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SOWING SEEDS FOR INNOVATION
THE IMPACT OF SOCIAL CAPITAL IN REGIONAL STRATEGIC NETWORKS

Jens Eklinder-Frick

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School of Business, Society and Engineering

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Jens Eklinder-Frick

Akademisk avhandling

som för avläggande av ekonomie doktorsexamen i industriell ekonomi och organisation vid Akademin för ekonomi, samhälle och teknik kommer att offentligen försvaras onsdagen den 23 april 2014, 13.15 i Pi, Mälardalens högskola, Västerås.

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Akademin för ekonomi, samhälle och teknik

Abstract

In order to promote regional innovation and stronger social coherence the European Union has set goals to become the world's most competitive, dynamic, and knowledge-based economy. These ambitious goals are supported by funds allocated to regional strategic networks (also called cluster initiatives). Usually, the management of regional strategic networks is left to the discretion of the project leaders. However, the industry agglomeration model which constitutes the foundation for regional development policies fails to consider the social context. It also overemphasizes the relevance of a linear approach towards innovation which is problematic, as this fails to consider the conditions for implementation in different contexts.

This thesis builds upon data from two case studies of regional strategic networks (Firsam at Söderhamn and FPX at Gävle) and serves to describe (1) how the management group of an RSN creates the prerequisite for an innovative milieu by analyzing the effects that social capital imposes on social interaction, and (2) how a policy initiated innovation process is supported by an RSN management group by analyzing resource interaction between the developing, producing and using settings.

As a conclusion it is stated that a manager of a regional strategic network should balance the bridging and bonding forces that social capital produces. Under some circumstances it might be advantageous to form tightly knit groups that can foster trust and cultural proximity. In other cases loosely knit groups might be preferable where novel information is exchanged between previously unconnected actors. Also, the innovation construct is applied in the thesis to denote the process where resources are combined in new ways within existing structures to offer new solutions in the market. The manager of a regional strategic network must consider not only the setting in which an invention is developed but also the settings where new solutions are converted into products and those where they are brought to use.

The performance of the investigated development initiatives indicates that merely funding regional strategic networks is insufficient to spur regional growth. It is not as easy as merely sowing seed for innovation; it must also fall on good soil.

Sowing Seeds for Innovation

The Impact of Social Capital in
Regional Strategic Networks

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Sammandrag

För att främja regionalt förankrad innovation och social utveckling har Europeiska unionen ambitionen att bli världens mest konkurrenskraftiga, dynamiska och kunskapsbaserade ekonomi. Dessa ambitiösa mål understöds av att medel satsas i regionala strategiska nätverk (RSN) (även kallade klusterinitiativ). Utformningen av strategi och styrning av de regionala strategiska nätverken överlämnas vanligen i hög utsträckning till dessas projektledare. Branschagglomerationsmodellen som utgör basen för den regionala utvecklingspolicyn tar inte tillräcklig hänsyn till den lokala kontexten. Dessutom tenderar den att utgå från en syn på innovation som en linjär process, vilket är problematiskt då hänsyn inte tas till villkoren för implementering i olika kontexter.

Denna avhandling bygger på studier av två olika RSN (Firsam i Söderhamn och FPX i Gävle) och beskriver 1) hur projektledarna för ett RSN skapar förutsättningar för en innovativ miljö genom analys av socialt kapitals påverkan på den sociala interaktionen, och 2) hur en politiskt initierad innovationsprocess understöds av projektledarna för ett RSN genom analys av resursinteraktionen mellan utvecklings-, produktions- och användarkontexten.

Projektledaren för ett regionalt strategiskt nätverk bör hitta en balans mellan de sammanbindande och överbryggande effekter som socialt kapital ger upphov till. Under vissa förutsättningar kan det vara fördelaktigt med tätt sammansvetsade grupper där förtroende byggt på kulturell närhet frodas. I andra fall är löst sammansatta grupper att föredra där ny information utväxlas i mötet mellan aktörer som inte har likartad bakgrund och tidigare kännedom om varandra. I denna avhandling ses innovationsprocessen som kontextberoende eftersom den bygger på hur specifika aktörers resurser kombineras. Projektledaren i ett regionalt strategiskt nätverk behöver därför inte bara hantera den kontext där nya lösningar utvecklas genom nya resurskombinationer utan även de kontexter där nya lösningar omvandlas till produkter och där de tas i bruk.

Nätverkens strategi bör därmed vara utformad med hänsyn till den regionala kontexten och inte minst till egenskaperna hos det sociala kapitalet. Det räcker inte bara så utsäde för innovation; det måste också hamna i god jord.



This thesis is included in a joint project involving



with financial support from



Preface

In January 2010 I moved from southern Sweden to Gävle to start my doctoral studies. Before that I had very rarely been north of Stockholm, and although the cultural differences are not that large I had to get used to a new living context at the same time as I started the challenging journey of entering academia. Being new to the region in which I was supposed to conduct my studies and collect data was challenging but also advantageous. Having the pretext of being the outsider enabled me to ask the naïve questions needed to expose underlying social structures that are often taken for granted. Also, since I was not part of the social structures I wished to examine I could use the fresh eyes of the outsider to see the socio-economic climate in a less biased and more objective manner.

The initial funding for my doctoral studies was provided by the SLIM project (Systems Leadership within Innovative environments and cluster processes in northern Mid-Sweden). SLIM was an “umbrella” organization that united the forces of cluster initiatives and regional strategic networks within the Swedish regions of Dalarna, Gävleborg and Värmland. The project was funded in accordance with the EU Development Fund for Regional Growth, which is the same funding body that promotes the cluster initiatives or regional strategic networks which was the object that I wanted to study. Being funded by a project related to the object I wished to examine gave me insight into the organizational goings-on within such projects, and provided me with access to relevant case studies. I also had the opportunity to attend meetings and conferences where the managers of the involved regional strategic networks discussed their concerns. These meetings enabled me to form an understanding of the challenges that concerned the cluster managers as well as the system set in place to fund their endeavors. This new world was sometimes complex and confusing, but always interesting and introduced me to the individuals in charge of balancing the interests of policy institutions and the business world. The challenge in merging policy, business and academia was made apparent to me, as I myself became a participant in its practice. This aided me in the writing of this thesis and in understanding the empirical complexities.

Besides finding my way into the arena of publicly funded regional growth projects, like every doctoral student I have ventured into the academic world.

I was admitted as a doctoral student at Mälardalen University but was employed by Gävle University in 2010, and after I completed my licentiate thesis in 2011 Gävle University became a joint funder of my research project together with SLIM. At Gävle University I got the opportunity to become involved in teaching and its subsequent challenges. However, as I was also enrolled as a doctoral student at Mälardalen University in Västerås, I got the chance to present my texts and receive feedback from researchers there within my field of interest.

I took most of my doctoral courses at Uppsala University through the Swedish national research school MIT (Management and IT). This offered opportunities to network with doctoral students from other institutions and to discuss experiences of research. Moving between Gävle, Västerås and Uppsala meant that I spent a lot of time travelling, but it surely had its advantages as it gave me a wider network of professional contacts and offered insights from several academic institutions.

In addition to travelling between universities in Sweden I visited the annual IMP conference once every year since 2010. This conference series focuses on business-to-business marketing, with a special interest in network research, and has therefore given me opportunities to interact with researchers in the international research community. It aided me in targeting appropriate journals and subsequently getting my work published.

I started my research journey by following up on data collected by Patrik Söderhielm and my supervisor Lars Torsten Eriksson. This enabled me to quickly choose a case study and to start the collection of my data early in my PhD process. My first case study involved the regional strategic network of Firsam situated in the municipality of Söderhamn (26,000 inhabitants). Söderhamn is a traditional industrial community (*bruksort* in Swedish) in the Gävleborg region and is founded on forestry commerce and therefore holds a very distinct regional socio-economic culture. This type of region was initially foreign to me since southern Sweden has different traits in several respects due to another industrial past. After some investigation into Söderhamn's history and cultural traits I began to understand the local setting better. The regional business climate is described in this thesis, and my gradual understanding of the Söderhamn region has been an interesting journey.

The Firsam case was analyzed using the concept of social capital and presented in my licentiate thesis in 2011. The licentiate thesis (paper I) is included in this doctoral thesis with some minor editorial adjustments. After the licentiate thesis was presented I continued my research process by analyzing the collected data using firstly different perspectives on networks that

can be tied to varying forms of proximity (paper II), and secondly three separate, but interacting, dimensions of the social capital concept (paper III).

Since papers I-III focus on the innovative milieu that the Firsam network created I thought it would be advantageous to investigate the process of innovation and the role that a regional strategic network plays in such endeavors. After all, creating innovation by bringing together the academic, the public and the business world can be described as the goal of regional strategic networks. Since Firsam did not initiate concrete innovation processes, another case study was needed.

The regional strategic network Future Position X (FPX), situated in Gävle, provided the opportunity to study an innovation process where academic, public and business actors had contributed. Gävle is the largest municipality (97,000 inhabitants) in the Gävleborg region and differs from Söderhamn in many respects. Gävle is a bigger town and has come further in restructuring the traditional manufacturing industry towards including service and knowledge intensive activities. Still, Gävle resembles the rest of the Gävleborg region in its reliance on traditional industry and a lower share of higher education among its inhabitants than other Swedish regions. This sets the scene for FPX, and its focus on the IT industry was seen as a needed contribution towards the development of Gävle's business climate. I soon realized that FPX was relying on a tradition of regional industries connected to geographical information system (GIS), and although FPX's projects were international it was easy for FPX to justify its operations regionally. The goal of turning Gävle into a European capital for GIS technology seemed to attract a lot of regional support, although a region with the socio-economic history of Gävle does not embrace such ambitious goals easily.

The studied innovation process connected to the FPX regional strategic network was analyzed using a theoretical framework based upon the inter-organizational network approach. The findings are presented in paper IV of this thesis and offer both theoretical and managerial conclusions regarding managing a policy initiated innovation process.

After the four papers included in this thesis were written I started to compose the cover paper to complete the thesis. The cover paper focuses on problematizing the adoption of the cluster model into economic policy and the use of the innovation concept in economic growth research. This serves to put my findings into a broader perspective and offers managerial conclusions towards a field that has traditionally focused on high order constructs such as viewing social capital as a regional trait and considering innovation to be a result of knowledge spillover and R&D investments. I conclude the thesis by offering some final thoughts on innovation and by comparing the two stud-

ied cases to each other. All in all I hope that this thesis will offer insights to both policy makers and managers of regional strategic networks on how investments in regional economic growth can be effectively managed and how regional strategic networks can be used as tools in such endeavors.

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Special thanks go to Patrik Söderhielm who contributed significantly to this thesis by gathering data at the beginning of the project. Thanks are also due to Ann-Sofie Gustafsson and Mats Jonsson from CFL (Centrum för flexibelt lärande) in Söderhamn for their valuable help with the transcription of data.

My research has been supported by the SLIM project (Systems Leadership within Innovative environments and cluster processes in northern Mid-Sweden), a project financed by the European Regional Development Fund (ERDF) and its programme for North Mid-Sweden, Gävle University, Karlstad University, the research school Management and IT (MIT), and Vinnova, which I hereby gratefully acknowledge. I would especially like to thank Staffan Bjurulf, Magnus Ernström, Gunnel Kardemark, Olle Wängsäter and Mats Williams and the other doctoral students within the SLIM project, Anna Emmoth and Line Säll, and their supervisors for sharing their valuable insights during our meetings.

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The last acknowledgement I have saved for my caring family, Elisabet, Göran, Anders and Marianne.

Gävle and Västerås in March 2014

A handwritten signature in blue ink, appearing to read 'Jens Frick', with a stylized flourish at the end.

Jens Eklinder Frick

List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

Eklinder-Frick, J. (2014) Sowing Seeds for Innovation. Summary of the thesis.

- I. Eklinder-Frick, J. (2011). *Building Bridges and Breaking Bonds. Aspects of social capital in regional strategic networks*. Västerås: Mälardalen University (licentiate thesis).
- II. Eklinder-Frick, J., Eriksson, L, T. & Hallén, L. (2011). Bridging and Bonding Forms of Social Capital in a Regional Strategic Network. *Industrial Marketing Management*, 40(6): 994-1003.
- III. Eklinder-Frick, J., Eriksson, L, T. & Hallén, L. (2014). Multi-dimensional Social Capital as a Boost or a Bar to Innovativeness. *Industrial Marketing Management*, 43(3): in press.
- IV. Eklinder-Frick, J. (2014). Development, Production and Use in Policy Initiated Innovation. Revised submission to *Journal of Business and Industrial Marketing*.

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Sowing Seeds for Innovation

Summary of the Thesis

Jens Eklinder-Frick

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1. Introduction

1.1 Overview

In order to create better-qualified jobs and stronger social coherence the European Union has set goals to become the world's most competitive, dynamic, and knowledge-based economy. These ambitious goals are reinforced by a strategy of creating a 'Europe of regions', which entails financial support to make business in specific industries agglomerate in certain regions. The general idea is that business actors in geographical and industrially defined agglomerations benefit from an increase of industry specific knowledge in the region. Moreover, the geographical proximity is assumed to enable some joint use of resources between firms. These ambitions are reflected in the allocation of public funding to cluster initiatives or regional strategic networks (RSNs) whose set goals are to bring together actors of a regionally dominant industry with regional academic institutions and policy makers. Their collaboration is supposed to create a beneficial milieu in which knowledge and other resources can be exchanged in order to promote innovation and regional economic growth.

Although this strategy may seem sound it has received a lot of criticism, which justifies further investigation into its merits. Undoubtedly, some regions with industry agglomerations have experienced elevated economic growth. This has received much attention in academia. Attempts to explain the formation and advantages of regional industry agglomerations are summarized as the cluster model, which stresses knowledge spillovers between regional companies with similar or complementary specialized skills, and increased regional competition spurring innovation leading to further regional resource agglomeration (Porter, 1990).

This model, however, was never meant as a recipe for realizing such advantages or building clusters elsewhere. The translation of the cluster model from a descriptive and explicative tool into a normative formula has distorted its original message. The application of this model cemented the notion that supporting interaction between actors within similar industries through the funding of RSNs would by itself create regional growth. How such collaborative ventures should or could be managed has been left to the discre-

tion of the individuals in charge of designing these regional projects. As advanced in the present thesis, applying the cluster model as policy without any further strategic guidelines fails to consider the social context and also overemphasizes the relevance of a linear approach towards innovation.

In the licentiate thesis (paper I) and in the two following articles (papers II and III) in this doctoral thesis I use the concept of social capital to capture the social context in which the studied RSNs are designed. The last paper (paper IV) of the thesis problematizes the innovation construct by posing that innovation is a result of the combinatory power of existing resources within the market. Hence, since innovation entails the process of combining resources at the disposal of specific interacting actors, it is seen as highly context specific.

This approach offers both managerial and theoretical conclusions regarding RSNs. From a managerial point of view this supports managers, firstly in creating a milieu that is conducive to innovative behavior, and secondly it offers insight into how to guide a policy initiated innovation process into achieving context specific adoption of inventions. I claim that merely investing money in the formation of RSNs is not enough to spur regional growth; the strategy of the networks must be formed from context specific considerations. It is not as easy as merely sowing the seed; it must also fall into good soil.

In addition to this cover paper, this doctoral thesis includes my licentiate thesis (paper I) and three additional papers (papers II-IV). In the cover paper I introduce the concepts used in the thesis, the methods and methodological concerns of my research, and I summarize the overall findings of my research. The licentiate thesis and papers II and III are based upon the theoretical concept of social capital and investigate how a manager of an RSN can create the prerequisites for an innovative milieu. The empirical foundation for the analysis of the role of social capital concept is a single case study. Managerial and theoretical conclusions are drawn. Paper IV goes beyond investigating how an innovative milieu is formed by analyzing how the management of an RSN can facilitate a policy initiated innovation process. The social conduits of interaction are less in focus as the interaction between the various resources that constitute technological innovation is investigated. Paper IV is based upon a different case study, rests upon the inter-organizational network approach and views innovation as the process of resource interaction involving several actors, which goes beyond the linear approach towards innovation that is often applied in studies of regional innovation policy.

1.2 Clusters and economic policy for regional growth

The starting point of the adoption of cluster concepts in regional development policy is often considered to be its use in the Maastricht Treaty of 1991 and the establishment of the Committee of Regions. This subsequently gave birth to the notion of what is often referred to as a 'Europe of regions' which can be considered as the starting point for the rise of regional administrative structures, partnerships, and post-national planning actions (Andresen, 2011; Veggeland, 2000). Consequently, changes in Swedish regional policy can be considered as following in the wake of the 'Europe of regions' or 'the new regionalism' (Säll, 2011). As a telling example of this tendency, Säll (2011) quotes Lovering (1999) who claims that '[t]he new regionalism has the big battalions on its side. National, transnational, regional and local authorities, academics, consultants and journalists are devoting enormous efforts to convincing their audience of the New Regionalist picture of the world'.

This tendency to adopt the new regionalism approach spurred the European developmental initiative, which was formed in the late 1990s. Andresen (2011) describes the bottom line of the European developmental initiative as offering support to and thereby realizing competitive regions and economic growth by means of business and product development. This would include the public sector, since its role would be to form strong regional administrative structures for economic purposes. This policy would be based upon clear guidelines for setting up competitive advantages while still refraining from imposing excessively rigid governance structures (Veggeland, 2004). The policy development was based upon the Lisbon Strategy (2000–2010) and its ambitious goal to make the EU the world's most competitive, dynamic, and knowledge-based economy, capable of maintaining sustainable economic growth as well as offering more and better-qualified jobs and stronger social coherence.

Following the ideas of the Lisbon Strategy the 'development of national priorities for regional competitiveness, entrepreneurship, and employment' (2007–2013) was formed, focusing on innovation and renewal, skills and improved workforce supply, accessibility, and strategic cross-border cooperation between the member states in the European Union. This national strategy was in turn linked to regional structural funds as well as to the regional development strategies and regional growth programmes (Näringsdepartementet, 2007:5). According to Andresen (2011) 'the regional development funds (also called the Structural Funds) are considered among the most important EU instruments for implementing the cohesion policy'.

The notion of building regions that compete based upon business agglomeration consequently trickled down from the Lisbon Strategy (on the EU level)

to the ‘development of national priorities for regional competitiveness, entrepreneurship, and employment’ (forming principles for a national strategy) and ended up forming the regional development funds (imposed on a regional level).

The notion of working with ‘regions’ was imposed on the national development policy of Sweden through a top-down approach. During the period 2007–2013, more than 8 billion Swedish crowns (approximately €0.9 billion) in EU funding were channeled through the eight regional structural fund programmes and distributed to regional development projects in Sweden (Andresen, 2011; Tillväxtverket, 2010). Encouraging the development of business agglomerations is thus the European Union’s strategy of choice when supporting regional innovation capability.

According to Säll (2011) the term ‘cluster’ was introduced into Swedish regional policy through the government bill ‘Regional tillväxt för arbete och välfärd’ (Proposition, 1997:62). The cluster terminology has since become very influential in Swedish policy concerning regional growth and innovation. However, this tendency is not exclusive to Sweden. All countries in the European Union have adopted the notion of clusters as a systems concept for establishing regional business agglomerations and innovation systems (Henning, Moodysson & Nilsson, 2010; Säll, 2011; Sölvell, 2009).

According to Säll (2011), the definition of clusters that is adhered to in this policy is found in the Commission’s ‘Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy’ (Commission of the European communities, 2008). This policy report states that ‘a cluster can be broadly defined as a group of firms, related economic actors, and institutions that are located near each other and have reached a sufficient scale to develop specialized expertise, services, resources, suppliers and skills. Cluster policies are designed and implemented at local, regional and national level, depending on their scope and ambition’.

1.3 Problematizing the cluster concept in regional development

Smout (1998) states that the top-down aspect of regionalization within industrialization policy only works if it is understood by actors at the bottom level such as entrepreneurs, tradesmen, workmen and consumers. Hence, critics of top-down, massive, and concentrated industrialization policies claim that such development requires skills rather than resources (Andresen, 2011; Gavlan, 2007). Sotarauta (2010:387) similarly claims that ‘people

responsible for regional development often understand fairly well the need to construct regional advantage and build clusters' and 'what they have not been given much advice on, is how to do it'. Steiner (1997:17) even posits that the term cluster has 'the discrete charm of hard-to-define objects of desire'. This suggests that the term has become a buzzword that at times may be used by policy makers without having to formulate further strategies around its implementation.

Taylor (2010) has voiced one of the strongest criticisms against the adoption of the cluster concept in regional policy. According to Taylor (2010) this use began with Porter's (1998; 1990) cluster concept and then added other cluster related concepts such as 'industrial districts', 'agglomeration', 'innovative milieus', 'regional innovation systems', 'learning regions', and 'learning firms'. For a further critique of these sets of ideas Taylor (2010) suggests Benneworth & Henry, 2004; Gordon & McCann, 2000; Lagendijk & Cornford, 2000; Tappi, 2005; Taylor & Leonard, 2002.

The eclectic cluster model and the various processes it embraces has been viewed through several different theoretical lenses and applied in many contexts including business consultancy, public policy arenas from the international scale to regional policy, industry policy and innovation networks in support of SMEs (Benneworth & Henry, 2004; Taylor, 2010). When the cluster concept is applied in political and policy-making arenas however, Taylor (2010) claims that its meaning and usefulness become distorted. Taylor (2010) argues that 'not only are the identified processes removed from their place-specific and time-specific context, but now the outcome becomes the goal. At the same time, the agents are no longer economic actors, but politicians and bureaucrats and, as Lagendijk (2001) emphasizes, they may not even be local to the region'.

In this way the limitations and inherent weakness of the theoretical elements of the cluster model gets amplified as the model becomes a recipe for creating economic growth, not just an analytical model for explaining such success in hindsight (Taylor, 2010). The cluster model was thus never meant as a normative recipe for regional growth and Taylor (2010) argues that 'the model [...] became a message', the message 'is now a mantra', and '[i]t is now a formulaic prescription for policy-makers: do it right, and growth and prosperity will follow'.

Even Porter (2000), often seen as the forefather of the cluster concept, expresses a similar notion and writes that 'a role for government in cluster development should not be confused with the notion of industrial policy as the intellectual foundations of cluster theory and industrial policy are fundamentally different, as are their implications for government policy' (Por-

ter, 2000:27). The use of the cluster concept as a policy tool for the enabling of economic growth is hence widely criticized. Eklund (2007) claims that Sweden became a passive recipient of the innovation systems and cluster policy through OECD policies and hence failed to actively assess its implementation. Also, the actual economic impact of the structural funds has been questioned, as few quantifiable effects of funding on target variables, such as per capita income and employment rates, have been found (Parker & Ekelund, 2011).

1.4 Scope and purpose of the thesis

Against this background I scrutinize the use of the cluster concept as a tool in regional development and innovation policy by studying the management of RSNs. I define an RSN as cooperation among companies in a region supported by public agencies and other organizations, aimed at promoting innovative network structures (Hallén & Johanson, 2009). The funding of these RSNs is based on grants from the regional development funds and can therefore be seen as an outcome of the focus on cluster policies within regional economic development and innovation policies.

According to Andresen (2011) both innovation systems and innovation networks overlap with RSNs. But Andresen (2011) claims that the two former concepts are narrower than RSNs as they focus exclusively on innovation, whereas RSNs can serve other purposes. However, they are also wider than RSNs as they are often assumed to encompass larger portions of business networks - for example several clusters, more extended value chains, and bigger regions.

In contrast to innovation systems or innovation networks, RSNs have explicit and set goals which a management hub or management team is responsible for implementing. The goals are tied to several quantifiable outcomes, often including the number of new employment opportunities generated in the region, the number of meetings generated between suppliers and users, and the number of innovations generated through the networking activities undertaken. These goals are also prerequisites for their funding by the regional development funds.

The term 'strategic' in the RSN concept is important. Håkansson and Ford (2002:137) define strategizing in a network context as 'identifying the scope for action, within existing and potential relationships, and about operating effectively with others within the internal and external constraints that limit that scope'. Thus, strategizing implies an ambition to exercise control and to influence the activities and actions of others, which is compatible with the

RSN concept. However, exercising control and managing the actions of others is problematic in an inter-organizational network context, and this is also true of imposing the strategies of an RSN on the RSN members. The resources controlled by the management group of an RSN are often less important for reaching strategic goals than the resources controlled by the member companies. Moreover, the RSN management seldom has formal power to enforce adherence to strategic goals or to control its member companies and must therefore rely on informal influence to make the members follow the joint strategy, e.g. by perceived legitimacy (Gebert-Persson, Lundberg & Andresen, 2011). The management group of an RSN can contribute to innovative behavior by the member companies but not through any formal authority. Nevertheless, the managers of an RSN are responsible for reaching joint goals and must impose some form of control mechanism to fulfill this responsibility.

The challenges in managing an RSN can also be found in the critique of the cluster concept described above. When the actors responsible for developing business agglomerations 'are no longer economic actors but politicians and bureaucrats' (Lagendijk, 2001), agency is removed from the actors closest to business and falls into the hands of other actors detached from the business setting. Handling this gap becomes a major challenge. In this thesis I address how these managerial challenges can be handled in an RSN.

Members of RSNs are often regional actors representing the academic, public and business spheres and the characteristics of these connections can be considered as the practical outcome of the cluster policies enforced by a top-down approach. If the connections between the academic community, the regional policy makers and the regional business actors are not properly managed the cluster policy will fall flat, since the top-down approach assumes that it rests upon connections between these three spheres.

Clusters and innovation systems are constructs that derive from economic geography, and their focus is on higher order systems such as regions and nations. However, in order to study RSNs I focus on the managerial issues of clusters and innovation systems and on relevant aspects of this approach on an operative level. The approach adopted for my study of these issues thus steers my research towards management studies and industrial marketing instead of economic geography.

Nicholson, Tsagdis and Brennan (2013) state that 'there is a coincidence of research interests between industrial marketing and economic geography in relation to spatial embeddedness in business relationships'. Howells and Bessant (2012) also claim that the fields of management and economic geography have moved beyond just cross-referencing each other and are now

interacting conceptually, as ‘certain themes within the management literature involving a geographical dimension have become more prominent’. Breaking down the larger order constructs of innovation systems and clusters into the managerial systems of RSNs serves to bridge these interests and add findings to both management within industrial marketing and the research field of economic geography.

The financial realization of these RSNs is tied to the facilitation of regional innovation in the Commission’s ‘Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy’ (Commission of the European communities, 2008). The innovation capability of a region is seen as important in the creation of economic growth, and clusters are in turn seen as the preferred tool for elevating this innovative capability. There is however little advice on how a manager of an RSN could facilitate this innovation capability (Sotarauta, 2010), and since ‘the cluster model was thus never meant as a normative recipe for regional growth’ (Taylor, 2010) little advice is found in the literature concerning the cluster model. The model rests on the belief that cognitive proximity and knowledge spillovers create the prerequisites for innovation, but how to facilitate such development on a regional scale is not included in the theoretical framework (Sotarauta, 2010).

Nauwelaers (2001) states that future policies regarding regional innovation and growth should capture ‘non-classical, difficult to grasp, determinants of innovation’ as well as ‘material input such as the availability of infrastructure, access to codified results from formal R&D projects, and financial capital’. The focus of innovation policy should consequently move from considering only ‘physical capital’ towards embracing ‘social capital’ in the form of norms, culture, institutions and networks (Nauwelaers, 2001). Similarly, Sölvell (2009) claims that social capital is the most important area for determining cluster growth. Social capital captures the relational aspects of knowledge spillovers and cognitive proximity that characterize studies of innovation systems and clusters. As social capital has been studied in both economic geography and industrial marketing it can serve as a bridge between these two research fields (Nicholson et al., 2013).

However, the discourse regarding social capital has some conceptual shortcomings that I address in this thesis. In the following two sections of this cover paper I clarify these conceptual shortcomings through a literature review. The conceptualization of social capital that I derive from previous research is applied in a case study in my licentiate thesis (paper I) and in papers II-III in this thesis. To this I add managerial conclusions regarding how a manager of an RSN can create the prerequisites of an innovative mi-

lieu in the confines of an RSN and thereby enable the exchange of useful information between the involved actors.

Contributing to the formation of an innovative milieu can be seen as the first step in promoting innovation through an RSN. However, enabling knowledge exchange between the actors is not enough to create a successful innovation process. In section 1.7 below I suggest that an inter-organizational networks approach should be introduced as a theoretical contribution to address issues dealt with in economic geography. In this approach an invention has to 'survive' in three empirical settings to reach widespread use and be defined as an innovation. First, new solutions need to be found by combining alternative sets of material and immaterial resources within a developing setting. Secondly, the new solution must be transformed into some type of product or process within a producing setting and this product must, thirdly, fit with the material and immaterial investments made by the actors in the established business structure to be adopted into a using setting. Understanding how resources interact in these various settings enables the manager of an RSN to go beyond aiding information exchange and encourage innovation processes. The model based on the three empirical settings is applied in a case study in which managerial conclusions are also drawn (paper IV).

Against this background, the purpose of the thesis is formulated as follows:

- To describe how the management group of an RSN creates the pre-requisite for an innovative milieu by analyzing the effects that social capital imposes on social interaction (papers I-III).
- To describe how a policy initiated innovation process is supported by an RSN management group by analyzing resource interaction between the developing, producing and using settings (paper IV).
- To derive recommendations for handling policy initiated innovation processes, particularly with respect to the social context.

1.5 The duality of social capital

In his seminal works Granovetter (1973, 1983, 1985, 1992) argues that economic activity is embedded in social contexts. Economic geographers have since comprehensively addressed the embedded nature of the economic context (Vorley, Mould & Courtney, 2012), from the institutional turn (Amin, 1999; MacLeod, 2001; Martin, 2000) to the cultural turn (Barnes, 2001; Crang, 1997; Thrift & Olds, 1996), as well as from social inequalities (Gray, Kurihara, Hommen & Feldman, 2007; MacKinnon, Cumbers, Pike, Birch & McMaster, 2009) to social capital and trust (Ettlinger, 2004, 2008; Murphy,

2006). Huber (2009) holds forth the seminal work of Putnam (1993, 2000) as inspirational in the growing use of the concept social capital in economic geography and regional studies (Cohen & Fields, 1999; Cooke, Clifton & Oleaga, 2005; Fromhold-Eisebith, 2004; Mohan & Mohan, 2002). In addition, social capital has been hailed as the ‘missing link’ (Grootaert, 1999) which goes beyond traditional forms of economic capital and ties relational aspects to value creation (Dasgupta & Serageldin, 2000; Francois, 2002; Isham, Kelly & Ramaswamy, 2002). Indeed, according to Howells and Besant (2012) the important social and cultural dimension of networks has been an area of ongoing cross-fertilization between researchers in management and geography.

In the current era of knowledge-based economy, the role of social capital for regional innovation and regional knowledge externalities is brought forward as a study object of particular interest (Fromhold-Eisebith, 2004; Maskell, 2000; Tura & Harmaakorpi, 2005). Regional knowledge spillovers in economic agglomerations are treated as features of utmost importance in economic geography, and social capital is often viewed as an integrated part of these processes (Döring & Schnellenbach, 2006). Hence, theories of economic clusters integrate social capital and link it to economic prosperity (Huber, 2009; Porter, 1998; Staber, 2007). Social capital is consequently critical in micro-clusters but few studies have examined how this has affected organizational acquisition of new knowledge (Inkpen & Tsang, 2005; Lowe, Williams, Shaw & Cudworth, 2012).

In order to understand and analyze spatially defined networks, the concept of social capital has been applied by scholars to identify the social norms and customs that ‘lubricate’ the transfer of knowledge (Capello & Faggian, 2005; Hauser, Tappeiner & Walde, 2007; Huggins & Johnston, 2010; Tura & Harmaakorpi 2005). However, Huggins and Johnston (2010) claim that ever since the contribution of Dicken, Kelly, Olds, and Yeung (2001) the networking paradigm has largely considered the practice of networking as inherently positive in economic geography. Consequently, Huggins and Johnston (2010) believe that economic geographers have not always critically engaged with the concept of social capital, thus leaving the relational networking paradigm underdeveloped, an underdevelopment that was voiced by Falconbridge (2007:929) as a ‘need for fine-grained analysis of the social practices and ongoings in relational networks.’

The tendency to consider only one tenet of the effects that relational networks might produce is also a consequence of social capital being conceptually underdeveloped. Grabher (2006) criticizes the networking paradigm because it considers social capital as inherently positive. Similarly Vorley et al. (2012) criticize the associative nature of network practices, claiming that

networks do not intrinsically produce positive outcomes. Putnam's influential conceptualization of social capital is commonly seen as suffering from this limitation since it views economic behavior as a collective good that is realized in communal life, hence privileging civic and communal interests over economic interests (Vorley et al., 2012). A consequence of Putnam's interpretation is, according to Lin (2001), that such oversocialization devalues the networks of economic relationships through which social capital is mobilized. Although other social sciences that have appropriated the network paradigm are more nuanced in scope, economic geography has been somewhat slower in this respect (Grabher 2006; Vorley et al., 2012).

Even if most researchers consider social capital as inherently positive, some researchers have questioned the positive effects of the concept and the network paradigm as a whole. Hadjimichalis and Hudson (2006) refer to unequal power relations and hierarchies within networks and to the 'darker side' of networks, Markusen (2003) refers to unequal power relationships and the fragility of networks, and Grabher (2006) questions the enduring nature of social relations. Hassink and Klaerding (2012) claim that the socio-spatial context, in terms of shared norms and values and other forms of social capital can either facilitate or hamper interaction among individuals. Or as Malecki (2012) puts it: 'it can be both a glue and a lubricant'. It can be the glue that binds people together by common norms and values, or a lubricant that facilitates exchanges among individuals because of the trust and reciprocity they develop in relations (Malecki, 2012). Hence, relational assets in one region might be a liability in another (Hassink & Klaerding, 2012; Rutten & Boekema, 2012; Yeung 2005).

Although different aspects of strong ties are often at the center of social capital research within economic geography and regional studies (Huber, 2009), the importance of weak ties (Granovetter, 1973) or structural holes (Burt, 1992) should not be ignored. Granovetter (1973:1364) introduces the concept of a bridge as '[a] line in a network which provides the only path between two points'. Putnam (2000) divides the social capital concept into its bridging and bonding effects to capture the duality of bonding and bridging tie formation. Bonding represents strong connections within homogeneous groups that often exclude interaction outside the group. Bridging, on the other hand, entails interaction between different social groups, and more loose bonds between actors. Combining different patterns of bonding and bridging of social capital is therefore considered to promote collaboration and the creative potential in networks (Camisón & Forés, 2011; Daskalaki, 2010; Lin, Huang, Lin & Hsu, 2011; Slotte-Kock & Coviello, 2010).

Based upon the lack of a nuanced view of the social capital concept in network studies in general, and in economic geography in particular, I use the

bridging and bonding forms of social capital as part of my theoretical framework in this thesis (papers I-III). I thus investigate how different patterns of bonding and bridging mechanics promote collaboration or deflect the creative potential in RSNs.

Portraying a nuanced view of social capital also favors the use of the concept as a managerial tool. My research stems from management studies and I therefore focus on the managerial implications of my research. Considering the bonding and bridging aspects of forming relations in a network context can aid managers in building innovative milieus within the context of RSNs.

1.6 Analytical levels of social capital and networks

Huber (2009) points out that the role of social capital for regional innovation has been highlighted by several studies of the knowledge-based economy (Capello & Faggian, 2005; Fromhold-Eisebith, 2004; Maskell, 2000; Tura & Harmaakorpi, 2005). However, conceptualizations of the knowledge-based economy within the literature have gone through changes in scope and focus (Rutten & Boekema, 2012). According to Rutten and Boekema (2012) in 'Knowledge Economy 1.0' the dominating definition of social capital with regard to learning was connected to 'firms, inter-firm networks and societies' (Morgan, 1997; Storper, 1993). In 'Knowledge Economy 2.0' however, Rutten and Boekema (2012) claim that social capital has evolved to incorporate 'networks of individuals and is much more diffused as individuals are members of multiple social and professional networks' (Amin & Roberts, 2008; Gertler, 2003; Westlund, Rutten & Boekema, 2010).

Thus, 'Knowledge Economy 1.0' defines regions as bounded territories having a regional culture that indicates that social capital exists and can be defined on a regional level (Asheim, 2012; Hassink & Klaerding, 2012; Moulaert & Sekia, 2003; Rutten & Boekema, 2012). When individuals in a region engage in interactions with 'spatially sticky' individuals in their home regions it gives rise to specific regional norms, values and other forms of social capital that are space specific and adhere to the region itself (Boshuizen, Geurts & van der Veen, 2009; Florida, 2002; Hauser et al., 2007). It might however be more realistic to argue along the lines of 'Knowledge Economy 2.0' and claim that 'regions harbor multiple social contexts and that not all of them need to be equally supportive of learning' (Rutten & Boekema, 2012). This indicates that studies of social capital in regional development has gone from considering regional cultures towards analyzing relational networks on a micro-level basis.

This notion is embraced by Huber (2009) who proposes that a major reason for conceptual shortcomings in the social capital literature is the lack of understanding and inclusion of individual actors as an analytical factor. Mayntz (2004) also claims that lower-level actors drive social mechanisms and that such mechanisms are best understood from the individual actors' point of view. Bathelt and Glucker (2003:123) even state that 'economic actors and their actions and interaction should be at the core of a theoretical framework of economic geography and not space and spatial categories' thus abandoning the focus upon the 'geographical' within economic geography.

Even if studies of regional development using the concept of social capital have started to involve more micro-level analyses of relational networks, innovation is still often explained as inherent and related to geographical proximity and shared cognitive culture (Coletti, 2010; Leenders & Gabbay, 1999; Putnam, 1993; Semitiel García, 2006). Talking about 'learning regions' is thus common in innovation research, and some regions are believed to be more conducive to innovative behavior than others (Florida, 2002; Hauser et al. 2007; Koschatzky & Kroll, 2007; Morgan, 1997). This tendency to investigate different levels of analysis while still using the same concept, often without explicitly defining the analytical intent, has left the concept of social capital strained and stretched. There are thus serious conceptual shortcomings in the literature which obscure the causal role of social capital (Adler & Kwon, 2002; Huber, 2009; Taylor & Leonard, 2002).

The predominant conceptualizations view social capital as a catch-all notion that involves different types of social concepts (Huber, 2009). Differing data sources, sampling designs and wordings make comparing different studies within the discourse problematic. The empirical indicators are also too indirect and do not satisfactorily grasp the studied phenomena (Sabatini, 2007). Social capital remains a nebulous term and the causal mechanisms of specific dimensions are indefinable as long as social capital is treated as an undifferentiated mixture of social dimensions (Hauser et al., 2007). Or as Taylor (2010) expresses it: 'it is difficult to identify whether social capital is the infrastructure or the content of social relations – it becomes impossible to separate what it is, from what it does'.

Rutten and Boekema (2012) claim that the change from 'Knowledge Economy 1.0' to 'Knowledge Economy 2.0' has spurred a growing interest in micro-level analysis of relational networks within the economic geography literature. Still, they highlight that the learning region's concern with relational concepts such as networks and social capital has largely considered these concepts as regional characteristics rather than studying them from a relational view (Rutten & Boekema, 2012; Sunley, 2008). Knobens and Oerlemans (2006) similarly claim that geographical proximity matters less than

relational proximity for knowledge links and suggest that empirical analysis concerning spatial embeddedness may benefit from more micro-level research. Hassink and Klaerding (2012) also argue for more research into relations or networks rather than regions as places when investigating culture-based learning processes. Theoretical approaches with micro-perspectives are also necessary in future research focusing on how social networks within the labor market affect knowledge diffusion (Lambooy, 2005). Partanen and Möller (2012) even pose that ‘researchers might need to go ‘back to the basics’ and adopt social network theory into their research frameworks’ to investigate network structures on a micro level.

Thus, there is a need for research investigating lower-level analysis of relational networks in economic geography. However, there may be no need to abandon altogether the ‘regional’ aspect of regional development or the ‘geographical’ dimension of economic geography. Some researchers claim that several conceptual shortcomings within the use of the social capital concept have been generated by an analytical leap from the individual to the collectivity (DeFilippis, 2002; Portes, 2000) and it may therefore be important to investigate this leap. Ibarra, Kilduff & Tsai (2005) argue that relatively few attempts have been made to link individuals and their networks to larger network systems. Research has embraced a divide between micro and macro structures. Consequently, few bridges linking these systems have been investigated.

By investigating both the macro-level, in the form of cultural traits within a region, and the micro-level of relational networks in the same case study, the analytical leap from the individual to the collectivity can be considered. Together with my co-authors I perform such an analysis of a publicly financed network project (paper III). This serves to tie together notions of cultural space and cognition with the analysis of network structure influenced by social network analysis. The construct of social capital is divided into three separate dimensions: (1) the socio-economic dimension, where social capital is defined as being created within a geographical region by ‘citizens’ (Maskell, 2000) and a specific ‘culture’ (Coletti, 2010; Inglehart & Baker, 2000); (2) the structural dimension, where social capital is being created within a network (Nahapiet & Ghoshal, 1998; Partanen & Möller, 2012; Putnam, 1995) as a product of the network’s density of ties (Burt, 1997; Lin et al., 2012), its structure (Bourdieu & Wacquant, 1992; Huber, 2009), and its evolution (Daskalaki, 2010; Tunisini & Bocconcelli, 2009); and (3) the actor-oriented dimension, where social capital is created by a single actor through the formation of weak or strong ties in order to gain access to other social actors’ resources (Cousins, Handfield, Lawson & Petersen, 2006; Granovetter, 1985; Knoke, 1999).

Undertaking a micro-level analysis of the social capital concept is also conducive to investigating the managerial aspects of RSNs. If social capital is viewed as a regional trait it implies that it is rather hard for an individual manager to influence it since it is a high order concept. When breaking the concept down to its relational network structure it becomes manageable for individual actors to trace the impact of their actions. Consequently managerial aspects of controlling or influencing the development of social capital can be defined. Social capital has often been viewed as rather rigid or even deterministic when considered on a macro level. Hence, linking individuals and their networks to larger network systems may make social capital considered as manageable.

1.7 Moving beyond regional knowledge flows and considering resource interaction

The new economic geography, as defined by Krugman (1998) is the research field that deals with why and how economic activity seems to cluster in space. Krugman refers to Marshall's notion of externalities as 'a regional concentration of economic activity that may create more or less pure external economies via information spillovers'. This notion is also captured in Marshall's famous words: 'The mysteries of the trade become no mystery, but are, as it were, in the air'. The definition of what is actually 'in the air' is often defined as cultures or norms that facilitate the exchange of tacit knowledge (Polanyi, 1966) and consequent knowledge spillovers (Basile, Capello & Caragliu, 2012; Currid & Connolly, 2008).

This focus in economic geography on enabling knowledge flows in order to facilitate learning has according to Gertler (2003) made it commonplace to refer to the current period of capitalist development as the era of the 'knowledge based economy' (OECD, 1996) or the 'learning economy' (Lundevall & Johnson, 1994). Gertler (2003) would even go as far as claiming that 'no matter which label one prefers, the production, acquisition, adsorption, reproduction and dissemination of knowledge is seen by many as the fundamental characteristics of contemporary competitive dynamics'. The focus upon knowledge spillover in the new economic geography has, according to Fujita (2007), spurred pioneering and influential works such as those of Jacobs (1969), Anderson (1985) and Lucas (1988) in an urban context, and Porter (1998) in the context of industrial clusters. The focus on knowledge as a concept, though its definition is continuously debated, is in other words very influential in the development of economic geography as a field.

The new economic geography field is as described above deeply rooted in the investigation of the concept of knowledge spillovers. However, the concept of knowledge remains central in economic geography in general and defines more contemporary studies of innovation in a geographical context. Martin and Moodysson (2013) claim that the geography of innovation and knowledge creation is a vital research field in contemporary economic geography. According to Isaksen and Onsager (2010) a large body of literature which studies geographical patterns of innovation has emerged in recent decades, building on a research tradition that ranges from Marshall's (1898) early work on innovation in industrial districts to more recent work including innovative milieus (Camagni, 1991), learning regions (Asheim, 1996) and regional innovation systems (Asheim & Gertler, 2005; Cooke, Uranga & Etxebarria, 1998). According to Martin and Moodysson (2013) all these research interests within economic geography are 'geared towards improved cooperation and knowledge exchange between industry, university and government', which highlight the ongoing focus upon analyzing knowledge distribution within the research field. Strambach and Klement (2012) also claim that the term 'knowledge dynamics' is increasingly used in the field of research focusing on 'knowledge economics', which defines knowledge as one of the driving forces for innovation.

The connection between knowledge flows and spillovers on the one hand and innovation on the other seems to be widely assumed within contemporary economic geography. However, some researchers within the field have argued for the inclusion of forms of resources other than merely knowledge in innovation studies. Geels (2004) realizes that the studies of innovation in '[t]echnological systems are defined in terms of knowledge or competence flows rather than flows of ordinary goods and services', and hence states that 'the material aspects of systems could be better conceptualized'. Bergek, Jacobsson & Sandén (2008) suggest that in analyses within economic geography, or technological innovation systems, it would be 'fruitful to distinguish a number of sub-processes that are directly related to the innovation process, i.e. the development, diffusion and use of new products, processes etc.' One of these 'sub-processes' he calls 'resource mobilization' and defines as the mobilization of 'human capital, financial capital and other complementary assets'. A call for research that goes beyond knowledge diffusion when investigating regional innovation is thus voiced.

In fields of research other than economic geography, predominantly industrial marketing and management, the focus on knowledge in innovation studies seems less rigid. Resources other than knowledge are often seen as essential. In her seminal work Penrose (1959) views value creation as inherent in the combination of heterogeneous resources. Her work spurred the resource-based view of the firm which recognizes that a firm's resources, including

their application and transferability, are critical factors in creating and sustaining competitive advantage (Barney, 1991; Huggins & Johnston, 2010; Rangone, 1999; Wernerfelt, 1984). According to Huggins and Johnston (2010) the resource-based view defines resources as including all the tangible and intangible assets owned or controlled by firms, which constitute a source of value creation for the firm that controls them. These resources are also considered to be associated with the firms' capability to undertake innovation (Wiklund & Shepherd, 2003; Thorpe, Holt, Macpherson & Pittaway, 2005). This definition goes way beyond what seems to be the major focus within innovation studies in economic geography that focus solely on knowledge dispersion as a source of innovation. However, Zaheer and Bell (2005) note that researchers with a resource-based view of the firm tend to focus only on the internal capabilities of firms. The scope of analysis within economic geography is much wider since it often includes the importance of space and place for the dispersion of innovation capabilities.

A research field that might bridge the gap in this sense is the inter-organizational network approach that according to Baraldi, Gressetvold and Harrison (2012) focuses on resource interaction, rather than resources per se, and also expands the focus from the single firm or dyad to consider the level of inter-organizational networks. The focus on resource interaction in inter-organizational networks emerges from longitudinal empirical studies of technological development and innovation (Baraldi et al., 2012), and hence from how several actors integrate resources within network structures in order to extract value through interdependent relationships. Research on inter-organizational networks goes beyond focusing solely on knowledge dispersion when investigating innovation, and more importantly like innovations system research, it goes beyond studying the single firm and considers how interaction between several actors promotes innovation. The inter-organizational network approach therefore has a lot to offer if applied to the issues normally attended to by economic geographers.

Another reason for looking beyond mere knowledge diffusion as a driver of innovation is the definition of innovation itself. According to Srholec and Verspagen (2012) the literature within economic geography has been preoccupied with using firms' investments in R&D as an indicator for innovation within regions. The literature thus neglects the fundamental issue about how firms actually innovate, since a focus on investments in R&D only captures a simplistic, linear perspective of how innovation works (Srholec & Verspagen, 2012).

Van de Ven, Polley, Garud and Venkataraman (1999) offer a different and less linear definition of innovation. According to Van de Ven et al (1999) there is a difference between achieving an invention and achieving an inno-

vation. An invention might be defined as a novel solution to a specific problem or in its most abstract form, a new idea. But in order for an invention to become an innovation the invention must have reached widespread use and thereby become integrated in the organizational and physical structures needed to enable its utilization (Fagerberg, 2004; Van de Ven et al 1999). Van de Ven's (1999) definition of innovation suggests that innovation is born out of reshuffling resources inside and outside of the firm. Thus, innovation goes beyond a single firm's investment in R&D.

When innovation occurs it takes place within established producer-user relationships (Ingemansson, 2010). Hence, the interfaces between the users and the producers of new technology are recognized as important in innovation studies (Fagerberg, 1995; Rosenberg, 1982; Van de Ven et al., 1999; Waluszewski, Baraldi, Linné & Shih, 2009). This way of defining innovation is consistent with Penrose's (1959) view of value creation as inherent in the combination of heterogeneous resources and is widely adopted in the inter-organizational network approach (Baraldi et al., 2012; Håkansson & Waluszewski, 2007; Knorrunga & Pegler, 2006; Murray, 2003; Waluszewski, 2006). The study of reshuffling of resources and how the interfaces between these resources become integrated is thus an established approach in inter-organizational network studies of innovation (Baraldi & Waluszewski 2005; Håkansson & Waluszewski, 2002; Lusch, Vargo & Wessels, 2008; Mele, Russo Spena & Colurcio, 2010).

In paper IV I analyze how an RSN can facilitate resource interaction between the academic and business actors involved in a policy initiated innovation process. Since I study the role of an RSN in a policy initiated innovation process, regional development is in focus. This ties my research closer to the issues regarding regional innovation and growth that are often discussed in economic geography. However, in my single case study I focus on the managerial issues that face the management of an RSN. Thus, a managerial and micro-level perspective is added to how innovation is generated within a regional context, thereby offering a contribution to the research field by both widening the scope of analysis from only considering knowledge flows in innovation studies, and by problematizing innovation as inherent to inter-organizational resource interaction and not just as a product of a single firm's R&D investments.

2. Theoretical framework

2.1 Defining the concept of social capital

The role of social capital for regional innovation has been highlighted by several studies of the knowledge-based economy (Capello & Faggian, 2005; Fromhold-Eisebith, 2004; Huber, 2009; Maskell, 2000; Tura & Harmaakorpi, 2005). Still, the concept is described as an ‘umbrella concept’ (Huber, 2009) or a ‘catch-all notion’ (Taylor & Leonard, 2002) that includes a wide range of definitions and interpretations. It is often cited as a single and implicitly coherent concept whereas in fact it involves multiple meanings. These separate interpretations are usually not made explicit and therefore confuse the debate. Definitions of the concept tend to be non-equivalent and highlight different dimensions, as some of them focus on trust, others on networks or institutions, and yet others on civic involvement (Huber, 2009). These wide arrays of definitions often cause an analytical leap from the individual to the collectivity, which leads to several conceptual shortcomings (Camison & Forés, 2011; DeFilippis, 2002,).

Crossing different levels of analysis corresponds well with current arguments in the social network literature regarding the need to develop a multi-level understanding of inter-organizational networks (Contractor, Whitbred, Fonti, Hyatt, O’Keefe & Jones, 2000; Hagedoorn, 2006; Slotte-Kock & Coviello, 2010). In an early contribution, Granovetter (1973) attempts to relate micro-level interactions to macro-level patterns with an analysis of social networks. He points out that relationships between people can exhibit either frequent contacts and deep emotional involvement (close friends or strong ties), or sporadic interactions with low emotional commitment (loose acquaintances or weak ties) (Hauser et al., 2007). Granovetter (1973) links the traits of the individual actors’ connections to the density of the whole network, but research linking actor-centered traits to network density in order to empirically investigate the association between performance and social capital have been sparse (Cooke et al., 2005). Cooke et al. (2005) investigate the performance and social capital used at the firm level and then seek to move beyond the confines of the individual firm in order to relate these ‘firm capabilities’ findings to the meso level. They thereby assess regional economic performance (the meso level) in relation to social capital at the firm level. Slotte-Kock and Coviello (2010) claim that the first step in creat-

ing a single framework within social network analysis would be to combine both the dyad and network as units of analysis. To ‘integrate the social network (whole network) and business network (focal firm) analysis to investigate both the macro level of network structure and the micro level of dyadic interactions would benefit research on networks’ according to Slotte-Kock and Coviello (2010).

In table 1 I list definitions of social capital used in the literature and divide them according to the three dimensions presented in section 1.6 (Analytical levels of social capital and networks). In section 1.5 (The duality of social capital) I also question the conventional view of social capital as imposing only positive effects upon interaction and neglecting its ‘dark side’ (Hadjimichalis & Hudson, 2006). Table 1 highlights this duality as the first column includes definitions that describe social capital as inherently positive, i.e. basically as bringing contributions through social interaction that are deemed valuable by society or individuals. Some other definitions of social capital, however, are more neutral regarding effects from social interaction and are listed in the second column of table 1.

	Social capital as positive in its effects on society and individuals	Social capital as neutral in its effects on society and individuals
<p>Socio-economic dimension</p> <p>Social capital as primarily explained by the shared cognitive culture connected to a specific geographical region.</p>	<p>‘social capital, in essence, is the institutions, relationships, attitudes and values governing interactions amongst people and contributing to economic and social development’ (Iyer, Kitson & Toh, 2005:1016)</p> <p>‘those voluntary means and processes developed within civil society which promote development for the collective whole’ (Thomas, 1996: 11).</p> <p>‘Social capital is associated with people's sense of community, their sense of belonging to a neighborhood, caring about the people who live there, and believing that people who live there care about them’ (Portney & Berry, 1997: 71).</p> <p>‘a culture of trust and tolerance, in which extensive networks of voluntary associations emerge’ (Inglehart, 1997: 188).</p> <p>‘Social capital can be defined simply as the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them’ (Fukuyama, 1997).</p> <p>‘an instantiated informal norm that promotes co-operation between two or more individuals.’ (Fukuyama, 2001).</p>	<p>‘the values and beliefs that citizens share in their everyday dealings and which give meaning and provide design for all sorts of rules’ (Maskell, 2000: 111).</p> <p>‘This kind of capital (social capital) is represented by norms of reciprocity and trust that facilitate the interaction between inhabitants of a community’ (Hauser et al., 2007:5).</p>

(Cont.)

	Social capital as positive in its effects on society and individuals	Social capital as neutral in its effects on society and individuals
<p>Structural dimension</p> <p>Network-based conceptualization of social capital with a focus upon network identities or a holistic network structure.</p>	<p>‘Social capital refers to the norms and networks that facilitate collective action’ (Woolcock, 1998:13).</p> <p>‘social capital refers to aspects of the network structure that encourage collaboration and coordination between friends and between strangers’ (Costa & Kahn, 2003:103).</p> <p>‘the brokerage opportunities in a network’ (Burt, 1997:355).</p> <p>‘the web of social relationships that influences individuals behavior and thereby affects economic growth’ (Pennar, 1997: 154).</p> <p>‘According to a network-based approach, one can define social capital as resources embedded in social networks which can be potentially accessed or are actually used by individuals for actions’ (Huber, 2009:164).</p>	<p>‘it is the density of relational networks that generates social capital’ (Rozenblat, 2010:2848).</p> <p>‘social capital is here defined as social, un-formalized networks that are used by the networks’ nodes/actors to distribute norms, values, preferences and other social attributes and characteristics’ (Westlund, 2006:1).</p> <p>‘Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure’ (Coleman, 1990:302).</p>

(Cont.)

	Social capital as positive in its effects on society and individuals	Social capital as neutral in its effects on society and individuals
<p>Actor-oriented dimension</p> <p>Social capital as a focal actor's network configuration, consisting of weak or strong ties between the focal actor and its associates.</p>	<p>'the number of people who can be expected to provide support and the resources those people have at their disposal' (Boxman, De Graaf & Flap, 1991:52).</p> <p>'friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital' (Burt, 1992:9).</p> <p>'investment in social relations for expected returns in the marketplace' (Lin, 2001:19)</p> <p>'the process by which social actors create and mobilize their network connections within and between organizations to gain access to other social actors' resources' (Knoke, 1999:18).</p> <p>'the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit' (Nahapiet & Ghoshal, 1998:243).</p>	<p>'an individual's personal network and elite institutional affiliations' (Belleveau, O'Reilly & Wade, 1996: 1572).</p> <p>'the information, trust, and norms of reciprocity inhering in one's social networks' (Woolcock, 1998: 153).</p>

Table 1. *Definition of the social capital concept divided by positive and neutral connotation.*

In paper III the proposed dimensions of the social capital concept displayed in table 1 are applied in the empirical context of an RSN. The purpose of paper III is to provide stricter definitions of social capital and thereby clarify how social capital influences the innovativeness of an RSN. The data collected also allow a comparative analysis between two points in time highlighting the process of designing an RSN.

The licentiate thesis (paper I) and paper II do not divide social capital into these analytical dimensions, but they display both the negative and positive

effects that social capital can induce upon an RSN. This allows a more nuanced conceptualization of social capital in line with the neutral definitions in table 1.

2.2 Resource interaction in the inter-organizational network approach

Johanson and Mattsson (1987) state that the markets-as-networks research tradition, founded largely in Sweden, brings the network to the forefront in marketing and related subjects. They define the network or the interaction approach as a subset of exchange relationship approaches and contrast this approach with the marketing-mix approach, which is defined as a paradigm where the seller acts and the buyer reacts. Hallén, Johanson and Seyed-Mohamed (1991) concluded that the patterns of exchange and adaptation processes between customer and seller vary depending on the interaction strategies of the parties and the history of their relationship, confirming that the interaction and adaptation processes of a firm are vital both in marketing ventures and in the organization of the firm. Within industrial marketing interaction and mutual adaptation within network structures have proved to be a fruitful way to describe the mechanisms behind value creation within the market, rather than focusing on one-off transactions between buyer and seller.

Adding the notion of resource heterogeneity (Penrose, 1959) to the network approach further elevates the impression that value is created by the adaptation of the resources controlled by economic actors. Baraldi et al (2012) claim that ‘focusing on the processes of resource interaction provides one way of mapping and investigating resource development and utilization’ and define these processes as ‘combination, re-combination, and co-development of resources that happen through the interaction among organizations’. In this framework innovation is seen as the reshuffling of producer-user interfaces in order to find new ways in which to utilize existing resources in a manner that improves combinatory power (Håkansson & Waluszewski, 2007; Perks & Jeffery, 2006). Hence, innovation takes place within established producer-user relationships (Ingemansson, 2010). Consequently, achieving resource interaction between the users and the producers of new technology are recognized as an important but problematic issue in innovation studies (Fagerberg, 1995; Rosenberg, 1982; Van de Ven et al., 1999; Waluszewski et al., 2009).

Håkansson and Waluszewski (2007) claim that in order for an invention to become an innovation, i.e. to obtain widespread commercial use, it must

‘survive’ in three empirical settings: a developing, a producing and a using setting. This can be called the DPU model. In the developing setting new solutions are searched for by combining alternative sets of material and immaterial resources (Håkansson & Waluszewski, 2007; Perks & Jeffery, 2006). Within the producing setting the invention must be transformed into some kind of product or process. Thus, it has to be embedded into the existing system of production to be brought into the marketplace (Håkansson & Waluszewski, 2007). The user setting consists of a wide set of material and immaterial investments made by the actors in the established business structure. The outcome of any new solution is dependent on how it affects these actors’ prior investments; if only a few can gain advantages from using the new solution it will never reach the widespread use required for making it an innovation (Håkansson & Waluszewski, 2007).

In paper IV the DPU model, focusing on the developing, producing and using settings is applied in a single case study of a policy initiated innovation process undertaken in the context of an RSN. Both academic and business actors were involved in the studied innovation process. The resource interaction between these actors is focused since previous research describes the combination of their resources as extra challenging (Ingemansson & Waluszewski, 2009; Lundberg & Andresen, 2011; Nowotny, Pestre, Schmidt-Asmann, Schulze-Fielitz, Trute, 2005). Although several studies have investigated empirical settings with resource combinations in innovation processes (Baraldi, 2003; Bengtsson & Håkansson, 2008; Ingemansson & Waluszewski, 2009; Wagrell & Waluszewski 2009), no such studies have focused specifically on the role of an RSN.

Research investigating policy initiated ventures to achieve regional economic growth has mostly concerned knowledge transfer among academic, public and private actors. Resource interaction within this context is hence largely ignored and paper IV adds to the discourse of regional development by including these issues explicitly.

3. Overview of the constituent papers of the thesis

I started my research process by investigating the effects that social capital imposed upon the formation of an RSN and how it affected the development of an innovative milieu. The abundance of the bonding form of social capital imposed by the dependence-oriented culture residing in the region resulted in several negative effects from the social interaction between the involved actors. This enabled me to provide a contribution to future research as a contrast to the focus on the positive effects imposed by social capital, largely ignoring the negative effects that became apparent in my research. This nuanced conceptualization of social capital is presented in my licentiate thesis ‘Building bridges and breaking bonds’ (paper I; single author).

In paper II (co-authored), ‘Bridging and bonding forms of social capital in a regional strategic network’, my co-authors and I wanted to contribute to industrial marketing research by applying the findings from the licentiate thesis of bonding and bridging forms of social capital in that theoretical setting. Different kinds of proximity within network configurations are of interest in industrial marketing research (Kilduff & Brass, 2010; Li, 2013; Rivera, Söderström & Uzzi, 2010) and in economic geography (Knoben & Oerlemans, 2006; Lagendjik & Lorentzen, 2007; Ter Wal & Boschma, 2009). These different kinds of proximity facilitate flows of resources in networks and are considered vital in achieving exchange of novel information enabling innovative behavior. Cova, Prévot and Spencer (2010) offer a framework of different perspectives on networks that can be tied to varying forms of proximity. Paper II contributes to the discourse by combining three of these network perspectives in a single case study, and thereby addresses how RSN collaboration draws upon different kinds of proximity for its formation. Cognitive proximity between actors in regional knowledge formation is a common object of study in economic geography (Knoben & Oerlemans, 2006; Lagendjik & Lorentzen, 2007; Ter Wal & Boschma, 2009). In paper II however, this abstract concept was tied to managerial issues influenced by industrial marketing research. The concept of regional proximity was thereby shifted downwards from its position as a high order construct. Cognitive proximity can be studied in a regional perspective where it is captured by the regional culture. However, we propose that cognitive proximity is best un-

derstood by analyzing the effects that it produces on a micro level where it is manifested in the interaction between individual actors.

Paper III (co-authored), 'Multidimensional social capital as a boost or a bar to innovativeness', addresses not only the inherited positive definition of the social capital concept but also its tendency to implicitly incorporate several analytical levels of social phenomena. In the paper these analytical levels are made explicit and the definition of the concept is developed by dividing it into three separate but interacting dimensions. These three theoretically derived dimensions are applied empirically in a single case study, which consequently implies that the social capital in the case is analyzed at several levels. The interaction between the analytical levels is studied and the analytical leap from the individual to the collectivity (DeFilippis, 2002; Portes, 2000) is bridged conceptually. However, further studies are needed to clarify the connections between the defined dimensions. Thus, Paper III serves to further the conceptual definition of social capital beyond questioning its inherently positive definition towards also considering it as multidimensional in its analytical scope.

Paper IV (single author), 'Development, production and use in policy initiated innovation', is based on the notion that even if the social interaction and knowledge flows are enabled within RSN collaboration this is not sufficient to accomplish innovation. Knowledge exchange concerns solely one resource and in order for innovation to be accomplished other resources need to be integrated and adapted to the specific context where the invention is to be adopted. Paper IV therefore goes beyond investigating social capital as a facilitator for an innovative milieu (papers I and III) and cognitive proximity as a lubricant for knowledge exchange (paper II) and considers other resources, both intangible and tangible. Studying how resources are combined in an innovation process does not only concern how the conditions for innovation are formed within the context of an RSN, but also how innovation is actually accomplished.

In paper IV I study a single innovation process within an RSN. In the conclusion I question whether policy initiated innovation processes are at all possible to manage within the context of an RSN. Shortcomings within the producer setting of the DPU model are identified and these shortcomings are related to funding conditions that determine the RSN design. The inherent problem of administrative policies aimed at commercializing scientific findings and thereby tying the academic world to the business world is yet again made apparent (Christopherson & Clark, 2010; Goddard, Robertson, & Vallance, 2012; Ingemansson & Waluszewski, 2009; Waluszewski, 2006).

Name of publication	Theoretical framework	Research purpose	Data collection and analysis	Theoretical conclusions	Managerial conclusions
<p>I. Eklinder-Frick, J. (2011). Building bridges and breaking bonds – Aspects of social capital in a regional strategic network. Västerås: Mälardalen University (licentiate thesis).</p>	<ul style="list-style-type: none"> Four-by-four matrix dividing the bridging and the bonding form of social capital into its negative and positive effects upon an innovative milieu. 	<p>To describe the development of a RSN and how it affected network connections and to analyze this in terms of bonding and bridging forms of social capital.</p>	<ul style="list-style-type: none"> Single case study. Quantitative and qualitative data. Data collected at two points in time. 32 interviews (all involved actors in the RSN) lasting an average of 66 minutes. Qualitative data sorted by open coding Sub-group modularity within the RSN network is analyzed. 	<ul style="list-style-type: none"> A four-by-four matrix portraying effects of bonding and bridging forms of social capital in the studied RSN is constructed. 	<ul style="list-style-type: none"> Facilitating the management of balancing between reinforcing existing network structures and focusing on facilitating bridging connections between previously unconnected actors in designing RSN collaboration.
<p>II. Eklinder-Frick, J., Eriksson, L.-L., & Hallén, L. (2011). Bridging and bonding forms of social capital in a regional strategic network. Industrial Marketing Management, 40(6): 994-1003.</p>	<ul style="list-style-type: none"> Territory perspective on networks as including technological, cognitive and social proximity within a region. Community perspective on networks including cultural proximity. Industry perspective on networks focusing on business relations between companies within an industry. 	<p>To analyze the relation between bridging and bonding activities in a RSN and social capital in a context characterized by a dependence-oriented culture, using three network perspectives.</p>	<ul style="list-style-type: none"> Single case study. Quantitative and qualitative data. Data collected at two points in time. 32 interviews (all involved actors in the RSN) lasting an average of 66 minutes. Qualitative data sorted by open coding Sub-group modularity within the RSN network is analyzed. 	<ul style="list-style-type: none"> Industrial proximity between the actors formed the basis for the studied RSN and influenced the RSN design. Strong cultural proximity between the actors hindered the formation of an innovative milieu. The lack of technological proximity between the actors hindered the formation of an innovative milieu. 	<ul style="list-style-type: none"> Offers perspectives on how to balance the network conditions seen from an industry perspective with the conditions formed by the territorial delimitation and the inherited culture as seen from the community perspective. Gives advice on how to counteract a cultural proximity based upon the bonding form of social capital by managing the design of a RSN. Facilitating the Management of counteracting the lack of technological proximity within a RSN endeavor.

Name of publication	Theoretical framework	Research purpose	Data collection and analysis	Theoretical conclusions	Managerial conclusions
III. Eklinder-Frick, J., Eriksson, L.-T., & Hailén, L. (2014). Multi-dimensional dimension of social capital as a boost or a barrier to innovativeness. Industrial Marketing Management 43(3); in press.	<ul style="list-style-type: none"> The socio-economic dimension of social capital is constructed considering the concept as created within a geographical region by a specific culture The structural dimension of social capital is constructed considering the concept as created within a network, as a product of the network's density, structure and evolution. The actor-oriented dimension of social capital is constructed considering the concept as created by a single actor through the formation of weak or strong ties to other actors. 	To clarify how social capital influences the innovativeness of a RSN by identifying stricter definitions of social capital.	<ul style="list-style-type: none"> Single case study. Quantitative and qualitative data. Data collected at two points in time. 32 interviews (all involved actors in the RSN) lasting an average of 66 minutes. Qualitative data sorted by open coding Social network analysis of sub-group cohesion, network density, degree centrality and structural equivalence. 	<ul style="list-style-type: none"> Defining three separate dimensions of the social capital concept from previous literature to make the concept less nebulous in definition. Connecting the three theoretically derived dimensions of the social capital concept together empirically to bridge the analytical leap from the individual to the collectivity within social capital studies. 	<ul style="list-style-type: none"> Socio-economic dimension will portray the context in which a RSN is operating and set the scene for managerial action. Highlights the importance in loosening up rigid sub-groups within a RSN in order to create an innovative milieu. Detect actors within the actor-oriented dimension that can serve as agents for the desired change.
IV. Eklinder-Frick, J. (2014) Development, production and use in policy initiated innovation. Revisited submission to Journal of Business and Industrial Marketing.	<ul style="list-style-type: none"> The DPU-model of resource interaction within innovation processes. Interaction between science and business in policy initiated innovation processes. 	To explore and describe forces that promote or obstruct a policy initiated innovation process in the context of an RSN by focusing on resource interaction within and between the developing, producing and using settings.	<ul style="list-style-type: none"> Single case study. 24 interviews lasting an average of 69 minutes. Qualitative data sorted by open coding. 	<ul style="list-style-type: none"> Applying the DPU-model on a policy initiated innovation process will help to explain the difficulties of combining science and business in publicly financed innovation endeavors. 	<ul style="list-style-type: none"> Highlighting the importance of not to neglect the producing setting when developing innovation. Questioning if the rules regarding the funding of a RSN enable a producing setting to be properly managed. Giving advice on how to enable developers and users to collaborate when combining scientific, business and public actors in an innovation process.

Table 2. List of publications included in the thesis

4. Method and data collection

4.1 Research process and data collection

I started the research project that resulted in this thesis by sorting and analyzing raw data that had been collected in 2004/2005. The data consisted of transcribed and recorded interviews held by Patrik Söderhielm, a research assistant employed by the University of Gävle. He interviewed the managers of all 15 companies included in the Firsam project (Företag i regional samverkan—Firms in regional collaboration) in Söderhamn at the start of the venture. The Firsam project was initiated by officials of the municipality, prior managers of the Emerson/Ericsson plant in Söderhamn, together with researchers at the regional university at Gävle. In 2004 these three actor groups formed the RSN Firsam, which was set up as a project supported by the EU Regional Development Fund. The project idea was to bring to market the combined competence and capacity of the companies joining the Firsam network. The ultimate mission was to find a product idea to develop and produce jointly. Each company would be responsible for a step in the value chain. This demanded joint efforts in searching for new products, product development, marketing and financing. On Firsam's web site the mission was described by the catchwords 'from idea to the final customer in one chain' (see paper I for a thorough description of Firsam, its history and the region of Söderhamn).

The content of the interviews undertaken in 2004/2005 was steered towards firstly giving an adequate picture of the company that the respondent was representing; secondly, giving the respondent a chance to express his or her intentions when joining Firsam; and thirdly, portraying the expectations that he or she had of the Firsam collaboration. The respondents' prior experience of being involved in networks was also discussed and attempts were undertaken to form a representation of the respondents' general attitude towards networking. This material gave me an insight into the conditions that the Firsam project was faced with, and a picture of the individual managers' expectations on joining the project.

Based on these data I conducted in-depth interviews with the same individual managers in 2010 to follow up both the development of the Firsam project and the managers' personal development tied to the process of the Firsam

venture. The data were transcribed and sorted using open coding (influenced by Strauss and Corbin, 1998) into categories such as the marketing of the Firsam project, the trust generated within the Firsam project, and the selection of companies to be included in the project. Subjects referring to how the respondents viewed their own businesses were also categorized, such as the companies' view of their markets, their views of their unique selling propositions and their previous experiences of working within strategic networks. In preparing the material for paper III the data were sorted into subject categories referring to the three dimensions of the social capital concept (paper II). Secondary data such as protocols from meetings, official project descriptions, presentations on the official website and newspaper articles was also gathered and analyzed.

In addition to the qualitative data collected in the form of interviews, quantitative data were collected. The quantitative data analyzed in this thesis were collected by means of the questionnaire that was filled out by the respondents representing the companies included in the Firsam project in 2004. This questionnaire included questions regarding the respondents' current contacts with companies included in the Firsam project. The respondents filled out the questionnaire themselves in the presence of the interviewer so it could be collected immediately. In the questionnaire the respondents were asked to assess how often their own company worked together with the other member companies of the budding strategic network on a scale from 1 (not at all) to 5 (very often) (licentiate thesis, appendix 1). The same questions were asked to the same individual company representatives in 2010, but in some cases the names of the companies had changed, as some had been bought by other companies. The member companies were identified through aided recall as a list of company names was presented to the respondents (paper I, appendix 2).

The analysis of the data collected from the Firsam case resulted in the licentiate thesis and papers II and III. The analysis was primarily based on the social capital concept.

After this research had reached both theoretical and empirical saturation my focus shifted towards studying the concept of innovation in more detail, as accomplished innovation is the goal that is set by the eight EU structural fund programmes in Sweden which are the source of funding of RSNs (Tillväxtverket, 2010; Andresen, 2011). Although the term 'innovation' is very loosely defined in these policy documents (Tillväxtverket, 2010) the financing of the RSN projects rests upon achieving such processes. There is thus an obvious need not only to study the creation of innovative milieus but also complete innovation processes leading up to inventions being brought into use.

The Firsam project, analyzed in papers I-III, did not prove a success in terms of accomplished innovation. I therefore searched for an RSN that was both ongoing and also considered a success in terms of achieving innovation by regional policy makers and the media. In 2010 the manager of the RSN Future Position X (FPX) was awarded the title European cluster manager of the year by the European Cluster Excellence Initiative (ECEI), which is a club of professionals and institutions founded to promote cluster management excellence and to diffuse the adoption of its Quality Label among its members. In 2012 FPX was also awarded the gold medal by ECEI, which highlights increase of international and cross sector contacts. This put FPX among the top three Nordic European RSN collaborative ventures in the eyes of ECEI. In its region FPX can hence be considered a benchmark of successful RSN collaboration.

FPX is an RSN that focuses on geographical information systems (GIS), which is an application of information technology. It is located in Gävle, 200 kilometers north of Stockholm, Sweden (see paper IV for a more detailed description).

The data collection regarding the RSN of FPX started with an interview with the manager of the RSN collaboration. From that interview it was clear that the innovation process that had received most internal resources and had come closest to widespread use in the market (market interaction) was the development of a GIS technology called Crisis Information Sharing Platform (CRISP) (see paper IV). I set about interviewing the actors that were involved in this innovation process. The data collection concerning the FPX case of the CRISP platform included 24 in-depth interviews averaging about an hour (table 2). The interviews were transcribed and sorted using open coding into categories revolving around the three empirical settings described in the DPU model (see section 2.2).

Primary data were also gathered from secondary sources and analyzed, including such documents as project protocols kept by the FPX management group, report protocols directed towards the project funders, marketing materials produced for external use and peer-reviewed publications presenting the medical scientific aspects of the project (Yu Zhao, Cheng, Palm, Yan, Yan, Song, Zhao & Xu, 2012; Zhao, Yang, Palm, Yuan, Yan & Xu, 2012). These data were primarily used to describe the structure and time-line of the innovation process investigated in paper IV.

The three sets of interviews are summarized in Table 2, where the first column represents the interviews with the Firsam managers held by the research assistant in 2004/2005, the second column my follow-up interviews in 2010, and the third my interviews in the FPX network.

Interviews with respondents in 2004/2005 (Firsam case)			Interviews with the same respondents in 2010 (Firsam case)		Interviews 2012/2013 (Future Position X case)		
Re- spon- dent	Date (dd/mm/yyyy)	Du- ra- tion (min utes)	Date (dd/mm/yyyy)	Du- ra- tion (min utes)	Re- spon- dent	Date (dd/mm/yyyy)	Du- ra- tion (min utes)
1	01/11/2004	30	04/02/2010	65	18	29/03/2012	115
2	04/04/2005	50	04/02/2010	65	19	16/04/2012	60
3	03/11/2004	85	-----	---	20	19/04/2012	42
4	02/11/2004	45	01/02/2010	50	21	19/04/2012	72
5	10/04/2005	50	01/02/2010	60	22	09/05/2012	75
6	01/11/2004	30	02/02/2010	75	23	11/05/2012	60
7	06/05/2005	75	04/02/2010	70	24	14/05/2012	82
8	03/11/2004	80	03/02/2010	70	25	16/05/2012	40
9	03/11/2004	60	20/04/2010	75	26	23/05/2012	62
10	04/11/2004	60	22/04/2010	75	27	25/05/2012	111
11	04/11/2004	50	01/02/2010	60	28	29/05/2012	50
12	02/11/2004	60	02/02/2010	90	29	18/06/2012	60
13	10/04/2005	55	19/04/2010	50	30	09/10/2012	72
14	12/11/2004	70	02/02/2010	85	31	12/10/2012	51
15	29/10/2004	55	22/04/2010	80	32	22/10/2012	62
16	-----	---	22/04/2010	95	33	27/02/2013	130
17	-----	---	19/04/2010	50	34	19/03/2013	65
			15/01/2010	140	35	20/03/2013	42
					36	12/04/2013	59
					37	22/04/2013	56
					38	26/04/2013	70
					39	02/05/2013	80
					40	06/05/2013	70
					41	14/05/2013	73

Table 3. *List of interviews performed*

4.2 Methodological deliberations

The DPU model which I apply in paper IV stems from the inter-organizational network approach of the IMP research tradition. Within network theory the IMP school of thought views a network as depictions of an actor's bonds with other actors and how these influence how they perceive each other and form their identities in relation to each other; the activity links regarding technical, administrative, commercial and other activities of a company performed by these actors; and the resource ties connecting vari-

ous resource elements. Actors perform activities that modify the resources controlled by the actors. This actors-resources-activities model is often referred to as the ARA model (Håkansson & Snehota, 1995:26).

Lowe, Ellis and Purchase (2008) claim that ‘much IMP research describes these constructs as things with little consideration given to interaction processes and identity formation’. This would indicate that IMP network researchers mostly apply a ‘modernist, objectivist cosmology of substance’ (Gómez Arias & Acebrón, 2001). Chia (1999:219) claims that ‘any idea that network researchers can objectively and impartially observe symbols such as processes, actors and networks is an illusion’ and that researchers often believe that their network depictions are ‘self-evident representations of concrete social realities existing ‘out there’ ‘.

Lowe et al. (2008) suggest that one way to understand this viewpoint is by considering *The Treachery of Images* by the surrealist artist Magritte (completed in 1929). In the painting Magritte presents a picture of a pipe with the tag line ‘ceci n’est pas une pipe’ (this is not a pipe). This contradiction is understood when the observer accepts that the painting is in fact not a pipe but an image of a pipe. Lowe et al. (2008) claims that the same is true of ‘the sociograms portraying business-to-business connections’ which are often used in network studies. Therefore ‘naming a network as an entity brings it forward into ‘being’ or as structured and consequently reifies its enactment’. According to Lowe et al. (2008), this tendency to reification brings a failure in ‘incorporating the constructivism and postmodern approaches that are common within other fields of social sciences’.

This argument shows that many epistemological assumptions are formed when network studies are undertaken, and this is seldom properly addressed by researchers. Such criticism may be advanced both against the use of the DPU model in IMP research and against the use of the social capital concept in network research. A call for caution might therefore be voiced even if in recent years more attention has been drawn to constructivism ontologies within the IMP literature, as noted by Lowe et al. (2008). Methods such as discourse analysis, sense making and interpretative methodology are more frequently applied. The research field might therefore go beyond an objectivistic view of network formation and concentrate on the cognitive thought processes behind their network pictures (Lowe et al., 2008). Critical realism is emerging as a philosophical position of choice for the study of business relationships within the IMP tradition. According to Borg, Young and Munksgaard (2013), a growing number of papers incorporating this stance are purporting this position (Mouzas, 2001; Morais, 2003, 2010; Ryan & O’Malley, 2006; Sousa & Castro, 2008).

In line with this recent methodological development, my research serves to combine analysis of the structural identity of network sociograms (in terms of tie formation and subgroup cohesion) with the depicted actors' cognitive stance, as this would serve to go beyond a view that network structures are objective entities. This serves to connect the studied network structures to the subjective views of the involved actors.

Linking cognition with the more 'objective' structures of networks goes hand in hand with the epistemological approach of critical realism. Chalmers (1978) proposes what he calls a 'rough statement of realism with respect to science' as 'science describes not just the observable world but also the world that lies behind the appearances'. This viewpoint accepts that some of our reality might not be observable in a true sense of the word but is instead socially constructed by subjective actors. This resembles Godfrey and Hill's (1995:525) statement that '[t]he hallmark of realism is a belief that theories of science give us knowledge about the unobservable, and that under certain circumstances we may have good reason for believing statements about unobservable entities to be true. Thus realists are willing to take 'leaps of faith' regarding unobservables.'

Still, critical realism does not go as far as social constructivism in claiming that all that we can study in the world is socially constructed. Fairclough (2005) discusses critical realism in relation to human and social organization and argues that 'a critical realist position which is moderately socially constructivist but rejects the tendency for the study of organization to be reduced to the study of discourse, locating the analysis of discourse instead within an analytically dualist epistemology which gives primacy to researching relations between agency (process, and events) and structure on the basis of a realist social ontology'. Harré and Bhaskar (2001) for instance pose that 'one of the primary differences posited by constructivism versus critical realism is that constructivism maintains that social structures do not have active causal powers'. Thus, critical realists see social structures as real whereas constructivists do not (Peters, Pressey, Vanharanta & Johnston, 2013).

The social constructivist view that we can only observe reality through studying the discourse of actors creating meaning through their interaction is hence according to Fairclough (2005) a fallacy since the study of process and structure are left unproblematised in pure discourse analysis. Reality is hence emergent since it unfolds, and the world is therefore constituted prior to our understanding of it, and prior to our talk or knowledge of it (Bhaskar, 1998; Peters, Vanharanta, Pressey & Johnston, 2012; Westerhuis, 2007).

Since a critical realist approach embraces the possibility to study the unobservable entities of the world while still tying these unobservables to physical elements, such an approach is well suited to studies concerning regional growth from a socio-economic perspective. According to Jones and Murphy (2010) critical realism is 'not meant to ignore the physicality of social interaction but instead to transform the meaning of space's materiality such that it can be directly linked to its cognitive and relational aspects'. Jones (2009) gives the following example: 'conference rooms, kitchens, markets, factories, or trade fairs can be important 'containers' for practice but their significance lies not in the physical arrangement of chairs, machines, products, brochures, etc, but in the ways in which these objects are intertwined with, influential on, and shaped by intentions, perceptions, social patterns, power relations, and performances'.

Structure as an important issue in my research is hence used as a material issue but I only deal explicitly with this when it is tied to the cognitive aspects expressed by my respondents in the context of the collection of empirical data. The studied structure is represented through the quantitative data collected by the questionnaire and processed to form a depiction of the network of actors involved in the studied cases. The quantitative data serve to provide a depiction of the structure of social relations. This structure is in itself void of causality. Causality can be identified by connecting agency (found in the qualitative data) to structure. Since I do not interpret the quantitative data as providing innate causation I maintain a non-positivistic approach.

Jones and Murphy (2010) claim that 'the study of practice can complement existing explanations for economic-geographical phenomena by providing an analytical 'object' whose study can demonstrate how higher-order phenomena such as institutions, networks, class structures, and gender inequalities are enacted, reproduced, and/or transformed through the everyday actions embedded within them'. To focus on practice and how the focal actors enact this practice bridges the gap between higher-order phenomena such as institutions and socio-economic traits and the single actor's cognitive stance.

Studying the cognition of single actors and thereby using their practice to explain higher social orders implies a certain epistemological stance. Reckwitz (2002) claims that through this view of practice social order is created not through aggregations of individualized rational choices or by rules and hierarchies, but is cognitively and symbolically embedded in individuals, structures and within shared knowledge. According to Jones and Murphy (2010) this stance thereby enforces an epistemological strategy that 'is consistent in that a focus on the routine, everyday, and ordinary actions of indi-

viduals is used to provide critical insights into the social, cultural, political, and/or material factors that shape contemporary economic geographies’.

Jones and Murphy (2010) suggest that the way to overcome this analytical leap between higher social orders and the individual practice is to adopt ‘critical realist thinking’ because, as Lawson (1997) suggests, critical realism implies a more ‘fluid’ conception that ‘allows contingent historical premises and specific social conditions to produce hypothetical and conditional conclusions’. The focus on the study of process and structure coherent with critical realism (Fairclough, 2005) thereby aids the researcher in developing theories regarding higher social orders by studying the everyday practice of focal actors in a regional context.

Peters et al. (2013) similarly claim: ‘Sociology is not concerned with large scale, mass or group behavior (conceived as the behavior of large numbers, masses or groups of individuals). Rather it is concerned, at least paradigmatically, with the persistent relations between individuals (and groups), and with the relations between these relations (and between such relations and nature) and the products of such relations’ (Bhaskar, 1998:28–29). Hence Peters et al. (2013) claim that the realist position does not seek to reduce business networks to lower level explanations, such as individuals or psychology. Instead, critical realism engages in ‘explanatory reduction’ whereby a lower mechanism (such as a psychological mechanism) may be used to explain higher level phenomena (such as how groups enact practice).

Since my field of interest involves socio-economic and economic-geographical phenomena and combines this focus with studies of actor centered network analysis, the adoption of a critical realist thinking seems highly motivated. Particularly in paper III, my co-authors and I apply a multidimensional scope of analysis regarding the concept of social capital that serves to bridge the analytical gap between focal actors and economic-geographical phenomena. Social network analysis is placed in relation to higher social order phenomena such as cultural habits and institutionalized norms. Bridging the gap between these levels of analysis is well in line with the proposed critical realism approach described by Jones and Murphy (2010).

Ryan, Tähtinen, Vanharanta and Mainela (2012) claim that the inherent complexity of relationships and networks when studied over time is well suited for a critical realist approach because, as Goerner (1999) suggests, critical realism is not designed to ‘[u]ntangle [the] weave, but in keeping the tangle and looking at the patterns it produces’. Business network research shows interest in ‘the central questions of structural change and transformation’, and similarly ‘the critical realist conceptualization of such struc-

tures is not static, but changing based on continuous human agency' (Ryan et al., 2012). Hence, the incorporation of the critical realist approach enables business network research to investigate structural change as a consequence of human agency, thereby rejecting the more positivistic and essentialist views upon structure as self-contained and separated from the actions of individual actors.

The more static approach undertaken by positivist conceptualizations also makes studying changes in network structures over time conceptually difficult. Positivists view business networks as governed by law-like regularities that do not provide satisfactory explanations for change that occurs (Bhaskar, 1979; Porpora, 1989; Ryan et al., 2012; Sayer, 1992). The deficiency of positivistic methodological tools in examining processes has according to Halinen and Törnroos (1995) become a central weakness in current business marketing literature. Critical realism on the other hand sees the structural changes in networks as a product of individual agency and therefore in itself constituting a focal phenomenon in business network studies (Ryan et al., 2012). In light of the inherent benefits of critical realism there is evidence of a growing use of this epistemology within the study of business relationships and networks (Morais, 2010; Mouzas, 2004; Ryan & O'Malley, 2006; Sousa & Castro, 2010). The arguments for using a critical realist approach in the study of business relationships and networks mimic the arguments presented above regarding the need for bridging higher order social phenomena with actor oriented studies. Critical realism bridges the gap between the network structure and the higher social order on the one hand, with the individual's agency on the other. Thus, critical realism is suited for research proposing a marriage of these analytical levels.

I present network depictions of a studied network from two points in time, which enables me to analyze the structural changes that occurred. The rationale behind these changes is then explained using analyses of the individual actors' cognition, hence bridging the gap between higher social order and individual agency.

Although critical realism is well suited for the study of business relationships and networks, the application of such an epistemology leads to specific challenges. It is not an easy epistemology to apply as the language and the inherent concepts are impervious in nature (Danermark, Ekström, Jakobsen & Karlsson, 1997) and the need for theoretical consistency can both enable and constrain the researcher (Ryan et al., 2012). In dealing with these constraints Ryan et al. (2012) pose the question: 'How does the view that relationships and networks are 'real' affect our attempts to understand and explain them?/or what are relationships if they are not seen as 'real'?'. A common misconception of the realist position is that reality is confused with materi-

ality of objects or a naïve correspondence between a word and its referent object (Ryan et al., 2012). Critical realism however rests on the belief that 'there is a difference between business relationships 'out there' and our beliefs about them' (Ibid.).

Hence, reality is seen as something that may have a casual influence upon individuals and thereby cause events. Fleetwood (2005) gives an example that serves to clarify this idea of a casual reality. He claims: 'God may or may not be real, but the idea of God is as real as Mount Everest, because the idea of God makes a difference to people's actions'. By comparing Fleetwood's (2005) example with the example posed by Lowe et al. (2008) the critical realist stance towards networks starts to become clearer. Like the surrealist Magritte's painting of a pipe with the tagline 'this is not a pipe' it is safe to assume that the depiction of a network is not a 'real' network in itself, merely a picture of such. However, if this depiction of a network is manifested in the involved actors' cognitive version of their reality and consequently affects their actions, the depiction of the network influences the reality and therefore constitutes a fair reflection of real entities and takes on causal powers. Thus, business relationships and networks are seen as real structures that bring about new emerging properties that cannot be explained by merely analyzing individual actors in isolation (Bhaskar, 1979; Elder-Vass, 2005; Ryan et al., 2012).

In my research I therefore investigate how the studied networks relate to the focal actors' cognitive sense making and thereby give my network depictions causal properties. If these networks that I depict can be used to understand causal effects visible in the sense making of the focal actors, this elevates the studied structure as a real entity. If the understanding of a single actor is dependent upon understanding their structural relations to other actors, which is the case in network studies of business relationships, one must study the structures involved in the network depictions in order to create such understanding. Hence, a critical realist approach is explicitly opposed to reductionist objective methodological individualism (Elder-Vass, 2005) and consequently puts individual cognitive reflections of business relationships in relation to the social structure in which those relationships exist.

According to Ryan et al. (2012) several epistemological issues relate to the question 'what kinds of data should a critical realist be interested in and why?' Bhaskar (1998) claims that the starting point of a critical realist's approach to data collection is the rejection of a positivist view of causation as a constant conjunction of events. Causal laws are not found only in event regularities, and causality might therefore exist without event regularities (Bhaskar, 1998). Business relationships and network structures are fluent and ever changing entities with structures that both constrain and enable

what the involved parties can and cannot do (Håkansson, 1982). Ryan et al. (2012) therefore claim that ‘we can say that a business relationship has new emergent properties, not reducible to the properties of both parties in the relationship’. The properties that may be studied therefore give rise to new causal mechanisms and form the basis of the critical realist’s causal explanations.

Based upon this assumption there is no need for a researcher applying a critical realist approach to collect data about regular occurrence of events. Instead, researchers should concentrate on ‘open-system investigation of the changing nature of business relationships and industrial networks’ (Ryan et al., 2012). This notion rejects positivist claims of reliability and therefore does not restrict researchers to using statistically significant samples (Norris, 2007). Hence, Ryan et al. (2012) claim that critical realism is well suited to investigate heterogeneous structures such as business relationships and networks.

Instead, critical realist causal claims can rely on the notion of necessity (Sayer, 1992). If we understand why and what must be the case in a particular instance, it is neither possible nor necessary to further prove this point. Hence, Ryan et al. (2012) claim that ‘data integration both in source and nature is important’ and therefore suggest that ‘narrative interviews, archival documents and, if possible, observations should be collected’.

As to the problem of generalizability that so often faces the researcher undertaking qualitative studies there is often an assumption made that the findings of the research can be generalized from the sample group to the wider population (Easton, 2000). This view is often contested since a single case cannot produce enough data to explain the essence of the phenomenon itself. However, according to Ryan et al. (2012) this view is in contrast to the realists’ view on generalizability. Tsoukas (1989:556) claims that ‘within the realist paradigm, explanatory idiographic studies are epistemologically valid because they are concerned with the clarification of structures and their associated generative mechanisms, which have been contingently capable of producing observed phenomena’. In other words, generalizability does not rest within the essence of things in the realist perspective, but in the structures between them.

Hence, if logical causal explanation has been empirically derived in a case study then the constituents of that case provide the basis for developing theory beyond that single case (Easton, 2002). Since critical realist thinking does not rely on statistically significant samples in proving causality, case study research is often used in industrial marketing and network research (Visconti, 2009), and such research plays an ‘important role in theory development

within industrial marketing and the industrial networks paradigm' (Wagner, Lukasse & Mahlendorf, 2009:6).

My research rests upon single case studies, and drawing conclusions from such a data set is therefore well in line with my epistemological assumptions.

In my research both quantitative and qualitative data were collected. Bryman (2006) claims that if qualitative and quantitative methods are conducted in tandem, the potential of unanticipated outcomes is multiplied and unrealized potential in the data may emerge. In papers I–III the qualitative and quantitative data serve to complement each other, which according to Bryman (2006) is the most commonly used application in mixed-method design.

This varied source of data collection is well in line with a critical realist approach since the potential of unanticipated outcomes is important in the collection of data (Ryan et al., 2012). According to Greene, Caracelli and Graham (1989), complementarity 'seeks elaboration, enhancement, illustration, clarification of the results from one method with the results from another'. Our quantitative data serve to illustrate the focal actors' position within a network structure and the studied network's cohesion and density. These data are related to the qualitative data to analyze how the network structure or the network position of a focal actor might influence the cognition of the respondents.

As a follow-up to the question posed above, Ryan et al. (2012) pose the question 'What then, along with and beyond events, might critical realist research be drawn to in the study of business relationships and networks?' Sayer (1992) claims that a critical realist approach involves a gradual transition that links the actual, real and empirical domain 'from actions through reasons through rules and thence to structure'. Hence, Ryan et al. (2012) propose that a '[c]ritical realist will also be interested in a respondent's narrative accounts of events'.

Narratives offer 'data on deeper levels that helps our search for the generative structures that enable and constrain processes' and therefore enable analysis of the structures that cause relationships to form or dissolve the networks under investigation (Ryan et al., 2012). The data collected through in-depth interviews with the involved actors in the studied RSN and innovation project provide narrative accounts of the actors' experience of the social structure they are a part of. These narratives are pinned to the events in the actual domain represented by the limitations of the case study.

When investigating networks there is also the problem of identifying clear network boundaries (Halinen & Törnroos, 2005). The final research question

posed by Ryan et al. (2012) deals with this problem: when do we stop causal analysis? Ryan et al. (2012) claim that 'it is possible that there are no clear boundaries to a causal explanation of a particular business relationship incident'. Semitiel García (2006:11) points out 'as a network of agents and relations is embedded in a more complex one, social networks have no natural frontiers and, therefore, it is a methodological problem, faced by the researcher, to decide the boundaries and the relations to be studied'. Similarly, Ryan et al. (2012) pose that '[t]o overcome some of these difficulties in industrial marketing research a critical realist can make the distinction between 'internal relations' that change the properties of a business relationship (for example actor bonds and resource ties), and 'contingent relations' (for example hurricanes)'.

In my research, the focus is placed on specific RSN projects. The social relations and consequent effects of the characteristics of social capital in the regional socio-economic context therefore concern the members of this temporary meta-organization alone. The member companies' connections to actors outside these RSNs are not included. This puts a strong focus on 'internal relations' within the studied RSN and neglects 'contingent relations' to a large extent.

This is not unproblematic since it may affect my analysis of events and processes. According to Sayer (1992) a critical realist should focus only on the internal relations, which makes my limitations of my study well in line with my epistemological stance. Still, a many different mechanisms could affect the internal relations within a business network. Ryan et al. (2012) suggest that it is a problem facing the scientist himself in setting boundaries to critical realist causal explanations. 'The challenge for industrial marketing researchers is hence to find the essential mechanisms, which best explain the problem at hand, while disregarding the incidental mechanisms' (Ryan et al., 2012).

5. Conclusions

5.1 Methodological conclusions

In papers I–III a mixed-method approach is applied that incorporates qualitative and quantitative methods conducted in tandem. The quantitative data are analyzed using social network analysis and serve to depict the network structure that is formed by the relations among the participating actors in the studied RSN. This structure is put in relation to the qualitative data that portray the individual actors' subjective cognition and their interpretations of the processes within the studied RSN.

As critical realism is opposed to reductionist objective methodological individualism (Elder-Vass, 2005) and views individual cognitive reflections of business relationships in relation to the social structure in which those relationships exist, this highlights the link between individual cognition and network structure as the locus in which casual explanations are to be sought.

It is evident from the studies included in this thesis that there is a link between how actors view their participation in the studied RSN and their position in the studied network structure. The actors that were immersed in a cohesive sub-group expressed an unwillingness to interact outside their established social group, whereas actors holding a bridging position between two sub-groups expressed a higher willingness to merge existing groups. Since the data enabled a comparison between two points in time, the actors' rationale could also be tied to their actions and repositioning in the network structure. Actors immersed in sub-groups and unwilling to restructure existing relations formed fewer new relations, while actors with a less rigid network formed new relations more frequently. In this manner it became possible to explain how individual actors' cognition and network position interacted and how this in turn explained the development of new network configurations.

Sayer (1992) claims that causation in critical realist thinking follows 'from actions through reasons through rules and thence to structure'. In my research I traced the duality between individual thought and action and tied this to the development of structure. In a similar manner I found a connection between the actors' perceived network position and their actions. Thus,

the network structure constitutes a fair reflection of actual entities when applying critical realist thinking. The network structure in combination with the respondents' actions thus takes on causal powers.

The marriage between structure, cognition and causal effects visible in my research supports the rejection of the positivist view of causation as merely a constant conjunction of events (Bhaskar, 1998). The explanation of the development of the network structure was found in the analysis of the structure itself and in the involved actors' experience of this structure. Thus, this allowed me to put aside the need for constant conjunction of events to be studied in order to claim reliability.

Furthermore, my research has exemplified how business network research can investigate structural change as a consequence of human agency. Thus, my findings support the rejection by Ryan et al. (2012) of the more positivist and essentialist views of structure as self-contained and separate from the actions of individual actors. Studying the network structure alone would therefore not have offered me an insight into how the individual actors interpreted their positions in the structure and how this consequently affected the reconfiguration of the network.

When viewing causation as a consequence of the duality of network structure and individual cognition I also dissociate myself from the idea that the study of organizations should be reduced to the study of discourse. In social constructivism process and structure are left unproblematic based on the claim that all that we can study in the world is socially constructed (Fairclough, 2005). The connection between structure, individual agency and causation that I find in my research provides the network with properties as a 'real' structure, which elevates the studied relational structure above being the result of discourse alone. Thus, the social constructivist notion of reality as inherent in the discourse is not applied in this thesis. The structure mattered, and the studied discourse was a result of the network structure that set the scene for individual action to take place.

The derivation of causal effects from the study of structure in relation to individual cognition gave me insights into the design and development of the studied RSNs. These insights clearly show the relevance of applying a critical realist approach when studying inter-organizational networks and applying IMP theory and the growing number of papers incorporating critical realist thinking within this research field (Borg et al., 2013; Mouzas, 2001; Morais, 2003, 2010; Ryan & O'Malley, 2006; Sousa & de Castro, 2008).

5.2 Theoretical conclusions

The role of social capital for regional innovation has been highlighted by several studies of the knowledge-based economy (Capello & Faggian, 2005; Fromhold-Eisebith, 2004; Huber, 2009; Maskell, 2000; Tura & Harmaakorpi, 2005). Howells and Bessant (2012) even claim that the important social and cultural dimension of networks has been an area of ongoing cross-fertilization between researchers in management and geography. The study of social capital in the management of RSNs and highlighting the formation of social relations as important when building collaborative ventures seems highly justified. Still, even if social capital is considered critical in micro-clusters, few studies have examined how the concept has affected organizational acquisition of new knowledge (Inkpen & Tsang, 2005; Lowe et al., 2012).

A reason for this neglect of social capital might be that it remains a nebulous term. Causal mechanisms relating to specific dimensions of the concepts are left undefined since social capital is treated as an undifferentiated mixture of social dimensions (Hauser et al., 2007). The division of the concept into three separate but related dimensions made this mixture of social dimensions explicit and thereby addressed the conceptual difficulties that obstruct the use of the concept. The duality between micro and macro dimensions of social interaction inherent in social capital makes the concept useful when studying collaborative ventures undertaken with a regional focus. This duality makes it possible to capture the connection between higher order abstractions such as culture or regional traits and micro-level phenomena such as everyday practices and individual social relations.

An analysis of the relations an individual holds and connecting these relations to a more holistic network structure offers insight into the strategic value of the individual relations. Individual ties alongside structural holes in the holistic network structure offer different possibilities and challenges than ties that are stronger and integrated into a cohesive subgroup. Similarly, a dense network structure that is highly clustered around regional traits might favor a culture among its members that mimics the bonding form of social capital, whereas a less rigid network structure might impose both positive and negative effects of the bridging form of social capital on regional culture.

To capture the duality between different analytical dimensions it is consequently also of importance to consider both the positive and the negative effects that social capital can impose upon social relations, something that previous research often fails to do (Grabher, 2006; Vorley et al., 2012). Considering only the positive effects of social capital implies that several aspects

of social tie formation are lost. Ties enable but they also restrict, and sometimes the same tie will cause both of these effects at the same time. Thus, considering tie formation in a more holistic sense connects individual ties to network structures, and the formation of regional culture can become visible by extracting the higher order constructs from the micro level tie formation.

In table 4 the three dimensions of social capital are divided into the bridging and bonding form of social capital, and the positive and negative effects that these forms of social capital might impose on information flows are portrayed. The information flows form the basis for both social exchange and information exchange and thus for the potential of creating an innovative milieu. This table serves as a guide in conceptualizing the social capital concept in future research by making the concept more operational in empirical studies. My hope is that future studies will further test the connections between the dimensions and thereby aid researchers in managing the conceptual leap from individual agency to higher order social concepts.

	Bridging form of social capital		Bonding form of social capital	
	Positive	Negative	Positive	Negative
Socio-economic Dimension	<ul style="list-style-type: none"> • High adoption of new knowledge and critical thinking. • High tolerance for minorities. 	<ul style="list-style-type: none"> • Low cultural proximity. • Lack off cultural we-ness. 	<ul style="list-style-type: none"> • High cultural proximity. • High sense of shared values and trust. 	<ul style="list-style-type: none"> • High social conformity and conformative thinking. • High exclusion of dissidents.
Structural Dimension	<ul style="list-style-type: none"> • Formation of weak ties enables information flows between subgroups. • Low network density may cause structural flexibility. 	<ul style="list-style-type: none"> • Low density of network structure may hinder information flows. • Uneven distribution of network ties may cause high power centrality leaving the network structure vulnerable. 	<ul style="list-style-type: none"> • High density of network structure may facilitate information flow. • Even distribution of network ties may reduce centrality of power making the network structure stable. 	<ul style="list-style-type: none"> • High density of network structure may cause information feedback within subgroups. • High density of network structure may cause network rigidity, hindering network evolution.
Actor-oriented Dimension	<ul style="list-style-type: none"> • Bridging structural holes enable an actor brokering opportunities of novel information. • Knowledge brokering enable an actor to control the information flow bringing favorable power relations. 	<ul style="list-style-type: none"> • Weak ties produce flows of information irrelevant to an actor's context. • High reliance upon single weak ties makes an actor's knowledge flows vulnerable. 	<ul style="list-style-type: none"> • Strong network ties secure an actor rich information flows of highly context specific information. • High structural equivalence lessens an actor's dependence upon individual ties. 	<ul style="list-style-type: none"> • Clustering of an actor's network ties cause structural equivalence eroding the value of its ties. • High rigidity of an actor's network configuration hampers its ability to form new ties.

Table 4. *Dimensions of social capital divided by the positive and negative effects of its bridging and bonding form on information flows.*

5.3 Implications for management and policy

The adoption of the cluster concept in regional growth policies has inspired much criticism (Benneworth & Henry, 2004; Lagendijk, 2001; Parker & Ekelund, 2011; Smout, 1998; Tappi, 2005; Taylor, 2010; Taylor & Leonard, 2002). Still, Taylor (2010) argues that the cluster model has become a mantra and a prescription for policy makers to apply when formulating strategies for achieving regional growth. I argue that the cluster concept applied in regional growth strategy and the consequent formation and management of RSNs fail on two major points: they fail to consider the social context and they imply too linear an approach to innovation.

The claim that context matters seems to be an attempt to push at an open door, especially when it comes to regional development. In economic geography, and in regional innovation studies, space and place are central concepts. In management studies of inter-organizational networks, context is less central but still remains an issue that prior studies have considered quite extensively. Still, when the cluster concept changes from being a model explaining agglomeration of business in space towards becoming a recipe for achieving such agglomeration, the notion of context gets lost along the way. The cluster model was never meant as a recipe that could be applied in just any region. Regional traits differ; what works in one region might be detrimental in another. Thus, investing considerable amounts of money (approximately €0.9 billion over a 6 year period in Sweden alone) in the design of RSNs might be putting too much faith in a model whose application is far from undisputed. After all, the realization of these policy goals requires skills rather than resources (Glavan, 2007) and policy makers have not been given much advice on how to achieve these goals (Sotarauta, 2010).

So what is social context and how can it be conceptualized to fit into the management and design of a RSN? In this thesis I have focused on the relational aspects of building the prerequisites for regional growth. Social capital has been hailed as the missing link (Grootaert, 1999) which goes beyond traditional forms of economic capital and ties relational aspects to value creation (Dasgupta & Serageldin, 2000; Francois, 2002; Isham et al., 2002). Also, the social and cultural dimension of networks has been an area of ongoing cross-fertilization between researchers in management and geography (Howells & Bessant, 2012). Using social capital as the concept to tie together regional traits of social context with managerial issues regarding the management of RSNs hence seemed appropriate.

Conceptualizing context through the use of social capital makes it possible to consider not only higher order social concepts such as culture and regional habits, but also holistic network structures and individual ties between focal actors. The plasticity of the social capital concept thus makes the management of a multitude of social relations possible, which is a prerequisite for managing an RSN (see table 4). If the set goal for the management of an RSN is to pave the way for an innovative milieu by encouraging new knowledge flows it might be wise to try to loosen up or even dissolve existing network structures. A socio-economic dimension influenced by the bonding form of social capital might hamper such attempts. Still, such a milieu might elevate the importance of making existing network structures more loosely coupled since the milieu might be struggling with social conformity.

On the other hand, if the set goal of an RSN is to administer close cooperation between already integrated actors it might be beneficial to further strengthen already existing network structures. Thus, the manager avoids damaging the trust and relational proximity that these network structures have imposed. It is logical to assume that cooperation aiming at reinforcing existing network structures will be quick from design to functionality since social capital in this instance works as both glue and lubricant. However, the potential for innovative thinking is lower since novel network configurations might be hampered by existing structures.

Considering the goals for the RSN, and setting these goals in relation to the three dimensions displayed in table 4, can aid a manager of an RSN in achieving set goals. The context is taken into account and the high abstraction of social capital is reduced by breaking it down into more manageable dimensions.

Besides the tendency to neglect the social context in designing RSNs, the linear approach towards innovation is also a problematic issue in policy initiated regional growth. When considering innovation as not merely a single company's R&D endeavor, new challenges for achieving innovation emerge. Considering Van de Ven et al.'s (1999) definition of an innovation, the context yet again becomes vital.

However, the innovation context must include more than merely social relations and the knowledge flows that such connections might produce. The definition of innovation by Van de Ven et al. (1999), together with the seminal works by Penrose (1959), posit value creation as inherent in the combination of heterogeneous resources. Thus, an invention must fit with the resources that already exist within the market in order to reach widespread use and become an innovation. Hence, knowledge flows are not enough; a man-

ager of an RSN must work to facilitate resource interaction between its members considering all sorts of physical as well as immaterial resources. The members must work together to make their resource interfaces compatible and adapted to the subsequent market in which their invention is supposed to be integrated. Hence, a manager of an RSN must go beyond a linear view of innovation and realize that innovation takes place not within single organizations but in mutual adaptation between many organizations. Also, the manager should realize that innovation does not occur outside of the market, but in the relations that form the market since the market is embedded in social relations (Granovetter, 1985).

The DPU model (Håkansson & Waluszewski, 2007) considers the various settings that an invention must be adopted by in order to become an innovation. From my research it can be concluded that the producing setting, consisting of the established producer structures in which an invention must fit, was neglected in the studied innovation process (paper IV). This was due to the policies dictating the funding of the RSN, which may indicate that this problem is systemic and goes beyond the FPX case that I investigated. Further research might shed light on the connection between the policies and the tendency to neglect the producing setting. However, I believe that a manager of an RSN must consider the developing, producing and the using settings when getting involved in policy initiated innovation processes. To neglect one of these settings will make the adoption process of a new invention exceedingly difficult.

Solely focusing on the developing stages without considering the impact that the invention may have upon the existing resource structures in the producing stages jeopardizes the market integration of the invention. Moreover, the existing investments made by actors within the using setting must be analyzed in order to ensure that the proposed innovation will fit into the context in which it is to be utilized. This is particularly important when academic institutions dominate the development setting within the policy initiated innovation process. In the studied case (paper IV) it is evident that the invention was considered successful since it reached scientific use. However, interaction between a business producing and using setting was largely ignored and therefore not reached. Yet again this highlights that the context in which the invention is supposed to fit matters as science and business are based on different logics of use.

5.4 Concluding thoughts regarding policy initiated innovation

5.4.1 Regulation at the supranational level

This thesis builds upon the notion of ‘social systems for innovation development’ (Fagerberg, 2004) influenced by Van de Ven et al., (1999), who claimed that ‘popular folklore notwithstanding, the innovation journey is a collective achievement that requires key roles from numerous entrepreneurs in both the public and the private sectors’. This notion calls to attention the analysis of the relationship between innovation activities in firms and the wider framework in which these activities are embedded (Fagerberg, 2004). Innovation is seen as an interactive process (Kline & Rosenberg, 1986) and this has consequently inspired the concept of national innovation systems (NIS). Lundvall—deputy director of the OECD Directorate for Science, Technology and Industry (DSTI) in 1992-95— has been arguably the most important protagonist of the NIS concept and his affiliation with the OECD Secretariat has enabled him to produce several reports that looked at flows and forms of transactions among institutions (Godin, 2006). These institutions include such concepts as clusters, networks and mobility of personnel (OECD, 1995, 1997, 1999, 2001a, b, 2002). OECD has always looked for conceptual frameworks to catch the attention of policy makers and it is easy to trace the impact that the NIS concept has had on the policies formed by the European Union to encourage innovation (Godin, 2006). The structural funds (, 2007) are the EU’s main tool for encouraging economic growth in peripheral regions and thereby implementing economic cohesion among its member states. These structural funds are to a large extent based on the notion of NIS (Bachtler, 1997; Dumčiuvienė, 2011; Farole, Rodríguez-Pose & Storper, 2011), and €347 billion has been allocated for these funds for the period 2007-2013, making it the greatest area of commitment within the EU budget, greater even than the Common Agricultural Policy (CAP) (Farole et al., 2011). These policies have promoted the design of more than 1,000 innovation clusters in Europe (Sölvell, 2009) making the policy of creating business agglomerations for the purpose of achieving innovative behavior the European Union’s major concern.

The main intent behind the structural funds is to encourage innovation in peripheral regions in order to implement economic cohesion among EU members. There have been several studies that investigate whether these policies have encouraged such cohesion (Farole et al., 2011). Most researchers find that the EU development effort since the 1989 reform of the Structural Funds has had almost no impact (e.g. Boldrin & Canova, 2001; Dall’Erba & Le Gallo, 2007; de Freitas, Pereira & Torres, 2003; García-Milá

& McGuire, 2001), some find the impact to be limited (e.g. Bouvet, 2010; Bussolletti & Esposti, 2004;), and very few studies suggest that it has been a success (e.g. Cappelen, Castellacci, Fagerberg, & Verspagen, 2003). Even Lundvall (1992:6), whose work at the OECD helped to introduce the NIS concept into the Structural Funds, raises a critical voice, 'the most relevant performance indicators of NSI should reflect the efficiency and effectiveness in producing, diffusing and exploiting economically useful knowledge. Such indicators are not well developed today'. OECD itself admits: 'there are still concerns in the policy-making community that the NIS approach has too little operational value and is difficult to implement' (OECD, 2002:11).

There are many reasons not only to question the introduction of the cluster concept into economic policy (see the introduction of this thesis) but also the focus on innovation. Rehn and Vachhani (2006) claim that 'innovation management has fetishized the moment of innovation (the assumed 'original value event') as having an essential value that can be understood as freed from the process of valorization'. This entails that innovation is seen as something that holds value in itself, regardless of the actual value that society might be able to extract from its implementation. Innovation becomes an object of idolatry and a discourse is cemented that praises the creation of 'new' and its subsequent entrepreneurial activities (Jones & Spicer, 2005; Rehn & Taalas, 2004; Rehn & Vachhani, 2006). When a buzzword becomes a fetish in this manner it becomes immune to criticism, and economic policies seem to become implemented without much thought. Creating the prerequisites for innovation is put at the forefront and the kind of innovation that results seems less important. Considering the phrasing of policy documents, it seems to be enough to emphasize that something is an innovation to turn it into something useful for society at large.

OECD (2002) has concluded that the NIS approach has too little operational value and is difficult to implement. The findings presented in this thesis paint a similar picture, and I posit that investments in similar activities should be made with more care than has been shown so far. However, looking at the two cases presented in this thesis it is clear that the studied RSNs brought with them some changes in the regional economy and created some interesting results, although these results did not include creating innovation as defined in this thesis.

The study of the RSN of Firsam showed how reconfiguration of the network of included economic actors created not only new network configurations but also a new environment more conducive towards innovative behavior (papers I-III).

Innovative behavior is in this thesis defined as creating the prerequisite for innovation to be formed rather than working with the actual process of innovation. No innovation processes were formed in the Firsam case, which steered the attention towards studying the facilitation of future innovative behavior.

In the case of FPX an actual innovation process was studied although innovation failed to materialize. FPX played a role in the development of the studied technical invention and therefore conclusions regarding managerial issues within policy initiated innovation processes could be drawn. It is also important to mention that the Firsam RSN was active for 6 years and the studied innovation process within FPX spanned over a 5 year period. Innovation is a non-linear process and it is difficult to forecast when or if an invention will reach widespread use. The findings of this thesis subsequently focus on offering managerial conclusions of how to implement an RSN strategy rather than discussing or assessing the policy implications of RSN funding. The study of the managerial issues regarding RSN strategy is still very much in its infancy and since the European Union's policy regarding innovation has led to more than 1,000 innovation clusters in Europe alone (Sölvell, 2009), I would suggest that researchers pay more attention to these managerial issues in future studies. I think it is notable how much money is being spent in relation to how little research is being conducted in the field of managing RSN projects.

5.4.2 Practice at the regional level

The two studied cases were very different and my intention was not to undertake a comparative case analysis within the confines of this thesis. Instead I favored highlighting the complementarity of the cases. Nevertheless, I wish to mention some of the major differences between the two studied cases (Table 5). These concluding thoughts are intended to emphasize the results that a lack of formulated strategies from policy makers can impose. There is a lack of advice on how to implement the cluster notion into concrete RSN projects (Sotarauta, 2010) and this lack plausibly contributes to the wide array of different strategies among RSN managers.

Aspect	The Firsam RSN	The FPX RSN
Goal of the RSN	Linear process focused goals entailing manufacturing of goods	Knowledge and research focused goals entailing development of services and technology
Role undertaken by the RSN managers	Passive	Active
Innovation process focus	Production	Development, Use
Industrial scope	Narrow	Wide
Geographical scope	Regional	International
Number of concrete invention projects	Low	High

Table 5. *Comparing the RSNs of Firsam and FPX*

The goals for the two studied RSNs differ in many respects which subsequently impose different strategies on the managers. In the Firsam RSN the ultimate mission was to find a product idea to develop and produce jointly, where each company would be responsible for a stage in the total value chain (see figure 7 in the licentiate thesis). The Firsam goal was described with the catchphrase ‘From idea to the final customer in one chain’. The steps in the described value chain focused primarily on the manufacturing of products and the Firsam goal was therefore geared towards forming a chain-like and linear process of technical development of physical goods. The goal of FPX was less formulaic and also left more room for the development of services. The goal for FPX was formulated on its website as ‘To be an independent arena for testing, development and marketing of geographic information services and knowledge’, which puts a focus on ‘services and knowledge’ rather than ‘testing, manufacturing and assembling goods’.

This difference in focus can be related to the background of the managers involved. The directing manager of the Firsam project was the factory manager of the Emerson (formerly Ericsson) plant prior to his involvement in the Firsam project, and therefore had a background in managing the manufacturing of electronics goods for the telecom industry. The goal formulation of a linear process or ‘value chain’ geared towards the development of physical goods subsequently derived from the manager’s experience in managing such processes. The directing manager of FPX had a background in media, design and marketing and also founded a research institute focusing on the development of information technology. It is therefore no surprise that the goals of the FPX project focused on the development of services tied to GIS technology and that the FPX strategy resembled a research project rather than a linear manufacturing process. The Firsam RSN subsequently focused

on the production of goods while FPX applied a strategy dedicated to the development and future use of new services.

When comparing the roles undertaken by different managers in relation to the development of the RSN strategies it is evident that they faced different criticisms from their members. The management of Firsam was described as passive and the respondents expressed a need for the Firsam managers to act as hands-on projects managers on the development projects they initiated. The management of FPX was considered to be active project leaders in gathering the resources needed to implement the initiated projects. However, they were described as implementing projects that were too focused on research and the business aspect of the projects was consequently ignored. It can be concluded that the linear process focus that Firsam applied with regard to their goals infused an expectation among the members that they would be more hands-on in steering the projects, while the focus on knowledge creation within FPX did not. FPX however struggled to communicate the future commercialization opportunities associated with their projects, which might be related to their focus on creating abstract knowledge. Future research regarding the connection between goals and strategy within RSNs could serve to better answer this question.

Firsam was struggling with creating appropriability in between the two groups consisting of electronics companies and manufacturing companies. There was a lack of understanding of each other's technology and general business ideas which hindered knowledge exchange between the groups. Firsam struggled with finding a common technology which could join the actors together in projects with easily communicable mutual benefits. Within the FPX project the common denominator was the GIS technology which was described by the members as easily adaptable to suit a wide range of business interests. The core value of GIS technology was described as rather easy to communicate, and was summarized in the FPX tagline 'decision by position'. Most respondents expressed that they could see benefits of using GIS technology within their business operations even if their main core competence and business idea did not rest upon GIS technology. GIS technology became a loosely defined entity to gather around rather than an issue concerning a particular interest group or industry. FPX also consisted of members from a wide variety of industries with a core of companies whose major business entailed GIS technology development. Firsam concentrated on two major industries: telecom electronics and manufacturing. This notion poses interesting questions for future research regarding comparative case studies investigating the bridging and bonding forms of social capital in RSN design. The benefits and obstacles posed by forming heterogeneous or homogeneous groups in terms of industry, or imposing exclusive or inclusive

technological projects, will be an interesting field of research within studies of social capital.

The innovation process of the CRISP platform described in paper III of this thesis portrays how FPX worked together with actors from several different countries. FPX has members and offices in several different countries even if the management and most of the involved actors are based in Gävle, Sweden. The testing of the ISS applications of the CRISP platform was predominately located in rural China and India and it is within these organizational and cultural structures that the project was run. Firsam however, had a much more regionalized focus. The idea behind initiating the RSN came from an expressed need to compensate for the loss of employment opportunities within the Swedish municipality of Söderhamn. Two major employers, the world leading manufacturer of telecommunications systems Emerson and the military airbase F15, had closed shop within a five year period, leaving a sense of urgency among the inhabitants of Söderhamn. The expressed purpose of the Firsam RSN was to compensate for these losses by combining the knowhow left in the region from the closing of Emerson with the regional manufacturing companies.

The difference in geographical focus between the two studied RSNs serves to question the term ‘regional’ in the RSN concept. Some of the companies involved within the Firsam RSN had international business partners but the focus of the RSN project was regional, while the projects initiated by FPX had international reach. Since the purpose of the regional innovation strategies funded by the Structural Funds is geared towards creating regional economic growth it might be wise to question where the value of the initiated projects really ends up. Future research might pose the question whether investments in an RSN will give economic benefits back to the regional business climate or if the created value will be exported to the global marketplace. Rehn and Vachhani (2006) suggest that innovation has been given an intrinsic value regardless of its actual process of valorization, and this notion might explain why the expressed goal of achieving innovation in RSNs do not consider where the value of these innovations really end up. Critical studies by researchers might help to highlight the possible consequences of this problem further.

5.4.3 Connecting the two levels

The link between common ground for cooperation between RSN members and the imposed strategy behind the RSN will be a research question of increased interest as the policy of the EU2020 is implemented. These new policy documents rest upon the concept of ‘smart specialization’ and will require new strategies for the implementation of the EU Cohesion Policy

2014-2020 and its subsequent Structural Funds on national and regional level. Smart specialization includes that future funding by the Structural Funds will favor business agglomerations based on a thematic reasoning rather than on industry segmentation (McCann & Ortega-Argilés, 2013). People responsible for designing the regional innovation strategies are encouraged to undertake ‘entrepreneurial search processes’ which will serve to find different themes of sectors and businesses that are prevalent for the region and represent the strength areas of the regional business life (McCann & Ortega-Argilés, 2013). This will help the regional innovation policy to focus on their key sectorial strengths where there is a realistic opportunity to be a global player, recognizing that not all areas will have potential for growth in the same sectors (Brynhildsen, 2013; European Commission, 2012). It is too early to identify the impact that this new policy will have on the formation of regional innovation strategies around Europe and the formation of future RSNs, and this question is therefore left for future research. It is however clear that there is a shift in policy that favors strategies that span industry borders and serves to connect actors from different business and technological backgrounds. This tendency might elevate the need to further the discourse regarding bonding versus bridging forms of social interaction in future research, much in line with the content of this thesis.

In conclusion it is apt to posit that the RSN of FPX initiated more concrete innovation processes than Firsam. This thesis has not focused on answering the question of why this is the case. Different RSNs operate under different conditions and in different contexts and the main purpose of the thesis has been to emphasize this point. When considering both how an RSN’s management can create the prerequisite for an innovative milieu and how resource interaction within a single policy initiated innovation process can be supported, the regional context has proved to be of importance. This thesis has served to offer managerial conclusions towards how the design of a RSN can be conducted, but if I were to leave the reader with some suggestions on policy it would be to seriously scrutinize whether generic solutions to non-linear and interactive processes such as innovation really can be implemented with success. The cluster model that spurs the establishment of RSN collaboration is often seen as a recipe that can create economic growth regardless of context. It is widely accepted that if investments are made, and the policy structures are enforced, regional economic growth will follow. However, I believe that attention must be paid to the social structures that form the context in which the RSN is to operate. Moreover, if innovation is to be achieved it must fit into existing structures of prior investments. Borrowing the words of the parable of the sower it can be said that it is not as easy as merely sowing the seed; it must also fall in good soil.

A farmer went out to sow his seed. As he was scattering the seed, some fell along the path; it was trampled on, and the birds ate it up. Some fell on rocky ground, and when it came up, the plants withered because they had no moisture. Other seed fell among thorns, which grew up with it and choked the plants. Still other seed fell on good soil. It came up and yielded a crop, a hundred times more than was sown. When he said this, he called out, 'Whoever has ears to hear, let them hear.' (Luke 8:5-8.)

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