

**Sub-theme: 3. Triple Helix ecosystems and regional development**  
**3.6. Regional innovation ecosystems: are they possible in small and remote regions?**

## Rural innovation ecosystems – a challenge but possible

Dr. Ingjerd Skogseid  
*isk@vestforsk.no*  
Western Norway Research Institute  
Postboks 163,  
6851 Sogndal  
Norway

Dr. Geir Liavåg Strand  
*gst@vestforsk.no*  
Western Norway Research Institute  
Postboks 163,  
6851 Sogndal  
Norway

Ingjerd Skogseid (Dr. Scient) is a researcher at Western Norway Research Institute. She has a doctoral degree in informatics from the University of Oslo addressing rural innovation systems and development of information infrastructures. She has a Master of Science degree in Information Science from University of Pittsburgh PA, US from 1993. Following her master's degree she was employed as a research assistant at University of Pittsburgh, US (1993-1994). Since 1995 she has been a research scientist in the applied information technology at Western Norway Research Institute with a focus on ICT, innovation and rural development. At Western Norway Research Institute her tasks have involved both project management and research in both national and international projects.

Geir Liavåg Strand (PhD) is a researcher at Western Norway Research Institute. He has a PhD in Industrial Economics and Technology Management from the Norwegian University of Science and Technology (NTNU), addressing introduction of broad participation and collaboration between managers, employees and unions in companies.

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### Introduction

Rural regions are not homogeneous; they vary with regard to available resources, infrastructure, geography, population density, business sectors, and region's ability to collaborate. These are all factors that influence development in a region; the regional specificity is important.

This paper explores the development of rural innovation ecosystems, their development, operation and role in development of rural regions. It draws on theories and literature on how to create a self-reinforcing development in rural regions; in particular we have been inspired by literature on institutional capital, Triple Helix and the role and relationship of actors that together make up an innovation ecosystem.

In rural area the business sector often consists of a number of small and medium sized businesses with limited capacity to get involved in development processes outside their own business. Their

involvement is at the same time of importance. Without a business sector the livelihood of the region will be limited, the business sectors are also an important part of the knowledge resources (tacit and explicit knowledge) in the region which can contribute to development. Also universities and research organizations are scarce in rural areas. The size and knowledge resources vary from area to area, but in general the rural colleges are smaller than universities and colleges located in urban areas, they are often more applied and are specializing in a more narrow set of knowledge area. The university sector is smaller, but at the same time is important both with regard to the knowledge they can contribute, but also because of the links and networks to other academic and knowledge institutions located outside the region. These networks can bring in new ideas, knowledge and process skills to supplement what is available within the region beforehand. In rural Norway the public sectors often has a more prominent position and are larger organizations; more budget and employees than private sector. Their role in the ecosystem and innovation activities need to reflect this and they might have to take on more roles than in areas with a different balance between the stakeholders in the Triple Helix. This means that in a rural area the Triple Helix collaboration is not balanced, the government must take a stronger responsibility in rural than in urban areas.

This paper explores and analyses a development in one rural region to try and identify how it is possible to make a rural innovation ecosystems function, the role of and interplay between different actors seen in a Triple Helix perspective.

The paper begin with a state of art (Section 2), followed by a presentation of the methodology (Section 3). The article, then considers the case study example using the theoretical framework (Section 4) and final concluding comments on the analysis, policy implications and further research.

## **State of the art**

Our paper is focusing on a rural region with small agglomerated areas. Recent research in innovation and rural regions emphasizing the specificity of individual regions, and in particular the need for more knowledge about rural and remote regions (e.g. Gløersen and Dubois, 2010, Nuur and Laestadius, 2010, Tödting and Tripl, 2005).

The innovation ecosystem analogy to natural, biological ecosystems lends itself well to such an exercise because of its dynamic nature. Biological ecosystems have certain features; a structure, a dynamic relationship between available members, a set of roles to play, which may be held by different actors and all are bound together in a heterogeneous collective whole (Iansiti and Levien, 2004, p. 9). Such innovation ecosystems (Iansiti and Levien, 2004) are a complex, but dynamic, collection of heterogeneous actors, both private and public at local, municipal, sub-regional, regional and national level. The Triple Helix systems described by (Etzkowitz and Leydesdorff, 2000) is one type of innovation ecosystems. The Triple Helix focuses on the relations between university, industry, and government with regard to innovation (Etzkowitz and Leydesdorff, 2000). It is representing a view that innovation is something happening in the intersection between industry, knowledge producing institutions and government, rather than something happening in the industry alone (Etzkowitz, 2008). In a rural region there is an organizational thinness (Tödting and Tripl, 2005). This will influence the helixes in the system, even though they are rarely equal, even in regions with organizational thickness (Etzkowitz, 2008). Thinking of the process as an innovation ecosystem it allows other actors to stand in and emulate the missing components this makes it possible to draw together across organizations in the innovation ecosystem.

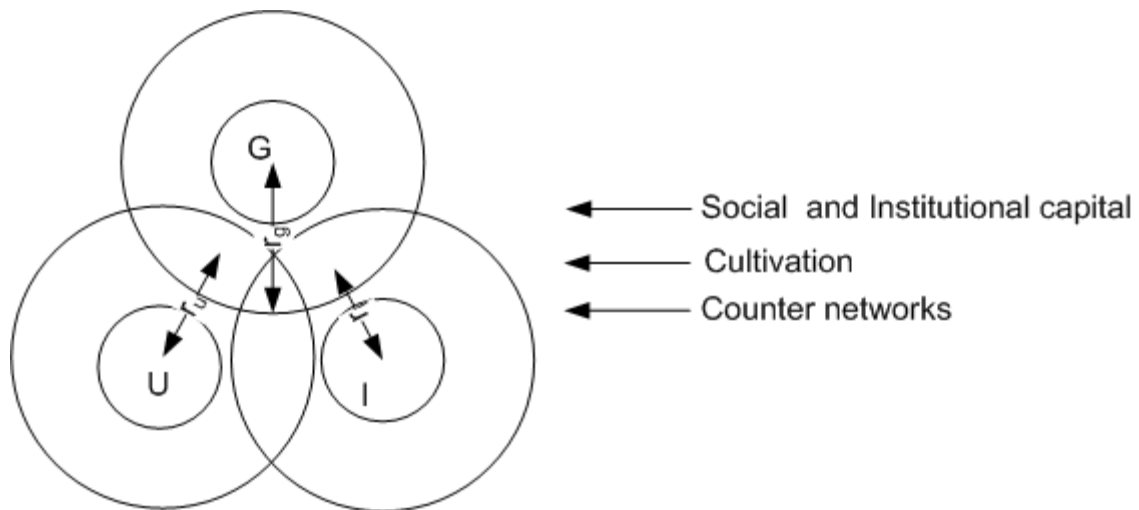
When working with rural regions and sparsely populated areas there is a need to take into account the existing industrial specialization, institutional architecture and patterns of innovation (Tödting and Tripl, 2005). The regional specificity needs to be looked upon as a resource and not as a "handicap" (Gløersen and Dubois, 2010) for development. When the regional specificity is put in the centre, a different process comes into place; one that is not possible to plan in a top down manner, but which needs to be developed organically based on the local resources available (Nuur and Laestadius, 2010, Skogseid, 2007). Nuur & Laestadius (2010) explored factors contributing to the development in rural area and identified the social capital available in the region as a core resource. The horizontal dynamics in the local network is in particular important, that is; the air of cooperation, informal networks and the fact that they are schoolmates, neighbors or have been work colleagues. All of these contributing to make it easy to meet informally and exchange views and learn from each other in the innovation ecosystem.

Skogseid (2007) research has among other identified three main characteristics for a reflexive rural innovation process; 1) institutional capacity (knowledge and relational resources and mobilization capacity); 2) counter networks (marginalized groups, localized processes addressing local needs, actions supporting a wanted/ desirable development); 3) cultivation as a development strategy to develop step by step based on the building blocks available in the local structure or through links to external structures. The institutional capacity is highly dependent on socio-cultural conditions (Uyarra, 2010); the ability to come into contact with and to co-operate with other actors, such as customers, suppliers, and R&D organizations (Tödtling and Trippel, 2005, Nuur and Laestadius, 2010). This is because innovation does not happen in a vacuum; local communities are currently facing challenges both from within their community and from the outside. As a result of technological development a local community is influenced and challenged by changes in a global perspective just like a biological ecosystem.

In change and innovation processes access to local immaterial resources is vital for the innovations taking place in a region. The most cited immaterial resources are; intellectual, social, cultural and institutional capital (Bourdieu, 2001, Healey et al., 1999, Putnam, 1993). *Social capital* refers to the social relations and duties that the individuals in a society have toward each other, and can be transferred to the innovation ecosystem. It takes time to develop this kind of capital, but it can later be taken out as surplus to gain personal or collective goals in the system in relation to change and innovation processes. Healey et al (1999) used the expression *institutional capital* to refer to a combination of the *knowledge resources*, *relational resources* and *mobilization capability* in a community. Access to knowledge and relational resources are a prerequisite for mobilization to develop a sustainable institutional capital and for mobilizing for and operating together in an innovation ecosystem. The knowledge resources are broadly defined as both explicit and tacit knowledge and the ability to absorb new ideas. The relational resources refer not only to the fact that every individual takes part in different types of social networks, but also to the dynamics of the network. To achieve common social goals, these resources have to be deliberately mobilized, or *cultivated*, through use of common arenas and networks, using mobilization techniques and change agents (Amdam and Veggeland, 1998, Healey et al., 1999, Amdam, 2005). The relational resource includes social and cultural networks that link individuals, social groups and different types of knowledge, the cultivation is happening in the process of engaging new interests in the ecosystem and modifying the plans and strategies as needed. In the networks, ideas and impulses are communicated. What connect such networks are common interests and relations. Törnquist (1997, pp. 102-103) showed that accumulation and development of knowledge in the networks happened through personal contact and communication. Healey (1997, 2007) claims that to develop a community there is a need to create alliances across special interest groups to be able to face the challenge together. When arenas are established actors meet and discuss, they can learn from each other. The common platform which emerges through this collaboration can be a basis for the mobilization process needed to meet future external challenges. By operating in this way the actors are better equipped to transform the external challenges to their community's advantage.

In an innovation ecosystem individuals, companies, and organizations must both co-operate and compete, and how they do that will influence their capacity to develop efficient responses to challenges (Diez, 2000, Healey et al., 1999, Putnam, 1993). It requires a flexible dynamic based on mutual trust and a sufficient action space to find practical solutions together. Innes and Booher (2010) say "*In collaborative practice... problems are treated as puzzles as participants work jointly to put pieces together to create shared picture of the future and a strategy for getting there. This open ended approach is at odds with both bureaucratic norms and the ideal of finding the right policy*". At the same time, challenges must be *countered*, proactively, through strategies and tasks that broadly involve the community and which are adapted to suit the actual situation, challenges and local needs (Skogseid, 2007).

By combining these theoretical elements with the Triple Helix field theory (Etzkowitz, 2008), our theoretical model is illustrated in Figure 1 below.



**Figure 1 Our theoretical model, modified from (Etzkowitz, 2008)**

The model shows the elements of the Triple Helix, Government (G), Universities (U), and Industry (I). The length of the radius ( $r$ ) of the circle around each of these elements vary dependent on the strength of the stakeholder. This is indicated by the arrows having different radiuses in Figure 1. The collaboration between the stakeholders are also dependent on the region's institutional capital, social capital and its ability to create counter networks, as indicated by the arrows at right-hand side of the model. We will use this model in our analysis of the presented case.

Our hypothesis is that in a rural area, the industry is often relatively weak, and this is also the case with universities. The government, on the contrary, are strong, illustrated by a big  $r_G$  and must act accordingly. The situation is differently from rural region to rural region, because active counter networks, high institutional capital, and high social capital influence the ability to achieve innovations through Triple Helix collaborations.

## Methodology

This is a study of development of a broadband infrastructure in a Norwegian region. The different stakeholders' roles and the collaboration between these stakeholders are in focus. As researchers we have taken part in this infrastructure development, both as project managers, discussion partners, and as writers of applications for public funding of the infrastructure. We have carried out actions, evaluated the results, and proposed new actions. According to Greenwood and Levin (2007) these are the characteristics of and Action Researcher; our selected work form is action research.

According to Reason and Bradbury (2008), action research is a set of practices of living inquires which goals are to improve human conditions in communities or organizations. As people collaborate to address their key challenges in communities or organizations, action research arises, involving creating positive change on a small scale or changes that affect the lives of many (Reason & Bradbury, 2008, p. 1). AR democratizes research processes by including the local actors as co-researchers (Greenwood and Levin, 2007, p. 3). "*Action research* refers to the conjunction of three elements: action, research, and participation" (Greenwood and Levin, 2007, p. 5). An action research project "proceeds in a spiral of steps each of which is composed of a circle of planning, action, and fact-finding about the result of the action" (Lewin, 1946, p. 38).

We were action researchers in the process and were active participants in the development and our conclusions are grounded in this action research. During this period we had different roles, and this influence our interpretations and findings, see (Hildrum and Strand, 2007) for a broader discussions of the researchers' roles in an action research project. Early in the process we were trust builders between the different stakeholders in the process. Then we were brokers and keepers of boundary objects; pointing to the fact that in this case it is the infrastructure development that counts, other cases should be solved elsewhere. During the discussions between the different stakeholders we were instigators of dialogues, and translators, especially in the dialogue with the vendors of broadband

infrastructure. The researchers have also been analysts, summarizing what happened, and interpreting the findings. This paper is an example of such analysis.

Data for the analysis are collected during our work as action researchers in the process. In addition, action plans, minutes of meetings, public tenders, and researchers' notes are used. The data is analyzed and presented according to the theoretical model, and presented as a case study utilizing the framework offered by the development story (Hildrum and Strand, 2007).

We understand a case study as "the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances" (Stake, 1995, p. xi). Our study is a single case where we look into a specific region. According to Yin the strength of the case study is that it both covers a contemporary phenomenon and its context (Yin, 1981, p. 98-99). Our findings are from a single case, but we claim that these findings also can be a "force of example" (Flyvbjerg, 2006) for other regions facing similar challenges.

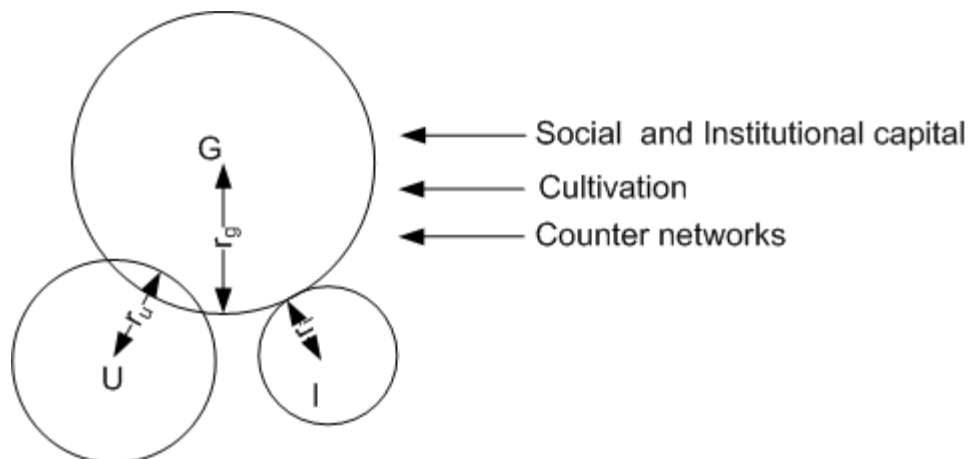
## Findings and interpretation

The paper presents a case from rural Norway, a region of 7,190 sq. miles and a population of just above 107,000 inhabitants, the Sogn & Fjordane County. This is a study of collaboration between public sector, industry, and research and development organizations in the region consisting of Sogn & Fjordane County. The region has three sub-regions: Nordfjord, Sunnfjord/Ytre Sogn, and Indre Sogn. There are a total of 26 municipalities in the region. The case is on regional collaboration to ensure broadband infrastructure in the region. In 1998 the Norwegian telecom market was deregulated, and telecom (like telephone, broadband), that previously was a government responsibility, was privatized, taken over by the free market. As a result of this liberalization, this free market gave the urban areas access to new infrastructure like broadband, but to build new infrastructure in rural areas was not profitable enough for the vendors, and rural areas didn't get access to broadband. To balance these regional differences, government decided in 1998 to co-fund infrastructure building in areas where the vendors didn't think the market demand was sufficient to make the investment.

This governmental funding, Høykom, was based on competition between applications from public sector (Lanestedt and Bygstad, 2009). The Høykom program has been one of the dominant financing channels for broadband development in rural Norway. The schema has called for regional and municipal funding and a lot of effort has then been allocated to this development. Høykom has contributed funding to the development and testing of new eGovernment services at municipal and state level and to infrastructure development. The program was built on the idea of regional innovation system in which the regional partnership holds an important role. The aim was to mobilize local resources and to adapt ICT-based services to local conditions and needs. Høykom program was concluded in 2007.

Turning to Sogn & Fjordane, applications from the region were sent to Høykom, but institutions from the region got few and small projects funded in the years 1999-2000. Compared to other remote regions, Sogn & Fjordane lost in the competition. As a consequence of this, the regional council in 2000 took an initiative to survey the broadband status in the region as a basis for coordinated initiatives. A status report (Loftesnes and Ølnes, 2000) was made by the regional research organizations, addressing infrastructure and resources available. One of the suggestions in the report was to establish a task force under the established network called IT-forum to promote closer collaboration between the local government, industry, and research and development on broadband matters. The suggestion was to establish a focused ecosystem, based on the broader IT-forum collaboration. IT-forum Sogn & Fjordane was established as a network in 1995 to guide the region into the information age. IT-forum is a Triple Helix-network consisting of organizations from industry, regional authorities, and research and development. The organizations are represented by their top managers at IT-forum's board, while the different work groups and task forces have operational level personnel involved. Many of the key stakeholders in the region are members of IT-forum. Through IT-forum, trust has been built between key actors and close relations developed between industry, regional authorities, and research and development organizations. The network is not balanced, local and regional authorities are better represented than the industrial sector. Figure 2 below illustrates the relationship as we perceive it at the time of the start-up. There is some collaboration and overlap

between government and university sectors, but not a substantial one with respect to broadband, while there is minimal collaboration and overlap with the industry sector.



**Figure 2 Illustration of the collaboration as we perceive it at start-up**

The work group Broadband forum was established at an open meeting in February 2001. Based on the work with the status report, key stakeholders from companies, public authorities, and region research and development organizations had been identified and they were specially invited to the meeting. From the companies' side, both local suppliers of broadband and local users of broadband were present. At the meeting keynote speakers told the participants about the challenge that the new national policy brought to the region: Access to broadband infrastructure was not a citizen right as before, but handed over to the free market. Sparsely populated regions, like Sogn & Fjordane, would probably not get access to this new infrastructure. The keynote speakers expressed a fear that one result of this would be that new innovative companies dependent on fast internet access would migrate to urban areas. It was also pointed to the fact that government had available Høykom funding to rural regions like Sogn & Fjordane, but that only a small amount of this money had been allocated to this region. One reason could be that by submitting a number of applications from the region, the regional organizations ended up competing between each other rather than improving the situation in the region. It was further claimed that as long as they continued to submit small independent applications, this would still be the situation in the future. One keynote speaker then suggested that if all applicants collaborated, we could utilize the collaboration between the stakeholders and through this collaboration infrastructure building would become more interesting for both the nation and local suppliers of broadband access, and the region could probably get a bigger share of the national funding.

The participants agreed that this would be a good idea and the broadband forum was established as a counter network with the aim to ensure sufficient broadband access to both public and private organizations and end users. A secretariat consisting of researchers from the regional research institute was appointed to coordinate and perform the daily work in the network<sup>1</sup>. Sogn og Fjordane county council funded the secretariat and a board was appointed consisting of one representative from the county council, one from each of the three sub-regions representing all the 26 municipalities in the region, one from the regional research institute, and two from the business community – one representing business users and one elected among the suppliers. In addition to representing different organizations the members of the board were picked because of their interest in broadband matters, they were not democratically elected. The goal was to establish a broad coalition with a board, a secretariat and a number of stakeholders (initially those attending the initiation meeting); referring to our model (Figure 1), this effort was put in place to widen the interaction and overlap between government, universities, and industry circles.

Several actions were taken the first year to broaden the collaboration and to start working on a joint priority list between the stakeholders of where to start the infrastructure building. Among other, three<sup>2</sup> information meetings were held with citizens and the business community in different parts of the

<sup>1</sup> One of the authors of this paper, Geir Liavåg Strand, has been member of the secretariat from 2001-2011.

<sup>2</sup> Måløy 8th November 2001, Høyanger 15th November 2001, and Aurland 29th November 2001

region, a secondary aim was to find ways of strengthening the industries participation in the collaboration and increase the knowledge relational resources available for the development. At these meetings the businesses informed broadband forum about their challenges and needs for new infrastructure. Business needs could be integrated in applications to Høykom, but the applicant had to be from public sector and have a main focus on public sector needs. One of the goals in the region was to build necessary infrastructure for the companies to grow and innovate. Based on the needs identified in both public and private sector, an application, BreIS, was developed for the Høykom deadline 17<sup>th</sup> April 2002. Without broadband forum's knowledge, five other local applications were also developed in parallel. When this was discovered, a negotiation meeting was arranged 3<sup>rd</sup> April 2002 between the different stakeholders that planned to hand in applications to Høykom. At this meeting, the six different applications were presented. One of the applications was a small collaboration project compiled by broadband forum's secretariat. The other applications were larger and from different parts of the region. The chief county executive participated at the meeting. He said that six different applications from the region to Høykom were too many. From the minutes of meeting: "The chief county executive doesn't want a "Winnie-the-Pooh" solution<sup>3</sup> ('both-and' situation). Should all applications be withdrawn?" The research manager proposed to develop a large joint project with different work packages and a common project manager. Each sub-region was offered to be responsible for its own work package. The sub-regions turned down the proposal and still wanted to submit their individual applications. At the same time, the secretariat was ordered to continue working toward a large collaborative project for a later deadline. The result of the application round was that two of the applications were funded, one of them the small collaboration project operated by broadband forum. It turned out to be difficult to get an agreement with the stakeholders to collaborate.

In 2002, BreIS (2002-03), the first collaborative national funded broadband project was started. This was a project that focused on how a region could organize to cope with the challenges associated with missing broadband access. This was a test project between the stakeholders to find out if the regional collaboration had a future and could surpass the municipalities and sub-regions need to have independent projects. The broadband forum and the project were organized as two parallel organizations, because the project should buy broadband services from the businesses and that excluded the business representatives from the project's board. The project board therefore consisted of the public sector and R&D members from broadband forum's board, which is the chief county executive, the research manager at the regional research institute, and the managers of the three sub-regions. The five members of the project board were all decision makers in own organizations, and during the project they worked closely and developed the foundation for a common social and institutional capital. This again led the basics for widening the government (county and municipalities) and universities (the research institute) circles as part of the project, while the industry circle remained more or less unchanged.

Parallel to the start-up of BreIS a new collaboration project was developed. At a stakeholder meeting in broadband forum 28<sup>th</sup> June 2002 the research manager informed about the result of the previous call for proposals and the process to develop a new larger integrated project. From the minutes of meeting: "...the sub-regions show interest for the new application, but they have not yet decided to join the application; a decision will be made after the summer holidays." Following the stakeholder meeting the board decided to continue the work for a large collaboration project without waiting for the feedback from the municipalities and sub-regions.

The plans were, in addition to the public sector needs, also covering the needs of industry and citizens in most of the 26 municipalities. One of the difficult tasks was to prioritize between the requests from the different parts of the region. The wishes for new broadband access were many, and the board of broadband forum considered it impossible to include all the needs in one project, the project would be too big and they feared that Høykom then would turn down the application. A plan for a staged process was developed; those that were prioritized down in the first initiative would be included in a later application. The different municipalities and sub-regions took part in developing the staged plan. At the meeting in broadband forum 15<sup>th</sup> September 2002 the secretariat could inform that the struggle had lead to submission of a joint application from the region. The project got funded, started in 2003 and by 2004 the planned infrastructure was built. The collaboration line had started. Following the

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<sup>3</sup> "Winnie-the-Pooh solution is a reference to the word "both" in a famous conversation between Winnie the Pooh and Rabbit: "When Rabbit said, 'Honey or condensed milk with your bread?' he was so excited that he said, 'Both,' and then, so as not to seem greedy, he added, 'But don't bother about the bread, please.'" [http://thinkexist.com/quotes/a.\\_a.\\_milne/3.html](http://thinkexist.com/quotes/a._a._milne/3.html)

Høykom program an alternative funding schema was set up, and the development and collaboration have continued. From 2002 to 2011 a total of 12 broadband projects have been operated by broadband forum, addressing new priorities and areas toward, all the time working toward the aim to ensure that the whole region and both private and public organizations have sufficient broadband access. There have also been run three other collaboration projects which are not operated by broadband forum but by new networks spun off from broadband forum under the IT-forum umbrella. government (county and municipalities) and university (the research institute) have widened their circles even more. The industry circle has also widened, but still the main collaboration in the rural innovation ecosystem is between government and university.

Currently almost all businesses and households in the region have access to first generation broadband. Ideas that came up in planning and carrying out one project, but which could not be prioritized in that project have been carried over to later projects in a staged development. In total more than 300 million NOK have been used to develop the infrastructure in the region, 150 million NOK of government funding has been matched with local and regional funding from public and private sector. The projects are all organized like the first projects with the county council as the formally owner of the project and a project manager from the research institute on behalf of the county council. A strong collaboration between public sector, the industry, and the three different sub-regions is built up during these years. The collaboration is still active today and the current issue of broadband forum is that all households in the region should have access to next generation broadband based on fiber.

Below we will further describe to changes according to the type of partner; government, university and industry partners.

### **Government**

Initial situation: A national program was put in place to ensure access to broadband for all independent of market forces but it required local coordination and funding. As a step in achieving this, the county council asked for a plan to ensure broadband access to public sector, the industry and the inhabitants in the region. At that time the three sub-regions collaborated with the municipalities in their own neighborhood, but they competed with municipalities in other sub-regions. The different arenas organized their work independently and it generated a lot of project ideas and applications to the Høykom program. But no or very limited funding was achieved because of the competition from both this region and other regions

Development: During the projects, this has changed and now coordinated actions with a number of sub-projects with joint management and structure emerged. Instead of many small projects that competed against each other for funding, the small projects are run as sub-projects in larger coordinated projects ensuring that the whole region is covered.

After situation: A strong institutional and social capital is developed with the members of the project board as the core group, but involving all the stakeholders in the broadband forum, and between the public organizations with the university partners and toward the industry partners. A realization among the public sector organizations the by collaborating they have achieved more than they would have on their own and in competition with their neighbors.

### **Universities**

Initial situation: The regional research institute had close collaboration with the county council but less collaboration with municipalities and industry with regard to technological development.

Development: The regional research institute has acted as trust-builder between the different stakeholders in the region, by facilitating the dialogue and by negotiating a joint priority list covering the whole region. The research institute has coordinated and written the applications to Høykom on behalf of the stakeholders, and all the coordinated projects have been managed by a researcher from the institute. The institute acted as action researchers and in that respect both contributed to the development and were analyzing, reflecting on the process on our own and together with other stakeholders and contributing knowledge about the technological solutions, process and funding. In part different persons held different roles in the collaboration, some with more focus on management and process others more contributing to the common knowledge base.

After situation: The research institute has a closer collaboration with county council, municipalities and the industry, though weaker toward industry than the public sector. We also observe that the skills



and knowledge involved and developed through the process is sought after in other similar processes on other topics.

### Industry

Initial situation: There are three types of industry stakeholder; users of the infrastructure, smaller local broadband suppliers and national suppliers of broadband infrastructure. Larger companies were able to negotiate own access with national providers, but small and medium sized companies did often not have sufficient needs to be able to negotiate an affordable price.

In the period after the liberalization of the telecom market a number of small local broadband providers had been established. Companies who earlier provided dial-up internet extended their services to also provide broadband services some wire based and some wireless. The national providers did not see a market potential in the small rural communities and their plans for the next years did only to a small extent involve communities within the region.

Development: Focus has been on the needs of small and medium enterprises in the region. They have together with the suppliers participated in the collaboration. This participation has been limited to suggest where to build new infrastructure and how much bandwidth the industry needs. In particular the local industry stakeholders developed their professional relations, as suppliers, to the government stakeholders. They have started to collaborate among themselves and there have been mergers in that way they have become larger and more professional suppliers. Also the national suppliers have found that the collaborative effort have made visible the local demand.

After situation: The often small municipalities have learned how to become demanding customers in the relation to both the local and the national providers. There is a real competition between local and national suppliers in providing broadband services.

Figure 3 below illustrate the relationship between the stakeholders at current. The government and university stakeholders are more integrated and the industry stakeholders are more integrated into the Triple Helix collaboration then they were earlier.

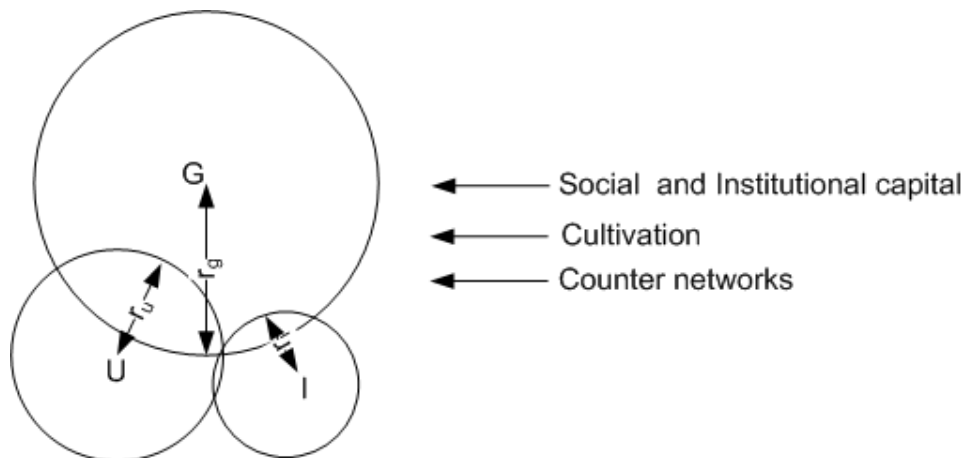


Figure 3 Illustration of the collaboration as we perceive it after operating the broadband collaboration

### Conclusions

Our case study illustrates the building of an innovation ecosystem in a rural area. Our finding is that during this process the three systems within the ecosystems have developed, and become more functional as an ecosystem. The development has been different in each of the subsystems. In the case the government and universities have widened their circles; broaden their collaboration. Because of a weak local industry sector they have also taken some of the roles that in other regions might have been held by the industry sector itself. The industry sectors have not changes much, but their role in the ecosystem and relationship to the other stakeholders has become more professional.

The Broadband forum started as a counter network, to mobilize municipalities and the industry sector to ensure access to sufficient internet infrastructure. They did not want to sit and wait until the national

suppliers found the region interesting enough. Instead they took charge and found ways to ensure a wanted development.

The collaborative effort ensured that the available knowledge resources in the region were used or at least available to the process. There was some knowledge about who could be good resources to use before hand, but to a large degree the initial organization of gathering stakeholders were by self selection. But coming from a rural region with an organizational thinness it is also easy to identify core resources for a process. The forum provided a meeting place where these learned to know each other and the skills available through the network. This was also the start of the relation building between stakeholders and between members of the board. It also became the arena for building trust between the sub-regions and municipalities. The collaboration and the success of the first projects made it possible to mobilize for further projects and a sequence of projects have been defined, funded and carried through. The process involves regional information meetings allowing municipalities and local business to report needs and discuss priorities. Each project, each interaction contributed to building an institutional capital and to strengthen the emerging innovation ecosystem.

This process of starting in the small developing a foundation for collaboration and from there on cultivating the development step by step, new needs were uncovered, new priorities made, new projects developed until today 12 projects have been completed and 300 million NOK (50 Mill USD) have been administered through the innovation ecosystem.

In the process the stakeholders have taken different roles. The government organizations at regional and local level have been providing co-funding together with the national program. In addition they have been a demanding user group and a demanding customer in developing the broadband industry in the region (both national and regional businesses). The industry sector representatives are either demanding users or suppliers of broadband infrastructure. And the university sector representatives are trust builders, knowledge suppliers and process builders negotiating further development.

## **Policy implications**

Our case study is limited, it is addressing one development in one region and it is difficult to generalize from a single case, but we claim that these findings can be a “force of example” (Flyvbjerg, 2006) for other regions facing similar challenges.

In regions where the government sector is the dominant one they need to be able to take a leading role in establishing a collaborative effort that also includes university sector and the industry sector. To have success in creating an ecosystem the government needs to care about the other sectors as well. In particular for the industry sector, this sector is not a homogenous group; they vary in size capacity and needs. It is important to identify both those businesses who can take a leading role in the development and those who are followers and need help to identify own needs.

## **Further research**

Working with a single case and looking for three characteristics in the collaboration the further research issues are

- What are the network characteristic and operation of the innovation ecosystem?
- What are the success factors for rural innovation ecosystems?
- Which barriers can be identified for innovation in rural places?
- Are lock-in effects more common in rural area, or do the members manage to utilize their networks to institutions outside the region?
- What are these kinds of innovation ecosystem contributing to development of the region – society influence?
- Are there similar patterns in other comparable rural regions and other development areas than infrastructure development?
- Can a strong government sector cover for both a weak regional university sector in addition to a weak industry sector?

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