Universities-Industry Collaboration from the Geographical and Social Perspectives

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Abstract

Numerous literatures have shown that higher education and industry enter the new decade with strong incentives to form alliances. Industries form liaisons with academic institutions to improve their competitive position and by gaining access to university research facilities and staff is an economical solution for many companies. However, thinking that any knowledge and technological need could easily be transferred from other organisations such as from the academic institutions is rather erroneous. This paper argue from the modern innovative theory and geographical aspects of collaboration and asserts that knowledge creation through technology transfer is an interactive process, localised and sociological in nature, and greatly facilitated by geographical distance, accessibility, agglomeration and the presence of externalities that often played out within regional area.

Keywords: University-Industry Collaboration; Geographical Perspective; Social Perspective.

1. Introduction

Inter-organisational relationships such as strategic alliances have proliferated in many industries in response to a number of environmental pressures and change. Firms have had to respond to a wide range of changes in their domestic and international markets with the globalization of production and technological advances. This changing nature of competition has placed an ever increasing need for organizations to continually create new technologies. However, the process of technological innovation which has been changing requires the fusion of multiple technological disciplines, more intense technical skills, and market knowledge, and these factors have great impacts on its management (Bessant and Rush 1995; Chiesa and Manzini 1998).

The increasing complexity of research and development (R&D) has made it difficult for a single corporation to develop in a self-sufficient research capacity. As the cost of R&D has increased dramatically and access to privileged information has become increasingly difficult in industry where innovation is the main competitive weapon (Ernst 1995), industry has turned to research organisations to compensate for their shortcomings. A potential remedy for this situation is to access to external sources such as academic institutions or other research organisations for inputs into the process of building up technological competence (Branscomb, 1984).

The linkages in technological collaborations are characterised by diverse functional modalities ranging from formal joint ventures, strategic alliances, exchange of knowledge, resources, and technology, joint R&D and production sharing projects to informal linkages between peers (Dodgson, 1993; Lopez-Martinez et al., 1994).

Although much of the current literature regarding collaborations has typically focused on alliances between business ventures, in the last couple of years the discussion on strategic collaborations between corporations and institutions of higher education have gained momentum (Saffu and Mamman, 2000). According to Wheelen & Hunger (2004), strategic collaborations have been intensified between business corporations and universities with the intent of mainly funding joint research programs in exchange for options on the results of the research that might solve their practical business problems. It has been viewed that the institutions of higher education have become important parts of a cooperative agreement that tries to tackle complex, fundamental industrial problems of major business or societal significance due to the challenge

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brought about by global competition and the changing emphasis on R&D (Dismukes and Petkovic, 1997). This links between industrial firms and universities are assuming ever increasingly importance as a mechanism to assist in the process of technology transfer because the relationships offer potential benefits to both parties (Fairweather, 1988; Ervin *et al.*, 2002).

As this co-operative pacts have received considerable attention, it is important to note that one of the successful factor for such collaborations whether it simply searches out success or the technological innovation that tends to accompany it, the opportunity costs of being 'in the wrong place at the wrong time' could be critical in locational terms. While the importance of location in R&D process can be seen in relation to its physical aspects such as the agglomeration of major industrial and main administrative centres in urban zones, and the proximities between the industry and academic institutions, the more important aspects of location that often been ignored in enhancing R&D process and collaborations are the sociological and cultural dimension that are embedded within the locational contexts. Drawing from the modern innovative theories and geographical perspectives, this paper will discuss the importance and argue why location is still important in UIC. The following sections will explain these aspects.

2. The Nature of Technology Transfers

Technology transfer like those from the universities to the industries has been described as the process of moving technology from one organisation to another organisation (Bessant and Rush 1995; Szabo 1996; Kirkland 1996). The processes serve to bridge the gap between basic knowledge or research and applied knowledge or research (Grant et al., 1996). However, thinking that any knowledge and technological need could easily be met by buying or transferring them "off-the-shelf" from other countries/organisations or by referring to the literature and manual is rather erroneous. It does not necessarily move between regions within countries let alone between nations.

According to Zysman (1992), technology transfer is step by step, a repetitive interaction between opportunity and knowledge in specific settings and is not simply information that can be bought or sold, but rather is rooted in the ongoing organised activities of process and production. In the widest sense technology transfer largely depends on tacit knowledge that are largely embedded in human beings. Unlike the explicit knowledge, Nonaka (1992) pointed out tacit knowledge involves cognitive dimensions (schemata, paradigms, and mental models etc.) as well as technical dimension (concrete know-how, crafts and skills which applied to scientific context). As Brown and Duguid (1998) have noted, an organisation's core competency is more than the explicit knowledge of "know-what"; it requires the more tacit "know-how" to put "know-what" into practice. Explicit (coded) knowledge can even be unusable without the augmentation of tacit knowledge (Shariq, 1999).

Tacit knowledge has been identified as an important component of the knowledge used in innovation, technology transfer and in technology diffusion (Rosenberg & Nelson, 1994; Dosi *et al.*1988). Scientific research demands large range of skills and tacit knowledge (Ravetz, 1971). The vital importance of know-how, 'a kind of knowledge which cannot be formalised, nor transmitted solely through written documents' has been evident from the earliest period of industrialisation through to the present day (Madeuf, 1984). Senker & Faulkner (1996) suggested that imitation and experience are the only methods for acquiring to formulate scientific problems and develop strategies aimed at their solution. Accordingly, know-how transfer requires personal interaction through secondment, training and so forth (Senker & Faulkner 1996). Such understandings necessitate face-to-face contact and interactive learning.

3. Technology Locality

Technological knowledge is local in nature and amassed in local institutions in the form of know-how which is also closely associated to locales in which it is generated. Both Zysman (1992) and Bessant & Rush (1995) agree that there is often a strong cultural dimension that is embedded within a particular technology. Innovation and learning rest on extraordinary complex variety of institutions, social habits, ideologies, and expectations, and that even firm and market structures are to certain extent outcomes of these underlying structures (Storper, 1992). Learning in this context is a social process and occurs best in communities (Lave & Whiner, 1991; Johansen *et al.*, 1991). Therefore the implementation of new technologies at a different location may fail when it is transferred because of the underlying cultural mismatch.

Zysman added further, the ties between activities are linked together by community practise and industry organisation and often bounded by geography. As noted by Howells (1996) geographical distance, accessibility,

agglomeration and the presence of externalities provide a powerful influence on knowledge flows, learning and innovation and this interaction is often played out within regional area. Another example is because of the importance of trust, industrial firms often search for information in close proximity, not only geographically, but also sociologically and sectorally (OECD 1993; Rehfeld 1993). For example banks and industrial firms are tied together in different ways in Germany, France, and Britain.

The system consisting of technological learning and knowledge accumulated in a particular industry within a national community, and within region within the national community, will turn on the character of these organisational and market linkages. Storper (1992) has underlined that the geography of specific subsectors (specialisation of each country) conforms to popular impressions about 'dynamic' regions of these nations. Storper also cited that in the USA, more than 50 percent of employment in the export specialisation industries are found in the eight states. In Italy, the design-intensive or craft-based goods are highly concentrated in the 'Third Italy' whose centre lies in the two regions of Tuscany and Emilia-Romagna. In France, high technology specialities in aerospace and defence are concentrated in Ile-de-France (Paris), Toulouse and Nantes.

In summary, the above argument suggests that technology transfer is more favourable to be established within the region or within locality.

4. Location and Geographical Aspects of R&D

Given the fact that the nature of technology transfer requires intensified interactive activities and is local in nature, the ties between activities are linked together by community practise and industry organisation that are bounded within the geographical proximity. In supporting this view, earlier researches has shown that location characteristics and proximity affect R&D facilities location. R&D process and technology transfer have a geographical phenomenon and its facilities have an uneven geographical distribution (Henry et al., 1995). R&D is strongly concentrated in the metropolitan centres located in traditional innovative core regions (see Howells, 1986; Thwaites & Alderman, 1990; Malecki & Bradbury, 1992).

First, it is typically argued that, because of specific agglomeration advantages, large agglomerations and core regions have greater opportunities for innovation, as interaction between proximate firms promotes the sharing of new knowledge and ideas (e.g. Bania et al., 1992; Howells, 1990). Second, it is argued that the availability, cost, and quality of labour are important locational determinants for high-technology firms (Corvers, 1997; Ke and Luger, 1996). Most early studies have shown that highly skilled labour in scientific and engineering occupations for R&D of products and processes themselves have a strong locational preference for large urban areas (e.g., Dicken & Lloyd, 1990; Herzog & Schlottmann, 1989;). The heterogeneous mixture of businesses and people creates opportunities for inter-cultural exchange of ideas in the city. The city's growth is the reflection of this human interaction. As Dill (1990) said that geographical proximity is one of the significant factors for interactions between organisations. Proximity is crucial to philanthropic activities as well as research relationships. Proximity is important in fostering interpersonal communication.

Later view by Howells (1996) also suggested that geographical distance, accessibility, agglomeration and the presence of externalities provide a powerful influence on knowledge flows, learning and innovation and this interaction is often played out within regional area.

5. Clustering and the Proximity of the Universities and Firms

Examples in the USA and in most industrialised countries have shown that geographic proximity is important to the formation of industry-university alliances. The strategic location of college or university, such as proximity to state capital or to specific companies, is also important. According to Powers et al. (1988), when firm choose to locate near campuses, they often do so to have access to campus services, facilities, personnel, and programmes. Interaction between HEIs academic staffs and firm personnel thus occurs more easily than when the people involved are widely dispersed.

With respect to UIC, clustering the university with industry may increase accessibility between the two by reducing the cost of time and travel. Clustering firms with universities enable firms to share expertise at university. Whether it is for research and development or new innovative products, firms rely on highly skilled labour force. In turn, the closeness of the university and industry create social exchange opportunities.

High-tech firms prefer interact with university near them in order to obtain high-quality labour form HEIs staffs and graduate students easily. There are other several studies which support the view that proximity between the university and the industry are important for

the interaction between the two. A well-known Premus (1982) survey in USA among high-technology firms indicates that the availability of skilled labour, and nearness to academic institutions are among the significant determinants of both interregional and intraregional location choices. Aydalot (1984) found similar results for France, and Nijkamp (1986) for the Netherlands. Further, a bias towards concentration in metropolitan areas for R&D departments, corporate headquarters, and high-skilled jobs has been observed due among other things to the nearness of universities oriented towards research (e.g. Bouman and Verhoef, 1986; Ewers, 1986; Goddard and Thwaites, 1986). These studies support a survey by Jones on R&D scientists indicate that the presence of good HEIs is the most important in decide where to locate. Research on the location decisions of high-technology companies has provide support for a number of locational attributes. First, the availability, cost and quality of labour is an important locational determinant (Haug, 1991). A second factor is proximity to a major university or educational resources. Availability and proximity to HEIs has been cited a major factor in the genesis of Silicon Valley and Route 128 (Premus, 1982; Rogers and Larsen, 1988), and this attribute has been supported by Malecki, (1986), Markusen et. al., (1986), and Hall 1987. Howell (1986) concluded that HEIs perform a secondary role in industrial location decisions.

From this point of view, the proximity between the universities and industrial firms would be an important factor affecting the interaction between the two. In conclusion it can be argued that firms (hi-tech) prefer to interact with HEIs located near them which produce highly skilled labour, because firms can get lower costs and better labour supplies from the university communities, and because personnel of the firms can easily access to university resources.

6. Conclusion

University and industry collaboration (UIC) is one in the larger and complex technology transfer structures. This paper asserts the belief that knowledge creation in technology transfer process such as in UIC is an interactive process and it also argue that learning in modern innovation theory is emphasised as a localised and sociological in nature, and not a placeless phenomena, and differences in particular regional economic structures, values, culture, and institutions may contribute profoundly to innovation process. As there is often a strong cultural dimension embedded within a particular technology the understanding the cultural determinants underlying the success or failure of technology transfer should become a strong feature of technology policy.

This paper has provided a view that possessing a technological resource is no guarantee of its effective use where developing technological competence requires a learning process to absorb and optimise the technology. Technology transfer is that it is not an instantaneous event but a time-based process involving several stages. The complexity activity involving multiple actors and elements and various different patterns of inter-relationship: at each stage in the process there may be different set of influential participants and issues. Therefore the technology transfer models should not underestimate participants' interaction in the process of innovation and re-innovation as this interaction is often a rich source of innovation. Thus policies designed to enable transfer of technology should include locational and facilities aspects to encourage continuing interaction and exchange between players. Encouraging the learning processes through participants' interaction which constitute good technology transfer practice should become an important policy goal.

The view of interactive learning as a fundamental aspect of innovation process provides the ground for the interactive innovation model, which is greatly facilitated by geographical distance, accessibility, agglomeration and the presence of externalities that will provide a powerful impact on knowledge-flows, learning and innovation. This understanding supports the contention that R&D progress to locational preference seen in the industrialised countries are due to contextual factors, the infrastructural development, socio-economic, and to the sociological factors.

As the sociological, cultural and locational aspects of have a strong impact on the successful technology transfer and inter-organisational collaborations such as UIC collaborations, it is suggested these contextual aspects should be considered in all UIC-related studies in order to provide informed knowledge for successful collaborations. As the location of the organisational facilities will have a strong implication to R&D inter-organisation collaboration, it also sends an important message to policy makers to enhance R&D development and eventually the nation's well-being through a balanced spatial policy.

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