

The role of a university in regional renewal: the case of Newcastle

Paul Benneworth and Gert-Jan Hospers

Introduction

There is increasing acknowledgement that we are living in a knowledge economy, and there is a growing consensus that 'knowledge capital' is an increasingly important determinant of productivity growth, economic development and ultimately improvements in standards of living (*cf.* [Temple, 1998](#), for a review). From the 1980s onwards, macroeconomists have noted that growth can no longer be accounted for in terms of investments in traditional 'factors of production': land, labour and machinery. Partly driven by recent trends around globalisation ([Wes, 1996](#)), and partly by the centuries-old shift from agriculture to manufacturing to services ([Hospers, 2004](#)), knowledge capital endowments are an important determinant of competitive advantage and hence the territorial distribution of economic activity. But there remains considerable uncertainty over its precise spatial implications, with predictions varying along a spectrum from the death of distance ([Cairncross, 1997](#)) to the rise of the mega-city ([Budd, 2006](#)). What is evident is the rise of a limited number of extremely successful exemplar regions, whose control over the way the knowledge economy is understood has led [Armstrong \(2001\)](#) to characterise these places as the 'totemic sites of the new economy'.

These changes have not gone unnoticed by policy-makers who have responded to the rise of the knowledge economy by switching their focus away from managing the location of productive industry towards investing in the sources of high-technology, knowledge based endogenous growth. Previous policy paradigms, focused on attracting large branch-plants, and stimulating innovation within large employers' supply chains have given way to the so-called 'third wave' of regional industrial policies ([Bradshaw and Blakely, 1999](#); [Larosse, 2004](#)). These new approaches seek to replicate

Paul Benneworth is an Academic Fellow in the Institute for Public Policy at Newcastle University.

paul.benneworth@newcastle.ac.uk

Gert-Jan Hospers is Assistant Professor of Economics in the School of Law, Economics and Governance Studies at the University of Twente.

g.j.hospers@utwente.nl

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the knowledge-based success (Hassink and Lagendijk, 2001; Hospers, 2006) of these totemic sites, often through promoting regional science-based innovation policies (Perry *et al.*, 2006).

But one key feature of knowledge capital is that of increasing returns to scale: the most productive place to deploy a unit of capital (Romer, 1994; Solow, 1994) is where there are the largest existing concentrations of knowledge capital. This implies increasing concentration of production around a relatively limited number of already successful cities and regions. In some ways, the rise of 'world city hierarchies' (Sassen, 2000; Smith *et al.*, 2003) with limited numbers of global cities and a second tier of specialised centres reflects this trend for agglomeration of knowledge capital. But total factor productivity is an abstract concept reflecting knowledge capital, and as a number of world cities are reaching their environmental and social limits, there are physical limits to agglomeration. In the UK, the introduction of the Sustainable Communities Plan (ODPM, 2003) attempts to finesse, rather than seriously address, these issues (Benneworth and Vigar, 2007). Notwithstanding political cowardice, the holy grail of contemporary economic development (Benneworth and Timmerman, 2005) remains finding a place for non-global or 'ordinary' cities (Amin and Graham, 1998) as alternative motors of economic growth.

In this paper, we acknowledge that ordinary cities and their regions *do* face multiple, overlapping problems which can present a seemingly inevitable vicious circle of decline. From this apparently intractable situation, we tease out three types of problems faced by old industrial regions, which we stylise as problems of regional 'hardware', 'software' and 'mindware'. Noting the increasing importance of universities to regional development, we use a case study from the North East of England to explore whether a university can address all three barriers faced by such regional economies. We conclude by observing that although the university can play an important initiating role, the scale of activities necessary to represent a real improvement require that critical activities are adopted and supported by actors across the region.

Three dimensions of old industrial regions: hardware, software, mindware

Old industrial areas typically have some features that set them apart from other territories. Generally speaking, these places experienced an early industrial revolution (often in the period 1780-1830) that laid the basis for growth in one or a few manufacturing sectors. Since World War II, however, these industries' life cycles

reached phases of maturity and decline, leading to plant closures and job losses. The very places that used to be the forerunners of industrial growth now had to give way to new growth poles. Examples are textiles agglomerations like Lancashire, Twente and Nord-Pas-de-Calais, coal and steel regions such as the West Midlands, Upper Silesia and the Ruhr as well as the harbour areas in Tyne and Wear, Pomorski (Poland) and Northern Jutland.

Tödting and Tripl argue that old industrial regions have their own distinct types of barriers inhibiting participating effectively in the knowledge economy, being locked-in to old regions with few growth prospects, and which offer few solid bases for economic restructuring and growth. In an attempt to list the commonalities of old industrial areas, we combine the frameworks of Hospers (2004) and Benneworth and Charles (2005), resulting in what might be called the 'triple bind of old industrial regions'. In this approach, we consider these three characteristics as three dimensions of the regional situation, and we characterise them as regional 'hardware, software and mindware' (cf Benneworth *et al.*, 2006). The three general determinants of a 'smokestack' region's economic development path will now be reviewed in more detail.

Hardware: obsolete structure and infrastructure

The term 'hardware' refers to the visible and tangible (hence 'hard') aspects of the regional economic structure. Traditionally, economists stress the importance of the production factors labour, land and capital for regional economic dynamics and productivity growth. A location with a sufficient level of qualified labour, natural resources (like proximity to the sea and raw materials) and means of production (e.g. machinery and buildings) should be able to generate growth (Barro and Sala-i-Martin, 1995). In the last decades, however, regional scientists have pointed to the role of infrastructure (roads, airports, harbours and digital infrastructure) and knowledge as additional factors of regional economic development (Vickerman, 1991; Florax, 1992; Temple, 1998). Old industrial areas suffer from heavily concentrated production structures and a rather large manufacturing labour force, often highly skilled, but whose skills are often highly specialised so that under periods of economic stress, unemployment rises significantly.

For historical reasons, regions that are specialized in heavy industry are often those that have historically had access to mineral resources such as coal and iron ore, producing a heavy extracting and engineering complex sometimes referred to as 'carboniferous capitalism' or the German *Montanenregionen*. Commercial R&D infrastructure in these areas is often focussed upon improving methods of industrial

production or innovating final products in existing industries. Old industrial regions can be recognized as well by their industrial relics in the built environment (e.g. production complexes, mines and shipyards) and mostly well-developed infrastructural works for transportation. Unsurprisingly, the majority of these areas suffer from the environmental problems associated with industrial production, including air and water pollution, contaminated soils and erosion. These physical, 'hardware', characteristics clearly contribute to a regional image of 'rustbelts' or 'smokestack areas' (cf 'mindware').

Software: institutional thinness & fragmentation

The rigid specialization trap of an old industrial region that follows from its one-sided 'hardware' is normally reflected in the area's 'software', i.e. its institutional set-up. Geographers and sociologists are not only interested in the production factors in a region, but also in the various actors that make use of them. In their view, regional economic development is also about people, the way they interact and their norms and values. The concept of new institutionalism has been developed to understand the roles of complementary social rationalities in the functioning of such institutions, with exemplars found in the literature on networks, industrial districts, innovative milieux and social capital (see e.g. Amin, 1999). Local networks and mutual trust lower transaction costs that in turn facilitate regional economic dynamics.

Old industrial regions indeed tend to have an institutional structure that used to function well in their heydays, but that is not necessarily conducive for times when change is needed. Tight networks of local business elites, workers and politicians that contributed to earlier economic success may refuse to believe in the area's industrial decline and put a brake on structural change (Fuchs and Wolf, 1997). Such situations are often characterised by a range of different lock-ins which can prevent a systematic attempt to address regional decline. Tödting and Tripl (2005, p1210) highlight the many dimensions of institutional lock-in, distinguishing three main kinds: 'functional lock-ins (too rigid inter-firm networks), cognitive lock-ins (homogenisation of world views), and political lock-ins (strong, symbiotic relationships between public and private key actors hampering industrial restructuring)'.

This defect in the 'software' may be called 'the weakness of strong ties' (Grabher, 1993; Hassink, 1997). In such a socio-cultural climate, new collaborations and co-operations do not readily emerge. There is a tendency for incremental rather than radical innovation, inhibiting the emergence of the kinds of innovative new activities, businesses, sectors and clusters with the potential to transform those regions' prospects.

Mindware: negative images

Alongside the realities of a region's 'hardware' and 'software', the image of a territory, which we term its 'mindware', also plays a role in regional development. Mindware can be considered to have two components, the way in which regions are perceived from outside, and the way that regions perceive themselves (Hospers, 2004). In terms of the former, regions increasingly compete to attract residents, entrepreneurs and visitors. As these groups cannot know everything when taking location decisions, they use whatever knowledge they happen to possess. This 'spatial cognition' is fragmentary and formed by previous visits to the region and by sources from outside, such as stories and media messages (Veitch and Arkkelin, 1995). Studies of spatial cognition show that areas with a good image attract more firms and people than areas suffering from a bad image (NEI, 2001). It would seem therefore that the Thomas's famous 1928 statement, 'if men define situations as real, they are real in their consequences', applies to territorial units as well. With one aspect of the knowledge economy - multi-dimensional knowledge investments - involving combinations of private, state and charitable resources, there is increasingly a self-reinforcing and self-fulfilling nature to investments in science, technology and innovation. External mindware matters to the geography of contemporary regional economic development.

Internal mindware represents the internal perceptions that regions have of themselves, which helps both to support constructive interaction but also conditions ambitions for regional mobilisation. Keating *et al.* (2002) distinguish between regions with strong and weak senses of identity. They note that across a range of European countries, a strong sense of internal regional identity provides a regional capacity to *imagine* a positive regional future. That regional imagining helps to shape and channel regional mobilisations in response to particular economic crises, and hence shapes the economic impacts of those crises. Whilst in regions with 'strong' regional features, plant closures and industrial restructuring can be the stimulus for aggressive regional policy that breathes new life into old areas, 'weak' regions may just passively accept their fate and further decline and stagnate.

'Outsider in': the role of the university as an external stimulus

Old industrial regions appear to face a range of structural, institutional and cultural problems which inhibit attempts to stimulate new economic activities and promote regional economic development. The fact that these problems are mutually reinforcing can breed a structural pessimism about the prospects of such places. And yet, such

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structural pessimism is extremely problematic given that there have been a number of regions which have successfully made a transition from old industrial economy to new knowledge region, such as Skåne in Sweden, East Flanders in Belgium and North Jutland in Denmark. These regions all underwent economic restructuring driven by significant global changes in their major economic activities. All three regions were dominated by heavy industry and engineering, including shipbuilding and chemicals.

In Skåne and North Jutland, although shipbuilding largely disappeared, new replacement activities emerged, driven in Skåne by large R&D-intensive companies such as Ericsson and Astra Pharmaceuticals, whilst in Jutland, traditional expertise in marine communications underwrote the emergence of bespoke electronics markets. In East Flanders, the strategic significance of Antwerp and its chemicals industry persuaded key governmental actors to subsidise innovation-driven conversion, so Antwerp has remained a significant centre for the European petro-chemical sector but also with novel pharmaceutical and biotechnology clusters. Common to all three stories is the importance of external agents bringing investment into those places in ways that addressed the hardware, software and mindware problems created by industrial restructuring. Hardware evolved as new sectors formed: Antwerp became a place where modernising chemicals firms invested in new technology sectors, North Jutland benefited from the long ICT boom of the 1990s, and both trends benefited Skåne. Software reconfigured itself: external actors' involvement prevented institutional lock-ins. These changes upgraded mindware: the advanced image of the pharmaceutical and ICT sectors helped reinforce these regions' images as the leading laboratories of emerging manufacturing sectors.

In all three examples, external agents played positive roles; firms invested extensively in new and innovative activities, whilst national governments acted extremely supportively in making these places into high-technology spaces. In many old industrial regions, firms and governments perform quite different roles, exacerbating the problems created by economic restructuring, and creating these economic lock-ins. As manufacturing has shed employment, firms and industries have rationalised and disinvested, and so may lack the capacity to invest with the long-term horizons sufficient for stimulating positive regional growth (Asheim & Herstad, 2005). The increasing neo-liberal view of many governments encourages the view that investments in knowledge capital should be restricted to the most successful regions to produce increasing returns, and so old industrial regions are seen as being unworthy sites for the kinds of productive knowledge investment that can support regional competitiveness through innovation (Marvin *et al.*, 2005).

If firms and governments cannot or will not provide the necessary economic stimulus for old industrial regions, this raises the question of who can. The answer is increasingly being found in the higher education sector (Boekema *et al.*, 2003). Universities are a significant sector in all developed economies, contributing around one third of all R&D, educating up to one half of the population, and supporting industrial competitiveness. Recent debates over the contribution that universities can make to regional economic development have focused on the increasingly international and globalised nature of universities and the multi-faceted nature of their economic and social contributions (Boucher *et al.*, 2003). In recent years, the landscape of higher education has changed considerably in response to the increased demands governments have placed on the sector.

Increased marketisation, global competition, standardisation and privatisation have encouraged universities to focus their external engagement upon economically rewarding collaborations (De Boer *et al.*, 2002), reorganising financially and institutionally to best work with rich and well-configured external partners (Clark, 1998; May, 2006). This suggests intuitively that universities could conceivably play this role as a conduit for external investments which stimulate local developments, what Bathelt *et al.* (2004) refer to a 'global pipeline, local buzz'. In this paper, we ask whether in attracting external resources, universities can make a significant effort to address the problems of old industrial regions in terms of their deficiencies in hardware, software and mindware.

Methodology

In this paper, we are focusing on three attributes which are not necessarily immediately conceptually reconcilable; hardware is a function of economic and industrial structure, software reflects institutional dynamics, whilst mindware represents local culture and external beliefs. This makes it difficult to build a comprehensive model of regional change which will establish beyond reasonable doubt the significance of observed changes. In an attempt to build a dialogue between these three very diverse areas, and inspired by Boucher *et al.* (2003), we are using a 'balanced scorecard approach', regularly used to attempt to gauge progress within multidimensional change situations, such as regional sustainable development (Benneworth *et al.*, 2002). In such an approach, particular changes can be categorised on each dimension according to a fourfold classification (Illsley and Lloyd, 2000):

1. *Individual*. The agenda is marginalised within the sponsoring organisation
2. *Organisational*. The agenda is mainstream within the sponsoring organisation

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3. *Network.* The agenda begins to compel other external partners to engage
4. *Regional.* The agenda becomes the central organisational rationale across regional partnerships.

Whilst Lloyd and Iley's concern was the impact of the adoption of Local Agenda 21 in Scottish municipalities, their attempts to reconcile and quantify very different variables (in their case structural, institutional, strategic, practical change) has clear resonances for our own approach. In this paper, therefore, we consider each of the three variables, the regional hardware, software and mindware, and estimate how far the university has contributed to addressing the central regional problem. A change in the regional situation is only significant if all three variables can be classified as '2' (behavioural change within a network), or '3' (behavioural change across the region). Of course, this is not a strict numerical method, more a heuristic to begin to estimate the significance of the changes for the region.

This paper reports a case study of institutional transformation that has been developed over a three year period (2004-06) and which was reported most recently in Benneworth (2006). This case study has involved a number of different components, including considering business engagement through consultancy and spin-off activity, and community engagement at an institutional level (Benneworth and Charles, 2005; Benneworth and Hodgson, 2005; Benneworth, 2006). The research underpinning the case study has been used to produce three synthetic narratives corresponding to the three dimensions, hardware, software and mindware. These narratives have been written following a critical realist approach, attempting to reasonably combine diverse data sources, not claiming to be 'true' but highlighting in a stylised manner key regional dynamics from which more general understandings can be inferred.

The North East of England: multiple, overlapping problems

We explore these questions with reference to one university in the North East of England, which as readers of *Northern Economic Review* will be aware, is a declining old industrial region. The origins of Newcastle University as a combined agricultural, engineering and medical college has meant that Newcastle University has long valued engagement with local industry, but recent economic decline has reduced the economic strength of key partners. We look at how Newcastle University has helped the North East to address problems with hardware, software and mindware as the

basis for a more general reflection of how universities can work effectively with local partners to stimulate economic development in old industrial regions.

Although the North East was one of the first regions to industrialise, its early industrialisation left a series of flaws which hastened its subsequent decline. The region steadily lost ground from the emergence of the USA and Germany in the 1870s to World War I (Tomaney and Heyward, 1996; Kitson and Michie, 1996; Elbaum and Lazonick, 1986). Governments were preoccupied with modernising its dominant sectors, but industrialists failed to secure the necessary investment for modernisation, although the severity of the decline was masked by boom demand periods associated with two world wars and the subsequent restructuring efforts. From representing a peak of 40% of the workforce in 1931, heavy industry entered a period of decline from which the region has yet to emerge (Table I).

Table I Employment in the key industrial sectors in the North East of England ('000s)

	1841	1861	1881	1901	1931	1961	1971	1981	1991
Population	617	942	1458	1,995	2,515	2,610	2,678	2,636	2,602
Coal miners	23	50	96	165	188	118	64	39	11
Iron & Steel	-	13	31	34	23	57	56	22	10
Shipbuilding	-	7	15	42	51	64	39	26	8

Source: Byrne and Benneworth, 2006

A second feature of this decline was a failure to attract or develop 'new' industries to replace old sectors. Existing industries continually failed to invest in new knowledge; privately owned coal, steel and shipbuilding industries failed to rationalise and restructure in the period 1900-50, undertaking little investment in innovation. During the period 1950-90, the North East *did* host a number of collective R&D facilities, in utilities (gas, electricity, water) as well as shipbuilding; however, financial pressures following privatisation in the 1980s led to their closure (Benneworth, 2002). The policy focus in the 1960s and 1970s shifted to the attraction and retention of inward investment in cost-conscious manufacturing activities. The 1980s saw a huge manufacturing recession and privatisation of key industries which dealt a further blow to the region's indigenous knowledge-intensive manufacturing base. Although the North East had been becoming a branch-plant economy since the 1960s, it was the loss of the last locally-owned engineering firms that marked the end of the North East

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as a manufacturing centre. How can this decline be conceptualised within our hardware, software and mindware framework?

In hardware terms, the economy of the North East is reasonably diverse, although with an above average employment in manufacturing and low levels of employment in knowledge intensive sectors, both manufacturing and services. The key structural problem for the region is not necessarily one that emerges in raw figures, but relates to the issue of the North East as a branch plant region. The region has suffered from plant closures in recent years, but there has been a shift from local bankruptcies towards relocations as activities at older facilities are relocated eastwards to more cost-effective locations. Four decades of increasing external control over industries has left only a very limited entrepreneurial class able to challenge this trend towards offshoring. The absence of a strong knowledge economy has meant that the region lacks identified economic strengths, creating difficulties for attracting the kinds of new investments which might stimulate the development of new economic sectors to replace jobs lost.

In terms of the software in the sector and its institutional capacity, it has long been recognised that although the regional might be institutionally 'thick', this does not necessarily translate into capacity for action. Since regional industrial problems emerged in the 1960s, there have been a range of regional economic strategies that have attempted to create an action plan for regional restructuring. These reports range from the *Challenge of the Changing North* (the Hailsham Report, 1962), and the Northern Regional Strategy Team's *Strategic Plan for the Northern Region* (1977), to the Regional Development Agency's more recent statutory strategies *Unlocking our potential* (1999), *Realising our potential* (2002) and *Leading the way* (2006). The North East has long been regarded as a regional policy laboratory from the creation of the Team Valley Trading Estate in the 1930s (Loebl, 1987). Today there is a dense, overlapping - and arguably redundant - tapestry of bodies seeking to promote regional development in the North East. But missing from this institutional labyrinth is a strong regional leadership able to mobilise these diverse actors into a focused coalition able to achieve effective change and win new investments to secure future regional success (Keating *et al.*, 2002; OECD, 2006).

The North East has problems with both components of mindware, internal and external image. Part of the problem for reindustrialisation in the post-war period was a reluctance by national policy-makers to invest in high-technology industries in the North East of England (Heim, 1985). This became self-reinforcing to some extent, and even under the period of nationalisation, the region received fewer industrial research organisations than might have been warranted given the industrial structure (Buswell

and Lewis, 1970). More recently, there has been a reluctance amongst central government to invest in knowledge based growth in the region (S&TC, 2003) and this has been paralleled by an unwillingness of private investors to invest in large high-technology regional facilities. Although Byrne (1996) argued that North East residents had very specific preferences for Scandinavian social democracy and a full employment manufacturing economy, there has been nothing equivalent to Scotland's constitutional rise in the North East. Regional politics remain dominated by national parties and issues, and in the one opportunity that regional citizens had to articulate a distinctive regional position, a regional referendum on an elected assembly, four people voted against this proposal for every supporter (Tickell and Musson, 2005). Although the meaning of this is difficult to rigorously decipher, it suggests that the region remains looking towards outside agents to solve its problems, agents who show every sign of believing the North East's problems to be intractable.

Hardware: building new science industries?

The key hardware problem in the North East of England is the lack of strong, dynamic growth sectors where local businesses benefit from the regional science and technology base. Newcastle University has been involved in attempts to develop and upgrade a number of regional sectors, and as an illustration of this, we examine the case of the pharmaceuticals sector, which was one of the branch-plant industries attracted to the North East from the 1960s, as part of attempts to consolidate the Teesside chemicals industry. Whilst bulk chemicals has declined dramatically in the region, pharmaceuticals has maintained a steady employment level, whilst the technological sophistication of activities has increased, even in externally owned manufacturing operations (Benneworth, 2004). However, none of the pharmaceutical activities in the region are predominantly R&D activities with the exception of a single small-scale development laboratory. At the same time, the key current technological driver for the pharmaceuticals industry is the challenge of new disruptive technological paradigms, notably biotechnology and nanotechnology.

Newcastle University (*inter alia*) has been active in trying to use its strengths in particular related scientific fields to strengthen the regional industry, both to support existing activities as well as to introduce new activities with a higher R&D component. Newcastle University has made contributions in three areas. The university has been actively promoting spin-off companies, and a number of these are in pharmaceuticals, nanotechnology and biotechnology; however, the relative contribution of spin-offs remains small, with under 100 employed. The second has been to develop research relationships with existing firms to help embed them in the region; those relationships

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have been most successful when the firms have been locally-owned medium sized enterprises. At least two regional pharmaceutical firms have significantly overhauled their technology base and maintained their competitive advantage by working with the university. Third, the university has helped a number of spin-off activities from businesses changing their technological direction, helping to safeguard jobs as well as encouraging diversity in the sector. The medical school incubated one firm that span out from a foreign owned plant, which subsequently grew into a medium-sized business. Fourth, the university is developing a strong technology base in stem cell research which is acknowledged to be world-leading; companies are investing heavily in this technology which promises panaceas and the North East could become the location for its subsequent commercialisation.

In terms of the scalar classification offered above, it is clear that the impacts of Newcastle University on the regional sector have been somewhat limited, although the university is clearly strongly externally engaged. An entirely novel high technology industry has been created in biotechnology from the intersection of pharmaceutical firms and the university's medical research, but this is very small in scale (<250 employees). There has been some modernisation of the industrial base, and the university has helped with business succession through encouraging spin-off companies. However, the university has not succeeded in creating a 'Cambridge phenomenon'-style growth blossom. At best, the greatest contribution from the university to the regional hardware will be in helping with a more general process of regional restructuring which uses university knowledge to create some regional competitive advantage.

Software: strengthening a locked-in institutional framework?

The software problem for the North East lies in the lack of local mobilisations to provide a positive regional response to the challenges of economic restructuring deriving from the locked-in regional institutional framework. The relative economic weakness of the region provides relatively little incentive for actors to collaborate, and responses to large crises such as branch plant closures tend to involve appealing for outside assistance. Newcastle University has been active in addressing both parts of this problem, the formal institutional lock-in as well as the absence of collaborative cultures in business, public and social life.

From a formal perspective, Newcastle University has been strongly engaged with the regional development institutions which have emerged since the 1997 elections. The most visible manifestation has been that the Regional Development Agency has placed *increasing emphasis* on the roles of universities as sources of growth and economic development; the 1999 Regional Economic Strategy included a chapter entitled 'Placing universities and colleges at the heart of the regional economy'. Since then, subsequent strategies have reaffirmed this privileged position, and there has also been the development of a separate stand-alone science strategy field in which the universities have themselves become increasingly important. When the science strategy, *Strategy for Success*, was initially launched in 2003, the main investments were to be made into intermediary institutions, the so-called 'Centres of Excellence' which were designed to help firms access university technology. After several changes to the strategy and an evaluation, the RDA accepted that investing in universities' technological strengths was vital for industrial policy.

Newcastle University's contribution to informal institutional development has been more muted, although as a large regional employer and R&D business, it is engaged with a substantial number of networks and partnerships in the region. There is an acknowledged regional problem that businesses favour subsidised support services rather than choosing support from partners with whom they collaborate. Newcastle University has been trying to change this business culture by creating a subsidy-neutral consultancy arrangement, although admittedly this impinges on a tiny percentage of all regional business. Newcastle University is also trying to involve excluded communities in its development by creating large-scale projects which create both community benefits as well as research opportunities for the university.

A heuristic for this approach is Newcastle University's GREAT Institute (Geothermal Research Education and Training Institute) to develop economic activity based on utilising local geological resources as an energy source. This institution is being created in Easington, an extremely poor former mining district where approximately 24% of the adult population are on incapacity benefit. GREAT is led by a research team with world-class expertise in environmental geology of the mining industry, (the Hydrogeochemical Engineering Research and Outreach Group). GREAT aims both to create employment opportunities around the early exploitation of geothermal as a community resource (akin to Danish wind co-operatives), and simultaneously provide a fertile 'laboratory' for an ongoing academic research project. Each of the university's four main research themes have an identified community dimension to help to overcome the North East's problems of social exclusion and underachievement, quintessential 'software' problems.

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Newcastle University has helped the North East make a shift in its policy communities' concepts of regional economic development, from innovation-based approaches to third-wave science policies. Although this remains a contentious policy change, it is clear that Newcastle University has been effective in advancing this agenda to the RDA, and as far as is permitted within national guidelines, One NorthEast is promoting science-based economic development. Allied to this, Newcastle University has made some attempts to engage with local communities to begin to upgrade their 'software' and help them to develop the necessary social capital to survive effectively in the modern economy. What characterises this approach is great success at elite levels, such as development institutions, with a much more moderate impact on the wider society at large.

Mindware: making Newcastle a UK 'science city'?

The North East's mindware problem stems from a national view of the North East as a 'problem region' and an acceptance by local communities that national government ultimately 'knows best', as demonstrated in the resounding 'no' vote in the 2004 referendum. Previously, regional agencies have not well understood the role of the university as an agent of transformation, one university employee noting that before 1997, universities' roles in regional partnerships were regarded through the lens of contemporaneous industrial policy, namely attracting inward investment:

The Northern Development Corporation used regional universities whenever they needed to put some clever bastard in front of the inward investor to prove that there was specialist knowledge in the North East.

Benneworth & Charles (2005) p38

Perhaps the most convincing evidence for the changing regional mindware has come about through the emergence of the Science City project. In November 2004, Newcastle was designated by national government, as one of three (later six) science cities, and the science city concept adopted in Newcastle was in using large scale research developments with built-in community engagement to drive economic competitiveness and social regeneration. The partnership that emerged was arranged between the university, local authority and regional development agency, and focused on developing innovative ways for university research to create economic regeneration and competitiveness benefits for Newcastle and its city-region (Kelly, 2006). The Science City designation reflects the fact that Newcastle University had managed to convince both national and local partners that the economic and social changes it had

delivered in the preceding decade were substantial enough for an expanded concept to become the new approach to regional economic development.

Newcastle University has come some way in persuading the national government that *pace Heim* that high quality scientific research can be performed outside the 'Golden Triangle' of the South East of England. This transformation has not been totalising or rapid; there are still important science policy actors who are in favour of concentration and specialisation in UK higher education, which frequently implies spatial and institutional concentration in south eastern institutions. An important part of Newcastle's value comes through its participation in wider networks of universities. Science City is in part justified by the fact that its benefits will actively be diffused throughout the region by other regional universities, with whom Newcastle University works closely in the representative organisation Universities for the North East. There is also evidence (Page and Secher, 2006) that it is the eight research-intensive northern universities which have managed to capture government attention as agents of socio-economic change, rather than Newcastle University alone. However, both these facts suggest that the university has had some role – hitherto not exercised by any other regional institution – in upgrading external perceptions of the region.

There is also evidence that internal perceptions of the region, its universities and their role in the regional knowledge economy have been changed by Newcastle University. The two preceding sections have both shown how Newcastle University has been instrumental in overhauling the way that the RDA and other regional agencies view Newcastle University in particular, and universities more generally. Recent figures show that there are increasing levels of R&D undertaken within the region (Owens, 2005), suggesting that businesses are becoming more involved in R&D simultaneously with increased university efforts to promote innovation and commercialisation. However, there is much less evidence that North Eastern universities are addressing problems with the mindware outside these elite groups of leading business and public sector organisations. Newcastle University has recently proposed – as part of the Science City project – to create four community-based activities integral within the four main science work-packages, to benefit local communities as well as generating scientific excellence. The benefits of this approach remain unproven. Despite concerted university efforts through programmes such as the Active Communities Fund, AIM Higher and Widening Participation, education and progression levels in the North East – a vital precondition for economic competitiveness – remain stubbornly and substantially below national levels.

Newcastle University: balanced contributions to regional renewal?

In the preceding sections, we have identified that Newcastle University has contributed to regional renewal along the three dimensions of hardware, software and mindware. Our first observation is that the university has a firm institutional commitment to regional engagement across a spectrum of approaches, and this appears to have had a regionally significant impact. In all three cases, there has been interaction with external agents, and there have been changes in those agents' behaviour which has in turn affected the North East's overall economic development trajectory. Indeed, Newcastle University certainly scores at least '2' (creating networks) along each dimension of hardware, software and mindware. Mature industries and firms have been encouraged to begin innovating (hardware), regional institutions have been encouraged to adopt new paradigms (software), and Newcastle University has participated in an ongoing process of changing the old, manufacturing image of the North East (mindware). However, it is immediately clear that there have been fewer successes in transforming *the region*, providing structural, institutional and cultural capacities to compete in the modern knowledge economy. Indeed, the Science City project may yet be recognised as achieving this transformation, but that is at such a gestational stage that it is impossible to meaningfully claim Science City's wider significance.

The 'software' example is instructive in providing a new perspective on how universities can help promote the knowledge economy in old industrial regions. In this case, Newcastle University helped to break path-dependency and lock-in amongst a group of policymakers who were very strongly committed to a particular version of industrial policy, attracting inward investment and using that to stimulate other economic activities. These policymakers set a development framework for the region focused on attracting new firms to replace lost jobs rather than creating knowledge capital assets. It took a protracted seven year struggle for the policy community to recognise the limits of the existing policy arrangements, and reconfigure themselves and their spending behaviours in support of the new policy paradigm, 'regional science'. Throughout this period, Newcastle University proposed alternatives, acquired external funding, produced successful projects and then allowed other partners to benefit from that success. This implies a model for how universities might be able to achieve a more substantive change within their regional economies to address the specific problems of industrial decline and lock-in.

The problem is that the central industrial policy community was, in reality, very small, comprising a limited number of RDA, local authority and government office staff. By

contrast, the key communities which need to be engaged to address the North East's remaining hardware and mindware problems are of the large, diverse, and often hard to reach varieties. On the one hand are the long tail of non-innovating businesses, on the other are the regional residents who see little real value in continuing education given the moderate returns to investment in education in poor regions like the North East. Newcastle University has placed significant institutional energy into business engagement and has in the process built up an impressive policy development infrastructure supported by a wide range of local and regional partners. Extending the university's impacts appears to require also extending their institutional development to further encourage structural change and promoting learning activities.

There is not necessarily the need for a university to act as animateur in every situation, and indeed, universities may not be well-positioned to approach every task as a matter of fundamental institutional importance. Yet it is clear that universities in less successful regions could contribute significantly towards their regions addressing their particular problems. Universities are engaged with both these groups in a range of projects promoting innovation in small business and widening participation, but these do not always systematically add up to provide the transformatory impulse that the North East requires. Perhaps the next step in furthering this agenda of university engagement in the North East is addressing the question of how this disparate system of engagement projects, activities and networks can be better co-ordinated, and diffuse the knowledge economy – and its undoubted benefits – throughout the North East of England.

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