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Regional
Observatory

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The Importance of Innovation in a Changing Economy



A State of the Region Thematic Report

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Executive summary

Executive summary

In difficult economic times, firms need to adapt if they are going to survive. Innovation is particularly important at such times. This report looks at some of the issues facing the region if it wants to be known as a leader in the field of innovation. All of these issues would have been relevant anyway, as the nature of the economy changed. They are even more important now that the economy is in recession.

The report, one of the Observatory's series of State of the Region thematic reports, is largely made up of four independent essays on key themes for regional innovation policy. These themes are:

- Innovation in services
- Innovation in the public sector
- Innovation links between industry and universities
- Innovation and skills

Between them, these essays present evidence about a number of key challenges for the region. These are discussed in more detail in the final section of the report and are summarised below.

Does the region need to break from its industrial past or can its unique history be channelled as a catalyst for higher growth?

De-industrialisation is a word used to describe the movement of an economy from primarily production-based sectors towards service sectors. In its simplest form this represents a break from an industrial past. But can the strengths of manufacturing be channelled into enhancing services?

In the first essay, *Service Innovation*, Dr. Palie Smart highlights the increasing importance of services to economic growth through their increased share of total output and improvements in productivity.

She highlights the blurring of traditional distinctions between manufacturing and services. New and innovative products are now often combinations of elements of both. Successful firms are increasingly providing integrated packages. For example, Rolls Royce supply their engines with supporting service contracts. These contracts provide management as well as diagnostic data to support the operational activities of buyers.

Successful innovation is also increasingly dependent on collaboration with other businesses and deeper and a more frequent dialogue with users to ensure competitive advantage can be maintained.

Can the public sector provide more innovative approaches to improve service delivery to its customers?

In the current economic climate, the public services, more than ever, need to be even smarter and more effective in delivering value from current and futures resources - people as well as funding. Bureaucracy can stifle creativity and limit new possibilities for improvements in service delivery and quality.

In the second of the essays, *Innovation and the Public Sector*, Prof. Adrian Cole highlights the differences between the drivers of innovation in the public and private sectors. Within the private sector the competitive environment of market forces drives firms to deliver service quality and to meet the changing needs of users while also ensuring economic performance improvements through increased productivity.

In the absence of competitive market pressures, organisation structures within the public sector play a more important role. Prof. Cole argues that centralised direction, a risk-averse environment and limited knowledge exchange all contribute to hinder innovation in public sector organisations.

While stakeholder engagement is important for transparency and accountability in public service delivery, the counterpoint to this is that it imposes constraints on, and delays in, innovation, thereby diluting the potential gains from new ideas and processes. The culture of incremental change in public sector organisations has the net result of limiting the potential for successful innovation.

Can we develop a new market place for knowledge?

Bill Joy, founder of Sun Microsystems, is quoted as saying, “*Not all the smart people in the world work for you*”. Open innovation requires that you source and develop new ideas from a range of external as well as internal sources. People, knowledge and capabilities are all drivers of growth in the new economies, and universities are acknowledged centres of expertise. However, they often find it difficult to communicate and exchange this knowledge with those better placed to channel this knowledge and expertise into new growth opportunities - businesses.

In the third of the think pieces, *Universities, Industry and Innovation*, Prof. Lynne Martin and Dr. Julia Rouse also reflect on organisational frameworks and the role they play in enabling universities to engage with the commercial sectors. The authors argue that effective knowledge exchange works best where long-standing relationships built on trust exist. This is due to the high ‘costs’ in terms of time and resources needed for engagement between academic researchers and businesses.

As with many market exchanges, established relationships that develop over time reduce the costs of doing business, as a shared language develops and the time and resources necessary for understanding each others’ needs are reduced. Where issues may affect this, particularly where there is less understanding of individuals’ perspectives or specialist knowledge, there is a role for skilled intermediaries to broker contacts and begin the process of developing the relationships and trust that will facilitate improved innovation links.

Can the region’s cities offer greater opportunities for businesses for increased innovation activity?

Related to the theme of open innovation is the availability and proximity of skilled workers. Economists have long understood that businesses benefit from being located close to other firms, be they suppliers or firms in the same sector. In the knowledge economy, the proximity of highly skilled workers to each other can rapidly increase the adoption and dissemination of new knowledge.

In the last of the essays, Dr. Vania Sena discusses the issues of *Innovation and Skills* against a geographical framework. In her discussion she highlights the availability of higher level skills as a key driver of relative levels of innovation. This occurs at both the level of the firm and the wider economic environment.

At the level of the firm, evidence suggests that if the workforce is made up of more higher skilled workers there is a greater likelihood that innovation opportunities will be identified, resulting in higher levels of R&D activity. This R&D activity can be a further catalyst for generating new knowledge within the firm.

The new knowledge initially remains private within the firm, but from here it tends to spill-over to the wider economy where it can be copied at limited or zero costs. The result is that knowledge spreads beyond individual firms. This leads to a second issue identified by Dr. Sena - the availability of skilled workers also increases the potential for absorption of the external knowledge generated by other firms.

The location of skilled workers thus also becomes important. The closer they are geographically, the faster new knowledge can be absorbed and disseminated. Increased knowledge transfer, through formal and informal contacts, gives considerable advantage to knowledge intensive firms locating close to one another.

Introduction

Introduction

Since 2004, the Observatory has been publishing annual State of the Region reports to inform strategic thinking and policy development in the region. Whilst we will continue to publish the annual reports, we have restructured the State of the Region process so that it will bring the reports closer to the needs of policy makers across the region.

Evidence-based policy can only become a reality if those producing the evidence and those making the policy work together. There needs to be an ongoing dialogue between the two groups rather than just occasional contact. The new State of the Region process provides exactly that. It consists of a series of thematic dialogues. Each starts with a workshop bringing together the key policy and decision makers with the researchers and analysts who supply evidence. The workshops receive “think-pieces” from experts in the field drawn from across the country to provide a fresh perspective and stimulate debate. Following the workshop, a work programme is produced to develop the regional evidence base and link it to policy developments, involving colleagues from across the region, and beyond it, throughout the process.

One of the outputs of each dialogue is a thematic report, in some cases more than one. These set out the key evidence and how it links to policy. This report is one of these State of the Region Thematic Reports.

Background

This thematic report has been produced as a result of a State of the Region dialogue focusing on the key issues and challenges that need to be addressed in how the region can effectively channel innovation activity by private and public sector organisations in the West Midlands.

The report is centered on 4 think pieces commissioned from independent academic experts. These are based on presentations made at our second innovation workshop, held earlier this year. These are followed by a short discussion, where we draw together wider issues and outline the implications for how increased innovation can help close the economic output gap.

Higher levels of innovation activity are necessary to increase the competitive advantage of our firms, to increase the efficiency and value of public services and harness the creativity and skills of the region's workforce to drive increased economic growth.

The four papers provide important evidence about how innovation activities are developing to meet the needs of a rapidly changing economy. As such, they can provide a guide to some of the key issues which regional policies linked to innovation will need to address in the future.

Activity so far has included:

- An initial seminar 'Measuring innovation for successful delivery', held in September 2008 in partnership with Birmingham City University. This enabled key stakeholders, policy makers and academics from around the region to come together to discuss how the region could contribute to improving the evidence base to support regional innovation.
- A workshop at the Observatory's annual conference in October 2008 where a series of expert speakers presented further research findings and highlighted some of the work that is already being done to address the issues.

On March 19th, WMRO hosted our second innovation workshop entitled: ***From recession to growth - the importance of innovation in a changing economy***. The workshop, supported by Birmingham City University and Contact Knowledge Exchange, brought together academics, policymakers, researchers and business to discuss how innovation can enable businesses to survive and potentially prosper through the economic downturn. The workshop focused on 4 key themes:

- Service innovation and implications for regional economy
- Innovation in the public sector
- Universities and their role in regional innovation.
- Innovation and the skills gap

Service innovation: What does it mean for UK manufacturers?

Key messages

This chapter was authored by Dr Palie Smart, Visiting Fellow, Centre for Innovative Products and Services, Cranfield University.

- The growing importance of services within the UK economy, and that of the West Midlands, means that service innovation has an important role to play in future growth and productivity.
- Increasingly, the boundary between manufacturing and services is blurring, with many new and innovative products containing elements of both. Successful firms will ensure that they can provide integrated packages of this kind.
- Successful innovation increasingly involves input from outside businesses as well as within, with the user community being an important source of ideas.
- Design is a key component of successful products and this applies as much to services as manufactured products. There is a need to extend design as a discipline so that it influences service development as well as tangible products.

Service innovation is important for UK economy

Understanding service innovation poses the need to be precise about our definition of service innovation. The recent DTI Occasional Paper No.9 (2007) Innovation in Services uses Crespi et al's (2006) definition as follows:

"...it is often useful to think of services as either intermediation activities, such as transport, that arise because consumers want to separate production and consumption, or contact services, such as haircuts or media services, where production involves the consumer directly and where the output of the activity is embodied in the consumer ... an important aspect of service is the 'jointness' of production and consumption - i.e. that goods can be produced meaningfully without consumers (think of a firm producing a car), whereas services require jointness (a haircut, or repairing a car)."

Services comprise a diverse industrial sector, from professional banking services to unskilled and semi-skilled cleaning, allowing for vast heterogeneity in terms of their respective knowledge bases. The Office of National Statistics (ONS) accounts show that services make up approximately 75% of economic activity and the remaining share is made up of manufacturing, energy, agriculture and construction.

The Community Innovation Survey (CIS4) confirms that firms across sectors innovate in both goods and services.

Firms are increasingly reinventing themselves as solution providers rather than providers solely of goods or services. For manufacturing firms this increasingly requires the delivery of a physical good/assets accompanied by a complementary service offering or bundle. This has been referred to as the servitisation of manufacturing and conversely service organisations are offering more productionised services (for e.g. levels of gold, silver and bronze service contacts) to markets. Both present examples of service innovation.

Service innovation: What does it mean for UK manufacturers?

Understanding innovation and how is it changing

Innovation is the successful exploitation of ideas (DTI, 2005), a definition that is relevant to all sectors of the economy. Whilst innovations are more easily identified in manufacturing firms, the UK has demonstrated important service innovations in retail, transport, leisure, distribution and healthcare sectors, often using new ICTs.

Seeking new sources of innovation for the purposes of R&D is changing for both manufacturers and service providers. Increasingly, firms that are benefiting now call their external R&D strategy 'connect and develop', recognizing that great ideas also lie outside the boundaries of their organisation. Chesbrough's (2003) concept of 'open innovation' is used to illustrate how the locus of innovation is shifting away from being firmly rooted within a single firm and into a multi-organization domain of diverse stakeholders. This is fast becoming one of the most distinctive features of leading economies and is very much in concert with Von Hippel's (2005) notion of the 'democratization of innovation'.

Sustained innovation for UK manufacturers and the role of design

Service Innovation Drivers for Manufacturers

Over 70% of people employed in the UK are now working in the service sector. Indeed some of the most successful manufacturing firms describe their market offerings as a strategic mix of manufacturing and service. For example, Rolls Royce plc offers a total care package, where customers buy the capability the engines deliver 'power by the hour' and retains responsibility for risk, maintenance, etc over a period of time. Other manufacturing firms, such as IBM, are now service businesses, moving away from the production of hardware and offering business solutions. Others, such as Shell, have integrated their service retail operations with the traditional production of oil reserves.

The following represent some of the major drivers underpinning UK manufacturing's shift towards long term service delivery (often in addition to product delivery), and sustained innovation:

Towards embodied intelligence. Products are moving from being simple commodities to more integrated bundle offers, which are knowledge intensive and embody intelligence. In complex capital goods the level of embodied intelligence, for example, in an aircraft engine capable of condition-monitoring, self-diagnosis and communication from mid-air to maintenance facilities at the planned arrival airport, represents a significant development in delivering service.

Towards servitization. This can be the bundling of associated services around the product to support its use and to extend the range of performance and the period over which the whole bundle is consumed. The famous 'power by the hour' model in aircraft engines extends the innovation offer from a basic product to a service offer over extended periods of time, based on functionality.

Towards user communities. Whilst Lüthje et al (2005) have shown the importance of users in the innovation process, recent years have witnessed an explosion of interest and opportunity around this theme. Whilst some of the notable user-led and open (source) community models are focused on software development (e.g. Linux) there is a strong body of evidence about their role in other products and services. Studies in sporting goods manufacturers for example, include extreme users in fields like kayaking, surfing, cycling and skateboarding indicate clear evidence. Early users shape the innovations, and the communities and networks which form around these sports create the social infrastructure that helps define the range of demand for products and services to support future growth.

Service innovation: What does it mean for UK manufacturers?

Sustainable innovation means manufacturing companies can rarely remain as just manufacturing companies, if they are to survive in the long term. They must move beyond solely producing and offer integrated services and solutions with their products and develop new business models. This general shift to servitization has recently been discussed by more recently by Baines et al, 2007; Neely, 2007; Slack, 2005).

The importance of 'design'

In many advanced economies the service sectors are becoming a dominant force, underpinning advances in national wealth and quality of life. The last century has witnessed significant occurrences of innovation including penicillin, electricity, digital media, fibre optic cable, biosensors etc; and so furthering our scientific body of knowledge and experience about successful product innovation. In stark contrast our understanding of the science, engineering, technology and ultimately innovation to manage the delivery of modern services is elementary and ripe for further academic inquiry (DTI, 2007). Recent deliberations to establish the discipline of 'service science' are both a testament and a case in point (Chesbrough, 2006).

In a global, competitive playing field the UK's increasingly knowledge-based economy continues to grow its reputation for hosting a locus of innovation activity through product design. The discipline of design and its creative embodiment into the development of new products often concur with higher levels of innovation capacity and performance (DTI, 2005). As UK manufacturers pursue their strategic exploration towards a more 'servitised' business, the role of design needs to accommodate both product and service conceptions. Reaping the benefits from such complementarities and synergies will lay the foundation of a more systemic and competitive approach to designing new market propositions. As history once dictated with product design, renewal through innovation in service design is a present day priority for practitioners, researchers and policy makers coordinating action to enhance the economic impact of servitisation strategies.

As product design typically commits up to 80% of total product development costs it presents a lucrative opportunity for enhancing value-in-use. The challenge of service design demands a significant behavioural shift away from traditional notions about design as a discipline and its application to conceive tangible products. Existing research in the field of innovation management suggests that some of the good practices for new product development translate well to new service development, whereas others may not (Tidd and Hull, ed. 2003).

Nevertheless, designing a service proposition entails a level of complexity unprecedented in product design. For example services are more intangible market offerings and formulating the correct specification and functionality often requires extraordinary levels of supplier-customer intimacy and experience sharing, an appreciation of 'ownerless consumption', a high degree of responsiveness and being attentive to erratic changes in public opinion and mood concerning a range of societal issues such as national security, youth culture, climate change, super bugs etc. Furthermore, service designs vary according to the relative overall product-service mix, volumes and the levels of customisation.

Therefore a plausible hypothesis suggests different types of servitised propositions (or service innovations) will promote distinct 'archetypal forms' of service design innovation, underpinned by a unique configuration (or pattern) of organisational professional practices and contextual features, yet signature a common core. Further research into the process of designing service innovations may uncover these archetypal forms, which would assist future innovation policy making.

Service innovation: What does it mean for UK manufacturers?

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Innovation and the public sector

Innovation and the public sector

Key messages

This chapter was authored by Prof Adrian Cole, Technology Innovation Centre, Birmingham City University.

Reforming the public service is rarely out of the news. The very recent launch of the “Working Together - Public Services on Your Side” paper by Gordon Brown at a NESTA Conference (Brown, 2009) is perhaps another example of an innovative initiative that Central Government is seeking to implement within the various strands of the public sector. This, of course, is not the first such paper and it is reasonable to assume that it will not be the last. Through these announcements what is being made clear is that the public sector is in a state of constant change, whether driven by top down initiatives such as Mr Brown’s or through the adoption of local pilots and best practice. The implication is therefore, that within the public sector continuous innovative change should now be the norm rather than the exception. The question is then, how best can this norm be achieved?

This short essay is intended to provide an overview of the status of current thinking on innovation within the public sector and to stimulate discussion on how regional innovation policy might be framed in light of recent experiences, academic research and central government strategy. Key messages include:

- The drivers of innovation in the public sector are different from those in the private sector, with service quality and meeting user requirements being important, alongside productivity issues.
- Organisational and cultural barriers often prevent effective innovation in the public sector. Examples include risk aversion, bureaucracy and limited knowledge sharing.
- Stakeholder commitment is important in increasing the likelihood of a successful innovation. However, the need to collaborate can cause delays and dilution of ideas.
- Many successful public sector innovations involve incremental change - doing the same things only better. Users are more comfortable with changes that are familiar than with completely new services.

Current thinking

Research has shown that the processes and drivers which enable innovation within the public and private (commercial) sectors have significant differences.

In the private sector the primary innovation drivers are seen as competitiveness and service cost whereas these drivers are the least important for the public sector (Parna and von Tunzelmann, 2007). What are the most important include; service quality, implementing on-line systems, responding to user needs and improving the take-up of the service. These drivers had been previously expressed in a slightly different way in earlier research (Moore, 1995):

Key Public Sector Innovation Drivers	
1	General productivity increase
2	Better customisation of services to meet varied and diverse customer needs
3	Introduction of new products and services to support or extend mission capability (strategic innovation)

The public sector is generally constrained by an unmoving purpose that is defined by its core brief, its charter or even just its name - the Police Force, the National Health Service etc. The private sector doesn’t necessarily have the same constraints and can adapt to new market needs and technology driven opportunities. The Virgin Group, for example, has moved its core activities from

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the record industry to telecoms (and even to space travel) in its drive for continual competitiveness and growth. The same core transformations could never apply to, say, the Fire Service, no matter how innovative they might be in flood disaster management in some parts of the UK.

Also, in contrast to the private sector, it is the originator of an idea ('or an initiative') within the public sector that is often given a higher status than those managers who try to make the idea work. Indeed most public sector managers believe that they have very narrow tolerances (Moore, 2005) in which to innovate - after all the public sector is often seen as a recipient of good ideas (from think tanks, foundations etc) rather than a source. If the implementation of a good idea is indeed attempted the consequences of failure can be quite severe - particularly if it involved a process failure to get the appropriate authorisation to innovate (going 'out on a limb' with an idea could end your career). The bureaucracy of getting permission to innovate means that even if 'brave' managers were willing to innovate then the overall innovation rate is far too low for a demanding and often fickle public and politicians.

To some (Schorr, 1988) it is the issue of scaling (or diffusion) that is the most important within the public sector. Ideas are already out there in the form of; pilots, local best practice, the occasional inspiring leader etc. It is 'just' a matter of getting these ideas implemented across the population/organisation as a whole. Experience shows however (Elmore, 1997) that the innovations often languish and die within the very organisation that had created them (the bureaucratic soup slowly drowning the enthusiasm).

Within the UK and other larger economies the most important internal factors that slowed down innovation were; the lack of supportive strategy, stagnating organisational culture, rigid structures and the existence of previous failures (Parna and von Tunzelmann, 2007). A notable exception to this is when the idea is given a status by an external professional body - then it became a badge of success to be sought after, exclaimed and most importantly the credit taken for! (E.g. the "Investor in People" awards).

In their recent white paper (Denham, 2008b), DIUS has recognized that it needs to bring together good ideas from not only the public and private sectors but also from the public themselves to help with the above scaling and stagnation issues. "The Lab: Innovating Public Services", recently launched by NESTA, will 'find ideas, test them and then roll them out to the wider world' (NESTA, 2009) and so help to trial the most radical innovations at reduced risk.

Studies of organizational innovation within large public sector organisations such as the NHS (Pope et al, 2006) have showed the problems associated with macro scale policy inspired innovations that are then to be implemented on at a micro (local) level. The tendency for the policy innovation to be reinterpreted at each organisational level means that at the 'coal face' there are multiple local variations of the same original policy. Each interpretation (NHS Treatment Centres in the case of the study by Pope) would have its own level of success dependent on whether the implementers were 'sceptics' or 'idealists' or somewhere in between.

The recent implementation of e-government in many countries has provided a rich source of public sector innovation case studies (e.g. Dovifat, 2007, Kawalek and Wastall, 2005, Wimmer, 2002, Beynon-Davies, 2005). For some, the implementation of e-government systems is a technology led innovation that satisfies all of Moore's three public sector innovation drivers and should be at the core of a wide range of government processes (including policy making). Indeed there is the opinion (Margetts, 2005, Beynon-Davies, 2005) that this type of innovation should also be driving changes in the actual processes themselves. For others (Ling, 2002), e-government is an example of high level process innovation (similar to 'creating partnerships', 'forming collaborations') that doesn't necessarily address customer and supplier needs.

Despite the clear innovation incentives, studies of e-government projects have shown mixed results. The study by Kawalek and Wastall (2005) into a number of projects showed that although at the start they all had radical and innovative objectives, as they progressed, these objectives were gradually 'watered down' to a level where they were effectively more akin to just incremental ICT

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development rather than the breakthrough innovations originally hoped for. A common feature of these projects was that they were managed by a process specifically designed for e-projects to ensure that all project stakeholders were actively engaged from the start. Kawalek and Wastall concluded that it was in fact this bespoke alignment process which was the actual cause of the watering down of the radical visions to incremental development.

While Kawalek and Wastall's projects were 'watered down' through stakeholder engagement they nonetheless achieved some level of 'success'. On the other hand, Dovifat's study (Dovifat, 2007) of the establishment of an e-collaboration platform for a local government organisation showed that through the lack of stakeholder engagement, particularly at the concept and final implementation stages, a project could fail. In Dovifat's case the primary reason for the failure of the e-platform was that it was seen by some (e.g. middle managers) as a threat to their personal power base and possibly to the very existence of the departments that they managed. On a similar vein the e-government initiative at the Inland Revenue (Beynon-Davies, 2005) was expected to produce a saving of '1300 posts over the long term', hardly a way of encouraging employee stakeholder participation in innovation!

An insight into the influences of a customer's (i.e. a citizen's) acceptance of innovation within the public sector is again provided by an e-government project, this time via surveys relating to on-line state taxation and vehicle licensing systems within the USA (Carter and Bélanger, 2005). Through the development of an integrated model, having its routes in the well known Technology Acceptance (TA) and Diffusion of Innovation (DoI) models (Davis, 1989, Rogers, 1995), the authors identified the most significant factors that influence a citizen to use an e-government innovation;

Factor	Coeff	Explanation
Compatibility	0.524	Capable of being related to something else that the citizen is already using. The innovation has a level of familiarity.
Perceived Ease of Use	0.172	Friendly, intuitive, simple to learn
Perceived Trustworthiness	0.155	Concerns regarding miss-use or loss of personal data. Third party security endorsements

The survey shows that the most significant acceptance factor within the Carter e-government model is "Compatibility" (having the highest coefficient). This suggests that the public would perhaps like to first see an electronic application that is similar to what they can already access within their own work/recreation lives before using it in their dealings with government. The study also surprisingly showed that the "Perceived Relative Advantage" factor (from the original DoI model) was *not* a significant factor in a citizen's intention to use the e-government system (and hence not included in the above table). This suggests the citizens thought that the e-system in this case wasn't a real innovation; it was just government trying to catch up with similar systems that they were already using elsewhere in their lives.

Key observations

Although it should be recognised that within the UK there has been a strong tradition of public sector innovation both at national and regional levels (Denham, 2008a), the above highlights some key challenges that need to be addressed in order to accelerate the innovation performance within the public sector. Some main points from the above discussion are drawn together below;

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- Strong innovation management and leadership that provide encouragement and support at all staff levels within the organisation tends to encourage an innovative culture. The existence of “committed key individuals” within senior management, Parna (2006), is seen as the most important internal factor supporting innovation.
- Recognising and nurturing good ideas that emerge from the service delivery staff can be as powerful as the top down initiatives. Reducing the personal consequences of failure and wider recognition of delivery success, through for example external validation, might help improve the pace of innovation.
- Early (and wide) stakeholder commitment is an important factor in increasing the likelihood of success. Excessive efforts to collaborate at all stages can result in initiative dilution, delay and sporadic implementation.
- The ‘thick soup’ of bureaucracy can frustrate fragile innovative ideas before they are allowed to be fully explored to an extent that they may not even emerge from the department or group where they were conceived. Those ideas that survive ‘infant mortality’ face an uphill battle as they seek wider adoption and recognition often against unfounded prejudice and fear.
- Rather than occasional ‘breakthrough’ innovations the public appear to most value almost incremental improvements in service customisation and quality. The “business as usual -only better” (Rogers, 2008) motto might apply although there will be limits where further improvements will not be appreciated or even noticed (at which point breakthrough thinking is required).

Regional policy implications - some ideas for discussion

The above provides some insights into the status and issues that are currently surrounding innovation within the public sector. The following looks forward and presents some slightly provocative thoughts on how future regional policy within might be shaped.

Gathering Evidence for Innovation Demand

Using interrogation techniques to fully understand how a service is actually used can provide a credible innovation ‘launch platform’. Mapping techniques such as the work by Macmillan and McGrath (2001) that include analysing stakeholder experiences at all stages of the service can provide a valuable insight for the need for innovation. Such insights or drivers provide an evidence-based understanding of stakeholder priorities, engender an early collaborative environment (including perhaps developing new external relationships) and provide sound points of reference that will support the innovation delivery team.

Learning

Learning what innovative ideas work and learning about the actual processes of innovation would seem to be good steps to help innovation to occur ‘naturally’ from within public sector organisations. Using the ideas emerging from NESTA’s “The Lab” or applying some of the Design Council’s thinking on service design or perhaps adopting some of the experiences of the many case studies explored by the Young Foundation and Innovation Unit (Maddock, 2007) all might provide useful insights. Similarly equipping staff with recognised tools and processes that enables the ‘mechanics’ of innovation to occur as part of normal routine might help develop confidence and local capability. For example, innovation ‘tool kits’ consisting of; Lateral Thinking, Systematic Innovation and Mind Mapping are already regularly used in the private sector with great effect and can also be directly applied within the public sector.

Innovation and the public sector

Reducing the Risk

What are required are organisations that are continually innovative in that they can produce and nurture a large number of small ideas within a culture of acceptance of change. Developing that culture is probably the greatest challenge and must start with clear and consistent leadership at the top. This process can be supported by both equipping staff with innovation capability 'innovation tool boxes' (see above) and also with a reduced impact of failure. It is possibly both the stigma of failure and the personal consequences of potentially wasting public money that are seen as the greatest risks to career advancement. Adoption of wide spread and routine innovation experimentation at all levels would perhaps make innovation more the norm and so help make the few failures less likely to 'make the headlines'. The 'brave' managers would have to be less 'brave' as they would be encouraged to continuously pursue a number of innovative pilots rather than the occasional single idea.

Accelerate Innovation Diffusion

The rate and efficiency of innovation 'roll out' or diffusion is a concern. Perhaps the adoption of an innovation pilot is seen as 'high risk' or a threat to personal authority (or even part of the 'not invented here' syndrome). Similarly while local customisation of national and regional ideas may have their merits (in that it is impossible to have a 'one size fits all' initiative) such customisation may heavily reduce the intended impact of the idea so causing it to appear to be ineffective (i.e. fail). External and independent recognition of the successful implementation of innovation pilots through awards/certification etc. could provide a stimulus to encourage greater diffusion rates and also ensure implementation quality is kept at appropriate standards.

Seeking Outcomes not Prescribing Methods

The tendency for a target and cost driven public service has in the past almost certainly had a positive impact on the quality and value for money of those services. There is now a recognition that the over prescription of these targets can have a constraining effect on those who are asked to deliver the service (ask any teacher about the impact of the SATs). Having this prescriptive approach to programmes that involve third parties from the private sector will have the same constraining effect and so 'squeeze out' the innovation potential that such partnerships could yield. Focusing on desired broad outcomes rather specific statistical measures will enable innovative solutions the chance to 'breathe' and so reduce the temptation to focus on selective narrow targets at the expense of the whole.

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Universities, industry and innovation

Key messages

This chapter was authored by Prof Lynn Martin, Birmingham City University and Dr Julia Rouse, Manchester Metropolitan University.

The current view that universities should have strong relationships with business and industry is based on the view that beneficial relationships between these apparently different spheres support the development of innovation. Where innovation occurs as a result of university-industry links, this is seen as knowledge transfer, revitalising both parties and actively supporting innovation via new knowledge creation.

Policy documents advocating knowledge transfer also emphasise the role of innovation as a route to competitive advantage. Following global research in both developed and developing economies, there has been a focus on the potential for knowledge transfer in the links between university, industry and the public sector, with UK universities encouraged to develop a range of initiatives to connect with business.

This short essay is intended to provide an overview of the status of current policy and practice related to university-industry links and the effects of these on innovation. The intention is to encourage discussion on how regional innovation policy might be supported to benefit the regional economy, based on academic research, governmental strategy and recent regional initiatives. Key messages include:

- Effective knowledge exchange between businesses and universities works best where there is a long-standing relationship built on trust. This requires significant investment to make it a reality, particularly for SMEs.
- Businesses and universities often have a lack of understanding of each other's perspectives. This can be overcome by skilled intermediaries with experience of both academic and business environments.

Current thinking

Organisations have the potential for innovation via effective internal knowledge transfer - and via new ideas transferred from outside the organisation. Knowledge - as embedded in the interactions of people, tools, and tasks - provides a basis for competitive advantage in firms (Argote and Ingram, 2000; Grant, 1996). When exploring how universities and industry interrelate, research on university-to-industry knowledge transfer can be divided into four categories; *firm characteristics*, *university characteristics*, *spatial relationships* and *channels of knowledge transfer*:

- Research in the '**firm characteristics**' category focuses directly on company issues, such as internal organisation, resource allocation, and partnerships.
- Research in the '**university characteristics**' category focuses on issues relating to the university, such as licensing strategies, incentives for professors to patent, and policies such as taking equity in return for intellectual property.
- Research into **spatial relationships** between firms and universities is related to performance in terms of knowledge transfer success.
- Research in the '**channels of knowledge transfer**' category examines the importance of knowledge transfer routes between universities and firms, such as publications, patents and consulting (Agrawal, 2001)

Universities are "central generators and repositories of knowledge" in society. How that knowledge is "developed, disseminated and applied" is a key issue since this affects not only the cultural richness of society, but also UK global competitiveness (Abreu et al, 2008; 5). The current view is based on - and reflected in - a series of UK government reports but especially:

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1. The *Lambert Review* (2003) - recommended resources to train university staff, especially 'commercialisation' staff, providing model agreements for sponsored research and IP licensing.
2. The *Gowers Review* of intellectual property policy (HM-Treasury, 2006)
3. The *Sainsbury Review: The Race to the Top*, (HM-Treasury, 2006) - suggested funding and other initiatives to support both research intensive and business facing universities: with research intensive universities pursuing 'knowledge transfer' and business facing universities pursuing 'problem solving'.
4. The *Innovation Nation White Paper* (DIUS, 2008) broadened innovation beyond the traditional science and technology paradigm to recognise innovation as a complex process, affected by both demand and supply.

Policy becomes practice via mechanisms such as the 10-year Science and Technology Investment Framework, 2004-2014, and the regional innovation and economic strategies. Assessing the effectiveness of these policies is difficult, with measures like the **Knowledge exchange efficiency**, attempting to capture the effect of government policies reconciling "differences in stakeholder incentives within the science and innovation system" which may impede knowledge transfer from achieving economic impact (Tam, 2007, 19). The sort of 'hard' outputs, numbers of patents etc, that can be measured, give uncertain indications of success; 'softer' factors such as the learning occurring, changes in culture etc, are not yet part of this process.

Given the efforts in place it might seem that knowledge transfer would be a well understood and well evidenced UK phenomenon. So does this mean that the relationship between university, industry and the public sector is fully established? Work still seems to be needed. UK firms were likely to have potentially extensive but weak links with universities, using them as one of a range of such sources for business partnerships, information or assistance (Abreu et al, 2008; Hughes, 2008). Even those firms seen as innovative put universities low in the pecking order behind customers and suppliers as sources of knowledge in the UK and the USA (Cambridge Centre for Business Research at Cambridge and the Industrial Performance Centre at MIT, 2007).

Perhaps this also indicates the relative *value* that company owners and managers place on different sources of knowledge for innovation. US firms more likely than UK firms to rate university sources of knowledge as very important for their innovation; US firms are also more likely to invest in training to support university links (Cosh, Hughes, and Lester, 2006). So when universities and companies connect, how does this occur? The following table suggests some routes.

How does Knowledge Exchange with HEIs occur?	
People	Recruitment, Personnel Exchanges and internships, Studentships
Codified Knowledge	Publications, Patents, Prototypes
Problem Solving Contract Research	Joint R&D Projects, Consulting by University Staff, Testing, Standards, access to specialised equipment, Consortia, Non exclusive and/or exclusive licensing
Public Space	Meetings and Conferences, Standard setting fora, Entrepreneurship Centres, Networks, Joint Curriculum Development Committees, Informal Contacts, Invited Lectures, Brainstorming Sessions
Other	Collaborations with University Spin Outs Contact with Intermediaries or Boundary Spanning Organisations

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What should universities and other organisations do to develop better relationships?

How well a university links with other types of organizations has been found to depend on its strengths, geographic location and relative business infrastructure, and on the social capital of both academics and local entrepreneurs. Potential barriers to collaboration include a lack of knowledge about potential partners and possibilities for mutual interaction, coupled with the difficulty of aligning the interests of businesses and academics without a solid grounding of mutual understanding and trust (which necessarily takes time and effort to develop). However, although there are multiple knowledge exchange mechanisms, the most important of these involve people. For this reason knowledge exchange may be “costly, difficult to implement and take time to succeed” - issues problematic for small and medium-sized enterprises.

These types of barriers - particularly supporting the right sort of links and the long term nature of relationships - may be overcome by **skilled intermediaries or gatekeepers**, with understanding and experience of both academic and business environments while having the skills to overcome barriers and foster relationships. (Abreu et al, 2008, 41-47). The intermediary can aid the process but to be effective, universities working with businesses need to understand the importance of relational rather than transactional aspects, *ie*, the development of long term relationships rather than basing links on short term or project-focussed activities. Universities also need to develop ‘public space’ activities including informal contacts, publications, conferences, graduate recruitment, internships, joint research projects, problem solving and consulting by university staff, testing and standard-setting, participation in networks, access to public space for cross-sector engagement, etc.

These intermediaries can also clarify the needs of companies and to support the whole process of knowledge transfer (see following table).

Recommendations from Connor and Hirsch, 2008
Companies/Employers should develop internal capacities, particularly of managers to be able to:
Be clear about what they want from HE
Choose academic partners carefully
Appreciate and use universities for their strengths
Use a range of links - informal contacts, local networks, internships, knowledge exchange and other actions
HE should:
Make it easier for employers and employees to find out what HE can offer via accessible points of contact
Improve internal communications to better join up external opportunities with internal resources
Be business-like in dealings with employers, by being responsive but realistic
Be strategic about employer enjoyment
Encourage academics to be 'industry active' and to make industry more aware of their applied research

Regional policy implications - some ideas for discussion

The previous sections provide some insights into the status and issues that are currently surrounding knowledge transfer and the relationships between universities, industry and innovation - a discussion 'think piece'. What follows looks forward in the context of the West Midlands and presents some thoughts on how future regional policy within this area might be shaped.

The Regional Context

Regional economy and innovation reports suggest that a key factor impeding growth of the regional economy is low R&D investment and innovation levels, so the overall aim is "to increase the regional levels of R&D expenditure and activity (especially by the private sector) and to increase knowledge transfer between research and business - and between businesses - to generate more innovative businesses". (AWM, 2007).

Previous and planned actions to build relationships between universities / research institutions and businesses and public sector organisations vary in scale but offer a "ladder of progression." This suggests entry at different points depending on past engagement, with priority for approaches enabling a strong business demand-led process to encourage business commitment and investment. Technology transfer activities and expertise are described as present in the private, public and HE sectors, with special mention for AWM's own Clusters and Technology Corridors plus the range of 'third leg' HEIF funded activities across regional universities.

The Regional Innovation & Technology Council's primary role is to champion the key areas where it sees the potential to leverage big economically significant innovations, and so promote the region globally as a distinctive and attractive place in which to innovate, while promoting learning about what innovative ideas work and learning about the actual processes of innovation. This is a logical approach in terms of investment but may not enable the level of development of innovation seen in Scandinavia for instance where a mixed approach was adopted (TEKES, 2007)

Focussing activities - picking winners?

The current policy aims to stimulate knowledge transfer via a focus on a small number of key areas. This includes specific subject areas, focussing resources into particular fields. It also includes intentions to encourage those currently not participating in innovative activities especially SMEs, to do so by stimulating Knowledge Transfer (KT) so that business participation in collaborative R&D is increased. This will include support for SMEs to access existing successful collaborative research funding schemes, initial support schemes and to develop collaboration to a stage that it can seek private or public research funding. The emphasis here is on short term, project-based funding. Universities are implicit, mentioned as one half of a KT Partnership project for instance.

How does this address the need for long term relationships, stressed in UK and US reports?

Priority will be given to "activity that transfers good practice in knowledge-exchange with SMEs to further areas of research strength, both between and within institutions". The programme will stimulate "high quality business-academic collaborative research" to increase private sector R&D investment, contributing to Lisbon targets as well as economic well-being. How achievable will this be without intermediary support designed to identify, support, develop and grow KT links?

Regional activities in knowledge exchange

The region has good examples of knowledge transfer activities across different universities. Some focus on formal knowledge transfer partnerships as with the group of such awards at the University of Wolverhampton. Many are led by key professors in specific fields.

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Whereas many rely on individual efforts, however, one 'intermediary' project run with HE Innovation Funds was the **Contact Knowledge Exchange** project (2002-9). Liaising with key academics in all regional universities, the Contact KE team also developed relationships with a range of agencies already working with private and public sector organisations. By working in this way small firms were contacted by agencies they already knew, trusted and had a relationship with. The beneficiaries of this process included many smaller companies, which would not normally have been in touch with higher education. This is exactly the role previous reports have suggested as key for long term development of knowledge exchange relationship. By acting as a bridge, working with all regional universities, they took the role of skilled intermediaries or gatekeepers, able to bring together different parties in an objective way, and to facilitate the process.

Other initiatives include more sector specific support, based on specific technical expertise. An example is the Jewellery Industry Innovation centre (JIIC), offering a one stop option for SMEs to micro businesses and producers of small products or giftware, in automotive, ceramic, engineering, and white goods industries. Companies needing help with new product development, design, technology applications and close to market research are aided by JIIC design, scanning and reverse engineering, laser welding and marking, surface finishing, anodising and colouring, investment casting, rapid prototyping, computer aided design (CAD), and computer aided manufacture (CAM). Training, mentoring and support are offered in all of these areas.

Regional Policy Implications - Some Ideas for Discussion.

This review of policy and practice briefly outlines some of the intended benefits of knowledge transfer, some key research as to the realities of university-industry relationships and an example of good practice in developing relationships between the two sectors. Having done so, the last section questions how we can progress these relationships beyond their current stage to ensure better knowledge transfer and effective translation into innovation in the region. How can policy and practice support this, given the current economic issues and their demands on regional resources?

Long term relationship?

The change of focus from short term project-based to long term trust-based relationships takes time and may need intermediary support. How can this be incorporated in current practice or future policy?

Learning

The range of projects and initiatives being reviewed offer key learning points for future knowledge exchange work - how can these be captured and used in making policy and practice decisions in the region?

Focus as a limiting factor

The policy and initiatives focus on a small number of areas, which it is hoped will deliver large returns. How is this affected by the credit crunch and how will the region deal with the implications of change?

Internal resources

Key factors impeding knowledge transfer are the managerial capacities in organisations, the ability to develop strong ties with useful partners and to capitalise on these - how will the region update its managerial base to face the challenge of the next 10 years?

Who or what will be the connectors between companies and universities in the next 10 years?

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Tam, J. (2007) "Measuring economic impacts of investment in the research base and innovation - a new framework for measurement", May, URN 07/1057, Science and Innovation Analysis, Office of Science and Innovation

Links

Contact the Knowledge Exchange, Richard Riley: <http://www.contactke.co.uk/>

Jewellery Industry Innovation Centre, Gay Penfold: <http://www.jewellery-innovation.co.uk/>

West Midlands Technology Network: <http://www.wm-tech.net.co.uk/index.php>

Innovation and skills

Key messages

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- The availability of higher level skills is a key driver of levels of innovation. This is true both at the level of individual firms but also within particular geographical areas due to knowledge spill-overs between firms.
- There are considerable advantages to knowledge intensive businesses in locating close to one another and to universities and other research organisations. This is due to knowledge transfer through formal and informal contacts and through mobility of individuals.
- The relatively low level of supply of, and demand for, skills has led to an equilibrium that will require both supply-side and demand-side interventions to break.

Introduction

Innovation is one of the key variables influencing productivity growth. Innovative firms grow faster and are more likely to survive during a recession. The benefits of innovation are not only limited to the original innovator though; by its own nature the production of innovation creates knowledge spill-overs that allow other firms to benefit from the initial innovation in terms of increasing total factor productivity. In turn this can create the condition for a virtuous circle of economic growth from which the whole of society can benefit.

Not surprisingly, then, stimulating the innovation performance of a region is one of the main objectives of a policy-maker. The West Midlands is no exception to this rule. The emphasis that the region's policy-makers put on innovation is hardly surprising. The performance of the region in terms of innovation is rather weak. Official statistics show that over the last decade total investment in R&D by both the public and private sector in the West Midlands has fallen significantly from its peak level in 1999. The incidence of innovative firms in region is rather low compared to other regions; also this is a more pronounced phenomenon in services than in manufacturing.

How can we improve the performance of the West Midlands in terms of innovation? To be able to answer this question, it can be a useful exercise to go back to economic theory to identify the drivers of innovation. The economic literature provides a long list: these include investment in R&D, skills of the workforce and so on. Of course, it is not the purpose of this paper to examine each of these drivers and assess their potential contribution to the improvement of the innovation performance of the West Midlands.

In this paper, I simply focus on skills and their contribution to the production of innovation while at the same time trying to formulate some policy measures that can help boost the region's performance with respect to both skills and innovation.

Again the performance of the West Midlands with respect to skills is rather depressing. The region has the largest proportion of working age population without any formal qualification (either academic or vocational) among the British regions. Even worse, the region is not capable of producing a suitably qualified workforce (judging from the GCSE and A-level scores). Given the scarce availability of skilled workers, firms have learnt to survive with a poorly skilled workforce. Not surprisingly, then, the demand for skilled workers is weak as well. For instance, evidence suggests that firms do not seem to need graduates; when graduates are hired, they are rarely employed in graduate positions. In aggregate this implies that the region is incapable of retaining graduates in spite of the fact it hosts very good higher education institutions and, even worse, there is no inflow of graduate workers into the region.

Against this background, the purpose of this paper is twofold. On one hand, it is a short review presenting the main results that economic literature can offer on the relationship between innovation and skills; on the other hand, it is a policy paper aiming to offer policy-makers in the West Midlands some suggestions (or probably more reflections) on what they can reasonably do to improve the region's performance. The structure of the paper is as follows. The economic literature on innovation and skills is presented in the following section while the next contains some reflections on possible policy measures that could help the region to improve its innovation and skills performance. The final section offers some concluding remarks.

Innovation and skills

The production of innovation and its spill-overs into new products, technologies and productive capacity are deemed to be important determinants of firms' productivity growth and ultimately their survival. In spite of its pivotal role, the process that leads to the production of innovation is still poorly understood. The traditional view of innovation has focused on technological innovation (carried out mostly in manufacturing) where investment on R&D is considered the fundamental input to the production of innovation; the availability of a skilled workforce was deemed to be less important, apart from the highly educated specialists in science and technology working in the R&D labs. However, as the structure of the Western economies has changed in favour of services, recent studies have started to suggest that innovation can take different shapes while its production does not necessarily need to be confined to the R&D labs.

The production of innovation is now a long and lengthy process requiring strong technical, marketing, and integrative competencies provided by different units within a firm (Teece, 1986). In other words, investing in R&D is now only the first (and sometimes optional) step of the successful development of a new product that can be profitably marketed. Unlike the case of technological innovation, the firms' skill base now becomes a key factor that can explain why firms differ in their propensity to innovate. There are several reasons for this.

First, the strength of a firm's skill base can have an impact on the marginal productivity of its investment in R&D. For example, firms that initially possess high skills might perceive R&D investment to be more productive, which makes virtuous cycles possible. Not surprisingly, cross-industry evidence shows that there is more innovation in skilled sectors of the economy and that new firms (usually more innovative) generally employ skilled workers. In contrast, low-skilled firms are less likely to recognise opportunities for innovation and may even decide against investing in R&D altogether. Indeed, Nickell and Nicolitsas (1997) have analysed the extent to which firms' investments in R&D and fixed capital were influenced by their availability of human capital. They concluded that an increase in the number of firms reporting skilled labour shortages in the industry to which a firm belongs will lead to a permanent reduction in its fixed capital investment and a temporary reduction in its R&D expenditure.

Second, the availability of skilled workers facilitates the absorption of knowledge spill-overs generated by other firms so creating another channel for a positive correlation between innovation output and skills to arise (see among the others Jaffe, 1989; Feldman and Audretsch, 1999; Peri, 2003). The hypothesis that technological knowledge acquired by a firm can spill over to other firms and so enhance their productivity was first suggested by Arrow (1962) in his work on the effects of learning embodied in new capital equipment. According to this view, knowledge produced by firms is first private to the firm; afterwards, it spills over to the rest of the economy as it can be copied at almost no cost by any number of firms, becoming social knowledge acting as an external effect in enhancing the productivity of all firms.

Due to this property, the benefits of technological knowledge spread beyond the limits of the original innovator as firms, not able to innovate on their own, can benefit from the research findings of firms working along similar lines. Again, the availability of skilled workers is an important condition

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for the process of absorption of knowledge spill-overs to be started and sustained (Moretti, 2004). This last point is rather central in the theory of localized knowledge spillovers where the human capital affects the speed by which knowledge is diffused and absorbed across co-located firms[1].

For instance, theories of localised R&D spill-overs emphasise the relationship between the geographical density of human capital and R&D spill-overs. Their starting point is that geographic proximity among firms reduces the cost of accessing and absorbing R&D spill-overs. Indeed, firms located in agglomerations will have higher profits than their isolated counterparts as they access external knowledge at a cost that is lower than the cost of producing it internally or of acquiring it externally from a geographical distance (Harhoff, 2000). The cost of transferring such types of knowledge is a direct function of geographic distance and gives rise to localised externalities (Siegel, Westhead and Wright, 2003).

The implicit assumption is that there is a specific type of knowledge, so-called 'tacit knowledge', which cannot be patented and that therefore can only be transmitted through direct contacts between the source and the recipient. This is typically true for basic research that generates new fundamental ideas. In spite of the fact that the core work can be made available through normal publicly codified channels (e.g. scientific journals), there is still a considerable portion of the research that can only be conveyed via direct interactions and discussions with scientists (Poyago-Theotoky, Beath and Siegel, 2002). Human capital affects the speed with which knowledge is diffused and absorbed across firms in several ways.

Indeed, knowledge can diffuse through informal contacts among workers (such as industry conferences, talks and seminars) made possible because firms (and more importantly, individuals working for them) share the same location, something which decreases the cost of participation in these activities. On these occasions, potential adopters of innovations (who have limited information about costs and benefits) come into contact with existing users, so the diffusion of intangible technological capabilities is promoted.

Obviously, the more qualified the users, the easier is the exchange and the absorption of new information, so suggesting that firms located in areas with a higher density of human capital will benefit more from existing R&D spill-overs. Also localised R&D spill-overs may be facilitated by workers' mobility from one firm to another[2] (Geroski, 1995). Indeed, the R&D capital of high-tech firms is mostly embodied into its employees and the mobility of (for instance) technical personnel (along with the human capital embodied in them) across firms is a substantial source of knowledge externality (Moen, 2005).

Another source of localised R&D spill-overs is the mobility of graduates from academia to local firms. Indeed, if we believe that in the case of tacit knowledge personal contacts are the main source for absorbing new knowledge, then the human capital embodied in students graduating from a research university may be another important mechanism through which R&D spill-overs can be diffused (Saxenian, 1994)[3]. In this case, R&D spill-overs will be more beneficial to firms located in areas where the proportion of graduates is higher.

Finally, Anon and Sena (2009) find that plants located in areas where skill gaps are less pronounced can absorb R&D spill-overs faster, and benefit from them in terms of increasing levels of output, than plants located in areas where skill gaps are larger. This result holds true for spill-overs generated at the three different levels (national, regional and county level) of geographical disaggregation. Also this mechanism of absorption of R&D spill-overs is more important for SMEs (that depend quite strongly on the ready availability of an educated workforce in the region where they are located) than for other types of businesses.

[1] Economists have long agreed that the local availability of more qualified workforce generates significant spill-overs for the firms located in that same area (Marshall, 1890; Ciccone and Peri, 2002; Moretti, 2004; Galindo-Rueda and Haskel, 2005). Marshall (1890) was the first to recognise

that social interactions among workers create learning opportunities that enhance productivity. Lucas (1988) showed that human capital externalities in the form of learning spill-overs may be large enough to explain long-run income differences between rich and poor countries.

[2] This may be particularly relevant in the case of technical personnel. See Moen (2005) for a study on Norwegian manufacturing.

[3] Varga (2000) shows that university graduates may be one of the most important channels for disseminating knowledge from academia to the local high-tech industry.

Some policy considerations for the West Midlands

From the literature presented in the previous section, it can be safely concluded that the incidence of innovative firms is larger in areas with greater densities of human capital. But can I deduce from these results that by attracting more skilled workers to the West Midlands the innovation performance of local firms will automatically improve? Not really. There are two reasons behind this answer.

First, a key problem for policy-makers working in this field is the causal relationship between innovation and skills; in other words it is not possible to identify “what causes what”: do firms become more innovative if they have more skilled workers? Or do they start hiring skilled workers if they are more innovative? For a policy-maker, this is a problem as the reverse causality between innovation and skills makes it difficult to identify a properly exogenous variable that can be used to boost both variables.

Second, the population of firms in the region is rather heterogeneous in both their capability of producing innovation and their skills requirements. Indeed, while there are firms that are willing to innovate but are let down by their employees’ lack of skills, there are also firms that find it profitable not to innovate and therefore they do not need particularly skilled workers. Obviously this heterogeneity implies that there is no such a thing as one policy that fits all cases but different policies must be put in place for each sub-set of firms.

Still, it is necessary to start from somewhere. Traditionally, policy-makers have tried to boost the innovation side of the innovation-skills equation. Innovation policy starts from the assumption that for a firm producing innovation is an expensive activity with an uncertain outcome. Not surprisingly then, innovation policy has focused on a) making the production of innovation less expensive by reducing the cost of investing in R&D (with tax credits, R&D subsidies etc.) and b) providing a stable macroeconomic environment so that the expected benefits (in terms of profits) from innovation are less uncertain. For a whole host of reasons (policy spill-overs, necessity of coordination of monetary and fiscal policies and so on), these policy measures should be carried out by a national policy-maker through the management of fiscal and monetary policy.

However, regional policy-makers can still play a role by promoting policies that can boost the right-hand side of the innovation-skills equation (while at the same time keeping in place the usual measures to support innovation). To understand what type of interventions can be put into place by a regional policy-maker to enhance the regional density of human capital, let us recall briefly how the local market for skilled workers works.

The local availability of skilled workers (or local density of human capital) is the result of the interaction between the local demand and supply of skilled workers. In general at any point in time, firms in a region may demand skilled workers, demand that will be accommodated by the local supply of skilled workers. However, if the supply exceeds the demand, then skilled workers will leave the region.

Now, as time goes by and the structure of the economy starts to favour services with new firms locating in the region, some local firms may find it profitable to hire skilled workers (because of the effect of either national or international competition). The implication is that over time firms will sort themselves into two groups: a first group made of firms pursuing low value-added product

Innovation and skills

strategies, with production concentrated on the less innovative end of the quality spectrum for which skill requirements are relatively low and a second group made of firms that would like to innovate but cannot have access to a skilled workforce and therefore suffer from skill shortages.

An obvious question at this point is: what happens to the labour supply? Can it accommodate the changes in the skilled labour demand? The main problem with the supply of skilled labour is that it is not very flexible: accumulation of human capital takes a very long time and the current availability of skilled workers is the result of the educational policies in place twenty or thirty years ago. So the labour supply cannot be expected to be too reactive. In other words, the equilibrium in the labour market is rather stable and market forces alone cannot get the region out of this equilibrium. In this setting, policy intervention is necessary to influence both the demand and supply of skilled workers. Indeed, just improving the supply of skills is not enough: while this is necessary to permit more firms to become more innovative and follow high value added strategies (particularly in internationally competitive markets), this in itself will not stimulate the overall demand for skilled workers and get the region out of the equilibrium it is stuck in.

What sort of supply side policies could be useful in this context? A useful distinction here is between short-run and long-run policies. In the short run, policy has to address the lack of skills in the local workforce: there are far too many firms in the West Midlands complaining that skill shortages are hindering their innovative capability and their growth. The key question then becomes: what sort of skills do these firms need and why can't they make use of the skills the graduates produced in the region are equipped with? Are these skills shortages systematic across the region?

To provide satisfactory answers to all these questions we need further investigation. However, it is clear that there is a mismatch between the demand and the supply of skilled workers: in other words, the educational institutions across the region do not equip future employees with the skills needed by local firms. Generally, though, firms tend to complain that workers are not equipped with skills that they may not be interested in paying for as they increase the market value of their workers and therefore the risk of losing them to their competitors.

To avoid this problem, an easy solution is to set up a scheme of demand-led job training grants that are publicly funded but allocated competitively by an external body according to criteria that can maximise the benefits to both society and the firms. More importantly, these grants are demand-led: in other words the structure and the educational content of the training programmes attached to the grants should be driven by the skill requirements of the firms. Of course it can make sense to use this scheme to better match new graduates to the skill needs of local firms so that it is possible to improve the retention of graduates in the region.

In the long-run though, stopping the "brain drain" from the region is the key priority. As the structure of the regional economy gets skewed towards services even in the West Midlands, retention of graduates becomes more and more important. A possible solution is to set up a scheme of university scholarships that would allow bright pupils from the West Midlands to get a first degree in one of the regional universities and require them to stay in the region for a certain number of years after graduation. This scheme could be modelled along the lines of the Hope scholarship that has been place in several US states for a certain number of years to stop the brain drain.

Finally, supply-side policies are not everything. As mentioned before, demand-side policies are an important component of the mix of policies that regional policy-makers can use to improve the density of human capital in the region. Designing demand-side policies is not easy. Generally speaking, increases in the demand for skilled workers are usually driven by technological change. In turn, this is often embodied in intermediate inputs and capital goods that are bought by firms along the value chain; the implication is that firms whose suppliers are continuously innovating may be in need of skilled workers to use the more advanced goods they are buying from their suppliers.

In other words, links among firms along the value chain are the perfect vehicle for the creation of technical change that in turn can stimulate the demand for skilled workers. To what extent can the policy-maker influence the nature of the linkages among firms to boost the demand for skilled workers? The main route is by increasing the number of innovative local suppliers. This can be achieved by either reducing transportation costs (through the improvement of the existing infrastructure) or by inducing “innovative” firms to re-locate in the region and set up links with local firms.

Conclusions

This paper has presented some policy suggestion aimed at improving the West Midland’s performance in terms of innovation and skills. In particular, I have focused on demand- and supply-side policies that could help to increase the density of skilled workers in the region as there is sufficient evidence suggesting that the incidence of innovative firms and the local density of human capital are correlated. Needless to say, I do acknowledge that there are complementary policy measures that may be needed: for instance, interventions to make living in the region more attractive to graduates are important as well as scholarships for graduates. Therefore additional research would be needed to understand how these different policy measures can complement and coordinate each other.

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Discussion

Innovation and the economic output gap

In this section we review the essays and consider some of the broader questions and implications they raise. The authors have outlined the key arguments underpinning their chosen theme and drawn out some of the main implications for regional policy makers to consider.

We briefly précis the key areas within each of the essays and highlight some of the wider practical and research issues that impact on the areas discussed. We begin by looking at innovation and productivity.

The West Midlands region is, when compared against the national economy, estimated to be achieving a level of economic output below its potential. Estimates of the size of the output gap are between £10bn and £15bn of lost output.

Analysis undertaken in the preparation of Connecting to Success, the West Midlands Economic Strategy (WMES), concluded that 80% of this was attributable to lower levels of output from region's businesses while the remaining 20% was due to below average levels of economic activity across the region.

Innovation is one of the key regional challenges to be addressed by the WMES.

“Tackling the innovation agenda and placing the region at the heart of the UK's high-value economy also requires action from the supply side; ensuring the skills and attitudes of people living and working in the region are the correct ones; ensuring businesses have the right mix of people; and ensuring an attractive supply of premises that meet the needs of business. Traditional and established firms - including those in rural communities - need to use new ways to develop and access employment opportunities, and new forms of service delivery, to meet the challenges of competitiveness and productivity”

The WMES evidence paper on the drivers of productivity produced by Aston University (Love et al 2006) provided a good basis on which to progress our understanding of regional economic growth.

One of the main conclusions of this work was the impact that lower levels of skills have on innovation among the region's firms. Among their other conclusions were:

- A low skills base and low R&D investment both contribute to limited absorptive capacity of local firms, which in turn limits the ability of local firms - particularly SMEs - to be innovative.
- Low R&D also directly results in relatively low innovation levels.
- Sectoral mix has an impact on regional productivity

The Aston report highlighted the important part that innovation plays in achieving the region's potential. While the size of the challenge, in terms of the output gap, has been estimated, the contribution from innovation is harder to quantify.

While the size of the output gap, as compared to the national average, has widened since 1998, the current economic recession has brought into sharp focus the vulnerabilities that exist both across national and regional economies. Recent economic growth, driven principally by the services - financial, property and business, public sector and consumer focused services - has stalled and a prolonged period of contraction is underway.

Discussion

The challenge for regional policy makers is how to develop and implement strategies that will enable the region to close the output gap. It extends beyond efforts to increase the regional share of high output, high growth companies. The authors outline 4 broad themes that could go some way to address the output gap.

- The region's traditionally prominent manufacturing sector needs to embrace innovative processes and extend their range to capture longer term revenue streams from their products.
- The region's large presence in public sector services needs to be more focused on innovation; there is a need to implement organisational change to promote and foster innovative practices to increase the productivity of public services.
- A more efficient system of exchanging knowledge between the region's universities, businesses and public sector needs to be encouraged.
- The on-going issue of the region's skills gap limits innovation performance and needs to be addressed through both demand- and supply-side measures

The following section provides an overview of the think pieces and outlines some wider issues that impact on regional strategies.

De-industrialisation may lead to slower economic growth

Services are an increasingly important part of the region's changing economy, but the increased share of output that is generated by services could slow down long-term total economic growth rates (Baumol 1967).

Increased adoption of machinery in production reduces the amount of labour required and displaced workers seek jobs in service sectors. However, these service sectors are less open to productivity gains but workers continue to expect comparable pay with higher productive workers. Consequently the service sector becomes more and more expensive because the increasing labour costs are not offset by innovation and automation. The conclusions that emerge from this theory have become known as Baumol's Cost Disease[1].

So, the changing pattern of sector shares within an economy could impede longer term sustainable growth. As the share of output that derives from services increases the unbalanced growth in productivity results in a dampening of aggregate productivity growth.

[1] In the most widely cited example of this theory it is pointed out that the same number of musicians are needed to play a Beethoven string quartet today as were needed in the 1800s; that is, the productivity of Classical music performance has not increased. On the other hand, wages of musicians (as well as in all other professions) have increased greatly since the 19th century.

Role of ICT and productivity

While Baumol's analysis may lead to a natural conclusion that an increased share of total output from services is to be avoided, the issue is far from straightforward. The impact that a shift in the balance of output could have on aggregate economic growth is dependent on the adoption of technology within the growing service sectors.

A key element of Baumol's theory derives from the clear distinction between production and services. His research was published in 1967 and he was unlikely to have been able to predict the technological innovations such as the Internet and other technologies that have shaped service delivery.

ICT has resulted in a change to the nature of services. Typically, services have been delivered to the final consumer. However, an increasing number of intermediate services have emerged. These services, particularly finance and business services have made an increasing use of ICT. Strong productivity growth in ICT-related industries in the US and Australia, for example, have challenged Baumol's theory (see Wolfl 2003).

ICT also changes the nature of manufacturing. The outsourcing of low value added, high volume manufacturing processes to other countries has led to a decrease in the level of employment in manufacturing. Adoption of new design processes and technologies, the increased use of ICT, and more effective coordination between design and production processes across virtual networks (Andriani et al 2005 pp 21-22).

Estimates suggest that growth in ICT sectors could indirectly increase productivity in other sectors by 40%; this translates into an estimated £3bn of extra manufacturing output for the region over a 3-7year period[1].

[1]<http://www.conferencepage.com/Forum2008/downloads/StuartWebb.pdf>

Product design, innovation and services

Innovation is one of the key drivers in generating increased productivity (HM Treasury) but the shift towards a service economy may limit the opportunities for the region to close the gap.

In the 2006 State of the Region report we highlighted the role of innovation as a catalyst for change.

"Innovation drives change in industries and markets and is the basis of economic growth and specialisation. The histories of products – compare today's cars with the original Model T Ford, by design, performance, market and production methods – and services – compare the range of financial products in, say, 1970, with that of today – illustrates this knowledge-driven economic development well".

WMRO (2006) p17

Innovation is traditionally associated with manufacturing as firms develop new or improved products as well as imitation strategies to try and secure market share. The increasing share of total economic activity from services - public as well as private - alters the dynamics through which innovation affects change.

In her essay on **service innovation** Dr. Palie Smart highlights the importance of service innovation and examines the blurring of the distinction between manufacturing and services that may reduce the risk from Baumol's disease discussed above.

She highlights the importance of incorporating effective product design in achieving successful innovation. She suggests that the shift towards long-term service delivery and sustainable innovation means that manufacturing firms can rarely remain as just manufacturing companies, if they are to survive in the long run.

As services grow in importance in determining economic growth, the environment through which innovation occurs is becoming increasingly complex and the boundaries between products and services becomes fuzzy.

She outlines 3 key drivers underpinning this process: these are

- Increasing embodiment of intelligence

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- Increasing servitisation
- Increasing adoption of user communities

In each there is a recognition that increasing complexity in product design requires on-going dynamic relationships between producers and users.

While Dr. Smart argues that the 'servitisation' of products will enable firms to draw on a longer term revenue stream for their products, further enhancing productivity, the next two contributions address issues around the organisational structures of universities and public sector organisations and the role these play in facilitating a successful environment for innovation.

Organisational failures hinder innovation

Enabling a successful environment for innovation depends on balancing control, be that centralised or formal reporting structures, and facilitating individual endeavour.

This is fundamental when one considers how the currency of innovation - knowledge - is coordinated. To understand this in more detail we need to review against the background of how markets really operate and how organisational structure can effectively channel knowledge and innovation to improve productivity.

A common theme of the essays on public sector and universities is the importance of the effective coordination of knowledge for improving performance. In the case of public sector innovation this is in facilitating an organisational structure that enables motivated individuals to exchange knowledge and to propose and take forward innovations. For higher education, the issue is one of enabling the exchange of knowledge through the use of brokers between universities, businesses and public bodies.

The economic study of organisational structure and their role in allocating economic resources is limited as orthodox economic theory, that which dominates our universities' and schools' curriculums, relies on the unrealistic assumption that knowledge is both complete and costless to exchange. In reality markets operate in a dynamic environment where knowledge is dispersed across the millions of individuals that make up society; coordination of this 'kaleidoscope' of market exchanges is facilitated via the information content of the price mechanism (Hayek 1945).

Furthermore market transactions are not costless. Ronald Coase (Coase 1937) was the first to identify transaction costs, the costs of engaging in market exchange, as the reason why firms exist. This idea laid the foundations of institutional economics (Williamson 1975).

Both Prof. Cole and Prof. Martin's papers illustrate this underlying theme in terms of the role of organisational structure and innovation.

Innovating in the public sector

Prof. Adrian Cole, in his essay *Public Sector Innovation*, outlined that the processes and drivers which enable innovation within the public and private (commercial) sectors have significant differences. Prof. Cole recognised that, while within the UK there has been a strong tradition of public sector innovation both at national and regional level, some key challenges remain that need to be addressed in order to accelerate the innovation performance within the public sector.

He argues however that organisational structure within the public services may inhibit effective innovation. Fear of sanction may make potential innovators risk averse, while a rigid reporting hierarchy and a tendency for stakeholder engagement at too many stages may impede effective communication and delivery of key ideas.

Prof. Cole outlines some implications for regional policy, notably to encourage learning within organisations and the pursuit of outcomes rather than prescribing uniform approaches and the chasing of targets.

Universities and effective knowledge transfer

Prof. Lynn Martin and Dr. Julia Rouse, in their essay *Universities, industry and innovation* discuss the role that universities can have as catalysts for innovation, but also how barriers continue to exist that weaken universities' potential.

Potential barriers to collaboration include a lack of knowledge about potential partners and possibilities for mutual interaction, coupled with the difficulty of aligning the interests of businesses and academics without a solid grounding of mutual understanding and trust (which necessarily takes time and effort to develop).

These types of barriers may be overcome by skilled intermediaries or gatekeepers, with understanding and experience of both academic and business environments while having the skills to overcome barriers and foster relationships. These intermediaries can also clarify the needs of companies and support the whole process of knowledge transfer.

Prof. Martin also notes that limitations in managerial capacity to identify and foster collaborative relationships hinder innovation. This is a further recognition that the skills gap identified by Aston's report in 2008 limits the prospects for closing the output gap through higher and more successful levels of innovation.

The issues raised by the two essays are further evidence of the importance of considering innovation, enterprise and skills in an integrated framework. Research published by the Observatory (Tilson 2006) argued that it is vital that all stakeholders possess a clear understanding not only of the components of innovation, but also of their own roles and potential. Realisation is growing of the importance of continuous learning and the diffusion of knowledge which occurs in high performance workplaces.

In such workplaces, 'knowledge workers' act as innovative lynch pins by developing and sharing their ideas and expertise, operating in teams, which may be multi-skilled, and coaching and mentoring others.

So the link between innovation, organisational design and skills is an important area for regional strategy. In the final paper by Dr. Vania Sena from Aston University examines the density of skilled workers and innovation.

Innovation and geography of skills

In her essay *Innovation and Skills* Dr Vania Sena outlines the key interdependencies between skills and increased levels of innovation. She outlines demand and supply-side policies that could help to increase the density of skilled workers in the region. She highlights the links between levels of innovation activity and the density of highly skilled people. This link is most likely to be dynamic, with positive feedback as innovative firms locate in areas which have a high number of skilled workers which in turn attract further skilled workers.

The Observatory has undertaken a number of research projects that have sought to provide greater understanding on these key areas. The State of the Region report in 2006 (WMRO 2006) examined the spatial patterns in the development of the region's knowledge economy. The report suggested that the urban core was providing a catalyst for the growth in knowledge intensive services (see WMRO 2006 pp20-21), which would support Dr. Sena's argument.

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For the region the density of skills is not just an issue of location of firms; it is also an issue of access to skilled workers, who for reasons of wider opportunity may choose to live outside the urban core. Where workers live and where they work will clearly impact on local economies and their links with neighbouring areas. As the economy moves towards a more service orientated employment, the links through commuting will increase. Urban areas are often the beneficiaries of in-commuting.

The Regional Integrated Economic Assessment (RIEA) (WMRO 2008) examined the distribution of knowledge workers by examining the patterns of residents' qualifications and the location of knowledge intensive jobs.

The availability of 'knowledge workers' with higher level skills and qualifications is critical to support the development of a 'knowledge economy' in the area and to underpin further growth in output, employment and GVA per head. However, Birmingham and Wolverhampton are significant attractors to higher level employment compared to the resident population qualified to meet this employment demand. In 2006, the ratios were 1.38 and 1.30 respectively; this means that, in Birmingham, the total number of workplace jobs in management and professional occupations in the authority was 38% more than the number of residents formally qualified to the highest level.

Skills gap

Dr. Sena in her paper emphasises the continuing skills gap and its detrimental effect on regional economic growth. The 2008 Regional Skills Assessment (WMRO 2008) highlighted the continuing problems of the skills gap. The research showed that, while public sector organisations were on a par with the UK average, demand for higher level skills from the region's private sector companies is relatively weak. Although the situation is improving year on year, the region still performs poorly in terms of the recruitment and deployment of highly skilled 'knowledge workers'.

The low level of demand for higher level skills from the private sector has a significant impact on graduate retention. A significant proportion of graduates leave the region to secure their first job, notably those with a desire to work in better paid, higher skilled and higher value added sectors of the economy.

Furthermore, firms are continuing to report skills gaps -employers in Birmingham and Solihull reported 7% of their professional workforce lacked important skills compared to 5% nationally (NESS 2007).

The issue for regional policy is how to address this market failure. In her paper Dr. Sena proposes a scheme of job-training grants which would address a perceived market failure in skilled labour supply. Firms choose to invest less than is necessary in up-skilling workers, for fear that they will become more financially attractive to competitors and will leave. Her proposal for a subsidised training grant scheme, administered independently, would reduce the marginal cost of training to a level that would encourage firms to invest.

She also recognises that this approach would have to be one of a number of policies. As the RIEA indicates, the region has to be able to offer a good quality environment within which people want to live as well as enabling access between the higher density major urban areas and the surrounding towns.

Conclusion

To conclude, improving the region's innovation performance presents challenges for many different groups:

For public sector organisations, there is a need to provide an environment where innovation is encouraged, by allowing greater risk taking, facilitating learning and increasing the speed with which ideas come to fruition.

For private sector companies, there is a need to develop a more integrated product offer, including elements of both production/manufacturing and services, with cutting edge design and the encouragement of user communities. Successfully achieving this will require a greater demand for higher level skills from employers.

For universities, there is a need to find more effective ways of developing effective, long term relationships with all of the individuals and organisations who can turn their ideas and innovations into practical applications.

For public policy makers, there is a need to put in place the infrastructure to allow all of these to happen, for example by raising the demand for and supply of the skills necessary to make a reality of innovation.

Next steps

The publication of this report is not the end of the process of developing the regional evidence base around innovation. The Observatory is engaged on a programme of work to inform the regional Innovation and Technology Council. This is focused on the “scale of the challenge” facing the region in closing the output gap with the rest of the country, and the role that innovation can play. The findings from this report will feed into discussions about that programme of work. Taken alongside the range of other work, we believe that this report can inform policies to help the region improve its innovation performance and, ultimately, its economic prosperity.

Through the process by which this report was prepared we have built a number of new and valuable relationships, not least with Birmingham City University. We hope to continue these relationships through future collaborative seminars, which will allow us to develop thinking about innovation still further.

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