

THE INNOVATORS'S SOCIAL NETWORK

A cross-sector exploration on the influence of social networks and social capital on innovation and success.

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Abstract

The concept of innovation has evolved significantly over the last decade. It now appears that inherent successful innovation can be explained by the influence of the social networks and social capital. Originally based on tangible forms of capital and the necessity of technology pull and push, innovation management is now integrated in a larger system. The innovator's social network contains knowledge and information obtained from multiple connections in the social capital embedded in organisational and Inter-organisational network. This study shows the impact of inter-organisational, personal and business network in different sectors. The impact of the different networks on start-ups and mature companies, and how this is related to different performance levels in mature companies, is also outlined.

Key words: Social Network, Social Capital, Innovation, Innovation Styles, Inter-organisational Networks, Organisational Networks

INTRODUCTION

Innovation has become vital for companies to gain a competitive edge in economies increasingly characterised by the importance of knowledge (DTi, 2003). In these economies innovation is a strong positive correlate of the successful enterprise, see for example Prajogo, and Pervaz (2007) or Hughes (2001). Innovation on a macro level is

considered here to be the production, diffusion and use of new and economically useful knowledge, a key factor for competitiveness and growth. Social networks and social capital are essential drivers to learn and exploit capabilities, yet for a long time they have been overlooked in the literature on innovation management. The innovator's social network contains knowledge and information obtained from multiple connections or ties: the inter-

organisational network, the personal network and the business network. It is thought that the more and the stronger that these ties are then the more successful will be the enterprise in pursuing innovation goals. Similarly if these ties are to prestigious entrepreneurs, venture capitalists and major companies then this social capital will correlate with innovation success. This study differs from previous research on several counts. To the knowledge of the authors, this research represents the first attempt to assess the impact of the social networks and social capital on start-up companies in comparison to mature companies. Secondly, it has the objective to explore the impact of the social network and capital to different performance levels of companies.

The paper is structured as follows. In section two a brief literature review of innovation and social networks and social capital is outlined. This is followed by the objectives (section three), the research design (section four), empirical results and outcomes, (section five) and the paper ends with a discussion on findings and conclusion.

INNOVATION & SOCIAL NETWORKS

In the context of this study innovation is measured by three categories, counts of incremental, radical and overall innovation. Incremental innovations are the improvement/expansion of existing products, services, processes, technical or administrative conditions. Incremental innovation does not cause a significant departure from status-quo. In contrast, radical innovations in products, services, processes, etc. are breakthroughs that fundamentally change a product or service of process. Overall innovativeness is the total of all innovations put into practice, radical and incremental in all typologies. These categories have been clearly identified by a number of authors such as Tidd et al., 2003 Gatignon et al., 2002; Garcia and Calantone, 2002 and Utterback, (1996). Social Networks and Social Capital have a strong influence of the innovation success and growth on companies as has been demonstrated from the work of Rizova (2005), Landry (2001). The aim pursued in this paper is to investigate these drivers of innovation amongst emerging companies in the area around Munich in Germany.

In this study, the impact of social networks and social capital on the number of innovations is explored in conjunction to all of the innovation typologies. Previous studies tended to look into social network with regard to new product development process or focused on research (Allen, 1977; Fleck, 1979), development collaborations (Rogers, 1995) and alliance networks (Ahuja, 2000; Stuart, 2000). Social network can be defined as “...a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a

whole may be used to interpret the social behaviour of the persons involved” Mitchel (1969:2). Social networks have a strong influence to individual, innovation and organizational success. Cross et al. (2005) drew attention to the important role of social networks in improving business efficiency. Mintzberg (1973) and Kotter (1982) observed that entrepreneurs and managers use their personal contacts or networks of relations to gather information and to access resources. According to Nahapiet and Ghoshal, 1998 social networks provide value derived from information and knowledge absorbed from mutual acquaintances, friendships, family and membership of certain groups. Especially the entrepreneur’s social capital consists of all the social structures and relationships that he/she utilizes to achieve the desired end. There is a common understanding that for example managers with longer tenure have access to people with special knowledge, while young graduates are more likely lack such contacts (see Campbell and Heffernan, 1981). More mature companies investigate the ties and expertise of employees and how they utilize their professional networks in the external approach of the inter-organisational network. The linkages (rational ties) between the different actors function as channels to transfer both material and nonmaterial resources/information. The rational ties provide the bases for network models show the structural network environment with opportunities or constraints for individual actions. As a result, network models outline the structure in different dimensions, e.g. social, economic, and political, etc. to provide a pattern of relations between actors (see Vázquez, 2007). Bourdieu (1985) defines the social capital as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition”. Innovation requires the convergence of different kinds of knowledge from different types of actors (Landry et al., 2002). Social network and enables this convergence.

Objectives

In this study the aim is to explore the influence of social networks and social capital on innovation. Two major networks, the inter-organisational and the organisational network, are investigated to identify the important elements in the innovator’s social network. The inter-organisational network is associated to social capital, the aim of which is to achieve reduced transaction costs between companies or realize benefits out of information, bargaining and decision making. There seems to be a trend for companies to cut their in-house R&D expenditures in favour of open, networked approaches to develop new products, processes and business lines. The value of an established social network can be described as social capital which has

various forms, primarily trust, norms and networks (see Dasgupta and Serageldin, 2000). The organisational network is thus related to changing organisational structures. It seems that many companies search for concepts to foster collaborative activities, not only within R&D, but more widely across hierarchical structures and departments (Hagedoorn, 2002). There is a correlation and positive impact between collaborative activities and companies capability to be innovative. One must also note that many informal networks within organisations accomplish tasks and create ideas more effectively than the procedures drawn on formal charts.

The aim then is to explore the extent to which social network and social capital contribute to incremental and to radical innovations, in different stages of the business life-cycle (start-up vs. mature), for different performance level (Low Performer vs. Average Performer vs. High Performer) and the importance of three distinct networks within different business sectors.

DATA COLLECTION

Over 200 CEOs and Managing Directors of innovative and technology driven companies in the high-technology cluster around Munich responded to an online questionnaire about their social network and social capital in conjunction to innovation as part of a larger survey to understand factors influencing innovation, (see Lewrick 2007). One part of the questionnaire was intended to survey the organisational and inter-organisational network with 11 key statements which respondents rated their extent of use on a seven point scale from 1, no extent to 7, a great extent. Biographical information (Sector, Core Competence of Company, Years in Business, Number of Employees, Sales, and Sales Increase) were also collected in the questionnaire. The specific statements asked for the respondents agreement were:

Statements on the organizational network were related to social networks beyond the organisational boundaries:

- Is innovation influenced by family and friends?
- Does innovation emerge from a social group related to Universities?
- Is innovation influenced by formal business bodies and business people, e.g. consultants ?
- Is innovation influenced by informal social contacts with other business people, e.g. the “golf course effect” ?
- Is innovation influenced by a larger social network, e.g. external workshops and conferences?
- Does the organisational network have experience in intrapreneurial activities?

The next section of statements aimed to explore how companies work together with other companies. Five key questions were developed to learn more about cooperation, alliances, and social capital. These were:

- Does the company market complementary new products with other companies?
- Does the company establish cooperative R&D agreements with other companies?
- Does the company introduce new products/services to market with other companies?
- Does the company jointly design and manufacture new products with other firms?
- Is the company in a central position within a network and actively seeks new ties?

ANALYSIS OF THE DATA

Before the data set was examined verification and data cleaning was applied to form a reliable set of cases. This reduced the number of usable responses to 171. Companies were then clustered into start ups and three performance levels based on the degree of sales increase and amount of innovations realized. These were labelled as Low Performers (LP), Average Performers (AvP), and High Performers (HP). The link between the different networks types an innovativeness was established by examining correlation matrices. Factor analysis was applied as a data reduction technique, to create new variables to determine the effect on the innovation measures and the variations of these networks across business sectors, by company age and by performance groups (High Performing Companies, Average Performing Companies, and High Performing Companies). Analysis of variance has been conducted using as factors business sector, years in business, and performance to determine the significance of these new variables.

RESULTS

The measures of incremental and overall innovations were found to be positively correlated with business success as measured by increased sales performance. The Pearson correlation coefficients were 0.270 and 0.312 respectively and were significant at the one per cent level. Thus the basic premise of this paper is established that innovatory activity should be encouraged as it is associated with high performance. However, no correlation was found between radical innovations and sales performance, this might be reflective of the appreciable time lag required in order to benefit financially from radical innovation. The mean responses to the networking questions are displayed in Table 1. From this table it is clear that personal networks are more used than organisation based networks. In

particular informal contacts, links made through heavily relied on.
conferences and workshops and entrepreneurial links are

Table 1: Summary measures of answers to network questions

Statement	Mean	Standard Deviation
Family and Friends	3.54	1.92
University	3.74	1.89
Business Bodies	4.28	1.52
Informal Contacts	4.79	1.71
Larger Network	4.54	1.43
Experienced Entrepreneurs	4.42	1.53
Market Complementary Products	3.29	1.75
Cooperative R&D	2.91	1.91
Introduction New Products/Services	3.32	1.90
Design & Manufacturing	2.90	1.86
Central Position in Network	3.96	1.74

Many significant correlations were apparent between innovation and network types and these are shown in Table 2. Indicated in the first block of Table 2 are the relations between the organisational networks and incremental,

radical and overall innovation. The second half of the table indicates the link between the inter-organisational network and innovativeness.

Table 2: correlations between network questions and innovativeness

	Total Innovativeness Incremental	Total Innovativeness Radical	Total Innovativeness Overall
Organisational Network			
Family and Friends	-.208(***)	0.009	-.157(**)
University	0.079	0.366(***)	0.195(**)
Business Bodies	0.023	0.006(*)	0.051
Informal Contacts	-0.083	0.178(**)	-0.022
Larger Network	0.332(***)	0.174(**)	0.310(***)
Experienced Entrepreneurs	.236(**)	0.08	.163(**)
Inter-Organisational Network			
Market Complementary Products	0.125(*)	0.190(***)	0.074
Cooperative R&D	0.299 (***)	0.285 (***)	0.312(***)
Introduction New Products/Services	0.204(***)	0.378(***)	0.182(**)
Design & Manufacturing	0.358(***)	0.292(***)	0.269(***)
Central Position in Network	0.217(***)	0.216(***)	0.171(**)
*** Correlation is significant at the 0.01 level (2-tailed)			
** Correlation is significant at the 0.05 level (2-tailed)			
* Correlation is significant at the 0.1 level (2-tailed)			

The influence of family and friends is negatively related to the total amount of incremental innovations realized. There is also a significant high negative correlation with the total overall innovativeness. Friends might include former peers and it seems that start-up companies tap into that knowledge, to share experiences and wisdom. They provide feedback for ideas, broadening the perspective, give advice and feedback. Therefore family and friends might become essential in the idea generation process but do not help in the actual innovation process to place the idea successfully on the market. The social group emerged from University is strongly related to radical innovations and is highly significant to the total amount of innovations put into practice. The network from universities might be stronger caused by the power of the expert's intellectual resources. It can be assumed that studying in the field links experts to discuss business processes and they address challenges and share knowledge on a specific subject. Business Bodies (e.g. consultants) as well as informal social contacts (e.g. golf course effect) are significantly positively correlated to radical innovations only.

The "golf course" effect might be important to improve the quantity and quality of the social network, which is a driver to increase the social capital available. Very significant were the correlations of the larger social network such as external conferences, to all three dimensions of innovativeness. The experience of the network with entrepreneurial activities supports only incremental innovations and the total number of innovations realized. The inter-organisational network is strongly related to almost all innovation outcomes, all of the statements correlate highly with incremental, radical and total overall innovativeness. Only the effort to sell complementary new

products with other companies is not highly related to total overall innovativeness.

The social network competence to market complementary products with other firms has a great impact on the ability to implement radical innovations. This might be caused by the need to adapt a product to the product of the company within the inter-organisational network. On both radical and incremental innovations the cooperative R&D is related. Hence it appears that the exchange of knowledge between companies foster innovations. Not surprisingly the successful introduction of new products/services is strongly related to radical and incremental innovations. This might include other innovation types, e.g. brand innovation, supply chain innovation, etc. which creates synergies between the firms to introduce the product/service successfully. The initial design and manufacturing in a joint approach also has a positive effect on innovativeness. It seems that again the knowledge of the network fosters innovation success. The overall idea of positioning a company in the central position in a network leads also to a strong innovativeness and might be road to success and to facilitate the realization the collaboration in the other elements such as R&D, design, manufacturing and the joint introduction of products and services on the market.

The level of agreement with the different statements were highly correlated and thus factor analysis with varimax rotation was used to reduce the number of variables and try to identify underlying traits. The Kaiser-Meyer-Olkin measure of sampling adequacy was satisfactory with a statistic of 0.712 and Bartlett's test of sphericity was found to be significant. This produced three factors accounting for 25.8%, 18.2% and 16.7% of the original variation respectively. The rotated component matrix is displayed in Table 3.

Table 3: Rotated component matrix

Question	Component		
	1	2	3
Design & Manufacturing	0.811	-0.078	-0.007
Introduction New Products/Services	0.773	0.083	0.118
Cooperative R&D	0.751	-0.162	0.029
Central Position in Network	0.618	0.197	0.404
Market Complementary Products	0.592	0.537	-0.142
Informal Contacts	0.137	0.761	0.313
Family and Friends	-0.226	0.756	-0.085
University	0.061	0.617	0.259
Larger Network	0.165	0.015	0.810
Business Bodies	-0.094	0.176	0.787
Experienced Entrepreneurs	0.427	0.280	0.434

These components are labelled inter-organisational networks, personal networks and business networks. (The factor loadings for each of the questions which primarily form these traits are shown in bold in Table 3). These are

now correlated with the number of incremental, radical and total innovations made by each company. These correlations are displayed in Table 4.

Table 4: Correlations between measures of innovation and network variables.

Network	Innovation		
	Incremental	Radical	Overall
Inter-organisational	0.355(**)	0.348(**)	0.286(**)
Personal	-0.158(*)	0.159(*)	-0.091
Business	0.212(**)	0.074	0.214(**)
** Correlation is significant at the 0.01 level (2-tailed)			
* Correlation is significant at the 0.05 level (2-tailed)			

Thus it is confirmed that inter-organisational networks appear to be important in promoting all types of innovation. Business contacts are also positively correlated with incremental innovation. However personal networks, while positively correlated with radical innovation, seem to significantly inhibit incremental innovations. To confirm these correlations the three types of networks were used as variables in a multiple regression models to explain the level of the different types of innovativeness. The models

which are summarised in Table 5 confirm the significance and direction of the effects of the network variables and that network variables explain only between 12 and 18 per cent of the measures of innovativeness. Although there are many other variables that can be mustered to explain the remaining variation such as competitor focus, customer orientation, knowledge management, human capital and business sector, (for more details see Lewrick 2007), social network variables are clearly important.

Table 5: Regression models of innovativeness.

Variable	Incremental		Radical		Overall	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Inter organisational	0.241	0.047	0.248	0.051	0.194	0.49
Personal	-0.107	0.047	0.113	0.051	-0.062	0.49
Business	0.144	0.047	0.053	0.051	0.145	0.49
Constant	1.936	0.047	1.749	0.051	1.877	0.49
Adjusted R ²	18.1%		13.7%		12.0%	

There is variation between the magnitudes of the network variables with business sector as can be observed from Figure 1. By applying one way analysis of variance this variation is significant at the 1% level for inter-organisational networks and personal networks across the

business sectors. However no significant variations were found for business networks.

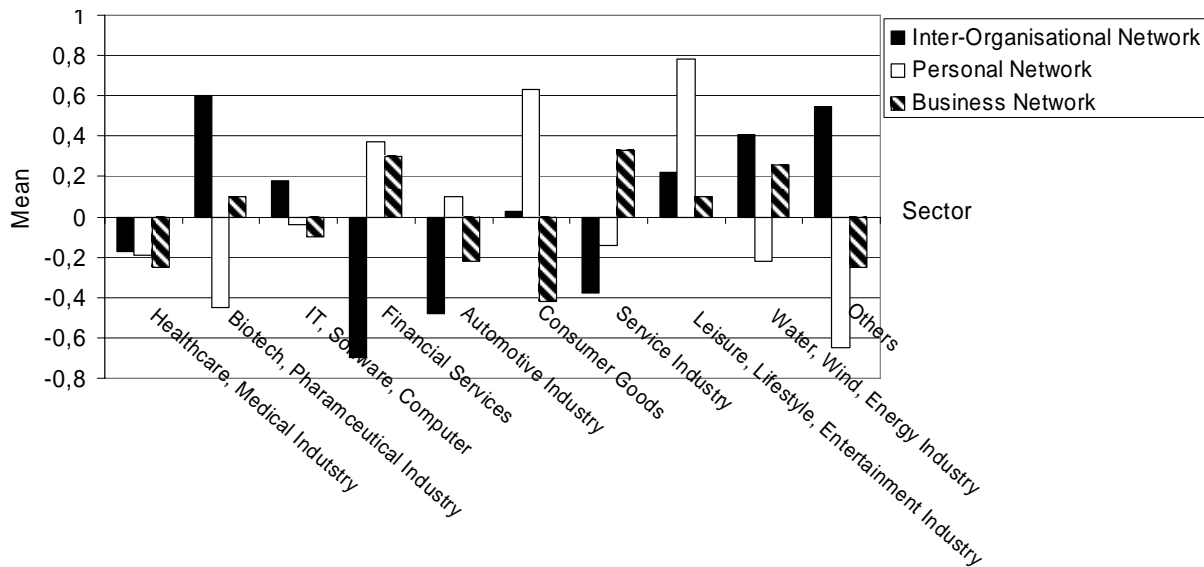


Figure 1: Variation of the inter-organisational networks, personal networks and business networks across business sectors.

Higher than average levels of inter-organisational networking was found for Biotech/Pharmaceutical and Water, Wind and Energy industries and other sectors (which included mostly companies in the machine building industry), these sectors had higher than average levels of overall innovativeness. Finance had very low levels of inter-organisational networking and had below average levels of overall innovativeness. However, contrary to this trend was IT, Software and Computing which had lowest levels of inter-organisational networks, yet this sector was very innovative on all dimensions of innovation. Consumer goods and leisure sectors, as one might expect, had high levels of personal networking. These sectors had lower than average levels of overall innovativeness confirming the inhibiting feature of less formal networks. There is no clear association of business networks to overall innovativeness.

The importance of inter-organisational networks in the sector Biotech/Pharmaceutical sector can be explained by the high-cost of R&D and the trend for big mergers in the pharmaceutical industry. It becomes crucial to acquire key business areas of competitors and to integrate them successfully and to do this it is necessary to use the expanded inter-organisational networks. Bas (2006) states with regard to the Biotechnology industry "...the cooperation agreements are extremely important in the search of missing competencies and resources (access to capital, distribution chains, asymmetrical reduction,

greater and better protection of the intellectual property, etc.), ...", other scholars observed "big-pharmas participated mainly with financial support; the small-sized intensive research companies with their technological capacities and the bio-pharmas with their technological capacities and financial support, depending on the partners" (Ohba and Figueiredo, 2007).

The personal network is most important for the Leisure, Lifestyle and Entertainment Industry. Especially in the entertainment industry the indirect and personal ties are of paramount importance to sustain business. The financial services sector resorts to a strong personal network and strong business network to stay successful and sustain their innovation activity. The business network is strongest in the Service Industry and weakest in the Consumer Goods sector.

More interesting is the importance of the different social networks on start-ups vs. mature companies and the comparison of different performance levels within the group of mature companies. This variation is plotted in Figure 2 for Start-ups and Mature Companies in the Performance Levels (Low, Average, and High). Inter – organisational networks do not appear to be important while personal and business networking is significant at the 1% level as confirmed by one way analysis of variance.

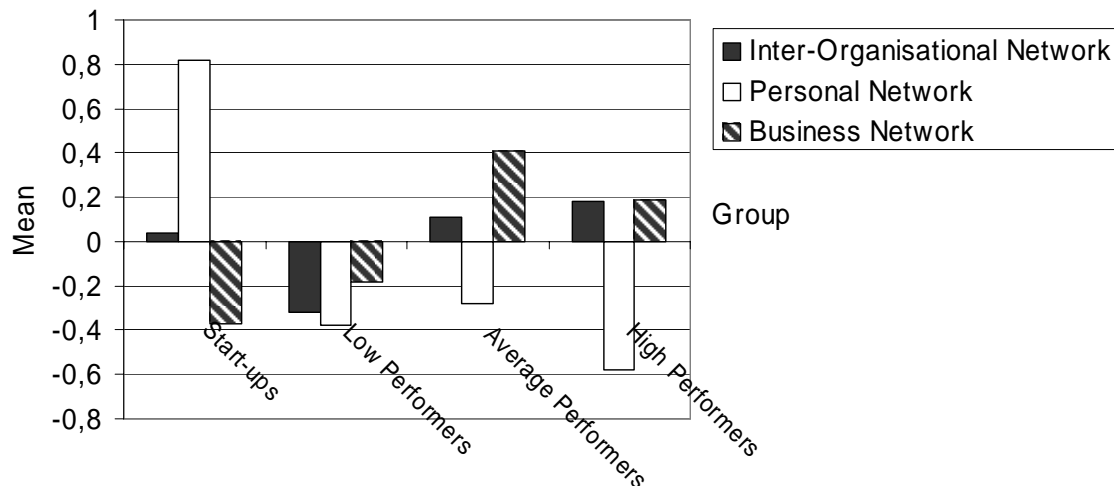


Figure 2: variation in networking by business performance classification

The personal network is of crucial importance for start-up companies. It seems that in an early phase of a venture the personal contacts to friends, former-peers, etc. are essential to start the business. The phenomena also observed by Régis, et al (2006) stating: “...the entrepreneurs’ networks structures are based on mentors’ social roles diversity and on strong ties” The effective use of the entrepreneurs network seems to be fundamental to become better grounded entrepreneurs and to build capabilities which help for further collaboration with other companies and within the business network. These capabilities are crucial differentiators of success because not all companies are able to learn how to network and to effectively lever opportunities.

Low performing mature companies lack in all three network dimensions. It seems that these companies have not realized the synergies of collaborating with other companies, nor the importance to get value out of the business network. Average and High Performers concentrate much more on the inter-organisational and business network to stay innovative and successful. It seems that companies change their network behaviour in the transition from a start-up phase to a more mature phase of business. The former personal network becomes less crucial and the inter-organisational and business network gain in magnitude.

The data was collected for start up companies and for those who have been in business for more than four years. The variation in networking with age of company is illustrated in Figure 3.

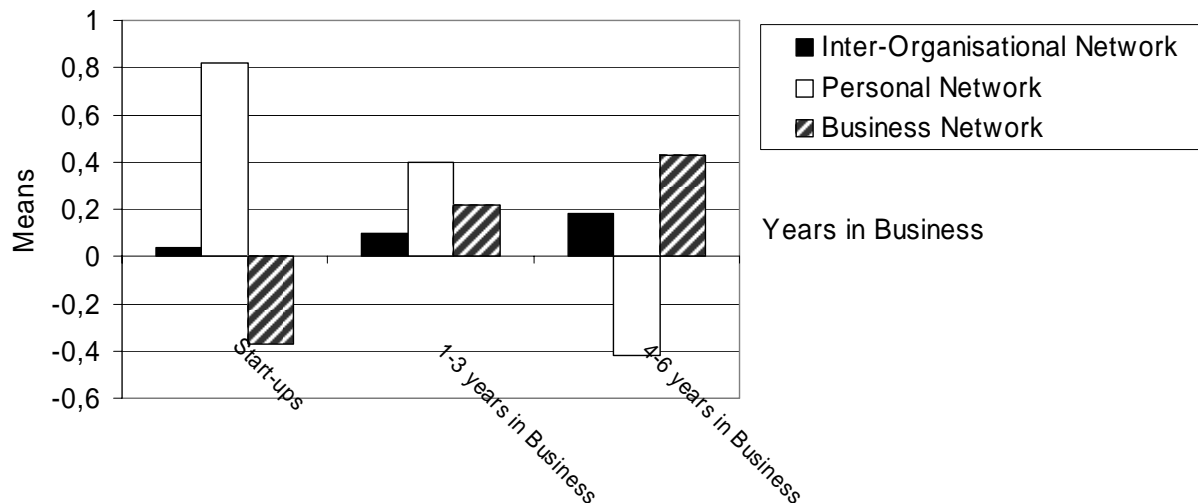


Figure 3: Variation in networks over time

Over the timeline of 6 years the decrease of the personal network and the shift towards the inter-organisational and business network becomes obvious.

DISCUSSION AND CONCLUSION

Different groups, actors and parties in the social network have impact on the innovativeness of companies. However, the inter-organisational network has the strongest impact on innovation and hence success. The configuration of different networks types (inter-organisational, personal and business network) and their development depends on the sector and the network configuration changes over time. A large shift of the network configuration is observable as companies evolve from their start-up phase to a more mature phase of business. The existence of networks and the social capital embedded within these networks have important ramifications for future business performance and we argue that these networks require nurturing. However, while important in getting businesses started, unless the goal of the company is to produce radical innovations, personal networks after the initial business inception should be discouraged.

The importance and influence of social networks and social capital is heterogeneous with regard to incremental and radical innovations. In addition, start-up companies utilize different networks from mature companies. It seems that the social networks and social capital must change to become a value driver over the life-cycle of companies. Family and friends are not positively linked to innovativeness. However, they may be crucial in the inception of the invention process and the later diffusion of the innovation. The linkage to Universities has an impact on radical innovations and the total overall innovativeness.

This agrees on views that the external relationships to universities, public laboratories, etc. are important (see Powell, et al., 1996). Informal contacts (e.g. “the golf course effect”) and are positively correlated to radical innovations only. The informal network might have access to innovation platforms, capital, and resources that support radical innovativeness.

The personal network and social capital generated by them is essential to transfer knowledge; however, this becomes less crucial as companies grow in size, revenue and complexity. In these larger companies informal networks based on personal contacts are replaced by more formal inter-organisational networks. Networks are not static entities; especially the power of the personal network seems to be dynamic and is related to innovation and success of companies.

Further investigations are required in to this area, for example the impact of differences amongst individual and groups of actors in the network needs to be determined. In addition, it would be interesting to rank the power of different networks by their impact on innovation and to explore the value of knowledge exchanged in the different social networks. On a macro-perspective the concept of social network and the social capital embedded in the networks should be explored within a high-tech cluster to better understand the impacts of vertical and horizontal relationships.

Thus not only are various capabilities essential to change, adaptation and success with regard to innovation but also the interactions of various groups with different compositions of actors must be recognized as an important dynamic.. The exchange of knowledge, information and contacts becomes vital for success and building of the

social networks to facilitate the transition to become a high performing company. This study has succeeded in capturing these invisible impacts on innovation. The real impact arises from social capital embedded in these networks. The more informal networks based on family, friends and consultants might bolster radical innovation but managed incremental innovation is more associated with high involvement in inter-organisation and business networks and this seems to be a safer route to success..

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