

**University of Limerick
Department of Sociology Working Paper
Series**

Working Paper WP2005-02

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***Engineering Relationships for Innovation:
Concerning the feasibility of public policy interventions
to engineer inter-firm collaboration in the private sector***

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Introduction

Regional development literature and policy has, in recent years, increasingly focused upon mechanisms for engendering inter-firm collaboration at a local level. Co-operation and partnership are regarded as key to encouraging endogenous innovation in the regions and thus to promoting balanced regional development. Using interview data from 30 companies located in one Irish regional agglomeration, this paper explores the feasibility of public policy interventions to engender inter-firm collaboration in the private sector. The interview data is used to chart the extensiveness and function of spontaneously forming inter-firm ties within the case-study agglomeration. The preconditions for these ties are explored and the relative attractiveness of local versus extra-local partners is given particular consideration. These issues are drawn together to inform the overall question regarding the potential for public policy to engineer such collaboration.

Models of innovation

The traditional model characterises innovation as a linear, unerring process, which begins with basic research and ends with the development and production of a product (Cooke and Morgan, 1998: 12).

It is now widely accepted that the traditional model is flawed. Many authors now reject the conceptualisation of innovation as a linear process where R&D culminates in commercialisation in a fairly uncomplicated manner.

As an alternative, critics have proposed the interactive model. In this model innovation is interpreted as occurring as the consequence of interactions between a wide variety of economic actors. These include R&D performers and agents of technology transfer such as firms, as well as public and private research institutes.

An illustration of the manner in which the actions of external actors can influence a firm's potential technological trajectory is provided by David (1985), in the development of the keyboard. The rapid spread of the QWERTY keyboard among users limited the development of new forms of this technology. Simply too many users had adopted the QWERTY keyboard to make it feasible for any one firm to pursue a different trajectory.

However, firms are not just restricted in their innovation activities by external actors, they also gain from learning acquired by other firms. Learning is cumulative; knowing how to

do one thing is generally dependent on knowing how to do another. Thus, progress in one area often leads to progress in another, innovation in one technology influencing the development of other related technologies (Storper, 1997: 19).

Innovation, is of course, inherently about learning. The type of innovation of which a firm is capable is considered to be dependent upon the type of learning in which it is engaged. First-order learning, i.e. learning to do things better or improving existing practices, is linked with incremental and process innovation. Second order learning, i.e. learning to do better things – the type of learning that is more likely to produce radical and product innovations - is strongly associated with interactive learning.

This association results from the significance of tacit knowledge to second order learning. Most knowledge originates in tacit form. Eventually, some of this knowledge will become codified. However, once it is codified it becomes ubiquitous and accessible to all in the market. Thus, in codifying information a firm loses control and possession over it. Tacit knowledge is therefore preferable because it can contribute to the competitiveness of the firm, while codified knowledge, being ubiquitous does not. As such, firms which are exposed to competition and do not compete on cost will therefore retain much of their knowledge in tacit form in order to maintain their competitive position. In turn, the potential for external actors to participate in the innovation process, will rely in great part upon the transfer of more exclusive tacit knowledge, rather than codified knowledge which is already accessible to all (Maskell, 1999: 45-7).

The question of how to encourage the transfer of tacit knowledge between firms, has been a key stimulus for interest in inter-firm collaboration.

Clearly firms can engage in bi-lateral and multi-lateral contractual relations to protect their interests while engaging in the exchange of tacit knowledge for the purposes of innovation. However, transaction costs theory would tell us that economic actors have a tendency to rationally pursue their own advantage. This increases the requirement for unwieldy checks and balances, which can act as obstacles to the flow of tacit knowledge. Moreover, Powell (1990: 297) relates that it is impossible for economic actors to draw every contingency into a contractual agreement. Such facts of life discourage collaborative innovation-oriented relationships.

The significance of the local

It is in overcoming the uncertainties associated with collaboration that the significance of the local is seen to lie – in providing a context, which may reduce the need for restrictively complex contractual agreements, and even permit the exchange of tacit knowledge on an informal basis.

The concept of untraded interdependencies expresses the potential advantages proffered by co-location in the transfer of tacit knowledge. Dosi (1988) explains that untraded interdependencies are the circumstances, experiences, resources and values shared by a group of firms.

Lundvall (1993: 59) illuminates the significance of this asset for interactive learning. He states that learning is constituted of three elements - technical, communicative and social learning. Technical learning differs for the user and producer. For the user, technical learning involves awareness of new technological opportunities; understanding of the potential value of new products and know-how regarding their application. For the producer, learning involves awareness of users' needs, understanding of how the producer can develop technologies in his own area of proficiency to meet those needs, and feedback from users concerning their experiences and difficulties with the application of the new product. It is apparent from this elaboration of the content of learning that communication between the user and producer is essential for the learning process.

Successful communication requires that both parties learn codes both specific to the technology and to the organisation within which the other party operates (communicative learning). Lundvall (1993: 59) holds that the user and producer can never communicate completely as equals on technical matters, as the producer will always possess a greater knowledge of the product. He considers that technical learning will thus be greatly inhibited and opportunism abetted, if social learning does not occur.

Social learning, he defines as:

“... understanding social as well as economic needs of the other party and developing common rules restricting egotistic behaviour.” (Lundvall, 1993: 59)

User-producer relations, and potentially any relationship involving technical learning, therefore involve:

“... common elements of technical knowledge, common codes of communication and social relations involving mutual trust and shared social values. All these dimensions of the relations take time to develop and are costly to learn. This fact implies that the relations are selective - it is too costly to develop too many of them.” (Lundvall, 1993: 60)

While Dosi (1998) considers that untraded interdependencies may exist regionally or nationally, Storper makes it apparent that he considers the regional level to be the most significant.

“... the most general, and necessary, role of the region is as the locus of what economists are beginning to call ‘untraded interdependencies’ which take the form of conventions, informal rules, and habits that coordinate economic actors under conditions of uncertainty; a central form of scarcity

in contemporary capitalism, and hence a central form of geographical differentiation in what is done, how it is done, and in the resulting wealth levels and growth rates of regions.” (Storper, 1997: 4-5)

It is theorised that untraded interdependencies would be augmented by the addition of a regional dimension, particularly where regional co-location is associated with common experiences of geographical differences in infrastructure, labour supply, transport costs, etc. As such, it is at the regional level that untraded interdependencies are expected to be most dense and consequently the potential for interactive learning greatest.

These are the key concepts which have resulted in a particular interest among governmental agencies in the potential of local inter-firm collaboration to increase levels of innovation, thereby enhancing the sustainability of regional economies. From Italy to Ireland, governments have invested funds in networking co-located firms to this end.

I will now describe the case study, on which I will draw, to make some observations regarding the feasibility of engineering such relationships.

The case study

The case study, which forms the empirical basis of this paper, was conducted on an agglomeration of information and communication technology companies located in a provincial Irish city. The city possesses a strong ICT sector, accounting at the time of the research for a far higher proportion of employment than was the case nationally. (Irish Council for Science, Technology and Innovation, 1999: 6) Furthermore the ICT sector was documented by the local Chamber of Commerce as an important growth area for the city.

The identification of potential participants was achieved by cross-referencing a variety of sources of company names and activities, including the Irish Kompass company register. A total of 40 potential participants were identified, excluding companies which were solely involved in retail and distribution activities.

7 companies refused to participate in the study overwhelmingly on the basis of 'research fatigue'. All of the remaining 33 companies participated in the study, however three were excluded from the final analysis as their core competencies were found to lie outside of the remit of the research.

Data was collected by means of semi-structured interviews. In each case the interviewee was sought at the highest level of management possible, i.e. managing directors or alternatively general managers. Such individuals were perceived as most likely to possess the broad range of knowledge of their companies' history, activities and strategies required.

Descriptive data collected in answer to predetermined questions was quantified and statistically analysed using SPSS. The 30 recorded interviews were also transcribed and analysed qualitatively, to identify and explain the major phenomena emerging from the data, their causal conditions, intervening conditions and context.

The Agglomeration

The case-study agglomeration was characterised by the presence of both large and small firms, but was dominated by SMEs. Of the 30 firms, 5 were foreign-owned subsidiaries. In total, over 80% of the sites employed less than 50 people.

3 (10%) of the participating companies operated in the computing services sector, 14 (46.7%) in software, 7 (23.3%) in electronic engineering, 3 (10%) in telecommunications, 2 (6.7%) in multimedia and 1 (3.3%) in electronic information services.

Despite the diverse core competencies of the firms, extensive vertical relationships were found within the agglomeration. 46.7% (14) of the companies had technology-based customers in the case study city (including beyond the boundaries of the sample¹) and its hinterland.

In terms of majority customer location, however, product-orientated companies were found to be overwhelmingly oriented to national and international markets. Service-orientated companies were significantly more likely to be oriented to local markets.

43.3% (13) of the companies visited were involved in activities which can be classified as significant product change and 53.3% (16) were involved in incremental product change. 33.3% (10) companies were involved in process change.

Formal Learning by Learning Linkages

15 separate relationships with external actors for the purpose of learning by learning, i.e. research, were identified among the sample. These included joint participation in EU networks, collaborative projects with Higher Education Institutes and the outsourcing of research activities. Only four companies had been involved in any private collaborative research relationship with other companies. Of these four relationships, three were with other local firms.

It is often considered that the supply-chain, in providing pre-existing relationships on which to build, offers the greatest potential for the spontaneous development of collaborative innovation-oriented relationships. Indeed, the three companies involved in local inter-firm research collaboration had all been, or were, suppliers or customers of

¹ Most of these companies are in ICT, although some are also in technology-based healthcare and transport.

their collaborative partners. However, they did not share an orientation to the local market. In fact, only one was primarily oriented to the local market, one to the national market and one to the international market.

Interview data indicated that these companies did not have vastly different orientations, from those who did not participate in local inter-firm collaboration. Participants were highly amenable to collaborative relationships in general. They recognised the imperative of interactive learning. However, because of their diverse range of core competencies, few of the companies were able to source appropriate partners within the locality.

The participants saw benefits to co-location. In particular they noted the added responsiveness which proximity to their suppliers produces.

“Well its always better, you’re dealing with somebody down the road and you can develop a personal relationship with those kind of suppliers as well. They’re always motivated then. Something goes wrong – it is easier to fix it and (*they are*) more responsive if you have an urgent requirement and all of that kind of stuff. So it is easier to deal with somebody locally rather than somebody lets say in Germany or whatever. It is much, much easier to do that.”

They also found local suppliers to be better integrated into their companies – more familiar with their systems and needs:

“In terms of proximity to suppliers if there’s a lot of design elements, if there’s a lot of interaction required, for instance choosing how to make this machine component, it has to be local because the time is just crucial.”

Interviewees also cited a sense of loyalty to local suppliers:

“Well my bias would naturally be local anyway and it would have been something that I would have been very strong on, so lets try and find a local solution if at all possible in terms of providing the support that’s required. Even if cost becomes an issue we’d bring the supplier in and we try and work our way through it rather than say no based on cost and try to work a compromise between them and us. So predominantly we would use local service and local support.”

More generally, co-location was seen to negate the disadvantages of travelling from a peripheral location.

Participants explained that they in turn have to invest particular effort into nurturing relationships of trust with distant clients:

“This is all mission critical software we sell. So a whole business could fall if it doesn’t operate. So trust is huge, and as far as we are removed, if you like, from a client, nervousness increases with geography.”

The vast majority of interviewees believed that face-to-face interactions were key to the development of trust. However, they overcame the obstacles posed by a lack of proximity

to customers by investing in iterated face-to-face contact in the initial stages of new relationships. While e-mail, telephone and video-conferencing could be employed once a solid foundation of trust had been established, in the early stages face-to-face communication was regarded as essential to ensure the success of the relationship.

“I think that for initial contacts it is important to have face to face contacts.

Updates and projects can be given through electronic mail or faxes and things. Personally I'd say I'd be keen to have people come and see the centre. It really does give that critical mass to the level of mutual understanding.”

That the companies were quite successful in overcoming the disadvantages associated with distance is evidenced by the significance of non-proximate customers to their acquisition of technology transfers. Certainly, the firms did not feel themselves confined to learning from those who share regional conventions, informal rules, and habits.

Other Learning Linkages

19 of the companies specifically stated that their customers were important sources of technology transfer.

There were three major categories of information and knowledge transferred between companies and their customers: information regarding technology trends, information regarding competitors, and feedback regarding the companies' own products and services (including gaps and deficiencies therein).

Of those receiving technology transfer from their customers, 31.6% said this linkage has resulted in changes to the products and services specific to that customer; 15.8% to generic products and services; and 31.6% to features of other customised products and services. One company stated that feedback from a customer had resulted in a process innovation.

Only one of the companies stated that they their technology transfer linkages to customers sited locally were more frequent than to those based internationally. There was a general belief that local customers are easier to communicate with, however all the companies compensated for the lack of proximity to other customers through significant efforts, including on-site visits, to build rapport with customers wherever they were based.

All of those companies whose major customers were located in the region, stated that their most important technology transfer links were with customers therein. 71.4% of companies oriented to the national market had their most important technology transfer links with customer across Ireland, however, 28.6% had their most important technology transfer links with foreign customers. All but one of those companies which are oriented towards European, US or international markets had their most important technology

transfer links with foreign customers. The firms are oriented to learning from customers in their major market, and more specifically, their most significant customers.

Obstacles to Collaboration

The ICT agglomeration in the case study city, demonstrated a great deal of social capital. There was extensive membership of an informal horizontal network, which although it was not significant to product or process innovations, did provide the shared conventions, informal rules, and habits, which are seen to facilitate the development of innovation-oriented linkages. There was little evidence of competitiveness among the companies. Indeed there was an openness to collaboration and a willingness to collaborate locally.

However, the core competencies of the agglomeration members were simply too diverse. While this study found extensive vertical commercial links between the companies, there was no evidence of the existence of an exclusively local integrated supply chain. Although companies used local suppliers and subcontractors, they also had many more such linkages outside of the agglomeration.

Moreover, most of the companies were not oriented to local markets. Their customers, who were a key source of learning for the purpose of innovation, were nationally and internationally based. Local technology-based customers were often not those upon whom the company was focusing. Often they were 'customers of convenience' or leftovers from the company's early years when local ties were key to acquiring contracts.

The lack of local commonalities & focus are key factors in explaining the low levels of R&D collaboration and technology transfer among companies in the agglomeration.

Agglomerations are considered to attract similarly specialised industry, reinforcing the sectoral image of the locality. Significantly however, this was not the locational motivation of firms in this study. Rather, their attraction to the agglomeration was based upon the availability of suitably skilled labour. They saw the agglomeration's function as providing a range of potential employment options, which made workers' decisions to relocate to the area less of a risk. This advantage was combined with the attraction of the case study city as a residential area for staff and owner-managers, a significant factor in the decision to locate firms there. Firms in the study did not cite the presence of potential inter-firm relationships as a factor in their decision-making. This is evidenced by their extensive use of non-local subcontractors, suppliers and customers.

The participating companies are not particularly unusual in this regard. For example research on Aragon, a peripheral region of Spain, found that personal ties to the region were a major factor in determining the location of high-technology firms therein (Martínez Sánchez, 1992: 162).

The dominance of labour supply and quality of life issues over the potential for inter-firm relationships in determining firms' decisions to locate in peripheral regions, has major ramifications for the likelihood of agglomerations to be composed of complementary and similarly occupied firms and consequently for the likelihood of inter-firm linkages.

Conclusions

The findings of this paper suggest that governments may need to exercise caution with regard to investments in network building. They recommend significant background research into the structure of candidate agglomerations. In the National Spatial Strategy, the critical mass necessary for inter-firm linkages is taken to be generated by the agglomeration of labour and skills rather than core competencies (Department of the Environment and Local Government, 2002: 35). The conclusions of this paper suggest that in the case of peripheral regions the assumption that an agglomeration represents an integrated production system should be avoided. Our assessment of what constitutes the 'critical mass' required for local interactive learning must be critically addressed.

Finally, the findings of this paper suggest that the potential of extra-local linkages should be considered. A discovery of within-sector diversity and an orientation to international markets may recommend governments to invest in supporting firms to develop extra-local relationships for the purpose of learning. In such circumstances, this strategy may be a more economical and feasible means to enhancing individual firms' sustainability.

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