A GUIDE IN THE RAIN FOREST? – THE ROLE OF A REGIONAL STRATEGIC NETWORK IN AN INNOVATION PROCESS

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Competitive paper

Studies of innovation systems emphasize the interactions between various factors that influence a country's innovation and growth performance. Within this context collaborative projects such as regional strategic networks (RSN) make up an important part of a regional innovation system. A RSN can be defined as cooperation projects involving companies in a regional setting which with the support of public agencies and other organizations strive to promote innovative network structures. In this paper I describe what hindrance and driving forces a RSN meet while attempting to make interfaces between developers, producers and users compatible. The innovation process investigated in this paper suggests that the strategy imposed by the RSN enabled the studied inventions to travel across the interfaces, but some problems remained regarding the integration of the different empirical settings investigated. Hence, a RSN can play the role of communicator between the interfaces but integration will not automatically follow. Knowledge flows between academia, the public sphere and business can hence be aided but resource integration is much harder to achieve.

Keywords: Strategic Networks, innovation processes.

INTRODUCTION

Today economists studying economic growth are in agreement that technological innovation is the key driving force (Nelson 2008:4). Encouraging companies to collaborate in regional strategic networks (RSN) is a common strategy used by municipalities to promote innovation and regional growth in peripheral regions (Cooke, 2007; Sölvell, 2009; Coletti, 2010). A RSN can be defined as cooperation projects involving companies in a regional setting which with the support of public agencies and other organizations strive to promote novel network structures (Hallén & Johanson, 2009; Eklinder-Frick et al., 2011). Local institutions take on the role of intermediaries and provide regional firms with new information and knowledge thereby supporting innovation (Camisón, 2004; He & Fallah, 2009; Camisón & Forés, 2011; Evers et al. 2010). Arikan (2012) portrays a similar logic where inter-firm knowledge exchanges might get amplified in a cluster of firms, which in turn lays the foundation for innovation. Hence, "establishing new clusters and promoting more regional cluster policies since clustering seems to provide better and positive inter-firm interaction" may "result in more innovative marketing strategies" (Felzensztein, Gimmon & Aqueveque, 2012). 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". Hence, there is an established strategy of creating prerequisites for innovation by encouraging regional firms to network. Still, Möller, Rajala and Svahn (2005) pose that "more knowledge about the organizational arrangements and managerial practices in nets aiming to create radical technological innovations and new business concepts is needed".

Studies of innovation systems particularly emphasize the interactions between the various factors that influence a country's innovation and growth performance (Nelson, 1993; Lundvall, 1992; Fagerberg, 2012; Martin 2012). Collaborative projects such as a RSN make up an important part of a regional innovation system. An innovation system constitutes a "new and more holistic perspective on the roles of policy, governance and institutions for innovation" (Fagerberg, 2012) and often such a perspective involves the notion that closer collaboration between these instances is needed. The concept of 'Triple Helix' (Etzkowitz & Leydesdorff, 2000), rests upon the idea that developing relationships between universities, industry and government are vital in encouraging innovation and regional growth. In this context, universities are seen as playing a central role in the knowledge economy and in the creation of innovation systems (Martin 2012).

In order to strive towards creating the prerequisites for innovation within an innovation system, it is vital to define the concept of innovation in itself. According to Van de Ven et al (1999) there is a difference between the achievement of an invention and an innovation. 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 within the organizational and physical structures needed to enable its utilization (Fagerberg, 2004; Van de Ven et al 1999). "The innovation is thus the invention in use" (Ingemansson, 2010:13). The hallmark of a successful innovation is therefore not only dependent on its technical novelty and the idea in itself, but also to how well the novelty fits its surrounding context.

Håkansson et al (2009) suggest an interesting metaphor when comparing the interaction processes visible in a marketplace to the complex ecosystem of a rain forest. In the ecosystem of the rain forest the "overview and visibility are limited due to the relatedness, dynamics and variety of phenomena where interactions are fundamentally complex and complementary in nature" (Håkansson & Olsen, 2012). An invention must in other words fit into the ecosystem of the market in order to become an innovation; solely enabling knowledge transfer is not enough. Hence, there is a lack of confidence in the idea that investment in knowledge production automatically leads to the development of new technology, which in turn will be absorbed by the business world where it will create economic growth (Waluszewski, 2006). Merely enabling connections between science institutes and business actors, which is often the focus within a regional innovation system, might therefore not be enough to create innovation.

PURPOSE

The function of an innovation system in bridging science producers and business users are of particular importance (Waluszewski et al, 2009). But studies of business users in a business setting show that this bridging process is a particularly complicated matter. Any new solution will meet a context of already existing and elaborated patterns of tangible and intangible resources and these resources relate across organizational borders and have developed organically over time and space (David 1985; Sturgeon 2000; Håkansson & Waluszewski 2007). Especially crossing the institutional settings between science and business may prove to be a challenging task and will consequently entail different patterns of how innovations are adopted and used (Van de Ven et al., 1999; Waluszewski et al., 2009; Lundberg & Andresen, 2011). Science and business may at times have conflicting goals that will consequently affect their ability to interact successfully (Waluszewski et al., 2009). The triple helix concept rests upon successful knowledge transfer between these actors (Etzkowitz & Leydesdorff 2000), as do a well-functioning innovation system (Cooke et al., 2000, 2004). It is hence of importance to bridge this gap through creating avenues of interaction between business and science. One such example is the design of regional strategic networks that often incorporate both universities and various business actors. But to merely create avenues for interaction is not enough, in order for innovation to form there must also be some form of resource integration between the involved actors (Håkansson & Waluszewski 2007; Waluszewski 2006; Van de Ven et al., 1999). Håkansson and Olsen (2012) claim that "In order for innovations to materialize, there is a critical need for some type of multi-functional, managerial network capable of recreating simplified and conceptual unity and a sense of direction while also managing the complexity, extendedness, ambiguity and multi-contextual challenges across the many complex interfaces". A RSNs purpose might fit into the criteria of being such a "managerial network" which Håkansson and Olsen (2012) claim is a prerequisite for a successful innovation processes. Hence, the purpose of this paper will be to analyze how a regional strategic network can make the interfaces compatible between business and science and thereby enable a technological invention in becoming an innovation by integrating it into its context.

The empirical data presented in this paper consists of a case study of the regional strategic network Future Position X (FPX). Between 2007 and 2013 FPX promoted an innovation process developing a GIS software application named CRISP. This technological platform was subsequently used in several other software applications involving private, public and academic actors.

This paper will hence investigate the hindrance and driving forces that a policy initiated innovation process will encounter when undertaken within the context of a regional strategic network.

LITERATURE REVIEW

Innovation systems and regional strategic networks

According to Tödltling and Tripple (2011) the regional innovation system (RIS) concept builds upon the interactive innovation model (Kline & Rosenberg, 1986), as well as on other schools of interactive innovation such as the milieu concept (Camagni 1991) and the studies of knowledge interdependencies in high-tech regions (Saxenian 1994, Keeble & Wilkinson 2000). The RIS conceptualizes innovation as an evolutionary, non-linear and interactive process, where the communication and collaboration between firms, universities, innovation centers, educational institutions, financial institutions, standard-setting bodies, industry association and governmental agencies are vital (Edquist, 2005 Arana et al. 2007; Berasategi, 2011; Martin, 2012). Both "hard" and formal institutions such as laws and regulations, and "soft" institutions such as such as practices and norms are taken into account when analyzing the interaction between these various actors. This associates RIS with the institutional school of thought, which according to some researchers has made the concept "fuzzy" (Doloreux &Parto, 2005; Tödtling & Trippl, 2011). Hence, RIS concept incorporates the study of the interaction between a heterogeneous field of actors and their respective institutional behavior that in turn threatens to weaken the concepts clarity.

According to Tödtling & Trippl (20011) "it is argued convincingly that the regional dimension is of key importance", as regions differ in regards to industrial specialization patterns and their innovation performance. Also, the importance of tacit knowledge (Polanyi 1966) and knowledge spill-overs (Audretsch & Feldman, 1996) cannot be underrated in forming the RIS, and these concepts are often bounded by geographical proximity. Easton (1992:19) claims "governments may only be able to achieve their policy objectives by seeking to strengthen, weaken or restructure relationships per se". Hence, forming collaboration project between these subsystems is a common strategy used by municipalities to promote innovation and is hence vital in forming the policies that will spur innovation processes (Lundberg & Andresen 2012). Such cooperation project will often focus upon one particular technology or business field and entail a set amount of actors with a shared geographical proximity (Hallén & Johanson, 2009). These projects are defined as regional strategic networks (RSN) and entail cooperation among companies in a region which, with the support of public agencies and other organizations, strive to promote innovative network structures (Hallén & Johanson, 2009; Eklinder-Frick et al., 2012).

It is apt to view a RIS as the macro system that sets the scene for the strategic application of a RSN. Hence, this emphasis of RSNs as being the strategic tools used by policy actors in achieving collaborative exchange separates a RSN from a RIS (Cooke, Boekholt & Tödtling, 2000; Tödtling & Trippl, 2011) and from geographical clusters (Porter, 1990; Vatne, 2011). RSNs show more organizational traits such as clearly defined membership and a management group or hub responsible for designing the collaboration between the selected members (Gebert-Persson, Lundberg & Andresen, 2011; Lundberg & Andresen, 2011). Moreover, a RSN have more explicit and defined goals than a RIS, even if these goals often develop exploratory during the projects lifetime (Gebert-Persson et al., 2011). The development of the RSN is therefore less organic and more strategically designed than RIS and clusters (Hallén & Johanson, 2009). To put emphasize on the term "strategic" in the RSN concept if hence of importance. 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". There is in other words some form of ambition to exercise control and thereby influence the activities and actions of others (Gadde et al., 2003), which yet again highlight a RSN as a tool being used by policy actors to actively influence the formation of new collaborative patterns. However, the public funding used for employing someone taking care of coordination and administrative work is often only provided for a couple of years at a time (Lundberg & Andresen 2011). This constitutes a challenge in itself since the development of relationships is often based upon longstanding sequences of interaction (Håkansson & Johanson, 2001). A RSN can be described as a project with a set timeframe in which to acquire the desired collaborative pattern, hence, a RSN can be defined as the policy makers' temporal attempts in influencing the creation of a productive and longer lasting RIS.

As described in the introductory part of this paper there is a lack of confidence in the idea that investment in knowledge production automatically leads to the development of new technology (Waluszewski, 2006). The notion of RIS (Saxenian 1994, Keeble & Wilkinson 2000) is based on the belief that reaching knowledge transfer and interaction between the different actors in a RIS will spur innovation (Saxenian 1994, Keeble & Wilkinson 2000; Kline & Rosenberg, 1986; Camagni 1991). To focus solely on the knowledge transfer between the actors will consequently ignore the prior investments made by actors that tie those actors into a structure of production and use. These structures might hinder the knowledge attained to be used in business transactions and are hence of importance in achieving innovation. Merely enabling knowledge transfer is therefore not enough to create innovation and puts the reliance upon enabling knowledge transfer by public agencies into question (Waluszewski, 2006).

Innovation processes within business networks

As afford mentioned, it is doubtful that investment in knowledge production and enabling contacts between the public, private and academic sphere is enough create innovation and economic growth (Waluszewski, 2006). In line with the network perspective, innovation is not just about coming up with a novel solution; it is a complex process of combining something new with the organizational structures needed to enable its widespread use (Fagerberg, 2004; Van de Ven 1986). In light of this notion an invention would not become an "implemented reality" (Van de Ven, 1986) without being relevant to the context where it currently exists. 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 but a problematic issue in innovation studies (Van de Ven et al., 1999; Rosenberg, 1982; Fagerberg, 1995; Waluszwski et al., 2009). A high degree of relatedness between the producer and the user therefore improves the chances of producing a product that will actually fit into the using setting (Harrison & Waluszewski, 2008; Håkansson et al, 2009).

Integrating science in business networks

Håkansson, Ford, Gadde, and Snehota (2009; 134) pose that "[t]here have been few empirical studies that have centrally addressed the nature of the business actor, its discretion, motives, or its effects on others" and Lundgren and Andresen (2011:429) follow up on this quote by claiming that this call for research can "be extended to include not only actors in the form of companies, but universities and governments as well". In recent years the focus upon how science and business interact is increasing (Lundberg & Andresen 2011). Universities are also more explicitly requested to interact with business in their R&D endeavors as society's expectations of economic returns from basic research have become greater (Schartinger, Schibany, & Gassler, 2001). Hence, "an innovation system's function of bridging science producers and business users is of particular importance" (Waluszewski et al, 2009; Corsaro

2012; Stock, Greis, & Fischer, 2002). Waluszewski et al. (2009) mention several sustaining institutions as fulfilling this “bridging” purpose, such as IPR regulations to technology transfer offices, from venture capitalists to public incubators or grants for science-based start-ups. In the Swedish context, the Vinnväxt competition, which awards funding to the winning Swedish region, organized by Vinnova (the Swedish Government Agency for Innovation Systems) requires cooperation between local government, universities and companies to enter, which indicate that bridging between these actors are something that is encouraged and rewarded by the Swedish government (Lundberg & Andresen, 2011). Also, the European Union has stated in policy documents regarding their Lisbon Strategy towards becoming a knowledge-based economy that “in the fast-changing knowledge economy it is all the more important to ensure that systems are in place to link the work of scientists with the innovators in business who can see a potential commercial use for the product” (OECD, 2004:2). This statement is a testimony to a widespread an ongoing change in the way science and industry interact, and how policy makers view the importance of such a change (Ingemansson, 2010; Nowotny et al., 2005; Waluszewski, 2006). In fact, several researchers describe a policy shift that has occurred during the 21th century elevating science as the most important source of innovation, business development and economic growth (Ingemansson & Waluszewski, 2009; Nowotny, Scott, Gibbons, 2001; Eklund 2007; Goddard et al 2012).

There is in other words a widespread consensus among policy makers that bridging between science and business is of importance. However, the value to both the participants and to society in general of such initiatives has been put into question by researchers (Huggins & Johnston, 2009; Christopherson & Clark, 2010; Harrison & Leitch, 2010; Waluszewski, 2006). Waluszewski (2006) refers to the knowledge paradox (Perez & Soete, 1988) which is defined as “the circumstance that regions with high research intensity still can have a relatively low proportion of research intensive products”, and hence question the assumption that merely enabling connections between science institutes and business actors are enough to create innovation. The view entails that “cutting edge” science and “high tech” innovations are not automatically adopted into the business world and commercialized. Thus, there is a lack of confidence in the idea that investment in knowledge production automatically leads to the development of new technology, which in turn will be absorbed by the business world where it will create economic growth (Goddard et al 2012; Christopherson & Clark, 2010; Waluszewski, 2006). A lack of confidence in what is referred to as the linear model will encourage researchers to further problematize the relation between science and business and how they might be encourage to interact (Håkansson & Waluszewski, 2002). Regions suffering from the knowledge paradox might have the “wrong” production structure in regards to absorbing high tech innovations; a low tech industrial structure might for instance be lacking the ability to absorb advanced knowledge (Edquist, 2002). In order to create prerequisites for scientific inventions to become adopted into a the business world Waluszewski (2006) stresses “ the importance of creating network-like structures that not only include the producers of knowledge, but also organizations that facilitate the transfer of this knowledge to the business world”.

Today universities provide knowledge to companies by educating future employees, by making scientific publications available and by joint cooperative research projects (Schartinger et al., 2001). Lundgren and Andresen (2011) claim that the first two avenues of knowledge diffusion are easily compatible with academic tradition, while creating cooperative research projects requires overcoming institutional and cultural barriers. Researchers need to actively publish their research findings in order to secure positions in universities and to further their careers, while companies wish to retain their commercial confidentiality to protect their market position (Siegel, Thursby, Thursby, & Ziedonis, 2001). Hence, in science the ultimate goal of creating innovative ideas is not to commercialize the invention but "to the get the new accepted as science in academia" (Ingemansson & Waluszewski, 2009). This implies that an invention developed in science will have different properties than invention developed in a business setting where commercial use is of higher importance than the novelty and scientific acceptation of the invention itself.

Ingemansson and Waluszewski (2009) pose that the dominating innovation journey takes place among established business relationships which enable producer-user interfaces to be bridged and an invention to become integrated in the user setting. Even if the parties behind the producer-user interfaces know each other, creating this connection is not an easy task. However, the risk for a misfit between the producer and user setting becomes even higher when this connection is supposed to be created between science and business actors (Easingwood, Moxey, & Zolkiewski, 2008; Yoffie & Kwak, 2006; Perks 2012). Håkansson and Waluszewski (2007) claim that in order for an innovation to get widespread commercial use it must "survive" in three empirical settings; a developing, a producing and a using setting. In the dominating policy models development takes place in science, and the key issue concerns creating avenues of knowledge transfers between academia and business (Ingemansson & Waluszewski, 2009). However, knowledge carries imprints of the empirical context in which it is created which makes such knowledge transfers problematic. Hence, the larger the difference between the developing, the production and the user setting the harder it is for an invention to survive and reach the status of a commercialized innovation (Ibid.).

The developing setting is where new solutions are searched for by combining alternative combinations of material and immaterial resources (Håkansson & Waluszewski, 2007; Perks & Jeffery, 2006). Established producer-user interfaces are reshuffled in order to find new ways in which to utilize existing resources in a manner that will improve combinatory power. However, the actors engaged in such exploratory activities can never fully predict the effect of new solutions in the producer-user interfaces where these solutions are embedded. The closer the developers are to a producer-user setting the easier it is to engage the established users in the new combinations of resources. Hence, knowledge about the already established structure in the producer-user interfaces in regards to past investments made in material and immaterial resources will make it easier to impose the desired change (Håkansson & Waluszewski, 2007). When it is academic researchers that are searching for new solutions their prerequisites are somewhat different, even if some researchers have close ties to business and other parts of society (Ingemansson & Waluszewski, 2009). For a new solution to be recognized as science it must be radically different to the existing scientific knowledge base (Jasanof, 2004) and to get the new solution accepted as science within academia is at the heart of the researchers development work (Ingemansson & Waluszewski, 2009). This goal differs from the pure commercialization of new resource combinations that is the prominent reason for new business innovation. Hence, if the development setting is based in scientific work the interaction with the producer-user interfaces might be further complicated due to the difference of their respective institutionalized context (Ingemansson & Waluszewski, 2009; Lundberg & Andresen, 2011).

The established producer structures are the prominent features that make up the producer setting (Håkansson & Waluszewski, 2007). In order for a new potential innovation to be embedded into producer-user interfaces it must be transformed into some type of product or process. Thus, it has to be embedded into the existing system of production. In a business producing setting it is normal that an end-producer is only responsible for a minor part of the total product cost, which will imply that others than the focal producer have important influence on the producing setting (Håkansson & Waluszewski, 2007). Hence, mutual adaption is mandatory and the question will revolve around how much of this adaptation can be mobilized from the sub-suppliers and how much are the producer itself forced to adapt to others prior investment. In science the producing setting revolves around the structure of production of scientific publications (Nowothy et al 2005; Ingemansson & Waluszewski, 2009). It is the structure of the publishers, editors and reviewers that determines if something can be labeled a scientific advance, be included in the production of science, and therefore become a successful scientific invention. This implies that when the producing setting is business and the developing setting is science the new invention has probably not emerged within an established producer structure of business actors. The problem of creating a fit in the interfaces between the development and the producing setting is therefore elevated in this instance (Ingemansson & Waluszewski, 2009).

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 upon how it effects these actors' prior investments; if only a few can gain advantages from using the new solution it will never reach widespread use (Håkansson & Waluszewski, 2007). Successful innovation is hence not dependent upon a few enthusiastic lead-users or the uniqueness of the solution in itself, but solely upon how well it fits into the existing using system. If the adaption of the new solution depends upon large investments to make it fit into the user system, it is unlikely that the benefits of the new solution will be larger than the sum of the investments needed. Hence, the better the solution fits into established settings the better the chance of adoption. The user setting in science is foremost science itself (Ingemansson & Waluszewski, 2009). Even if science as a source of useful answers to an ever-widening range of societal problems are more frequently addressed (Nowotny, Scott & Gibbons, 2001). To become "used" in the academic user setting can be defined as becoming cited in another scientific work. This kind of "use" do not require the same kind of physical or organizational fit as is often the case in the business user setting (Ingemansson & Waluszewski, 2009). The fit of a new solution is in the field of science often merely abstract and judged upon the basis of how it "fits" or "misfit" in an established theoretical framework.

According to Salavisa (2012) Innovation within software development in medical business can be described as mostly incremental and rapidly changing. In fact, Salavisa (2012) assess that "the level of technological opportunities in the industry is high but depends mostly on user-producer relationships, especially when it comes to embedded software and applications". Hence, the software industry is a knowledge-intensive sector which influences in the innovation processes of many industries (Salavisa 2012). Also, its evolution has depended largely on activities other than university research, such as the fast pace technological development of the computer manufacturers and segments of custom and service software companies within the private domain (Steinmueller, 1996, 2004; Salavisa 2012). To study an innovation process dominated by university research and involving user and producer relationships within the software industry might therefore be of particular interest.

METHODOLOGY AND DATA COLLECTION

Case study research is a well-established methodology in industrial marketing and network research (Visconti, 2009) and plays an "important role in theory development within industrial marketing and the industrial networks paradigm" (Wagner, Lukasse & Mahlendorf, 2009:6). As stated by Borghini, Carù and Cova, (2010) the principal objective of case study research is "a deep understanding of the actors, interactions, sentiments, and behaviors occurring for a specific process through time". According to Henneberg, Naudé and Mouzas

(2010) the methodological challenge for current business marketing research is to conceptually integrate the perceptions and cognitions of the individual manager or actor into the industrial network approach. This paper contains a case study of a single innovation process undertaken within a network context and will focus on how the involved actors interpret the process and strategy in which the process unfolds.

In the study of innovation systems and processes the network structure of the interacting actors has historically been in focus (Schmoch et al, 2006; Hekkert et al. 2007; Bergek et al. 2008). But according to Wieczorek and Hekkert (2012) "structural analysis has proved insufficient for the analysis of technological innovations". Thus, Wieczorek and Hekkert (2012) claim that the functional approach emerged as an important means of research methodology when studying good performance of technological innovation systems. Functional analysis focuses on the processes that are important for innovation systems to perform well rather than the systems inherent structure (Johnson 2001; Bergek 2002; Hekkert 2007; Bergek et al. 2008). However, Wieczorek and Hekkert (2012) believe that functional analysis could complement the structural by being a manifestation of the way in which an innovation system is organized. Hence, an incorporation of both forms of analysis will be preferred. This paper will focus predominantly on making a functional analysis of an innovation process within a RSN, as a part of a RIS. Attention will also be paid to the structure and roles performed by actors contributing to the studied innovation process. Hence, the structure of the included network system and the function these actors undertake in the value chain will be analyzed, bringing both these aspects into view in accordance with Wieczorek and Hekkert (2012) proclamation. Also, Corsaro (2012) claim that "research that explicitly connects value considerations with innovation network configurations is still in its infancy, with empirical evidence being notably scarce", which elevate empirical case studies as off primary interest.

24 respondents representing the involved actors in the development of the CRISP platform were interviewed in separate meetings lasting 60-100 minutes. Broad and open questions were used to let the respondents reflect freely. After transcription of the interviews the qualitative data were sorted by open coding influenced by Strauss and Corbin (1998). The empirical data is sorted in accordance with the three empirical settings relevant to innovation processes seen from a network perspective, namely the developing setting, the producing setting and the using setting (Håkansson & Waluszewski, 2007). These categories also form the headlines of the analysis part of the paper.

Primary sources of secondary data have also been 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 et al, 2012; Zhao et al, 2012). These data has primarily been used to form the structure of the innovation process (figure 1) and to describe the temporal process of the studied case (Case Description).

CASE DESCRIPTION

Future Position X

Future Position X (FPX) is a RSN that focuses upon a certain application of information technology called geographical information systems (GIS) and is situated in the municipality of Gävle, 200 kilometers north of Stockholm, the capital of Sweden. GIS is sometimes referred to as spatial data and entails sorting information according to its geographical position, often concerning tying an information flow to a position on a map. This technology helps organizations in making informed decisions where spatial information is key, inspiring FPX to adopt the tagline “decision by position”.

In 2006 10 member companies founded the association of FPX. Money from the European Union Regional Development fund, among a local development fund Sparbanksstiftelsen Nya and membership fees finance the association. In 2013 FPX contained 41 member organizations, 13 of which the primary business involves GIS technology. The other members are either supporting IT and knowledge companies that deliver strategic expertise or complementary services for GIS companies, or frequent users of GIS technology. FPX currently holds 13 employees, and there are 11 people connected to the association’s board. Six of the board members represent privately owned companies, three represent the public sector and two represent academic institutions. The set goal for FPX as voiced on its website is “to be an independent arena for testing, development and marketing of geographic Information, services and knowledge”.

In 2010 a manager of FPX was awarded with the European cluster manager of the year award by the European Cluster Excellence Initiative (ECEI). FPX was also the first European RSN to be awarded a gold medal by ECEI in 2012, implying that FPX is considered to be a well-functioning RSN by international agencies. On behalf of the municipality the consultant company Ramböll (2010) undertook an evaluation of the RSN projects in Gävleborg. This report highlighted FPX as a RSN with high innovative capability, sporting collaboration with a high involvement of scientific institutions and with a focus upon internationalization (Ramböll, 2010).

The innovation process of the CRISP technology

After the terrorist attacks upon World Trade Center in New York 2001 the need of information integrating systems in the emergency service started to become discussed around the world. After a visit to a GIS trade fair in USA the founder of the FPX member company ESRI Sweden introduced the idea of creating such an integrated GIS emergency system to the managers of FPX. This spurred the innovation process that this paper focuses on which involves the development of the GIS technology Crisis Information Sharing Platform (CRISP). The start of the development of CRISP in 2007 was a collaboration between FPX and the emergency service of Hälsingland (a city council in Sweden), which received the project name Connect and Protect and was funded by FPX. The software would enable the leader of the emergency task force to gain access to a wide range of spatial information concerning reports from the Swedish Transport Administration of traffic incidents that could affect the flow of traffic, information from the real property registry enabling the task force manager to access information regarding the property the emergency concerned, information from the police and emergency service regarding additional alerts and weather information that might cause certain problems for their work. The CRISP platform is owned by FPX and is developed in cooperation with FPX member company Invotech Solutions with the aid of Hälsinge and Gästrike emergency service in the project RALF. The RALF application of the CRISP platform was initiated in January 2011 and will be used live by Gästrike Emergency service and North and South Hälsingland Emergency service in April 2013. Also, a spin-off using a specially adapted version of this software has been developed into a commercial product on the initiative of the company Soft Security. The software Blueplot became developed into its commercialized application in close collaboration with the Gästrike emergency service and Invotech Solutions (figure 1). To date 7 different emergency services in Sweden have implemented the Blueplot application into their organizations, the application was launched for full commercial use at the end of 2011.

After the Connect and Protect application of the CRISP platform the technology got integrated into another application; the project Integrated Surveillance System for infectious Diseases (ISSC). After the SARS epidemic a few researchers at the Karolinska University in Stockholm, Sweden, formed the idea of tracking symptoms of infectious diseases as they spread in real time. This would enable governmental bodies to undertake appropriate measures to hinder an outbreak before it took on pandemic proportions. Karolinska University consequently put together a team involving the Chinese Universities of Fudan and Huazhong and the University of Heidelberg in Germany. In order to secure funding for the research project an application to the HEALTH initiative by the European Commission (FP7) was planned. In the funding prerequisites for an application to the "Integration of Disease Surveillance and Health Systems Response" (part of the HEALTH initiative) it is stated that inclusion of SMEs would be advantageous (European Commission, 2008). Also, the involved universities did not have the required technical competence to develop the IT system that their project would entail. Employees at Karolinska University had heard of FPX and its expertise in GIS related technologies. A contact was initiated and FPX became consequently involved in the application for funding sent to the European Commission's HEALTH programme. The ISSC project acquired the funding of 3 million euros and was set to start March 2010 and end in February 2014 (programme FP7-HEALTH, reference 241900). The objective for ISSC is according to their application "to improve the early detection of epidemics in rural China by integrating syndromic surveillance with case report surveillance system" (CORDIS, ISSC).

Before the beginning of the project FPX met the project manager from Karolinska University to learn about the basic ideas behind the system and the epidemiology knowledge set to be integrated into the system. The intent was to unify their views on the future development of the system. The system developers of FPX went to China in April of 2010 to study the operational conditions in rural China in order to "develop an effective GIS system to be adapted to the end users on study spots and personnel at rural units in China" (Report on the development of ISS, 2011).

FPX made a plan of the expected development work and presented it on the 6-7 September 2010. All partners in the project discussed the issues of the system´s applications and came to an agreed development plan. After the development plan was set FPX selected the private company of R-con Sweden AB as the subcontractor to develop the system. Another member company Invotech Solutions was chosen to undertake the programming of the system. The development of the basic customization of the technological platform of CRISP employed 3 persons spending 383 working hours (Report on the development of ISS, 2011). A Chinese map provider Baidu Map was also contacted since a requirement set by the Chinese collaborators was that internal Chinese servers and maps were used at all times. In March 2011, the version 1.0 of the ISSC system was ready to use for the entering of data and could therefore be evaluated. On the 7-8 of March 2011 a workshop including all the parties involved in the ISSC project was undertaken. During the workshop instructions were given to the 25 medical phd-students in charge of instructing the end users of the ISSC application. How to register into the ISSC application, the data collection interfaces in surveillance units and data import/export functions were shown. After the run through suggestions on how to modify the system was voiced, and after those suggestions had been addressed, version 1.1 of ISSC was installed on a web hotel in China on the first of July 2011. On the first of August 2011 the phd-students had taught the medical personnel selected to be a part of a test group how to report data and the system started to retrieve real live data. In the first month 20 000 records were reported. Shortly after, in August 2011, all the participants held a meeting at the University of Heidelberg where the new functions of the dashboard interface in the ISSC application was introduced to the 25 phd-students. Suggestions on how to improve the features was discussed and followed up by the programmers before the system went into wider use. In 2012 the whole program went live and approximately 1 500 end-users now report data concerning approximately 50 000 patients on a daily basis. These end-users entail local medical facilities together with pre-schools and kinder gardens reporting for children being absent due to disease. The users report symptoms of illness and if certain symptoms are being reported in a particular geographical area more frequently than normal, there are logarithms developed by the medical Universities that will strike an alarm. By 2013 there has been two alarms registered that did not become detected in the existing registry of health in China, hence proving the systems positive effects in tracing epidemic symptoms (Yu et al, 2012; Zhao et al, 2012). One additional meeting has been undertaken in 2012 to follow up on the progress and to collect feedback from the users for suggestions on how to improve the system further.

Since its launch in China the ISSC application has also been tested in other environments. Another research project has been initiated were the system is supposed to be tested in India. Funder for the India version of ISSC, the ISSI, is the Swedish International Development Cooperation Agency (Sida). So far the system has been launched on an Indian Web hotel and 10 users have been reporting input data. Karolinska University is also the project manager of ISSI together with the Swedish Civil Contingencies Agency and the Swedish Institute for Communicable Disease Control. A National institute for communicable diseases from South Africa is also project developers along with the Indian medical college of Gardi, both are providers of disease logarithms for detecting epidemics. The county of Ujjain is also contributing with logistics and local contacts enabling the system to be tested in their region. The ISSI application will be evaluated at the end of 2012, and a decision will be made in 2013 if the system should be launched on a bigger scale.

The ISSC application has also been introduced in Sweden in collaboration with the county of Gävleborg, were FPX is situated. This project was named ISSS. The local epidemiologist employed by Gävleborg County receives reports from data collected by the local medical counseling hotline 1177. When in contact with this medical counseling service the patient will report the symptoms he/she is suffering from together with their personal number. The personal number is tied to their home address that makes it possible to create input data of the symptoms tied to a geographical position. A daycare center Uppfinnaren also reports any absence because of diseases among their children directly into the ISSS application. Outbreak of possible epidemic diseases can therefore be tracked. FPX holds regular meetings with the local epidemiologist about developing the system in accordance with their needs.

The development of the CRISP platform through ISSC is not the only way in which FPX is developing the technical application of CRISP. In close collaboration with their member companies FPX are using CRISP to display other kinds of input data than medical reports, traffic information and real property information. In the project Smart City Arena (SCA), which is funded by FPX, the member companies of FPX are invited to create input data corresponding to their own business interest and thereby to develop their business model by incorporating GIS technology into their operations. This project was initiated in January 2011 and will be financed until December 2013. Meetings with the member companies are held where suggestions on further application of the CRISP platform are brainstormed and discussed. One of the managers working at FPX describes SCA as both a showroom displaying the possibilities of GIS technology towards outside actors, but also a way in which to let the member companies benefit from GIS and to enable innovations to form from widening the use of the technology. In a marketing folder (FPX, 2012) FPX state their strategy behind SCA as “gives companies a large demonstration area for displaying solutions to customers and as an arena for cooperation between researchers and users in order to discover innovations that develop competitive advantages". On their webpage (fpx.se) FPX are describing the strategy behind the SCA project as "The project will also run a number of venues between different types of business, occupations, users and researchers in order to create creative labor mobility and a higher degree of innovation and renewal within the region's business". To incorporate users with developers into a joint innovation process seems thereby to be an explicit strategy behind the SCA project. Hence, through the project of SCA the CRISP platform is also made available to the other FPX member companies not previously involved with developing GIS technology. Through their input of ideas of how to use the technology several new ideas of how to apply the CRISP platform has arisen. These ideas are developed and assessed by the use of the project management software Anido that has been developed by the FPX member company Reflektus. When the idea´s commercial capacity has been evaluated using the Anido software and thought to be sound, a project can be initiated bringing the idea into development by incorporating the joint expertise of the FPX members. The project initiated within FPX also becomes reported into the Anido software or regular basis.

The city of Gävle has been a close collaborative partner to FPX in their development of the SCA application. Gästrike Recycling, Gästrike Water and Gävle Energy, all part of the utility companies owned by the city of Gävle, have produced input data into SCA. Data portraying water quality, wind flow and electricity being generated in the water dam in central Gävle is portrayed on a map that is accessible for the public. This gives the publicly owned utility companies a chance to show the public the benefit of their services, and help them in their internal organizing of resources. Another example of an application of the CRISP platform that has started among the FPX member companies and thereafter been developed into a commercial product is the project owned by the member company Triona. The application concerns finding suitable routes for bicycles, which take into consideration other traffic, quality of roads and natural beauty of surroundings. This application is primary of use for cyclists but also the traffic and quality of road aspect of the application has sparked interest by insurance companies and the National Road Administration. Data collected in this application would enable these associations to better their allocation of resources to areas most in need of attention, as well as in dealing with insurance claims. The FPX member companies Donald Davies group and Reflektus, both project consulting companies, worked together with Triona in developing the application. The local college in Gävle, Folkuniversitetet, has in collaboration with FPX and several of their member companies developed a course, teaching students to use and develop GIS technology. The development of the courses started in 2007, and was expanded in 2011 when the course was relaunched as a KY-programme. Students taking this new course also use the CRISP platform within the project of SCA to learn programing and to develop new GIS technology based applications. The students use an application within SCA named Geotest allows for geographical information to be tested for accuracy and further developed. ESRI Sweden represent as a part of the ESRI S-Group the biggest provider of GIS related technology in northern Europe, they have their headquarters in Gävle and is a member of FPX. Together with the University of Gävle they have started the education programme ESRI Development center where ESRI is supplying the University with expertise, free licenses and trainee positions within their organization. The collaboration was initiated during the fall of 2011 and within the ESRI Development Center part of the CRISP platform through the Geotest application is used in educating students and developing new applications. The privately owned FPX member company Gadder also uses the CRISP application of SCA in developing their GIS related products. A successful collaboration involving the SCA application is the project "Catch a Feather" initiated by Gadder and the city of Sandviken. In order to celebrate the city of Sandviken turning 150 years old, Gadder developed a real life treasure hunt enabling local youth to use GPS in their smartphones to seek out different locations in Sandviken. The content of the application was developed by a group of youths from Söderhamn and included events and quiz walks at different locations around town. Hence, the project had an educational purpose as providing information regarding their hometown tied to the different locations, but also served as a public relations stunt raising the awareness of Sandvikens upcoming birthday.

As described above the GIS technological platform of CRISP has had several different projects and applications emanating from its original purpose (see fig 1). The development has incorporated several of FPXs member companies stemming from the private, the public and the academic sector. These companies have represented both the developers of the technology and the end-users of the applications developed, as well as idea generating actors and science institutes. In figure 1 the companies and organizations involved in the innovation process of the CRISP technology has been visually represented as a network where the connections between the involved actors are shown.

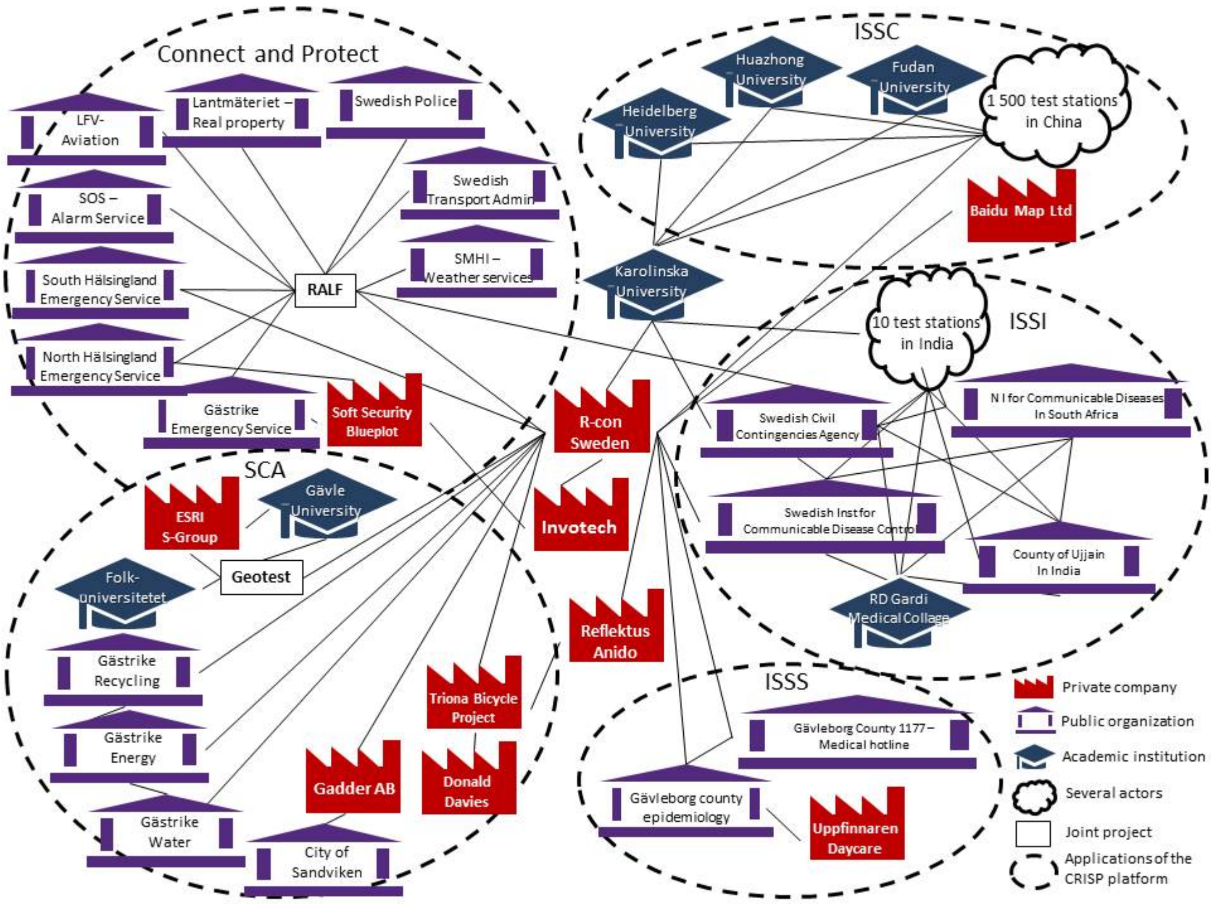

Figure 1: Network portraying the innovation process of the CRISP platform

ANALYSIS

Håkansson and Waluszewski (2007) claim that in order for an innovation to get widespread commercial use it must "survive" in three empirical settings; a developing, a producing and a using setting. I have therefore divided my empirical data analysis in accordance with these empirical settings. Under separate headlines I will present the predominating reasoning found in the data concerning the empirical setting of the studied innovation process. I illustrate these reasoning with representative quotations selected from the data to provide a deeper insight into the respondents' cognition.

The developing setting

It is easy to see from the case description that the innovation process emanating from the CRISP platform has been a cumulative process. The developed technology has spread between different applications and this has been an intentional strategy adopted by the managing actors. A respondent representing a technology developer state that;

> *The CRISP platform was already half way developed when the ISSC project was initiated. It was easy to see that the CRISP information and disease it is almost the same thing and we can plot it out in the same system. In that way it was possible to use the knowledge that we already had and the development could therefore be slimmed down.*

Since FPX owns the CRISP platform it has been their intention to use this platform as the base for the technological inventions of their member companies. This was thought to aid their role as a catalyst for regional growth. A respondent representing the FPX management assessed:

> *We have said, so far, that in the other project, besides the China project, and SCA, and for the city of Gävle and the municipality, and in India, they get to use the platform for free. So we have not charged any license fees and there is a huge technical structure that we do not charge anything to use. We have said that this is an innovation platform; therefore it is without any charge.*

Another respondent representing the FPX management voiced that it is in FPXs modus operandi to offer a technological platform to be used freely by their member companies to develop their respective business offerings.

> *If you have completed a project in one area of application then it is in the financiers' interest that the knowledge gets distributed. Otherwise it might take on the form of supporting a single business benefactor. We are allowed to support business but we have to follow certain rules, and we have to be aware not to support a single business benefactor.*

To enable the dispersion of the technology the FPX management seemed to realize that it is vital to create an awareness of the possibilities the technological platform can offer. Enabling the member companies to take advantage of the CRISP platform became a central issue. A FPX manager claimed

> *When we released this ISSC application on the first of March 2011 we did it during a members meeting. We presented the functions and the content. We also held presentations during the different steps in the release process were we present what we are doing and how this application might be developed to suite other purposes; purposes that might be of interest for our member companies or for us at FPX.*

Another respondent representing the FPX management described their strategy in making the technical platform widely adaptable to different kinds of data entry.

> *Because the system deals with information, and the handling and analysis of this information, there are a lot of opportunities if you choose not to get tied down into one application. It is a very open system that might read input data automatically from other systems as well. Regardless if it may entail projects initiated within SCA or input data regarding what medicines the pharmacies are selling at the moment (ISS projects).*

There was a widespread consensus among the respondents that the end-users were very important in the innovation process of ISSC, Ralf and SCA. A respondent representing a technology development company said in relation to the ISSC development;

> *I think that a single business actor will focus upon what is the most important for the user, but in a rather limited manner. I think that we in collaboration have managed to focus more on being user-friendly and have sorted the information and communicated with the end-users so that we have assured that the end-users gets what they want in the next release. If you already have a finished product it might be hard to customize it, if you make changes it might affect your other customers. Our system is so flexible that we can install it in different countries and adapt it in several new ways; the core of the system will still work.*

Even if the technical platform was believed by the developers to be very adaptable, the rift between science and business was discussed as a problem area. A respondent representing the management of FPX described creating goal coalescing between science and business actors as an inbuilt problem in their collaborative fit.

> *It is often so with these kinds of constellations where the private and the public are involved, it will be clashes. Everyone wants to get something out of it so sometimes there might be some not so successful compromises. It might become hard to find a field of interest for research, but if you come from the other direction it might be hard to find a market for a scientific idea. It is not always that these things coincide. Most often, something arises from the academic field, but how do we commercialize it? It is tricky. If you look at it from that point of view it is the public sector that is the easiest to work with. They do not have any clear bias in any direction.*

A respondent representing the management of FPX also talked about this problem, but felt that their goals should be able to merge.

> *If you look at the business actor, he wants to build a profitable business and it is of public interest since it will create tax revenues. The researchers' primary interest is to get published. But I think that it is too easy to just define these goals as incompatible, it is possible to combine them. It is solvable. If the issue at hand concerns solving a specific problem then the research question will be finding generalizable results, while the business actor wants to solve the problem practically and in that particular situation.*

The set goals for the development of the different applications of the CRISP platform in regards to the management of FPX were all explicitly tied to solely the technical development of the platform not its integration into widespread use. In regards to the SCA project a manager of FPX explained;

> *The project that is owned by FPX and is ongoing until December 2013, need to reach certain goals. We need to establish x number of sensors or functions in the system. We need to collect a certain amount of data, and all the activities and meetings need to be accounted for.*

The project goals for the ISS projects were described in a similar manner with a strong focus upon the technical development. Another FPX manager explains;

> *Regarding the goals for the different phases of the ISS projects we need to reach certain milestones. To collect input data and present that data, that was the first phase. The second phase included the development of the calculations and logarithms needed to analyze the input data. Then the system needed to be evaluated. -How will it affect the healthcare sector on a national level? If this system existed ten years ago it would have been possible to prevent epidemics and pandemics. That is something that has backed us up, together with the fact that Karolinska is top three among "health" universities.*

The evaluation of the FPX organization at large was described as focusing on number of contacts initiated and new members gained. A manager describe their goals as;

> *We want to elevate this town into becoming more technology savvy. Bit by bit we are creating Europe's center for geographic information, right here in Gävle. That is FPXs contribution. We have received awards as well. We have reached gold level in managing a cluster. They are measuring how many contacts that have been initiated by us in a year. How many new individuals and companies it involves. How much of these meetings have generated a new product. 36% of our meetings have generated something concrete. For instance something novel that might materialize in a new business down the line. They also measure our activity abroad; how many personal meetings have we arranged for our members.*

The producing setting

There was a widespread realization and appreciation among the member companies that FPX did not only have GIS technology specialized companies as members. Several other organizations were a part of the RSN, often organizations that represent different aspects of the producer setting. Some of these companies contributed with resources in the process of designing the different applications of the CRISP platform, others contributed with input data. A respondent representing a project consulting company said;

> *To run a successful cluster I think you need a certain excellence in your specific area, may it be packaging or GIS technology, and then you also need the supporting organizations, companies in other lines of business that will support the GIS companies. It also requires knowledge on how to manage projects; FPX got expert companies in that regard. We have helped FPX to develop a process for how to manage the innovation processes that they initiate and how to evaluate the projects in a structured manner. This is where we come in; we are not a GIS company as such.*

As previously discussed in the case description part of the paper, FPX combines public, private and academic organizations. Among the organizations involved in the producer setting of the CRISP platform development there are several privately owned companies, while the development setting is dominated by public and academic organizations. A respondent representing a project management consultant company voiced the rather popular opinion among the actors involved within the ISSC project that such an explorative project as the ISSC might not have been possible to run in a environment of only privately owned companies. The notion that the Universities were the idea generators within the ISSC project was voiced as a driving force that shaped the prerequisites of the project.

> *This ISSC application, what would it look like if it was developed by a single private company, would it even have been developed; probably not. I do not think there are people in business that thinks in this manner. It would have been a far more technically complicated solution, and for no use, if it had been developed by a single business actor. In this project it is the academics that have created the problem that they are trying to solve, and they have theories they wish to verify. If a single business actor would steer the development they would have a single practical problem that they wished to solve. The set problem was "find epidemics" in this case. In business they would not have analyzed the problem from such a basic and wide angel. So, the academic world is slower and more thorough, but they think more long term to.*

The possibility for FPX to not pay as much attention to short term profit in their innovation processes is on the other hand described as something positive by most of the interviewed actors. A respondent representing a management consulting firm said;

> *There are possibilities to undertake projects in FPX that are very interesting but it is almost impossible to get done in private companies. If you are working in a private company everything you do must be profitable, preferably from day one, which is completely impossible. This does not mean that the projects in FPX are not interesting; they might create spin-offs that will be profitable further down the line.*

Another respondent representing a private company voiced the concern that the public financing might be the drive behind the projects not future commercialization.

> *I see this tendency that "now we secured external funding of this project, what a relief". Then they sit down and relax because they have money for an additional 18 month, the organization is saved. Instead they should seize the opportunity to take this money and really create an attractive product, to bundle it, to make it into something commercially gainful. No, the main concern is to secure the funding.*

Also respondents representing an academic institution found it hard to pin down the role that FPX played in this regard.

> *Making a profit is of course an issue for them (FPX) since they need to show that their projects are profitable. But it is somewhat confusing to me. I do not understand them. Sometimes I feel that we have the same relationship with them as we have with another university; it is the research that is of importance. That we share a common goal of making the world a better place, to do well. But sometimes you notice that they have other more monetary ambitions. It is hard to know their standpoint and what motivates them.*

Yet again the difference in financing structures was voiced as a source of the communicative problems between the private companies and the Universities in regards to making resources available. A respondent representing an academic institution said;

> *When working with FPX it is evident that they operate within a business culture. We are immersed in the academic world. In their world, every hour is counted for. It must be paid for. In the universities, we do not count the hours like that. It may take 5 hours or in may take 50; the job must be done. Our funding is more flexible. FPX are not allowed that kind of flexibility. It must be funded, or the company that undertakes the job must get paid in order to pay out their salaries.*

The private companies involved found FPX to be more interested in public funding than in commercializing a product while the public and academic actors portrayed FPX as having both commercial and academic interests. Hence, the financial motivation behind FPX seems to be rather confusing to the actors involved in the producing setting, and a passive stance often followed.

In regards to the specific projects the respondents addressed several problematic issues regarding the producing of the applications. In the disease surveillance applications (ISSC, ISSI and ISSS) the CRISP platform is used as the technical base. However, the Swedish Institute for Communicable Disease Control who is involved with the CRISP disease surveillance applications also has a similar project in South Africa. In the South African project a decision was made not to use the already developed CRISP platform as their main source of technical development. A respondent explains why;

> *It is because we gather data from pharmacies, schools and the primary care in China, and it was considered to be too much of a challenge to gather such data in South Africa. These data do not exist in a digital form in South Africa and it would entail too much work to gather them manually, even if we gather this data manually in the Chinese project. In South Africa we just do not have the staff resources to gather the data manually.*

Another respondent involved in the development setting of the ISSI project compares the two projects and further explain the rationale regarding the decision not to use the CRISP platform in South Africa.

> *In India we could use the same platform since we had more staff resources to do the manual data input. We had 7 assistants that gathered the data manually, and the work labor is not as expensive in India. That is why we could do that, and this was also something that was a part of the project in the formal application for funding. Therefore we were able to test the platform using manual input of data in India. Hence, it was not a decision against using the platform in South Africa that was based upon an unwillingness to use the platform in principle; it was a matter of resources. It is important that the collaborators that work on sight gets involved in the major decisions, in order to get the system working in their country and in their infra structure.*

The difference in governmental structures was also highlighted as a reason why manual input of data would not work in South Africa.

> *I think that if you ask for manual input data in China and India, and you are some sort of authority or university, you will get what you ask for. That does not seem to be the case in South Africa. There is a lot more autonomy in the different authorities and forums and less of a hierarchal structure of government.*

Besides the structural and cost inefficient related issues with collecting manual input data some respondents representing the producing setting voiced that the gathering of manual input data was to resource straining for the healthcare organizations.

> *You should aim at gathering data that the healthcare actors are already obliged to gather, not new data. It is already a lot of pressure upon the healthcare system regardless of country and you do not want to put any additional burden upon the healthcare personnel. In both South Africa and India we use other forums to gather the input data, we have therefore not asked the people directly involved with the treatment of patients to gather any data for us.*

However, to be able to facilitate widespread use of the ISS applications the respondents realized that collection of some sort of manual data would be needed. No actor to address this problem existed in the existing development scheme; this was voiced as a problem to be addressed before the technology could be integrated into the healthcare organizations. One respondent said;

> *But in the long run, if there is a stable system in place, you might consider using the healthcare personnel to do some of the input data. As long as it will not take up too much of their time and there is a real benefit in doing so. If there is some feedback going back to the healthcare personnel as a result of the data input that could be beneficial to their own operations it might be worth their while. At the moment that is not the case.*

The developers of the ISSC system was aware of the lack of resources in the producing setting but finding a solution was not covered by the project plan at hand. A respondent representing a developer voiced;

> *We also have this problem, which they are aware of, involving the manual input of data. Not even in China is it safe to assume that it is feasible to include manual data into a large scale system. In time there is a need to find electronic sources of information to run the system against. But that is not something that can be solved in the confines of this project. The project time is soon to be over and it is also an EU financed project. There is a large inflexibility regarding adding new things to the project plan after its initial acceptance in EU projects. If you said five years ago that you are going to reach certain results, you are tied to that, even if that might not be the most advantageous for the project in itself.*

The lack of resources in the producing setting to enable input data was also described a problematic issue regarding integrating the "Catch a feather" application of the Smart City Arena project. In the Catch a Feather application data needed to be gathered to display the different organizations that wished to market themselves in the application sponsored by the Municipality of Sandviken. The application was designed as a treasure hunt that would enable people to walk around in Sandviken and compete in events hosted by the local organizations. A respondent describes the situation;

> *It could be used to create relationships with customers or visitors to Sandviken. But who got the knowledge or time to create this application, and to mediate between the different actors involved. You would need to contact the different actors and making them understand what is needed; -Am I supposed to include a question regarding my local shop? -Am I supposed to arrange an event that attracts customers to my venue? It would take a while to coordinate all these different data into an application, and to communicate the benefit. Then you would need to market the application and to provide support enabling the use. Marknadsplats Sandviken does not have the knowledge required to handle such an operation. There is hence a need for someone to coordinate and administer such projects, and I do not think that Gadder has the resources to do that.*

All respondents not directly involved in the developing setting expressed that there was a lack of actors within the producing setting in the developed applications of the CRISP platform. Several important roles was left unfulfilled, a respondent involved in the Catch a Feather project said;

> *So, what is their (FPX) role, looking at it from a regional growth perspective? Is it to create employment opportunities in the region? Some companies have received a lot of PR which generated a certain amount of customers. But the best case scenario would be if it involved more actors. The product exist is developed and has been used. But it might take more actors to really make the product into business. There is some business to be made, and some regional growth potential, if someone working in between the developers and the end-users existed, someone that could produce and market this technology.*

In the RALF application of the CRISP platform actors in the producing setting was also missed. In regards to offering technical support for the ongoing use of the RALF application a respondent representing a end-user of the application voiced;

> *It has been really interesting to be a part of the development, but the most important issue is that when this project comes to and end and we are supposed to enter the next phase in development, there must be a supplier that takes care of certain things. We are in need of some form of customer support that may help us in customizing the applications; it is beyond our expertise to handle that ourselves.*

Among the end-users there was a sense of awarness of that it is not part of FPXs funding to take an active role in supplying the resources that are needed in the producing setting. A respondent said;

> *To initiate a project like this, that is one thing. But I feel that FPX got their hands tied. The rules that enable their financial backing hinder them from becoming involved in the operational part of their projects. Considering the resources that exist in such a cluster project, it would be feasible to support an organization like Gadder in taking the technology to the next level and making it into a business.*

The using setting

A respondent representing a University using the ISSC application explained that he appreciated that the end-users were involved in the development of the application.

> *Yes, they want to know what we want, which might be normal. We are probably more open at a university. Business actors want to keep the information to themself in order to make some money. We on the other hand want to make it easier for the end-user in Medicare. A business actor does not know what happens when a patient arrives to a hospital. How much time is being wasted in entering data into journals? We know more about these problems. We want to solve these problems from our own perspectives. Then they have expertise in what type of technology is available and how this technology might be developed. The important thing is that there is communication between us and them; that they know of our problems. "We want to solve your problems", that should be the business actors role.*

A respondent representing an end-user of the RALF application concurred.

> *I have to give them credit for asking us what we need and want, they have been doing that all along. A year ago we questioned the development of the project. We said; -You need to join us in the field when we are practicing our rescue operations. Then you might see for yourself what we need and what you can do for us. The developers joined us for a couple of days. I think that was really important, they now understand what we want.*

From studying the different actors involved in the development setting within the CRISP technology it is evident that academic and public actors play prominent roles. Also, these actors are also active within the user setting while the producing setting involved several private companies. There was in other words an interaction between academic actors, public organizations and private companies within FPX. A respondent representing a University involved in the ISSC development expressed the following sentiment.

> *This is an example of a very tight collaboration between business and the academic; very tight. They (FPX) handled the instructions (of the end-users) and FPX developed the way in which we collect data. Therefore we are more dependent upon FPX than we usually are in our cooperation with business actors. Usually we would buy the single tests we need from a company and handle the analysis ourselves. But in our collaboration with FPX we could not do that. We did not fully know what was needed.*

A respondent representing a University involved in the ISSC project expresses a similar sentiment and felt that the involvement of the Universities created a focus upon the necessities of the systems application and removed the technological showboating that otherwise would have become to apparent.

> *If you consider the developers that we have dealt with through Invotech, they kind of live in their world and want to perform thereafter. Sometimes you have to stop them and tell them that we only want the basic functions. They want to show us what is behind the technique and what they can accomplish. But how do WE want the system to perform? It has been a really good dialog with Invotech, and good feedback from their work.*

The technical adaptability and ease of use was appreciated by the end-users. However, when it comes to the issue of reaching widespread use of the ISS applications the end-users yet again highlights the difficult task of getting the input data reported into the system. In the ISS applications it is the authorities that need to invest and enforce the handling of input data, it is hence a political decision that needs to be made among the end-users of the application. An end-user assesses;

> *In the future it is up to the authorities to realize the benefit of the system and to invest in its application. In South Africa we are using an open source program still it takes some investments in time and effort to get it to work. The technology is really a small part of the investment needed. What is also needed is the training of the users and the incentive to do so. You need to get people to use the system and all actors to gather and report input data.*

A developer of the ISS application agrees with this assessment:

> *Yes it is really a complicated matter to get the system widely used. I do not have a solution at hand. Especially in India it seems rather complicated, it is a large country with a lot of different levels of defense against communicable diseases. Considering everything from the national level down to the local authorities and all the way to the individual doctor doing the actual reporting of input data. As far as we are concerned it is more about proving that this technique is available and working. It must be a national decision to get it integrated into widespread use, NCDC1 in India must see this as important and be willing to push the issue. We have an*

[1] National Center for Decease Control, a national center of excellence for control of communicable diseases run by the Indian Government (www.ncdc.gov.in)

advantage in China since we have a close collaboration with the CDC2 and they are involved in the project. In South Africa we are also collaborating with them, while in India this collaboration is not in place. But if we can prove that the system works and publicize the findings internationally, other countries might become interested.

An end-user involved in the Smart City Arena project communicated the rather common belief among the involved end-users that the CRISP platforms technical flexibility might be rather confusing for the end-user.

Well, when he (a developer of CRISP) is making his sales pitch, it gets a little too complicated. -What can you do and offer? -Well, everything! The customer wants to know more precisely what is on offer; -we can to that, and that. Then you do not need to sell the whole shebang and explain everything you can do. It gets too complicated being a customer. You get forced into being a collaborator in developing the service; maybe you do not want that.

A respondent involved as an end-user in the Catch a Feather project assessed that the integration of the new application into existing structures regarding how to market a municipality might be hard to reach.

It is hard to develop new avenues of communication and to develop something new. There is a lot you do not understand. It is easy to buy an advert in the local paper; you understand how to do that. Maybe it would be more beneficial to spend that money on creating an application that would attract people to your area instead. But then you would need to involve several other actors in the development, and you need to learn how to use the application in order to get the most out of the technique. You do not need to help the customer to read the local paper, but to use an application is another issue

The respondent also explains that it would be difficult for the end-user to redo a project like Catch a Feather.

Concerning our future collaboration, we do not have the same organizational setup as we had during the Catch a Feather project. During the jubilee year we had extra money and the organizational possibilities to undertake the project, normally that is not the case. On the other hand, it might be possible to undertake similar project in the tourism sector. Like a guided tour of the city, such issues are already dealt with in existing projects. But there is still a lack of knowledge and funding to really make something happen.

Regarding the resource integration that would enable a prolonged use of the Catch a Feather application into Sandviken municipality´s organization the respondent assesses;

I was the organization when it came to this project, so it was not integrated. I did everything in regards to the jubilee year celebrations. We have off course presented the project to the head off the municipality, but I cannot say that it is an integrated part of our organization to use this kind of technology. It was a project that got managed on the side of the normal organizational structure of the Culture and Recreation department.

Besides the issues of intergating the CRISP platform into the users organizational structures the issue of creating knowledge among the end-users of the technology was voiced by several end-users. A respondent assesses;

I think, if you look at these FPX member companies, some are companies dealing with technology; they might be able to buy some of the technology developed. But the end-customers, they are not ready for this technology; they do not have the knowledge needed. FPX should play a role in helping their member companies in the marketing of the technology developed. There might be some success stories, but more could have been done.

DISCUSSION

[2] Centre for Decease Control and prevention, a national center of excellence for control of communicable diseases run by the Chinese Government (wwwnc.cdc.gov)

The developing setting

Several researchers studying innovation systems question the assumption that investment in knowledge production automatically leads to the development of new technology that will be absorbed by the business world and generate economic growth (Goddard et al 2012; Christopherson & Clark, 2010; Waluszewski, 2006). Bridging science producers and business users are therefore of importance (Waluszewski et al, 2009; Corsaro 2012; Stock, Greis, & Fischer, 2002) to avoid what Waluszewski (2006) calls the "knowledge paradox".

The innovation process involving the CRISP technology incorporates science institutions, public actors and private companies, (see fig 1) which is a prerequisite for enabling bridging between these actors. Moreover, it is interesting to see how the development of a single innovation process has spread over time to incorporate 5 different applications and several individual projects. The development of the CRISP platform started out in a collaboration between several public organizations involved in infrastructure and one private GIS developer. The technology developed in this setting did however get incorporated into an application where the development was led by science institutions. In the ISS projects medical scientific organizations are the main idea generators with public departments involved with communicable disease prevention as end-users of the GIS applications. Finally, the CRISP platform found a third major application when its further development was brought to the attention of the other member companies in the FPX network. In the SCA project public organizations, private companies and academic actors acted as developers, producers and end-users, which indicate that an invention might travel between the private, the public and academia much in line with the notion of a triple helix as posed by Etzkowitz and Leydesdorff (2000). Hence, the strategy of making the CRISP technology into what a FPX manager called an "innovation platform" enabled several different applications to emerge from the initial technology.

The intent and strategy of the RSN managers was to make the CRISP platform as adaptive as possible to enable the spreading of the "innovation platform" to involve several different applications. Making the inventions available and adaptable to all its members was considered a part of a RSNs purpose since otherwise the RSN is in risk of "supporting a single business benefactor". However, according to Van de Ven (1986) an invention will not become an "implemented reality" without being relevant to the context where it currently exists, and new solutions must be embedded in the specific producer-user interfaces of its context to reach widespread use (Håkansson & Waluszewski, 2007). It is evident that innovation processes favor specific and context dependent adaptions of resources rather than achieving general adaptability of those resources. The set goals of the development of the CRISP platform were all focused upon the technical development of the platform itself. Goals regarding the integration of the producer setting into the development were non-existent. Issues addressed in the development setting hence address solely the development of a technical solution that would fit a multitude of using settings, consequently neglecting the producing setting.

7.2 The producing setting

In order for a new potential innovation to be embedded into producer-user interfaces it must be transformed into some type of product or process. Håkansson and Waluszewski (2007) claim that in a business producing setting it is normal that an end-producer is only responsible for a minor part of the total product cost, which will imply that others than the focal producer have important influence on the producing setting. The FPX network included several organizations stemming from different type of business that was described as complimentary to the companies directly involved in the GIS technology development. There organizations involvement into the development of the CRISP platform was elevated by the respondents, predominantly from the development setting, as vital in the development process. However, the producing setting predominately consisted of private companies who expressed problems with understanding the projects short-term profitability. This notion made them praise the focus on long term benefits but also made them rather passive towards investing their time and effort into the projects. Ingemansson and Waluszewski (2009) suggest that when the producing setting is business and the developing setting is science the new invention has probably not emerged within an established producer structure of business actors. Hence, the problem of creating a fit in the interfaces between the development and the producing setting is elevated. Within the ISS projects it is easy to see that this problem became apparent in the studied case and resulted in a gap of resources in the producing setting. Also, the developing setting within the other project was deeply immersed in the public sphere, making the interfaces between the privately dominated producing setting and the developing setting hard to integrate.

It is evident from the collected data that there was a significant gap in the producing setting in the studied innovation process. All of the respondents in the using setting expressed that they were missing actors that would offer support, market the applications, validate the systems technical stability or administer the input of data into the various applications. The undertaking of these roles was voiced as indispensable in enabling the future widespread use of the applications at hand. As previously mentioned, the respondents within the development setting had a strong focus upon the developing and the using setting and the producing setting was thought to sort itself out once a product and a collection of end-users existed. The different applications of the CRISP platform are still in their early stages of development, but to find and integrate actors within the producing setting in a later stage of the innovation process might be a task that you do not want to underestimate. The "knowledge paradox" (Perez & Soete, 1988) that according to Waluszewski (2006) refers to "the circumstance that regions with high research intensity still can have a relatively low proportion of research intensive products" rests upon the notion that a lack of resources in the producing setting might hinder an invention from becoming widespread. A region with a low-tech industrial structure might for instance be lacking the ability to absorb advanced knowledge and inventions (Edquist, 2002). Hence, a lack of resources in the producing setting will not automatically solve itself once a developing and a using setting is integrated. Especially since the actors engaged in exploratory activities within the developing setting can never fully predict the effect of a new solution in the producer-user interfaces where this solution is to be embedded (Håkansson & Waluszewski, 2007).

The using setting

In the Connect and Protect project the emergency service organizations are both involved in the development of the GIS application by them testing and evaluating the system, but they also represent the applications end-users. This is also the case regarding the Gästrike recycling, energy and water organizations and the municipality of Sandviken within the SCA project, as with the Gävleborg County epidemiology center in the ISSS project. In the ISSC and ISSI projects the end-users are such organizations as the Swedish Institute for Communicable Disease Control and National Institute for Communicable Diseases in South Africa among Karolinska University and the other academic institutions involved (see fig 1). Hence, the actors within the developing setting have had contact with the end-users in the using setting throughout the studied innovation process. Håkansson and Waluszewski (2007) claim that knowledge about the already established structure in the producer-user interfaces in regards to past investments made in material and immaterial resources will make it easier to impose change in the structure and imbed new innovations. In this regard FPX enabled such knowledge to be formed by initiating collaboration between actors from the using and the developing setting. The respondents in the using setting praised the close collaboration between the developing and the using setting and this was emphasized as the most appreciated task that FPX undertook in the development of the CRISP platform.

Several researchers have highlighted the integration of science and business as one of the challenges facing innovation processes within a regional innovation system (Ingemansson & Waluszewski, 2009; Håkansson & Waluszewski, 2007; Corsaro 2012; Stock et al., 2002), because of their diverging institutional goals and organizational traits (Ingemansson & Waluszewski, 2009; Goddard et al 2012; Christopherson & Clark, 2010; Waluszewski, 2006). Of the 36 organizations involved in the innovation process developing the CRISP platform there is 10 private companies, 19 public organizations and 7 academic institutions. Hence, the main focus is upon public organizations as both end-users and developers, but all of the actors associated with triple helix collaboration (Etzkowitz & Leydesdorff, 2000) are involved. This also seems to be an explicit strategy since it is stated of FPXs webpage “the project (SCA) will also run a number of venues between different types of business, occupations, users and researchers”. The prerequisite for enabling knowledge to become exchanged between these actors is hence present in the studied innovation process.

Even if actors from both business and science were involved in the project the end use of the developed ISS applications stayed within scientific use. The organizational structure within the business using setting of this application of the CRISP platform was described as vast and rigid. Large investments were needed in resource integration to enable widespread and national use of the ISS application. Hence, the set goals of this project were limited towards achieving use in the science field and the use within a business setting was left for future endeavors. This mimics Ingemansson and Waluszewski (2009) notion that use within science do not require the same kind of physical or organizational fit as is often the case in the business user setting. Because how well a new solution fits in the field of science is often merely abstract and judged upon the basis of how it “fits” or “misfit” in an established theoretical framework. A respondent representing a developer of the ISS application said that "if we can prove that the system works and publicize the findings internationally, other countries might become interested". This indicates that integration into the business using setting was neglected and rested only in a hope that the scientific use would in turn generate an interest in the using setting within business.

In the Connect and Protect application of the CRISP platform some integration between the developing and using setting has been reached. Most notably by the product Blueplot which has started to reach some use in the using setting. However, a lack of resources in the producing setting was still thought of as a problem in reaching widespread use. This fundamental problem also manifested itself in the SCA application where some integration in the using setting did get established through most notably the Catch a Feather project. In the Catch a feather project the organizational resources in the using setting was lacking which hindered the application from reaching widespread use within the organization in which it was tested. The adaptability of the CRISP platform was described as confusing for the end-user since the knowledge of using the application was too limited to enable the end-user to get involved in the customization of the application. Clarity in the incentives of use was requested among the end-users and the lack of such clarity was explained by the absence of a clear marketing plan developed by actors in the producing setting. Yet again this indicates the problematic issue of reaching widespread use in the using setting without resource integration in the producing setting.

CONCLUSION

Fagerberg (2012) defines an innovation system as a "new and more holistic perspective on the roles of policy, governance and institutions for innovation" and I have argued for the RSN to be the strategic tool used by policy actors in achieving collaborative exchange between these actors. But this collaborative exchange is often confined to merely enabling knowledge to be exchanged. The integration of user and producer structures between actors is often neglected and therefore merit elevated interest in future research. In this paper the integration of these structures are put into focus.

Within the network perspective, innovation is not just about coming up with a novel solution; it is a complex process of combining something new with the organizational structures needed to enable its widespread use (Fagerberg, 2004; Van de Ven 1986). An innovation must find its way into this eco-system to survive and reach widespread use. Håkansson and Olsen (2012) claim that "In order for innovations to materialize, there is a critical need for some type of multi-functional, managerial network managing the complexity, extendedness, ambiguity and multi-contextual challenges across the many complex interfaces". Within this context the most pressing challenge defined in previous research entail crossing the institutional settings between science and business, since they act upon different patterns of how innovations are adopted and used (Van de Ven et al., 1999; Waluszewski et al., 2009; Lundberg & Andresen, 2011). The studied innovation process involves actors from all of these different contexts and has therefore given interesting perspectives on the role played by a RSN in integrating different developing, producing and using settings.

FPX played the role of being the bridge between science and business since the CRISP platform was used as a common "innovation platform", enabling technology developed in science to be used by business actors. A closely knitted collaboration between academic and business actors was therefore described as being promoted by FPX. Hence, to undertake this role in innovation processes might become a way in which to overcome the constraints of the knowledge paradox (Perez & Soete, 1988) and enable a functioning regional innovation system. However, The ISS applications of the CRISP platform have so far remained in scientific use and the resources that exist in the organizational structures of the using setting are described as hard to manage and integrate. A knowledge flow was in other words created which can be defined as a major driving force behind the initiated innovation process. However, resource integration did not automatically follow.

Even if these applications of the CRISP platform did not reach widespread use other applications of the developed technique might stand a better chance. The Ralf and the Blueplot projects are instances were the CRISP technology has reached some use and therefore became integrated into the using setting. Development within one application has therefore spread into another, yet again highlighting the importance of the FPX management in enabling the "innovation platform" to be used in different projects. Combining a wide range of developers and end-users in one innovation process without retaining intellectual property rights and heightened secrecy might be one way in which a RSN plays an important role in the eco-system of the market (Håkansson et al, 2009) or function as a "managerial network" (Håkansson & Olsen, 2012). The role of being a guide paving the way through the "the complexity, extendedness, ambiguity and multi-contextual challenges" (Håkansson & Olsen, 2012) that the rain forest of business pose is in this instance undertaken by the RSN since resource integration is made possible.

It is however evident that the focus in the studied RSN was put upon the developing and the using setting. Within these settings some resource integration was enabled which contributed towards the development of the different applications of the CRISP platform. FPX also enabled the developed technology to spread between the different applications and hence involved varying user settings for the developed invention. In this regard it is easy to see the positive impact that FPX had on the innovation process at hand. A technical solution got developed whose benefit for the end-user can easily be defined and communicated towards outside stakeholders and funders. This gave the RSN of FPX a good reputation and awarded them praise from the actors involved in the innovation process. Hence, the developing and using setting provided the driving force in the studied innovation process. However, the integration into widespread use in business that by definition is necessary for an innovation to form is another issue. This integration was hindered by the lack of resources in the producing setting.

The lack of resources in the producing setting was by several respondents adhered to the rules that a RSN must abide by because of their external funding. FPX was described as "having their hands tied" in this regard. If a RSN is supposed to bring an invention to market and handle support and undertake the producing activities, they run the risk of becoming a competitor towards their own member companies. Also, a RSN cannot support a business actor in their marketing and sales endeavors directly. To use public funds to support a single business benefactor will skew the prerequisites for local competition in favor of a single company. To play an active role in creating and promoting the integration of resources in the producing setting might therefore be incompatible with the function that a RSN is supposed to have in the confines of a RIS. This notion puts into question if a RSN is suited to promote innovation processes at all, or if resource integration within business must simply be created within business itself. To be able to integrate the producing setting into their strategic managing of innovation processes is at least a problematic issue facing the managers of a RSN and an issue that needs to be further investigated in future research. This notion yet again highlight that it is easier to create knowledge flows between business, academia and the public sphere than to create resource integration. A RSN might hence play the role of adapting and spreading the invention between different developing and using settings, but to involve and integrate the producing setting seems to be the problematic issue.

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