The Role of Science Parks in Developing Company Networks

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Abstract

The aim of this paper is to describe the role of the science parks in developing the networks of companies that belong to the science park. As a phenomenon science parks have been researched for almost 20 years from various viewpoints. In this paper the science parks are approached as intermediators of relationships and networks of start-up companies located in science parks. This is done through theoretical discussion related to horizontal networks, intermediators and science parks together with interviews.

Introduction

It is well over 50 years since the first research park[2] was established in Stanford (Why 2001). Research parks became more common in Europe during the 1980's. However, majority of the currently existing Science parks in the world were created during the 1990's. It is interesting to notice that 18% of the existing Science Parks have been launched in the first 2 years of the new century, which confirms that Science Parks are a growing phenomenon. (IASP 2003)

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[2] There is no uniformly accepted definition of science park and there are several terms used to describe similar development, such as Research Park, Business Park, Innovation Centre, Industrial Park, Science park, Technopole etc.

As a phenomenon science parks[3] have been researched for almost 20 years (e.g. MacDonald 1987). The most essential research areas related to science parks are new technology based firms (Löfsten-Lindelöf 2001; Lindelöf-Löfsten 2002), academic entrepreneurship (Mitra 2002), university-industry links (Westhead-Storey 1995; Vedovello 1997), technology transfer (Grayson 1993; Buratti-Penco 2001; Sigel-Westhead-Wright, 2003) and networks (Mäki 2002). Because of the significant objectives and expectations which are directed towards science parks, their operations and results arouse interest in several stakeholder groups. The effect of technology centres have been discussed in several research papers (see for example Massey-Quintas-Wield 1992; Guy (ed.) 1996, Autio-Klofsten 1998, Westhead-Batstone 1998; Druilhe-Garnsey 2000; Mäki-Sinervo 2001). These reports have considered the subject also from a regional policy point of view. The relationships with and inside the science parks have not been widely discussed in the research related to the science parks. In the IMP-tradition, in turn, the economic exchange relationships, and especially buyer-seller relationships, have dominated both the theoretical and empirical discussion related to industrial networks (Easton-Araujo 1992, 67). However, the often non-economic, horizontal, relationships can have a great impact on the operation of the whole network (Easton-Araujo 1992, 68; see also Möller-Halinen 1999; 415-416). The science parks in this context can be seen either as actor in the relationship between two organisations, i.e. between science park and company belonging to the science park, or science park can be seen as intermediator[4] (Havila 1996, 25; see also Thibault-Kelley 1959, 191; Simmel 1950, 135; Tähtinen 2002; Mota-de Castro 2003) in relationship between buyer and seller. The intermediator role can be even extended from the triad (e.g. Havila 1996; Tähtinen 2002) to a larger network.

The aim of the paper is to describe the role of the science parks in developing the networks of companies that belong to the science park. The viewpoint taken in the study is the viewpoint of new, start-up companies located in the science park. To the network of the companies are included both vertical and horizontal economic relationships (i.e. relationships for example to the suppliers,

[3] According to International Association of Science Parks (IASP 2002), a Science Park is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities. As it is seen in the definition science parks are regarded mainly as promoters of national and regional technology policy.

[4] Intermediator term is used here in the same meaning as Havila (1996, 25) uses the term intermediating actor. Intermediator is thus "a third party in common".

customers and financers). The non-economic relationships are limited to the intermediator role of the science parks. The theoretical discussion is concentrated on the horizontal relationships and networks, the intermediators and their roles in network together with the discussion concerning the nature of science parks in general.

The empirical part of the paper will consists of the preliminary interview of a start-up company located in the science park together with the interviews of the representatives of that science park. Later on the study will be extended to quantitative survey and additional interviews. When the study is extended to other science parks it is possible to analyse whether different management concepts and agreements have any effect on the way the companies located in science parks form their networks. This comparison can be extended to cover start-ups not having any science park connections. It is also possible to use longitudinal research methods by following how certain start-up companies form their networks.

The science park representatives interviewed in this study were the CEO of the Tampere Technology Centre Ltd and the manager and CEO of Hermia Business Development Ltd. Tampere Technology Centre Ltd was established in November 1990 as a development and administration company for Hermia Technology Centre (HTC). Tampere Technology Centre Ltd promotes the development of both beginning and existing high-tech companies. The company produces different services, operations and cooperation concepts for the utilization of knowledge, expertise and technology in the Tampere region. Hermia Business Development Ltd is a private-public owned company which aim is to help customers to commercialise their technology based product and business innovations, and to develop business of technology based companies. Hermia Business Development Ltd commercialises customer IPR's and searches financiers and business partners for customer companies. These two companies cooperate closely in Hermia Technology Centre so that Tampere Technology Centre Ltd mainly concentrates on administration and premises, and Hermia Business Development Ltd provides the business services, including the incubator. Together these two companies form a science park that is called Hermia Technology Centre.

This preliminary study covers also 11 interviews of CEOs of start-up companies which have used the Hermia incubator services at least for one year during the years 2000-2004. The most of the companies are located in Hermia Technology Centre and three of the companies are located in the city centre of Tampere. 10 of the 11 interviewed companies have been located in Hermia for ½-6 years. Three of the companies were established in 1998-1999, three of them in 2001, four of them in

2002 and one company in 2004. 9 of the companies have 1-6 employees and 2 of them employs 10-12 persons. The most of the companies are in ICT companies; except one electronics company and one in marketing-communication company.

Horizontal relationships and networks

Knowledge and learning have become important issues for companies, which are aiming at adapting their operations into the changes in the company environment (e.g. Nonaka-Takeuchi 1996). This does not concern only big multinationals, but also SMEs perceive these as crucial for their successful operation. In SMEs networks have a central role in learning, knowledge creation and innovation processes. (Tell 2000, 308)

Companies are no longer not only interested in financial or product related benefits offered through network, but mutual sharing of knowledge and experiences can be a key motivator for building networks (e.g. Tell 2000). Lundberg and Tell (1997) have noticed that although the core competencies and expertise exist inside that companies (also in SMEs), companies often need impulses from outside in order to start development processes inside. Thus, companies that have too limited networks, are facing problems in getting their inner development projects started. (Tell 2000, 305) The relationships that emphasize non-economic factors like knowledge sharing and learning can in the long run have positive financial effects for the company.

In network literature, the horizontal relationships, like relationships between competitors, have not got as much attention as the vertical relationships (see for exception e.g. Cunningham-Culligan 1988; Easton-Araujo 1992; Easton-Burrell-Rothshild-Shearman 1993). Cooperation based relationships between vertical actors (like buyer-seller) are easier to comprehend as there are build on sharing resources and activities between actors in the value chain (Bengtsson-Kock 1999, 178). Vertical relationships are usually concerned about financial exchanges (Easton-Araujo 1992, 63). Horizontal relationships in turn can often be described as more informal and invisible as they are often based on information and social exchange. The differences between horizontal and vertical relationships are remarkable but both types of relationships can equally important for the company operating in the network. (Bengtsson-Kock 1999, 178) Vertical and horizontal relationships are

integrated as they both form the focal network (Möller-Halinen 1999, 414). In addition to the relationships with competitors the horizontal relationships include the relationships with, for example, universities, research institutions and public administration.

During the last 20 years the relationships between companies and research institutions/universities have gradually increased, and they have grown in importance. Two reasons can be found behind this development. First, universities and research institutions have technical competence which combined with commercial competence, can advance competitive advantage of companies. Second, universities and publicly funded research institutions demand more and more equipment, space and personnel. Close cooperation between universities and companies has also been argued by increased relevancy of research in respect to market needs. (Storey-Tether 1998, 1044) The development of cooperation between public and private sector has been rapid for example in Scandinavia (Storey-Tether 1998, 1044).

Intermediators in business networks

Intermediators in business networks have not been widely discussed in the literature concerning business networks. Network literature often sees business networks as structures which do not have any boundaries. In a network that does not have any boundaries every actor can be regarded as intermediator as it is connected to many companies.(Havila 1996, 31) The intermediator role can be approached also from the point of view of triad (e.g. Havila 1996, 27, Tähtinen 2002). Havila (1996, 27-29) distinguishes between two types of triadic business relationships. In the first type, serial triad, the intermediator mediates most of the contacts between the other two actors. This type of triad reminds of series of two dyads; one between intermediator and seller, the other between intermediator and customer. In the other type of triad, unified triad, each actor has more or less equal contacts with each, and thus this type of triad is like a group of three actors. (Havila 1996, 28)

By extending this triad thinking into a focal network context (e.g. Salmi 1995; Möller-Halinen 1999) the intermediator can be a company that is connected to a focal company and its network partners or at least part of the network partners. In the figure 1 this kinds of network with focal company, intermediator, and other network actors is described in the context of science parks. This imaginary example describes three different triads between focal company located in science park, intermediator (=science park) and the third actors. There is a unified triad between university,

science park and focal company, two serial triads; one between the science park, focal company and potential customer, and the other between science park, focal company and potential supplier.

The figure 1 can be also interpreted as consisting of a focal dyad between focal company and the intermediator, the science park. This kind of approach can be applied to the start-up companies and science parks as for the start-up companies located in science parks the most important relationship especially in the beginning of the incubator period is the relationship with the science park. Most of the other (new) relationships are born through this focal relationship during this period.

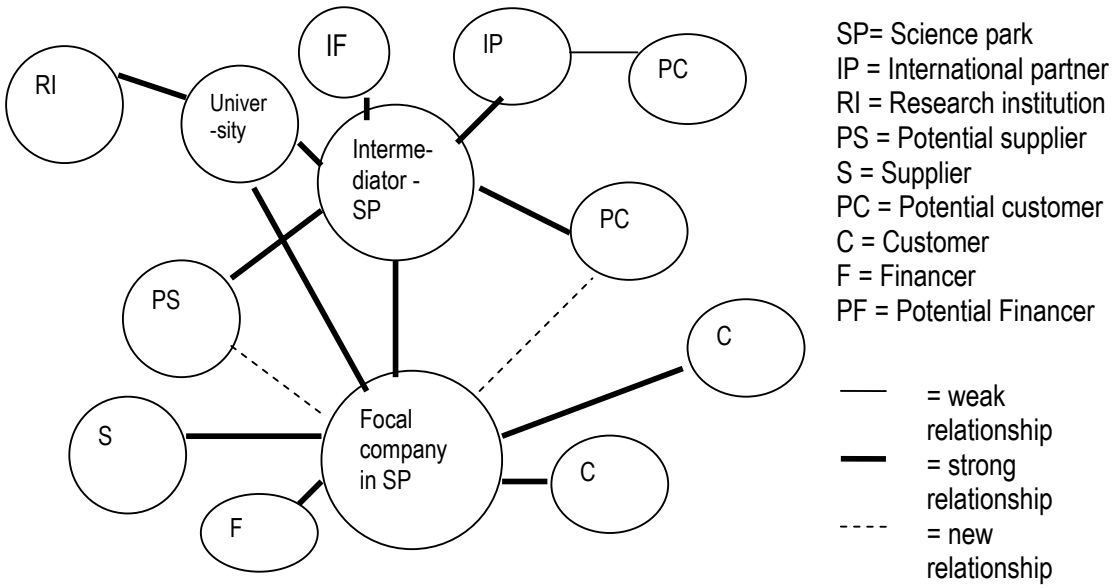

Figure 1. Intermediator in the focal network.

The case company has strong relationships with the university (as does the science park), they do not need any new suppliers, and at the moment they do not need any new customers, although they are considering expanding their operations into international markets. The most important triad (or triads) needed to build concern the triad between this company, the science park and the financers. The focus in this new start-up company is clearly in the relationship with the science park and through the science park with the potential financers.

In a triad net the actors may have different roles or functions, and at different times any of the triad members may play one of these different roles. Mediator, *tertius gaudens* and oppressor functions of the third party in the triad can be distinguished (Tähtinen 2002; Simmel, 1950, p. 145–169). The

mediator is involved in the both sides of the relationship (often buyer and seller), and aims at enhancing the relationship between these two by keeping them together. Thus the mediator is interested in finding solutions and creating situations which benefit both the parties. Mittilä (2000, 39) uses the term bistomer for the similar type of intermediator in business relationships as mediator. The *tertius gaudens* and oppressor have the opposite attitudes as they are in the triad in order to satisfy their own interests. The *tertius gaudens* is ready to take advantage of every emerging possibility, but not taking an active role like the oppressor. (Tähtinen 2002, see also Simmel 1950, 147) In Hermia Technology Centre (HTC), the role of the science park reminds the role of the mediator, as the success of the science park is highly dependent on the success of the companies located in the science park. In case of HTC, at the moment at least, the success of the companies is dependent on the ability of the Hermia Business Development Ltd. to find the financers for the companies. One reason for the importance of the relationships with financiers is that most of the start-ups located in HTC are technology companies that need financing for the technology development.

Start-up companies and science parks as network intermediators

Start-up companies, science parks and universities/research institutions

The proximity of science park in relation to the university or research institutions has been found as an important factor affecting the potential performance of the science park development (Southern 1986; Tweddle 1987; see Gower-Harris 1994, 26**)**. However, the level of interaction between these companies and universities has been considerable low (MacDonald 1987; Massey-Quintas-Wield 1992). The interaction level is still, however, higher than in case of companies located outside science parks (Felsenstein 1994). For the case intermediator, HTC, the contacts to the Tampere University of Technology (TUT) located nearby are important especially for the attractiveness of the science park. Often the companies that come to HTC already have good relationships to certain department(s) of TUT. The HTC, however, can have a central role in finding the special expertise that the company is not familiar with. For the interviewed start-up companies the main motivator for entering to the HTC was its closeness to TUT. Some of the companies believed that HTC was able to help them to find the expertise needed from TUT, and some companies were spin-offs from TUT, and for them HTC that located nearby was a natural choice as incubator.

There are different views about the importance of the distance between science parks and universities/research institutions. According to one view the distance should not be so long that it

restricts either formal or informal contacts between the companies in science parks and the academic researchers (Gower-Harris 1994, 26). The representatives of the other view claim that the geographic closeness is not an essential issue in building or strengthening the contacts between companies and universities at least for those related to the research activity (see e.g. Vedovello 1997). In HTC the geographic closeness to TUT is seen as central factor by the companies located in the science park. It seems to be however that the importance of TUT, and the importance of HTC as intermediator between companies and TUT, decreases as the start-ups get older and grow. Many interviewed start-ups were both research and technology oriented, and they find the geographic closeness with TUT important in the beginning when the business is still research and technology oriented. But as they develop, other aspects of the business become more important and the other relationships grow in importance. Furthermore, as start-ups in HTC are technology based they find quite easy to develop the relationships with TUT after the first initiatives by HTC are made, and thus the role of HTC in developing the relationships between start-ups and TUT can be seen more or less as initiator.

Start-up companies, science parks and business partners

The intermediator role of technology centers can also concern the relationships of start-up companies with other companies like customers, suppliers, financers and innovation partners. Traditionally, especially in Finland, the science parks have concentrated in innovation networks, and thus the main focus in partnering has been in universities, research institutions and companies that can act as innovation partners (Autio-Klofsten 1998; Abetti 2004). Transferring the focus from innovation partners to other business partners like customers and suppliers, of course, calls for knowledge and access to different kinds of networks, and often changes the focus from local networks to international networks.

In case of HTC the Hermia Business Development has in recent years paid a lot of attention in building these kinds of international networks. However, the interviewed start-ups did not find the role of HTC as important in building their business relationships. Only two of the interviewed start-ups had get help from HTC in building their relationships with suppliers, and three of the companies had found a customer with the help of HTC and one company got a list of potential customers as special service offered by HTC. Thus, it seems to be that HTC is starting to pay more attention in enhancing the relationships between start-ups and potential customers and suppliers, but has not yet gained remarkable results.

Start-ups, science parks and financers

In the local or regional level the science parks are often perceived as respected locations for start-up companies (Löfsten-Lindelöf 2001, 309). According to a Swedish study the science parks have a positive effect on the growth of the companies in science parks, especially when growth is measured by turnover and number of employees. Thus, the companies located in science parks grow faster than similar types of companies located somewhere else. (see Lindelöf-Löfsten 2002) One critical question, however, that the European science park system is facing, is the fact that the companies located in European science parks do not reach the growth figure of their US counterparts (Storey-Tether 1998, 1041). One explanation behind this difference could be found from the differences in organising the financing for the start-ups. In USA business angels, that are specialist in financing small start-ups, invest twice as much as the venture capitalists. It has also been argued that for the start-ups business angels are more suitable financers than the formal venture capitalists. (Jungman-Seppä 2002, 176; see also Mason-Harrison 2000, 111)

In HTC it has been self-evident to enhance the relationships with potential financers as the science parks in Finland do not have the funds of their own. For HTC the most important financer–relationship, is the relationship with the National Technology Agency, Tekes, which funds technological research and technological innovations. During the last years HTC has been active in building relationships to other science parks mainly located in EU-countries, and the aim is to help the companies located in HTC to find the right European partners through these relationships.

As mentioned earlier the start-ups in HTC need financing especially in the early stage when their operation is often research oriented, and the amount of income financing is limited. The operation of HTC supports this, as HTC has good relationships with Tekes. Some of the more developed start-ups, however, felt that they would need also relationships with other kinds of financers too. The HTC have been able to help these companies to finds some contacts, but most of them have not been fruitful for the companies. As in case of suppliers and customers, the development work done by HTC with respect to financer relationships has not reached a concrete level.

Relationships between science park companies

The science parks offer an important resource network for new technology companies (Storey-Tether 1998, 1041). The amount and scope of interaction can form an important factor in the operation of science parks. For example, the synergies developed between the companies located in

incubator can turn out to be critical for the innovation processes. (Bakouros-Mardas-Varsakelis 2002) Thus, one of the critical issues in the operation of science parks is the collection of critical mass and the cooperation resulting from informal social interaction between companies. In addition to critical mass the informal interaction is a central way for technology transfer and business development in science parks. In this respect by informal interaction is meant the social contacts and meetings. These are seen as activators for interaction between companies located in the science park and other actors. Critical mass and informal contacts are not, however, directly dependent on the services offered by science parks rather than on existence and growth of the science parks. (Mäki-Sinervo 2001, 50-51)

In HTC special attention is targeted to arrange possibilities for informal interaction. Means for these are for example the combined lunch and lobby facilities, small lunch restaurants in which you have to sit with persons you do not know, and different get-togethers and seminars. The interviewed start-ups did not feel that HTC has had a central role in building the relationships between companies located in HTC. Most of the companies felt that they have done most of the work by actively searching the potential partners among the other companies located in HTC. Some companies mentioned that they have had some contacts with other companies during training periods and in seminars organised by HTC. It seems to be that the companies in HTC represent different fields of expertise among which it is hard to find synergies, and if there are potential synergies due to limited resources start-ups find it difficult to exploit these potentials. Consequently the intermediator role of HTC in helping the start-ups to build the business relationships with other companies located in HTC, can be seen as a role of invisible hand. HTC is creating the possibilities and facilities for social interaction, and only the active initiatives done by start-ups themselves can lead to something that can be called business relationship.

Conclusions and discussion

The intermediators in business relationships have been a quite neglected area in network literature. In the few studies related to intermediators, they have been usually studied in the triad context. In this paper we have suggested two alternative perspectives for analysing or approaching intermediators in business relationships. The first concerns the focal network, in which the intermediator mediates the network or part of the network of the focal company. The other is related to the focal dyad perspective, in which the main emphasis is in the relationships between the focal company and the intermediator, and the most of the contacts and all the new contacts are handled

through the intermediator. This is close to the serial triad presented by Havila (1996, 27-28) or bistomer –concept presented by Mittilä (2000, 39). However, here the emphasis is on the dyad and the intermediator can enhance relationships with different types of companies (customers, suppliers, financers, innovation partners etc).

The science park can be seen as having a mediator role in the relationships or networks. This means that the science park as a intermediator is acting for the interest of the companies located in the science park, and not so much satisfying their own interests. In the focal dyad between the company located in the science park and the science park, the latter is having the role of the seller as it is offering its intermediator services for the companies located in the science park. This can of course have an effect on the power balance between these actors.

The start-ups located in the science park often have a quite established innovation network, and the contacts and partners they are looking for through the science park are more business related like financers, suppliers and customer. However, in their operation science parks have traditionally, especially in Finland, focused on intermediating the relationships with innovation based partners like universities and research institutions. This technology orientation needs to be transformed into the business orientation in order to serve the start-ups better.

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