council