Reach-in and Reach-out: the story of the MSc in Pipeline Engineering at Newcastle University

Fiona Whitehurst, Frank Siedlok & Julia Race

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Fiona Whitehurst
Lecturer in Management
Newcastle University Business School
CityWall, CityGate
St James Boulevard
Newcastle upon Tyne
NE1 4JH

Tel: +44 (0) 191 243 0838
Fax: +44 (0) 191 243 0875
E-mail: fiona.whitehurst@ncl.ac.uk

Fiona is a lecturer at Newcastle University Business School. She completed a PhD in Economic Geography at Newcastle University in 2005 looking at the use of clusters in economic development policy and retains a research interest in the interactions between firms, and other entities, particularly in the marine technology industries. She has been involved in a variety of research assignments including an identification and assessment of sectoral strengths in the North East for the regional development agency One NorthEast; a study of the implications of an emerging regional policy for higher education in England for Universities UK and a study of the impact of the higher education institutions in the Yorkshire and the Humber Region for Yorkshire Universities and work from her PhD contributed to an EU FP5 research project CRITICAL (City-Regions as Intelligent Territories: Inclusion, Competitiveness and Learning)

Frank Siedlok
Research Assistant
Strathclyde Business School
University of Strathclyde
McCance Building,
16 Richmond Street,
Glasgow,
G1 1XQ

Tel: +44 (0) 141 548 6120
Fax: +44 (0)141 552 5860
E-mail: frank.siedlok@gsb.strath.ac.uk

Frank is currently working as a research assistant at Strathclyde University on a multidisciplinary project funded by EPSRC which aims to stimulate collaboration between researchers in the mathematical sciences, ICT and engineering and increase the take-up of the resultant research advances. Before joining Strathclyde Frank worked as a researcher at Durham Business School on an EU pilot project [NeKS] which resulted in establishment of Subsea NorthEast – a representative body for the subsea sector in the North East of England.

After completing the NeKS project he worked for a short time at Cranfield University as a research fellow, finishing a two year research project into innovation networks in biotech and pharmaceutical industries.
In addition to his work at Strathclyde Business School, Frank continues his part-time doctoral research at Durham Business School, focusing on the recombination of old industrial skills and emergence of new sectors in the context of heavy deindustrialisation and identification of new sectors/ clusters.

Dr Julia Race
Lecturer in Pipeline Engineering
School of Marine Science and Technology,
Armstrong Building,
University of Newcastle upon Tyne
NE1 7RU,
UK

Telephone +44 (0) 191 222 6964
Fax: +44 (0)191 222 5491
E-mail: j.m.race@ncl.ac.uk

Dr Julia Race is a lecturer in Pipeline Engineering within the School of Marine Science and Technology at Newcastle University in the UK, principally lecturing on the structural integrity and asset management aspects of pipeline engineering. Her research interests include pipeline and marine transport of carbon dioxide for carbon capture and storage, modelling external corrosion in pipelines and evaluating the effect of denting on pipeline integrity. Prior to moving to Newcastle University, Dr Race worked in the oil and gas pipeline, petrochemical and power generation industries as a materials and structural integrity consultant.

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Abstract

This paper presents an unusual case of university-industry interaction whereby a group of small businesses came together to persuade a university to establish an MSc in Pipeline Engineering.

We identify that the course contributed to regional development in four ways. Firstly, it provided graduates for local industry. Secondly, it linked local firms with pipeline engineers world wide and raised the region's profile within that network. Thirdly, it strengthened the research base of the university through the recruitment of pipeline engineers from industry and fourthly, it facilitated the possibility of joint research between the university and local firms. We question whether this model is transferable to other industry sectors/universities.

We conclude that this outreach activity has been shaped by the 'reach-in' to the university of the local business community and propose a revised model of university interaction with regional industry. Traditionally universities have been seen as 'reaching out' to regional industry and the collaborations have been viewed as being instigated by the university and often research-based. Our revised model proposes an alternative mechanism whereby collaborations can be instigated by industry and through a teaching-route.

Key words: universities, industry, collaboration, teaching, regional development, 'reach-out'

Introduction

In the United Kingdom, within the last decade, national policymakers have envisaged an enhanced role for the higher education sector in contributing to the economic well being of the nation. Universities are now considered to be 'not just creators of knowledge, trainers of minds and transmitters of culture, but can also be major agents of economic growth, responding to the influences of globalisation and new technologies, and the need to interact with businesses' (DTI, 2000: 28). The gauntlet has been thrown down and the higher education sector, in the UK and elsewhere, particularly in the United States, has been challenged 'to stimulate and increase transfer of knowledge to business and society, across all sectors of the economy' (*ibid.*), while simultaneously improving the quality of teaching and research undertaken, and therefore justifying the public investment in higher education.

Changing Role of Universities

To reap the benefits of university activities both national and regional policymakers have stressed the need for, and desirability of, increased collaboration between universities and businesses. However, there are barriers to interaction which are rooted in stances that differ culturally and philosophically. Academics have been characterised as pursuing research based on personal interest and driven by, and rewarded for, publication in academic journals, while industry is seen as valuing knowledge not for its own sake, but only to the extent to which it resolves immediate problems and brings immediate gains (Santoro and Chakrabarti, 1999). Greenwood and Levin (2000) refer to the university system as autopoetic, self-referential and dominated by career opportunism that fails to serve society or businesses. However, as the perceived role of universities changes and there is an increasing recognition that industry cannot rely on internal resources alone to compete there is a growing impetus to encourage collaboration between universities and industry. The Lambert Review (HM Treasury, 2003), commissioned in November 2002, by HM Treasury, the Department for Education and Skills

and the Department for Trade and Industry, sought to identify the benefits for business of collaborating with universities and to both identify barriers to demand for such collaboration and identify mechanisms to promote interaction.

The main mechanisms by which knowledge accumulated and produced by universities can be commodified have been seen as firstly, the licensing of intellectual property and secondly, the spin off of new firms (Charles, 2006). Consequently the main focus of the academic literature, particularly in the United States, has been on technology transfer through licensing of intellectual property and spin out activity, with worldwide studies covering the US (O'Shea *et al*, 2005), Canada (Landry *et al*, 2006), Italy (Chiesa and Piccaluga, 2000), and the UK (Benneworth and Charles, 2005; De Coster and Butler, 2005). However, the potential range of interactions between universities and businesses is complex (Charles and Benneworth, 2001; Charles *et al*, 2005), and a series of mechanisms, including technology transfer offices, have emerged to manage these interactions from a university perspective. The interactions can be grouped under the broad, and potentially overlapping, headings of commercialisation of knowledge utilising a range of mechanisms (including patenting, licensing and the formation of new ventures through university spin offs); research and innovation collaboration to create new knowledge; knowledge transfer in the form of the dissemination and application of existing knowledge; and interactions broadly concerned with infrastructure provision (including the availability of accommodation for businesses, provision of tailored training, access to university infrastructure and the facilitation of networks of businesses).

Universities as economic actors

The recognition that these interactions between universities and external bodies represent a potential third element of university activity, outside of the traditional roles of teaching and research, has been met with a considerable increase in the funding for so called 'third stream' activities with business and communities. One of the first forms of funding for these activities

in the United Kingdom was the Higher Education Reach Out to Business and the Community (HEROBC) fund. This fund was introduced in 1999 and was intended to provide a third stream of funding, in addition to existing grants for teaching and research, to encourage universities to interact with business and to 'reach out' to their wider business community. The HEROBC fund has since been replaced by the Higher Education Innovation Fund (HEIF). HEIF supports institutions to engage in a broad range of knowledge transfer activities with business, public sector and community partners, for direct or indirect economic benefit. The first round of funding, amounting to over £77 million was made available in 2002, with a further £186 million made available for the two years 2004-5 and 2005-6, and a further £238 million for the two years 2006-7 and 2007-8.

Universities as regional actors

The Lambert Review (HM Treasury, 2003) recognises the role that proximity plays in fostering collaboration. While Boschma (2005) points out that geographical proximity *per se* is neither necessary, nor sufficient, for learning between parties to take place, it is widely held that geographical proximity facilitates processes that lead to the building of relationships necessary for collaboration. The importance of business-university collaboration for *regional* development has also been reinforced by the review. The review attributes universities' increasingly important role in regional development to four factors. Firstly, the need for business within the UK to compete on the basis of innovation, not cost. Secondly, the increasing significance of universities as economic actors themselves within the economy, particularly in the face of a decline in manufacturing. Thirdly, the high proportion of research and development expenditure concentrated within universities and finally the recognition that many successful business clusters have, at their heart, a research-intensive university. It is on the relationship between a research intensive university and a business cluster in an area of manufacturing decline that this paper focuses.

An interest in the role of higher education in *regional* development has also increased among national policymakers. The higher education white paper, *The Future of Higher Education* (DfES, 2003), maintains that 'institutions should increasingly be embedded in their regional economies' and that 'universities and colleges are key drivers for their regions, both economically and in terms of the social and cultural contribution they make to their communities' (p.36). This national impetus for universities to engage regionally is concurrent with a growing focus on regional development from endogenous sources (Sabel, 1989; Storper, 1995; Morgan, 1997) and this has led regional policy makers to consider universities as a key resource in regional development. This has particularly been the case since the establishment of Regional Development Agencies (RDAs) in 1999, with a remit to use the resources at their disposal to further the economic development and the regeneration of their region; to promote business efficiency, investment and competitiveness in their region; to generate employment; and to encourage and enhance the relevant work skills of the people living in their region. These agencies have increasingly seen universities as playing a key role in these areas and indeed the regional economic strategy of the Regional Development Agency for the North East of England, One NorthEast, sought to place 'universities and colleges at the heart of the region's economy' (One NorthEast, 2002: 48).

As well as being recognised by policy makers, the regional role of universities is increasingly recognised from within universities and, while there remains an unresolved tension, particularly within research-intensive universities, between pursuing a place amongst an international elite of universities and undertaking a role within a regional economy (Boucher *et al*, 2003), a regional mission is often explicitly recognised. For example, Newcastle University's mission statement is:

> To be a world class research-intensive university, to deliver teaching of the highest quality and to play a leading role in the economic, social and cultural development of the North East of England[i]

The recognition of a regional role has gone hand in hand with the considerable increase in the funding for so called 'third stream' activities with business and communities outlined above. Although, as discussed above, proximity may facilitate collaboration, there is nothing inherently territorial about the interactions whereby knowledge is exchanged between universities and businesses, and within the UK national funding for these interactions is not allocated specifically for regional interactions (Charles, 2006), although the presumption is that these interactions are more effective when they are conducted on a regional basis (Lawton Smith, 2007). The Lambert Review (HM Treasury, 2003) concluded that more could be done to support new sectors, small and medium-sized enterprises and services through better engagement with higher education, *particularly regionally and locally*, and from 2004-5 RDAs have had a larger formal role in the distribution of HEIF funding.

Cox and Taylor (2006) recognise two types of linkages between a university and the regional economy: *backward linkages* arising as an expenditure of university staff and students in the local economy and *forward linkages* which often arise as an effect of the services provided by the university to the regional economy (e.g. business support, human capital formation, knowledge economy). Boucher *et al* (2003) identify four potential roles for universities in regional development – firstly as an economic entity, a business in its own right; secondly as a producer of knowledge to be commodified through licensing arrangements and spin-off activities; thirdly as a shaper of human capital, producing students with higher level skills to be employed in regional businesses and fourthly as an institutional actor with an emerging role in regional governance. Lawton Smith (2007) cautions both against viewing universities as crucial stakeholders in the innovation process and particularly as territorial actors in the innovation process, but she notes that increasing attention is being paid to the way in which universities contribute to innovation through the knowledge that is embodied in the students who study at the institution.

University, Industry and Knowledge Transfer- the current model

Traditionally therefore the research on university – industry interactions has focused on intellectual property transfer. However, more recent literature highlights the multifaceted nature of these relations, identifying a number of other channels, or mechanisms, which facilitate knowledge and resource exchange between universities and industry (Perkmann & Walsh, 2007). Schartinger *et al* (2002) list sixteen of the most relevant knowledge interactions between university and industry (table 1 below).

Type of knowledge interaction
Employment of graduates by firms
Conferences or other events with firm and university participation
New firm formation by university members
Joint publications
Informal meetings, talks, communications
Joint supervision of Ph.D. and masters theses
Training of firm members
Mobility of researchers between universities and firms
Sabbatical periods for university researchers
Collaborative research, joint research programmes
Lectures at universities, held by firm members
Contract research and consulting
Use of university facilities by firms
Licensing of university patents by firms
Purchase of prototypes, developed at universities
Reading of publications, patents etc.

Table 1: Types of knowledge interactions between university and firms. Source: *Schartinger et al, 2002*

In comparison with the interest in university spin-offs and licensing, there has been much less of a focus on the role of universities in transferring knowledge through the education of individuals (Boucher *et al*, 2003). There are some recent outputs including papers on corporate education (Ryan, 2007), case studies of particular programmes (Gulledge and Sommer, 2005), a special edition of Education and Training on work-based learning (Roodhouse, 2007) and a longer tradition within engineering of studying university-industry collaboration in course design (cf. Friesen and Taylor, 2007). However, as will be seen there is much less of a focus on the way in which universities transfer knowledge by embodying it within the graduates they produce. In addition, although data on the destination of leavers of higher education (DLHE) is collated by the Higher Education Statistics Agency (HESA) there has been relatively little research into the way students transfer from higher education into local labour markets (Charles, 2006).

This paper presents an unusual case of university-business interaction contributing to regional development. Short courses provided by universities for small and medium enterprises (SMEs) are one way in which it is envisaged that knowledge can be transferred from universities to the SME community thereby potentially increasing the performance of those firms. However, this paper presents an example whereby a small group of SMEs came together to persuade a university to establish an MSc in Pipeline Engineering and assisted in its design and delivery, creating a much more complicated pattern of knowledge transfer than the one way, university to business, model portrayed in the traditional model. We examine how this course was conceived and developed and the, at times unexpected, benefits that have emerged from the course. We show that the course has provided highly skilled graduates for local industry, but has also enhanced access for local firms to worldwide networks of pipeline engineers, strengthened the research base in pipeline engineering within the university and promoted the possibility of collaborative research with local industry.

We will show that this outreach activity has been successful but unusually has been greatly shaped by the 'reach-in' to the university by the local business community and this leads us to suggest amendments to the traditional model depicted in Figure 1 below.

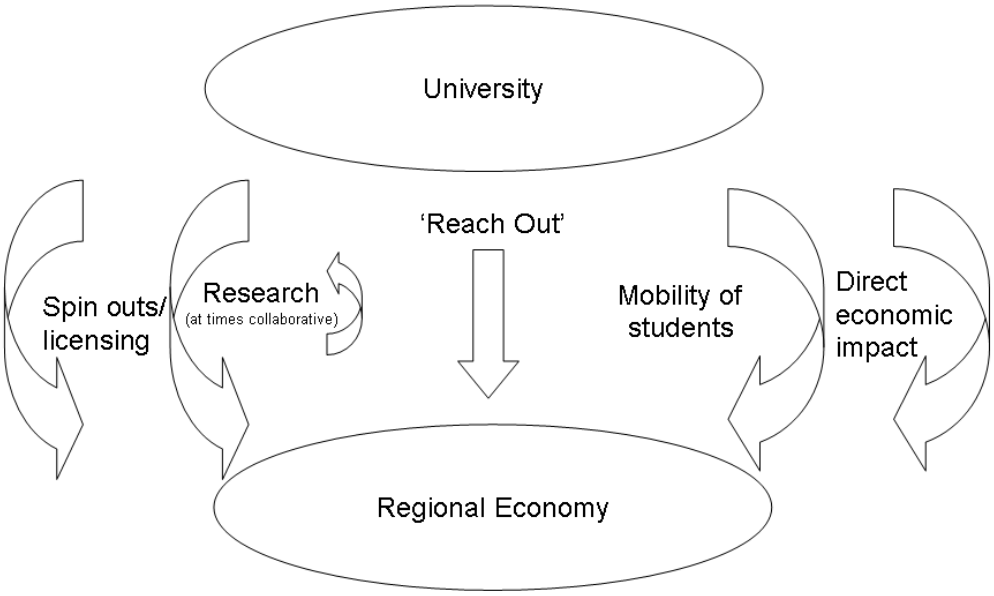

Figure 1: Traditional model of university-regional interaction

Methodology

This case study emerged from two separate research projects – one undertaken for a PhD thesis at Newcastle University and one research project undertaken at Durham Business School as part of an EU pilot project NeKS (Networks, Knowledge Sharing and Cluster Development).

The PhD research focused on cluster policy in the North East of England whereas the NeKS project aimed to develop clusters of knowledge-based companies through hands-on research,

collaboration and a series of supporting actions. Both these pieces of research used a case study design comprising in-depth interviews with relevant actors and analysis of documentary sources.

Initial sets of relevant actors were identified for the purpose of the two, separate at the time, projects and in-depth semi-structured interviews were carried out. As the projects overlapped, researchers from both met and started collaborating on their projects. Subsequently through the discussions, new trajectories to the main research themes started to emerge and formed the basis of new research, part of which is the focus of this paper.

The story of the pipeline engineering course had been relayed by numerous respondents from both academia and industry. It told how a group of engineers who had worked for, or been closely associated with, British Gas's Engineering Research Station (ERS) had persuaded Newcastle University to establish a Masters degree in pipeline engineering and how a Centre for Excellence in Pipeline Engineering had subsequently emerged. This frequently recited narrative led to a recognition that the initiative was interesting not only empirically, but also because it adds to a conceptual understanding of university-industry collaboration.

Interview transcripts from the original projects, including 11 interviews for the PhD project and 12 for the NeKS project, were reviewed and cross-referenced. Then, to further elucidate the story both researchers returned to some of the original actors involved in the design and delivery of the course from both the business and university perspective. A snowball approach was used to identify and approach any additional relevant actors. Documentary evidence in the form of funding applications and programme material was also studied and contact was made with six of the industry players who lecture on the programme. If a set of voices is missing it is those of the students and that is an area that will be addressed in future research. Figure 2 depicts the data gathering, analysis and subsequent theorising process

driving the development of this paper. Table 2 classifies those interviewed into groups and outlines their applicability to the overall case study.

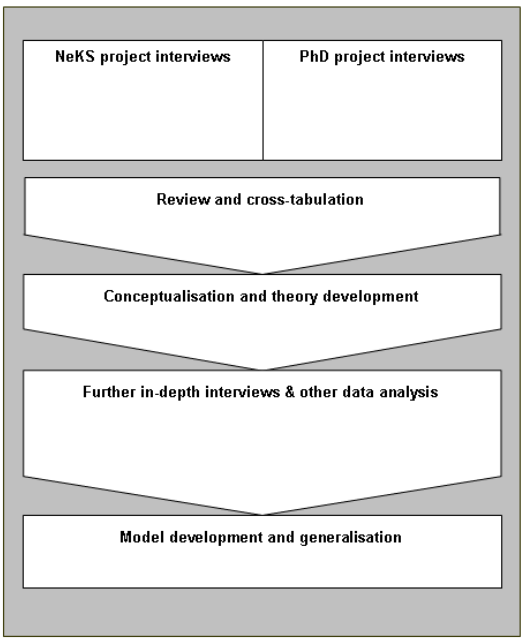

Figure 2: Methodological process adopted for development of the paper

	PhD research interviews	NeKS interviews	Follow-on interviews specific for the paper	Other
ex-ERS engineers directly involved in establishment of MSc and CoE	6	4 (1 of which interviewed for PhD)	4	Documents analysis
ex-ERS		2	1	Email enquiries

engineers (other)				
Newcastle University Staff	1	2 (1 of which interviewed for PhD)	2	NeKS Closing Conference
Other stakeholders including local councils	4	6 (3 of which interviewed for PhD		Historical data (newspapers, academic articles)
Total	11	12	7	**30**

Table 2. Overview of interviews

As summarised in Table 2 above, four major groups of stakeholders were interviewed for the purpose of this research. These included ex-ERS engineers – both those actively involved in development of the Masters course and those who either were involved in the later stages or were involved only indirectly. The second group of respondents included university staff involved in development and operations of the MSc course. This group included the then Head of School of Marine Science and Technology. Finally, a number of employees of two local city councils and a local cluster development agency were interviewed, as their role proved to be instrumental in facilitating the establishment of the MSc and the 'reach-in' initiative. A breakdown of the rationale for the interviews is provided in Table 3 below.

The interviews were undertaken on a semi-structured basis and lasted up to two hours. In both the research projects the majority of the interviews were recorded and transcribed. In the few cases where it was impossible to record the interviews detailed notes were taken instead

Groups Interviewed	Rationale

ex-ERS engineers involved in establishment of the MSc and Centre of Excellence (CoE)	Insight into the rationale, drivers and barriers behind the MSc and Centre of Excellence Understanding the impact of ERS corporate culture on the development of Pegasus (the formal network of pipeline engineering companies) and the Centre of Excellence Understanding of benefits and costs for the industry / ex-ERS engineers Understanding the dynamics of the process Understanding the role of local embeddedness and reasons behind philanthropic actions of individuals Understanding personal drives Reconstruction of the story Insights into the collaborative processes within the group
Newcastle University staff involved in establishment and running of the MSc and CoE	Understanding the costs and benefits for the University Understanding the rationale, mechanisms and barriers in developing both initiatives
Other actors directly involved in establishment and operations of MSc and CoE	Understanding the motives behind collaboration and knowledge creation Understanding the role of local policy makers Understanding the benefits for local economy

Table 3: Source and rationale of empirical evidence

History, culture and motivation.

The North East of England has a strong reputation for its engineering skills, which have shaped the local economy and culture. The association with pipeline engineering began with the decision taken in 1964 by British Gas (BG) to locate one of its four research centres in Killingworth. By the 1990s The Engineering Research Station (ERS), as it was known, had

become a leading research institution in the field of gas pipeline technology and had developed the prevailing international quality standards (Benneworth, 2002). The research stations were set up to support the activities of British Gas and were not viewed as profit centres. Indeed, external commercial consultancy was not encouraged and significant research grants were allocated on yearly basis, giving the staff considerable freedom to pursue projects of their own interest. Another important feature of the ERS, mentioned numerous times during our investigations, was its academic-like internal culture. Staff were highly trained and often pursuing academic research. Funding and budgeting structures were organised in a way more similar to academia than traditional business models. As one of the ex-employees pointed out, 'it was a very good place to work with good pay, a strong academic background, and you could do almost anything you wanted!' The academic-like culture was further amplified by the existence of a training centre for BG employees and external organisations. By the 1990s, ERS employed some 450 people, over 200 of those being engineers, with a significant percentage in possession of a PhD. By then the research was mainly focused on the increasingly important issue of pipeline inspection and integrity.

In 1995, British Gas decided to merge the existing research stations into a single entity located in Loughborough, East Midlands. ERS was to be closed with the intention that the majority of its staff would re-locate to the new site. Developments, however, took a different route from the one foreseen by BG. Described elsewhere in more detail (Whitehurst and Siedlok, 2006) local embeddedness combined with generous redundancy packages resulted in a chain of ideas and actions leading to establishment of the MSc in Pipeline Engineering and, subsequently, a Centre of Excellence in Pipeline Engineering at Newcastle University. The resistance to relocating was strong. As a result, a group of engineers from ERS prepared a detailed business plan to buy out the existing facilities from BG and turn it into a centre for pipeline consultancy, retaining some quarter of the existing staff. The proposal was firmly rejected by BG, and as a result many of the senior engineers decided to accept the redundancy package, stay in the region and set up their own consultancy businesses. As recalled by one of

the key engineers, ‘we basically told them to bugger off – in a polite way. As BG offered a good package, many decided to stay and try to set up their own businesses’. As a result between ten and twelve companies[ii] were established. Hence the skills and knowledge were retained in the region, despite the withdrawal of BG, leading to the emergence of a new cluster of pipeline businesses. The individuals who instigated those businesses would play an important role in the establishment of the MSc in Pipeline Engineering.

Our interviews with the ex-ERS employees revealed that, while certainly experts in pipeline engineering, most of them were not used to the world of business and profit seemed to play a secondary role in most (but not all) of the newly formed companies. As it was reported, the main reason for setting up their own businesses was to preserve the skills and knowledge in the region in which they desired to stay. The closure of ERS and early retirement seemed to them as ‘an awful waste of talent and expertise’. Some of them ‘felt morally obliged to pass on the expertise, don’t let it die and to promote the region and industry after being lucky enough to work for years in British Gas’. Another respondent explains that ‘we all were 40-60 years old, experienced. From other cases, we knew that if we didn’t pass the expertise down it would get just lost’. They not only wanted to preserve the skills and knowledge, but to further develop the expertise and ensure that the region was acknowledged as a centre of excellence for pipeline engineering. However, they soon realised that to achieve that they would need to find a way to give the sector more credibility and profile.

With the financial and administrative help of a local council, the new companies were gathered into a grouping known as the North East Pipeline Group to help them grow and ‘to promote an interest in pipeline engineering’. To gain credibility the group understood that ‘to do that we needed a university to be involved, then we could try to get accreditation’. At first, they decided that a chair at a university would be the best solution, but, at that time it looked almost impossible to achieve. However, since some of the companies had experience in delivering training courses in pipeline engineering, some course in conjunction with a

university seemed as a feasible idea. The North East Pipeline Group approached a number of universities with the idea in mind that large part of the course would be delivered by the ex-ERS staff. As one of the engineers recalls, 'we said to them: we know the stuff, you don't. So we will do some teaching. We were troublemakers in a way'. It was Newcastle University which took up the challenge and the then Head of School of Marine Science and Technology is acknowledged as being key to the success of the project. He shared the vision of what the course could be and was willing to invest substantial time and effort in getting the course up and running. There were two overlapping reasons for setting up the course: firstly, to gain credibility for the industry and secondly, to address the growing age gap in the industry (the average age in some of the companies was nearing 55) by attracting more young graduates to the region. A series of meetings took place and finally Newcastle University agreed to enter into this somewhat unusual agreement and Newcastle City Council agreed to co-fund the initial years of the MSc. Pipeline engineers involved in the set-up process not only designed the curriculum, but also provided some (over 50% in the first year) teaching, with the University providing the rest. The programme commenced in 2001, under the guidance of a combined academic and industry steering committee with an enhanced contribution from the non-academic members. The goal of the programme was 'to equip the next generation of pipeline engineers with appropriate qualifications' but also to ensure that 'as sector, we have people to work for us'. The high involvement of industry in the course design and delivery was to ensure that the graduates possessed enough practical knowledge and interest to be attracted to the sector. However, there was another outcome of industrial involvement, which will be discussed in the next section.

After five years in operation, authorities at the University consider the course to be 'a great success' in terms of uptake, interest and quality of teaching. The course attracts over 30 students per annum at present and the course coordinators are considering implementation of an upper limit to the total number of students on the course. Table 4 presents the number of students since the inception of the course.

There are two options to take the course: 12 months of full-time study or 36 months of part-time study. The part-time option has been introduced specifically for local companies to enable continued professional development (CPD) for their staff while they are still working in the company. Many of the modules continue to be delivered by a partnership of academic staff and specialists from local companies.

Students on MSc in Pipeline Engineering

Academic year	Full Time (Part Time)	Total
2001 – 2	5 (1)	6
2002 – 3	18 (1)	19
2003 – 4	18 (2)	20
2004 – 5	35 (7)	42
2005 – 6	27 (8)	35
2006 – 7	25 (7)	32

Table 4: Number of students enrolled for the MSc in Pipeline Engineering at Newcastle University.

Intended and Unintended Outcomes of the MSc in Pipeline Engineering

In general two types of outcomes of the MSc course were identified by our respondents: the expected, or intended, and the unintended. As mentioned above, two main drivers for setting up the course were firstly, to attract local graduates to join the course and subsequently the industry and secondly, to gain credibility for the growing sector. Another expected benefit for the industrialists was an opportunity to influence the future graduates and increase their readiness to undertake work. Our respondents frequently pointed out the time and resources needed to turn a graduate into an employee. No first level degree course exists in pipeline engineering, so companies had to train and develop staff, who entered the industry with

generic science or engineering degrees, from the most basic level upwards. The MSc model was expected to accustom graduates to the industrial way of working and thinking and, also to get to know and test them and, potentially, attract them to one of the companies.

Although one of the goals had been to recruit Newcastle University engineering undergraduates on to the programme, in the first few years there was little interest from those graduates in progressing to the MSc course and retention of students in the region following completion of the course was minimal. The situation has improved in the recent few years and a number of the graduates have joined the local businesses. Final destination information for the 45 students who graduated in the two years to 2006 reveals that all but two of these students have found employment in the pipeline industry or are continuing their studies. Of these 43 students, nearly three quarters have found employment or are conducting research in the United Kingdom. Of those students staying in the United Kingdom, nearly half have either remained to work for the local companies who lecture on the course or are conducting PhD research at Newcastle University. It is difficult to obtain comparative figures for other courses as little data on regional employment of graduates is available at a sufficiently disaggregated level. However, it is clear that the MSc programme has contributed to a transfer of knowledge to the local cluster by embodying knowledge within graduates employed in that cluster.

Despite the initial low levels of attraction to the local students and minimal retention of the students in the region, other, unintended outcomes soon emerged. Due to the high proportion of lectures being delivered by industrialists with worldwide reputation, the course attracted a high number of experienced engineers already working in the Oil & Gas industry. This phenomena was explained by one of the professionals joining the course rhetorically asking 'why did I come here to the course? Where else would I get the chance to have X hours with PERSON-A, Y hours with PERSON-B?' [iii]

Lecturing these experienced engineers resulted in an increasing international profile for participating companies. As explained by one of the lecturers, if any of these graduates encounters a pipeline-related problem during their work, there is a good chance they would contact one of the companies they met during their study. Therefore, indirectly the course contributes to developing a valuable network of contacts in the industry, which potentially can lead to new contracts. The respondents confirmed that contacts with their ex-students led to additional consulting work.

The reputation of the course continues to grow and an ongoing engagement with industry is illustrated by the addition of seven new companies to the collaboration list since 2006. Two companies in particular have approached the university directly to offer workshops and guest seminars on the course as they have identified the benefit of engaging with the students early in terms of recruitment opportunities.

A few years after establishing the course, the group of pipeline engineers turned part-time lecturers achieved yet another success. A Chair in Pipeline Engineering has been established, therefore achieving one of the first ambitions of the group, and subsequently a permanent Lecturer in Pipeline Engineering has been recruited. The increased profile of the industry and research has also led to the creation of a Centre of Excellence in Pipeline Engineering, which it is anticipated will further increase the international profile of pipeline engineering research at Newcastle University and the credibility of the industry within the region. The Centre of Excellence has secured a number of research contracts from multi-national industrial players and a Memorandum of Understanding has been signed with the Russian Academy of Sciences. In addition, ways of engaging in research with the local firms who provide teaching for the course are being investigated.

Other reported benefits of this particular MSc programme relate to the quality of teaching. First of all, the involvement of world renowned industrialist as lecturers has ensured the

applicability and practicality of the course. As highlighted by on of the lecturers 'through close collaboration with the companies the course is more hands-on, closer to the real world' and hence attractive to experienced technicians as well as students. This in a way addresses some of the recent debate about the applicability of knowledge production at universities (Gibbons *et al*, 1994; van Aken 2005). Furthermore, it was reported to us that the opportunity to lecture was very much refreshing for the industrial lecturers, who appreciated the break from daily business life. Table 5 presents the outcomes and benefits of the MSc to different stakeholders.

Stakeholder:	MSc in Pipeline Engineering & Centre of Excellence
Companies	- opportunity to assess and train potential employees - network of contacts with potential clients - promotion / marketing - access to university staff and research / linkages with academia - stronger identity - opportunity to conduct fundamental research via CoE - opportunity to meet and collaborate (with potential competitors) on a 'neutral' ground - post-retirement opportunities in education
University	- stronger links with local industry - access to expert knowledge (knowledge transfer and creation) - funded research (CoE, industry) - prestige in the sector
Students	- applied teaching - access to real-life problems - opportunity to work with experts - increased employment possibilities

	- network of service / advice providers in the future career
Region	- promotion of the region at the international arena and markets - influx of graduate students with possibility of retention - influx of professionals (with high spending power – multiplier effect) - prestige of the region as a Centre of Excellence - promotion of the region
Industry	- stronger, international identity - influx of trained staff - retention of skills and expertise - access to fundamental research - bi-directional knowledge transfer mechanism

Table 5: Outcomes and benefits of MSc in Pipeline Engineering

Success factors and limitations of the MSc in Pipeline Engineering

The success of the described model can be analysed at a number of levels. It is not our intention to evaluate the course, but to highlight any important benefits this model can provide as well as issues it can pose.

It was pointed out to us on numerous occasions that, without the personal engagement, devotion and sacrifice of key individuals, the course would not have materialised, with the consequent loss of local expertise. In particular, a few of the ex-ERS engineers channelled a significant amount of effort into ensuring continuity of this expertise and finding an appropriate vehicle to deliver this goal. The provision of courses for local industry is not unusual. According to the Higher Education Business and Community Interaction survey the majority of universities are providing courses for businesses (see table 6 below), some of which will be local to the university.

Area	Distance learning for businesses		Continuous work-based learning		Short bespoke courses for business on campus		Short bespoke courses at companies' premises	
	2005	2004	2005	2004	2005	2004	2005	2004
UK total (n=164)	108	109	101	97	145	141	132	128
%	66%	66%	62%	59%	88%	86%	80%	78%

Table 6: Provision of courses for business (source: HEBCI survey 2004/5)

However, the provision of an entire MSc course with such industry involvement is unusual and the small enterprises and individuals who instigated the course were exceptional. Many of them were ex-British Gas and there was substantial social capital in the networks that existed between them. Many of the external lecturers reported that they became involved through a personal contact who was already involved in the process. They were willing to undertake what some of them called 'charity work' for little monetary return. In addition to this almost philanthropic approach, the substantial industrial involvement in the course is possible because the visiting lecturers are ex-researchers and therefore not intimidated by the academic environment. Even then the practicalities of bringing in so many external lecturers can be challenging for academics. Minor irritations such as the lack of a parking space can damage the goodwill on which the course relies. There is also an ageing profile amongst the lecturers and issues of succession occur given that 'the kid is 43'. Therefore not only may there be some difficulties in maintaining this level of involvement by external lecturers, but also this academic culture and philanthropic approach appear to have largely resulted from a culture at British Gas that was closer to an academic one than a traditional 'hard-nosed' industry culture.

As the course became established the appointment of a specialised member of lecturing staff to focus on the course was very important. She was recruited from a local pipeline company and had already acted as an external lecturer on the course. Additionally the newly established Chair of Pipeline Engineering at the university was filled by a local industrialist. Both these appointments mean that there is a heightened sensitivity to the needs of industry within the pipeline engineering specialism at the University. The rather small initial cohort taking the course also contributed to its success. Getting to know the students seemed an important factor for two reasons: firstly, to see if they can be offered employment, but secondly to ensure that the interaction serves as a vehicle to pass experience. Therefore the course coordinators are considering an implementation of a higher limit of students on each iteration of the course, explaining that 'we are passing our experience – this is why we will probably cut down on the number of students again – 37 is too easy to hide and too difficult to get to know every one of them. Experience can be passed through knowing them, not lecturing'. The course was specifically designed with this high level of external lecturer involvement (i.e. over 50% of lectures delivered by industrialists) and student feedback indicates that high level of external lecturer involvement is an attractive component of the course, as insight is provided into the industry and real issues, problems and solutions. Industrial partners also collaborate by helping with projects and there are examples of companies providing materials, software and project supervision.

As already mentioned, there were numerous challenges and issues in the development of the MSc and Centre of Excellence. At the outset, the model failed to attract enough interest from the big companies. An earlier attempt to attract sponsorship for the course, software or a chair from the major international operators failed due to the lack of interest. As a result the majority of the support still comes from local SMEs.

The significant amount of time and resource such initiative requires and a relatively uncertain return on investment in terms of employable graduates can discourage many profit-oriented companies. It required a group of industrialists with the willingness to allow the long-term vision and understanding of the future needs of the whole industry and region to take precedence over the needs of a single company to establish this programme. An important role can be assigned to the academic-like culture at BG, which enabled this behaviour. A lack of a strong commitment from local businesses and an unwillingness to collaborate may threaten any attempt to replicate the model elsewhere.

Due to the high reliance on personal engagement, the somewhat unusual chain of events and the specific culture characterising the ERS and its ex-employees, this model may be rather difficult to replicate. However, a recent example of subsea industry in the North East of England joining forces together and looking at a similar solution to solve their problems seems encouraging. Subsea North East, a committee formed by a group of companies to look at some of the issues the industry needs to tackle at the regional / sectoral level, is considering establishing a similar model of MSc course with subsea engineering as the focus. As the initiative is still in its early stages it is hard to predict its future at this time.

Discussion and Conclusions

The benefits of a university to its region can be in the form of direct economic impact; the production of knowledge of use to regional firms through licensing of existing knowledge, spin off ventures and joint production of new research; a contribution to regional governance and by the transfer of knowledge embodied in students into local labour markets (Boucher *et al*, 2003). This paper has focused on one particular course which has particularly contributed to this final area. However, we have sought to show that the delivery of the course has also led to a strengthening of pipeline research within the university, to an increased profile of the region in pipeline engineering internationally and a strengthening of the networks, both

internal and external to the region, within which actors in the pipeline industry in the region operate. Etzkovitz and Klofsten (2005), in proposing a model of knowledge-based regional development, conclude that '[k]nowledge-based economic development can be traced to specific actors, typically operating in collaboration with each other' (p.254). The success of pipeline engineering teaching and research in Newcastle University bears this out, but it was industry that 'reached-in' to the university, rather than the university 'reaching-out'.

Models of university-industry collaboration have tended to view knowledge transfer and collaboration as a rather one way process, however we would argue that there should be a recognition that knowledge can flow into universities from industry as well as in the opposite direction and can be instigated by industry. The cluster of pipeline engineering businesses in the region has been significant in transferring knowledge *into the university* by providing human resources and teaching expertise, as well as benefiting from knowledge transfer *from the university*, not necessarily via the most prominent mechanisms of spin out companies and licensing of technology, but via the employment of highly skilled graduates. This resonates closely with the notion of *forward links* that local universities can create by engaging with local businesses, significantly contributing to regional development (Cox and Taylor, 2006). These *forward links,* previously often overlooked in evaluating the effect of universities on their local economies, can have a significant impact on competitiveness of local businesses (*ibid*), but can also affect competitiveness at the regional or industry level.

While the industrialists '*reached in'* to the university and proposed and substantially contribute to the course, the then Head of School of Marine Science and Technology is acknowledged as being key to the success of the project. He shared the vision of what the course could be and was willing to invest substantial time and effort in getting the course up and running. The conclusion of one of those involved was that to get this kind of programme running successfully you need 'six hardy individual and a fantastic head of school'. This finding is reflected in a review of the literature on industry-university 'champions by Santoro

and Chakrabati (1999). They identified that champions act as a link between the two types of organisations and are able to influence both parties while being aware of the differing needs of the parties. They conclude that an effective champion is crucial for effective relationships between industry and universities. In a similar tone the importance of 'agents of change' has been highlighted (Stewart, 1999 in Butcher and Jeffrey, 2007) as an effective means of communication between the two diverse cultures. Certainly the role of the Head of School as champion for this case was invaluable**.** During the early days of the idea most of the universities approached did not show much interest in collaboration with the pipeline companies, despite the generous contribution offer from the industry. It could be speculated that the industrial focus of the course did not appeal to the universities which did not see much value in the idea. This partly resonates with the recent criticism of universities becoming rather detached from the societal needs, often offering courses that are unsuitable for industry (van Aken, 2005, Greenwood and Levin, 2000).

Returning to the model of traditional linkages between universities and regional economies (see Figure 1), we believe that the model should be updated by adding the feedback loop of knowledge flow from industry to university (see Figure 3) as an important factor in understanding knowledge transfer, creation and management at the regional or industrial level. This could be perceived as part of the transition from the uni-directional, linear model of knowledge transfer to more contemporary, multi-directional network model (Butcher and Jeffrey, 2007; Stewart, 1999).

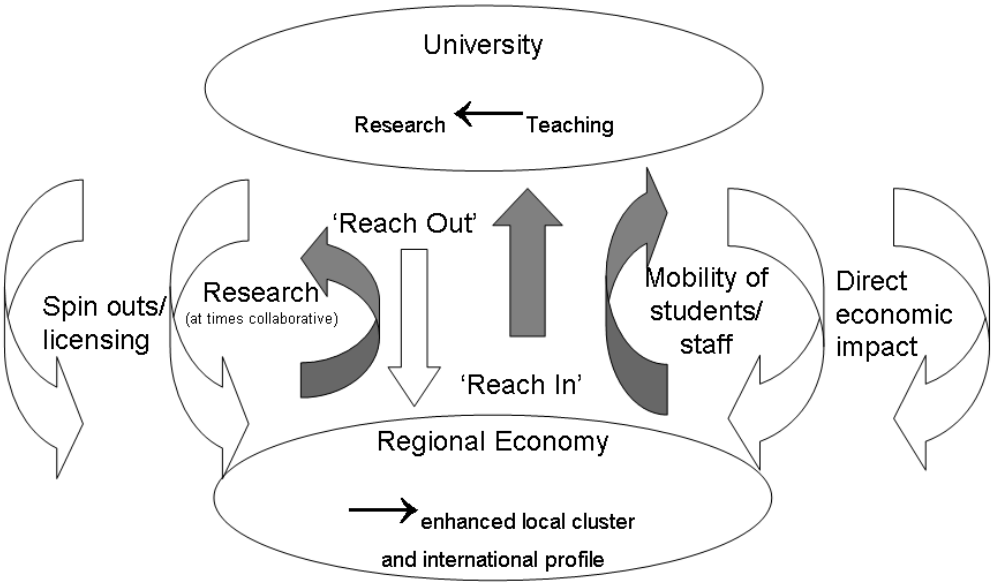

Figure 3: New model of university-regional interaction – incorporating 'reach in' from industry into the university

The barriers to collaboration, and even the unintended costs (Behrens and Gray, 2001), have been subject to much review and cultural differences have been seen to play a part. This paper has outlined a case in which cultural overlaps and cultural 'proximity' along with key champions of the project may have been fundamental to the outcome. However, we have also sought to identify another way in which university - industrial collaboration can contribute to regional development. We believe that this case contributes to the understanding of the impact of engagement of universities in the region on local economies (Cox and Taylor, 2006, Boucher *et al*, 2003). Additionally, this case supports the notion that local universities can play a significant role in sustained growth of highly specialised, local economies by ensuring the 'supply of skilled people in synch with the demands of growing firms and industries' (Best, 2003: 28). As in the case portrayed by Best, meeting the demands of the industry can be expensive for universities, however it is also one of the crucial conditions for sustained growth of specialised regions. Local firms, on the other hand, are important to the region as 'a

carrier and developer of a region's distinctive skill base and technological capabilities' (Best, 2005: 3), which in turn is a source of competitive advantage. In the case of pipeline engineering, the MSc course ensured sustainability of the competitive advantage at both regional and individual firm levels.

Although there has been some recent championing of the use of case studies in journal articles (Eisenhardt and Graebner, 2007), there remains an underlying concern that the results can lack generalisability. However, Peck (2003) suggests that cases be selected for their explanatory power. We believe this case provides a novel model of university-industry collaboration that adds to the theoretical understanding of collaborations and knowledge transfer between universities and their regions. It enforces the role of teaching as a means of collaborating and highlights the ability of industry to 'reach-in' to a university. This case may be difficult to replicate elsewhere, however, we believe it offers interesting practical lessons for both universities and businesses seeking to increase collaboration, particularly where regional development is one of the goals. It also contributes to the under-researched area of the way in which universities transfer knowledge by embodying it within their graduates.

[i] http://www.ncl.ac.uk/about/today/ (consulted 18 January 2008)
[ii] the reported numbers vary as there were some mergers of existing firms, and some people established themselves as individual consultants
[iii] PERSON-A and PERSON-B are internationally renown authorities in the pipeline engineering industry

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