

**Venture Capitalists
in Systems of Innovation**

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VENTURE CAPITALISTS IN SYSTEMS OF INNOVATION

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ABSTRACT

In contemporary literature on venture capital financial infrastructures are identified as major contributors to a large proportion of today's innovations. Yet quite contradictory the literature on systems of innovation, hardly ever treat venture capitalists as a coherent actor in neither national nor regional innovation systems.

In attempt to locate and determine the potentials and importance of the venture capitalists in the innovation system a two-dimensional taxonomy is constructed and used to illuminate their role and position. The taxonomy gains insights through theoretical reasoning and the possible location is exemplified by a case of the Danish venture capital market.

It is argued in this article that venture capitalists stand a better chance of realizing their potential when they take and are given direct and formal responsibility in the innovation system. In relation hereto, the authors thus present initiatives to be taken to raise venture capitalists to a more direct and formal role in the context of systems of innovation.

Key words: Venture capital, innovation systems, innovation.

1 INTRODUCTION

Theoretical studies on venture capital closely link the existence of risk-seeking capital to the continuous development and formation of new products and processes (e.g. Kortum & Lerner 2000; Gompers & Lerner, 1999; Block & McMillan, 1993). Other studies indicate the relevance of network relations where innovation can happen as inter-organizational processes - often referred to as Systems of Innovation (e.g. Lundvall, 1992; Nelson, 1993; Edquist, 1996; Chung, 2002; Niosi, 2002). This concept has emerged during the last decades especially working with defining the composition of innovation actors. Yet, most of the studies in the area of venture capital and venture capital management take place outside the system framework whereby the potential role and influence of venture capitalist in the innovation system to some extent is neglected. As a result venture capitalists are seldom mentioned as more than an important factor for innovation-based growth.

This paper therefore aims at providing a more conceptual and theoretical understanding of the potential role and influence of venture capitalist in the innovation system. This is done by taking a systems approach i.e. positioning venture capitalists in relation to other actors in the innovation system. It is argued in this article that constructing a macro approach describing and positioning venture capitalists helps to create both the self-understanding within actor subsets and to define the broader institutional set-up. It is additionally argued that creating such understanding will support the possible synergies between actors in the innovation system.

Based on a theoretical discussion and an exemplifying case about actors in the Danish market the paper analyses venture capitalists in the systems of innovation - in relation to mapping innovation actors and the relationships between these. Primary effort is put on discussing how to realize the potential of venture capitalists as collaborative innovation partners in the system.

It is argued that incorporating financial structures, especially risk-seeking venture capitalists in collaborative arrangements (with different actors in the system of innovation) will cause macro economic benefits i.e. support the development of new technology based firms. By committing to a closer relationship to *investees*, venture capitalist will simultaneous gain strategic intelligence on markets, technologies etc. hereby enhancing their selective capacity.

THEORETICAL FRAMEWORK

Taking a financial perspective on innovation, a very fundamental element is the allocation of venture capital investments (Gompers & Lerner, 2000). Hellmann and Puri (2000) find that innovators stand a greater chance of receiving venture capital funding than imitators. Kortum and Lerner (2000) follow the same line of argumentation. They argue in a study on the relations between venture capital and innovation that:

[...] *“The empirical results ... suggest that there is a strong association between venture capital and patenting and that corporate R&D and venture funding are highly substitutable in generating innovations”* [p.682]

Their analysis underlines the argument that venture capital funding can have a strong and positive impact on innovation (Kortum & Lerner, 2000). Thus, it is argued by both Hellmann and Puri (2000) and Kortum and Lerner (2000) that the reason for greater innovation success by venture-backed companies is due to the involvement of venture capitalist. Because there is a greater risk associated with early stage projects, venture capitalists are more concerned when it comes to maturing an investment. Venture capitalists in many cases look for a solid investment that is likely to be fast growing and provide an over average return (Bygrave et. al, 1992). Traditionally the relationship between venture capitalists and entrepreneurs is based on the flow of capital as an imbursement for entrepreneurial action. Investors and venture capitalists provide funding based on perceived future revenue streams.

In markets for venture capital demand and supply are strongly separated: Supply of entrepreneurial action on the one hand and demand for such by venture capitalist on the other. Thornton (1999) argues that the entrepreneurship literature can be classified into two schools: one taking the supply-side perspective and the other, the demand-side perspective. *“The supply-side school focuses on the availability of suitable individuals to occupy entrepreneurial roles; the demand-side, on the number and nature of the entrepreneurial roles that need to be filled”* [p. 20]. Thornton (1999) argues that the ones taking the demand-side perspective suggests a number of ways to examine the context of organizational founding, such as the generation of new ventures by organizational hierarchies (Freeman, 1986), the activity of the professions (Wholey et al., 1993), the policy of nation-states (Dobbin & Doud, 1997), the development of markets (White, 1981, King & Levine, 1993), and the advent of technological change (Shane, 1996). Following this separation we discover a similar distinction of demand and supply.

It has been commonly known that two separate markets exist: one governed by individual entrepreneurs and another dominated by venture capitalists. It is clear that firms (entrepreneurs) do not demand innovation services, consequently making it hard for innovation service suppliers (i.e. venture capitalists) to identify the innovation needs in the market (Oughton et. al, 2002). This separation is strongly embedded in what constitutes a marketplace, even though different actors and organizations represent both demand and supply.

Other similar attempts have been made to illuminate the potential of venture capitalists. In the entrepreneurship literature (e.g. Arrow, 1974; Evans & Jovanovic, 1989; Amit, Gloten & Muler, 1990) focus on micro processes and facilitation and exploitation as been predominant¹. In the financial literature on venture capital (e.g. Gompers and Lerner, 1999) focus has been placed on individual portfolio strategies and optimal investment strategies, even though the macro economic benefits to some degree are acknowledged (Jaffe, 1996; Griliches, 1992). Within corporate entrepreneurship, venture capital has been a tool to improve innovation in large firms (e.g. Burgelman, 1983; Ginsberg & Hay, 1994; Husted & Vintergaard, forthcoming).

Several researchers have discovered several economic drivers which influence the initiative for venture capitalist to engage in innovation e.g. the past performance of the venture capitalists (Balboa & Marti, 2000), GDP growth (Gompers & Lerner, 1998), the state of the IPO market (Jeng & Wells 2000; Black & Gilson, 1998) (Berlin, G&L) and, the stock market capitalisation growth (Jeng & Wells, 2000). However little of this literature has viewed venture capitalists as actors in macroeconomic context – to some degree neglecting the overall picture of how venture capital is related to other actors in the innovation system.

1.1 STRUCTURING THE SYSTEM

In order to ensure the most favourable involvement of venture capitalists in a larger macro economic perspective - i.e. to focus on the relationships that carry innovative capacity - there's an evident need to understand the systems approach. A dominant part of the systems of innovation literature focuses on the national level and the central theoretical and empirical contributions within this approach has been published during the last decades by the work of Lundvall (1992), Nelson, 1993; Edquist, 1996, setting forth a framework allowing for a systems approach in understanding the possibilities and opportunities in innovation (Lundvall, 1992, 2000). The national perspective in analyzing the innovative capacity of nations has become widely diffused and is now an integral part of the analytical tool-box of such organizations as OECD and the European Commission.

The functioning of the system rests on the ability for all actors to interact. Interaction is facilitated through proximity and collaborative initiatives; joint research activities and licensing agreements between public and private sector actors. In this capacity, private sector actors can access and leverage the pure science competencies generated in public organizations and institutions and the public sector can realize the transfer and application of its technology into commercially viable products; thus achieving objectives for enhanced social welfare. Investigating venture capitalists as actors in a macro perspective helps us illuminate the possible potential of venture capitalist in more general terms than a micro perspective would do.

¹ Scott Shane (2002) II volume provides with a well-collected anthology on venture capital articles in an entrepreneurial perspective.

The main assertions in the innovation system are intuitively and empirically based on a set of components, the relations between those and the influence of institutions (Niosi 2002, Edquist 2001, Carlsson et. al 2002)². The components comprise a set of interlinked organizations of which the core is constituted by those organizations that produce, use and diffuse new knowledge. Relations comprise the links between these organizations, be they of formal, informal, human, regulatory or of commercial kind. A striking feature of the systems approach is the relevance of institutions. In the systems literature the term institutions is used to describe conceptually diffuse and heterogeneous set of underlying structures. The concept of institutions is worked with from two angles, one as a complex set of normative structures, regimes, and routines (Lundvall, 2000) and another as formal and explicit organizations (Nelson and Rosenberg, 1993). Though it is not the purpose of this paper to theoretically clarify this duality it is important to stress that the term institutions in this paper falls between these two concepts and is used to describe both objects pattern behaviour and more formal organizations that create these objects. Yet, what is in our interest is to introduce the terms of formal and informal institutions. Formal institutions namely describe the abovementioned “formal organizations” while the informal institutions refer to the existence of attitudes, norms and behavioural patterns constituting the innovation culture. The formal institutions in the innovation system are often equal to Etzkowitz and Leydesdorff’s (1996) components in their Triple Helix model.

The influence of informal institutions on the innovativeness of the national economy is only slightly touched upon in previous research of this kind. Yet, other contributions in scientific literature, outside the narrow definition of innovation systems, point to the fact that informal institutions are also decisive for the innovativeness of a national economy (Saxeenian 1994). Schertler (2002) have argued that a highly educated population might not be the same as a very entrepreneurial population with a lot of start-ups, but the very nature of the businesses that highly educated people are likely to start makes venture capital funding very relevant.

Distinguishing formal and informal institutions becomes a key element. As argued by Carlsson et al. (2002; p. 242) ”*A technological system has a number of different types of actors: firms, organizations, policy bodies, venture capitalists, etc. To evaluate the performance of a system, therefore, means to evaluate each of these players, not primarily as single entities, but connected in the entire system*”. Even though this being the case a literature review on the perspectives of venture capitalists in the system reveals only limited attention to the potentials of venture capital in a macro economic context. As argued by Van Kersbergen and Waarden (2001) “... *the concept of institutions has mostly been reduced to organization sets that provide resources, possibilities, and constraints for innovation: banks, venture capital providers, research organizations, training 'institutes', unions, and standardization agencies. The literature recognizes that the organizations that*

² The discussion on how to formulate the exact properties of a National System of Innovation has many strands. Niosi 2002 provides with a picture of the semantic core of the concept.

make up 'national systems of innovations' are influenced by 'institutions', now used in the more specific meaning of 'norms, habits, conventions and rules' of a society. However, the latter remain largely unexplored'. By looking at some of the ways researches have perceived venture capitalist in relation to the system of innovation much of this seems plausible. It becomes evident that venture capitalists are not considered as a direct actor subset in the system but merely as a resource provider. Many scholars within systems of innovation have implicitly treated venture capitalist in this way, i.e. (Lundvall, 1992; Nelson, 1993; Edquist, 1996, Freeman 1999). Freeman argues in *Venture Capital as an Economy of Time* (1999) that venture capitalists are an important participant in the innovative process as they provide funding for new ventures and also help build the new ventures. He further argues that this is done by making social connections to other important actors and by for instance providing advice.

This leads us to believe that Van Kersbergen and Waarden (2001) arguments are also valid for venture capitalists. As indicated venture capitalists are predominantly viewed as resource providers, making their exact role and potential blurred and difficult to analyse. To an even greater extent it becomes difficult to determine what makes them distinct from the other actors in the innovation system. Consequently their relations to other actors in the innovation system and their possible position and role in the innovation systems become open-ended.

In the following a Danish case has been selected as an illustrative example of the arguments presented in the paper. The case serves as a practical illustration of how venture capitalists have tried to position themselves in relation to other innovation actors.

2 VENTURE CAPITALISTS IN THE DANISH SYSTEM OF INNOVATION

In order to provide examples of the current role and positions of venture capitalists in the innovation system, the following case functions as illustration. The empirical evidence offers a rich illustration of how venture capitalists perceive themselves in relation to actors in the innovation system.

The case is based on 25 in-depth interviews conducted with top and middle managers of venture capital firms from a selective representation of industries. This resulted in more than 100 hours of interview. Each interview has been taped recorded and later transcribed. The interviewees all hold jobs in a diverse set of venture capital companies - with diverse investment strategies and industry focus. Every investor holds a central position in top management. Additionally the case is based on material such as peer review articles, books, news services, venture capital statistics etc.

2.1 ROLE AND POSITION IN THE INNOVATION SYSTEM

The Danish venture capital market is relatively young compared to the rest of the European countries and especially the United States. The market was initiated in the late 70's and the early 80's. From 1982 to 1985, 10-15 new venture funds were established. The positive development, however, did not last and a few years later the number was reduced to only a few (Christensen, 1998, 2000). After this downturn, it took almost 10 years before focus once again was on venture capital in Denmark. In 1992 the establishment of the governmental institution: the Danish Investment Fund again shed light on the entrepreneurs. The focus has remained since 1994 although the market experienced a downturn after the year 2000. Today, the market for venture capital is growing, which is supported by statistics concluding that the total number of venture capital companies increased from 33 in 1998 to almost 80 today (EVCA, Vækstfonden 2003).

The Danish venture capital industry is still trying to find its feet and define what kind of role it should play in the innovation system. Lars Bruhn, managing partner of the venture capital company IVS A/S and chairman of the Danish Venture Capital Association, clearly indicates states: *"I hope that we will get more venture capitalists in the market that take active part in influencing the political agenda"*. Trends towards a more mature market have however started to show. As an example it can be mentioned that the Danish Venture Capital Association (DVCA) increasingly is making an impact. In 2002 and 2003 DVCA has established several committees in order to influence the political agendas and ensure the right climate for venture capitalists. Trends towards a greater interest in developing the market have however started to show by the Danish Government. The Danish Venture Capital Association (DVCA) increasingly is making an impact and succeeded in getting 5 out of 10 suggestions accepted by the government in 2003. DVCA has established several committees in order to influence the political agendas and ensure the right climate for venture capitalists. The latest committee, which has been established, is trying to support and promote education in entrepreneurship and venture capital. This initiative also tries to

create the link between entrepreneurs and venture capitalists. Other committees are responsible for supplying historical market data, which can later be used, or decision-making and international comparison.

It is argued by Thor Birkmand, Futuri Invest, manager of Slottsbacken Funds, that such initiatives are needed as “...*entrepreneurs are not as well aware of venture capital to help them grow their business as in many other countries*”. He further argues, “... *as a result of the immature Danish market many entrepreneurs perceive venture capitalists as hunters that shoots around and pick up whatever ends of on the floor*”. He however also stress that many venture capitalists operate in an immature fashion – in most senses more like traditional financial institutions than as venture capitalists. Most of the initiatives in DVCA still remain on the basis of volunteers. In order to gain more momentum on a macro economical level Thomas Weilby Knudsen (Chief Financial Officer) Internetventures Scandinavia A/S ads “*Even though IVS do not formally have a task in this context, we do prioritise active work in organizations such as DVCA [Danish Venture Capital Association] and other organizations, in order to improve conditions for innovation*” ... “*As IVS is dependent on attractive investment cases, it is part of our concern*”. These statements give indications that only a limited proportion of the Danish venture capital industry has yet started to influence agendas on macro economic level – becoming a more formalised group of actors. As part of this development a number of actors see the possibilities and incitements to pursue a more formal existence in the innovation system.

In relation to governmental influence, venture capitalists are also seeking additional help too boost the support to new ventures. Poul Andersson, CEO of the investment company BioVision, says “*When venture funds move to a higher level on the scale of risk they leave an open gab where there is no funds to push the companies further on. If the early projects are not to die out there is more then ever a need for the government to take on a proactive role*”. In this relation Mark Sonne Kharazmi from Danske Venture Partners argues that venture capitalists has just initiated actions that will influence government decisions. This initiative included a list of practical initiatives to improve the conditions for venture capitalists. Mark Sonne Kharazmi further argues that venture capitalists are starting to find niches in which they can specialize. Thereby they will create a broader interface with the market, and become known to a larger group of actors.

A large proportion of new venture capitalists in the market spend most of their time on developing their business structure while spending limited energy on positioning activities e.g. influencing the degree of innovation. This indicates little interest in fertilizing the grounds for new innovations.

Many Danish venture capitalists’ count on the educational system to provide good investment opportunities. In relation to the educational system Henrik Albertsen, Managing partner, CEO of the Danish venture capital company Nordic Venture Partners expresses:” *We need to have an educational system, which is of international standard. Its our job to discover, evaluate and capitalize on this research*”. A similar quote from Thomas Weilby Knudsen (Chief Financial Officer) position the role of Internetventures Scandinavia A/S (IVS) in the Danish innovation system: “*IVS sees its role as twofold: as a*

facilitator of the innovative environment, and as a partner. The facilitator role is visible through our promotion and investment in companies, thus creating further growth and success stories about innovative entrepreneurs who succeed in building a business. As a partner IVS is highly dependent on sourcing for its investments opportunities. The innovative environment is an important source". Directed by the quotes it becomes obvious that the role ascribed to venture capitalists is very focused on the area of facilitating the innovation process, rarely taking active part in actual creation. This goes hand in hand with the early theoretical separation of markets. In relation to the involvement the following quote answers the question of whether Internetventures Scandinavia A/S takes active part in the innovation process: *"No, however, we do spend effort on improving conditions for entrepreneurs on different levels"* says Thomas Weilby Knudsen.

The practical distinction of markets is very much grounded in traditional financial funding as provided by banks and other credit institutions. The common perceived value-adding element of venture capitalist lies in their ability to help entrepreneurs develop their idea into a viable business. These quotes provide some empirical perspectives: *"We meet entrepreneurs who believe that having a significant technology is equal to a brilliant firm... it is one of our obligations to make these evaluations and aid management and entrepreneurs to best possible approach the market and then later on bring these to market"* (Thor Birkmand, Futuri Invest, manager of Slottsbacken Funds). An additional quote further underline this point: *"It is our role to provide capital, but also advise and make resources available that the entrepreneur didn't have access to before"* Helle Busck Fensvig, Partner, Danske Life Science. Helle Busck Fensvig further argues *"This type of active involvement in the investment is something that is often stated by Danish venture capitalists, but something that they rarely do"*. Venture capitalist are however well aware that innovation is the main fuel for their business model. Indirect action for improving such conditions has therefore also started to be formulated as direct proposal to the government. DVCA tries through its committees to ensure that the pipeline is filled with new venture ideas, while at the same time creating general support to the industry.

The case provides examples as to how venture capitalists see themselves in the innovation system. Venture capitalists only in rare cases take part in the process of idea creation and consequently early phase innovation – a feature very much connected to a less developed financial market. Consequently venture capitalists are not viewed as a direct component in the system as such, but function as a facilitating sub-layer providing innovations with financial recourses for it to develop. Yet, some venture managers from the Danish case indicate that the sector is in a transitional phase and that in future perspective venture capitalists might gain enough market intelligence to identify special viable opportunities in the market and later on act on these. It becomes clear that many of the theoretical point on separation on markets also are present in this case. The case also provides an indication that the degree of involvement in innovation is only one parameter when mapping their role and importance; the level of formality as an actor subset is equally important. A better understanding of this connection is provided in the coming chapter.

3 CREATING CONCENUS

As indicated in the previous case and theoretical rationalization venture capitalists can take on several positions in the innovation system and also contribute to the systems in diverse ways. As pointed out, venture capitalists provide financial resources for innovation as the bulk of traditional financial institutions do. However their financial strategy differs on several parameters to traditional credit institutions, such as risk profile and complementary resources etc. (Gompers & Lerner, 1999). Partly due to these reasons the services rendered by venture capitalist differ significantly from traditional credit institutions. By examining venture capitalists in previous research and in the case, insights into their role and position are improved.

It is historically grounded that venture capitalists are not as publicly known as other financial institutions. The early rise of the venture capital industry and its development towards maturity was initially constituted of “business angles”. A common characteristic of these business angels was that these were individual investors investing their private money (Mason and Harrison, 1992). Quite obvious these single individuals, not being part of a larger organization, were not as identifiable as the larger organization in the institutional landscape (Fenn and Liang 1998). These elements have however shifted in mature venture areas yet we find these characteristics present in the Danish case. Comparing mature and immature venture capital industries thus show conspicuous differences in the degree by which venture capitalist have established themselves around a professional body or community. Evidently Danish venture capitalists to a less degree have established themselves as actor subset or community whereby their official appearance as a collective in the innovation context is blurred. This problem is in many cases due to the fact that venture capitalists to a large extent have relied on their informal relations and specifically their ‘nose’ for sniffing up the good investment proposals –reserving fewer resources for positioning activities. Mitchell Berlin (1998) argues that most venture capital firms often consist of small independent partnerships with a professional staff of between six and 12 people, including a few general partners and a small number of associates who are venture capitalists in training. This naturally makes the individual venture capitalist appear less formal than traditional banks, which are far greater in size (Berlin, 1998).

John Callahan and Steven Muegge (2003) argues that only *“In rare instances, a venture capitalist may become involved in the development of a new venture before it is ready for investments of the size and type appropriate for VCs. More commonly, however, the deals seek out the VC, who often maintains a high profile in their investment community – spending significant amounts of time at business events and conferences. The timing of VC financial entry into an opportunity can depend greatly on the supply of and demand for good opportunities by VCs”*. Following this line of argumentation researchers such Hellman (1997) stress that if investors play an active role in the development new start-up companies, the identity of the investor becomes an important determinant of the venture process. Trying to deal with this problem venture capitalists often make syndicate investments and exchange good proposals (Amit, Glosten, & Muller, 1990).

Even though research in this area is only an indirect representation of venture capitalists practice it does give a clear indication on how the relationship is between the innovation system and venture capitalists. Venture capitalists can primarily be seen as organizations that are willing to provide risk-willing capital in return for an abnormal payoff (e.g. Block & McMillan, 1993). A central issue is to be found in the strong separation of markets. Venture capitalist and the primary innovation network often does not see one another to have inter-correlated interests. There is a strong belief that separate organisations should do what they are best at (Thornton, 1999). In this way the components and relations in the system of innovation should be the ones providing innovations and venture capitalists should be the ones, exploiting these opportunities (Sarasvathy, Dew, Velamuri and Venkatarman, 2003).

A partial reason for this indirect position in relation to the innovation system is stemming from a strong belief that venture capitalists cannot contribute with any value in the innovative process. There is a common perception that the value that these organisations render should be brought in much later in the process: i.e. exploring the opportunities, staffing, growing the business etc. It is often argued that venture capitalists play a critical role in the innovation process, not only as a source of finance to innovation but through other functions that lie at the core of high tech development (Burgelman, 1985). Another reason for the level of directness in the approach of the venture capitalists might also be found in not knowing where and how the contribution should take place. The venture capital actors in many cases carry traditions from traditional funding; such as we know it from banks and other financial institutions.

3.1 TAXONOMY

Condensing the illustrations from the Danish case and the present research of venture capitalists in the system of innovation a framework starts to take shape. The clarity by which venture capitalists operate in the system with clear tasks to fulfil is only in the making in the Danish case. This development can be seen in perspective of network theory, where there is an increased focus on formal or informal positions as the locus of innovation (Pyka 1997, Waldstrøm 2001, Dahl 2002, Cross et. al., 2002). These theories help to provide one dimension of the position of venture capitalists: formality or informality. This dimension of formality/informality helps us determine the possible potential of venture capitalists and also provide an important element in the taxonomy. This determines to what degree venture capitalist known in the system. The analytical context, when looking at formal/informal factors influencing innovation, implicitly touches upon the extent and scope by which formal and informal entities influence innovation. Adapting the formal/informal terms to the taxonomy with connection to the innovation process also reveal the concepts of direct/indirect influence on the innovation process i.e. are the actors formally or informally involved in the innovation process and is the involvement direct or indirect. Direct/ indirect naturally refers to the degree involvement in the innovative process.

As the purpose of the present paper is to analyse the potential of venture capitalists in the system of innovation as well as their influence on the system, the criteria of formal/informal actors and of direct/indirect participation in innovation are chosen to support the line of argumentation. From the Danish case it becomes evident that formal/informal and direct/indirect are central dimensions when mapping venture capitalists in the innovation system. What appears is a multi-dimensional taxonomy categorizing central institutions in the system of innovation. As analytical criteria these create a two-dimensional taxonomy in which it is possible to position the components in the innovation system. In relation to the taxonomy the location of the venture capitalists can later on be carried out in perspectives of various inputs from research as well as the Danish case. It should be noted that this builds on the assumption that the two dimensions of the variables varies between high and low. Yet, this categorization helps to disclose and systematize the components and relations involved in innovation in a quadrant model.

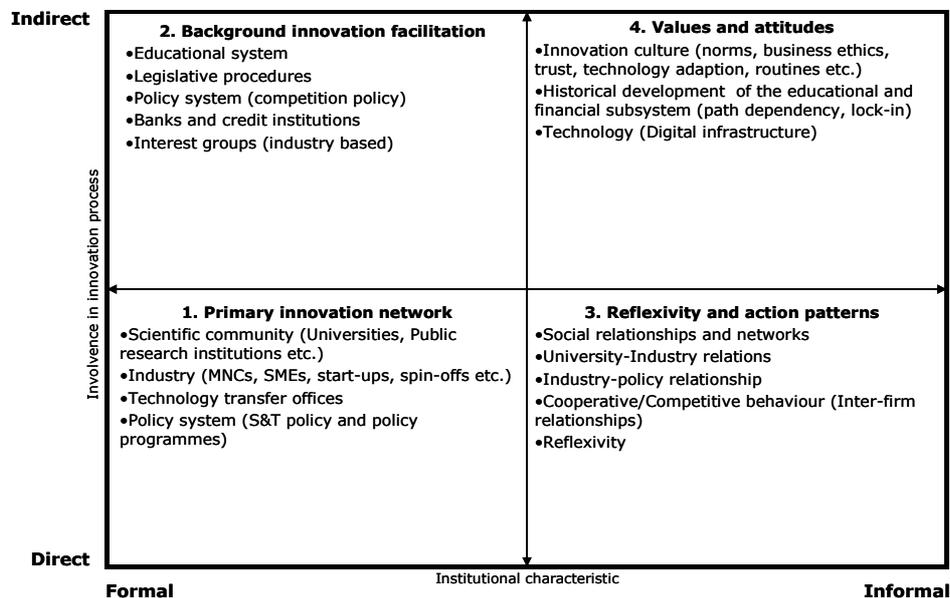


Figure 1: Components and relations in the innovation system³

3.1.1 Primary innovation network (Formal/direct)

The primary innovation network is basically constituted of the explicit core of the innovation system (Etzkowitz & Leydesdorf 1996; Nowotny et. al, 2001). As can be seen, the group comprises public research institutions and universities as well as private companies – yet all with direct responsibility for the generation and application of new knowledge within their fields and at the same time participating in collaborative arrangements and networks. The entities in this quadrant of the figure are the same that are worked with in the theories of the triple helix (Etzkowitz and Leydesdorf, 1996) and the mode 2 knowledge production (Gibbons, 1994, Novotny et. al, 2001).

³ Inspiration comes from Schloser 1999. Look to Liu and White 2001 for another taxonomy.

As an example, the development of S&T policy and the diffusion of these highly influence the processes of innovation as well as implementing programmes that facilitate the development of new technologies and set forth future research goals. A collective characteristic of the group is a close and continuous interaction with other components in the innovation system and awareness of their position and contribution to the system as a whole.

3.1.2 Background innovation facilitation (Formal/indirect)

Background innovation facilitation represents formal components indirectly affecting the innovation system – not as directly carrying innovations from idea stage to actual development but through their influence on the systems ability to actually run. Taking the example of the policy system it is evident that the development of policies that support business goals are essential otherwise hampering firms autonomy of action. The educational systems can be regarded from the same perspective – feeding the system with both qualified manpower and knowledge needed to develop new products and processes. Shertler (2002) conclude that human capital, defined as the number of people employed in research and development relative to the total labour force, is a good explanation for the level of venture capital i.e. the higher the percentage of the workforce that works in research and development, the more often they innovate.

3.1.3 Reflexivity and action patterns (Informal/direct)

This section deals with the same agents as the first, but the starting point here is the relational network. The informal character of the factors constituting this quadrant has proven to influence innovation to a great length. While these factors often are not bound within any formal organization, they frequently are the sources of both strategic and operational success. Studies (e.g. analysing collaborative arrangements between universities and industry) are increasingly pointing towards the importance of informal networks. (Powell, 1996; Jones et. al, 1997, Lundvall, 1992)

The most indicative examples of informal networks are the networks of individuals – constituted by former fellow students, colleagues etc. Moreover many organizations have placed themselves in networks of informal character. Networks of this kind first and foremost exist because they bring people together and because there's a need for continuous cultivation of ones network (Pyka, 1997).

3.1.4 Values and attitudes (Informal/indirect)

This section comprises a sub layer of historical and cultural features that primarily show themselves as attitudes and behavioural patterns in society – entrepreneurial culture (Hornsby, Kuratko & Zahra, 2002). The layer can be characterized as the innovation culture from which entrepreneurial behaviour, risk-willingness, adaption of new technologies and general social attitude towards the system as a whole emerges (Kuratko, Hornsby, Naffziger & Montagno, 1993).

These factors influence the behaviour on markets, strategic decisions and political processes, thus indirectly influencing the innovation processes.

4 DISCUSSION

Four different positions are revealed in the previous figure and indicate that there are both institutional and organization overlaps between the quadrants. At this point it is important to emphasise that one quadrant in the taxonomy is not better than the other, but each quadrant carries specific benefits depending on the task at hand. It will however be argued that in order use and exploit the potentials of venture capitalists in the innovation system the best foundation will be a formal direct position. From this position venture capitalists will have a better starting point for influencing the agendas in the other quadrants and contribute to the overall performance of the system.

During the innovation process, it is important that venture capitalists recognise and finance commercially viable opportunities (Stasch, 1994). They represent a vital actor subset for the innovation system to perform. As consequence of separation of markets venture capitalists however often take an informal and indirect part in early phase of innovations even though studies indicate that direct and formal involvement host potential value for the venture capitalists (Husted & Vintergaard, forthcoming).

Venture capitalists are highly dependent on accessing new unique ventures, which can provide them significant return – the “raw material” in their business model. In addition it is argued that one of the most significant impediments for many companies is too few mainstream ideas (Block & MacMillan, 1993; Tidd et al., 2001) If venture capitalists haven't got access to a sufficient number of unique ideas, the venture unit will not be able to create a sufficient number of profitable ventures and will eventually cease (Block & MacMillan, 1993:94). Etzkowitz et. al (2001) stresses that also in relation to commercialisation of university science this largely depends on a marriage between venture capital and university scientists. Such involvement will also benefit the innovation system by providing better exploitation of the capabilities and resources which venture capitalists possesses i.e. increase the level of innovation.

It is argued in this article that through a more formal and direct role in the innovation system, venture capitalists will surpass the position as intermediaries and will gain access to a larger stream of ideas. Obtaining this position is however only achieved through collective means. Venture capitalists have to learn to become more proactive and direct partners in the process of innovation while also ensuring a more formal position. *Pari passu*, it is also important that other actors and the policy system support this process. Only through a collective effort will the system harvest from a new actor group in the system.

Even though reconfiguration of the venture capitalist in the innovation taxonomy model has appealing outputs there are strong demands on the venture capitalist as a specific group of actors and on the rest of the actors in the system. In order for venture capitalists to achieve the possible benefits of innovation and achieve a direct and formal position in the system several actions can be proposed:

Dynamic participation. The first initial consideration is to establish concrete actions in order to achieve a fruitful position in the innovation system. In order for this to manifest

itself proactive initiatives need to be taken from the collective of venture capitalists. Simultaneous efforts from other actors of the "primary innovation network" to include and use venture capitalist in their innovative actions should happen. The reason to take active part in the system as such is naturally twofold: 1) for venture capitalists to gain access to and benefit from innovations (Vintergaard & Husted, forthcoming) and 2) in order to facilitate the system as such. As earlier illustrated, indicators have shown that active involvement in the process leads to a potential higher profit. Simultaneous direct and formal participation will also enhance the facilitation of the other parts of the system of innovation. As illustrated in the relation of demand a supply, it is often taken for granted that innovations and thereby entrepreneurs automatically generate venture ideas and that no initiatives are necessary to facilitate them. The type of actions that can be proposed could be to accommodate stronger ties between venture capitalists, universities, government and other parts of the "primary innovation network".

Setting agendas. In order to achieve a formal position in the innovation system an important element is to take part in influencing agendas (political and institutional) in the formal and informal networks that constitute the relations between different components in the innovation system. Doing this will enhance the position and resource allocation and focus will shift the desired direction. In order to achieve such a position, the venture capital actors must nevertheless learn where and how to position themselves in such a structure. Huxham and Vangen (2000) argue that: "*Structures thus play an important leadership role because they determine such key factors as: who has an influence on shaping a partnership agenda, which has power to act, and what resources are tapped.*" They further argue that when the structure of collaboration is part of a system of multiple overlapping partnerships, the influence on the agenda may be even more significant (Huxham & Vangen, 2000). By taking active part in influencing the agendas in the network, corporations will also have a greater chance of gaining a central position in the network.

Reconfigure the innovation network. Knowledge on how to position oneself, influence the common agenda and to actively interact in the innovation system is essential. Given proactive presence in the network, one quite evidently becomes more interesting as a collaborative partner (Powell et. al, 1996, Cross et. al, 2002). In general it is often important to understand the extent to which the network as a whole is reliant on one both as individual and as group. Understanding how ones enactment might impact connectivity and information flow is critical to ensuring network resiliency. The network relations discussed above of course applies within the systems of innovation. As argued by Seufert et. al 1999: "*the locus of innovation should be thought of as a network of inter-organizational relations*"[p.181]. In relation to the presence in the system of innovation he further argues that successful organizations position themselves at the hubs in the centre of overlapping networks stimulating rewarding research collaborations among the various actors.

A direct position in the system cannot be based purely on facilitating the system. A central task for the primary innovation network is learning how to interact and create networks in

order to be able to manage their position in the innovation system (Powell et. al, 1996). Seufert, Krogh and Bach (1999) argue that individuals in an organization should be able to recognize personally relevant knowledge within the organization, which can be exploited. The ability to create and participate in a network and to contextualize one's knowledge (Gibbons et. al, 2001) has to be seen as something that can be learned, but also something that often depends on personal traits.

Have something to offer and can absorb. Following the above argumentation the actors in the primary innovation network need to engage in network formation, and also have something to offer in terms of their own level of knowledge production, reputation etc. Venture capitalists will not become part of a value-creating innovation system unless they can contribute with something that is not already present in the network. However other actors in the systems also need to learn how to make use of the resources and capabilities which venture capitalists possess. Powell et al. (1996) argue that a partnering decision depends on each partner's size and position in the "value-chain" and the level of technological sophistication. They further argue that to remain current in a rapidly moving field an organization must be involved in the research process. Passive recipients of new knowledge are less likely to appreciate or be able to respond rapidly. In industries where knowledge is crucial, companies must be experts in both in-house research and in cooperative research with external partners, such as university scientists, research organizations, and skilled competitors.

4.1 CONCLUSION

Following the reasoning above venture capitalists, presently informal entities in the system, need to become a formal and direct part of the industry – a shift demanding collective effort. Eventually they will follow temporary trajectories into the formal and direct sphere and gain advantage of the move. The shift is not to be seen as binding the venture capitalists to a distinct area or place within the primary innovation network or the background innovation facilitation – yet it constitutes a shift in self-perception and the degree and type of interaction with other key innovation actors.

Conclusively, it is important to note, that what the venture capitalists are actually feeding on is the formality, or rather the rigidity of institutions affecting the other primary network actors. Values and attitudes are namely holding the formal actors in rigid positions, eventually preventing i.e. banks and credit institutions from providing the innovation system with services comparable to those delivered by venture capitalists. So the event of combining a formalized and direct involvement in innovation while at the same influencing the formation of norms and values as well as becoming present in network relations e.g. brokering in university-industry relations is important.

5 REFERENCES

- Amit, Raphael, Lawrence Glosten, and Eitan Muller, 1990. "Entrepreneurial Ability, Venture Investments, and Risk Sharing." *Management Science* 36:1232–1245.
- Arrow, K., 1974. "General Economic Equilibrium: Purpose, Analytic Techniques, Collective Choice" *American Economic Review*; V.64-#3, pp. 253-272.
- Balboa, Marina, and Marti, Jose, 2000. Determinants of Private Equity Fundraising in Western Europe. Working paper, January, Spain.
- Berlin, M., 1998. That thing venture capitalists do. *Business Review*. Philadelphia, PA: Federal Reserve Bank of Philadelphia
- Black, S. & Gilson, R., 1998. "Venture capital and the structure of capital markets: banks versus stock markets", *Journal of Financial Economics*, 47, s. 234–277.
- Block, Z. & MacMillan, I. C., 1993. *Corporate Venturing – Creating New Businesses within the Firm*. Cambridge, MA: Harvard Business School Press.
- Burgelman, R., 1983. Corporate entrepreneurship and strategic management: Insights from a process study. *Management Science*, 29, 1349-1364.
- Burgelman, R. A., 1985. Managing the new venture division: Research findings and implications for strategic management. *Strategic Management Journal*, 6(1): 39-54.
- Bygrave, William D. and Timmons, Jeffrey A., 1992. *Venture Capital at the Crossroads*. Boston: Harvard Business School Press.
- Callahan, John and Muegge, Steven, 2003. "Venture Capital's Role in Innovation: Issues, Research and Stakeholder Interests", , in L.V. Shavinina, editor, *The International Handbook on Innovation*, Elsevier Science.
- Carlsson, Bo, Jacobsson, S., Holmén, M., and Rickne, A., 2002. Innovation systems: Analytical and methodological issues. *Research Policy* 31:233-245.
- Christensen, Jesper L., 1998. Private investorers bidrag til innovation. Ervervs Udviklings Rådet. DISKO-projectet.
- Christensen, Jesper L., 2000. Effekter af venturekapital på innovation og vækst. Erhvervsministeriet.
- Chung, S., 2002. Building a national innovation system through regional innovation systems. *Technovation* 22:485-491.
- Cross, Rob, Prusak, Laurance and Parker, Andrew, 2002. Where Work Happens: The Care and Feeding of Informal Networks in Organizations", *Institute for knowledge-based organizations*, IBM
- Dahl, M.S and Pedersen, C., 2002. Informal Networks in a Dynamic Regional Cluster.
- Dobbin, F.R. and Dowd, T., 1997. How policy shapes competition: early railroad foundings in Massachusetts. *Administrative Science Quarterly*. 42:501-29.
- Edquist C., 1997. Systems of innovation approaches - their emergence and characteristics in Edquist, C. (ed.) (1997) *Systems of Innovation: Technologies, Institutions and Organizations*, London: Pinter/Cassell .
- Edquist, C. (ed.), 1997. *Systems of Innovation: Technologies, Institutions and Organizations*, London: Pinter/Cassell.

- Edquist, C. and Johnson, B., 1997. Institutions and organisations in systems of innovation, in C. Edquist (ed.) *Systems of Innovation: Technologies, Institutions and Organizations*. London and Washington: Pinter/Cassell Academic.
- Edquist, C. and McKelvey, M. (Eds.), 2000 *Systems of Innovation: Growth, Competitiveness and Employment*. An Elgar Reference Collection (two volumes), Cheltenham: Edward Elgar.
- Etzkowitz, H. and Leydesdorff, L., 1996. Emergence of a Triple Helix of University-Industry-Government Relations. *Science and Public Policy* 23:279-286.
- Etzkowitz, Henry, Gulbrandsen, M., and Levitt, J., 2001 *Public Venture Capital: Sources of Government Funding for Technology Entrepreneurs*. New York: Aspen/Kluwer.
- Evans, D. & Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy*, 97(4): 808-827.
- Fenn, G. W., N. Liang., 1998. New resources and new ideas: Private equity for small businesses. *Journal of Banking and Finance*, 22, 1077-1084.
- Freemann, John, 1999. Venture Capital as an Economy of Time. In *Corporate Social Capital and Liability*. Edited by Roger Th. A.J. Leenders and Shaul M. Gabbay
- Gibbons et. al, 1994. *The new production of knowledge - the dynamics of science and research in contemporary societies*, SAGE Publications.
- Ginsberg, A. and Hay, M., 1994. Confronting the Challenges of Corporate Entrepreneurship: Guidelines for Venture Mangers. *European Management Journal*, 12: 382 – 389.
- Gompers, P. A. & Lerner, J., 1999. *The Venture Capital Cycle*. Cambridge, Massachusetts: MIT Press.
- Griliches, Z., 1992. The search for R&D spillovers. *Scandinavian Journal of Economics*, 94, Supplement, 29-47.
- Hellmann, Thomas & Puri, Manju, 2000. The Interaction between Product Market and Financing Strategy: The Role of Venture Capital". *Review of Financial Studies* (web site) 2000 13 (4)
- Hellmann, Thomas, 1997. Venture Capital: A Challenge for Commercial Banks. *Journal of Private Equity* 1(1): 49-55.
- Husted, Kenneth & Vintergaard, Christian (forthcoming) 2004. Stimulating innovation through corporate venture bases". Forthcoming in *Journal of World Business* - for publication in Volume 39, Number 3.
- Jaffe, A. B., 1996. *Economic Analysis of Research Spillovers: Implications for the Advanced Technology Program*. Washington, D.C.: U.S. Department of Commerce, National Institute of Standards and Technology, Advanced Technology Program.
- Jeng, L and P. Wells, 2000. The Determinants of Venture Capital funding: evidence across countries", *Journal of Corporate Finance*, 6: 248-289
- Kenney, Martin and Richard Florida, 2000 *Venture Capital in Silicon Valley: Fuelling New Firm Formation in Martin Kenney, ed., Understanding Silicon Valley: Anatomy of an Entrepreneurial Region* (Stanford: Stanford University Press)
- King, R.G. and Levine, 1993. Finance and Growth: Schumpeter might be right. *Quarterly Journal of Economics* vol. 108, pp.717-737.

- Kortum, Samuel and Lerner, Josh, 2000. Assessing the Contribution of Venture Capital to Innovation” *RAND Journal of Economics*, vol. 31, issue 4, pages 674-692
- Lundvall, B-Å. (1992) (ed.). *National Systems of Innovation: Towards a Theory of Innovation and Interactive learning*, London: Pinter.
- Lundvall, B-Å, 2000. Innovation policy and knowledge management in the learning economy – the interplay between firm strategies and national systems of competence building and innovation, Mimeo, Department of Business Studies, Aalborg University.
- Lundvall, B-Å Johnson B. and et.al, 2002. National systems of production, innovation and competence building. *Research Policy* 31:213-231.
- Mason, C.M. and R.T. Harrison, 1992. Strategies for Expanding the Informal Venture Capital Market, *International Small Business Journal* 11(4), 23-38
- Nelson, R., 1993. *National innovation systems - a comparative analysis*, Oxford University Press, New York.
- Nowotny, H. et. al, 2001. *Re-Thinking Science – Knowledge and the public in an age of uncertainty*. Blackwell Publishers Inc.
- Oughton, C., Landabaso M., and Morgan, K., 2001. The Regional Innovation Paradox: Innovation Policy and Industrial Policy. *Journal of Technology Transfer* 27.
- Powell, W., Koput, K. and Smith-Doerr, L., 1996. Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. *Administrative Science Quarterly* 41:116-145, 1996.
- Saxenian, AnnaLee, 1994. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Harvard University Press.
- Sarasvathy, Dew, Velamuri and Venkatarman, 2003. Three Views of Entrepreneurial Opportunity” in *Handbook of Entrepreneurship Research: An Interdisciplinary*. by Zoltan J. Acs, David B. Audretsch (Editor).
- Schertler, Andrea, 2002 Under What Conditions Do Venture Capital Markets Emerge? Kiel Institute for World Economics. Kiel Working Paper 1119.
- Schoser, C., 1999. The Institutions defining national systems of innovation: a new taxonomy to analyse the impact of globalisation. Freiburg: Instituts fur Allgemeine Wirtschaftsforschung, Universitat Freiburg im Breisgau, (Instituts fur Allgemeine Wirtschaftsforschung Discussion Papers; No 20)
- Seufert, Andrea, Bach, Andrea, and Von Krogh, Georg, 1999. Towards knowledge networking. *Journal of knowledge management*. Vol. 3. pp. 180-1090. MCB University Press.
- Shane, Scott, 1996. Hybrid Organizational Arrangements and theirs Implications for Firm Growth and Survival: A Study of New Franchisers, *Academy of Management Journal*, 39, 1, 216-234
- Stasch, F. Stanley, 1994. Evaluating New Venture Ideas: Considerations from the New Product Development Process. In *Marketing and Entrepreneurship Research Ideas and Opportunities* Edited by Gerald E. Hills. Quorum Books. Westport, Conn.
- Vækstfonden, 2003. Det danske marked for venturekapital og private equity. Vækstfonden.
- Thornton, H. Patricia, 1999). *The Sociology of Eentreprenurship*, *Annual Review of Sociology*, Vol. 25, pp. 19-46.

Waldstrøm, C., 2001. Informal Networks in Organizations - A literature review. DDL Working Paper No. 2, Aarhus Business School

White, H. C., 1981. Where do markets come from?', American Journal of Sociology 87: 517-47.

Wholey, D. R., Christianson, J. B., and Sanchez, S., 1993. Professional reorganization: The effect of physician and corporate interests on the formation of health maintenance organizations. American Journal of Sociology 99:175-211.

Van Kersbergen, K. and F. van Waarden, 2001. Shifts in Governance: Problems of Legitimacy and Accountability. The Hague: Social Science Research Council.