Co-evolution lets in other systems. The conception of systems as self-organizing under conditions of co-evolution allows us to understand governance in terms of processes which do not operate simply under terms of command and control” (Byrne and Callaghan, page 225).
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| EMNEORD: | <Kompleksitetsteori, sosial innovasjon, innovasjon i periferien, transnasjonal læring, selvorganisering, emergence, fler-nivå-forvaltning, smart spesialisering |
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PREFACE:

This is the final report from the SEIKO project, funded by the Norwegian Research Institute VRI program and Nordland County Council (Nordland Fylkeskommune). The analysis of this report is also indebted to work for the EU Commission IPTS in Seville, coordinating the Smart Specialization platform, Smart Specialization analysis undertaken in Finland and Norway and financed by Nordland Fylkeskommune and the Municipal Council of Ostrobothnia, work funded by the LUBAT Interreg project, as well as the on-going RISKC project, funded by the third round of the VRI program. Some of the issues raised in this report is continued in RISKC, in cooperation with SINTEF.

The question of SEIKO was how programs financing projects like VRI may contribute to innovation and institutionalization of networks and systems of innovation in two broadly defined sectors, experiences and energy in Nordland, through enhancing flows of knowledge between science and industry. It this reiteration triple helix coordination, complexity and social innovation are referred to.

The answer to the question is the recommendations in the conclusion, where experiences are seen as a “good practice”. Energy seems to be at a crucial turning point, where the dysfunctional factors blocking innovation in energy and industry are revealed. A crucial distinction both in experience and energy is between social innovation-style triple helix self-organization on one hand, and business and technology driven innovation on the other.

The analysis is based on long-term cooperation and discussions with Jarle Løvland, Nordland Research Institute, Håkon Finne, Sintef and Seija Virkkala, Vasa University.
1 INTRODUCTION

The major metrics in conventional systems of innovation analysis is the Oslo manual or Community Innovation Survey (CIS) definitions of innovation. Indicators based on the Oslo manual are sometimes used as if innovation crucially depends on national or company level decision makers. Analysis is often related to the question like is the level of investments in innovation sufficient or not. Furthermore, most conventional innovation system approaches tend to praise well-performing regional innovation systems with historically given good practices, sometimes described with loose reference to biological metaphors, such as “ecosystems” of various kinds. In this setting of historical explanations and biological metaphors, the ecological diversity of the regional system of innovation often is seen as the result of long processes of historical development, typically through co-evolution between industrial value chains and supporting technological universities and policy institutions, referred to as a well-connected triple helix below.

Needless to say, this approach and their findings are not seen as relevant by regional innovation policy decision makers, who are stuck within fragmented and complex networks and systems of innovation in peripheral areas and regions.

1.1 COMPLEXITY THEORY

Today, social science takes steps towards “understanding the complex” (Byrne and Callaghan, 2014). In doing so, complexity theory is moving in the direction of multi-disciplinary empirical research on the economy. ¹An important cornerstone in this shift is the rejection of biological metaphors, and the reintroduction of organizational rather than biological perspectives on learning and innovation.

Complexity theory rests on a few simple assumptions:

- First, complex systems are not designed top down, they are the result of self-organization by many autonomous decision makers.
- Secondly, complex systems have emergent properties in the sense that they have the capacity to change in new directions.
- Third, in order to do so, complex systems are able to create energy, by increasing the system scale.

¹ In reading “economy” as “neo-classical economic theory”, one might say, both innovation economics and complexity theory are related through a common enemy, neo-classic economics. But before defeating this enemy, there is a bridge or two to cross. For instance, Byrne and Callaghan conclude that “Complexity treatments of economic systems have a way to go” (page 221). Never the less, their vision is:”(...) we may even soon see a dissolution of Economics into an interdisciplinary complexity-informed social science. (...)”. (opt. cit page 211). The word “dissolution” should be taken seriously, as complexity theory provides “a set of demolition charges” for economic theory (opt. cit. page 224).
Fourth, complex systems are inherently unstable

The practical use of complexity theory explains how instability, emergence, and energy accumulation may enable self-organization.

A complex system is “open”, and it may “let other systems in”. It may accordingly appear to be fragmented, with tensions which create frustrations. This lack of clear borders makes it into a difficult object. It may be contrasted to something which may be seen as more successful, a well-functioning, closed and complicated system.

“A complicated thing can be taken apart into its bits and reassembled from those bits.” (…) A complex one can’t be analyzed and integrated either in reality or in mathematical representation” Byrne and Callaghan, 2014, page 4

If we look at the stylized story of complicated, but not complex, well-functioning regional systems of innovation, they consist of a core university and other research institutions, as well as supporting regional political-administrative institutions, which co-evolves with globally competing industries located in the region. The relations between the three helixes (business, politics and science) are close and mutually beneficial. The result is sustainable trajectories, in terms of level of innovations and an ability to defend and maintain the position of the region in the world economy, despite market turbulence and challenges. The complicated but not complex regional innovation system may be analytically taken apart into bits and pieces, as clockwork or machine, and put together again. The story of these systems often includes top down coordination and design. Research on regional systems of innovation has brought forward several of these stories. 20 years ago or so, there was an entrepreneurial hero (or a network of heroes), a visionary mayor of the municipality, a clever rector at the university, and industrial investors with huge long term investment projects. They sat down together, understood what was to be done, made the right decisions and implemented them forcefully. These entrepreneurial heroes created top-down the machine of triple helix co-evolution, a university, an industry and regional policy coordination mechanisms which has been producing innovations, money, employment, and growth ever since.

In this story of change, actors are successfully working inside their structures, and transforming/ modernizing them from within, in accordance with classical sociological perspectives of modernization, such as Giddens. Complexity-theory has a different perspective on agency and structure.

Here, actors and structures are related, but also potentially disconnected. Actors may relate reflexively to several structures, whereby they may choose between different structural contexts, networks, and roles. As we will see below, this enables a new type of innovation
through analysis involving monitoring of others, or comparisons, leading to new types of innovation through transnational learning, enabled through systems of multi-level governance, such as Smart Specialization (see below). Complex structures may give birth to new structural forms, through emergence (see below). According to Byrne and Callaghan, core empirical elements in complexity theory are co-evolution and self-organization.

Co-evolution lets in other systems. The conception of systems as self-organizing under conditions of co-evolution allows us to understand governance in terms of processes which do not operate simply under terms of command and control” (Byrne and Callaghan, page 225).

Indeed, in organizational theory, command and control are recognized as barriers to innovation. This is what Virkkala and Mariussen say:

Tacit mechanisms blocking learning is a well-known phenomenon in geography and in different parts of the broader field of organizational theories. In the classic organizational theory, (...) knowledge was at first seen as something that is embodied in humans. Furthermore, humans and their knowledge are seen to be potentially controlled by organizations. These organizational administrative mechanisms are seen as restrictive, as they define objectives with clear implications as to what is relevant and what is irrelevant to the operations of the organization. The top sections of the hierarchy decide what kind of knowledge is relevant and legitimate, and the vision of the leadership is biased toward the exploitation of solid existing knowledge rather than of uncertain new knowledge. Within this theory organizations possess bounded rationality, as they focus on efficiency rather than effectiveness, developing myopic visions. An alternative to the idea of the restrictive and restricted organization in the organizational theory is learning organizations (..), such as adhocracies, which may thrive in dynamic and open innovation systems. (Mariussen and Virkkala 2013: Learning Transnational Learning. page 159).

In this way, one might say, complexity opens up for strategies of innovation which are beyond the restrictions principal agents and their top-down hierarchies of implementation may impose. Below, we will discuss this from the point of departure of a theory which explains how complexity may be created within a hierarchy, Nonakas theory of new knowledge creation through SECI.

1.2 NORDLAND, A COMPLEX REGION

Nordland is an industrial region, with energy intensive metal and mineral industries, a high level of hydroelectric energy production, a world leading industry in salmon cultivation and a strong experience economy. Never the less, until quite recently Nordland did not have a university. The regional economy evolved through specialization in exploitation of natural
resources based on craft skills and experiences learnt through hardship and labor. It was developed further through corporate investments with application of science, which opened up for new technologies and methods, enabling new ways to exploit nature. Institutions managing natural resources in sustainable ways were set up. They enabled the development of regional green energy and marine seafood clusters. In this way, there is a lot of embedded scientific knowledge in use in the region, but it is mostly externally controlled. Core elements of the regional economy rely on national and global systems of innovation. In many firms and sectors, innovation simply is based on in-house staff skills, or production systems and networks, with suppliers and customers as the main sources of local innovation. Path-breaking innovations come as investments by corporate owners, located in far-away places, and accessing global systems of innovation. In core industrial sectors, such as aquaculture and energy-intensive processing industries, technological innovations are results of corporate investment decisions, made in the context of national (aquaculture) and global (metal industry/ material technology) systems of innovation.

Accordingly, compared to a more mature and stable regional system of innovation, with a well-connected triple helix and regionally embedded scientific knowledge, capable of supporting industrial trajectories, Nordland is a more fragmented, or complex, system, which “lets other systems in” on a regular basis. This complexity creates an instability, which opens up a space for development strategies where different internal and external resources and actors may be involved. Warning bells which has been observed and reflected upon are a relatively low level of innovation, measured with the Oslo manual statistics, as well as a relatively low level of education.

This is where self-organization and emergence comes in. The logic of self-organization in this context means the development of consensus between key actors in the regional development partnership of how problems should be understood, and solutions sought. A core actor is the institution with responsibility for regional development, the County Council or “Fylkeskommune”. As a result of some of these efforts, the University of Nordland has been established, so far as the smallest university in Norway, with so far fairly low scores on university policy indicators. Due to its history in the pre-existing institutions, the young university has a focus on public sector education and business studies. The continued effort is to strengthen the existing university, and, more generally, work to develop relations between firms and other relevant R&D institutions in terms of increased access to technological research.

A catalyst for these strategies has been various project-based development program administered by regional development institutions (such as the VRI program financed by the Norwegian Research Council) involving firms and researchers, and led by a regional partnership, with the Regional County Council at the core, as well as various programs supported by Innovation Norway, such as ARENA, a network program promoting tourism in Lofoten, and NCE Aquaculture, a center of expertise for seafood and aquaculture.

Whereas complicated systems are supposed to bring equilibrium and stable trajectories, a characteristic feature of complex systems is instability. In the aforementioned stylized version of a complicated, but not complex, system of innovation, the system is kept in
equilibrium through the interaction between research institutions and industrial actors. Research institutions are supposed to be embedding the development of immature technologies, in that way supporting new path creation. A successful commercialization is achieved through interaction with receiving regional industries. On the other end of the scale, applied technologies which becomes obsolete, or industrial actors who decide to leave the region, may be quickly replaced through the mobilization of research capabilities and innovators in the university helix and in the regional labor market. In this way, a system with a well-developed triple helix is able to regenerate lost industries. This creates a sustainable path of development.

It soon became clear that VRI outcomes were to a considerable extent influenced by instable industrial paths of development, characterized by innovation-driven booms created by industrial actors, followed by financial busts, in some cases, such as solar industry, with negative regional impacts. In this way, several VRI priorities were turned into failures. Recent examples are the boom and bust of investments in cod production, growth and fall of solar wafer production, and growth and fall in investments in wind power (see below).

A contrasting development is innovation driven growth in the experience economy part of tourism. So far, this growth has become more sustainable, because it was possible to link the industrial development to supporting research at the University of Nordland, and dialogue and networking between the researchers and the tourist industry entrepreneurs. In other words, self-organization which is needed to develop complex systems was put in place in tourism (see below).

In the other cases, the unstable paths of development was a result of a lack of stabilizing factors which could have countered the fall and created a more sustainable pattern of economic development, such as a regional system of innovation. This lack of an “adequate” regional system of innovation, was met with new regional development strategies, such as the decision of Nordland to join the EU based Smart Specialization platform. This decision opened up for a system of multilevel governance, as shown below. Supported by the VRI program, the region joined the Smart Specialization platform, set up by the Commission to create growth in Europe. This opened up the possibility to develop a new analysis of the region, based on the S3 Guideline (IPTS 2013).

In the Smart Specialization analysis, the following major export clusters were identified as the core of the economy (Mariussen & al 2013)

- Marine cluster. The region has a strong fishing sector, which has evolved into production of domesticated salmon and other species based on aquaculture.
- Green energy region. Processing industries, where metals, minerals, chemicals, metal products and machines are produced, with mining and hydroelectric power as core suppliers. This cluster is now supplemented by a closely related oil and gas industry.
- Experiences in nature, based on a strong tourist industry with the archipelago of Lofoten as the main destination.
These major clusters are supported by maritime industries which make it possible to operate in coastal waters, cross deep fjords, and handle the complex logistics and technological challenges involved in extracting resources and connecting them to the global markets. They are also supported by a KIBS (knowledge intensive business) sector which connects the nature based industries with the dynamic internal economy, based on household consumption including a credit based housing sector and a well-developed public sector providing services. The report also pointed out that several of the support industries have developed export activities themselves, following the logic of innovation through related varieties and entrepreneurial discoveries. Examples are oil spill equipment, closely related both to equipment for salmon production, as well as mechanical and other products well suited for a maritime cluster operating in challenging coastal waters. Some of the KIBS sectors which connects private consumption, public sector services and export industries are also exporting. Then based on these factors, the region is well equipped when it comes to logistics, transportation and other infrastructures. As a result, the Nordland economy is open, based on natural resources, and successful, measured in net trade balance. The report found that the trade balance between Nordland and the rest of the world shows a net surplus in favor of Nordland of +30%, excluding oil and gas. In comparison, the Norwegian balance of trade is +20%, including oil and gas exports.

The emergent properties of this complex system influenced by VRI investments are

1. In tourism, several initially competing models of development converged and provided a language to discuss and monitor a shared strategy, with key words such as “experience economy”, “destination development” and SMB networking, through the ARENA program financed by Innovation Norway. This seemingly uncoordinated series of programs turned out to be the start of an “ant hill” development analyzed below.

2. In industry, the analysis of the system of innovation was supplemented with transnational learning through the introduction of “the German model” of industrial education, assisted by the successful introduction of a multi-level system of governance, the Smart Specialization platform.

3. In energy, frustrating attempts to develop wind-power based green energy production led to the formation of new ideas of Nordland as a “green energy region” or “the Nordland model”.

8
So how does this complexity open itself up to self-organization and innovation? What, if any, is the role of project based programs, such as VRI? Below we will discuss this from two related perspectives, first the micro level relation between self-organization and innovation, seen as the SECI process (section 2), and secondly, the meso level seen as triple helix (section 3) and multi-level governance (section 4).
2 INNOVATION AND SELF-ORGANIZATION

A core topic in innovation system theory is the importance of well-developed and internally highly differentiated clusters, networks and ecologies of innovation. This is extensively discussed in the literature, often with a focus on “leading cities, clusters or networks”. The short story is: the more differentiated networks, the more connections, the more interactivity, the more co-evolution, the more potential for innovation through interactive learning in different, related directions. Below we will discuss this from the point of departure of a specific form of self-organization, such as destination development in tourism and triple helix connectivity to promote industrial innovation, which was a core issue in the analysis leading to the innovation strategy in Nordland 2014 (Mariussen & al 2013).

In moving away from natural geography stories of complicated ecologies in the direction of an inter-organizational analysis of complex systems, we need to explore the actor – structure relations a bit closer. In particular, the role of actors is obvious for entrepreneurial discoveries, where entrepreneurs or institutions promoting innovation policy, are analyzing the structure, looking for alternatives, and subsequently intervene to transform it. Complexity theory assumes that actors somehow are disconnected from structures, or at least able to monitor, change them, and use and combine them selectively. In the cases of emergence and connectivity, actors are present, but they are operating within dynamic network structures. In this way the border between innovation, seen as investments to make a private profit, and social innovations, which, by definition are aiming at the creation of collective goods, is blurred. In these cases, as we will see below, the core innovators are not necessarily individual entrepreneurs, but rather collective actors, supporting processes creating collective goods which, in the next round, may enable business innovations.

This raises the question of coordination to achieve connectivity and co-evolution. There is an old story of how complexity and self-organization may be created within a hierarchy. In knowledge management co-evolution goes well together with Nonaka and his perspective on knowledge conversion as the core of new knowledge creation in the company.

One might say that the BA – SECI method suggested by Nonaka is a managed way of creating new forms of co-evolution and self-organization between different forms of knowledge. In addition, it is a story of how these management operations may initiate and guide processes of innovation all the way, not just to invention, but also through implementation.

What makes the BA-SECI process interesting is not its application within corporations, but rather because it provides a micro-level perspective on the above discussion of innovation based on connectivity and self-organization by Nonaka referred to as socialization. Within
this framework, the micro-level of the SECI process may be seen as complimentary to structural level governance facilitating *self-organization and social innovation*.

In turning Nonaka in the direction of self-organization, the stylized SECI process (socialization, externalization, combining and integrating) of new knowledge creation looks like this:

**Table 1: RELATIONS BETWEEN SECI AND SYSTEMS OF INNOVATION POLICIES**

<table>
<thead>
<tr>
<th>BA-SECI MICRO-LEVEL</th>
<th>STRUCTURE</th>
<th>INNOVATION POLICY</th>
<th>EXAMPLES OF ANALYSIS SUPPORTING SELF-ORGANIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCIALIZATION (sharing tacit knowledge)</td>
<td>SELF-ORGANIZATION CONNECTIVITY</td>
<td>NETWORKING, CLUSTERING</td>
<td>INNOVATION NETWORK ANALYSIS, TRIPLE HELIX CONNECTIVITY, RELATEDNESS, GAP ANALYSIS</td>
</tr>
<tr>
<td>EXTERNALIZATION (codifying tacit knowledge)</td>
<td>ENTREPRENEURIAL DISCOVERIES</td>
<td>SUPPORT FOR ENTREPRENEURS</td>
<td></td>
</tr>
<tr>
<td>COMBINING Recombining different forms of analytic knowledge</td>
<td>INVENTION (analytical discovery)</td>
<td>TRANSNATIONAL LEARNING, MULTI-LEVEL GOVERNANCE</td>
<td>LEARNING THROUGH MONITORING/TRANSNATIONAL LEARNING</td>
</tr>
<tr>
<td>INTEGRATING/EMBODYING Applying the new knowledge</td>
<td>EMERGENCE</td>
<td>DISCOVERY AND SUPPORT FOR NEW CLUSTER FORMATION</td>
<td>ANT HILLS/COLLECTIVE ENTREPRENEURSHIP</td>
</tr>
</tbody>
</table>

Localized socialization refers to what we have called self-organization. This externalization enables a collective movement from tacit to shared codified knowledge and analysis (externalization) possible. Externalization makes invention (combining) possible at an analytical level. This analytical discovery of a new possibility is then translated to a new practice or integrated into the organization. In terms of complexity theory, this is emergence. This process will be described below.

To Nonaka, this sequence of socialization, externalization, combining and integrating, or SECI, is a practical approach to innovation inside the company (see section 2.1). In our case, it is expanded to the macro level of the system of innovation, understood as the triple helix. As we will show in section 2.2, innovation at the level of the system of innovation may be facilitated by multi-level governance and Smart Specialization (see section 2.2).
2.1 LOCAL INNOVATION (BA)

In the framework of corporate governance, in the case of Nonaka, the challenge was how to create more cognitive complexity in a situation where the innovative capacity was strangled by hierarchies with departmentalized chimneys or other types of organizational lock-ins. The solution of Nonaka is to create cross-departmental and cross-disciplinary meeting places, where different specialists from different sectors, disciplines, and levels of the organization could break out of their organizational iron cage and create new products and new forms of knowledge. To put this differently, his recommendation was to create complexities and co-evolution where new knowledge creation, based on new connections between different and so far unrelated forms of knowledge. The micro level parallel to connectivity, in other words, is organizing BA, or places where different forms of knowledge may meet. The SECI process following from BA basically follows a complexity theory script, a movement from complexity (socialization and knowledge sharing between people who embody different kinds of knowledge which has so far not been related) into a horizontal process of learning where the explain what they know to each other, and in that way, one might say with reference to Luhman (see below), generate expectations through what Nonaka calls externalization (or codification). This is achieved inside the corporation through governance of the framework of the process, where the middle management organize meeting places between people with different forms of knowledge (BA) and through justification and legitimation of the process based on recognition from the top management. Since SECI opens up for the formation of entirely new systems, there is a follow up administrative support for continuation of the process, which results in not just invention (as explained below) but also innovation, through re-combinations and integration.

This is what Virkkala and Mariussen say about SECI

Nonaka and Takeuchi (1995) present four modes of knowledge conversion which are created when tacit and explicit knowledge interact with each other, and which constitute the engines of the knowledge-creation process. They are the mechanisms by which individual knowledge gets articulated and amplified into, within and throughout the organization. Taking the first letters of the name of each type of conversion gives rise to the SECI mnemonic. According to the SECI model (Figure 3.1), knowledge is created through interaction, by conversing knowledge (Nonaka and Takeuchi 1995: 62). The four modes through which knowledge is created are:

1 socialization: from tacit to tacit
2 externalization: from tacit to explicit
3 combination: from explicit to explicit
4 internalization: from explicit to tacit.
In the first stage of socialization, tacit knowledge is created and shared between individuals in physical proximity, mainly through face-to-face communication and other direct experiences. Transferring tacit knowledge requires sharing the same experience through joint activities, spending time together, or living in the same environment. An example of socialization is traditional apprenticeship. Apprentices learn their craft by observing, imitating and practicing the works of their masters (Nonaka et al. 2001: 16).

Through externalization, in the process of articulating tacit knowledge in order to convert it into explicit knowledge, knowledge becomes crystallized, meaning it can be shared by others, and it also becomes the basis of new knowledge. Our expressions are often inadequate, inconsistent and insufficient. When

![FIGURE 1 THE SECI PROCESS BASED ON NONAKA ET AL.](image)

Tacit knowledge is expressed and translated into metaphors, concepts, diagrams, models or prototypes so that it can be understood by others. Metaphors create new ways of experiencing reality, and are a way of perceiving or intuitively understanding one thing by imagining it symbolically as something else. Using an attractive metaphor and/or analogy is highly effective in fostering direct commitment to a creative process (Nonaka and Takeuchi 1995), and therefore metaphors are a tool for creating a network of new concepts. The creative process continues as we think of similarities between concepts and feel an imbalance, inconsistency or contradiction in their association, which often leads to the discovery of a new meaning or even to the formation of a new paradigm. Dialogues also support externalization (Nonaka et al. 2001).
During the third stage, explicit knowledge is increased by combining it with already existing knowledge. Through the combination process explicit knowledge is converted into more complex and systematic knowledge. The new knowledge is then connected with existing knowledge through sorting, adding, combining and categorizing. New explicit knowledge is disseminated among the organizational members through presentations and meetings, and thus processed within the organization in order to make it more usable. Middle management plays a critical role in creating new concepts through the networking of codified information and knowledge. New concepts are combined and integrate with broader concepts, such as knowledge vision, in order to generate a new meaning for the latter. In this mode, communication, diffusion and the systematization of knowledge are key.

In the fourth stage, explicit knowledge is internalized and ‘conversed into’ tacit knowledge, when individuals apply the knowledge. Internalization is the process of embodying explicit knowledge in order for it to become tacit knowledge, and it is closely related to learning by doing. Explicit knowledge has to be embodied in action and practice. Through internalization, knowledge that has been created is shared throughout the organization. Internalized knowledge is used to broaden, extend and reframe organization members’ tacit knowledge (Nonaka and Takeuchi 1995).

In this context, self-organization may be seen as composed of two elements. First, there may be a “self-awareness” or shared understanding (what Luhman refer to as auto-poiesis) between the actors involved in the process of structural transformation, which makes it possible for them to coordinate between themselves and achieve goals jointly, without a central or coordinating agency (Byrne and Callaghan 2014, page 66).

A classic sociological version of the formation of this self-awareness from the point of departure of complexity theory is found in Niklas Luhman. Here auto-poiesis or self-referential systems of communication are seen as emerging in the context of complex environments (Luhman, 1995, page 96). According to Luhman, the basic element in the formation of the systems of communication, or social systems, is development of shared expectations. Expectations start as simplifications of complexity, as “condensations” where certain among several possible elements in a complex situation are selected (as expectations), and tested. Successful expectations are reinforced through positive experiences or feedback generated in interactions (“we understand each other”), they become mutual, and accordingly they make up the building blocks of a self-referential system of communication, or a shared, common understanding of the purpose of interaction. In that way, mutually shared expectations which are reinforced through

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2 With reference to Reschke, Byrne and Callaghan criticize Luhman for a lack of understanding of processes through time, or a collapse between synchronic and diachronic analysis (page 97). According to our opinion, this criticism overlooks as important point, Luhmans discussion of expectations.
experiences evolve into the structures of social systems\(^3\). A crucial issue is the formation and maintenance of system borders. Luhman emphasize that expectations which are mutually reinforced may become immune and able to endure frustrations. They develop into stable deep structures of the national system. Here, we all know what to expect from different sectors, because they are institutionalized through ministries and layers of administration and policy delivery mechanisms and institutions, such as schools, universities, development agencies and so on. In highly performing systems of innovation, where positive feedback mechanisms are strong and tend to generate strong networks of mutual expectations this mechanism of immunization might backfire and create lock-in situations as conditions change.

Secondly, there might be a coordination agency which is regulating not by top-down coordination, but rather through inserting elements in the process which leads in the right direction (opt.cit page 225). In political science, this is often referred to as “governance” rather than “governing”.

Figure 2 SECI AND SMART SPECIALIZATION

In the story of social system formation told by Luhman, the development of mutual expectations results in a shared form of understanding. With Nonaka, this process is

\(^3\) This theme is also found in the literature on pragmatic learning theory elaborated by Charles Sabel, according to which economic actors are able to apply the logic of self-organization to create shared rules of conduct and cooperation (institutions) which enables growth.
discussed in the context of innovations. New knowledge creation means that knowledge from different sources, or institutionally distant knowledge, such as scientific codified knowledge (know what) and tacit knowledge (know how), are shared, discussed, and codified. In this way, tacit “know how” becomes “know what”, in other words codified. This process of codification opens up for shared re-combinations of codified, scientific knowledge and tacit knowledge. This does not necessarily mean that the recombined knowledge is scientific. Quite the contrary, this explication has to be done in a way which is mutually recognizable and understandable from the different knowledge owners going into the process. Mutual expectations are created for practical purposes, and shared within the site of localized learning, or BA.

In well-connected systems of innovation, we expect that there will be rich sets of relations connecting actors. This means that each actor can choose different partners and accordingly different strategies as the external conditions changes. In modern theories of innovation, and through the Smart Specialization program, entrepreneurial discoveries is a form of innovation which starts with a discovery of a hole or a missing link within existing networks and clusters. There is a missing connection. This flaw is discovered through analysis, and acted upon. By establishing a new bridge between two or more components in the network, the entrepreneurial explorer may open up for a new strategy of innovation which may be followed by others. If successful, it may lead to an improved structural context of innovation, through enhanced connectivity. This may be seen as complimentary to innovation through abduction. Abduction is a strategy of innovation based on comparative analysis. Based on comparisons between different systems (as in transnational learning), it is possible to discover missing relations and components in one regional system of innovation, which are there in another system (see below).

In the Nonaka world of innovation, this new mutual understanding has to refer to an object with certain functions, and a need for improvements. Nonaka refer to the analysis of this object as an “archetype”. The archetype is a codified model of “what is going on”, created through dialogue inside BA. Again, the archetype, importantly, is not a strictly scientific concept. It is created as a heuristic tool for communication between actors with different forms of knowledge. It is the common definition of what we are discussing, a model explaining how our situation may be understood. In this way the archetype is created through abstraction from the complex concreteness of the real life object in tacit knowledge, or know-how, as well as abstraction from the specificities of scientific concepts and theories which are brought to the table. Once the object (the archetype) has been constituted as a real “know what”, a codified, abstract knowledge created and shared through the dialogue inside BA, the process of transformation of the archetype and new knowledge creation may start.
The driver of this process of transformation is frustrations (differences between expectations and experiences) on behalf of the archetype.

Transformation means that the archetype is made dynamic. The archetype can be reconstructed. A step towards change could simply be the recognition that the existing archetype has failures. Typically, it may be a frustration with the existing situation, for instance through a comparison with another object. In the classic example provided by Nonaka, the discovery of the Japanese car concept, the point of departure was frustration among Japanese car manufacturers by just being in a position where Japan was copying the hegemonic model of the US car of the 1970s. There was the US car – and its Japanese copy. It was necessary to create a cognitive framework which could help them to break away from this hegemonic model, and create a uniquely Japanese car. They had to start to discuss the car in a different context or through different concepts. The abstraction which enabled this break was a metaphor, “fat boy”, characterizing the US car. Once this metaphor was discovered, it was possible to move conceptually to the opposite end, “tall boy”, as a tentative new definition of the yet unborn Japanese car concept. This means that the concept of the US car was abducted, taken away from its usual context, as the hegemonic car of the world, and put into a completely different conceptual framework of male identities (tall-fat) where its shortcomings were visible. It was this abduction which made the break with the hegemonic model possible, through the discovery of the opposite of a fat boy, a tall boy. Armed with the new concept, “tall boy” (expected to be superior to the hegemonic “fat boy”) it was possible for Japanese car manufacturers to start to specify the basic design, including the technological and functional parameters of this new type of car, such as slimmer, taller, lighter, more energy efficient and so on. This again, required a wide range of redefinitions of technological components in order to produce such a new car in practice. From this point followed a flow of innovations, within the framework of the new car concept. This led to new BA situations where the new components had to be designed and constructed in a way which corresponded to the new over-all design. Through implementation, the concept was improved, changed, and developed, tested, and, as we all know, during the 1980s, it became integrated into the Toyota lines of production, as the framework for the industrial strategy which made it possible to out-compete its rival, the US car of the 1970s.

Through the development of two archetypes, it was possible to make comparisons which opened up for a radical recombination of the components, and the discovery of a new car concept, tall boy. This discovery was not possible as an inductive improvement of the existing car, or as a modification, created by, say, a deductive modification of the design. Quite the contrary, the new concept enabled a new, radical design, with components which were not there before. This is innovation through abduction. A component which has not been there before, but which may come from abroad, may be taken and inserted (abducted) into the design. Abduction is risky. The new design is different from what we have seen.
before. It is not routine procedure, based on accumulated knowledge within a single system. Instead, it means that the system lets in another system.

This logic of innovation through abduction is described below with reference to multi-level governance, Smart Specialization and transnational learning (good practice translation and transfer). The basic steps are described by Pierce (reference here) as a logic (abduction) which is different from deduction and induction.

It starts from the realization that our information is incomplete. With this information a weak hypothesis is developed through a logic which is akin to intuition or guessing.

1. We know that practice P1 works well in region A, and we have a preliminary understanding of why it works so well, in other words the causal chain which creates this desired outcome described in the good practice analysis.
2. We know that there are certain similarities between region A and region B.
3. We observe that this practice is not applied in region B. Instead, region B has another practice, P2, with another outcome, which seems to be less optimal.
4. In this situation we may make a guess, regarding whether P1 can be transferred from region A to region B. This guess is a weak hypothesis.

This is what Mariussen and Virkkala say in Learning Transnational Learning

Abduction means that we hypothetically take the practice P1 from region A, make a good practice analysis according to the above-mentioned principles, and after that try to understand how it may be applied in region B. If the regions A and B are similar in all other aspects which are relative to P1, we might find that B can simply copy P1.

If region A has a hegemonic position, say, it is broadly recognized as the ‘Silicon Valley’ of these types of regions, there might be a strong political motivation to copy P1 in region B. In this situation the selection mechanism of region B may be wide open to P1. If, in addition, A and B turn out to be similar when it comes to crucial institutional and structural preconditions in making P1 work, B is also likely to be able to apply a copy of P1 in practice. If so, the absorptive capacity of region B exists, and the full circle of the SECI process may be completed. The outcome is a copy of P1 in region B.

To describe this process in more detail, first, there is another practice, P2, in region B. Even though P2 may be inferior when it comes to regional development outputs, compared to P1, it might be hard to document that this is the case. Second, there are institutional arrangements in place in region B which are likely to be supportive of P2. For example, there might be job descriptions, job contracts and other institutional
arrangements which are mobilized to defend P2. The institutional arrangements which have to be in place to support P1 might not be available in region B. Further, the institutional leaders (know-who) of region B may join up to prevent the implementation of P1. Still, it is worth questioning whether region B should copy A in the first place. All in all, there are likely to be obstacles when it comes to the selection (know-who) and absorption (know-how) of good practices.

The strategy of innovation through abduction is also applicable in innovations at the meso level of the system of innovation, its triple helix and its networks of innovation (section 2.2). Here (as we will see in section 2.3), it is known as Smart Specialization.

2.2 TRIPLE HELIX

This is what Virkkala & al. say about triple helix.

One conceptual framework studying regional innovation system is a triple helix i.e. close interaction between academy, companies and public institutions launched by Etzkowitz and Leydesdorff (1997; 2000). Triple helix model is used as a heuristic for empirical study on connectivity which is seen as a precondition for regional innovation processes. Helix refers to the spiral way in which various bodies are intertwined, as for example a double-winding staircase (Quartorp 2006).

The operating codes of the helices are different. The scientific system communicates and functions in accordance with the code true/false, and it uses a great deal of energy on testing its own results, academic discussion, falsification attempts etc. The research system observes itself by the development and use of methods and theories, since these are the way to generate new knowledge. New knowledge is important weather it is useful or not. (Quadrup 2006; Luhmann 1990) The economic system communicates and acts in accordance with the code profit/loss (Luhmann 1988). The system is result-oriented to a very great extent. For it competition as an incentive to raise productivity and to reduce costs, and it emphasizes the form of business plans, goals and criteria for attaining those goals. Companies make their special contribution, which are useful products and services and financial profits. However, the companies also observe their outside world via this optic: they attempt to impose targeted behavior on both the scientific system and the public sector and encourage both parties to focus on use-value. The public sector (Luhmann 2000) communicates and acts in accordance with the code right/wrong: are services supplied right or wrong in relation to politically defined need, i.e. are they politically correct or incorrect. The public sector observes itself and its own degree of success via a politicized optic. Public sector supplies it special product like welfare service. It regulates private companies’ behavior on the basis of collective welfare criteria.
Public sector is also regulating and planning the institutions supporting innovation in the regions.

**TABLE 2. THREE HELICES AND THEIR TASKS ACCORDING TO THE SYSTEM APPROACH (BASED ON QUARTROP 2006)**

<table>
<thead>
<tr>
<th>Character</th>
<th>Science/universities</th>
<th>Business/economy</th>
<th>Politic/public sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>The operation code</td>
<td>True/false</td>
<td>Profit/losses</td>
<td>Right/wrong</td>
</tr>
<tr>
<td>Way to operate</td>
<td>Theories, methods, Verification, falsification</td>
<td>Results, business plans</td>
<td>Governance of other sectors</td>
</tr>
<tr>
<td>Self-evaluation</td>
<td>Peer review etc,</td>
<td>Profitability</td>
<td>Implementation of decisions and political plans according to criteria: democracy etc.</td>
</tr>
<tr>
<td>“products”</td>
<td>Articles, reports, books</td>
<td>Products and services</td>
<td>Welfare services, guidance of regional development</td>
</tr>
<tr>
<td>Time horizons</td>
<td>Long</td>
<td>Short</td>
<td>Short/long</td>
</tr>
</tbody>
</table>

In industrial society, universities and business were more independent entities under the guidance of the governance/state. Nowadays in the knowledge society, these sectors or helices are more in interaction and their domains are overlapping. When the helices are overlapping, each of the helices takes roles of others. Former boundaries between private and public research and applied research are crumbling. Research which was earlier in the universities is re-defined and new cooperations and institutions for research work have been developed. Universities emphasize entrepreneurial tasks, such as creating companies, while industrial enterprises take on academic dimensions of sharing knowledge and training employees. The third mission of economic development has emerged to supplement the earlier missions of research and teaching of universities. (E & L 1998).

According to the Triple Helix thesis, the potential for innovation and economic development lies in a more prominent role for the university and in the hybridisation of elements from university, industry and government. The non-linear interactions between the helices can generate new combinations of knowledge and resources that can advance innovation at the regional level. (Ranga and Etzkowitz 2014.).

The institutional spheres of university, industry and government are interlinking differently and triple helix model has different variants in different regimes (Martin & Etzkowitz 2000). In a statist regime, government pays a leading role driving
academia and industry but also limiting their capacity to initiate and develop innovative transformations (Russia, China, Latin America). In a laissez faire regime characterized by limited state intervention (USA, Western Europe) industry is the driving force, with the other two spheres as ancillary support structures and limited roles in innovation: universities acting mainly as provider of skilled human capital, and government mainly as regulator of social and economic mechanisms. The institutional spheres have strong borders and highly circumscribed relations among them. In the transition to a knowledge society, a balanced regime is emerging, whereby universities and other knowledge institutions play an increasing role, acting in partnership with industry and government and even taking the lead in joint initiatives (Etzkowitz 2008). This variant denotes a knowledge infrastructure that takes the roles of each other and produces hybrid organizations. The objective is to realize an innovative environment consisting of university spin-off firms, tri-lateral initiatives for knowledge-based economic development, and strategic alliances among firms., government laboratories, and academic research groups. (Etzkowitz & Leydensdorff 2000; Tuunainen 2002).

According to the triple helix balanced model the best environments for innovation are created at the intersection of the spheres. This is where creative synergies emerge and set in motion the process of innovation in innovation, and create new venue for interaction and new formats (E&L 2000; E2003). In the intersection of these helices are hybrid organizations, which in our case study are local development organizations with the task to link the activities of different helices (research to companies etc.)

In order to innovate the triple helix, there is a need for transnational or trans-regional comparisons leading to abductions. Through comparing the archetype of the triple helix with other archetypes, it may be possible to discover a candidate for abduction. It may be a good practice, waiting to be transferred (see below). These comparisons are enabled through multi-level governance.

2.3 THE PROMISE OF SMART SPECIALIZATION (MULTI-LEVEL GOVERNANCE)

Smart Specialisation (S3) is a new framework for research and innovation strategies which together with other instruments, such as Horizon 2020 is designed to pull Europe out of its current economic problems. Successful RIS3 strategies are improving and sometimes changing conditions promoting innovation, competitiveness and growth. In order to do so, RIS3 operates with six steps of planning, outlined in the S3 Guide. This is how Mariussen, Midtkandahl and Ruslan
S3 PROVIDES A COMMON FRAMEWORK
The S3 guide outlines Research and Innovation Strategies for Smart Specialisation to improve the performance of regional and other systems of innovation, as well as suggestions of methods and approaches of “how to do it” in terms of policymaking. The implementation of the guide is supported by a platform in Seville, hosted by DG JRC IPTS. Regional and national S3 programs are expected to be submitted to an evaluation of DG REGIO, as conditionality for support from the European Structural Investment Funds.

S3 PROVIDES A COMMON “LANGUAGE”
The S3 guide provides the basic “dictionary” for knowledge sharing, a “language” for transnational peer reviewing and communication, consisting of definitions of core concepts for analysis and planning. In this way, S3 provides a framework for dialog on regional development opportunities and challenges between regional development policymakers inside regions and between regional planners in different countries.

...AND OPPORTUNITIES FOR TRANSNATIONAL DIALOGUES
Through peer review workshops knowledge about the region, its regional innovation system (RIS), its “triple helix” (3H), as well as it on-going work on the Smart Specialisation strategies are put on the table, and explained and discussed with peers, experts and critical friends from regions in other countries. Core components in these attempts at transnational learning so far have been “Critical friends” and “peer review”. Peer review sessions follow certain rules, such as shared objectives, mutual respect, openness, shared information and acceptance of different perspectives.

... BUT HOW DO WE MOVE FROM DIALOGUES TO REAL CHANGE?
However, the over-all aim of Smart Specialisation is not to discuss, it is to pull Europe out of its economic problems. In several European regions, this is only possible through considerable improvements of the regional institutional conditions and frameworks promoting growth and competitiveness. Europe cannot succeed without deep changes in improving innovation and competitiveness. So how do we go from dialogue to change?

CHANGE STARTS WITH AN “OUTSIDER” PERSPECTIVE
A short answer is: most regions and regional development institutions or partnerships have a hegemonic self-understanding or “story” of what they are doing. These stories often tend to take their existing strategies and practices as given. Change is only possible through reflection upon these practices from an analytical point of view which is located outside this self-understanding. We have to put the practices and the stories explaining the practices on the table and discuss and analyse them. In order to be able to reflect upon what you are already doing, you have to look upon yourself
from the perspective of an outsider. This is what the S3 common framework, common
language, and opportunities for transnational dialogues are all about. It is the first
step in the direction of a new perspective on your systems of innovation. This new
perspective might help you to discover problems and shortcomings which are invisible
seen from an insider perspective, or opportunities and new strategies you might need
in the future. In other words, the new perspective could lead to real change.
At this point, however, there is reason to be cautious. Advice from peers from other
regions or international experts may just be pushing fashions which may be more or
less relevant and useful.

SMART SPECIALISATION IS NOT A FASHION
The concept of transnational learning is used in different ways. It is often understood
as diffusion of “best practices”, based on “hegemonic models”, which are supposed to
be applied in similar and standardized ways elsewhere. In these cases the “model” is
often provided by a transnational consultancy, and it is likely to be implemented in a
“cut and paste” manner, based on a generalized description of what the “best
practice” is. One example is the diffusion of “new public management” models of
organization, where public policies were left to regional development and other types
of agencies, which operated on a contract basis. During the 1980s and 1990s different
New Public Management agencies emerged in many countries.

The result of this kind of learning is often the creation of what professors studying
diffusion refer to as “fads and fashions” where several countries and regions go in a
similar direction. Fashions start with solutions (such as new public management forms
of organization) which look for problems. Following a successful fashion may be easy,
because “everybody else does the same”. Because everybody does the same, the
fashion creates a legitimacy of its own. “Everybody” cannot be wrong. However, after
a while, based on some negative experiences or following a change of government, a
successful fashion is likely to create a reaction. (....)

What follows from fashions is an unstable system of policymaking which moves
between different solutions. Smart Specialisation is not about “following a fashion” or
applying the same standardized model or “best practice” which may be applied to
different problems.

SMART SPECIALISATION STARTS INSIDE YOUR OWN REGION, BASED ON YOUR
UNIQUE RESOURCES
Smart Specialisation starts with the analysis of the regions own preconditions for
development, its “critical mass”, specialisation and challenges.
Most regions are already likely to have several studies as a basis of their on-going regional planning. What is more, in several cases, it is likely that these studies confirm the ways in which the regional institutions already operate. Whereas existing planning documents are likely to contain useful data, analysis and information, they are not usually regarded as sources of the discovery of new strategies. Quite the opposite, documents outlining existing plans and practices are likely to be consistent with existing plans and practices. Smart Specialisation is about experimental change, where the analysis should move us from what we know today into the discovery of new possibilities. This is where we need to take a new look at what is happening inside the region, applying an outsider perspective. In that way we can discover a driver of change.

LOOKING INSIDE YOURSELF WITH AN OUTSIDE PERSPECTIVE, YOU ARE LIKELY TO DISCOVER YOUR DRIVER OF CHANGE

The dynamic element which may move planning out of a lock-in situation can be a driver of change. This driver can be a frustration with the current situation, a weakness, and/or it can be the discovery of an opportunity of development. Frustrations and the discovery of opportunities are closely related. If you have lost the ability to experience a frustration with your own performance, you are unlikely to look for new opportunities. In the analysis, the driver of change is likely to be summarized as a SWOT, which outlines strengths, weaknesses, opportunities and threats.

This frustration, importantly, may be created through comparisons with others. It may also be present already, as a tension between current realities and opportunities you have not been able to reach. Comparisons with other can help you to see your own region in a new perspective, and to discover your own shortcomings and hidden possibilities. Comparisons with others may also help you to confirm that the emergent strategies you are already working on are relevant, and should be reinforced, taking the advice from others into consideration.

Among industrial actors, this is called “learning through monitoring”. Industrial actors apply benchmarking and monitoring of what their competitors and suppliers are doing, and how well or bad they perform compared to their competitors as a basic tool of corporate governance. It is an efficient way to understand their position in global competition, and identify areas which needs improvements. 5

Regions are not companies. They are not actors in markets. However, regions and countries who are successful in providing triple helix frameworks for globally competitive industries, and have well-functioning systems of innovation, may sustain high levels of employment, decent standards of living and welfare, in short, preconditions for happiness. In so far as regions follow unique S3 strategies, they are
not competing with each other. In this respect, within the context of Smart Specialisation, regions may learn from each other and share experiences of how their regional economy may become more globally competitive.

The motivation to do this varies. Regions may in varying degrees feel the forces of global economic competition. Then again, why should regional policymakers care? Regional policies and the ways regions work in relation to the global market are kept in place through several institutional arrangements. Similarly, in trying to relate to science policy and regional development, S3 project may meet science policy actors and institutions happy to stay inside their policy paradigm, follow the science policy indicators, and just skip any thought of adapting universities to regional development needs. These and other obstacles to triple helix connectivity might be frustrating, but at the same time, if you are able to create new university – industry relations, or repair other flaws in your system of innovation, obstacles are also opportunities. In order to realise these opportunities, you need an analysis of your problems which identifies your needs.

Using transnational learning to change your own region takes a coordinated effort, which involves several phases of analysis and planning. It is an analytical task to find out what lessons needs to be learnt, and it is a task of S3 policymaking to identify how they can be implemented, and to do it. A point of departure is to look for other regions which may provide relevant input and guidance. Preferably, this should be regions which in important and relevant ways are comparable to your own region, in terms of spatial structure, institutional setup, sector specialisation or along other dimensions where you might need assistance.

The basic problem in attempts at transnational learning is that most projects succeed in discovering “good practices”, but they fail miserably in implementing them. There are usually two villains in this drama, discussed in section 3 below. First, there are local actors who are embedded in networks (as described in Actor Network Theory or ANT) which resist change. ANT theory may be contrasted with ANTHILL theory, where the ANTs are seen as innovative creatures, constantly looking for new resources to improve their ANTHILL. This is described in section 3 below. Then, there are the selection mechanisms of the state, which may exclude good practices which the state elite do not regard to be according to their strategy (see section 4).
3 EMERGENCE THROUGH SELF-ORGANIZATION — AND ITS LOCAL LIMITATIONS

Emergence means that there is a process of structural transformation going on. It may for instance have been started through an entrepreneurial discovery, a new strategy of innovation, where the leader is being supported or copied by others, and where this collective movement is driving a process of structural change, for instance through the formation of a new cluster, with new supply industries, value chains, and markets. To innovation policy makers, emergence is especially important as it may be discovered as a new potential for growth, a new growth sector, which needs support and attention, and which may be copied elsewhere. It may also refer to innovations in the triple helix.

Below, this is discussed from the point of departure of ant-hill theory, applied on tourism and industry in Nordland. The ant hill metaphor is based on the assumption that many small actors may create structural change, as long as they are working in the same over-all direction, guided by certain shared forms of understanding, provided by self-organization. Ant hill processes illustrates a core aspect of development in complex systems: complex systems may generate energy, by increasing the scale of the process, by increasing the number of ants walking in the same direction.

3.1 ANTS AND ANT HILLS

The success of emergence must be seen in opposition to the ability of existing systems to resist change. This is emphasized in Actor Network Theory.

(...) institutionalized trajectories have been described in the ANT or actor network theories of Michael Callon (1980) and Bruno Latour (2005). ANT theory refers to the generalized symmetries of mutual influences between artifacts, micro-level actors and macro-level institutional arrangements and structures, which create a stable actor-system (or an ‘actant’) capable of reproducing itself. All these factors tend to be mutually adjusted to each other, and make up an internally homogenous entity, a structure which produces consistent outcomes. By discussing the structure as an ‘actant’, actor network theory emphasizes the mechanisms of structural integration, symmetries and mutual influences around a given set of networks, rather than the gatekeeper function of selection at the border which is focused on by Jessop.(....) an ‘actant’ is likely to reproduce itself and not be transformed through policy learning intervention (...).

For these reasons, Czarniawska is critical of the idea of ‘institutional entrepreneurship’. Institutions simply do not change as a result of a single
entrepreneurial actor, although, one might say, entrepreneurial actors often try to influence, remove or transform institutions. Instead Czarniawska proposes the following typology of actors trying to influence institutions:

1 Institutions may be ignored by actors following strategies of change which are disruptive in relation to existing institutional complementarities.
2 Actors may introduce new practices, and hope they may diffuse and thus become institutionalized.
3 Actors may set up formal organizations, hoping they may become institutions.

There is, however, a fourth alternative: innovation through diffusion. Despite the self-preserving dynamics of integration of the actant, or the gatekeepers of the state structures analyzed by Jessop, components may be transformed and new designs imported from elsewhere, as well as adapted and used by actors in ways which incrementally change the existing actant structure. Czarniawska (2009) and Djelic and Quack (2010) refer to this process of combined diffusion and change as ‘translations’. A translation means that the object is not just diffused between different actants in different countries, but it is also changed and adapted to fit into a new context. According to Jessop, the action is ‘strategically calculated’.

As pointed out by Djelic (2008), two of the fathers of the actor-network theory, Callon and Latour, have somewhat different opinions in this respect. Callon emphasizes the homologizing impacts of global flows, as they seem to reinforce the internal consistency of the anthill. Latour, on the other hand, is not so certain about the results of translation. According to him:

the spread in time and space of anything – claims, orders, artefacts, goods – is in the hands of people; each of these people may act in many different ways, letting the token drop, or modifying it, or deflecting it, or betraying it, or adding to it, or appropriating it.

(Latour 1986: 267)

This is where abductions may lead to emergence.

(...) Czarniawska argues that stories of entrepreneurial heroes changing institutional complementarities should not be taken at face value. The reality of institutional change, or learning, tends to be much more complex, where actors occupy more modest roles. In describing the modesty of actors Czarniawska applies the metaphor of ants building ant hills, where, while doing so, they are likely to find additional building materials scattered around (see Figure 4.1). They then select what seems to
them to be appropriate, bring it to their ant nest, and apply it as best they can. In this metaphor, entrepreneurial heroism does not come as a result of strong actors making big decisions, but rather as a result of gradual processes of transformation, where influential actors are able to generate concerted actions, say, by creating networks where successful building material is discovered and applied, and where other actors may follow. In short, institutions, according to Czarniawska are not pyramids created by an all-powerful pharaoh. They are instead ant nests, evolving as a result of broad collaboration between several actors, who jointly find the seemingly appropriate solutions to problems by providing new collective solutions. This approach to change is somewhat different from the selection mechanism of Jessop. Ants may slip through the gates of the nest and apply their findings as they see fit. In practice, as we will see below, the metaphorical ant nests may also, as anticipated by Jessop, have guardians who reject elements they regard as alien. In other words, successful translation seems to rely upon certain specifics in the receiving ant nest. At the very least, there should be a need for change.

To rephrase this in relation to innovation through transnational learning, one might say that translators have to take two related contexts into consideration, the ‘nest’ where the translators themselves come from, including their own potential needs for improvement, as well as the solutions to these needs which they discover outside, in a different region. Unlike powerful entrepreneurial heroes, translators may be seen as much more humble creatures, as they simply discover something somewhere, pick it up and take it home for further scrutiny. Second, in doing so, the translator may utilize the power of the existing institutional arrangements and achievements elsewhere, remembering to point out that these are indeed ideas from elsewhere, in other words alternative solutions to local problems, which are already practiced elsewhere. But then, there are gatekeepers.
4 LIMITS TO MULTILEVEL GOVERNANCE, THE STATE AND INSTITUTIONAL CHANGE

Any kind of change is not possible.

(...) Jessop (2008) regards states as relations between sets of actors producing specific long-term strategies. These long-term relations or alliances form structures which are visible as patterns of selectivity. Empirically, this can be observed in the ways in which suggestions of change are evaluated. The structure emerges as selection mechanisms, where a suggestion for change which is consistent with the overall strategy might be accepted and selected, while others are excluded. This selection mechanism is apparent in the ways in which states, or more broadly speaking national systems, use power. So how do these selection mechanisms or structures work? According to Jessop:

Structures emerge in specific places and at specific times, operate on one or more specific scales, and with specific temporal horizons of action, have their own specific ways of articulating and interweaving their various spatial and temporal horizons of action, develop their own specific capacities to stretch social relations and/or to compress events in space and time, and, in consequence, have their own specific spatial and temporal rhythms.

(Jessop 2008: 45–6)

Jessop also stresses that structures (selection mechanisms) have specific ways of understanding the complex context within which they operate, they have their own ‘imaginaries’ which provides the basis for the ‘lived experience’ of a complex world (Jessop 2008: 239). These imaginaries, for instance ‘hegemonic visions’, are crucial in constituting the ways in which actors understand the world around them and their role (or their ‘construal’) in it. In his approach, the challenge is to examine how

a given structure may privilege some actors, some identities, some strategies, some spatial and temporal horizons, some actions over others; and the ways, if any, in which actors (individual and/or collective) take account of this differential privileging through ‘strategic-context’ analysis when choosing a course of action.

(Jessop 2008: 236)

Structures accordingly consist of actors, which may operate at different levels, at the regional or local level. Jessop’s theory of the state is produced as part of a wider theory of society, where the state is not just national institutions, but also ‘present’ at the micro level as the values and norms actors follow (Jessop 2008: 79). Thus, Jessop uses a method of analysis where micro-level phenomena, such as the selection or rejection of a given ‘good practice’ in a process of transfer from a region in one country to one in the context of another, may be related to wider structural properties of the national systems of the two countries. This structure of the national system explains patterns of selection and path dependencies.
Mariussen and Virkkala discuss institutional changes like this:

Institutions are building blocks of social order, and they can be seen as social regimes that provide sets of rules stipulating expected behavior, and discouraging behavior deemed to be undesirable. However, those who control the institutions don’t have perfect control over the rules themselves (Streeck and Thelen 2005: 16–19). Instead, institutions are distributional instruments that are charged with power implications, distributing power and other resources unequally. This asymmetric distribution of resources causes internal tensions, as actors struggle over the meaning, application and enforcement of institutional rules, resulting in either compliance or non-compliance with the rules. The creation of an institution might reflect the motivation of actors with particular resources, but also conflicts among actors with different resources and interests. The institution ends up being a reflection of the institutional preferences of the actors within it (Mahoney and Thelen 2010).

Streeck and Thelen (2005: 8) distinguish between processes of change, which may be incremental or abrupt, and the results of change, which reflect either continuity or discontinuity. Change is often endogenous and it is produced by the behavior that an institution generates itself (Streeck and Thelen 2005). Streeck and Thelen focus on transformative change as it relates to a process of an accumulation of gradual and incremental change, and argue that instead of ‘big shocks’ it is often a number of smaller events that lead to major historical discontinuities.

Mahoney and Thelen (2010) argue that change occurs when problems of rule interpretation and enforcement give actors within an institution an opportunity to implement these rules in new ways. Those who benefit from the existing set-up may be interested in continuity, whereas those with diverging interests favor change. Efforts to maintain an already established institution are manifested as an ongoing mobilization of support for the institution. Change may imply a shift in the power balance.

Institutional change (.... ), according to Mahoney and Thelen, can be classified according to two broad dimensions. First, there is the ability of the defenders of the status quo to veto change. Second, there is the question of discretion when it comes to the interpretation of what this change actually means, and accordingly, how it should be enforced in practice. (....)

There are four possibilities when it comes to implementing the good practice against resistance (based on Mahoney and Thelen 2010: 19). Following this classification, Streeck and Thelen (2005) point out that institutional change can be divided into five gradual but nevertheless transformative modes: displacement, layering, drift, conversion and exhaustion. Displacement means the removal of existing rules and the introduction of new ones, in a situation where resistance is broken down, and implementation is explicit and transparent. In this phase new models emerge, diffuse and call into question existing, previously taken-for-granted organizational models and practices. Some institutional arrangements may support the dominant logic of action, but these coexist with other arrangements, created at different points in time,
which might embody conflicting and even contradictory logic. New institutional arrangements are often introduced by actors that can be considered losers in the existing one. The emergence of new institutional arrangements can happen through a radical shift or a slowly evolving process where new arrangements are presented, which compete with existing ones, rather than replacing them directly. This displacement-effect might come as a result of a successful process of transnational learning, as in the case of New Public Management and World Heritage, for example. Layering means the introduction of new rules on top of or alongside existing ones, without actually replacing the institution. In other words the existing institutions are revised or combined with new ones. Layering often happens when defenders of the status quo prevent a complete turnover of the institution but are not against the introduction of amendments and modifications. Layering involves the active combining of amendments, additions or revisions with an existing set of institutions. The actual mechanism for change is differential growth; the introduction of new elements that set in motion certain dynamics through which, over time, the old system is crowded out. Layering may also mean new complementarities between the new institution and the old. An example of layering is when a program for ‘sustainable tourism’ was introduced in relation to World Heritage Sites, complemented with networks of sociologists studying the ways in which locals had adapted to World Heritage status. If actors decide to accept and promote this action, support from abroad in developing the new rules may be welcomed. A program of sustainable tourism may strengthen the local support for protection, or undermine it, as has been the case in regions where tourism has simply acted to draw the attention of Al Qaida, for example.

### TABLE 3 TYPOLOGY OF INSTITUTIONAL CHANGE

<table>
<thead>
<tr>
<th>Low level of discretion</th>
<th>High level of discretion</th>
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</thead>
<tbody>
<tr>
<td>Strong veto possibilities</td>
<td>Layering</td>
</tr>
<tr>
<td>Weak veto possibilities</td>
<td>Displacement</td>
</tr>
</tbody>
</table>
5 THE GOOD PRACTICE OF EXPERIENCES IN NORDLAND

Tourism, or the “experience economy” has been the focus of the VRI program for a long time. Within tourism, the main outcome so far is application of a «layer» of research based generation of new perspectives and dissemination of good practices or archetypes «on top of» the «established» forms of innovation driven by entrepreneurs. In some cases, scientific knowledge was involved at the core of the process of innovation, in discovering new opportunities, mainly through projects involving geology (Geopark in Helgeland) and cultural sociology. The predominant form of innovation support from researchers was diffusion of new, emerging perspectives, ideas and business models, mainly the archetype of tourism as an experience economy. In addition, VRI, together with other innovation policy instruments, such as Innovation Norway, has supported social innovations, such as destination development. These social innovations were more or less closely related to business innovation, such as in the winter tourism drive in Lofoten, extending the tourism season with new experiences. Gradually, social innovations opened up for business innovations. This created an ANTHILL effect.

At the point of departure in Nordland, tourism was not regarded as a serious business. The major organizing actors were the tourists themselves. They started to come, and they used existing lines of transportation, coastal liners, airports, hotels, shops and other services which were available to the population in general. Initially, tourists were seen as a seasonal side-kick by businesses and institutions who focused on their core, domestic market. After a while, however, they were discovered as a business potential by local entrepreneurs. This started a process of self-organization, where small scale entrepreneurs set up businesses, often in close cooperation or as additions to on-going businesses with other markets. The VRI program brought researchers on board. Other initiatives, notably from a national innovation agency with strong regional offices, Innovation Norway, brought external consultants. The Regional County Council became pro-active. Initially, these sources seemed to be competing. After a while, they were converging around certain common themes. A triple helix started to form. The sources were:

1. A pro-active strategy to promote tourism and experience economy from a special unit in the Regional County Council. They encouraged contacts between researchers and tourism operators, facilitated conferences, and supported transnational learning through active participation in Interrreg projects.
2. Research on tourism undertaken by researchers at the University of Nordland and Nordland Research Institute, and mostly financed by VRI. This enabled cumulative learning among researchers.
3. A national research program was initiated by the Norwegian Research Council, Northern Insights (Opplevelser I Nord) started in 2009, with PhD students at the core.

4. Novadis, a center for communication and networking between entrepreneurs in the industry and researchers, located to Nordland Research Institute and financed by VRI. It facilitates various forms of contacts and networks, including a seminar.

5. ARENA, a program financed by the national innovation agency of Norway, Innovation Norway, promoting cooperation between entrepreneurs in the tourism/experience economy sector in Lofoten. It was operated by an external consultant, following a standardized method of cluster development “owned” by entrepreneurs, developed and co-financed by Innovation Norway.

6. Destination Lofoten, a cooperation on destination development between the municipalities in Lofoten

7. Lofoten Winter, an innovation network between entrepreneurs promoting experience products for the winter season

There are several different stories of how these factors were initiated, and how they converged. Initially, there were no or just insignificant contacts between researchers and tourism firms. At the same time, the tourism office in the Regional Council kept the door open, and tried to initiate interesting projects to develop tourism through research. Based on these incentives, researchers started to study the field.

An important factor was a successful import of two powerful archetypes, referred to through two loose metaphors: “experience economy” and “destination development”. The idea of the experience economy strategy emerged among researchers in Nordland Research Institute, based on a study of a good practice in Finland, Rovaniemi, and the Santa Claus theme park. In Finland, it was started by an entrepreneur, playing the role as Santa himself. His idea was extended by a state based intervention, which created a science based mass tourism theme park as a national strategy. The organization of this park is science based. It has a sophisticated system of formal education and research at the core, supporting the experiences of children brought in by charter planes from abroad, meeting Santa. Whereas this science based strategy in Finland had a heavy national backing, the translation to a Norwegian context initially was related to a system of entrepreneurial innovations, where the self-made entrepreneurs enjoyed support from their networks, suppliers of equipment, and other operators in the tourism sector. This entrepreneurial system of innovation was based on individual learning and learning together with others, in particular, individual learning together with the customer. In other words, this was individualized and experience based, very far from the mass tourism approach applied in Rovaniemi. The links between researchers and entrepreneurs started to evolve through small VRI projects, which were aiming towards cooperation and networking between researchers and tourist sector operators, often with an aim to create entrepreneurial networks. This enabled cumulative learning on the sector within the community of researchers, and it enabled the development
of networks and contacts across the different parts of the triple helix. New ideas and model stories of good practices gained traction and widespread attention, among other things through high profile conferences, with triple helix participation. Another bridge which enabled contacts was the background in entrepreneurship research among many of the researchers, as well as the professors and students involved in the national program located to the regional university, Northern Insights. The entrepreneurial researchers and the entrepreneurs were to a certain extent “old friends” with questions relating to SMB strategy and characteristics of the experience economy market, explored by the PhD students of the Northern Insights program.

On the other side of the scale a more collectively oriented approach to destination development was developed by regional actors in Lofoten, both in the public sector end (destination Lofoten) and among private actors, in networks such as ARENA and Lofoten Winter. ARENA was “owned” by the participating entrepreneurs, and driven by a consultant, paid by Innovation Norway. This form of self-organization is not without hierarchies. The main sources of funding were short term projects, combined with long term funding of research and networking from several institutions, working together. These mechanisms of coordination were characterized by cooperation and self-organization between several actors and institutions in the triple helix, not top down coordination from a central agency. Researchers were invited into this work. Core elements in the contacts between researchers and entrepreneurs were:

1. Facilitation of meeting places, such as conferences, seminars and projects with shared participation from researchers and entrepreneurs
2. The development of a set of broad and inclusive concepts and stories which were mutually recognizable and gradually constituted a “common language” with the entrepreneurs
3. Since these concepts were broad, they could be applied in different directions in a pragmatic way.
4. Gradually, positive micro level experiences and stories were reinforcing and improving the strategies. Positive feedback loops were created, the ANTHILL effect took off.
5. As the entrepreneurs leading the development on the business helix succeeded, and as the destination development efforts started to pay off, large hotel chains and other, bigger investors were attracted.
6. A collective “macro story” of how the process had started, developed, and led to results emerged, and was told and reiterated in seminars and workshops.
7. Mechanisms of diffusion of these stories through conferences and VRI projects led to a collective increase in energy in the field, including a high level of experience economy innovations.
This process was to a considerable extent driven by the regional development helix, supported by the national level, through the Northern Insights program. Most of the public money invested contributed to the social innovation which was the construction of a collective good, a higher and higher level of self-organization of tourism in the region. But these complex policy-driven systems are unstable. They are in need of political support and external funding through allocation of new projects. At the same time, they need to be constantly reinvented. Some initiatives may rise and generate positive feedback loops. After a while, they demonstrate weaknesses, which have to be overcome through new strategic approaches.

A current attempt for the way forward is closing the gap between externally operated mass tourism, such as cruise liners and conference tourism, and the individualized small scale approach of the experience economy “innovation with the customer” business model. This seems to point “back to Rovaniemi” and a closer look at opportunities to reintegrate destination development and experience economy innovations on a scientific basis.
6 ENERGY AND INDUSTRY: TRIPPLE HELIX GAPS IN NORDLAND

Innovations in the industrial sector in Nordland are, as pointed out in the introduction, sometimes characterized through turbulent periods of investment, based on expectations of possibilities, leading to rapid growth, followed by bust, when projects fail. In a region with a well-developed system of innovation, as mentioned earlier, the expectation is that if the industry fails, the research system based on the university sector and the skills embedded in the region will be able to regenerate industrial growth.

As a contrast, Nordland has gone through several phases of boom and bust, where the triple helix has failed to absorb turbulence:

1. In the salmon farming industry, expectations that it should prove possible to apply salmon technology on a new species, cod, led to intensive research in several areas, such as breeding and feeding cod larvae, followed by what proved to be too early investments in commercialization and production of cod. There was a collapse in the efforts, which could not be compensated for by project based research institutions with too weak basic funding.

2. In the solar industry, a successful entrepreneurial achievement in the 1990s, to up-scale solar cell production from craft based technology to processing industry, carried out in the small company town of Glomfjord in Nordland, led to a rapid growth and a position as world leader in wafer production in the early 2000s. The owners tried to follow up this success by investing in increased capacity based on the end of 1990s technology. This spectacularly failed because of Chinese competition, as well as competitive technological innovations owner, Renewable Energy Corporation or REC was not able to meet. When the crash came, the industrial locality and the region proved to have a too weak institutional basis to regenerate growth. Efforts to build energy research to meet the bust and generate new industry failed. Local skills and competencies were lost.

3. Another energy policy initiative to promote windmill production in Norway was initiated at the central government level. The plan included a setting up of a new institutional framework for regulations of windmill production, based on a central level institution, combined with a CO2 quota system, in cooperation with Sweden. The plan was policy-driven on a Nordic scale, with an over-all objective to reach certain targets of windmill production capacity in Norway and Sweden, taken together. Most of the new windmill production facilities were set up in Sweden. For two reasons. In Nordland, there was already an over-production of energy by the existing hydro-electric power plants. In addition, transfer capacity out of the region was restricted. Besides, both spatial planning and incentives were set up in a more...
streamlined fashion in Sweden. Accordingly, the largest contribution, when it comes to increase in green energy production, including the regional economic spinoffs, ended in Sweden, paid by Norwegian money.

The shortcomings of the wind power initiative led to debates between actors in the energy sector as well as the local energy intensive industries.

In terms of micro level connectivity, we made a reference to Luhman, and his discussion of how mutual expectations are formed. Mutual expectations may be seen as common or shared simplifications of how a potentially complex relationship should play out.

6.1 SEARCH FOR THE GERMAN MODEL

Within the framework of Smart Specialization, two parallel studies of expectations were carried out in Nordland and a Finnish region, Ostrobothnia, using this template as a survey:

<table>
<thead>
<tr>
<th>Question</th>
<th>Expectations</th>
<th>Experiences</th>
<th>Direction of development in the past</th>
<th>Direction of development in the future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperation in research</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Using one sample of process industry leaders in Nordland and a sample of energy industry leaders in Finland, the following findings were made:

<table>
<thead>
<tr>
<th>Education</th>
<th>Expectations</th>
<th>Experiences</th>
<th>gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ostroboithia</td>
<td>8.5</td>
<td>7.0</td>
<td>-1.5</td>
</tr>
<tr>
<td>Nordland</td>
<td>9.0</td>
<td>5.8</td>
<td>-3.2</td>
</tr>
</tbody>
</table>

The energy cluster and triple helix in Ostrobothnia is regarded as well integrated. The leading firms covered in the survey were recognized as research intensive. In comparison, Nordland processing industries to a large extent relies on a combination of local DUI (doing, using, innovating) innovations, incremental innovations in the production process to enhance productivity, and innovations carried on the wings of corporate investors and global
science based systems of technological innovation (STI), where new technologies are applied, adapted and industrialized through local DUI. Somewhat surprisingly, then, we found that the expectations of the Norwegian process industry operators towards their regional universities and institutions of education were fairly similar to their Finnish counterparts. The gaps, on the other hand, were substantially larger in Norway than in Finland. This led to a search for good Finnish practices which could be applied in Nordland. One of the answers was the metaphor “the German model” of research and education, where innovation and skill development in firms are closely connected to polytechnic education and research at regional universities. This analysis was included in the regional innovation strategy of the County Council.

6.2 REDISCOVERING THE NORDLAND MODEL

During the 20th century Nordland developed into an energy region through the exploitation of hydroelectric power for energy intensive purposes in several sectors. This development was enabled by a national industrial policy combined with regulations of energy production for local industrial use and ownership (concession laws). This framework enabled industrial growth through long-term energy contracts which secured industrial investments. This was the formation phase of what we refer to as the 'Nordland Model'. This model is currently confronted with new uncertainties' caused by shifts in domestic and global energy markets. A key issue framing this project is therefore future sustainability of the 'Nordland Model'. In the latter part of the 20th century, Norwegian energy policy shifted in the direction of oil and gas production. Proactive state industrial policies were largely abandoned in the 1970s and 1980s. The electricity market was liberalized in 1991. This led to a halt in investments in energy production capacity, and the national system of innovation which had enabled the development of a globally competitive electricity-industry complex was fragmented. As a result of this, and despite considerable state R&D funding for energy technologies, Norway now has a weakly developed innovation system for energy technologies. At the same time, the debate on export of hydroelectric power (Norway as a 'green battery' for Europe) instead of regional power exploitation for industrial purposes has created uncertainties on the future of energy-consuming industries, thus threatening the Nordland Model.

Energy producers in Nordland now face the challenge that they are locked into a regional market with falling demand. At the same time, the region has large potential resources of unexploited and renewable energy sources, both for mature technologies such as hydro and wind power as well as for emerging technologies harnessing the power of waves, ocean and tidal currents. Little has been done to upgrade the electrical grid connecting Nordland with the Nordic and European energy markets. This blocks the possibility of increasing green energy production for the export market in the short run. Productivity increases have been formidable in the energy consuming industries, as has energy efficiency gains. However, both established industry actors and potential investors continue to rely on long term energy
contracts. Nordland has a strong knowledge base in energy intensive industries, and regional labor markets supporting these industries. Recent research on energy efficiency shows that losses in transportation of energy through the electrical grid far exceed losses in transport of 'packaged' energy in the form of industry outputs. For example, trans- porting electrons through the grid to Germany are 10 times less energy efficient than transporting a metal product. Currently, there is a need for several actions:

1. Better shared knowledge among and between our industrial partners leading to synergies between energy exploiting and energy producing industries. Cooperation between them is today regarded as fragmented, with a lack of shared perspective combined with institutional and political uncertainties. Shared knowledge may be seen as a regional innovation platform supporting the energy efficient 'Nordland model' of green energy production based on local energy consumption

2. The major innovative capacity of the energy consuming industries is the knowledge the operators use in creating world class productivity. This knowledge crucially depends on regional labor markets and educational institutions. The long-term prospects of these regional labor markets are crucial to corporate in- vestment decisions in new technology today. The roadmap and scenarios provided by the project is expected to guide triple helix actors in improving the framework for industrial investments.

3. The long-term objective is to create knowledge which can help to guide decisions to invest in energy production and industrial energy consumption in Nordland. The future technologies of these investments will be based on global systems of innovation. The position of Nordland is at the industrialization end of these global systems of innovation. Nordland has to be better in absorbing these new technologies, and using them in high- productivity industrialization.

What is seen as needed is better institutional and regulative preconditions for growth in green energy production seen in tandem with future investments in industrial energy consumption. This opens up issues such as supplier net- works, regional R&D support, educational institutions, labor markets, institutional set-ups and framework conditions that are necessary to accommodate investments both in energy production and consumption.

The basic finding is accordingly that there is a need for social and policy sector innovations, such as improvements in the science and education helix, and better coordination between energy producers and industrial consumers in the business helix.
7 SELF-ORGANIZING SYSTEMS OF INNOVATION IN THE PERIPHERY

From the point of departure of complexity theory, the above discussion opens up for a model of self-organizing systems of innovation in the periphery.

A. Fragmentation opens up for dynamism with the policy sector as driver. Innovation systems and networks in peripheral regions are fragmented, and they have weak supporting institutions. This means that the triple helix is likely to be stuffed with complexities such as differences in operational codes, ways to operate, forms of self-evaluation, products or outputs, and time horizons between universities, the public sector and industry. The question then becomes how to move from these complexities to action. This is an important limitation, but it also opens up an opportunity for intervention, because institutionalized lock-in mechanisms, seen as actor networks (ANT) are likely to be unable to put up a strong defense for dysfunctional status quo arrangements.

a. **Weak science helix.** In triple helix development, scientific institutions are often regarded as crucial contributors and partners, but at the same time as potentially rent seeking and disruptive. However, weak scientific institutions in peripheral regions may be expected to be sensitive and adaptive to policy interventions.

b. **Weak business helix.** Peripheral regions may have business helix ANTs with a capacity to resist change through protection of tacit knowledge. These ANTs may be opened through disruptive economic changes, as well as through well-adapted educational policy interventions. Experiences from the energy and experience sectors indicated that these systems are open for new forms of self-organization, taking current shortcomings into consideration.

c. **The potential driver is a multi-level policy helix.** Under these conditions, innovation policy crucially depends on the strength of the regional policy helix, as well as the coordination between the regional policy helix, the national level and the system of multi-level governance provided by Smart Specialization and Interreg platforms.

B. Phase 1: Self-organization leading to social innovation (socialization and externalization). Because the two other helixes (business and science) are far apart and not very well organized internally, policy interventions should focus on the creation of collective goods, which is the development of triple helix connectivity and self-organization leading to common strategies within the business helix, as well as institutionalized networks between the business helix and the science helix, both to
Science institutions inside the region as well as to relevant science institutions outside. These collective goods are created through processes of social innovation, driven by long-term policy helix interventions, with considerable components of “trial and error”. A core element is the collective construction of narratives of what is happening, and archetypes, such as “destination”, “experience economy”, “the German model”, “the Nordland model” and so on. A crucial element at the level of the triple helix is socialization (BA), leading to collective processes of analysis (externalization/self-organization), search for new solutions, entrepreneurial discoveries (combinations), and integration of the new solutions (SECI). In the initial phase, these collective goods may only in exceptional cases be expected to lead directly to profitable business innovations. In this early phase, the core indicator should be GAP analysis between the helixes, and not business innovations. An example of this kind of analysis is referred to above. There is a need of a coordinating group which monitors projects and reflects on the development of the triple helix. They rely on three potential sources of funding, which has been facilitated by VRI

a. public sector funding
b. public-private partnerships in funding.
c. civil society (quadruple helix) local self-organization mobilizing voluntary efforts

C. Phase 2: Emergence. A successful social innovation is likely to kick off an ANTHILL processes with feedback loops driven by profitable business innovations. These business innovations should be expected to emerge outside the self-organizing networks and institutions put in place through social innovations, but never the less related to them. Indicators measuring business innovations should be able to track and document these indirect relations between social and business innovations.

D. Phase 3. Reinvention. In the next SECI circle, there is a need for a new analysis of the relation between the social innovation and the business innovations, in order to understand the dynamism and potential of the emerging new sectors. This includes a re-assessment of the triple helix configuration, including twist and turns of the hegemonic story, reflecting experiences and new realities on the ground.

So what are the implications in terms of VRI? Integration of the triple helixes in peripheral areas seems to rely on extended processes of social innovation and institution building in the field of triple helix intermediaries, such as networking institutions, who gain traction not because they directly generate profitable business innovations, which they do not, but because they are creating conditions where flows of these innovations may be generated. One example of this is NOVADIS. The logic of this kind of institution building, based on the experience economy narrative, seems to be according to the ANTHILL model, generation of more energy through the mobilization of followers, combined with positive feedback loops from the market.
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