Innovation and the Knowledge Economy: Implications for Penrith

Dr M. Cristina Martinez-Fernandez
Senior Research Fellow

Dr Phillip Toner
Senior Research Fellow

AEGIS is a Research Centre of the University of Western Sydney
Level 11, 263 Clarence Street
Sydney NSW 2000
PO Box Q1287
QVB Post Office
NSW 1230
Phone: (02) 8255 6200
Fax: (02) 8255 6222
Email: aegis@uws.edu.au
Web: www.aegis.uws.edu.au
Executive Summary

- Innovation as a driver of growth is increasingly acknowledged not only at the level of National Innovation Systems but also at the regional and local level. A critical element contributing to regional and local innovation systems is an efficient knowledge system that connects industry, education, research institutions and government. The organisation of knowledge thus becomes an issue for local and regional planning and for related policy development. Penrith is well positioned in terms of knowledge organisations, with one university campus with business and teaching streams, a teaching hospital, and TAFE colleges. In addition, there are research companies, business organisations, and a major government department (the Australian Taxation Office). The impact of these organizations in the development of knowledge in Penrith will depend on the extent and quality of the interactions between the different stakeholders in the region.

- A growing body of literature is focusing on the role that Knowledge Intensive Business Services (KIBS) and Knowledge Intensive Service Activities (KISA) have as intermediaries of knowledge. KIBS are among the fastest growing and most dynamic sectors of modern economies. Recent economic studies have found higher levels of reported innovation and expenditures on innovation-related activities among manufacturing SMEs who interacted with KIBS than among those who did not. The same applies to those KIBS: they were more innovative than those that do not engage in such interactions. These results point out the critical outcomes in terms of innovation resulting from the interaction of SMEs in formal or informal activities with knowledge providers.

- The GROWES (2003) research shows that the service economy in Penrith is growing in its support of the traditional sectors that are well established such as motor vehicle services, machinery and equipment manufacturing, installation trade services, and construction site preparation services. Analysis of the census data of 1991, 1996, and 2001 shows that the Property and Business Services industry ranked 5th in 1991 with a share of 6.49% of employed persons; 4th in 1996 with a share of 8.22% of employed persons and 3rd in 2001 with a share of 9.18% of employed persons. In 2002-2003, in terms of generating employment, this sector, together with Health and Community services, and Personal and Other services, leads the field. The Finance and Insurance sector does not have the same growth trend and has in fact been declining steadily since 1991. This sector is important for the service economy as it contains many of the Knowledge Intensive Business Services (KIBS) responsible for innovation in SMEs in manufacturing and services companies.

- At the level of knowledge intensive occupations GROWES found that Intermediate Clerical Sales & Services, Professionals and Associate Professionals are the major generators of employment in Penrith (see Figure 4). Professional occupations are still below average in Penrith and quite low when compared with the Sydney average. Professionals are key staff in knowledge generation, diffusion and transfer and in the application of knowledge to other enterprises within the industry system. The relationship of professionals to the training system is critical in the promotion of innovations.
at firm level, as specific and upgraded knowledge is necessary for knowledge workers to work better with innovations and to be more proactive with respect to innovation.

- A key suggestion for Penrith is that both research priorities and policy issues in relation to the knowledge economy could be explored by a group that bring together experts from KIBS, Research and Technology Organisations (RTOs), and others from relevant domains such as local and regional policy and knowledge infrastructure planning. This group will need some time to develop a common understanding of how to make ‘knowledge’ a strong focus for the development of Penrith. This group could develop baselines of how KIBS and KISA could contribute to knowledge development, enterprise innovation and employment in knowledge intensive occupations.

- A second recommendation is to encourage training organisations to play a role in KIBS training. This might imply the need to closely examine course provision to ensure that the right mix of organisational, communication and technical skills, and an innovative attitude are generated, so as to serve the service sector, and especially KIBS, in the Penrith area.

- A final recommendation regards the understanding of the organisation of knowledge in Penrith. More clarity is needed regarding interactions occurring between industry and knowledge providers and where challenges might need to be addressed. The role of local institutions, in particular the Penrith Council, in maximising the use and access of knowledge organisations needs not to be underestimated as we know today innovation occurs as a holistic process within a certain space.
1. Introduction

This paper was prepared at the request of the Penrith City Council. The issues raised here were not part of the original briefing for the research undertaken by UWS-GROWES. The following discussion represents the current available and very limited data on the region’s knowledge related issues.

Although modern Western economies are increasingly realising that the key to their future competitiveness lies in their success in generating and using new knowledge, the methods used to measure ‘knowledge’ and the critical elements to be analysed, are unclear and adequate territorial level of analysis does not exist. It is now widely recognised that global competitiveness is dependent on the capacity of economies to acquire knowledge capital and to apply new knowledge through a highly trained and specialised workforce. The term ‘knowledge-based’ or ‘learning economy’ has emerged to describe those economies in which the production, distribution and use of knowledge are the main drivers of growth, wealth creation and employment across all industrial sectors (OECD 2001a).

A knowledge-based economy is not simply one that emphasises new technologies or even new knowledge. A knowledge-based economy is one in which all sectors are knowledge-intensive, are responsive to new ideas and technological change, are innovative and employ highly skilled personnel engaged in on-going learning (Smith 2000, AEGIS 2003). In short, knowledge and skills have to be usable and used in the production of all manner of goods and services (OECD 1999: 11; Smith 2000). There are two solid streams in the literature that critically contribute to the understanding of knowledge as a key asset in innovation and growth. One stream, that of sociological perspectives, focuses on the organisation of knowledge as a way to maximise its effects. Another stream, organisational and innovation studies, focuses on the intermediaries of knowledge such as knowledge intensive business services (KIBS), research and technology organisations (RTOs) and Knowledge intensive service activities (KISA). This paper explores these streams as they applied to Penrith.

Recent studies on the knowledge economy are un-packing our understanding of the transformation now underway in our society. This transformation is based fundamentally on human intelligence, knowledge and creativity as discussed in Florida's latest work, 'The Rise of the Creative Class' (2004). Under the heading of the Creative Class, Florida amalgamates those occupations that deal essentially with creative work and includes scientists, engineers, artists, musicians, designers and knowledge-based professionals. According to Florida, people in these occupations constitute the 'talent', that is, the creative capital of a place. The model of economic growth he proposes refers to the three T's: Technology, Talent and Tolerance. We readily accept Technology as a driver of societal transformation with its associated areas of innovation and high-technology. To include the notion that Talent and especially Tolerance are also drivers in this process, gives us a new way of understanding the development of cities. Florida's work points out that places that are open and tolerant attract a diverse range of people (from ethnic, sexual orientation and

---

1 Our gratitude to Jenny Turner of AEGIS for her assistance editing this paper.
ideological backgrounds), giving those places an edge in making them better at generating new ideas. Cities like Penrith will do well to make consideration of the 'three T's' when developing their 'creative ecosystem'.

The paper presents some critical issues and implications of the role of innovation and knowledge in the development of the knowledge economy in the Penrith area of Sydney. The paper is divided into four sections. Following the introduction a discussion on the relationship of innovation and place as it relates to the organisation of knowledge is presented. The paper then goes on to discuss the role of KIBS and KISA as intermediaries of knowledge. A subsequent section elucidates some of the lessons learned about the service sector and knowledge intensive occupations in Penrith and finally some preliminary conclusions and suggestions are presented.

2. Innovation and Place: The Organisation of Knowledge

As knowledge economies develop, our understanding of the role of knowledge and the importance of spatial proximity become clear (Maskell, 2001, Audrestsch, 1995). In fact, much knowledge travels through networks of organizations and institutions that are geographically close. In Australia, it is therefore often important for firms and organisations located close to universities, research institutes, Co-operative Research Centres (CRCs) or the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to maximise their information concerning products and services developed by local knowledge-intensive institutions. If they do not, that knowledge may remain unused or underused.

However, spatial proximity might not be the only key factor for sharing, transforming and adopting knowledge. Multinational corporations, for instance, have learnt to locate their R&D departments in one country while diffusing and adopting the knowledge developed to the rest of their facilities around the world. This means that geographic proximity does not automatically imply that the different parts of the regional innovation system will generate, share, transform and adopt knowledge. Special measures might be needed to ensure that knowledge circulates through the system, creating new opportunities for players that otherwise would not have access to specialised information, skills or technology.

The organization of knowledge within a certain space is what is called a ‘knowledge hub’(TIAC, 2002). This may be defined as an ensemble of knowledge-intensive organisations located in both public and private sectors. Some are research-intensive knowledge producers, such as research institutes or universities. Others are demanding knowledge users, including firms, but also service providers such as hospitals (Turpin and Martinez, 2003:11). The intensity of the knowledge produced and transmitted makes the hub a ‘system of activities’ and while the boundaries are not limited at the geographical level, the organization at the core of the hub does need to be in geographic proximity if it is to function well (Acs, 2003).

Innovation at the national level has been identified as driven by networks of public-private sector organisations whose activities and interactions initiate, import, modify, and diffuse new technologies and practices (OECD 2001). In the case of regions,
these public-private networks can be clearly identified as a system of interactions sometimes called ‘innovative milieu’ which advocates that the flexibility of the space stimulates innovation cycles that benefit the region (Capello 1999). Authors of this approach (Maillat 1991; Kogut et al. 1993; Camagni 1999) advocate the importance of the formation of tacit knowledge and the close interaction needed among firms to facilitate learning. Cooperation is then seen as a decisive factor in collective learning and innovation.

Recent research has moved into Regional Innovation Systems (RIS) arguing that firms are increasingly dependent on the direct involvement of institutions to stimulate innovation and thus competition (Landabaso 1997; de La Mothe & Paquet 1998; Cooke 2001). A strong, regionalised innovation system is one with systemic linkages between the sources of knowledge production (universities and research organisations), intermediaries (government and private innovation services) and firms (Cooke 1995). However, research into RIS is still not systematic, regional comparison is difficult and remains dependent on the framework of National Innovation Systems (NIS). This, in part, is because analysts have been too focused on the geographic boundaries of cities or regions and less on the regional innovation capabilities and their effects.

Acs (2003) argues that at the core of the ‘new’ growth theory is the concept of technological knowledge as a non-rival, partially excludable good, as opposed to the neoclassical view of knowledge as an entirely public good. Acs differentiates between ‘knowledge’ and ‘technology’. Knowledge is a non-rival good because it can be used by one agent without limiting its use by others. Technology in many cases is partially excludable because it is possible to prevent its use by others with legal methods such as patents and commercial secrecy. However, no method can put boundaries to such things as information so it can be suggested that industrial R&D may generate technical spillovers via mobility of highly skilled personnel between firms, and by interactions among actors in an innovation system bounded by geographic proximity. The implications of knowledge spillovers being positively impacted by ‘proximity’ might mean that new producing inputs are not evenly distributed across space and so regions might not grow at the same rate. Theoretically this implies that geography might be a relevant unit of observation of knowledge spillovers. In addition there are important implications for entrepreneurship as available information and knowledge is the basis for recognising ‘opportunities’ that can be profitably exploited. Thus, those regions with more ‘available knowledge’ might present more opportunities to be pursued by entrepreneurs than regions where ‘knowledge’ is not produced or available.

Some empirical evidence from Acs research supporting ‘local systems of innovation’ is that R&D spillovers are greatly influenced by geographical coincidence of the several partners. Acs found evidence that innovative activity increases as a result of research undertaken by universities within the area. Many case studies have also provided evidence of the local systems approach, pointing out the importance of proximity and the centrality of community. The systems of innovation approach can be characterised as holistic in the sense that they have the ambition to encompass a wide array of the determinants of innovation that are important. This approach also allows for the inclusion not only of economic factors influencing innovation but also of institutional, organisational, social and political factors. Another important factor is...
their emphasis on the role of institutions as crucial for innovation processes. These different evidences challenge the traditional role of national systems of innovation and the long held and widespread value, in terms of policy, placed on NIS.

Acs concludes that local systems of innovation rely more on the knowledge economy as knowledge has increased the importance of geographic proximity, and empirical evidence suggests that location and proximity clearly matter in exploiting knowledge spillovers. Local proximity becomes critical when the relationship between the firm and the scientist involves the transfer of new economic knowledge. The increased importance of innovative regional clusters as an engine of economic growth has led policy-makers to focus on cluster solutions instead of old solutions based on the regulation of the industry.

A regional innovation system can be composed of knowledge institutions such as universities, TAFE, CSIROs, CRCs, airports, teaching hospitals, Government organisations, not-for-profit organisations, research organisations and business enterprises. An analysis conducted by AEGIS in 2003 shows that in Greater Western Sydney (GWS) there are two main knowledge institutions: University of Western Sydney (UWS) and TAFE. There are no CSIRO or CRC’s located in GWS, however UWS is a core participant in three CRC’s located in Brisbane and UNSW.

The University of Western Sydney has six campuses spread across the Greater Western Sydney: Hawkesbury, Blacktown, Parramatta, Bankstown, Campbelltown and Penrith.

There are the following teaching hospitals associated with Sydney Uni, UNSW and UWS:

- Westmead Hospital: Teaching hospital, Sydney University, UWS;
- Nepean Hospital, Teaching Hospital, Sydney University, UWS;
- Bankstown Hospital: teaching hospital for UNSW;
- Liverpool Hospital, teaching hospital for UNSW, research links to UWS;
- Blacktown, Mt Druitt, Auburn and Hawkesbury are smaller hospitals which participate in teaching.

TAFE has three Institutes in the region with 17 campuses administered through the Western Sydney Institute (8), Southern Sydney Institute (3), and South Western Sydney Institute (6). Other organisations that are part of the regional system are a small airport located in Bankstown with links to the aviation department at UWS Bankstown campus; 23 regional organisations in GWS from the public, private and civic sector and 20 research companies.

Specifically Penrith is well positioned in terms of knowledge institutions, with one university campus with business and teaching streams, a teaching hospital of UWS and Sydney Uni, a TAFE college also offering business courses and personal and community services. In addition there are research companies, business organisations and a major government department (the Australian Taxation Office).

Figure 1 shows the main knowledge institutions in GWS.
Figure 1: Map of Greater Western Sydney and its Knowledge Institutions

Note: government departments, regional organisations and the airport are not included in the map.

3. Intermediaries of Knowledge: KIBS and KISA

A second literature stream focuses on firm innovation and the role of KIBS and KISA in all sectors of the economy.

Knowledge Intensive Business Services (KIBS) are among the fastest growing and dynamic sectors of the economy. They contain many innovative users of new technologies, especially its; and they provide considerable potential for future employment growth. They play a role in improving the competitiveness of enterprises (and the quality of public services) throughout the economy. They form important intermediaries and nodes in innovation systems. Through innovation support and outsourcing of services, they can improve quality and help adapt production structures to the challenges of the knowledge-based economy. (Miles, 2003:11)

All economic activities require some form of human knowledge. To identify those activities that are knowledge intensive we can look into activities that are both highly specialised and learned through a professional process usually requiring some type of formal education (although this can be substituted by experience). Using this definition, some business services are not knowledge intensive as the bulk of their employees have low status, are poorly educated and poorly paid; this is especially true of the cleaning, catering, security and transport industries. In contrast, the staff profile of KIBS includes many people with professional qualifications and higher levels of education. KIBS staff usually deal with complex tasks and specialised services not with routine solutions to common problems. So, in general, KIBS are problem-solvers (Miles, 2003). KIBS might give specialised services in legal and accountancy, technical and engineering fields, they might be services to laboratory testing or research services, or market analysis.

Economic studies (Peneder et al, 2001; Miles, 2003) have analysed the performance of users of KIBS and found that their use enhances the performance of those sectors that consume most of them. The use of KIBS is especially important for regional and local organisations because KIBS are intermediaries of ‘global knowledge’ and ‘best practices’ so their knowledge is extremely strategic for local development (Miles, 2003). In this way problems in some industry sectors might be polarised by their access to KIBS. The analysis of Muller & Zenker (2001) shows how important it is for SMEs to access local KIBS. They found higher levels of reported innovation and expenditures on innovation-related activities among manufacturing SMEs who interacted with KIBS than among those who did not. The same applies to those KIBS: they were more innovative than those that do not engage in such interactions (see table 1).

<table>
<thead>
<tr>
<th>Table 1: KIBS-SMEs interaction and proportion of innovating firms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>% Innovating firms</strong></td>
</tr>
<tr>
<td>SMEs interacting with KIBS</td>
</tr>
<tr>
<td>SMEs non-interacting with KIBS</td>
</tr>
<tr>
<td>KIBS interacting with SMEs</td>
</tr>
<tr>
<td>KIBS non-interacting with SMEs</td>
</tr>
</tbody>
</table>

Source: Mueller & Zenker, 2001

These results point out the critical outcomes in terms of innovation resulting from the interaction of SMEs in formal or informal activities with knowledge providers. The
knowledge intensive service activities (KISA) involved in these interactions have not yet received much attention in the literature but are subject to an OECD study that will finish at the end of 2004. The KISA project investigates the nature and use of knowledge-intensive services in innovation across a number industries at the firm level. KISA are defined as production and integration of service activities undertaken by firms in manufacturing or service sectors, in combination with manufactured outputs or as stand-alone services. KISA can be provided by private enterprises or public sector organisations. Typical examples include: R&D services, management consulting, IT services, human resource management services, legal services such as IP-related issues, accounting and financing services, and marketing services (OECD, 2003).

These activities can be sourced in-house or by external knowledge-intensive service (KIS) providers. These providers are usually KIBS but increasingly Research and Technology Organisations (RTOs) are competing with KIBS due to changes in their funding systems. Provision of KISA can also come from informal sources through networks and clusters or industry associations. Preliminary results of the study into software firms found that the great majority of firms preferred to keep most KISA sources in-house. The KISA of high importance and core competency for the majority of the firms are IP related services, R&D services and software marketing services. Overall, KISA are mainly sourced internally and sometimes as a mix of external and internal services. The principal exception was legal and accountancy services that were sourced externally in all participant countries. The reasons for seeking external assistance were diverse. Firms preferred to source internally in many cases because of the need for speed, for secrecy or for cost reduction reasons or because they saw the competences as critical for their operations and wanted full control. In some cases, they mixed and matched external and internal services because they were in the process of building internal capability or because their internal competences lacked some necessary elements, perhaps because the firms were too small to contain them or too new to contain the skills at the present stage of development. In general, KISA were considered important to building and maintaining the innovation capability of software firms. The specific contribution of KISA to innovation was found to be dependent on the firm’s expectations of the particular activity it played in the firm (OECD 2003).

The research commissioned by the Penrith City Council to GROWES did not focus on the audit or the role of KIBS and KISA in the Penrith economy. However, some lessons can be drawn from the analysis of the performance of the service sector in Penrith and the knowledge occupations in the area. Some relevant notes arising from the GROWES research are presented in next section.
4. Notes on the Service Sector and Knowledge Intensity in Penrith

An important line of work on economic analysis goes into understanding the growth of business services in national economies. For example, Barker (1990) in a fairly early study discussed five large groups of services: 1) business services (banking & finance, insurance, and business services, hiring & real state), (2) transport, (3) communications), (4) distribution & repair & hospitality services, and (5) other services. The supply of services can have different patterns in different countries. Karaomerlioglu and Carlsson (1999) argue that most producer services growth in the US reflects the requirements of manufacturing. In the case of the Dutch economy (Bilderbeek & Den Hertog, 1992) business services also contribute to the service’ activities in the economy.

Australia follows international trends towards the growth of the service economy. The GROWES (2003) research shows that the service economy in Penrith is growing in its support of the traditional sectors that are well established such as motor vehicle services, machinery and equipment manufacturing, installation trade services and construction site preparation services. Analysis of the census data of 1991, 1996 and 2001 shows that the Property and Business Services industry ranked 5th in 1991 with a share of 6.49% of employed persons; 4th in 1996 with a share of 8.22% of employed persons and 3rd in 2001 with a share of 9.18% of employed persons. In 2002-2003, in terms of generating employment, this sector, together with Health and Community services, and Personal and Other services, lead the field. The Finance and Insurance sector does not have the same growth trend and has in fact been steadily declining since 1991 (see Figure 2).

Figure 2: Share of employed persons in property & business and finance & insurance

The sector of finance and insurance is important for the service economy as it contains many of the Knowledge Intensive Business Services (KIBS) responsible for innovation in SMEs in manufacturing and services companies (Miles, 2003). KIBS are among the fastest growing and dynamic sectors of modern economies. They contain many technological and organisational innovations and are critical in the

AEGIS (Martinez-Fernandez & Toner) 11
The competitiveness of companies. KIBS are knowledge generators giving specialised services in support of the core or strategic production of enterprises. A more detailed analysis of KIBS in the Penrith industries would give more insights into their role as intermediaries of innovation at the firm level.

The survey of job vacancies by industry for the period 2000 to 2003 which also shows Property & Business and Health & Community services as being strongly represented in the number of job vacancies over the four-year period (see Figure 3).

**Figure 3: Penrith Job Vacancies by Industry (2000-2003)**

Source: GROWES, 2003

On average, manufacturing job vacancies were registered at 8.8% average while services industries account for 46% of vacancies over the same 4 year period.

At the level of knowledge intensive occupations GROWES found that Intermediate Clerical Sales & Services, Professionals and Associate Professionals are the major generators of employment in Penrith (see Figure 4). Professional occupations are still below average in Penrith and quite low when compared with the Sydney average (GROWES, 2003).

**Figure 4: Key Growing Occupations in Penrith**

Source: GROWES, 2003

*Intermediate clerical sales & services separate data from 1996 only*
The professionalisation of the economic base in western economies shows a similar trend towards the increase of professional occupations in the service economy (Miles, 2003). Professionals are key staff in knowledge generation, diffusion and transfer and in the application of knowledge to other enterprises within the industry system. The relationship of professionals to the training system is critical in the promotion of innovations at firm level as specific and upgraded knowledge is necessary for knowledge workers to work better with innovations and to be more proactive with respect to innovation.

5. Conclusions and Suggestions

The current focus of most developed economies on understanding the dynamics of the so-called ‘knowledge economy’ has focused the attention in un-packing the concept of ‘knowledge’ in elements that can be analysed and applied to both industry and regional innovation. In the case of Penrith, conventional research is still needed to understand how knowledge is transforming the innovation processes ultimately responsible for sustained local growth. However, both research priorities and policy issues could be explored by a group that bring together experts from KIBS, RTOs, and others from relevant domains such as local and regional policy and knowledge infrastructure planning. This group will need some time to develop a common understanding of how to make ‘knowledge’ a strong focus for the development of Penrith. This group could develop baselines of how KIBS and KISA could contribute to knowledge development, enterprise innovation and employment in knowledge intensive occupations. In this way the group can determine actions in the short and long term, needs for further research, need for innovation policies, connections to other city planning activities.

This is a key recommendation especially when the data from the GROWES research shows that the service sector in Penrith has an uneven growth trend and that some critical KIBS sectors for innovation support development of SMEs, such as the finance and insurance sector, is steadily decreasing. Attention is needed in this area as Penrith might be disadvantaged in the use of local KIBS which can critically impact on the innovation of SMEs and, in the end, on the whole industry base of Penrith.

A second recommendation is to encourage training organisations to play a role in KIBS training. This might imply the need to closely examine course provision to ensure that the right mix of organisational, communication and technical skills, and an innovative attitude are generated, so as to serve the service sector, and especially KIBS, in the Penrith area. A sophisticated knowledge of what KIBS requirements are in the Penrith area is needed to have a positive impact in the sector.

A final recommendation regards to the understanding of the organisation of knowledge in Penrith. More clarity is needed regarding interactions occurring between industry and knowledge providers and where challenges might need to be addressed. The role of local institutions, in particular the Penrith Council, in maximising the use and access of knowledge organisations needs not to be underestimated as we know today innovation occurs as a holistic process within a
certain space. Thus, all key actors in an economy need to be innovative, not only those closely related to industry sectors.

A note of warning on how the uneven development of KIBS might create inequalities in the future of Penrith if these issues are not addressed. SMEs interactions with KIBS are still limited elsewhere and it is perceived barriers of cost that are among the most important limitations for their use. Innovative policy measures are needed to overcome these limitations so that SMEs of any sector can access specialised services. KIBS are also a growing sector of the national economy. KIBS expertise is exportable to the Asia-pacific region and Australia is well placed to reach these markets. In this way addressing current limitations in KIBS development in Penrith might create a positive exporting opportunity for local enterprises.
References


TIAC (2002) The Organisation of Knowledge: Optimising the Role of Universities in a Western Australia ‘Knowledge Hub’, Western Australia: TIAC.