

Satu Rinkinen

**CLUSTERS, INNOVATION SYSTEMS AND
ECOSYSTEMS**
**Studies on innovation policy's concept evolution
and approaches for regional renewal**

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Abstract

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Societies and national and regional economies face several challenges that set needs for new solutions and new innovations. Innovation policy aims at strengthening the competitiveness of economies in order to increase wider societal welfare through economic development. During past decades several innovation policy related concepts have been developed and utilized in innovation policy practice. However, the rich concept evolution has also led to a situation where different concepts are used in policy dialogue without making clear distinction between them and without deeper analysis of what these concepts mean for policy-making practice. The aim of this dissertation is to help fill the gap between theory and practice and provide new insights to the concept evolution of innovation policy approaches and to regional renewal processes in the context of innovation theory and concepts developed and utilized thus far. This research deals with perspectives of place-based policy, sustainability, foresight, business and innovation ecosystems, and creating new radical and niche innovations. Three key concepts – the cluster concept, the innovation system concept and the ecosystem concept – were examined through these perspectives.

This dissertation consists of six sub-studies. The first one is a conceptual study based on research literature and a literature review. The following five studies are empirical studies that utilized data consisting of literature, policy documents and reports, observation data, interviews and a questionnaire. The data were analysed using qualitative content analysis and three of the studies also utilised case study approach.

Previous developments in innovation policy field and different innovation policy approaches such as cluster approach and innovation systems approach have created a strong basis for innovation activities and policy practices. Previous advancements and policy learning in innovation policy field provide a good basis to utilize existing theoretical approaches in practice, but the implementation of these approaches requires special attention. Regional renewal can be enhanced by different means and through different approaches. The results of this research present social sustainability and future-oriented thinking as potential approaches for enhancing regional renewal. These

approaches are also closely connected to the ecosystem-based innovation policy that can be viewed as a new type of innovation policy approach. The results present a conceptual framework for ecosystem-based innovation policy that perceives the need for constant evolutionary and emergent change that begins from the grass roots level and also recognizes the possibilities of influencing on this change through intentional policy-making.

Finally, as a synthesis of the results, this dissertation presents a general view of the perspectives on future innovation policy and different evolution paths of innovation policy concepts. Based on the results, future innovation policy could better take into account, encourage and direct towards sustainability and future-oriented anticipatory culture, not only in companies but also in other organisations and in policy-making. Future-oriented thinking also includes learning from the past and utilizing the lessons learned as building blocks in future policy-making. Also, policy thinking that acknowledges the need for a wider systemic transition and is willing to make room for it in the form of supporting policies is needed. Policy concepts are born and developed through different paths. The content and use of policy concepts can be intentionally shaped based on the needs rising from the grass roots level. Widely used concepts are renewed and new elements and perspectives are included. New concepts can be adapted to policy practice as 'forced' concepts defined by upper level policy actors. Research can also develop new concepts through theory, empirical research and scientific argumentation to policy practice.

This dissertation research contributes to innovation research by bringing new perspectives to the examination of innovation policy. Also, it presents an overview of some of the needs of reformulation of the current innovation policy. The most significant novelty value of this research is the introduction of the business and innovation ecosystem concepts in the context of innovation policy, which presents a new perspective to the innovation policy research theory. This research sets light on the changes facing innovation policy and the results build a framework for innovation policy that takes into account these changes and rests on ecosystem-based thinking which also considers the relevance of place, future oriented thinking, sustainability and entrepreneurship.

Keywords: innovation policy, cluster, innovation system, innovation ecosystem, regional renewal

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When I graduated from University of Turku, department of Geography in 2011 I thought it would be interesting to start post-graduate studies at some point during my future career. However, I didn't think that I would end up as a graduate student already a year after graduation. But life surprised, as it often does, one decision led to another, and I got to start working as a researcher and a doctoral student at Lappeenranta University of Technology in February 2012. During the past almost five years I've realized that this was not a bad time at all for dissertation work, quite the contrary. I've also experienced personally what so many others have told me; that writing a dissertation truly is, in so many ways, a learning process, and also, a creative process. Even though dissertation work sometimes feels very personal and at times even a bit lonely process, I have been anything but alone, and there are many people I want to thank.

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Lahti, November 2016

Satu Rinkinen

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Abstract

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List of publications

This thesis is based on the following papers. The publishers have granted the rights to include the papers in the dissertation.

- I. Rinkinen, S. and Harmaakorpi, V. (submitted). The business ecosystem concept in innovation policy context: Building a theoretical framework. Submitted to *Innovation: The European Journal of Social Science Research*.
- II. Rinkinen, S. (2015). Smart regional innovation policies – From cluster approaches to place-based policies. *International Journal of Innovation and Regional Development*, 6(2), pp. 204–218.
- III. Rinkinen, S., Oikarinen, T. and Melkas, H. (2016). Social enterprises in regional innovation systems: A review of Finnish regional strategies. *European Planning Studies*, 24(4), pp. 723–741.
- IV. Rinkinen, S. and Mäkimattila, M. (2015). The use of foresight information in small and medium-sized enterprises – The role of intermediary organisations. *International Journal of Foresight and Innovation Policy*, 10(1), pp. 1–16.
- V. Rinkinen, S., Pekkarinen, S. and Harmaakorpi, V. (2016). Policy framework for supporting business ecosystems and niche development through innovation policy. Proceedings of the European Conference on Innovation and Entrepreneurship 15–16 September 2016, Jyväskylä, Finland.
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Author's contribution

I: The author created the research plan and conceptual framework with the co-author. The author conducted the literature review and analysis. The author and co-author wrote the article and made revisions together.

II: The author is the sole author.

III: The author created the research plan, wrote the article and made the revisions with the co-authors. The author collected the data and made the data analysis.

IV: The author created the research plan with the co-author, participated in the data collecting and carried out the data analysis. The author wrote the article and made the revisions with the co-author.

V: The author created the research plan with the co-authors and participated in data collecting. The author made the data analysis, and wrote the article. The author made the revisions with the co-authors.

VI: The author created the research plan with the co-author and participated in the data collecting. The author analysed the data with the co-author. The author wrote the article with the co-author.

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Abbreviations

CEP	Centre of Expertise Programme
EU	European Union
NIS	National Innovation System
RIS	Regional Innovation System
R&D	Research and development
SE	Social enterprise
SME	Small and medium-sized enterprise
SmSp	Smart specialization

1 INTRODUCTION

Background, research environment and motivation

Well-known megatrends such as globalization, urbanization and climate change have had, and continue to have, an enormous impact on economies and societies at large. The innovation environment has changed drastically during the past couple of decades and internet economy has challenged old business models and how firms operate, compete and create value for their customers. Change is the permanent phenomenon cutting across societies and influencing all actors, from individuals to organizations and communities. The systemic and interconnected nature of these changes makes them hard to anticipate and even harder to manage. The objective of public policies is not merely keeping up with change and adapting to changes but also being able to influence the speed and direction of change. Change is a multifaceted process that arises from different levels. Change also creates space for developing new approaches and updating the old ones. Public policy often aims at reducing ambiguity and uncertainty in society but, as Sotarauta (2005) notes, ambiguity and emergence can also act as the much-needed sources of innovation and change. Therefore, according to Sotarauta and Srinivas (Sotarauta, 2005; Sotarauta & Srinivas, 2006), we need to be able to combine the emergent developments with policy intentionality in order to exploit the development potential of emergence instead of merely adapting to change without a strategic view of the future. In this research innovation policy is seen as an inseparable part of the aim of enhancing economic development and wellbeing in regions and nations, and the ability to respond to the continuous change of the surrounding operational environment of firms and organisations. This is also what separates this research from a pure conceptual study and closely connects it to economic geography and policy practice.

Innovations are widely recognized as the basis of the economic development of regions and nations, as well as being the drivers of wider socio-technological transitions (Geels, 2002). Knowledge of how innovations are successfully developed and diffused increases constantly as a result of the vast amount of innovation research. Also new knowledge of the ways innovation activity and processes could be supported by public policy is constantly provided by researchers. Different innovation policy approaches have been developed and their boundaries are not always clear. These approaches include for example the cluster approach and innovation systems approach utilized widely in innovation policy since the 1990s. The use of innovation concepts can be somewhat fuzzy and new concepts from the academic world quickly diffuse into political and overall societal discourse without attention being paid to their definitions and meaning in different contexts. For example, Lundvall (2007: 97) notes, referring to the popularity of the innovation systems concept, that: *'This wide diffusion in policy circles is a mixed blessing. The concept has been both used and abused. Quite often policy makers pay lip-service to the concept while neglecting it in their practice.'* The rapidly increasing use of the ecosystem concept (Hwang, 2014; Majava et al., 2013) has created a situation where

the concept is on everyone's lips but few bother to define it or clarify why they are using the ecosystem concept and how it differs from the concepts used in innovation policy discussions so far. The ecosystem concept has been widely adopted in academic literature during the 2000s, especially when discussing business collaboration (Majava et al., 2013). However, despite the wide range of business and innovation ecosystem related research literature, the academic community has so far failed to construct a coherent theoretical framework for the use of these concepts (Thomas & Autio, 2014). The lack of a coherent and widely-accepted theoretical framework – as well as the casual use of the concept – also makes it a problematic concept from the policy point of view. The ecosystem concept is increasingly used (for example in Finnish policy discussion next to the innovation system concept) but often without a proper definition. Therefore the ecosystem concept cannot be viewed as a coherent and established policy approach but needs a lot of theoretical (as well as empirical) research to support its possible future development into a worthy innovation policy approach.

In addition to the poorly justified use of new concepts, policy concepts that are given from an upper policy level (from supranational to national or from national to regional or local), such as the smart specialization (SmSp) concept strongly promoted by EU-level policies, cause challenges to policy-makers. Utilising these given concepts can at its best help the same 'language' to be spoken between different policy levels and through that also help create common understanding and discussion, and help in learning from others. On the other hand, it can also lead to repeating hollow concepts in policy discourse that lack the true conceptual depth that is useful in policy-making practice. Conceptual examination can deepen the understanding of why different concepts are useful and utilized in different contexts, how they differ from each other, and it can help in understanding the evolution of theoretical concepts into the concepts used in policy-making at different policy levels. Opening up and examining the content of policy concepts and their evolution can also open up new potential applications in real-life contexts.

Based on different international comparisons of competitiveness, innovation and wellbeing, Finland has long been considered one of the top countries in Europe (Jauhiainen, 2008; Oinas, 2005). However, as has become evident, Finland as a society and Finland's national economy are facing interwoven internal challenges (for example population ageing, unemployment and social exclusion) and external challenges (for example climate change, global competition and international crises) that have effects on the economic development of the nation as well as on the wellbeing of its citizens. Internet economy has changed the nature of global competition, and national and regional economies are in desperate need of new innovations, entrepreneurship and jobs. The need for renewal and wider societal transitions has been recognized but the ways in which these objectives could be reached are still a subject of contention. In many countries, including Finland, the policy discussion about the role of the public sector has focused on the enabling and facilitating role that aims at setting the rules for competition, creating favourable environments for entrepreneurial activities and 'de-risking' the private sector. This type of thinking has been challenged, for example by Mazzucato (2011; 2016) who

has presented an alternative policy approach to tackling modern societal challenges. Mazzucato's 'entrepreneurial state' takes a more mission-oriented role in setting directions for change instead of limiting the public sector role to an administrative and facilitative one.

Based on its success in international comparisons, Finland has been considered an example of a country with successful technology, science and innovation policies. Innovation theory – including cluster theory and innovation systems theory – has been actively utilized and adopted to policy-making since the 1990s. As Oinas (2005) presents it, Finland has been able to successfully transform and renew its industrial composition and national institutions in the past. What is needed to ensure it is capable of the continuous development and renewal that seems to be essential in order to stay among the most competitive states in the global environment? Oinas (2005) also brings forward the need to consider social values and to design a sustainable society that values not only economic competitiveness but also a satisfactory standard of living for all, and healthy and contented citizens.

My educational background as a human geographer is strongly connected to an interest in regional development and thus also to the development of overall well-being in regions. In Finland regional development is strongly innovation led, and therefore innovation policy has a strong influence on the future development paths of regions. For me, this regional/national level research is the most 'natural' level of doing research, which is also strongly reflected to this dissertation, though neither of these levels are particularly at the centre of this research as a whole. My motivation to pursue this research theme also arises from the current societal and economic situation, and the interesting, yet challenging, changes in the development environment discussed in the beginning of this section. The timely nature of this research theme made it particularly interesting for me as researcher and hopefully also makes it interesting to anyone reading this dissertation.

Research problem and objectives

During recent decades several innovation policy-related concepts have been developed and utilized in innovation policy practice. However, the rich concept evolution has also led to a situation where different concepts are used in policy dialogue without making a clear distinction between them and without deeper analysis of what these concepts mean for policy-making practice. The research problem arises more from practice than theory. However, the solution is sought through conceptual and innovation theory-based means with the help of empirical research material. The aim of this research is to help fill the gap between theory and practice and provide new insights to the concept evolution of innovation policy approaches and to regional renewal processes in the context of innovation theory and the concepts developed and utilized thus far.

The above-discussed challenges that societies and national and regional economies face have created a need for new perspectives in policy-making. This research approaches this need through (and with the help of) conceptual means. This research deals with certain perspectives (place-based policy, social sustainability, foresight, business and innovation ecosystems, and creating new, radical and niche innovations) that are related to responding to the challenges discussed above. Three key concepts – the cluster concept, the innovation system concept and the ecosystem – concept were examined through these perspectives. These first two of these concepts were chosen as the basis of the research as they have been the key concepts and the most utilized concepts in innovation policy during the past two and a half decades. They both originate from research on the economic development of regions and countries. The ecosystem concept can be considered a newcomer in the innovation policy arena compared to the other two concepts. However, it was chosen as a part of this study as it was already adopted from the fields of biology and ecology into business studies in the 1990s (see e.g. Moore, 1993) and later on it has also been utilized in innovation studies, even though its policy-related research has been rather scant until recent years. The ecosystem concept has already become part of policy discussions, at least in Finland, and it appears to hold potential as a future innovation policy concept, and therefore it would be beneficial to study it more extensively in an innovation policy context.

Another concept briefly mentioned in some of the sub-studies and more extensively discussed in sub-studies I and II is SmSp. SmSp, though its roots are in academic discussion, was not extensively discussed and researched in academia before it was rather quickly adopted as a part of EU policy. Even though SmSp is one approach emphasizing the relevance of place, specialization and diversification in regional economic development, based on its theoretical foundation it can be broken down into the concepts of clusters and innovation systems. SmSp can be considered a somewhat ‘forced’ policy concept that has been adopted in EU member states due to supranational policy-making. Due to the differences between the SmSp concept and the other studied innovation policy concepts, SmSp as a policy concept has not been in the focus of the research. Though the SmSp concept is an important part of sub-studies I and II, it is not particularly the subject of these sub-studies.

Sub-studies I, V and VI are exploratory in nature as they deal with a new concept, in a new context and from a new theoretical perspective. Sub-studies II, III and IV are again more descriptive as they attempt to explore and explain the research objective while providing additional information about the topic. From the methodological premises of scientific research this study relies mainly on a structural approach and the study is qualitative by nature. Structuralism is an often-used methodological approach in social sciences. In contrast to humanism, in structuralism the aim is not merely to understand phenomena but also to explain societal phenomena. Research should aim at revealing structural mechanisms restricting and controlling the behaviour of people and the functioning of the society. (Häkli, 1999.) Policy research and social science research in general are closely related to structures underlying societal functions and interactions. Realism is based on the idea that natural and societal phenomena are real phenomena

independently of human knowledge or awareness. This also means that we can obtain understanding and knowledge of a reality that is separate from our representations of it (Cruickshank, 2004). This research can be viewed as leaning on ideas of realism, also of critical realism. According to Cruickshank (2004) critical realism stresses the need to link structure and agency in order to guide empirical research. Also, critical realism differs from what Cruickshank calls 'naïve realism' in that it views the task of a researcher to be to engage in political argument in order to challenge the structures that have possibly, through research, been found to be exploitative.

The primary research question set for this study follows: *How does the set of innovation policy concepts evolve through different paths and policy perspectives?*

Answers to the primary research question were sought through three sub-questions. These sub-questions follow:

1. *How can innovation policy's concept evolution contribute to the development of new policy approaches?*
2. *What kind of approaches does innovation policy's concept evolution offer for regional renewal?*
3. *What kind of a policy framework do the business and innovation ecosystem concepts offer for innovation policy?*

This research is structured in the following way. It begins with a conceptual level examination (sub-study I). In order to reflect the conceptual considerations of the existing innovation policy of a certain country or a region, instead of merely leaving it to the level of conceptual examination, the innovation policy concepts and the challenges they encounter in the current innovation environment were examined in a Finnish context using empirical material (sub-studies II, III and IV). Empirical material is also utilized in sub-studies V and VI but these studies examine the ecosystem concept and its policy implications in a more general innovation policy context rather than studying them in some specific national or regional context. Various data collecting and analysis methods were used in the sub-studies. As a whole, this research can be described as an innovation policy concept-focused study that also deals with innovation policy practice through empirical data and research methods. Therefore, this study cannot be considered a fully theoretical work.

This study contributes to innovation research – particularly to innovation policy research – by bringing new perspectives (especially on the examination of Finnish innovation policy) that are related to social sustainability, future-oriented thinking and place-based innovation policy. Also, it presents an overview of some of the needs for reformulation of the current innovation policy. The most significant novelty value of this research is the introduction of the business and innovation ecosystem concepts in the context of innovation policy. At the same time, it presents a new perspective to innovation policy research theory. This research sheds light on the changes faced by innovation policy and

the results build a framework for innovation policy that takes into account these changes and rests on ecosystem-based thinking which also considers the relevance of place, future oriented thinking, sustainability and entrepreneurship.

This dissertation consists of an introductory part and six scientific articles. The introductory part presents the theoretical background of the research, a description of the research design and the used methodology, and a summary of the results. The synthesis of the results of the sub-studies is presented in the conclusions section, which is followed by a brief discussion section. The six original articles (e.g. the sub-studies of this research) can be found at the end of this dissertation.

2 THEORETICAL BACKGROUND

2.1 On innovation and economic evolution

The innovation activity of firms is widely recognized as the driving force of economic growth and the foundation of economic activity. Innovation has been defined in several different ways. One definition is presented by Tidd and Bessant (2014: p. 3) who define innovation as *'the process of creating value from ideas'*. Porter (1990: p. 74) approaches the concept of innovation the following way: *'Companies achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things.'* What differentiates innovation from invention is that innovation includes the commercialization or implementation of the new idea. Whatever definition one chooses to use, the essence of innovation is in exploiting new knowledge to create something with novelty value and putting it to practice. Innovations consist of new combinations of existing elements (Edquist, 1997). Different types of innovations can be identified. For example, innovations can be product, process, service, organizational or social innovations (Tidd & Bessant, 2014; Armbruster et al., 2008; Koschatzky, 2005; Schumpeter, 1934).

Much of the modern innovation literature draws from evolutionary economics. Scholars of the evolutionary theory of economic growth viewed neoclassical growth theory to be inadequate in its treatment of technological development (Nelson & Winter, 1974). In evolutionary theory, diversity and change are central phenomena of technical advance, and the underlying process of economic evolution is the internal development of knowledge (Nelson & Winter, 1974; Nelson & Winter, 2002; Boschma & Martin, 2010). Knowledge is in continuous evolution and this continuous process of change also drives economic evolution (Boschma & Martin, 2010). The evolutionary approach views innovation processes as evolutionary and path dependent, and views systems of innovations to be evolving over time in an unplanned manner (Lundvall, 2007). The concept of 'complexity' is strongly related to the evolutionary approach in economic development and the system view of innovation processes. Complex systems are systems in a process that constantly evolve over time as the interconnected elements they consist of adapt or react to the changes in the environment through interactions, communication and coordinated activities (Arthur, 1999; McGregor, 2012). Social and economic systems include different forms of complexity, and social, spatial and historical contexts shape the nature of the economy (Martin & Sunley, 2010). Also, human agents, compared to the elements of natural sciences, can react to changes in the environment with strategy and foresight, and by considering the outcomes of their planned behaviour (Arthur, 1999). Complexity thinking offers several concepts – such as emergence, adaptation, self-organisation, networks and interdependence – that are applicable to the research on socio-economic systems and their evolution (Martin & Sunley, 2010).

Joseph Schumpeter (1883–1950), one of the pioneers of evolutionary economics, argued that the driving forces in an economy are competition and innovation. Competition pushes

firms to innovate as they make their best effort to survive. This competition eventually leads to what Schumpeter named ‘creative destruction’, that is, to a situation where firms unable to renew will vanish and new firms with new ideas and innovations will take their place (Saarivirta, 2009; originally Schumpeter, 1934). In theoretical discussions the linkages between knowledge, innovation and economic development have long been acknowledged as has the fact that knowledge changes economic activity just as economic activity changes knowledge (Howells, 2005). Entrepreneurship and competition between firms were seen as the seedbeds of new innovations.

The innovation paradigm has shifted from mainly viewing innovations as a result of a linear process, starting from scientific research and leading to practical applications, to also embracing the non-linear model of innovation, where innovation is seen as a complex, uncertain social process with feedback loops, requiring cooperation between different actors and organisations during the process (Kline & Rosenberg, 1986; Lundvall, 1992; Edquist, 2009; Melkas & Harmaakorpi, 2012). As Melkas and Harmaakorpi (2012) also note, innovations are not necessarily radical but are quite often incremental social and organizational changes and technological advancements (see also Kline & Rosenberg, 1986). Much innovation potential also lies in knowledge that is not scientific research-based knowledge. Jensen et al. (2007) have identified two different modes of learning and innovation, of which the science–technology–innovation mode refers to scientific and codified knowledge, and the doing–using–interacting mode is based on more practice-based learning. Combining these two modes is what can truly improve innovation performance (Jensen et al., 2007; Harmaakorpi et al., 2011).

Understanding innovation as a more interactive, interconnected and systemic process has led to emphasizing the importance of external knowledge and open innovation in addition to the internal knowledge and closed ‘in-house’ innovation processes. Open innovation, as defined by Chesbrough (2006: p. 1), is *‘the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.’* The open innovation paradigm regards research and development (R&D) as an open system and notices that valuable ideas can come both from inside or outside the firm and can also go to the market from inside or outside the firm (Chesbrough, 2006; 2004). The open innovation paradigm increasingly turns attention towards the importance of outside knowledge and innovation networks. However, the ability of a firm to exploit the benefit of external knowledge also requires an absorptive capacity. An absorptive capacity refers to the ability of a firm or an organization to value, assimilate and apply new knowledge (Cohen & Levinthal, 1990). One increasingly appreciated form of external knowledge utilized in innovation processes comes from the users – be they individual consumers or firms – of the end products or services (von Hippel, 2005; Thompke & von Hippel, 2002).

Theory on innovations, their creation processes and diffusion, as well as their relevance to economic development, has come a long way from its early days. Schumpeter’s heroic entrepreneurs are not seen as the only existing types of innovators; innovators can also be different types of organizations, communities, networks and users. The placement of

innovations as the core of economic activity and growth has remained, but innovations are also increasingly viewed as novelties having influence on societal change and wellbeing at large. Innovations, especially the ones first developed as radical niche innovations, can help tackle the so-called wicked problems (such as climate change) deriving from macro-level changes. Wider sociotechnical transitions, in which radical innovations play a crucial role, take place in an interplay between three levels: changes at the landscape level that exert pressure on the existing sociotechnical regime; radical niches that can challenge the existing regime; and radical niches that act as seeds for change when the regime level faces destabilization (Geels, 2002; Geels & Schot, 2007; Kemp et al., 2001). Sociotechnical transitions can be for example transitions in mobility systems, food and energy production, communication or health care. They require radical innovations in mind-sets, practices and structures and involve actors from different sectors, domains and scale levels (Loorbach et al., 2010). The growth of radical innovations from niche to regime level happens gradually as they are used in different and subsequent application domains (Geels, 2002). When the transition of technological regime is considered desirable, for example when searching for solutions to the aforementioned wicked problems faced by societies, niches can be managed strategically to provide space for developing new, promising technologies (Kemp et al., 2001).

2.2 The regional dimension of innovation

Regional (innovation) environments have an impact on the birth and development of innovations just as regional innovation activity has an impact on the development of regional (innovation) environments. Innovations form the foundation upon which firms and regions achieve competitive advantage and enhance their competitive position in the global environment (Jauhiainen, 2008). Different regional development theories have examined innovation activities from their spatial premises. The earliest of these theories deal with the concentration of economic activities, its causes and effects. Models and theories explaining the territorial features of innovation most relevant for this study include industrial districts (Marshall, 1890), an innovative milieu (Maillat, 1995), clusters (Porter, 1990; Krugman, 1991), innovation systems (Freeman, 1987; Lundvall, 1992; Nelson, 1993), learning regions (Florida, 1995) and the Triple Helix model (Etzkowitz & Leydesdorff, 1995). Despite the differences between these concepts and their origins, they share common aspects in the explanation of innovation activities and regional economic development. These common aspects are the relevance of spatial proximity to innovation, the spatial concentration of economic activities, decentralized production, innovation clusters and networks, and collective learning processes (Koschatzky, 2005).

Proximity and distance play an important role in innovation activity. Porter's cluster theory suggests that competitive advantages are created not inside companies but in the locations where companies are based (Porter, 1998; 2000). Porter's view is based on the idea of localization economies, according to which firms benefit from locating close to

other firms in the same sector. The term *urbanization economies* refers to the advantages gained from locating close to other firms and other organisations in a wide range of sectors. Locating in close proximity to other firms, and education and research organisations creates advantages, for example better access to a pool of skilled employees, specialized information and knowledge, and to institutions and public goods (Porter, 1998).

However, the role of proximity in innovation activity can also refer to other types of proximity than merely geographical proximity. In addition to the effects of geographical proximity on innovation, other types of proximity (and distance) have been found to be important factors influencing innovation and interactive learning (Boschma, 2005; Harmaakorpi et al., 2011; Parjanen et al., 2011). Boschma (2005) lists different forms of proximity as cognitive, organizational, social, institutional and geographical proximity. Harmaakorpi et al. (2011) add communicative, functional and cultural proximities to this list and Parjanen et al. (2011) further add temporal proximity, referring to differences in the ability to imagine potential futures and make use of future-oriented information and knowledge. According to Boschma (2010) geographical proximity alone is not enough for interactive learning to take place, it requires a sufficient amount of other types of proximity as well.

Learning and innovation processes utilize different types of knowledge. These can be classified as explicit or codified knowledge, tacit knowledge and future-oriented self-transcending knowledge (Nonaka & Takeuchi, 1995; Scharmer, 2001; Uotila et al., 2005; Harmaakorpi & Melkas, 2005). Tacit knowledge is often specific to organizational and geographic locations and therefore has a particular regional dimension (Amin and Wilkinson, 1999). Also, tacit knowledge has a crucial role in innovation processes (Reichert, 2006; Schienstock & Hämäläinen, 2001). However, according to Howells (2002) codified knowledge, its interpretation and assimilation are also influenced by geography. Regional collective and interactive learning processes can be enhanced by different tools and processes, for example supporting and facilitating collective creativity and regional brokerage functions (Parjanen et al., 2011), absorptive capacity (Kallio et al., 2010; Abreu, 2011) and social capital and network building (Tura & Harmaakorpi, 2005; Uotila & Ahlqvist, 2008).

Too much proximity can also have negative effects on regional innovation and learning due to regional lock-in, caused by a lack of openness and flexibility (Boschma, 2005). Regional lock-in is one of the core concepts in the path dependence model that has become a popular model among economic geographers in explaining the evolution of regional economies (see e.g. Hassink, 2010; Martin & Sunley, 2006; Martin, 2010; Boschma & Frenken, 2006). Regional lock-in is seen as a consequence of the path-dependent nature of regional economic evolution. According to Martin and Sunley (2006: p. 399) '*a path-dependent process or system is one whose outcome evolves as a consequence of the process's or system's own history.*' Regional lock-in restricts the ability of regional economies to adapt or renew in the face of external shocks (Martin, 2010). Although the path dependence model, with lock-in as its core concept, is

frequently used in economic geography, it has also received criticism. For example Martin (2010) argues that the path dependence model and lock-in concept stress continuity and stability rather than change, which is quite contradictory when discussing evolution.

As Hassink (2010) notes in relation to path dependence, an intriguing question is why some regional economies succeed in renewing themselves, whereas other regions seem to be locked into decline. Boschma (2005) summarizes, stating that a knowledge base made up of diverse and complementary capabilities, loosely coupled networks, a mixture of embedded and market relations with other actors, a common institutional system that guarantees checks and balances, and a combination of local 'buzz' and extra-territorial linkages are some solutions offered to solve the problem caused by 'too much proximity'. In contrast to path dependence Schienstock (see e.g. Schienstock & Hämmäläinen, 2001; Schienstock, 2004) talks about path creation (see also Simmie, 2012). The path creation perspective emphasizes, for example, viewing economic actors, such as entrepreneurs, as knowledgeable agents instead of passive observers, and as a steering form needs vision creation and discursive coordination as its key elements (see also Cooke, 2012a). Ståhle (1998) and Sotarauta (2005) have utilized the concept of a self-renewal capacity when discussing the ability of organisations and regions to continuously renew. A self-renewal capacity can be simply defined as *'the set of capabilities targeted at renewing oneself in a continuous process'* (Sotarauta 2005, p. 7). A self-renewal capacity is based on individuals from whom it extends to organisational, regional and even national levels (Saarivirta, 2009). According to Saarivirta (2009) adaptation is at the core of self-renewal. In addition, self-renewal requires an ability to exploit existing knowledge as well as to explore new findings. Also, leadership and strategy are needed to keep the process and its orientation under control (Ståhle, 1998; Sotarauta, 2005). As the above notions from the wide strand of literature concerning innovation and regional economic evolution imply, regions need to be able to continuously renew themselves in response to the turbulent economic environment. Adapting to change is a slow process and it is challenging to find the balance between adaptation and anticipatory thinking and actions. Different policy approaches, particularly the ones focusing on supporting regional innovation activities and enhancing regional innovation capacity and competitiveness, have sought to offer tools to support regional economic development and renewal. The next section presents the most influential of these approaches from the perspective of this particular research.

2.3 Innovation policy

2.3.1 What, why and the concept evolution

Broadly defined, innovation policy has traditionally been defined as all those actions and decisions made by public organisations that aim at affecting the birth and diffusion of

innovations (Edquist et al., 2009). Lundvall and Borràs (1997: p. 37) use a more detailed definition: *'Innovation policy refers to elements of science, technology and industrial policy that explicitly aim at promoting the development, spread and efficient use of new products, services and processes in markets or inside private and public organisations.'*

In addition to their definition of innovation policy, Lundvall and Borràs (1997) remark that many other policy areas – like competition policy, macroeconomic policy and environment, energy and human resource development policy – also affect innovation. In this study innovation policy is understood in its broad sense, following the innovation policy definition presented by Kuhlmann and Edler:

[Innovation policy is understood here as] *the integral of all state initiatives regarding science, education, research, technological development and industrial modernization. Thus, innovation policy is a broad concept that contains research and technology policy and overlaps with industrial, environmental, labour and social policies. Public innovation policy aims to strengthen the competitiveness of an economy or of selected sectors, in order to increase societal welfare through economic success.* (Kuhlmann & Edler, 2003: p. 620)

In its early days innovation-supporting policy was mainly science and technology policy. The move from mainly understanding innovation as a linear process to acknowledging the complex nature of innovation processes has also changed how the role of policy is viewed. Innovation policies can be nowadays seen to be formed in co-operation with private organisations. The different approaches developed within different fields of science concerning economic growth and development, and the birth and diffusion of innovations have affected the birth and development of different policy approaches. Some of these approaches, like cluster theory and the systems of innovation theory, have become more widely adopted than others.

Innovations are not the main interest from the policy point of view. It is the influence that innovations have on other things – such as productivity, competitiveness, health care, social conditions and sustainable development – that makes it desirable to promote the creation and diffusion of new innovations from the policy perspective (Edquist et al., 2009). The rationale for the need for innovation policy can be found from the theory on innovation processes. As noted earlier, instead of the linear model of innovation, innovation processes are now seen as complex processes having several different phases and involving a variety of actors and organisations, and feedback loops. Therefore innovation policy cannot only focus on basic research and market failure but has to take a wider systemic perspective, focus on the bottlenecks of development in the different phases of the innovation process and identify what and where are the weaknesses of the innovation system (Schienstock & Hämäläinen, 2001; Edquist, 1997). Schienstock and Hämäläinen (2001) name these 'systemic failures' to be, for example, infrastructure failure, institutional failure and transformation failure that can all be fought against with different types of policy intervention and tools.

Many of the innovation policy activities have focused on clusters as the basis for economic growth and national and regional innovation activities. Porter's cluster theory (see e.g. Porter, 1990; 1998; 2000) relies on localization economies, where the competitive advantage is viewed to lie in the locations where business units are based. Cluster theory focuses on the linkages between different actors in the production chain and in innovation activities. Porter's (1998, p. 78) definition of clusters follows: '*Clusters are geographical concentrations of interconnected companies and institutions in a particular field.*' Clusters help firms benefit from the advantages of geographical proximity, including knowledge spillovers, trust and better access to employees, supplies, information, institutions and public goods (Porter, 1998; Maskell, 2001). The driving force of clusters is the interaction between cluster firms. Clusters promote both competition and cooperation. Though competition is what drives the cluster, there is also cooperation, mainly vertical, between cluster members involving companies in related industries and local institutions. Competition and cooperation occur on different dimensions and among different members of the cluster (Porter, 1998). Firms form the core of clusters but clusters may, and often do, also include governmental actors and other organisations, for example education and research organisations, technical support providers and customers (Roeland & den Hertog, 1999; Porter, 2000).

The wide adoption of the cluster theory has led to a generation of cluster policies aiming at supporting clusters and cluster development. Governments have an important role in ensuring macroeconomic and political stability as well as in ensuring the supply of the needed infrastructure, qualified employees and economic information (Porter, 1998; Roeland & den Hertog, 1999; Porter, 2000). Policy also has a role in setting the rules of competition and intellectual property rights, and in promoting cluster formation and upgrading. Cluster policy aims at removing obstacles hindering cluster birth and growth, developing local network relationships between firms and strengthening their local supply chain linkages (Porter, 2000; McDonald et al., 2007).

According to Porter (1998) cluster policies should support the overall development of all clusters showing growth and innovation potential instead of focusing on particular clusters. Despite Porter's notion, cluster policies have tended to focus on high-tech clusters such as ICT and biotechnology. The cluster approach has also been criticized, for example for being too vague and generic in nature (Martin & Sunley, 2003), but despite this it is highly promoted worldwide and remains one of the basic building blocks of innovation policy at both national and regional levels.

Another rather dominating innovation policy concept has been the national systems of innovation (later referred to as *the national innovation system [NIS]*) concept developed by Christopher Freeman, Bengt-Åke Lundvall and Richard Nelson, which gained wide popularity in the innovation policy field soon after its conception in the late 1980s and early 1990s. Other concepts developed that emphasize the systemic characteristics of innovation were the technological systems concept (Carlsson & Stankiewicz, 1991) and the sectoral systems of innovation (Breschi & Malerba, 1997). Also, Oinas and Malecki (2002) presented the spatial innovation system concept that emphasizes the external

relations of system actors and the changing locational centre points of technological paths in time.

Metcalfé (1994, p. 940) gives the following definition to the national systems of innovation concept as a *'set of distinct institutions which contribute to the development and diffusion of technologies and which provides the framework within which policies are implemented. It is a set of institutions to create, store and transfer the knowledge, skills and artifacts which define technological opportunities.'*

According to Niosi et al.

a national system of innovation is the system of interacting private and public firms (either large or small), universities, and government agencies aiming at the production of science and technology within national borders. Interaction among these units may be technical, commercial, legal, social, and financial, inasmuch as the goal of the interaction is the development, protection, financing, or regulation of new science and technology. (1993, p. 212)

The NIS concept was strongly influenced by evolutionary economics and literature on clusters, innovative milieus and industrial districts (Lundvall, 1992; Nelson, 1993). The NIS concept as a policy concept was especially adopted in the Nordic countries. The system view on innovation activities sees organisations as part of a wider system upon which their innovation performance is partly dependent. The focus in the NIS approach was to identify the national actors and structures contributing to innovation and economic development. The quality of the system and its subsystems has an effect on the innovation performance of the organisations within the system (Smits & Kuhlmann, 2004). The systems of innovation approach was developed to take into account all the important factors shaping and influencing innovations (Edquist, 1997). The innovation system approach also has a special interest in how institutions behave and relate to each other.

Despite of the wide adoption of the innovation systems concept in innovation policies, it has also received criticism. It has been claimed that it has little operational value, lacks substance, is challenging to implement and lacks tools with which to be measured (Godin, 2009; Sharif, 2006). However, the concept has had an important influence on the development of the innovation policy field. As the most important positive effect of the NIS concept, Lundvall (2007) observes the fact that it has moved attention towards national policy strategies that can have positive effects both domestically and internationally. Also, popularizing the 'system' perspective on innovation helped move the attention of policy-makers from the linear model of innovation to more interactive thinking of innovation and innovation processes.

One of the newcomers in the group of innovation policy concepts is the innovation ecosystem concept. The concept has its origins in the business ecosystem concept introduced by James F. Moore to business and innovation studies in the 1990s. The business ecosystem concept views firms not as a part of an industry but also as a part of

an ecosystem wherein companies cooperate, compete and co-evolve capabilities around new innovations (Moore, 1993). Autio and Thomas (2014: 205) define innovation ecosystems as: *'network of interconnected organizations, connected to a focal firm or a platform, that incorporates both production and use side participants and created as appropriates new value through innovation.'* Innovation activity within business ecosystems is strongly based on open innovation and the ecosystem can be basically opened up to all possible contributors and participants and in that way develop an organizational form of distributed creativity (Moore, 2006). A business ecosystem also has a leader, whose role as a leading organization enables ecosystem members to invest in a shared future and common goals (Iansiti & Levien, 2004; Nambisan & Baron, 2013). The business ecosystem concept emphasizes the complex nature of innovation activities, co-evolution and the interdependency between different actors. The business ecosystem and innovation ecosystem concepts are often used without making clear distinction between them. The innovation ecosystem can be viewed as a wider concept than the business ecosystem concept as it also includes the political, economic and technological environment affecting the ecosystem and its members. Also, the customer side is often absent in the innovation ecosystem concept (Wright, 2014). Wessner (2007) states that the innovation ecosystem concept is based on the NIS concept discussed earlier in this subsection. Compared to the NIS concept, which emphasizes the role of non-market institutions, the innovation ecosystem concept puts more emphasis on the market mechanisms than the traditional innovation systems approach (Papaioannou et al., 2007).

The increasing popularity of the ecosystem concept in policy discussion could be seen as related to the call for a stronger evolutionary view to innovation policy (Boschma & Sotarauta, 2007; Hämäläinen, 2015). However, drawing on evolutionary economic concepts often means utilizing ideas that are the focus of ongoing academic debate and lack established meaning. Therefore Martin and Sunley (2006) advise (geographers) to exercise caution in applying and using these ideas and concepts. Mytelka and Smith (2002) have presented how the development of innovation theory and innovation policy has been an interactive and co-evolving but also a problem-driven and crisis-driven process. The ongoing turbulence of global economy and its effects on employment and productivity open up space for new ideas to emerge and develop, and to further the innovation policy field. Therefore new concepts and theoretical frameworks, as well as empirical studies, can be seen as a welcome steps forward in this field, as long as their development and application is based on scientific rigour. Taking account of the complex nature of the innovation environment and innovation processes discussed above results in stiff sectoral policy that is incapable of supporting the most effective way for the complex systems to produce new innovations or handle the complex problems or challenges facing society. Hämäläinen (2015) has analysed the nature and evolution of wicked policy problems and argues that they result from the gap between the complexity of the problem and the wide variety of corresponding governance arrangements. As a solution he suggests governance solutions that emphasize, for example, the importance of interaction and cooperation, collective learning processes, decentralization, diversity and experimentation. Even though Hämäläinen's suggestions concern public policy and governance in general, these suggestions are also relevant for innovation policy that aims

at tackling wicked problems by creating (at least partial) solutions to these problems in the form of new innovations.

2.3.2 Regional innovation policy

The regional aspect of innovation policy has been an important part of innovation policy research and practice since regions (as sub-national spatial entities) started to awaken interest in theoretical and policy discussions in the early 1990s (Koschatzky, 2005). The concepts with most policy effects during the 1990s were the cluster concept developed by Michael Porter (1990; 1998), the above-discussed NIS concept and its regional counterpart, the regional innovation systems (RIS) concept, created especially by Philip Cooke and developed further by several other authors (see e.g. Cooke, 1992; 1998; 2001; 2008; Cooke et al., 1997; Asheim & Isaksen, 1997; 2002; Autio, 1998). Before the 'regional turn' in the 1990s, innovation and technology policy focused mainly on enhancing and ensuring national technological competitiveness and economic growth (Koschatzky, 2005). As the focus was redirected to the regional level, innovation policy started to focus on gathering regional assets and bringing them together. Multi-level (national, regional, local) governance allowed regions to influence the development of their own competitiveness through policy.

In general, regional innovation policy can be defined as the policy initiatives and practices that aim at improving the innovation capacity of firms in a particular region to develop new products, services and processes and to enter new markets by applying new knowledge (Lagendijk, 2011). The term 'regional' can refer either to regions developing their own bottom-up policy initiatives and practices that aim at boosting their economies or to national top-down policies implemented at sub-national level (Lagendijk, 2011; Howells, 2005). Regional innovation policy aims at boosting regional economies and enhancing regional competitiveness. Regional innovation policy is placed in a tricky position between innovation policy and regional policy and their differing aims and objectives. Implementing traditional regional policy that aims at distributing welfare throughout the country simultaneously with new innovation-focused competitiveness policy easily leads to a policy mismatch, as the competitiveness policy tends to focus mainly on large urban agglomerations instead of the regional policy type that promotes a balanced regional structure and opportunities for growth regardless of the location (Jauhiainen, 2008). As the importance of the innovative capacity of regions has become more obvious, regional policy in many countries has become more and more innovation-oriented regional policy.

One of the challenges of the successful implementation of regional innovation policies arises from what Oughton et al. (2002) call the regional innovation paradox. This paradox arises from the contradiction between the need to target innovation funds to lagging regions in order to enhance their competitiveness and the lower capacity of these lagging regions to absorb public innovation funds and to invest in innovation activities compared

to advanced regions. This makes it difficult to close regional innovation gaps across regions. From a policy perspective this paradox can be resolved by creating policies that increase the capacity of regions to absorb the innovation funds targeted to those regions. This means for example networking the key players of the region and catalysing innovation investment both on the demand and supply side of the system (Oughton et al., 2002).

Another innovation policy challenge is how to choose which fields, clusters or industries to support or whether the innovation policy support should be equally divided between all actors. There has been debate about whether innovation policy should support regional (Marshallian) specialisation or the contrary, diversification (Jacobs' externalities), in order to support regional economic development (van der Panne, 2004; Feldman & Audretsch, 1999). This debate seems to have led to support of the ideas of related variety and 'specialized diversification'. The related variety concept is used to describe the technological relatedness of different sectors within a region that enables knowledge spillovers between these sectors when there is enough cognitive proximity (Boschma & Frenken, 2011; Frenken et al., 2007). Related variety is considered essential for regions that aim at developing new growth paths and diversifying into new sectors and industries (Asheim et al., 2011). The cluster theory discussed in the previous subsection is one of the most popular policy approaches at a regional level as the importance of geographical proximity for innovation and growth is one of the key features of cluster theory. Regional cluster policy aims at supporting the development and growth of clusters in a particular region. Cluster policy has changed from one of the dominating regional innovation policy approaches to being an important basis for new policy approaches such as the SmSp approach.

One of the most utilized and also most researched regional innovation policy concepts and approaches is the RIS approach developed by Philip Cooke. The RIS concept was differentiated from the NIS concept by how it embraces the regional dimension of innovation and recognizing that systems of innovation have regional specificities that set them apart from wider national systems (Cooke, 1998; Autio, 1998). The key organizational elements of RISs are firms, technology-transfer agencies, universities and other research organisations, funding organisations, skills-development organisations, consultants and non-firm organisations that are involved in innovation processes (Cooke et al., 1997). Autio (1998) presented RISs as consisting of two subsystems that include the aforementioned organisations: the knowledge generation and diffusion subsystem, and the knowledge application and exploitation subsystem. The knowledge generation and diffusion subsystem includes the various regional institutions and organisations that produce and diffuse knowledge and skills. The knowledge application and exploitation subsystem again includes all the firms, their clients, suppliers, competitors and partners that utilize this knowledge in their daily operations and innovation processes (Autio, 1998). As the subsystem division indicates, knowledge and learning are the most influential processes within RIS that have an effect on the regional innovativeness and economic development (Kautonen, 2006). The system also includes various intermediary organisations that work in the intersection of the two subsystems (Smedlund, 2006).

The RIS approach emphasizes the institutional elements of regional systems, such as associative governance, institutional learning and interactive innovation processes. The role of networks and linkages between the key organizational elements and actors is also at the core of the RIS approach (Cooke et al., 1997). Uotila and Ahlqvist (2008) suggest creating network-facilitating innovation policy to enhance networking between different agents and through this overcoming the illusion of viewing and treating RISs as isolated and self-sustaining systems. Though a region as a defined sub-national entity is the central geographical level in RIS, RIS also acknowledges the importance of outside network linkages for regional innovation. The RIS approach has been an important tool for regional innovation policy making. RIS policies deal with system imperfections by e.g. enhancing the Triple Helix cooperation between firms, universities and the public sector. As knowledge and learning processes are at the core of the RIS concept, RIS policies aim at fostering knowledge spillovers, the absorptive capacity of organizations, regional learning processes, and trust and social capital building (Cooke, 2011; Kallio et al., 2010; Cooke, 2008; Tura & Harmaakorpi, 2005; Cooke et al., 1997). Cooke (2001) argues, that the strong reliance on the public side is one of the pitfalls of RIS policy and when the public side of the system is too strong, it is not able to compete with strong private systems that, for example, the United State has. However, it should also be noted that economies like for example Sweden and Germany, with strong role of the public side, have also succeeded well in the global competition. The RIS concept has also been criticized for conceptual 'fuzziness' and lacking an established definition (Doloreux & Parto, 2005). The scattered nature of the concept makes it hard to operationalize in practice and thus causes challenges for regional innovation policy practitioners. Also defining what is meant by a *region* and how to define the boundaries of an RIS is often problematic (Doloreux & Parto, 2005). Despite the empirical RIS studies, Kautonen (2006: p. 261) notes that when developing the RIS approach, the interest seems to have been more on sketching the broad outlines of the concept than on empirical verification. Kautonen (2006) also suggests putting more emphasis on the bottom-up studies of RIS, as the studies conducted in an RIS fashion have typically followed a top-down approach.

Partly due to the criticism presented towards the RIS concept, it has been developed further and new elements, such as innovation platforms, have been emphasized instead of, for example, clusters (see e.g. Uotila et al., 2012; Cooke, 2012b; Harmaakorpi et al., 2011; Harmaakorpi, 2006). The central actors of these platforms are firms, technology and expertise centres, research centres and educational organisations, and the like. The development and growth potential of these platforms comes from exploiting distance as innovation potential but also utilizing the synergy of related variety (Harmaakorpi, 2006). Regional innovation platforms are resource configurations based on past development trajectories that also present future potential in the form of redefined existing resource configurations (Harmaakorpi, 2004; 2006). The platform approach can be seen as a regional innovation policy approach that emphasizes the role of proximity and distance and that is based on building regional advantage through related variety (Asheim et al., 2011; Cooke, 2007; Harmaakorpi et al., 2011; Cooke, 2012b).

As mentioned above, the RIS approach has aimed at enhancing the Triple Helix cooperation between regional industries, universities and governmental actors. As innovation processes are more often seen as co-creative processes that also utilize the knowledge of users and citizens, the idea of updating the Triple Helix model into a quadruple helix (where the public forms the fourth helix) has been presented in several studies (see e.g. Carayannis & Campbell, 2009; McGregor et al., 2010; Lindberg et al., 2014; Markkula, 2014). Carayannis and Campbell (2009: p. 206) define this fourth helix as a '*media-based and culture-based public*' that is associated with '*media, creative industries, culture, values, life styles, art and perhaps also the notion of the creative class*'. While previous policies aiming at enhancing regional economic development have emphasized the need to create structures for Triple Helix cooperation, the new cooperation dimension aims at creating regional innovation platforms that enable the utilization of the knowledge of users and citizens. Local living labs can be seen as an example of such user- and citizen-centric cooperation platforms (see e.g. Dekkers, 2011; Bergvall-Kåreborn & Ståhlbröst, 2009; Konsti-Laakso & Pekkarinen, forthcoming). Carayannis and Campbell (2009) also note that regional innovation policy should acknowledge the importance of the role of the citizens in achieving the policy goals and objectives because the public influences every innovation system.

Though using RIS theory and its usability as a basis for regional innovation policy has been criticized, it has been widely utilized, especially in Europe. According to Asheim et al. (2013) the RIS approach has especially contributed to the need to recognize the specific innovation policy needs of different regions according to their regional conditions. New regional innovation policy discussions seem to call for a place-based policy that is connected to the ideas of innovation platforms and related variety, and takes account of regional characteristics (see e.g. Asheim et al., 2011; Frenken et al., 2007; Tödtling & Tripl, 2005). One presented example of such a policy concept is the SmSp concept especially promoted by the European Commission (see e.g. European Commission, 2011; Foray et al., 2012; McCann & Ortega-Argilés, 2013; Boschma, 2014; see also Cooke, 2016). Clusters and RISs have remained an important basis for regional innovation policy but in updated forms or when embedded in new policy approaches.

2.3.3 Innovation policy in Finland

Even though the Finnish context is not in the focus of this dissertation research, it is however relevant for understanding the premises of this research whole and the Finnish innovation policy context is the one of the main research contexts of three of the sub-studies (articles II, III and IV). Therefore a brief look is also taken at the evolution, focus and current state of Finnish innovation policy, both from a national and a regional point of view.

The roots of Finnish innovation policy can be traced back to the 1960s and the initiation of science and technology policy (Jauhiainen, 2008; Boschma & Sotarauta, 2007).

However, the most significant steps towards innovation policy were taken during the 1980s. Niinikoski (2011) has analysed the formation of Finnish innovation policy from the late 1980s until the late 2000s and names the period from the late 1980s to the mid-1990s as the emergence phase of Finnish innovation policy. During the 1990s the innovation policy concept started to appear in Finnish policy discourse, particularly as a part of science and technology policy but also connected to other policy fields such as industrial and education policies (Niinikoski, 2011). The deep recession at the beginning of 1990s required extensive economic restructuring that finally led to a fast economic recovery at the end of the decade. This recovery was particularly facilitated by the rise of the ICT cluster and the transition to a knowledge-driven economy (Jauhiainen, 2008; Boschma & Sotarauta, 2007; Oinas, 2005; Lemola, 2002). Investments in R&D remained high throughout the recession and the level of public R&D support even rose when most other public expenditures were cut (Georghiou et al. 2003). Also, internationalisation and globalization – including Finland joining the European Union (EU) in 1995 – significantly influenced innovation policy during the 1990s as it meant moving towards becoming an economically open and technologically advanced country that meets the standards set by the EU (Jauhiainen, 2008).

Finland was one of the first countries to adopt the NIS approach as a framework for policy-making and key features of the NIS were identified (the development and utilization of new knowledge and know-how, a national research system, a supportive atmosphere for innovations and internationalization) (Niinikoski, 2011; Jauhiainen, 2008). Though the focus in the implementation of the innovation system approach was at first mainly national, the ideas were rather quickly also applied to the regional level where Porter's cluster approach was utilized to create regionally focused cluster policy (Jauhiainen, 2008). Also, from the 1990s onwards regional policy started to converge with innovation policy due to the strong focus on competitiveness and high-technology in economic policy. At first, the aims of regional innovation policy (competitiveness) were combined with those of traditional regional policy (cohesion) (Kautonen, 2012). As a result, programme-based regional innovation policy was developed (Jauhiainen, 2008). The launch of a new Centre of Expertise Programme in 1994 can be viewed as the birth of a formal regional innovation policy in Finland (Kautonen, 2012). All in all, the innovation-driven approach and a focus on regional and economic development emerged. Boschma and Sotarauta (2007) call the policy direction adopted during the 1990s 'enabling policies' although some elements of the 1980s' 'picking the winners' policy were still left (Georghiou et al. 2003).

In spite of the policy development and adaptation of innovation theory concepts during the 1990s, Niinikoski (2011) argues that innovation policy only reached its status as an independent policy field in Finnish policy-making during the 2000s and from then onwards started its broadening phase. At the beginning of 2000s a need to renew innovation policy was recognized. Innovation policy had to be renewed in order to be able to respond to the changes in the innovation environment, including globalization. Several policy reforms that aimed at gathering resources and achieving critical mass in chosen areas of expertise were carried out during the 2000s. A broad-based innovation

policy concept appeared in innovation policy discussions, even though the concept or the tools for its implementation in practice were not presented. (Edquist et al., 2009.) However, this new view to innovation policy led to the acknowledgement of the importance of using practice-based innovation activities alongside the traditional science-based activities and also embracing the non-linear model of innovation processes (Edquist et al., 2009).

During the past couple of decades there have been several programmes that have aimed at bringing forward and exploiting regional potential more efficiently. Uotila et al. (2012) studied the RISs of all Finnish regions and found outstanding examples but also a lot of room for improvement. They identified needs in the light of the used RISs and innovation platforms framework, for example the need to create methods and procedures to renew regional innovation activities, the need to facilitate inter-regional and global networking and the need to anticipate user needs and to utilize ICT efficiently. Also Georghiou et al. (2003) named diffusion of ICT into traditional industries as one of the challenges of Finnish innovation environment and policy. According to Uotila et al. (2012), the development of RISs in Finland could be enhanced by adopting a new policy framework that focuses on the development of innovation platforms instead of the former cluster- and industry-driven development thinking.

Jauhiainen (2008) notes that although it has already been understood and emphasized that innovations are social processes that are affected by wide networks of different actors at national and regional levels, decision-making in Finnish innovation policy has remained strongly centralized. Sotarauta and Kautonen (2007) studied the co-evolution of Finnish national and local innovation and science policies and found that even though science policy has been in the hands of the national government and that regions or localities have not had much say in the formulation of these policies, they have had an indirect influence on how national and local-level policies have co-evolved over time in innovation and science policy. In an evaluation of the Finnish national innovation system from 2009, Edquist et al. (2009) suggested that innovation policy should shift from supporting existing industries to supporting the birth and development of new industries and, at the regional level, focus on supporting regional learning and innovation capacity, especially that conducted in the spirit of non-scientific innovation. In the same evaluation report Ottaviano et al. (2009) argue that regional imbalances should not be a concern for any innovation related policies because any regional agenda may be harmful for productivity development.

Boschma and Sotarauta (2007) also suggest that Finnish innovation policy should take better account of social and organizational innovations alongside the traditionally emphasized technological innovations. Schienstock and Hämäläinen (2001) argued already at the beginning of 2000s, that there was an increasing need for new organizational solutions, operations models and conceptual frameworks that can help answer to the multifold challenges faced by modern society. Social innovations are also harder to imitate and copy than product innovations, which is an important fact for countries like Finland that cannot compete with cheap production costs. New themes on

the innovation policy agenda, such as knowledge-intensive business services, cultural industries and growth entrepreneurship cannot be handled with traditional manufacturing and technology orientation, in which Finland has been successful in the past (Kautonen, 2012). This poses new challenges to Finnish policy makers. The previously successful 'Finnish model' of innovation policy will, in the near future, also be challenged by population ageing and its related issues (Boschma & Sotarauta, 2007). Changes in the global and national innovation environment require a wide capacity to renew, which also requires flexibility and 'sensitivity' in innovation policy (Schienstock & Hämäläinen, 2001). According to Kautonen's (2012) study, two separate innovation strategies are emerging (or perhaps have already emerged) in Finland: (1) strategy striving to foster national competitiveness and (2) strategy focusing on building regional innovation capabilities. Finnish innovation policy has, at least in the past, successfully reacted to changes and adapted to new circumstances (Georghiou, 2003). However, also the ability to be proactive and anticipate future changes in the policy environment is needed.

3 RESEARCH DESIGN AND METHODOLOGY

3.1 Research problem, questions and design

The research problem arises from the gap between innovation theory and its policy implications in practice, as discussed in the introduction. The aim of this research is to help fill this gap and provide new insights to the concept evolution of innovation policy approaches and to regional renewal processes in the context of innovation theory and concepts. Though regional and national policy levels are at the core of this research, no particular region or country were set as the focus of the research. However, the discussion in the Finnish context was used in order to elaborate the studied concepts in a real-life policy context. In scientific fields this research is positioned at the intersection of economic geography, innovation studies and policy studies. This research focuses on widely-used innovation policy concepts, related policy approaches and their utilization in innovation policy practice. Also, articles II, III and IV study existing innovation policy in regard to a certain pressure for change in the innovation environment.

The research problem was approached with the primary research question and three sub-questions. The primary research question set for this study was *How does the set of innovation policy concepts evolve through different paths and policy perspectives?* The answer to the primary research question was sought through three sub-questions, which each relate to two of the sub-studies of the research whole. The relation between the sub-questions and the six sub-studies is presented in figure 1.

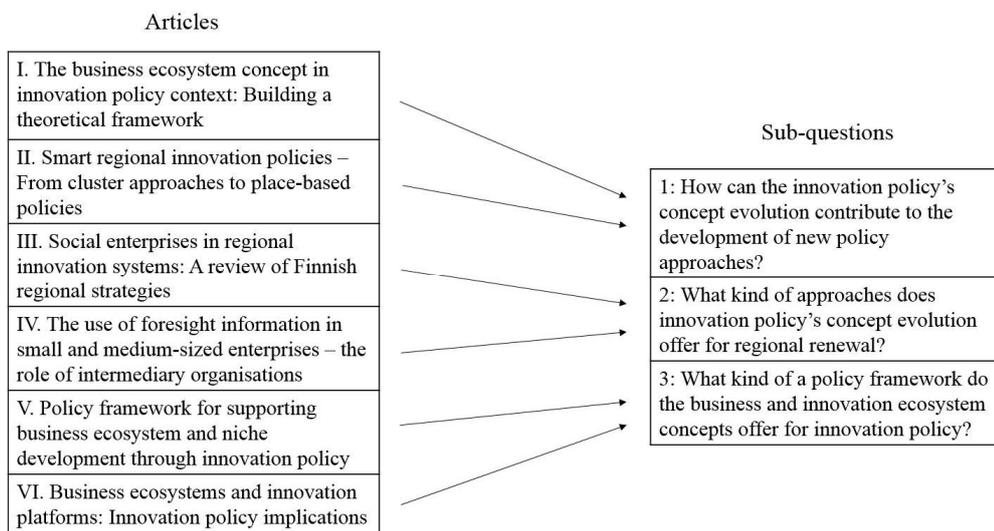


Figure 1. The relation between the sub-studies and research sub-questions

The research sub-questions form three interconnected themes: the innovation policy's concept evolution, approaches that enhance regional renewal and the ecosystem-based innovation policy approach (figure 2). The first two articles (I and II) deal with the innovation concept evolution, which also works as a basis for the examination of the ecosystem concept in an innovation policy context as the discussion around the ecosystem concept is also a part of the wider innovation policy's concept evolution. The next two articles (III and IV) deal with innovation policy approaches related to social enterprises (SEs) and sustainable innovation policy, and with fostering anticipatory culture in small and medium-sized enterprises (SMEs), which have the potential, starting from the regional enterprise level, of contributing to regional renewal in the long run. These articles continue the study of innovation policy's concept evolution by studying the innovation system concept through two different perspectives (sustainability and foresight). The last two articles (V and VI) examine evolutionary innovation policy approach, which at the regional level aims at fostering continuous regional renewal and is connected to innovation policy's concept evolution through the ecosystem concept.

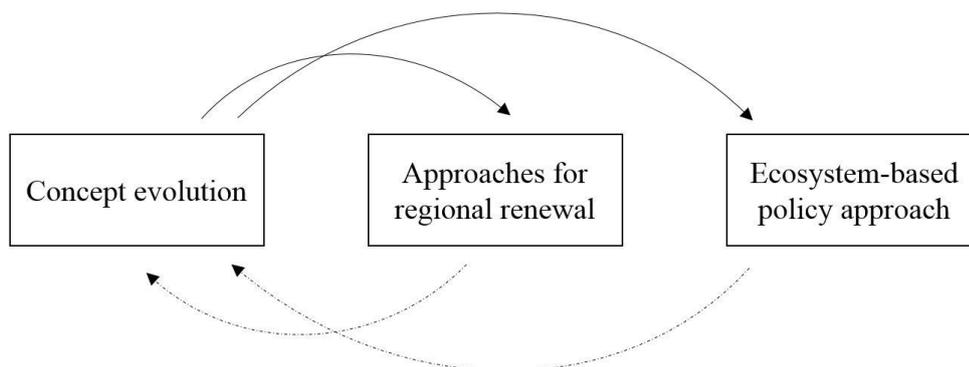


Figure 2. The research themes in relation to each other

This research consists of both conceptual and empirical studies. In scientific research both types of research – conceptual and empirical – can examine the same phenomenon, the difference is in the perspective of the examination (Tuomi & Sarajärvi, 2009). The research consists of a conceptual level theory-based study and five empirical studies, and the synthesis of the conceptual and empirical studies presented in the concluding part of this dissertation (figure 3). Each of the empirical sub-studies (the roman numerals in figure 3 relate to the corresponding sub-studies) is connected to the concepts examined in article I and each empirical study adds to the theory and practical use of the policy concepts of the conceptual sub-study.

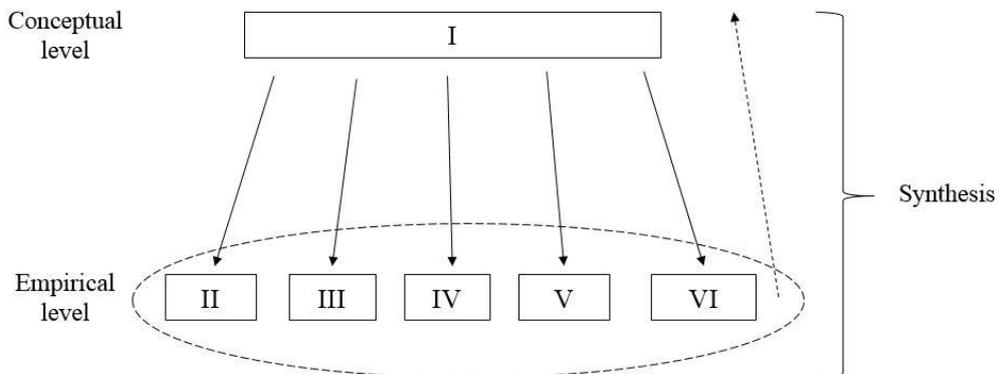


Figure 3. The composition of the study

3.2 Research methodology

The research methodology utilized in this research is qualitative by nature. In general, research methodologies can be divided into quantitative and qualitative approaches. The division is not always clear in research work practice, and both quantitative and qualitative approaches can be utilized in the same research. Also, Flyvbjerg (2006) reminds us that good social science is problem driven, not methodology driven. Good research employs methods that best help answer the research questions, which often leads to utilizing a combination of both quantitative and qualitative methods. However, the separation between quantitative and qualitative methods remains in scientific practice. (Flyvbjerg, 2006.)

Scientific reasoning is based on two different models: deductive reasoning and inductive reasoning. Deductive reasoning is based on general rules or hypotheses that help explain a particular phenomenon by following a linear reasoning process. All the studies that form the empirical part of this research are based on inductive reasoning. Inductive reasoning, in contrast to deductive reasoning, is based on observations and cases through which more general statements about the same type of case can be made.

During the dissertation research several qualitative data collecting and analyzing methods were used, which makes the examination of the research problem more versatile. The research design of each sub-study is determined according to the specific research problem and questions. Sub-study I aimed at creating a conceptual framework, and hence the data also consists of previous research literature. The following empirical sub-studies utilized both the available literary material – such as official documents, reports and strategies – and data collected in the form of interviews, observations and panel

discussions. The case study data consisted both of the secondary data collected by other members of the research group and primary data collected by the author and co-authors. The data and methods utilized in each sub-study and the contribution of the sub-studies to the research whole are presented in table 1. The methods used in the data analysis phase in sub-studies I, II and III, and the case study approach utilized in three of the sub-studies are described in more detail in the following sub-sections.

Table 1. The data and methods utilized in each sub-study

Article	Data	Method	Content
I	Previous research literature	Literature review	Creating a conceptual framework for the examination of different innovation policy approaches
II	Official documents and reports concerning the Centre of Expertise Programme, literature concerning SmSp	Qualitative content analysis	An empirical examination of the Centre of Expertise Programme in the context of the SmSp approach
III	Regional innovation and business strategies (n = 22), INKA applications (n = 18), final INKA proposals (n = 5)	Qualitative content analysis	An empirical examination of the recognition of SEs in regional innovation policy in the context of the RIS concept and Finnish innovation policy
IV	Workshop observation data, interviews, questionnaire	Case study	An empirical examination of the use of future-oriented information in the context of the RIS concept and Finnish innovation policy
V	Case study data (interviews, observations, reports, articles), interviews, a panel discussion, observations	Multiple case study	An empirical examination of the ecosystem concept and an introduction of the preliminary innovation policy implications of the case study results in an innovation policy context
VI	Case study data (interviews, observations, reports, articles), interviews, a panel discussion, observations	Multiple case study	An empirical examination of the ecosystem concept and an introduction of the innovation policy implications of the case study results in an innovation policy context

3.2.1 Literature review

Sub-study I utilized a qualitative literature review in order to create a theory-driven conceptual framework for the comparison of different innovation policy approaches. This literature review consisted of a concept analysis that operates with theory-focused literature material. A literature review is an especially useful research method when the idea or approach is new and it is therefore particularly important to build upon the foundation that has been laid out in prior research (Savin-Baden & Major, 2013). Savin-Baden and Major (2013) state that a good quality literature review should be conducted in an organized manner and it should rely upon sound, documented evidence from high-quality sources. Also, a good literature review goes beyond summary and draws connections and conclusions, and also includes criticality. Literature reviews usually aim at summarizing existing research literature by identifying patterns, themes and issues and by doing this they help to identify the conceptual content of the field and contribute to theory development (Seuring & Müller, 2008).

Cooper (1998) presents the process of conducting a research review as consisting of five stages: problem formulation, a literature search, data evaluation, data analysis and presentation. In sub-study I, the research literature (both theoretical and empirical research papers) covering the studied innovation policy approaches was gathered after defining the research problem. Based on the first round of the literature search and analysis, a conceptual framework and its basic elements were outlined. The following rounds of the literature search and analysis focused on these elements more precisely, and the framework, its elements and the comparative analysis of the studied innovation policy approaches were corrected and elaborated during this iterative process of data analysis. As Seuring and Müller (2008) note, a practical challenge or a problem of conducting a literature review is that it is impractical – if not impossible – to read everything. Therefore, in sub-study I, literature on the innovation policy approaches related to the elements of the created conceptual framework was analyzed up to the point where data saturation was reached. During the research process the created framework and its content were discussed, evaluated and reframed with the co-author.

3.2.2 Qualitative content analysis

The data of sub-studies II and III was analyzed utilizing the qualitative content analysis method. Krippendorff (2004: p. 18) defines content analysis as *'a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use.'* Content analysis is a systematic way of analyzing text material. The research material in sub-studies II and III consisted of text material – such as official documents and reports, innovation and business strategies and innovation program applications – in contrast to the literature review conducted in sub-study I where only research articles dealing with the theoretical basis of innovation policy concepts were utilized in the analysis. Utilizing this type of data for research purposes pursues the aim

of analyzing and opening up research material that is not created on the basis of data collection by the researcher (Seuring & Müller, 2008). Content analysis is a commonly-used data analysis method that is used when the research data consist of text material. Content analysis can be divided into two approaches: the quantitative and qualitative approach. However, Krippendorff (2004) questions the often-used separation between quantitative and qualitative content analysis. Krippendorff argues that ultimately the reading of texts is qualitative, even when converting certain characteristics of the text into numbers during the analysis.

Sub-studies II and III utilized the principles of qualitative content analysis, though less strictly or mechanically than is prescribed by some of the methodological writings. Qualitative content analysis is a flexible text-analyzing method. It encompasses a variety of analytical approaches ranging from strict textual analyses to more interpretive approaches (Hsieh & Shannon, 2005). In qualitative content analysis data are categorized inductively, and the goal is to reduce the data into manageable segments in order to understand the phenomenon (Miles & Huberman, 1994; Morgan, 1993). As in the literature review process discussed above, the qualitative content analyses were also iterative processes that required returning to the data several times during the research process, discussing the interpretations with other researchers and examining the interpretations in the light of previous theory and research literature. Data structuring was based on categories that were developed and defined inductively during the research process, as is typical of qualitative content analysis.

The empirical material in sub-study II comprises of documents and literature concerning the SmSp concept, along with key documents relating to the Finnish Centre of Expertise Programme (CEP) from the last programme period (2007–2013). Data were analysed through an iterative process and less as a mechanical task than as a reflective process. In the first phase of data reduction, items unrelated to the research problem were removed. The purpose of the following round was to obtain a sense of the main characteristics of SmSp and the CEP, and their differences. Next, the data was structured into themes that were further modified during the analysis. The final three emerging themes were the premises of the concept/programme, strategy formation processes and the inclusiveness of the concept/programme.

In sub-study III the data consisted of the (at that time) latest regional innovation and business strategies (n = 22), applications to the Innovative Cities programme (the new national innovation programme) (n = 18) and the final proposals of the leading city regions (n = 5) to the Innovative Cities programme. The regional innovation and business strategies used were the latest operative strategies available at the time the data were collected (December 2013). The strategies have varying time spans within the time frame of 2005–2025. The Innovative Cities applications are from 2012, and the final proposals are from 2013. The data cover all the regions of Finland. The data were first read through using specific search words in their different forms in Finnish. This was done in order to effectively find the text that relates to the research theme. These parts were then analysed in relation to the aims of the strategy. The identified text parts were divided into two

categories: those that had explicit references to SEs and those that contained the ‘spirit’ of the social perspective on business and regional development.

3.2.3 The case study approach

The case study approach is a very often utilized research approach in social science research. Yin (2009: p. 18) has defined the case study approach in the following way: ‘*A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.*’ The distinctive need for case studies arises from the desire to understand complex social phenomena. In brief, the case study as a research method allows investigators to retain the holistic and meaningful characteristics of real-life events. The rising popularity of case studies among qualitative researchers can be partly explained by its flexibility and how it enables in-depth study of the target phenomena (Savin-Baden & Major, 2013). In case studies the emphasis is on the production of detailed and holistic knowledge and the aim is to make room for diversity and complexity, and therefore it also avoids overly simplistic research designs (Eriksson & Kovalainen, 2008). The case study method can be found useful, especially when trying to find answers to the *how* and *why* type of research questions (Eisenhardt, 1989; Yin, 2009). It is also often used when the research focus is on a contemporary event/phenomenon over which the researcher has little or no control (Yin, 2009).

In case studies the phenomenon under study is studied in its real-life context. This makes the examination remarkably rich: typically multiple sources of evidence and different data collection methods are utilized, which also facilitates validation of data through data triangulation (Yin, 2009). Case studies can also comprise of either single cases or multiple cases. Despite the often qualitative character of case study research, quantitative data can also form a part of the case study data (Eriksson & Kovalainen, 2008). Case study research also forms a highly iterative process where the data collection phase and analysis and interpretation phase alternate during the research process (Eisenhardt, 1989; Yin, 2009).

The case study approach has several advantages that have made it very popular among social scientists. These include its flexibility and holistic nature, the depth of investigation, its thoroughness and responsiveness, and empirically valid resulting theories (Savin-Baden & Major, 2013; Eisenhardt, 1989). However, as with any other approach, case study research also has disadvantages. The case study method has been criticized because it is limited by investigators’ preconceptions. However, Eisenhardt (1989) argues that just the opposite is true. Reconciling evidence across cases and types of data, and juxtaposing different realities, enhances thinking and generates theory with less researcher bias (Eisenhardt, 1989). Another common criticism against the case study approach is related to generalizing on the basis of an individual case or a few cases (Flyvbjerg, 2006; Yin, 2009). It might also seem difficult to summarize and develop

general propositions on the basis of specific case studies. However, Flyvbjerg (2006) argues that the case study may in fact be central to scientific development, via generalization, as a supplement or alternative to other methods. Flyvbjerg (2006) has also examined four other common critical claims about case studies (including context-independent knowledge being more valuable than context-dependent knowledge, case studies being useful merely for generating hypotheses, case studies containing a bias toward verification and the difficulty of summarizing and developing general propositions based on case studies) and corrected these misunderstandings. He concludes by arguing that the case study is a necessary and sufficient method for research tasks in the social sciences and that it is a method that holds up well when compared to other research methods. Also Yin (2009) has discussed the common prejudices against the case study method and responded to the presented criticism, however, also noting that case study research nevertheless is remarkably hard and requires skill and precision.

The case study approach was utilized in sub-study IV. The data consisted of SME workshop observations, interviews and questionnaire responses. The gathered data was qualitative in nature. Two foresight workshops, organised by a Finnish regional science and business park (which is also one of the realisers of the national CEP 1), were held in autumn 2011 and spring 2012. The aim of the workshops was to facilitate interaction and collective interpretation of the signals presented to the participants. They were organised for SMEs interested in clean-tech business in Russia. These workshops were observed by altogether three researchers. To obtain another perspective on the research problem, eight leading Finnish authorities using foresight for innovation were interviewed. The first two interviewees were selected by the research group; after that, the pyramiding strategy (von Hippel et al., 2009) was used to identify the top Finnish experts in this field. Semi-structured interviews were carried out and questions covered foresight culture in Finland, how foresight information is collected on a national level, how foresight is used among SMEs and the methods used in interpreting foresight information.

Later in 2012, four separate SME interviews were carried out in order to collect more detailed information about entrepreneurs' insights on foresight. All interviews were recorded and transcribed. In June 2012, a questionnaire was sent to experts working within the CEP. The question-specific response rate varied between 16.5% and 8.6%. These response rates were considered satisfactory, since information was received from most Centres of Expertise (15 out of 22) and from 11 out of 13 competence clusters. Triangulation was used to validate the interpretations gained by the observations, transcribed interviews and the responses to the questionnaire. The interpretations were also considered in the light of previous literature and discussed among the research group several times during the research process.

Sub-studies V and VI utilized the multiple case study approach. The case studies formed a larger project wherein the aim was to study different types of ecosystem as seedbeds for new innovations and to study their formation, functioning and evolution. The purpose of the multiple case study approach was not to use the cases for comparison between different types of ecosystem but rather to use them to complement each other in order to

gain a wide enough view of the phenomena. The innovation policy related research was part of this project ensemble and utilized the data and results gained from the case studies.

The four case studies – the San Diego Health and Life Science Ecosystem case¹, the Eindhoven Health and Life Science Ecosystem case², the Finnish Winter Road Maintenance case³ and the Smart Card Platforms case⁴ – were conducted between January 2014 and July 2015. The case studies, and their data and results were discussed among the research group throughout the research process, but the more thorough innovation policy – focused on analysis of the case studies – was conducted between June 2015 and September 2015. The lessons learned from the case studies and their policy implications were also discussed among the research group in a workshop organized in June 2015. The case study data was supplemented with interviews with Finnish innovation policy experts (n = 8) and a panel discussion among five innovation policy experts. This additional data helped to put the case study results into a Finnish innovation policy context as the interviewees and panelists represented different policy-level expertise and organizations closely related to Finnish innovation policies.

¹ The San Diego Health and Life Science Ecosystem case focused on the study and analysis of the health and life science ecosystem of San Diego in the US. The ecosystem was studied as a spatial business ecosystem focusing on the different actors and their roles within the ecosystem, ecosystem growth drivers and growth inhibitors, the role of trust among the ecosystem actors and the evolution of the ecosystem. The ecosystem consists of more than 600 companies. An important part of the ecosystem is the regional programme called CONNECT that is designed to catalyze the creation of technology and life sciences' products by linking innovators, investors and entrepreneurs with the needed resources (see also Majava et al., 2014; 2016; forthcoming).

² The Eindhoven Health and Life Science Ecosystem case was also a spatial business ecosystem focused on health and life science business, located in Eindhoven in the Netherlands. The region houses over 800 businesses that are active in the health sector, including large multinationals like Philips Healthcare. Eindhoven also has a reputation as one of the world's leading open innovation environments. The High Tech Campus hosts over 100 companies and over 8000 high-tech people, forming an open innovation ecosystem that is completed by service providers and research institutes.

³ The Finnish Winter Road Maintenance case focused on a Finnish winter road maintenance ecosystem, an emerging sectoral and national business ecosystem in Finland. The core of the ecosystem consists of a group of Finnish companies and their expertise and know-how related to winter road management. The ecosystem covers a variety of companies, ranging from meteorological observation technologies to winter maintenance equipment supply, and meteorological services and service concepts. The case study focused on the different ecosystem actors and their roles, the risks and revenues of sharing, collaboration and the possibilities of accessing new markets and on whether public innovation support mechanisms play any role in these (see also Leviäkangas et al., 2014; 2015).

⁴ The Smart Card Platforms case examined smart card platforms in public transportation. These technology platforms were examined as sources of innovation, and in terms of diffusion and externalities. The study included four different smart card platforms: Octopus (in Hong Kong and parts of China), Oyster (in the Greater London area), EasyCard (in the Greater Taipei area and other parts of Taiwan) and OV-chipkaart (in the Netherlands). The case study provided new knowledge on the development, successful implementation and diffusion of technology platforms for innovations in a spatial context. As new business ecosystems are built around new platforms understanding the success factors, and growth enablers and growth inhibitors, it is also important for policies aiming at supporting new-platform development and growth (see also Kinnunen et al., 2015).

4 SUMMARY OF THE ARTICLES

4.1 Article I: The business ecosystem concept in an innovation policy context: Building a theoretical framework

BACKGROUND AND OBJECTIVES

There are several different approaches and concepts that guide policy-makers within the innovation policy field. These concepts and approaches are utilized in different ways. In policy discussions the use of these concepts is sometimes somewhat fuzzy and new concepts and approaches emerge before policy-makers have really gained a deep understanding of the previous ones. The business ecosystem concept is one of the concepts that have lately become popular in business and innovation studies, as well as in policy discussions. It has been acknowledged that competition happens more and more in international ecosystems rather than in regional or national clusters and thus innovation policy needs to focus on nurturing evolving ecosystems (Moore, 1993; Hearn & Pace, 2006). The business ecosystem concept dates back to the early 1990s but innovation policy-wise it is still a fairly new concept. The question set for this study is *What is new about business ecosystems as a policy approach and how do they differ from the currently widely utilized innovation policy approaches?*

The aim of this conceptual study is to explore the business ecosystem concept in an innovation policy context. A comparative study was conducted where three widely utilized policy approaches were examined together with the business ecosystem concept. The aim of the study is to bring more clarity to the ecosystem discussion at policy level in order to avoid the incoherent and mixed use of different concepts. This literature-based study creates a conceptual framework for the comparison of different innovation policy approaches.

THE MAIN FINDINGS

On the basis of the comparison, the ecosystem approach seems to differ in many ways from the three other approaches under examination. The ecosystem approach differs from the three approaches, for example in ecosystems evolving around innovation, and their self-organizing and self-renewing nature. This paper sets a conceptual basis for further empirical research concerning the innovation policy implications of the business ecosystem concept.

Based on our conceptual examination we suggest that an ecosystem-supporting innovation policy could include the elements of creating and opening up common

platforms and promoting ecosystem-based value networks, quadruple helix cooperation and ecosystem renewal. Crowdsourcing, shared value creation, peer-to-peer activities, platform-enabling creativity skills and nurturing new entrepreneurship are examples of the actions and tools that can help realise these policy objectives. Key policy challenges are likely to be linked with ecosystem evolution, especially its renewal and death.

It can be questioned whether it is appropriate and useful to bring yet another concept to the discussion and attempt to draw policy conclusions from it. However, based on the analysis, the business ecosystem approach seems to bring new elements to the innovation policy discussion since its structure and functions differ from the three other approaches. The economic landscape and the ways firms operate within it change over time, and thus we also need new ways to examine this change and the actors involved in it.

CONTRIBUTION

This paper provides a conceptual framework for innovation policy comparison and sets the basis for further empirical research. The contribution to the previous literature is twofold. First, this study provides a new perspective on widely used policy approaches through comparative examination. Second, it adds to the discussion of business ecosystems by integrating them with theory on innovation policy and examining both their characteristics in a policy context and the challenges posed by this new approach. The article also contributes to the discussion on business ecosystems as well as regional innovation policies by integrating the business ecosystem concept with the theory of regional innovation and development policies, and by comparing it to three widely utilized and researched policy approaches. From the perspective of the dissertation research as a whole, this study sets the conceptual basis for the empirical study of each of the policy approaches examined in this sub-study.

4.2 Article II: Smart regional innovation policies – from cluster approaches to place-based policies

BACKGROUND AND OBJECTIVES

SmSp is one of the key concepts of the EU's Innovation Union flagship initiative and is considered essential for truly effective research and innovation investment that will enhance regions' innovativeness and competitiveness, and deliver targeted structural fund support (McCann & Ortega-Argilés, 2015; Foray et al., 2012; European Commission, 2011). Drawing up regional research and innovation strategies for SmSp is a precondition for the use of Structural Funds for research and innovation investments (European

Commission, 2011). In recent years, SmSp has been the subject of both political and academic discussion focused on questions concerning the theoretical basis of the concept and its applicability within regional and innovation policies (see e.g. Boschma, 2014; Foray, 2013; Goddard et al., 2013; McCann & Ortega-Argilés, 2013; 2015).

Finland has, at least in the past, been considered a forerunner in the development of innovation policy and in creating new innovation strategies. The CEP was for a long time the centrepiece of regional innovation policies in Finland, and it has been considered a good example of a national and regional programme that directs development funds to selected areas of expertise. For this reason, the CEP has been presented as the Finnish version of constructing regional (smart) specialisation strategies. The CEP also represents the state of regional innovation policy in Finland quite well during the previous EU funding period (2007–2013). This study examines the Finnish CEP as a policy tool and reviews its characteristics in the light of the SmSp framework. The aim of this study is to assess the novelty value of the SmSp approach by answering the following research questions:

- 1. What similarities and differences can be identified between SmSp and the CEP?*
- 2. How should the CEP be characterised as a policy tool in the light of the SmSp concept?*

THE MAIN FINDINGS

The paper argues that from the perspective of SmSp, the CEP is more a national cluster-based tool for regional and innovation policies than a tool for fostering ‘smart’ regional specialisation. However, the CEP cannot be described as an equivalent to traditional cluster policies as it has also striven to find emerging industries – such as ubiquitous computing and nanotechnology – that could have greater innovation potential than existing fields of expertise. It remains the case, however, that most CEP clusters continue to rely more on existing areas of expertise. The structures and practices developed within the CEP over its history offer a good base on which to develop SmSp strategies, but from an SmSp perspective, new policies would be better based on bottom-up strategy processes and better aimed at exploring new potential domains and renewing old industry bases. This requires the ability to cross conventional industry and cluster boundaries or find new niches, for instance, with the help of new technologies.

CONTRIBUTION

This article examines the former long-term building block of Finnish regional/national innovation policy tool, the CEP programme, in the light of new policy approach, SmSp and new requirements set at the EU level. Supranational, EU-level policy decisions affect national and regional innovation policies in Finland as well as in other member countries

and more or less set the framework for developing future national and regional innovation policies, which provides one perspective for examining also the future of Finnish innovation policy. This study combines the examination of supranational and national level innovation policy and cluster-based innovation policy programme in the light of previous development and new requirements.

4.3 Article III: Social enterprises in regional innovation systems: a review of Finnish regional strategies

BACKGROUND AND OBJECTIVES

RIS theory (Asheim & Isaksen, 2002; Braczyk et al., 1998; Cooke et al., 1997) has been one of the most utilized frameworks for innovation policies and activities. Current innovation policies (including the SmSp approach) emphasize the importance of entrepreneurship for regional economies. However, it appears that no types of entrepreneurship are as yet properly incorporated into RISs, policies and strategies. In seeking smart, sustainable and inclusive growth, many expectations are set for SEs. The EU, for instance, expects SEs to be a source of new and innovative solutions to the persistent problems of society, to allow better inclusion of workers and consumers and to produce ‘laboratories’ of social innovations, especially at the local or community levels (EU, 2012). The aim of this paper is to identify whether and in what way SEs are communicated as an innovative solution and as a source of sustainable innovations for economic and development activities through regional strategies. Answers to the research problem are sought by setting the following research questions:

1. *In what way can SEs contribute to regional development through RISs and their objectives?*
2. *Do Finnish regional strategies include themes related to social perspective, and is the potential of SEs to contribute to strategic objectives identified and communicated in these strategies?*

THE MAIN FINDINGS

The results are presented as ‘identified and utilized potential’ and ‘identified but not yet utilized potential’ within a conceptual framework (figure 4). *Identified and utilized potential* refers to the potential of SEs to contribute to RIS objectives that have been recognized and also utilized regionally. However, according to our research, this potential is not identified in every region and is utilized in even fewer. *Identified but not yet utilized*

potential refers to the strategies where the social perspective is present in the form of the thematic references that were discussed above. However, SEs are not yet recognized as potential contributors to the policy objectives related to these themes. These themes appear to have strategic importance for RISs and their development since they are included in the regional strategies. They also have a strong social perspective, which again indicates that SEs could be potential contributors.



Figure 4. A summary of the results of sub-study III

The thematic references to social perspective in the regional strategies indicate that the social perspective is viewed as a strategically important aspect for regional development. SEs are not yet recognized as concrete contributors to development goals. For example, strategies discuss communities but these are not connected to entrepreneurial activities. Communities, in the sense of developing and testing platforms, are seen as a source of, for example, information – not as potential independent actors and producers. The social aspect of entrepreneurship and economic activity is still handled at a rather vague discursive level, instead of as a more materialized processes in a specific (regional) context. The results point out that RIS theory, and innovation and development policy based on the RIS approach include areas and objectives where the principles of sustainability could be better incorporated and where SEs could contribute to the objectives. The main argument of this paper is that Finnish RISs – as reflected in their central policy instruments and regional strategies – still maintain a rather traditional growth-oriented focus instead of reflecting and promoting the objectives of sustainable innovation policy on a larger scale. We note that SEs hold unused potential to answer the

expectations concerning RIS, particularly the social ones, and SE as a concept sustains both entrepreneurship and innovation and an alternative type of sustainable innovation policy.

CONTRIBUTION

This sub-study contributes to regional innovation and development theory by bringing the concept of sustainability to the discussion, particularly through RIS theory. The article contributes to the regional development theory by arguing that RIS theory and innovation and development policy based on the RIS approach include areas and objectives where the principles of sustainability could be better incorporated and where SEs, in particular, could contribute to the objectives. The sub-study sheds light on the new developments of the RIS theory and practice by examining it in a social sustainability context. Finland has been a forerunner in utilizing the innovation systems concept in innovation policy practice. However, the changes in the innovation environment set pressures for renewal and for viewing RIS and their objectives in new ways.

4.4 Article IV: The use of foresight information in small and medium-sized enterprises – the role of intermediary organisations

BACKGROUND AND OBJECTIVES

Given the rapid pace of global change, it is crucial for firms to keep track of the changes in the operational environment. In the early phases of the innovation process, acquisition and the use of external knowledge are critical success factors, and thus the development of new sharing activities and methods to enhance knowledge management and creation are needed (Bergman, 2005). The amount of literature on the use of foresight knowledge on an enterprise level is vast. However, the use of foresight knowledge in an SME-specific context has not been as widely studied. Furthermore, the gap between knowledge generation, knowledge exploiting systems and the channels through which new knowledge filters to the SME level have rarely been studied.

The aim of this paper is to study the role of intermediary organisations in promoting the use of foresight information in SMEs. Intermediary organisations are a part of the regional innovation support infrastructure and are also the practical realisers of regional innovation policies. The research question set for this study is *What is the role of intermediary organisations within regional innovation systems in promoting the use of foresight knowledge in SMEs?* Answers to this question were sought by using previous literature and by conducting a regional case study within a Finnish setting.

THE MAIN FINDINGS

The studied intermediary organisations appear to have several ways to disseminate foresight information to local entrepreneurs. What is lacking, however, are the tools to help entrepreneurs analyze and interpret this new information in their business context. According to our results, the role of intermediary organisations is often that of information disseminators rather than active information brokers. Intermediary organisations could provide more tools for transformation processes instead of just offering information that is easy to assimilate to current business operations – which rarely results in growth-producing innovations. The need to find alternative interpretations for the presented foresight information and signals was emphasised. Also, the need for brokering functions and the need for rooting a new type of foresight culture in SMEs were identified from the results of this study.

Intermediary organisations are important information disseminators, but in order to enhance more thorough information processing, they could offer platforms for communicating, sharing thoughts and interpreting future-oriented information. Organisations contributing to the use of foresight information and the adoption of a continuous anticipatory culture in SMEs could involve those who offer not only external information but who also offer an understanding of the SME context relevant to this information and the means to fruitfully facilitate information processing. National-level foresight information producers and diffusers are often quite distant from local enterprises. As such, RISs need regional intermediaries that can offer platforms for knowledge transformation processes that are fuelled by communication. Hence, our study supports Uotila's (2008) suggestion that an intermediary subsystem within an RIS serves as a knowledge broker between the knowledge-generating and knowledge-exploiting subsystems. Supporting a more communicative and active way of using foresight information and knowledge can be seen as a part of a wider policy model wherein future-oriented thinking is emphasised.

CONTRIBUTION

This study contributes to the theoretical discussion of using foresight information and the role of regional intermediary organisations in SME contexts. In practice, these results can be used when framing the functions of regional intermediary organisations or formulating future innovation policies that take into account the multidimensionality of information and knowledge-transferring mechanisms. As a sub-study of the wider dissertation research, it contributes to the research on innovation policy based on the RIS theory and how changes in the business environment have affected knowledge exploitation at the SME level. The study contributes to the research of RIS-based policy in enterprise context but from a different perspective (a knowledge-exploiting perspective) than sub-study III.

4.5 Article V: Policy framework for supporting business ecosystems and niche development through innovation policy

BACKGROUND AND OBJECTIVES

The use of the word *ecosystem* outside of an ecological context has increased drastically, especially in the business world (Hwang, 2014; Majava et al., 2013), which perhaps reflects a change in the way we think about business and innovation, and the changes in the global operational environment wherein firms operate and new innovations are created (Gobble, 2014). New technological niche innovations are needed for new solutions (e.g. in energy production), employment, sustainable growth and social wellbeing. However, changes in the operational environment also change the ways these small-scale innovations can grow and develop into comprehensive new solutions. It has also been acknowledged that competition happens between business ecosystems rather than between individual firms or clusters (Moore, 1993; Hearn & Pace, 2006). Research on the innovation policy implications of these changes and the ways new business and innovation ecosystems emerge and evolve is still rather scant.

The aims of this study are to (1) examine the potential of the ecosystem approach for new technology and niche innovation development, based on a literature review and (2) sketch the basic elements that this ecosystem-supporting innovation policy consists of, based on empirical case study material. The data was gathered within a research project consisting of several case studies examining spatial business ecosystems and local innovation platforms.

THE MAIN FINDINGS

Ecosystems are by definition self-organizing and complex systems, which, from theoretical perspective, could make them potential platforms for radical innovations and niche development. Niches are developed by unexpected collisions producing serendipity. Therefore an ecosystem-based innovation policy calls for the intentional mixing of different fields, feeding variation and looking for the unknown and unexpected. As a result, it also calls for the flexibility to directly support fields (and mixes of different fields) showing potential and growth.

Ecosystems evolve through trials and experimentation, which requires a new kind of experimentation culture. Policies can enable and support the adaption of this culture by offering platforms upon which these trials can be carried out and that support the pilots, demo phases and rapid prototyping that lead to new innovations. When it comes to the wicked problems (such as climate change) that have a significant effect on societies at large, legislation can also be used to steer activity towards the development of innovative

ecosystems based on the new technology of certain fields. Radical innovations can be the result of pure serendipity or of persevering R&D work. For innovation policy this means that both long-term R&D work, and fast trials and experiments should be funded.

Innovation policies have aimed at supporting e.g. cluster development. The changes in the global and national innovation environments call for a new innovation policy approach that takes into account the development mechanisms of business ecosystems. If attention is directed towards technology startups, more attention can be paid to emerging ecosystems rather than to the old industrial clusters. A good idea and a new innovation can alone go far but building an ecosystem around one of these or connecting it to an existing business ecosystem can further its implementation and reveal new applications.

CONTRIBUTION

This study contributes to both the theory and practice of innovation policy. It provides a new perspective on innovation policy, based on the concepts of business and innovation ecosystems connected to theory on sociotechnical transitions. The results offer a new perspective on innovation policy theory and a framework for ecosystem-supporting innovation policy. The policy framework offers a good basis on which to build and formulate the practical innovation policy operations that support new business and niche development. As a part of the dissertation research this paper presents suggestions for the basis of ecosystem-supporting innovation policy (especially in the technology innovation and niche development context) based on empirical research.

4.6 Article VI: Business and innovation ecosystems – Innovation policy implications

BACKGROUND AND OBJECTIVES

The amount of research on business and innovation ecosystems is rapidly increasing but research on the policy implications of these concepts is still rather scant. We have gained understanding about how business and innovation ecosystems are developed, how they evolve and what type of actors they consist of through several studies, but there is still a lack of understanding about the role of the public sector and public policies; how they can support the birth of new ecosystems, and their growth and renewal. The research question set for this study is *How can innovation ecosystem development be supported by means of innovation policy?*

The aim of this paper is to present the innovation policy implications of the ecosystem case studies. The purpose is not to provide specific policy guidelines for innovation policy regardless of context but to sketch a basis for innovation policy that takes into account the nature of business and innovation ecosystem development and brings out the distinction between this type of innovation policy and the currently applied policy approaches. The study utilizes a multiple case study approach to study real-life business and innovation ecosystems in an innovation policy context. The data was gathered within a research project consisting of several case studies examining spatial business ecosystems and local innovation platforms.

THE MAIN FINDINGS

The most prominent characteristic of innovation ecosystems is their complex and self-organizing nature. This complex and self-organizing nature requires that policies orchestrate and facilitate innovation through, for example, funding, public procurements, providing development platforms, and through laws and regulations. Ecosystem-based innovation policy is able to prioritize the fields from which innovative collisions are expected but without defining what those collisions are and who collides. Also legislation can be used to help develop successful ecosystems in certain fields.

From the ecosystem perspective more flexible and constant feedback mechanisms are needed in order to be able to cut off failing trials and feed the successful ones in time. Ecosystems evolve through trials and experimentation, which requires a new kind of experimentation culture. Policies can enable and support the adaption of this culture by offering platforms upon which these trials can be carried out that support the pilots, demo phases and rapid prototyping that lead to new innovations. The role of innovation policy in this is to help provide platforms, and co-develop and foster ecosystem formation through, for example, public procurement.

Another characteristic of innovation ecosystems is their ability to produce new niches. Niches are developed by unexpected collisions producing serendipity. Therefore an ecosystem-based innovation policy calls for the intentional mixing of different fields and looking for the unknown and unexpected, and as a result it also calls for the flexibility to directly support fields (and mixes of different fields) showing potential and growth. Also, developing innovations that have scalability is important in order to gain access to global ecosystems. Keystone organizations are often the key to these ecosystems, which makes it important to nationally and regionally develop innovation ecosystems that also attract large foreign enterprises that provide investments and become cooperating partners.

In the ecosystem context the role of policy is not direct steering through, for example, traditional cluster programmes but orchestrating and enabling innovation, for example, by directing public procurements to enable the birth of new ecosystems and by strengthening the self-renewal capacity of existing ecosystems.

CONTRIBUTION

The study contributes to current innovation policy theory by bringing a contemporary business and innovation concept to innovation policy research and examining it empirically in an innovation policy context through multiple case studies. It furthers the somewhat underdeveloped theory on innovation ecosystems (Thomas & Autio, 2014) by widening the perspective to include an innovation policy context and at the same time bring a new perspective to innovation policy research. This article adds to the theoretical examination of the business ecosystem concept in an innovation policy context (presented in sub-study I) by presenting an empirical study of business and innovation ecosystems and their innovation policy implications.

Furthermore, in addition to the theoretical contribution, the study has a clear practical contribution as well. The results of the study set the basis for applying the ecosystem approach in innovation policy at national and regional levels. The innovation policy implications for ecosystem-based innovation policy presented in this article are not designed or targeted to a specific national or regional setting – rather, the emphasis has been on providing a basis for applying the ecosystem approach in any nation or region. This, the final sub-study of this dissertation, deepens and widens the implications of the ecosystem-based policy approach that was presented in sub-study V in a narrower context.

5 CONCLUSIONS

5.1 Policy learning and the concept evolution of innovation policy approaches: The building blocks for future innovation policy (articles I and II)

The past approaches upon which innovation policies have been practiced in Finland have built a strong basis for successful innovation policy. They have helped in internationalization and in increasing critical mass through networking and strengthening Triple Helix cooperation: the CEP is a fairly successful example of cluster policy. Previous developments in the innovation policy field and different innovation policy approaches – such as the cluster approach or the innovation systems approach – have created a strong basis for innovation activities and policy practices. However, for example, cluster policy in its original form does not meet the requirements and expectations set for modern innovation policy. There is demand for new type of place-based innovation policy but it has not yet been developed, let alone practiced, in Finland.

Cluster-based policy relies heavily on locations and regions. This policy aspect is not diminishing as the SmSp approach (strongly promoted by the European Commission) also emphasizes the importance of regional assets and local knowledge bases. However, the regional aspect is updated to focus on finding unique, ‘hard-to-imitate’, complementary and cross-cutting fields of expertise based on regional assets, quadruple helix cooperation and global networks, rather than on localization economies, specific industries, local networks and knowledge spillovers. The changes in the innovation environment require changes in the innovation mindset; innovation and innovation processes must be seen as wider wholes – more flexible, more networked – as flows and relations, and through a new type of value creation (see also e.g. Moore, 1993; Iansiti & Levien, 2004; Asheim et al., 2011).

New innovation policy approaches are created all the time and they are promoted by different national or international institutions. Mytelka and Smith (2002) view theory and policy learning as an integrated and co-evolving process and argue that the close link between theory and policy has been one of the keys to the development of this particular field. As innovation theory develops, also innovation policy changes (or is changed) as a result of increased understanding of innovation processes and the role of different actors and their interaction in these processes. Mytelka and Smith (2002) also state that the economic turbulence and its negative effects on employment and productivity create space and a policy need for new innovation theory and policy ideas. The idea of the business and innovation ecosystem-based policy approach presented in article I can be viewed as a new theoretical idea that utilises the space created by the changes in the economy and business logic. As a policy approach the ecosystem approach is still in its early infancy and its further development and success is dependent on how rigorously its theoretical basis is developed by academia and how eagerly it is adopted by policy actors as a result of the interaction between theory and policy.

Previous advancements and policy learning in the innovation policy field provide a good basis for utilizing existing theoretical approaches in practice. The European Commission is the executive organization of the EU whose interests are in the overall economic development and well-being of the member countries and it aims at reaching these objectives by adopting and developing policy instruments, for example, by developing innovation activities. SmSp is a good example of an innovation policy concept that has its origins in academic discussions (Foray & van Ark, 2007) and that became a European 'policy innovation' and was quickly and widely applied as an innovation policy instrument. Its promotion by the European Commission has helped legitimize the SmSp concept and furthered its adoption in European countries.

However, it is still important to be able to change the mind-sets of policy-makers and practitioners in order to benefit from the advancements in innovation policy theory. If policy renewals are top-down, forced processes, there is the danger that in practice these new approaches are only applied/implemented as apparent reforms. For example, one of the acknowledged challenges of SmSp is translating it from a theoretical framework into policy practice and implementing it in different regions (Charles et al., 2012; Camagni & Capello, 2012; McCann & Ortega-Argilés, 2015). The problem of implementation is surely also a question of resources. If place-based policy is truly place-based and seen as a desired outcome, one must also know how to promote regional renewal and transformation through policy. New policy concepts and approaches lose their potential value if, instead of adopting their content, the only thing adopted is putting the new concepts to use when communicating about policy actions.

The evolution of the innovation field has been the co-evolution of innovation theory and innovation policy ideas and the strong interaction between these two (Mytelka & Smith, 2002). Mytelka and Smith (2002) presented how, for example, the innovation systems approach was developed from innovation theory into the widely-utilized policy approach promoted, for example, by the OECD and the European Commission. Policy learning in the innovation field has been a process that is simultaneously affected by both the development of innovation theory and the changes in operational environment that have affected policy objectives. SmSp is a recent example of an approach that has been adopted at the supranational EU level and has thereafter been widely applied in EU member states and regions. The development of both SmSp theory and policy practice are still an ongoing and interactive process. Article I presented how business ecosystem theory compares to that of clusters, innovation systems and SmSp. However, as a policy approach the ecosystem-based idea is still a far from comprehensive innovation policy approach on any policy level. The theoretical basis of business and innovation ecosystem concepts exists and is already quite vast. However, though article I presented an attempt to link this theory to innovation policy discussion, there is still a long way to go before arriving at a policy approach that could be legitimized by international policy organisations or national governments. Another challenge lies in linking this approach from macro-level theory to micro-level actors and activities.

5.2 Adopting a wider perspective on entrepreneurship and entrenching anticipatory culture: Approaches for regional renewal (articles III and IV)

Articles III and IV focused on foresight knowledge and anticipatory culture as the transformative drivers in enterprises and on the social sustainability view on entrepreneurship, both being seen through an RIS lens. Regions with rapidly changing environments need to be capable of renewal and ‘re-inventing’ themselves in order to avoid regional lock-in. In order for this renewal to be on a sustainable base, it needs to be rooted in existing regional strengths and assets. Stähle (1998) and Sotarauta (2005) present a self-renewal capacity (discussed in subsection 2.2) as the driving force for organisational and regional renewal. A self-renewal capacity is based on individuals, from whom it extends to organisational, regional and even national levels (Saarivirta, 2009). Thus, enterprises and the individuals working in these enterprises are the key drivers of this regional transformation, as transformation can be enhanced by public policies but one of the key elements is the capacity to change of local firms. Through these firms the anticipatory culture and wider perspective on entrepreneurship through, for example, social sustainability (as discussed in articles III and IV) can be seen as approaches for this regional transformation in search of new sustainable paths in economic development.

Social entrepreneurship can be seen as a potential tool for transformation from the regional perspective. This transformation is related to taking account of the sustainability perspective when seeking regional growth. Sustainability has become quite a common theme in an environmental and economic context. However, social sustainability is not a widely discussed theme in innovation policy and it is also a challenging objective to measure. Still, it is an important aspect to consider when discussing e.g. regional development and social change. As article III shows, all three aspects of sustainability (environmental, economic and social) are often already included in regional strategies and their objectives. Based on this observation it can be said that the social sustainability perspective is seen as a strategically important aspect from a regional development perspective. However, taking this aspect into practice as materialized processes still remains a challenge that must be tackled in the future. Overall, the sustainability perspective can be seen as creating space and possibilities for new innovations as old courses of action and structures are challenged and changed.

By offering tools to support information transformation processes within firms through RIS intermediaries, these intermediaries can help firms in their renewal and create innovations that differ from their current business and product or service pool. In order to interpret foresight information in the context of a firm, managers need the capacity for in-depth information processing and interpretation, which can lead to radical innovations and renewal. This information processing and interpretation can be promoted and facilitated by building different types of platform for communication and interpretation. Based on the results and conclusions of article IV, enhancing the rooting of anticipatory

culture and foresight thinking in regional SMEs can be seen as one tool for firm-level transformation and for regional-level transformation. Regional innovation policies can enhance the creation of an intermediary subsystem within the existing RIS where different system-level actors can work as information brokers between knowledge-generating and knowledge-exploiting subsystems (Uotila, 2008; Uotila & Almqvist, 2008).

Articles III and IV offer two examples of approaches and elements that can be utilized in regional transformation and renewal processes. As noted above, individuals are the key element of these processes and influence the organizational level and regional level renewal that also have wider societal effects. As a result, these transformation processes can, both at firm and regional level, become concrete actions that strive towards sustainability and a long-term perspective in development actions, enhance anticipatory culture and the ability to respond to unexpected changes in the operational environment. From a policy point of view, the capacity to renew can be seen as an individual, organizational or regional capacity, the elements of which can be influenced by policy. Policy actions are developed on the basis of intentionality, that is, the intention to steer economic development in a certain direction. Sotarauta (2005) states that a self-renewal capacity can be seen as a way to understand how the intentionality of policies and emergence are encountered in the practices of economic development. The approaches presented in articles III and IV can be viewed as policy tools supporting a regional self-renewal capacity and contributing to sustainable economic development in the context of the widely adopted RIS approach.

5.3 The ecosystem approach: A new conceptual framework for innovation policy (articles I, V and VI)

Articles I, V and VI examined the business and innovation ecosystem concepts and their potential to contribute to innovation policy and its conceptual development. All three articles discussed the ecosystem theme from a slightly different viewpoint. While article I was a conceptual examination of three widely utilized innovation policy concepts and the business ecosystem concept, articles V and VI were empirical studies focusing on the innovation policy implications of business and innovation ecosystem case studies. However, all three studies focus on examining the potential of business and innovation ecosystem concepts in an innovation policy context and thus present an emerging new conceptual framework for innovation policy.

The results of articles V and VI present the basic elements of a policy approach that is based on the theory and empirical evidence of business and innovation ecosystems. The articles present the elements of this policy approach in more detail but the key elements are presented in table 2.

Table 2. The key elements of ecosystem-based innovation policy

Innovation ecosystem characteristics	The elements of ecosystem-based innovation policy
Complex and self-organizing	Innovation orchestration & facilitation; funding
Niche development	The flexibility to directly support fields showing potential and growth
Finding innovation potential from interfaces and unexpected combinations; complementary innovations	Intentional mixing; looking for the unknown and unexpected
Ecosystem management; the keystone organization's role; peer-to-peer management	Providing platforms for development; fostering ecosystem formation through public procurement
Global business ecosystems based on local/regional innovation ecosystems	Access to successful global ecosystems
Complex and self-organizing	Leaving room for serendipity; flexible projects to ensure dynamism
Open innovation; co-creation; users	Quadruple helix cooperation
Trial-based; experimental; rapid prototyping in the real world	Experimentation culture; offering platforms; supporting pilots; trials and demo phases
Complex and self-organizing	Prioritizing the fields from which innovative collisions are expected but without defining what those collisions are and who collides
Rapid changes; new courses of action	Constant feedback mechanisms; cutting off failing trials and feeding the successful ones

The research objectives of these studies and the results can be viewed as a response to the call for a stronger evolutionary view in innovation policy (Hämäläinen, 2015; Boschma & Sotarauta, 2007; see also Sotarauta & Srinivas, 2006). A policy approach that relies on the ecosystem concept and evolutionary thinking offers a new type of approach and framework for innovation policy. Ecosystem-supporting innovation policy recognizes the need for constant evolutionary change. Therefore, the presented ecosystem-based innovation policy approach aims at both supporting the development of new innovation platforms and emerging ecosystems, as well as assisting ecosystem renewal. Also, as the results of article V show, ecosystem-based innovation policy could have a role in supporting wider socio-technological transitions, as policy also plays a role in the selection environment of technological evolution (Geels, 2002).

The constant production of new concepts in innovation studies has been criticized and it has been claimed to cause conceptual fuzziness within the field and among policy-makers. Developing new concepts should not be an end in itself but should always serve a specific

purpose. The ecosystem-based view on innovation policy is a response to the change in business logic and global competition that more often happens between business ecosystems rather than between individual firms or clusters (Hearn & Pace, 2006; Moore, 1993). The framework for ecosystem-based innovation policy presented in articles V and VI can be viewed as drawing from evolutionary economics and evolutionary economic geography as it particularly pays attention to continuous change and complexity.

Boschma and Sotarauta (2007) name the enhancing of the capacity of organisations and institutions to change as the key objective of evolutionary innovation policy. This view is also at the core of the policy approach presented in articles V and VI. It is essential to facilitate renewal and the search for the unknown and unexpected. Also, it is worth noting that by facilitating and enabling new things to happen, policy-makers cannot predict what will actually happen. What will happen is eventually dependent on the individuals, firms and communities that drive change and create new innovations. In addition to Mytelka and Smith's (2002) notion about the co-evolution of theory and policy (discussed in subsection 5.1), Sotarauta and Srinivas (2006) note that public policy and economic development also co-evolve. In policy-making the interplay between intention (policy) and emergent development is always present and both intention and emergence influence each other. Ecosystem-supporting innovation policy perceives the need for constant evolutionary and emergent change that begins from the grassroots level and also recognizes the possibilities of influencing this change through intentional policy-making.

5.4 Innovation policy's concept evolution and perspectives on future innovation policy (Articles I, II, III, IV, V and VI)

Even though this research cannot be considered as actual futures research, the examination of the innovation policy's concept evolution in a way opens up new windows and paths to the future of innovation policy. Figure 5 presents the synthesis of the different perspectives on future innovation policy in relation to the wider innovation policy field. The outer circle represents the wider innovation policy field that is also connected to other policy fields. These are by no means the only perspectives on the future of innovation policy but the ones chosen as the basis of this research and to which the research results provide new content.

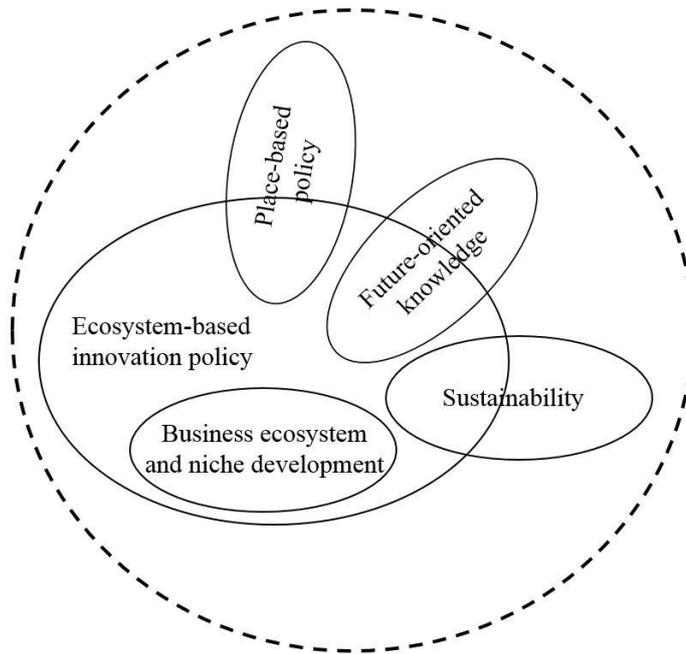


Figure 5. Perspectives on future innovation policy

When examined considering innovation policy's concept evolution, the future of innovation policy continues to stress the need to develop policy approaches that take into account the systemic, complex and evolutionary nature of change and economic development. Based on the results, future innovation policy could better take into account, encourage and direct towards sustainability (in its different dimensions, not only ecological sustainability). Another important aspect is future-oriented anticipatory culture, not only in companies but also in other organisations and in policy-making. The future cannot be foretold and therefore it is also practically impossible to prepare for it. However, the point in adopting a future-oriented and anticipatory culture is not the attempt to adapt to the existing and future circumstances but to aim to anticipate societal and economic dynamics and explore the different potential future paths, which again can help further one's capacity to renew instead of merely trying to adapt to external changes. As Oinas (2005: p. 1240) puts it, *'waiting for "favourable winds" is not enough – technological leaders need to "generate their own winds".'* Future-oriented thinking also includes learning from the past and utilizing the lessons learned from this as building blocks in future policy-making.

Wider sociotechnical transitions could be enhanced by encouraging the development of radical innovations and by challenging existing structures and barriers. This type of policy thinking acknowledges the need for a wider systemic transition and is willing to make

room for it in the form of supporting policies. Policies aiming at wider sociotechnical transitions cross different policy sectors and include many policy fields in addition to innovation policy; they require close cooperation and a common view between policy sectors. However, innovation policy is one of the main policy sectors as radical niche innovations are an essential element in initiating sociotechnical transitions (Geels & Schot, 2007; Geels, 2002).

When discussing innovation policy's concept evolution, special attention could also be paid to the evolution concept. In general *evolution* can be used as a synonym for *development*. However, in the light of this research and its results, evolution can be understood as, on the one hand, the change and development of individual policy concepts over time and, on the other hand, the wider system-level evolution of innovation policy that includes all the individual concepts, the evolution of which is a part of the system-level evolution that happens over time. In this research innovation policy concepts can be viewed as 'species' within an ecosystem that evolve over time. The innovation policy ecosystem as a whole includes these different concepts and theories. As these concepts and theories change and develop further, the ecosystem also encounters gradual change.

As we have seen, innovation policy concepts such as clusters and innovation systems have remained but their content and practical implementation have changed over time. Simultaneously, new concepts have been developed, of which some have remained alongside the older ones and some have more or less become 'extinct'. Policy concepts are born and developed through different paths. Articles III and IV (and partly also article I) show how the content and use of policy concepts remodels and can be intentionally shaped based on the needs rising from the grass roots level. Widely used concepts are renewed and new elements and perspectives are included. New concepts can be adapted to policy practice, for example, as presented in article II, as 'forced' concepts defined by upper level policy actors. Also, research can develop new concepts through theory, empirical research and scientific argumentation to policy practice (articles I, V ad VI).

With new concepts the challenge is to adapt them to policy context and prove their worth and utility in policy practice. The ecosystem concept can be seen to be in this position; it is researched and it has also been adopted to policy discourse but its utility and worth for policy practice has not been proven. Therefore, it is too early to predict what kind of position the ecosystem concept will get in the innovation policy field in the long run. Even though the idea of evolutionary development was already present in the innovation systems concept, the ecosystem concept as a policy concept and the idea of evolutionary innovation policy can be viewed as challenging current innovation policies at the ecosystem level but possibly remaining only as 'species-level' development. The challenges we face as societies, communities, organisations and individuals can be affected by policies, and the direction of policy is in the end dependent on political decisions, for which research can provide important knowledge. However, new practices can be developed also at the grass roots level, and these developed and adopted new practices can also pave the way for new policy directions and upper level political decisions.

6 DISCUSSION

Contribution to theory and practice

Innovation policy studies that are based on evolutionary economic geography have been presented during the past couple of decades. However, what this study brings to the discussion is the (business and innovation) ecosystem concept that is increasingly used, especially in business and innovation studies but also in policy discourse. This research sheds light on the changes faced by innovation policy and the results build a framework for innovation policy that takes into account these changes and rests on ecosystem-based thinking, which also considers the relevance of place, future-oriented thinking, sustainability and entrepreneurship.

From the perspective of innovation policy theory this research contributes to the discussion on business ecosystems, as well as regional innovation policies, by integrating the business ecosystem concept with the theory of regional innovation and development policies. The first two articles focus on innovation policy's concept evolution, widened the conceptual examination and study two more recently adopted concepts (the SmSp concept or place-based policy and the ecosystem concept) in relation to existing policy approaches and practices.

In addition to the conceptual examination, the empirical studies related to the ecosystem concept contribute to both the theory and practice of innovation policy. First, the studies provide a new perspective on innovation policy based on the concepts of business and innovation ecosystems, which is also connected to theory on sociotechnical transitions, by hybridizing the 'Moorean' theory of business ecosystems and their development with the 'Geelsean' theory of sociotechnical transitions to form the basis for a new type of innovation policy. These studies further the somewhat underdeveloped theory on innovation ecosystems by widening the perspective to include an innovation policy context. Furthermore, in addition to the theoretical contribution, these studies have a practical contribution as well. The results present the practical implications of applying the ecosystem approach in innovation policy at national and regional levels. The results offer a basis on which to build and formulate the practical innovation policy operations that support new business ecosystem and niche development.

This study also contributes to the understanding and theory related to the utilization and enhancement of the endogenous potential for renewal that begins at the firm level, with the help of innovation policy approaches. This study contributes to the understanding of the wide range of policy approaches and elements that can be utilized for regional renewal. The approaches presented in this study are tools and notions that are particularly related to the evolutionary approach and the sustainability view (not only ecological or economic sustainability but also social sustainability). Also, though sub-studies III and IV focus on this regional renewal and related policy approaches, they also contribute to

the study of innovation policy's concept evolution as they utilize the RIS approach as a framework for the empirical examination.

Finally, this study contributes to innovation policy research from the sustainability point of view. The sustainability aspect is incorporated in this study in its different forms. Article III approached the research theme particularly from the social sustainability perspective but, for example, articles IV, V and VI also touch on economic and environmental sustainability. Sustainability is a multifaceted concept that has become one of the central concepts when discussing economic development. Considering the limited resources we have and the interwoven nature of the three sustainability dimensions (the economic, ecological and social dimensions), sustainability will surely also continue to be an essential part of innovation policy in the future. When discussing sustainable innovation policy (see e.g. Nill & Kemp, 2009; Pelkonen, 2009) the social aspect, seen alongside the environmental and economic aspects, is also an inseparable part of the policy discussion.

Limitations

This research is only a limited effort to scratch the surface of a wide research theme. However, it brings new perspectives to innovation policy theory and conceptual examination through empirical research. Instead of focusing on the in-depth examination of a particular innovation policy aspect, this research whole approaches the research problem from different perspectives. Three of the empirical sub-studies consisted of case studies. Using a case study as a research approach contains the challenge of generalizability. Even though the case studies in this research provide useful information about the studied research themes and form a good basis for the further examination of these themes, more research is still required (as noted in the research articles).

This study presents general policy approaches that are not targeted to any specific context. However, what is essential in policy-making practice is the regional context in which the policy approach is applied, its history and 'hidden potential'. For example, the framework presented for ecosystem-based innovation policy consists of more general elements, based on theory and empirical research, that are to be developed into more concrete and place-specific forms in the different policy-making contexts (for example in national and regional level policy-making). No universal policy model, framework or tool can be created that can work in the same form in any region or country. This notion is relevant for all the sub-studies in this research.

Policy-related research tends to be rather normative by nature as it often includes suggestions about how policy should be formulated and implemented. The aim of this research is not to present what should be done but rather to present options and tools that can – based on the research results – be considered as potential alternatives. However, a wide range of other approaches, tools and perspectives exist, and not all of these are

exclusive of one another. Therefore these new ideas and perspectives should also be examined in the context of their practical applications.

Validity and reliability

Scientific research is traditionally evaluated using the concepts of validity and reliability. The use of these concepts in the evaluation of the quality of qualitative research has been criticized because they were born within a quantitative research sphere and were developed to match the needs of quantitative research (Tuomi & Sarajärvi, 2009). Despite of this criticism, validity and reliability continue to be an important part of the evaluation of qualitative research. The validity of research refers to the question of whether the conducted research concerns the phenomena the researcher aimed to study. Ensuring the validity of research begins in the research design phase (Yin, 2009). Also, as Eskola and Suoranta (2000) note, in qualitative research the evaluation of the research is important throughout the research process, not only after the research has been conducted. In this research, working mostly as part of a research group enabled the continuous reflection and evaluation of the research design, methods, analysis and interpretations throughout the research process.

In order to increase the validity of this research, multiple forms of triangulation were used. Patton (1999) lists four different forms of triangulation: (1) methods triangulation, (2) the triangulation of sources, (3) analyst triangulation and (4) theory/perspective triangulation. Different sources and methods were used to collect and analyze data in order to get a wider perspective on this multifaceted research problem. Also, the nature of the individual sub-studies required different types of approach to the research problem in the form of the used methods and sources of data. Utilizing different sources of data and methods can increase the validity of qualitative research, especially case study research that often consists of a large amount of research material.

As mentioned above, most of the research was conducted with a research group, and the interpretations made from the research material and results were discussed together within the group and handled through several rounds. This analyst triangulation helped avoid too much subjectivity, and author bias in the analysis and interpretation of the research results. Also, being cross-disciplinary research this dissertation also utilizes different theoretical viewpoints instead of being based on or highlighting only one strand of research or one discipline.

Reliability refers to the degree of consistency and repeatability of the research and its results. Repeatability is often a challenge in qualitative research as the researcher is also a central instrument in qualitative research (Eskola & Suoranta, 2000). However, reliability can be enhanced in several ways. One of these ways is to carefully document the different phases of the research process as it proceeds. According to Yin (2009), documenting the research process strengthens the reliability of a case study as it makes it

possible to do the same case all over again. The reliability of this research was strengthened by documenting the research process in enough detail to enable another researcher to follow the same research process and repeat the study. Also, all the research processes of the sub-studies were reported in the form of research articles and, in the multiple case study, also in the form of research project reports.

Suggestions for future research

The ecosystem approach to innovation policy serves as an interesting avenue for future innovation policy-related research. As noted earlier, this research only scratches the surface of this wide research theme. Business and innovation ecosystem research is a rapidly increasing research field and therefore it will surely also be one important strand of innovation policy research in the near future. Also, as innovation policy related research on business and innovation ecosystems is connected to other strands of research, such as SmSp (e.g. Boschma, 2014; Foray, 2013; McCann & Ortega-Argilés, 2015), the entrepreneurial state (e.g. Mazzucato, 2011; 2016) and transition policies (e.g. Alkemade et al., 2011; Elzen et al., 2004; Kern & Smith, 2008), examining it together with these other policy-related concepts could help link the useful ideas from different conceptual approaches, which again would be useful from the policy-makers' perspective.

When it comes to innovation ecosystem research, research on the different regional levels is also needed. In this research for example the case studies include local, regional and national level examination. Focusing (in a wider research whole) particularly on one of these levels could offer very useful information, for example about how innovation policy could (on this particular governance level) strive to enhance and promote the development and renewal of ecosystems in their different evolution phases.

As article V shows, the ecosystem concept has potential development paths from the perspective of wider sociotechnical transition. It could be useful for future research to grasp the ideas developed in article V and take them further by linking them to transition management literature and utilizing them as the basis for empirical research. More empirical research is particularly needed now, after opening the theoretical discussion and conducting a few case studies. This strand of research also has potential as a new research path combining 'Geelsian' transition theory and 'Moorean' ecosystem theory, and also having apparent practical value from a policy-making perspective.

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Publication I

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The business ecosystem concept in innovation policy context: Building a theoretical framework

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The business ecosystem concept in innovation policy context: Building a theoretical framework

Abstract

The aim of this conceptual paper is to explore the business ecosystem concept in innovation policy context, and question whether it has something new to bring to the innovation policy field compared to previous theoretical discussions. A comparative study was conducted where three widely utilized policy approaches were examined together with the business ecosystem concept. The ecosystem concept differs from the three approaches, for example in its evolving around innovation, and its self-organizing and self-renewing nature. This paper sets a conceptual basis for further empirical research concerning the innovation policy implications of the business ecosystem concept.

Keywords: business ecosystem, innovation policy, cluster, innovation system, smart specialisation

1. Introduction

There are several different approaches and concepts that guide policy makers within the innovation policy field. These concepts and approaches are utilized in different ways. In policy discussions the use of these concepts is sometimes somewhat fuzzy and new concepts and approaches emerge before policy makers have really gained a deep understanding of the previous ones. If the different concepts are to be utilised in policy making, they should be clearly defined and differentiated from one another. The business ecosystem concept is one of the concepts that have lately become popular in policy discussions. The concept itself dates back to the early 1990s but innovation policy-wise it is still a fairly new concept. The question set for this study is: What is new about business ecosystems as a policy approach and how do they differ from the currently widely utilized innovation policy approaches?

The general economic situation in many European countries is challenging, to say the least, and regional differences in economic performance are increasing. This has forced policy makers to seek new ways to boost and support growth and development. EU has adopted a place-based policy approach for funding research and innovation investments through structural funds (European Commission, 2011; McCann and Ortega-Argilés, 2013). Focusing investments on defined fields of regional specialisation is seen as a requirement for the effective use of funding and investments (McCann and Ortega-Argilés, 2011; Foray et al., 2012). At the same time it has been acknowledged that competition happens more and more in international ecosystems rather than in regional or national clusters and thus innovation policy needs to focus on nurturing evolving ecosystems (Moore, 1993; Hearn and Pace, 2006; Wallin and Laxell, 2013). Some suggestions of the policy implications of the business ecosystem theory have been presented (see e.g. Wessner, 2004; Mason and Brown, 2014; Clarysse et al. 2014) but more extensive research in this field is still needed.

The aim of this paper is to examine the currently widely practiced innovation policy approaches and bring to the discussion this latest business and innovation related concept, which has attracted a lot of attention in business and innovation literature: the business ecosystem concept. Business ecosystems are born and evolve around new innovations, which makes them relevant from innovation policy perspective.

Business ecosystems have their roots in wider innovation ecosystems that include also the political, economic and technological environment. Compared to innovation ecosystems, business ecosystems include also the customer side that is often absent when discussing innovation ecosystems (Wright, 2014). Innovation policies can have an important effect on innovation ecosystems and therefore also on the creation of new innovations and new business ecosystems that e.g. create new jobs.

This paper provides a conceptual framework for innovation policy comparison and sets the basis for further empirical research. Our contribution to the previous literature is twofold. First, our research provides a new perspective on widely used policy approaches through comparative examination. Second, it adds to the discussion of business ecosystems by integrating it with theory on innovation policy and examining both its characteristics in a policy context and the challenges posed by this new approach.

The data used for this study consists of literature dealing with three innovation policy approaches, clusters, innovation systems, smart specialisation (SmSp), and the business ecosystem concept. Since the discussion around the first two of these concepts has been vast during the past decades, we concentrate on the early developments of these concepts. The SmSp concept is the 'youngest' of the policy concepts and thus the academic research related to it is not yet as extensive compared to the other three approaches. Business ecosystems are widely discussed in innovation and entrepreneur literature, especially that related to the ICT industry, but it is still theoretically quite a fuzzy concept which makes its utilization challenging at policy level. Our aim is to bring some more clarity to the ecosystem discussion at policy level in order to avoid the incoherent and mixed use of different concepts. Our literature based study creates a conceptual framework for comparison of different innovation policy approaches. The framework will be later utilized as the basis of an empirical analysis of innovation policies in the business ecosystem context.

2. Four approaches to innovation policy

The policy approaches analysed for this study, alongside the business ecosystem concept, are the cluster approach, innovation systems approach and the SmSp approach. These policy approaches were chosen for the analysis as they are all widely discussed and utilised approaches that have awoken attention among researchers and policy makers, some more recently than others.

2.1 Clusters

Cluster theory was introduced by Michael E. Porter in the early 1990s and clusters have since become both an extremely popular subject of study and tools for economic development purposes (Martin and Sunley, 2003). Cluster formation is based on the idea of localization economies, that is, that competitive advantages lie not inside companies but in the locations where business units are based (Porter, 2000). Localisation economies generally refer to economies that are developed due to geographical agglomerations of related activities (Maskell, 2001). The cluster approach offered a new alternative to the traditional sector-based approach by focusing on the linkages between different actors in the production of goods and services and in innovation activities (Roelandt and den Hertog, 1999). The discussion has come far from Porter's original cluster theorizing and though clusters are still an essential part of innovation policy, they are nowadays more often discussed in the context of wider policy subjects, such as regional innovation systems, rather than as the main policy target (Cooke, 2002). Clusters are viewed as an essential part of wider regional systems.

In their simplest form clusters are defined by Porter (1998a) as 'geographic concentrations of interconnected companies and institutions in a particular field'. Clusters are formed in order to benefit from the advantages offered by geographical proximity, such as knowledge spillovers, trust and better coordination (Porter, 1998a; Maskell, 2001). The close proximity of other firms in the same field help in the perception of emerging buyer needs and new innovation opportunities (Porter, 2000). Local clusters also provide better access to employees, suppliers, specialised information, institutions and public goods (Porter, 1998b). Cluster borders don't often fit with political boundaries; they may cross both city, regional and national borders (Porter, 1998a; Porter 1998b). Industrial borders are also rather vague since clusters can cross several industry boundaries.

Interaction between cluster firms is the driving force inside clusters (Padmore and Gibson, 1998). Though competition is of key importance, cluster firms also cooperate with other firms within the cluster in related industries and institutions, much of this cooperation being vertical relations (Porter, 1998a). Competition among cluster firms increases the productivity of cluster firms, drives the pace of innovation and stimulates the formation of new firms within the cluster (Porter, 1998a). Though competing and cooperating firms form the basis of clusters, clusters may also include governmental actors and other organisations, such as education and information providers, research organisations, technical support providers and customers (Porter, 1998b; Roelandt and den Hertog, 1999; Porter, 2000). Clusters are not restricted to single industries but can encompass several linked industries and organisations (Porter, 2000).

Cluster theory has generated a field of cluster policies aimed at supporting regional clusters and their development. Cluster policy differs from traditional industrial policy in regarding all clusters as having the potential to improve productivity and generate growth, instead of supporting a few desirable industries (Porter, 1998b). Governments have an important role, first and foremost in ensuring macroeconomic and political stability and, second, in ensuring the supply of qualified employees, infrastructure and economic information (Porter, 1998a; Roelandt and den Hertog, 1999; Porter, 2000). Policy actors also set the rules of competition and intellectual property rights, promote cluster formation and upgrading. Policy mechanisms should strive to remove obstacles hindering cluster growth, help companies to develop local network relationships with other firms and strengthen their local supply chain linkages (Porter, 2000; McDonald et al., 2007). Cluster policies should not be focused on supporting particular regional clusters but on the overall development of clusters with growth and innovation potential and with a potentially positive effect on regional economic development (Porter, 1998a). According to Porter (1998a; 2000), cluster initiatives should seek to pursue competitive advantage and local specialisation, which requires building on local assets and uniqueness. The cluster approach has been criticized for being too generic and vague in nature (see e.g. Martin and Sunley, 2003) but it has nevertheless been a highly promoted and utilized concept all over the world.

2.2 Innovation systems

The systems of innovation approach was designed to take into account all important factors shaping innovation activity (Edquist, 1997). The foundations of the innovation systems approach originate from the discussion on national systems of innovation by Christopher Freeman, Bengt-Åke Lundvall and Richard Nelson during the late 1980s and early 1990s, as well as from the literature on clusters and innovative milieus and the older related literature on industrial districts (Freeman, 1987; Lundvall, 1992; Nelson, 1993; Edquist, 1997; Asheim et al., 2011a). The focus on national systems of innovation aimed at identifying the national actors and structures contributing to innovation and economic development. The regional

dimension of innovation systems was first brought up by Philip Cooke, and he has also been the lead person developing the concept (see e.g. Cooke, 1992; Storper, 1997; Braczyk et al., 1998; Cooke, 1998; De La Mothe et al., 1998; Cooke, 2001a; Cooke, 2001b; Doloreux, 2002; Doloreux and Parto, 2005; Cooke, 2008). The system view takes the viewpoint that the innovation performance of organisations is dependent on the quality of the system and the subsystems they operate in (Smits and Kuhlmann, 2004).

Cooke and co-authors (1997) suggested a regional approach to complement the national and rather operational examinations. This regional approach embraces the view of the regional dimension of innovation and of systems of innovation having regional specificities that separate them from national systems (Cooke, 1998; Autio, 1998; Howells, 1999). The systems view of innovation has its basis in evolutionary and institutional economics (Edquist, 2007; Tödtling, 1998; Cooke et al., 2000; Doloreux, 2002). Cooke (1998) states that the regional innovation systems approach is an outcome of a partial overlap of science and regional studies and the national systems of innovation approach. He distinguishes between conceptual and operational systems, seeing a conceptual system as a logical abstraction and a theoretical construction, and an operational system as referring to a real phenomenon.

An innovation system can be regarded as a geographically bounded system of several innovation networks. Cooke and co-authors (1997) define the key organizational elements of a regional innovation system as firms, universities and other research organisations, technology-transfer agencies, skills-development organisations, consultants, funding organizations and non-firm organisations involved in innovation. Autio (1998) divides regional innovation systems into two subsystems: the knowledge generation and diffusion subsystem that covers various (mainly public) institutions that are responsible for the production and diffusion of knowledge and skills, and the knowledge application and exploitation subsystem that consists of companies, their clients, suppliers, competitors and industrial partners. Several institutional elements are important for regional innovation systems, such as institutional learning, associative governance, proximity capital and interactive innovation processes (Cooke, 1998).

What are important in the systemic approach are the linkages between these main elements. These linkages can be defined as information and knowledge flows, investment funding, flows of authority, networks and clubs of partnerships (Cooke et al., 1997). The role of networks is strongly emphasized in the innovation systems concept (Cooke, 2001b). Asheim (1998) has distinguished between three types of regional innovation system, of which the regionally networked innovation system is regarded as the ideal type and also the most typical innovation system type of the Nordic countries (Asheim and Coenen, 2005).

National and international level institutions and policy instruments, as well as other innovation systems, are the main external forces influencing the systems (Autio, 1998). As the innovation systems approach emphasizes the role of networks and networking, it also notices the networks extending outside the system's geographical boundaries. But since the role of governance is of great importance in the (regional) innovation systems approach, its focus is on the geographical meso-level, even though the national and international linkages should not be ignored. The innovation systems approach emphasizes the importance of knowledge as the fundamental resource and learning as the most important process (Kautonen, 2006). An innovation system is considered a social system and innovations the results of social interaction between the innovation system's actors (Cooke, 1998; Doloreux and Parto, 2005). The system is formed by the aforementioned actors, their relationships and the processes related to producing, distributing and utilizing economically useful knowledge (Cooke, 1998).

The innovation systems concept can be regarded as an important tool for policy making (Cooke, 1998; Harmaakorpi, 2006). The concept has been used widely as a framework for innovation policies (Jauhainen, 2009; Asheim et al., 2011a). Smits and Kuhlmann (2004) argue that, as traditional innovation

policies were fighting against market failures, modern innovation policies also have to deal with system imperfections. In conclusion, innovation policies should be embedded in a broader socio-economic context, the overall policy domain should be broadened and management revised from having top-down steering to network steering (Cooke, 2001b; Smits and Kuhlmann, 2004). This system view is what encourages governments to take part in innovation system building and organizing. The cooperation between the public sector, firms and universities is one of the key functions of the innovation system and fostering this so-called Triple Helix cooperation is one of the policy objectives. The innovation system is very public in nature (with technology transfer bodies, science parks, an R&D driven focus and a focus on incremental and user-driven innovation) and it has been argued that it is not able to compete with the strong private system of, for example, the United States (Cooke, 2001a).

Asheim and his colleagues (2011b) emphasize the importance of the related variety and differentiated knowledge bases of a region in establishing effective regional innovation policies. They argue that policies must be based on the identification of regional related variety and knowledge bases and the use of them to construct regional advantage (see also Uotila et al., 2012). Fostering regional learning processes, organizational absorptive capacity, knowledge spillovers and trust building between actors are also at the core of regional innovation system focused policies (Cooke et al., 1997; Tura and Harmaakorpi, 2005; Uotila et al., 2006; Pihkala et al., 2007; Cooke, 2008; Kallio et al., 2010). Cooke (2008) argues that policies should help establish a regional innovation culture that is inclusive, open and transparent to all actors and institutions. The regional innovation system can be used to create platform policies for developing regional innovation platforms (Pekkarinen and Harmaakorpi, 2006; Harmaakorpi et al., 2012). Policy tools and actions based on the innovation systems approach do not focus solely on traditional input-output relations but also on those social and institutional factors that have an effect on the economic development of the region (Kautonen, 2006).

Despite all the conceptual development of the systems of innovation concepts and its wide utilisation in national and regional innovation policies, the systems approach has received criticism for example for its little operational value, lack of substance, challenging implementation and lack of tools to measure the concept (Sharif, 2006; Godin, 2009).

2.3 Smart specialisation

Smart specialisation was first presented as an academic concept but was thereafter quickly developed for policy purposes. The concept was first presented by Foray and Van Ark (2007) and then further developed in 2008 by the members of the 'Knowledge for Growth' expert group (McCann and Ortega-Argilés, 2011). The SmSp concept originates from discussion concerning the productivity gap between Europe and the US (Foray and Van Ark, 2007; McCann and Ortega-Argilés, 2011). The original concept was entirely sectoral in its construct, but, recently, it has been applied to a regional context (Camagni and Capello, 2012; McCann and Ortega-Argilés, 2013). The concept has gained a lot of attention in policy arenas; it has been discussed in various publications and applied in regions all over Europe.

The SmSp approach is about creating a unified innovation strategy for a region; a strategy that is based on regional assets in order to ensure the targeted use of funding and investments by focusing on the fields with the most future innovation potential. The aim is not to blindly stick to existing clusters but to perform a thorough analysis by which new potential combinations, niches and cross cutting fields of expertise can be discovered. The SmSp approach is based on the concepts of embeddedness, relatedness and connectedness (Foray et al., 2012). Embeddedness refers to the importance of existing industries that

can rely on the local workforce and existing networks of cooperation with regional actors, and that are in tune with the relevant socio-economic conditions. The principle of relatedness encourages actual diversification within a specialisation – more precisely diversification into related areas based on new technologies or processes. In addition to the principles of embeddedness and relatedness, the SmSp approach emphasizes the importance of linking existing knowledge bases to other actors outside the region and networking both nationally and internationally.

The design of a SmSp strategy consists of six steps, presented in detail in the RIS3 Guide (Foray et al., 2012). These steps include: an analysis of the regional context and innovation potential, ensuring participation, creating a future vision for the region, identifying priorities, and creating a suitable policy mix and monitoring and evaluation mechanisms. The SmSp concept emphasises the importance of a combination of top-down and bottom-up processes when formulating and choosing the fields of regional specialisation (Camagni and Capello, 2012). McCann and Ortega-Argilés (2013) refer to this as the process of ‘self-discovery’.

The SmSp concept is at the core of the new European growth strategy. It is the EU’s response to the need to better target structural funds and to the demand for a place-based policy approach. It is not meant to be a strategy for ‘picking winners’ but for targeting scarce R&D and innovation resources in the fields that have the most innovation potential and finding niches that relate to regional assets. Wintjes and Hollanders (2011) consider SmSp a combination of excellence-based and place-based policies. It embraces innovation as a broad concept, including not only the manufacturing sector but also the design and creative industries, social and service innovation and practice-based innovation (Foray et al., 2012). The role of key enabling technologies, especially ICT, is emphasised. It also challenges regions to go beyond the traditional sectoral approach. Apart from a thorough strategy building process, policy-wise the SmSp approach means, for example, supporting the commercialization of research results, specialized training for the local labour force, joint branding and marketing programmes for cluster firms and policy support to take better advantage of open innovation (WOLFE, 2001). Defining a coherent policy mix for the strategy is one of the steps of a smart strategy building process, and thus there are no universal policy mixes but every region creates the right policy mix to match its overall strategy, goals and action plan.

2.4 Business ecosystems

Applying the ecosystem concept to a business context was first drafted and presented by James F. Moore in 1993. He stated that competition had changed from the traditional head-to-head situation and that this change should be examined in a new way. According to Moore (1993), firms should not be seen as a part of an industry but as a part of an ecosystem where companies cooperate, compete and co-evolve capabilities around a new innovation. He defines a business ecosystem as ‘a type of a business network, a collaboration to create a system of complementary capabilities and companies’ (Moore, 2006). Ecosystems can be regarded as value networks in which the value is co-created (Leviäkangas et al., 2014; Peppard and Rylander, 2006). Typically these network relationships are loose, which makes ecosystems adaptable as fruitless connections can be cut and new ones formed at a rather fast pace (Iansiti and Levien, 2004). Basically, a business ecosystem can be opened up to all possible contributors and participants and thus create an organizational form of ‘distributed creativity’. Moore (1993) has defined four different stages in the development of business ecosystems: birth, expansion, leadership and self-renewal or death. As in biological ecosystems, each member of the system shares the fate of the whole ecosystem (Moore, 1993; Moore, 2006; Iansiti and Levien, 2004).

The business ecosystem has a leader, or as Iansiti and Levien (2004) call it, a keystone organization, whose role is valued by the rest of the ecosystem members. The lead firm provides an open platform that offers solutions to other members and on which other firms can build and innovate in order to increase the customer value of the ecosystem products and services (Iansiti and Levien, 2004; Teece, 2007; Adner and Kapoor, 2010). Leadership enables ecosystem firms to invest in a shared future and common goals bind the ecosystem members together (Iansiti and Levien, 2004; Nambisan and Baron, 2013). From the perspective of an individual entrepreneur however, it is necessary to maintain the balance between an independent entrepreneur mindset and an ecosystem mindset since there might be conflicts between ecosystem's and individual member's success (Nambisan and Baron, 2013). It is crucial to be able to consider the whole business ecosystem when making strategic choices and decisions within an organization (Adner, 2006). Business ecosystems may also include bottlenecks to innovation in a particular location of the ecosystem, which poses challenges for value creation and ecosystem management (Adner and Kapoor, 2010).

These ecosystems are first and foremost global. The role of a region is not visible in the literature concerning ecosystems. The national level perspective is the main way in which ecosystem discussion is connected to the geographical context. It is generally difficult to define the ecosystem boundaries, whether they are geographical or not. When mapping an ecosystem, one should try to identify the organisations whose futures are most closely intertwined and who share certain dependencies (Iansiti and Levien, 2004). Santos and Eisenhardt (2005) have sought to contribute to the solving of the organizational boundary problem in business ecosystems by developing four conceptions of organizational boundaries (efficiency, power, competence and identity) by which the boundaries can be sketched. Ecosystems cross a variety of industries and contain several ecosystem domains (Iansiti and Levien, 2004). The ecosystem may share these domains with other ecosystems. Ecosystems may also consist of independent niches that can be developed within an ecosystem by specialized new ventures (Moore, 2006; Zahra and Nambisan, 2011). Moore (2006) also discusses the concept of space as a domain for business opportunity. It is a space for a future business activity that does not necessarily exist yet or is in its early beginnings.

As the ecosystem approach is fairly new policy-wise, business ecosystem literature does not offer many suggestions for the policy implications of this approach. Moore (1993) notices the possible societal downside of ecosystem evolution and notes that we must find ways to help individuals within dying ecosystems to shift to new, emerging and more vital ecosystems. From the ecological perspective it is not desirable or wise to support failing ecosystems but rather to ensure that the competition among ecosystems is fierce and fair. It is fairly obvious that as ecosystems consist of several, often rather small, firms, policies should draw special attention to the role of small firms in innovation, economic growth and employment. Moore (2006) also stresses the importance of ecosystems being able to address new business domains. He argues that helping ecosystems (by for example, with financing) to address new 'opportunity spaces' is important for a society that hopes to attract entrepreneurs and be innovative. Wessner (2004) has listed some innovation ecosystem policy lessons from the United States. He advises focussing innovation programmes on the individual entrepreneur, basing government fund granting on a competitive basis, improving markets by encouraging private initiative, fostering a culture of innovation and matching policies to market realities. Also, according to Mason and Brown (2014) ecosystem-supporting policies should be a blend of top-down and bottom-up policies, wherein the involvement of major businesses is also important in the bottom-up initiatives. However, these suggestions seem quite general and do not offer anything particularly new to innovation policy discussion. Peltoniemi and Vuori (2004) state that if we follow the theory of ecosystems as complex, self-organising and self-sustaining systems, then no government interventions should be needed for them to survive in global markets.

3. A comparison of three innovation policy approaches and the business ecosystem concept

The business environment is in a fast disruption. Usefulness of the decades-old hegemonic concepts in business development such as clusters, value chains and core competences are challenged, but not yet buried. Internet economy has changed the economic environment remarkably: central terms of the new business logic are business and innovation ecosystems, development platforms, technology adjacencies, value networks and crowdsourcing. As business logics change, research and innovation must respond to this development and practices in them are challenged considerably in the near future.

All of the presented concepts are somewhat fuzzy policy-wise. All of them have varying emphasis related to agglomeration economies, specialization, networks and regions. The innovation system and the SmSp approach were originally developed more with policy targets in mind than was the case with the other two. This sets challenges to their comparison, as does the longer history of the cluster approach and the innovation systems approach compared to the other, more recent and less researched approaches. Table 1 summarizes the stylized characteristics of the four examined approaches and works as a framework for future empirical research. Questions concerning ecosystem governance, the role of the public sector, policy objectives and key policy challenges are left open in the framework. These and several other issues are to be researched in the future.

-----INSERT TABLE 1 HERE-----

When comparing and evaluating these policy approaches it should be borne in mind where these approaches originate from. Their origins might explain some of their distinctive and differential characteristics. The idea of clusters originates from economics, whereas the discussion on innovation systems originates from regional sciences and economic geography. The SmSp approach originates from discussion of the productivity gap between Europe and the US, and differences in R&D expenditure. As can be assumed from the name of the concept, the business ecosystem approach has its origins in the fields of biology and ecology, and from there the concept has been adapted to business and innovation literature. Since the origins of this concept are in such a different field to economics and business literature, some of the analogies may seem somewhat forced and lack theoretical basis. On the other hand, utilizing these analogies drawn from biology brings out in new ways to examine the importance of complexity and evolution in business, innovation and economic development.

The cluster characteristics presented and analysed here are drawn from the Porterian cluster definition and cluster theory. Porter's views have been criticized as defective and cluster theories and policies have since been shaped more in line with the innovation systems approach. This is why the later cluster and innovation systems literature are quite overlapping and it is sometimes hard to find distinctions between the two (see e.g. McDonald et al., 2007). The innovation systems approach can be considered to build on the cluster approach since, though as a whole it includes more than just cluster actors and emphasises the public sector and governance role, it also considers clusters as the best context for promoting

localized learning and economic development, and clusters are an important component of an innovation system (Asheim et al., 2011a). The cluster approach is thus strongly integrated to the innovation systems approach. The innovation systems approach can be regarded as a more generic approach than the cluster approach, and thus it also provides a more comprehensive policy approach (Asheim et al., 2011a).

The cluster approach, as well as the ecosystem approach, takes into account the role of the public sector but the main focus is on the firms. The innovation systems approach includes a strong public system and it has thus been argued that it cannot compete with the strong private system, for example, that of the US (Cooke, 2001a). Cooke (2001a) also states that in Europe there is excessive reliance on public intervention and there is a need for stronger institutional and organizational innovation support from the private system, along with the evolution of the public innovation support systems. Is the ecosystem approach an attempt to answer to this challenge? This question can be better answered after researching in more detail the role of the public sector in a business ecosystem context.

Cluster birth and development is based on localisation economies where the advantages of scale are mainly the outcome of firms within the same field or industry locating in close proximity to each other (Capello, 2002). In innovation systems the advantage is again gained from the overall large scale of activities in a particular geographical area (urbanization economies) and the related variety of knowledge and expertise among organisations. For example, Asheim and Coenen (2005) argue that the cluster concept is a substantially narrower concept compared to the innovation systems concept. This is due to the cluster concept's strong sectoral focus, whereas the innovation systems concept can transcend multiple sectors. In the SmSp approach the economic advantage is achieved by focusing R&D investments in selected fields of specialisation. These strategic fields of expertise are chosen based on the concepts of regional embeddedness, relatedness and connectedness. The idea of relatedness is closely in line with the related variety idea of the innovation systems approach. Business ecosystems again benefit from the complementary assets of different firms which all add value to the end product or service.

Clusters evolve around highly specialised knowledge and learning and innovating is based on local knowledge spillovers among cluster organisations. The innovation systems approach also emphasizes the importance of regional knowledge spillovers but in addition regards innovation first and foremost as a social process. The SmSp strategies are created based on highly specialised pools of knowledge combined with key enabling technologies (KETs). Innovation potential lies in the combination of regional assets, specialised high level knowledge and cross-cutting fields of expertise. Business ecosystems highlight the importance of complementary pools of specialised knowledge. New innovations arise from open innovation and co-creation processes where the ecosystem partners are free to utilize and build on the platform provided by the ecosystem leader.

Cooperation is one of the key elements of all of these examined approaches. Which cooperative partners are most valued varies. The cluster approach concentrates on the cooperative actions between cluster firms, though it also notices the advantages and possibilities of cooperation with public organisations. The innovation systems and SmSp approach consider the role of the public sector as a cooperative partner as a crucial element. The innovation systems approach has adopted the idea of the Triple Helix where firms, government and universities work in cooperation. The SmSp approach takes this concept a bit further, adding citizens as a fourth group of actors (the Quadruple Helix) and as a part of the strategy process. In business ecosystems cooperative partners can include any organisations that are connected to the value creation process and are an essential part of the ecosystem. Among other firms, this group of partners may also include various public organisations and end users for example, but the role of a specific group of actors is not emphasized.

Cluster policies as well as policies promoting regional innovation systems can be regarded as top-down governed policies where the public sector has a key role in nourishing development. The public sector can influence cluster development by building infrastructure according to cluster needs and providing education and training that matches cluster labour needs. Regional innovation systems are also top-down systems where regional strategic choices have a strong influence on the future of, for example, industrial clusters. The SmSp approach strives to combine top-down and bottom-up governance. In the strategy formation process both the lead role of the public sector and the bottom-up 'entrepreneurial discovery processes' are emphasized.

The issues concerning the role of the public sector, as well as those related to the policy aspects, are still uncertain when it comes to business ecosystems. In the framework some suggestions are presented on the basis of the theoretical analysis. In the cluster approach the main role of the public sector is to provide training and education in order to secure the availability of skilled labour, to develop and maintain infrastructure and to set rules and regulations. The main policy objective is to foster local cluster growth and competitiveness, and that is also why old and declining industrial clusters are often regarded as a true challenge for policies. In the innovation systems approach the public sector role includes the aspects defined in the cluster approach but in addition the governance role that includes defining the regional innovation system and its development strategy, and the role of an intermediating body inside the system. The main policy objective is to foster networking and improve interfaces between subsystems, especially the research system and the industry. Thus the main challenge is creating an appropriate innovation support structure, fostering networking, knowledge flows and learning. In SmSp the public sector role is essential when starting and carrying through the strategy process. The main object of the whole SmSp strategy process is to find unique, complementary and cross-cutting fields of expertise that are networked with related fields and 'hubs' outside regional borders. After the strategy process is carried through, the key policy challenge is to put this strategy into practice. As noted above, the policy implications of the business ecosystem concept are still rather scant. Some central elements of ecosystem perspective on innovation policy are depicted in Figure 1.

-----INSERT FIGURE 1 HERE-----

Based on our conceptual examination we suggest that ecosystem supporting innovation policy could include the elements of creating and opening up common platforms, and promoting ecosystem-based value networks, quadruple helix cooperation and ecosystem renewal. Crowdsourcing, shared value-creation, peer-to-peer activities, platform-enabling creativity skills and nurturing new entrepreneurship are examples of the actions and tools that can help realise these policy objectives. Key policy challenges are likely to be linked with ecosystem evolution, especially its renewal and death.

The geographical scope of business ecosystems is still somewhat a question mark. Literature suggests that ecosystems are first and foremost global whereas for example clusters are mostly local or regional and innovation systems regional or national systems. However, innovation policies are often bound to administrative boundaries and therefore mostly national, regional or local by nature. Also, global

business ecosystems have their basis in local knowledge and business ecosystems (Clarysse et al. 2014). The geographical scope of business ecosystems can be a fruitful theme for future research as well as its implications on innovation policies aiming at supporting business ecosystem development in its different development phases.

4. Discussion and conclusions

The conceptual evolution of regional innovation policies can be detected from the examined approaches, especially considering the cluster, innovation systems and SmSp approaches. What is the next 'big thing' in the innovation policy field? Competing new approaches set challenges for policy makers: How can one get a deeper understanding of these approaches in order to examine and evaluate their potential for policies?

On the basis of the comparison, the ecosystem approach seems to differ in many ways from the three other approaches under examination. It can be questioned whether it is appropriate and useful to bring yet another concept to the discussion and attempt to draw policy conclusions from it. However, based on the analysis, the business ecosystem approach seems to bring something new to the discussion since its structure and functions differ from the three other approaches. The economic landscape and the ways firms operate within it changes over time, and thus we also need new ways to examine this change and the actors involved in it. Cooke (2001a) makes a distinction between old and new economy. Old economy refers to more traditional manufacturing industries. New economy is characterized by decentralization, value abundance, maximizing network value and disruptive innovation (Cooke, 2001a). Examples of this new economy are ICT, bio- and nanotechnology and the media sector. Perhaps the latest theoretical approaches, especially the ecosystem approach, are more suitable for these 'new economy' sectors that differ from the more traditional sectors that still evolve around regional clusters rather than global ecosystems. The SmSp approach is strongly promoted by the European Union and thus it will probably be applied in some form all over Europe, but this does not mean that the ecosystem approach couldn't be, for example, applied within SmSp based policies. Instead of regarding different policy approaches as alternatives to each other, they can also supplement each other.

Our research provides a new perspective on widely used policy approaches through comparative examination. The aim of the study was also to contribute to the discussion on business ecosystems as well as regional innovation policies by integrating the business ecosystem concept with the theory of regional innovation and development policies and by comparing it to three widely utilized and researched policy approaches.

This paper is based on conceptual and theoretical examination. Empirical evidence on business and innovation ecosystem policies is not provided. Empirical studies of policies contributing to ecosystem evolution are needed and this is proposed as an important field for future research. Though this research perhaps sets more new questions than it succeeds to answer, it is a step forward for research focusing on the 'grey area' of the policy aspects of the ecosystem approach concept. Future research results may also provide valuable policy suggestions concerning business ecosystems as this approach is still in its early infancy policy-wise. The analysis and the created framework set several questions to be answered in future research. Some of these questions are listed below.

- What is the overall role of the public sector in business and innovation ecosystems?
- Should we even try to influence business ecosystems with policy instruments or should the ecosystem evolution be left to be driven by the processes of self-organisation and self-renewal?

- What are the essential policy mechanisms needed to nurture existing and emerging business ecosystems?
- Considering the structure of business ecosystems, at which policy level (regional, national or international) should the policy mechanisms and tools be set?

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Table 1. The main characteristics of the analysed policy approaches and the business ecosystem concept

	Cluster	Innovation Systems	SmSp	Business Ecosystem
Scope	Certain industry and related businesses	Regional platforms	Specialised fields of know-how and complementary industries	Complementary industries, niches and firms
Actors	Firms within certain industry and related fields	Firms, public and private organisations, NGOs	Firms, public and private organisations, NGOs, citizens	Ecosystem firms and organisations
Networks	Local networks	Regional and national networks	Global networks	Global networks
Dynamics / driving force	Localisation economies	Urbanisation economies, related variety	R&D investments, embeddedness, relatedness, connectedness	Complementary assets, shared value creation
Knowledge and innovation	Highly specialised knowledge, local knowledge spillovers	Regional knowledge spillovers, innovation as a social process	Highly specialised knowledge combined with KETs	Complementary and specialised knowledge pools, open innovation
Cooperation	Cluster firms and related organisations	Triple Helix, subsystem cooperation	Quadruple Helix	Ecosystem firms and organizations, crowds
Governance	Top-down	Top-down	Top-down & bottom-up	Peer-to-peer?
Public sector role	Education, training, infrastructure	Innovation systems governance, intermediation, education, training, infrastructure	Starting and managing of the strategy process, funder and cooperation partner	Removing the bottlenecks of evolution?
Policy objective	Foster local cluster growth and competitiveness	Improve interfaces between research system and industry	Find unique, "hard-to-imitate", complementary and cross-cutting fields of expertise	Nurture new entrepreneurship, assist in ecosystem transition, foster ecosystem renewal?

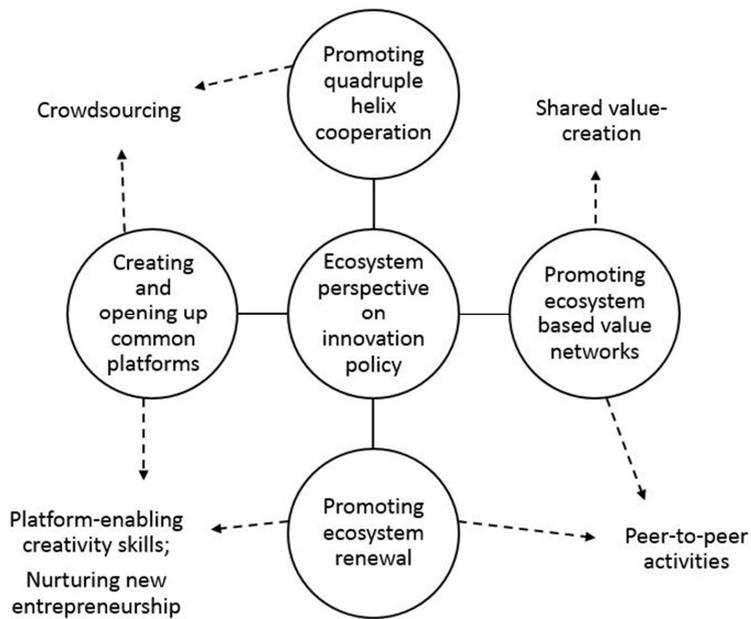


Figure 1. The central elements of ecosystem perspective on innovation policy

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Smart regional innovation policies – from cluster approaches to place-based policies

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Abstract: The concept of smart specialisation (SmSp) has attracted widespread attention in recent years in the European policy arena. This paper examines the SmSp concept and its characteristics in the context of Finnish regional innovation policy, comparing it with the centre of expertise program (CEP), a Finnish regional innovation initiative, to assess its novelty value. The findings indicate several similarities between the premises of the two approaches; the main differences lie in the respective regional strategy formation processes, and in the comprehensiveness of SmSp and CEP from a regional perspective. These results can be of use in planning future innovation policies and applying the SmSp approach in regions across Europe.

Keywords: smart specialisation; SmSp; cluster; innovation policy; regional policy; centre of expertise program; CEP; regional development; innovation.

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1 Introduction

The European Union is struggling to emerge from its economic crisis by means of the new Europe 2020 growth strategy. The EU's response to the crisis has been to invest more in research, innovation and entrepreneurship. The commission has adopted this new approach in the belief that it can maximise European, national and regional innovation potential (Foray et al., 2012). New strategic focus points and objectives have been set, and there is a commitment to better targeting of funding to selected areas of specialisation. Smart specialisation (SmSp) is one of the key concepts of the Innovation Union flagship initiative, and is considered essential for truly effective research and

innovation investment that will enhance regions' innovativeness and competitiveness and deliver targeted structural fund support (McCann and Ortega-Argilés, 2013b; Foray et al., 2012; European Commission, 2011). In the immediate future, drawing up regional research and innovation strategies for SmSp will be a precondition for use of Structural Funds for research and innovation investments (European Commission, 2011).

SmSp concept was first presented by Foray and Van Ark (2007) and further developed in 2008 by a group of academic experts (McCann and Ortega-Argilés, 2013b). It almost immediately attracted a lot of attention in policy arenas and made an impact on the policy audience (Foray et al., 2011). The concept has been discussed in various political forums and publications, but its rapid adaptation from academic idea to policy concept has created a gap between theory and policy practice. Although specialisation as an economic or development strategy has been much researched and practised in the past, the ideas underlying the SmSp concept have not been extensively researched in a regional context. Understanding the concept in the context of innovation and regional policy is important if all EU regions are to benefit from this new direction in European innovation and cohesion policy.

In recent years, SmSp has been the subject of both political and academic discussion, focused on questions concerning the theoretical basis of the concept and its applicability within regional and innovation policies (see e.g., Boschma, 2014; Foray, 2013; Goddard et al., 2013; McCann and Ortega-Argilés, 2013a, 2013b). Finland can be considered a forerunner in the development of innovation policy and in creating new innovation strategies. The centre of expertise program (CEP) was for long the centrepiece of regional innovation policies in Finland, and it has been considered a good example of a national and regional program that directs development funds to selected areas of expertise. For this reason, the CEP has been presented as the Finnish version of constructing regional (smart) specialisation strategies. The CEP also represents quite well the state of regional innovation policy in Finland during the previous EU funding period (2007–2013).

The present study examines the Finnish CEP as a policy tool and reviews its characteristics in the light of the SmSp framework. Because Finland has been considered a pioneer in terms of innovation policies in Europe, examination of the SmSp concept in relation to the Finnish policy context can provide insights for policy developers and practitioners seeking best practices and experiences in applying SmSp to their own innovation policies. The aim of this study is to assess the novelty value of the SmSp approach by answering the following research questions:

- 1 What similarities and differences can be identified between SmSp and the CEP?
- 2 How should the CEP be characterised as a policy tool in light of the SmSp concept?

The rest of the paper is structured as follows. The next part discusses in more detail recent developments in regional innovation policy frameworks and the concept of SmSp. The third part sets out the research design. The fourth part offers a brief overview of the CEP as a tool for Finnish regional innovation policy during the latest program period. The fifth part discusses the key characteristics of the CEP from the SmSp viewpoint, and the sixth part provides a synthesis of these findings and considers their usefulness for innovation policy development. This is followed by final conclusions.

2 Regional innovation policies in change

2.1 Regional specialisation and place-based innovation policies

Innovation policy has traditionally been nationally focused on research and development (R&D) functions, but the vast innovation research literature has broadened our understanding of the nature of innovation and of innovation processes. Recently, the regional dimension of innovation has also attracted wide attention – not least as a consequence of globalisation and economic crisis within the European Union. Much of the discussion links to regional innovation systems logic (McCann and Ortega-Argilés, 2013), shifting the focus of innovation policies from national to regional level.

Questions concerning regional agglomerations, clusters and specialisation have generated a vast amount of both theoretical and empirical research for decades, beginning with Marshall's industrial districts and specialisation and leading on to the current discussion of new cluster policies and contemporary regional specialisation. Numerous studies have explored the emergence of regional clusters (Feldman et al., 2005; Casper, 2007; Manning, 2013), cluster evolution (Mensel and Fomahl, 2009; Sadler, 2004; Iammarino and McCann, 2006; Järvinen et al., 2012) and cluster policy and regional development (Cooke, 2008; Cumbers and McKinnon, 2004; Martin and Sunley, 2003; Newlands, 2003; McDonald et al., 2007). Of special interest for the present study is what Cooke (2009) referred to as 'contemporary regional specialisation', and the new policy structures that support it.

There has been some debate about whether (Marshallian) specialisation or diversification (Jacobs' externalities) is the more fruitful for regional innovativeness (van der Panne, 2004; Feldman and Audretsch, 1999). Feldman and Audretsch (1999) argued that innovation in a region is best stimulated by industries sharing a common knowledge base. This view aligns with the concept of 'related variety' (Frenken et al., 2007; Boschma and Frenken, 2011), which is widely considered to be an important factor for regions diversifying into new industries and developing new growth paths (Asheim et al., 2012). Related variety refers to technological relatedness between different sectors, enabling knowledge spillovers when there is some (but not too much) cognitive proximity between sectors within a region (Frenken et al., 2007). But neither Feldman and Audretsch's proposal nor the concept of related variety encourages as much specialisation or diversification of activities as possible within a narrow range of individual industries. The essential factor in stimulating innovation is the connectedness between different sectors, combining relevant new knowledge with old knowledge structures.

The nature of competition in international markets has changed, from technology- and cluster-based to competition between ecosystems rather than between individual firms or clusters (Adner, 2006; Wessner, 2004; Wallin and Laxell, 2013). What, then, are the right policy models to support innovation ecosystems and the aforementioned 'smart' regional specialisation based on related variety? Policy discussion (see e.g., Barca, 2009; Tödtling and Trippl, 2005) has led to a call for place-based policies that take account of regional characteristics. To avoid the dangers of 'picking the winner' that sectorally targeted national policies often lead to, Asheim et al. (2012) argued for a shift from sector- or cluster-based policies to platform policies, embedded in their spatial settings and based on related variety (Frenken et al., 2007; Boschma and Frenken, 2011) and on differentiated knowledge bases (Asheim and Gertler, 2005; Asheim and Coenen, 2005;

Asheim et al., 2007). The next section discusses one possible place-based policy model, proposed by the European Commission for regions throughout Europe.

2.2 *SmSp – from academic idea to policy concept*

The concept of SmSp originated in discussion of the productivity gap between Europe and the USA (Foray and Van Ark, 2007; McCann and Ortega-Argilés, 2013b). First sketched out by Foray and Van Ark (2007) and further developed by other members of the ‘knowledge for growth’ expert group, the original concept of SmSp was entirely sectoral in its construction, but it has more recently been applied in a regional context (Camagni and Capello, 2012; McCann and Ortega-Argilés, 2013). The SmSp concept has attracted rapid and growing interest in innovation and regional policy arenas, and it is at the core of the European Commission’s Innovation Union flagship initiative, which aims to enhance growth and to achieve the objectives of Europe 2020. Regional innovation strategies for SmSp are an *ex ante* condition for funding from the Structural Funds for research and innovation investments in 2014–2020 (European Commission, 2011). In a sense, cohesion policy is forcing European regions to adapt to this new approach. SmSp is the EU’s response to the need for better targeting of structural funds, and to demands for a place-based policy approach. Rather than a strategy for ‘picking winners’, this directs scarce R&D and innovation resources to fields with the greatest innovation potential, targeting niches that reflect regional assets.

All regions, leaders and less advanced, are expected to create strategies for SmSp, which emphasises the importance of combining top-down and bottom-up processes when formulating and choosing fields of specialisation (Camagni and Capello, 2012). McCann and Ortega-Argilés (2013) referred to this as the process of ‘self-discovery’. Innovation is embraced as a broad concept, including not only the manufacturing sector but also the design and creative industries, social and service innovation and practice-based innovation (Foray et al., 2012). The role of key enabling technologies (KETs), especially ICT, is emphasised, and regions are challenged to go beyond the traditional sectoral approach.

Wintjes and Hollanders (2011) viewed SmSp as a combination of excellence-based and place-based policies. They suggested that regional diversity in path-dependent trajectories of innovation calls for differentiated policies, and that at regional level, absorbing knowledge and applying technologies will be more important than hosting basic research (Wintjes and Hollanders, 2011). In the literature, SmSp-based innovation and regional policies are considered to have high potential for success, but the importance of suitable policy tools and implementation processes is also emphasised, especially for lagging regions (see Foray et al., 2011; Charles et al., 2012; Camagni and Capello, 2012; McCann and Ortega-Argilés, 2012, 2013). These weaker regions may face several difficulties in the implementation phase, such as a narrow knowledge base, a lack of connectedness or the fact that they are already too specialised (McCann and Ortega-Argilés, 2012).

Boschma (2014) has compared geographers’ idea of constructing regional advantage to the SmSp concept, noting that evidence of the positive economic effects at regional level of related technologies and related variety (Boschma and Frenken, 2011; Neffke et al., 2011) suggests that SmSp should aim for specialised diversification into related technologies rather than specialisation or diversification *per se*. Compared to

approaches like constructing regional advantage and platform policies (Asheim et al., 2007; Asheim et al., 2011; Harmaakorpi, 2006; Harmaakorpi et al., 2011), the geographical dimension is less well addressed by SmSp, but it does focus in more detail on the policy process (Boschma, 2014; McCann and Ortega-Argiles, 2013b).

In applying the SmSp concept to EU regions, the European Commission (2013) has attempted to clarify the role of clusters. As cluster policies have been widely practised in Europe, clusters as phenomena are highly relevant to SmSp and are likely to be of central concern in strategy development. However, as the Commission notes, clusters and SmSp are not equivalent concepts; SmSp domains do not align with the sectoral boundaries along which clusters are often defined, and traditional cluster policies may be a hindrance to developing strongly forward-looking SmSp strategies. The potential pitfalls of traditional cluster development relate to path-dependency and lock-in dynamics. In contrast, SmSp domains focus on new types of knowledge spillover, related variety and emerging new market niches (European Commission, 2013). According to the Commission (European Commission, 2013), the most important difference between the two concepts concerns their explicit goals. While clusters strive to enhance the performance of the cluster companies, the aim of SmSp policies is to transform regional economies by exploiting unique, knowledge-based domains.

Giannitsis and Kager (2009) posed a fundamental question about how we judge which policy targets are smart. They claimed that smart policies can be labelled ‘smart’ only *ex post*, which presents a great practical challenge for these policies. By way of response to this question, the original conception of SmSp ensures the ‘smartness’ of the policies in the process through which they are formed. McCann and Ortega-Argilés (2013) point out another challenge arising from the novelty of this policy framework and the consequent lack of experiences and best practices to draw from. The challenge, then, is to translate this concept from a complex academic framework into policy practice (European Commission, 2013).

3 Research design

The empirical material analysed here comprises documents and literature concerning the SmSp concept, along with key documents relating to the CEP from the latest program period. Previous CEP periods are briefly discussed, but the detailed analysis focuses on the third program period (2007–2013), as its characteristics differ substantially from those of previous periods.

The study utilises the principles of qualitative content analysis, though less strictly or mechanically than is prescribed by some of the original methodological writings. Qualitative content analysis is generally regarded as a flexible method for analysing text data, encompassing several different analytical approaches that range from more interpretive to strict textual analyses (Hsieh and Shannon, 2005). The chosen approach is based on the theoretical and substantive interests of the researcher and the research problem. Data structuring was not based on predetermined categories; instead, the categories were developed and defined inductively during the research process, as is typical of qualitative content analysis (Mayring, 2000). However, as Srivastava and Hopwood (2009) note, categories do not emerge on their own but are driven by what the inquirer wants to know and how the inquirer interprets what the data are telling him/her, according to theoretical allegiance or subjective perspective.

Data were analysed through an iterative process and less as a mechanical task than as a reflective process. In the first phase of data reduction, items unrelated to the research problem were removed. The purpose of the following round was to obtain a sense of the main characteristics of SmSp and the CEP, and their differences. Next, the data was structured into themes which were further modified during the analysis. The final three emerging themes were the premises of the concept/program, strategy formation processes and the inclusiveness of the concept/program.

4 CEP – the centrepiece of Finnish regional innovation policy

The CEP is “a fixed term special government program aimed at focusing regional resources and activities on development areas of key national importance” (<http://www.oske.net>). It was launched in 1994, and while the first two program periods centred on regional development policy, the latest program period (2007–2013) had much more to do with innovation policy. The CEP’s basic task has been to utilise top international-level knowledge and expertise in enhancing entrepreneurship, creating jobs and fostering regional development. Operational responsibility falls to regional technology centres or science parks, and all centres of expertise work to the development needs and possibilities of regional innovation systems and enterprises (program document).

The latest program period featured a cluster-based model consisting of 22 regional centres of expertise and 13 competence clusters.¹ The objective behind this cluster-based model was to increase specialisation within regions and to strengthen cooperation between different Centres of Expertise (Program Document). When the CEP was launched in 1994, Finland was coming out of recession and was about to become an EU member state. A lot has changed since then in terms of the economic and political environment. In the latest CEP period, because one of the main goals was to shift the focus from mutual competition to intensified global competition and increasing critical mass, the new objectives emphasised national networking and internationalisation.

The formation of competence clusters was based on a national bidding process. All regions were invited to put forward their suggestions about the new competence clusters, and the national authors formed the final clusters after sending feedback and receiving final applications (program document). The new cluster model can be seen as combining a decentralised cluster model, where the regions are in charge of identifying their own clusters, with a centralised model, where the national government decides on the selection of cluster networks (Pelkonen et al., 2010). The CEP, then, is a program in which local strategies meet national coordination.

Because of the regional policy focus during the first two program periods, the CEP is a relatively new subject of study from the innovation policy perspective. Jauhiainen (2009) has examined the CEP as a component of Finnish regional and innovation policy, observing that the national authorities play a key role in the regional formation of innovation systems by virtue of the national bidding and selection process. And since party politics is involved in the selection process, the number of centres of expertise can be said to be ‘higher than their performance’. The CEP has also been criticised for not being a truly region-based program, and for overlapping too much with the national strategic centres for science, technology and innovation (SHOK) program

(Edquist et al., 2009). Despite these criticisms, the CEP has also attracted a lot of praise, and has been presented internationally as a good example of how regional innovation policy can promote specialisation and cluster development.

In a final evaluation of the CEP (Wallin and Laxell, 2013), the program has been said to come to the end of its natural life cycle. From a company perspective, innovating is now more about global ecosystems and less about national clusters, and this is what future innovation policies must also take into account (Wallin and Laxell, 2013). This statement indicates a will to move away from the traditional cluster approach when designing new innovation policies. The final evaluation document also states that greater emphasis is again likely to be placed on a regional perspective at the end of the current CEP period.

5 CEP as a tool for smart regional specialisation

Based on the data analysis, SmSp and the CEP have several common characteristics, but they also differ in significant ways. The main differences can be detected in the regional strategy formation processes and the inclusiveness of these policy tools. Overall, the CEP relies more on the traditional cluster approach while SmSp relates to platform policies. The main findings, are elaborated in more detail in the next three chapters.

5.1 Common premises

Many of the basic ideas behind SmSp and the CEP appear similar in character. Both aim to exploit excellence based on regional assets, focusing resources on internationally competitive areas of expertise and enhancing regional specialisation. Research and innovation investments are to be focused on those potential fields where the region can do better than others and compete internationally. Emphasis is placed on fields of top expertise, cooperation between research organisations and entrepreneurs, and achieving critical mass through networking.

The role of strong regional clusters is emphasised in both approaches. The CEP stresses the importance of strong national clusters operating internationally. The emphasis on national clusters is justified on the basis that networking nationally first will help subsequent international networking and attainment of critical mass. The SmSp approach regards clusters as important tools for the design and implementation of SmSp strategies. However, the cluster policies implemented in SmSp differ from the traditional form as they must be integrated in a broader transformation agenda for the entire regional economy, and complemented by cross-cutting domain-specific policies, enabling the growth of newly emerging domains (European Commission, 2013).

Neither approach refers to specialisation as relating only to specific technologies; both have their roots in the ideas of a broad-based innovation policy that recognises the importance of science-based science-technology-innovation (STI) as well as more practice-based doing-using-interacting (DUI) types of innovation (see Jensen et al., 2007). In practice, the relationship between the STI and DUI types of activities in the CEP remains somewhat unclear. An evaluation of the Finnish innovation system (Edquist et al., 2009), suggests that the focus of the CEP should be directed more clearly to supporting non-scientific, experience- and practice-based regional innovation and

learning capacity, given that science and technology-oriented activities are also supported by the SHOK program.

The principles of embeddedness, relatedness and connectivity can be found in the CEP as well as in the basic principles of SmSp. 'Relatedness' refers to exploiting expertise arising from the history of the region and its industries and aligning with the relevant socioeconomic conditions. It is also necessary to connect the ideas of 'relatedness' and 'embeddedness'. Relatedness refers to diversifying into related areas with the help, for instance, of new technologies and processes. The idea of relatedness originates from the concept of related variety discussed in Section 2.1. Although the CEP acknowledges the opportunities afforded by related variety, the mid-term evaluation of the program points out the current lack of mechanisms for identifying new innovation potential in crossing the boundaries of national clusters, and further encourages clusters to cross the borders of different fields of expertise. SmSp is as much about diversification as it is about specialisation. The idea of diversifying into related fields via technologies is an opportunity also for regions with narrow industry and knowledge base. Connectivity again emphasises the importance of linking existing knowledge bases to other actors outside the region, networking both nationally and internationally. As noted before, networking is one of the core objectives of the current cluster-based CEP period.

5.2 Top-down vs. bottom-up

Both SmSp and the CEP attempt to bridge the traditional dichotomy between top-down and bottom-up processes. Building a regional strategy for SmSp is presented as a six-step process emphasising regional entrepreneurial discovery as well as linkages to other national and international hubs. The entrepreneurial discovery process – strongly embraced in the RIS guide – is very bottom-up in character. However, the whole strategy formation process can be described as bi-directional and dynamic, since the regional and/or national authorities play an important role – for instance, when choosing the right policy mix. Entrepreneurial discovery promotes cooperation between different regional actors, as well as entrepreneurs and local residents, and it is essential to involve all the key regional actors in the process.

Organising a national competition should ensure strongly motivated applications for the CEP program, but on the other hand, it may also tempt some to specialise in 'hip' areas such as nano- and biotechnologies, even where there is no real international or national level competitive excellence in these fields. The national bidding phase reflects a bottom-up perspective, in which regions can make their own suggestions for the new program period and the competence clusters. In general, however, the CEP can be viewed as a top-down policy tool; the final decisions were made at national level, and the program structure is formulated to reflect national strategies and objectives.

5.3 Comprehensiveness

Every region within the European Union is expected to build regional innovation strategies for SmSp. There is no defined size for regions, but they should be large enough to have critical mass in their fields of specialisation, either on their own or by networking with other regions. In principle, the CEP covers all of Finland's larger urban regions, but as noted earlier, regional policy objectives seem to take priority over actual

international-level regional expertise. Within the CEP, some regions are part of only one cluster, which from a regional innovation perspective is a quite superficial strategy in thinking of the region as a whole. For example, the whole of northern Finland is involved in only one cluster, the Tourism and Experience Management cluster. SmSp appears to be more comprehensive in taking account of regional needs for an innovation strategy.

According to the program document, the task of the centres of expertise is to create a long-term innovation strategy in conjunction with other such centres. However, this extends only to the competence cluster to which the centre belongs; innovation strategies created under the CEP relate only to the nationally selected clusters and not to other fields of expertise or to the region as a whole.

The CEP does not emphasise the strategy formation process as such, nor is it as precisely defined. Each region formulates its strategies as it sees fit, so that great variance is likely across regions. Especially in larger university centres, the CEP has no significant influence on planning of strategic objectives and targeting of resources. The centres of expertise are supposed to take part in planning regional strategies, but unlike SmSp, the program does not start from any comprehensive strategy formation process. The final evaluation of the CEP states that the program has unified regional strategies but that the value it adds to regional activities has diminished. SmSp focuses particularly on the importance of a thorough regional strategy formation process, and also acknowledges the importance of linkages of those strategies to the 'outside world', both nationally and internationally. In other words, regional strategies should not be formed in a closed system but with due regard to other regions as well. Regional strategies should be also evaluated by comparison with others. Overall, the regional strategy formation process appears to be given much more weight in SmSp than in the CEP.

The CEP and SmSp approaches are both innovation-driven tools at the intersection of regional and innovation policies. They both focus on selected fields of specialisation identified as having innovation potential. According to the mid-term evaluation of the CEP, "the current third phase of the program aims to be less regionally oriented" [Pelkonen et al., (2010), p.27]. This refers to the role of the current program period as more innovation policy-oriented than regional policy-oriented when compared to the previous program periods. Despite this aim, and owing to the CEP's underlying regional policy perspective and its history as a regional policy tool, the program also includes centres and clusters that cannot be considered to meet the requirements for top-level international expertise. One of the core objectives of the CEP is to support global-level excellence, but some regions are seen to be insufficiently mature for strong internationalisation, again raising the question of regional political pressure to include these centres in the program.

SmSp is a comprehensive strategy for all regions – not in the sense that it supports every sector in the region, but in that it offers every sector a presence in the strategy (Foray, 2013). Through the entrepreneurial discovery process, domains with the greatest innovation potential should be discovered. This process should not be restricted to the already dynamic and productive parts of the economy but should extend to the less dynamic parts in need of structural change in order to be revitalised and renewed. This aspect of inclusiveness is less in evidence in the CEP. The lack of a thorough strategy formation process equivalent to the entrepreneurial discovery process in the SmSp, and the fact that final decisions are made at national rather than regional level, diminishes the comprehensiveness of the CEP as compared to the SmSp approach.

6 Discussion

Combining regional and innovation policies is never an easy task, and regional innovation is caught between these two policy fields. Innovation policy is directly linked to national interests, and innovation policies in most national economies have remained very top-down in nature, even when the importance of the regional bottom-up perspective is acknowledged (Howells, 2005). The CEP was developed to serve the development of both national and regional innovation systems. The national perspective need not be abandoned, but the SmSp approach calls for a policy model better designed to realise the bottom-up thinking characteristic of SmSp rather than the top-down model of the CEP. The practical challenge in the interplay of regional and national innovation policies is how to successfully combine the SmSp approach with national objectives and programs. As outlined in the previous section, Finnish authorities have already applied many of the basic ideas of SmSp in practice – for instance, by increasing critical mass through networking, emphasising internationalisation and Triple Helix cooperation, and at least aiming to find new innovation potential from the intersections of different sectors.

What is challenging about SmSp from the Finnish perspective is that many city regions are rather small, with no universities, which means limited (related) variety and fewer alternatives from which to ‘choose’ than in larger city regions that have a strong research base of their own. This problem of fewer agglomeration advantages in smaller regions is also discussed by McCann and Ortega-Argilés (2013b) and Boschma (2014). However, with smart platform policies, the ideas of SmSp can also be applied in regions with no universities and low R&D investment (see Harmaakorpi, 2006; Harmaakorpi et al., 2011).

The CEP idea of networking small city regions nationally in order to increase critical mass could be utilised in applying the SmSp approach in Finland. The CEP has created lots of connections, building trust and good practice between regions, and these benefits should not be overlooked. However, the most suitable partners for cooperation are not necessarily found inside national borders, and national networking should not overrule the importance of international connections. It will be important to sustain the international connections already created within the CEP into the future. In light of global competition, it is essential to become and remain part of global ecosystems rather than relying only on national networks.

Again, the disadvantages of smaller size could be overcome by focusing on niches emerging from within, from the intersections of sectors and domains and from being unique and inimitable. The CEP incorporated the objective of finding new domains that cross traditional cluster boundaries. However, such activities were properly launched only at the end of the program period. Centres that had built-in connections between different clusters were able to more systematically create additional value of the program (Wallin and Laxell, 2013), and it seems likely that directing more attention to emerging domains and niches in the intersections of clusters would better serve the policy objectives of SmSp.

Applying the SmSp concept begins from a thorough strategy formation process, but in regions with a long history of innovation system development it would clearly be a waste of resources to start from scratch. Existing structures, knowledge and social capacity should be exploited, but it should also be possible to explore regional strengths

and clusters (both existing and emerging) in new ways and with an eye on other regions, inside and outside national borders.

European Commission (2013) document on clusters and SmSp argues that cluster policies as such are not a response to the needs of SmSp, although they provide material for creating SmSp strategies. Knowledge domains can differ a great deal from clusters, and cluster policies lack mechanisms to identify emerging clusters and to support cross-cluster development. Cluster policies focus more on existing areas of expertise while the SmSp approach again highlights emerging industries (European Commission, 2013). In this sense, the CEP cannot be described as equivalent to traditional cluster policies, as it has also striven to find emerging industries such as ubiquitous computing and nanotechnology that could have greater innovation potential than existing fields of expertise. It remains the case, however, that most CEP clusters continue to rely more on existing areas of expertise.

7 Conclusions

This study has sought to illuminate the relationship between the new EU policy concept of SmSp and the Finnish regional innovation policy tool, the CEP, which has been viewed as the Finnish version of SmSp logic. The findings here suggest that the CEP cannot be said to have created strategies that match the SmSp approach. The study shows that Finnish regional innovation policy, at least in the case of the CEP, is more a traditional cluster policy than a platform policy, even though that is the apparent future direction of such policies.

Based on this analysis, the CEP can be seen to support SmSp ideas, but it cannot be regarded as a policy tool for creating comprehensive regional SmSp strategies. However, over the long term, the CEP has built good practices between different regional actors and organisations, and fostered stakeholder engagement and prioritisation, all of which can enhance the process of creating smart innovation strategies.

The SmSp concept and the CEP share several common premises and basic ideas. Both aim at focusing scarce resources on fields that are competitive internationally and seek to utilise regional assets and their potential in global markets. The biggest differences are to be found in the respective strategy-building processes, and in terms of inclusiveness. While SmSp emphasises the importance of a sound and thorough regional process, the CEP favours a more national procedure, and regional strategies are less central. SmSp can also be regarded as a more comprehensive concept in that it is more about creating a thorough regional innovation strategy; the CEP is more of a tool for realising one part of such a strategy. However, regional differences do exist, and some regions may already have followed the principles of SmSp better than some others, regardless of what is happening in terms of national-level innovation policies.

In summary, the paper argues that from the perspective of SmSp, the CEP is more a national cluster-based tool for regional and innovation policies than a tool for fostering 'smart' regional specialisation. The structures and practices developed within the CEP over its history offer a good base on which to develop SmSp strategies, but from an SmSp perspective, new policies would be better based on bottom-up strategy processes and better aimed at exploring new potential domains and renewing old industry bases. This requires the ability to cross conventional industry and cluster boundaries or find new niches, for instance, with the help of new technologies.

The present study examines and compares an advanced regional innovation policy program and the SmSp concept, as these have been equated in some policy discussions. The observations and conclusions here may help to avoid creating only advanced topdown-led cluster policies when aiming for SmSp strategies. This study also offers a perspective on an EU member state with no grand metropolis, where the targets for regional development actions are rather small by population, setting several challenges for development.

This study has discussed SmSp as a given at EU policy level. It is beyond the scope of this paper to speculate on whether this is a useful strategy for enhancing the innovativeness of different regions, or to consider the approach's advantages or disadvantages. These issues certainly constitute a useful direction for future research, as does the effect of vast regional differences in economic activity and innovativeness within the EU on the implementation of SmSp strategies. SmSp and the CEP have quite distinct origins. The former is a policy concept that originated in academic discussion and has only recently attained significance in the planning of future EU innovation and cohesion policies. The latter is a political tool – a fixed-term program that has been a part of Finnish regional (and innovation) policy for almost two decades. During this time, its focus and form have changed. These differences should be borne in mind in any concurrent discussion of the two approaches. As noted in Section 2.2, there is a need for empirical case descriptions and examples of good practices from SmSp strategy-building processes and implementation, which would be of value both to the academic field and to policy planners and practitioners.

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Notes

- 1 1 – Cleantech, 2 – digibusiness, 3 – energy technology, 4 – food development, 5 – forest industry future, 6 – healthbio, 7 – health and well-being, 8 – intelligent machines, 9 – living business, 10 – maritime, 11 – nanotechnology, 12 – tourism and experience management, 13 – ubiquitous computing.

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Social enterprises in regional innovation systems: a review of Finnish regional strategies

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ABSTRACT

The aim of modern innovation policies is to enhance the innovation capability of regions, their organizations and people. Regional innovation system (RIS) theory has been one of the most popular frameworks for realizing innovation policies. Yet, adopting the perspective of sustainable innovation policy where innovation is also seen as a solution to various societal and environmental problems has been slow. Social enterprises (SEs) are discussed here as a means to address those problems, particularly through collaboration between sectors and focusing on social sustainability. The aim of this paper is to identify whether and in what way SEs are communicated as an innovative solution and as a source of innovations for economic and development activities through regional strategies. The data consist of regional innovation and business strategies from all Finnish regions, analysed using qualitative content analysis. We argue that there is a need to go deeper and include effective support mechanisms for SEs in these documents. Better inclusion of SEs as part of innovation systems and communicating this through regional strategies would help to develop SEs and to have them perceived as potential innovators and active entrepreneurial actors in innovation systems contributing to economically, environmentally and socially sustainable development.

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Introduction

Regional innovation system (RIS) theory (Asheim & Isaksen, 2002; Braczyk, Cooke, & Heidenreich, 1998; Cooke, Uranga, & Etxebarria, 1997) has been one of the most utilized frameworks for innovation policies and activities. At the regional level, the current European Union's (EU) growth strategy, Europe2020, and related innovation policies are implemented, for example, in the form of regional innovation strategies for smart specialization. Smart specialization approach is about creating a unified innovation strategy for a region; a strategy that is based on regional assets in order to ensure the targeted use of funding and investments by focusing on the fields with the highest future innovation potential (see, e.g. Foray, 2009; Foray, David, & Hall, 2011; McCann & Ortega-Argilés, 2013, 2015). The smart specialization approach promotes entrepreneurship,

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thus making use of regional assets. However, it appears that all types of entrepreneurship are not yet properly incorporated into RISs, policies and strategies.

In seeking smart, sustainable and inclusive growth, many expectations are set for social enterprises (SEs). The EU, for instance, expects SEs to be a source of new and innovative solutions to the persistent problems of society, to allow better inclusion of workers and consumers and to produce 'laboratories' of social innovations, especially at the local or community levels (EU, 2012). SE has been conceptualized in different ways across nations (Kerlin, 2006). It is seen as a new and distinct entity compared to classical business and traditional non-profit activity, focused on addressing social issues (Borzaga & Defourny, 2001) and combining different elements of the social purpose, the market orientation and the financial performance standards of business (Young, 2008). A SE has been equated with an innovative approach to tackling social needs and promoting social inclusion (Defourny & Nyssens, 2006; Kerlin, 2006). However, more research is needed to understand the conditions under which SEs can contribute effectively to solving social challenges in a sustainable way.

The aim of this paper is to identify whether and in what way SEs are communicated as an innovative solution and as a source of sustainable innovations for economic and development activities through regional strategies. Answers to the research problem are sought by setting the following research questions: first, in what way can SEs contribute to regional development through RISs and their objectives? Second, do Finnish regional strategies include themes related to social perspective, and is the potential of SEs to contribute to strategic objectives identified and communicated in these strategies? The data consist of regional innovation and business strategies from all Finnish regions, analysed using qualitative content analysis.

This paper contributes to regional development theory by bringing the concept of sustainability to development theory discussion, particularly through the RIS theory which has dominated the field of regional innovation research during the past decades. Our paper points out that the RIS theory and innovation and development policy based on the RIS approach include areas and objectives where principles of sustainability could be better incorporated and where SEs could contribute to the objectives. The main argument of this paper is that Finnish RISs – as reflected in their central policy instruments, regional strategies – still maintain a rather traditional growth-oriented focus instead of reflecting and promoting the objectives of sustainable innovation policy on a larger scale. We note that SEs hold unused potential in answering the expectations concerning RIS, particularly the social ones, and SE as a concept sustains both entrepreneurship and innovation and an alternative type of sustainable innovation policy.

Regional innovation systems

In the development of regional innovation activities and policies, the innovation systems theory has been widely applied. The innovation systems approach originates from the discussion on national systems of innovation (Edquist, 1997; Freeman, 1987; Lundvall, 1992; Nelson, 1993) from which the regional dimension of innovation systems was developed by Philip Cooke (see, e.g. Cooke, 1992, 1998, 2001a, 2008) and RIS became a popular concept when developing and realizing innovation policies at the regional level. The important aspects in the systemic approach are the linkages between the elements of the system.

These linkages can be defined as information and knowledge flow, investment funding, flows of authority, networks and clubs of partnerships (Cooke et al., 1997). The systemic approach was designed to take into account all important factors shaping innovation activity (Edquist, 1997). The policy conclusion of the RIS theory was that innovation policies should be embedded in a broader socio-economic context, the overall policy domain should be broadened, and management should change from top-down steering to network steering (Cooke, 2001b; Smits & Kuhlmann, 2004).

A RIS is considered a social system, and innovations are the result of social interaction between the innovation system's actors (Cooke, 1998; Doloreux & Parto, 2005). Policy tools and actions based on the innovation system approach focus not only on traditional input-output relationships, but also on those social and institutional factors that affect the economic development of the region (Kautonen, 2006). However, Fløysand and Jakobsen (2011) argue that the innovation systems approach has fostered an instrumentalism that views innovation as a predictable and standardized process. They argue that a spatial- and context-sensitive relational turn is needed also in innovation studies. A relational turn in economic geography has meant viewing the economic and the social as fundamentally intertwined, and economic actions as context-specific processes (Bathelt & Glückler, 2003). Within the relational turn, economic practice is seen as an action with many goals, not solely meeting material needs and making profits (Fløysand & Jakobsen, 2011). This view is in line with the idea of sustainable innovation policy that views innovation not merely as a means for profit making and growth, but as a solution to a variety of societal and environmental challenges, not only to economic ones (Pelkonen, 2009). The EU is struggling to rise from its economic crisis with the help of the new Europe 2020 growth strategy that focuses on smart, sustainable and inclusive growth (European Commission, 2010). Smart growth refers to an economy based on knowledge and innovation. The aim is to invest more in research, innovation and entrepreneurship. Sustainability deals not only with environmentally sustainable, efficient and competitive solutions, but it also underpins economic, social and territorial cohesion. The new growth strategy and objectives have an impact on national and regional policies and strategies in the EU member states, also in Finland. Receiving funding from EU Structural Funds for research and innovation investments requires a regional innovation strategy for smart specialization (RIS3) (European Commission, 2011). RIS3 is thus one of the latest policy tools shaping regional strategies and systems.

Finland can be considered a forerunner when it comes to developing innovation policies and creating new innovation strategies (e.g. Cooke, 2012a). The Finnish national innovation system has been a good example of a successful science- and technology-based innovation system. It has succeeded in producing examples of internationally competitive and successful enterprises, such as Nokia (in earlier times) and Rovio (an entertainment media company and creator of the globally successful Angry Birds franchise). Despite these success stories, the Finnish innovation system and policy have encountered challenges to their future development. Getting involved in global networks is becoming crucial for Finnish enterprises, as the competition is moving from head-to-head competition to competition between global business ecosystems (Hearn & Pace, 2006; Moore, 1993; Wallin & Laxell, 2013) and because of the very limited Finnish domestic market. Innovation policy should better take into account the systemic nature of innovation and the competences embedded in networks and ecosystems (Wallin, 2012).

In addition, the examination of RISs has been argued to be somewhat outdated (Harmaakorpi & Uotila, 2012). Regional systems are often perceived to comprise regional innovation platforms (Cooke, 2007; Harmaakorpi, 2006; Uotila, Harmaakorpi, & Hermans, 2012). Regional innovation/development platforms have been defined as

regional resource configurations based on past development trajectories, but presenting future potential to produce competitive advantage existing in the defined resource configurations. The central power of development platforms may be found in exploiting distance as innovation potential, but synergy in the platforms is emphasised in terms of related variety. (see Harmaakorpi, 2006, p. 1089)

The actors of a platform are firms, technology centres, expertise centres, research centres, educational organizations and alike. A platform must be separately defined each time. It is often based on an industry, area of expertise or future megatrend, or a combination of these (Harmaakorpi & Uotila, 2006; Uotila, Harmaakorpi, & Melkas, 2006). Platform-based innovation policy is based on the idea of building up a regional competitive advantage through related variety (Asheim, Boschma, & Cooke, 2011) and focusing on the identification of the regional resource base instead of existing clusters. Innovation systems and platforms should be developed to highlight new emerging technologies and the increasing importance of both service and other non-technological innovations.

During the past decades, the Finnish innovation policy has been rather science and technology focused. However, there has been a shift towards more broad-based innovation policy that also acknowledges the importance of more practice-based innovation activities (Edquist, Luukkonen, & Sotarauta, 2009). Regarding innovation policy goal-setting, Pelkonen (2009) argues that the Finnish broad-based policy still largely adopts the perspective of a growth-oriented policy, which places economic competitiveness and productivity growth as central objectives instead of adopting the perspective of a sustainable innovation policy in which innovation is seen as a solution to various societal and environmental problems.

The current economic situation poses challenges in both policy planning and practice. These challenges include finding and defining regional strengths in global competition, creating new courses of action, activating people and better exploiting the innovation potential embedded in regional characteristics and people in order to create both wealth and well-being. By definition, SEs have potential in terms of responding to these challenges.

Social enterprises

Businesses can play a key role in the pursuit of achieving the worthy goal of sustainable development (DeSimone & Popoff, 2000). Sustainable businesses could address social challenges that are barriers to advancing sustainable development (Fisk, 2010). Sustainable and socially responsible businesses incorporate sustainability principles into everyday practices of a business, from the fringes to the heart of the business (Fisk, 2010; Weybrecht, 2010).

In seeking smart, sustainable and inclusive growth, many expectations are set for SEs. SEs are perceived to be a source of new and innovative solutions to the persistent problems of society, as well as a means to facilitate better inclusion of workers and consumers (see

Campi, Defourny, & Grégoire, 2006). SE is considered a business model that can simultaneously address issues of economic growth, employment and quality of life and a source of solutions to certain illnesses, wicked problems (such as environmental problems, social exclusion, injustice and poverty), of our modern societies. They are acknowledged as a major producer or 'laboratory' of social innovations, especially at the local or community level (EU, 2012). In fact, SEs have solved those problems that other bodies such as traditional private, public, voluntary or community mechanisms have not been able to solve despite their efforts (Shaw & Carter, 2007).

The utility of SE as an instrument for governments has been greatly emphasized, but how it is used is unclear. There is poor understanding of its functioning; lack of visibility in terms of its local, domestic and international roles; inadequate access to resources and inappropriate legal environments, all of which prevent a SE from realizing its full potential (EU, 2012; see also Sjögrén, Puumalainen, Syrjä, & Barraket, 2015). The concept of SE is vague and there are numerous definitions in the literature (Bacq & Janssen, 2011; see also the review of definitions of social entrepreneurship/entrepreneurs/enterprises in Dacin, Dacin, & Matear, 2010). SEs cannot be defined by their legal form, their sector of activity or any other fixed criteria. Moreover, the social aspect may relate to the input used (workers or working conditions) or the output produced (goods or services aimed at a target group in need). Therefore, it is almost impossible to obtain concise statistical information about the SE sector (Heckl, Pecher, Aaltonen, & Stenholm, 2007). Therefore, the evaluation and assessment of the impacts, as well as comparisons of SEs, are very challenging, and general guidelines for how to promote their functioning are hard to outline. Comparisons across countries – and even within countries – may be misleading. Different legal and political standings in different countries also affect how SEs are set up and funded, by and for whom. All these make SEs challenging targets for research.

SE can be seen as an outcome of social entrepreneurship (Mair & Martí, 2006). SEs combine business logic and social goals, which distinguishes SEs from traditional for-profit or non-profit activity (Borzaga & Defourny, 2001; Huybrechts & Nicholls, 2013). The impact of an SE on the society is potentially large, as its purpose is to achieve the desired social change by solving the societal problems and generating revenue at the same time (Brouard & Larivet, 2011). Social sustainability lies embedded within the core of SEs, but understanding the crucial social sustainability perspective in its true sense has to be the goal of every SE, and they typically need support in this (Khan, Pekkarinen, Konsti-Laakso, & Melkas, 2015).

Social sustainability covers the broadest aspects of business operations and the effects that they have on employees, suppliers, investors, local and global communities and customers. It is also focused on protecting the vulnerable, respecting social diversity and ensuring that we all put priority on social capital (Vavik & Keitsch, 2010). The community benefit brought about by SEs may be various degrees of financial self-sufficiency, innovation and social transformation (Brouard & Larivet, 2011; see also Magis & Shinn, 2009; Thomsen & King, 2009). SEs should understand how to address economic, social and environmental challenges holistically in order to create a better world (Fisk, 2010). The progress in sustainable development can only mean improvement in all the three dimensions: economic, environmental and social (Littig & Grießler, 2005; Tueth, 2010). In their study on Finnish SEs, Khan et al. (2015) linked the concepts of social sustainability and SEs. They show that social sustainability is in many ways realized through the

development of SEs, but that there are also numerous challenges that SEs face. The government should help regions improve the support for SEs, raise awareness about SEs and promote their uptake (Khan et al., 2015).

The definition of the Social Enterprise Research Network EMES is used in this study to frame SE (Defourny, 2004). The EMES' definition distinguishes between SE criteria that are more economic and entrepreneurial and indicators that are predominantly social. These indicators have later been divided into three subsets for comparative purposes (Defourny & Nyssens, 2012). The distinction of criteria resonates with the notion that SE is constituted both 'discursively' to solve wicked social problems innovatively and 'materially' to perform efficiently in its sphere of operations. The four dimensions related to the economic and entrepreneurial criteria are as follows:

- *A continuous activity producing goods and/or selling services.* In contrast to some non-profit organizations with advocacy activities or that are in charge of the redistribution of money, the provision of goods and services is the main reason for the existence of SEs.
- *A high degree of autonomy.* SEs are often (co-)financed but never managed by public authorities. This autonomy is also apparent in the right of 'voice' and 'exit'.
- *A significant level of economic risk.* The founders of an SE assume the major part of the economic risk; financial viability depends on the efforts of the members and workers.
- *A minimum amount of paid work.* SEs can combine monetary and non-monetary resources and voluntary and paid workers, but they do not operate only with volunteers.

The social criteria are as follows:

- *An explicit aim to benefit the community.* One of the principal aims of SEs is to serve the community or a specific group of people. In the same vein, a feature of SEs is their desire to promote a sense of social responsibility at the local level.
- *An initiative launched by a group of citizens.* SEs are the result of collective dynamics involving people belonging to a community or to a group that shares a well-defined need or aim.
- *Decision-making power not based on capital ownership.* This generally refers to the principle of 'one member, one vote' or at least to a decision-making process in which the voting power in the governing body with the ultimate decision-making rights is not distributed according to capital shares. Moreover, although the owners of the capital are important, decision-making rights are generally shared with the other stakeholders.
- *A participatory nature, which involves the various parties affected by the activity.* Representation and participation of users or customers, stakeholder influence on decision-making and participative management are often important characteristics of SEs. In many cases, one of the aims of SEs is to further democracy at the local level through economic activity.
- *Limited profit distribution.*

The EU has been a strong actor in promoting research and programme support for SEs. In Western European countries, the support of SEs is tied to governments and the EU. Government support includes legislation, coordination, policy work and programmes. In terms of public policy and financing, however, much of the government support is narrowly focused on work integration SEs (WISEs) and is often targeted and limited to start-

up initiatives and to make up for the temporary unemployability of disadvantaged persons in labour markets (Kerlin, 2006). In Finland, there are two main types of SEs: (1) WISEs that offer employment to disabled and long-term unemployed people and that are provided for by law (Act on Social Enterprises, 1351/2003) and (2) organizations that have adopted an SE business model and are therefore eligible for the SE mark (Finnish Ministry of Employment and the Economy, 2011). Currently, there are 43 enterprises that have been granted the SE mark, and approximately 160 companies are registered as WISE. A report published by the Finnish Ministry of Employment and Economy recently estimated that 4% of small and medium-sized enterprises in Finland (which roughly means 8000 companies) could fulfil the SE criteria used in the UK (Finnish Ministry of Employment and the Economy, 2011).

The expectations for SEs as innovators are also high. The EU defines social entrepreneurship as

an activity whose primary purpose is to pursue social goals, produce goods and services in a highly entrepreneurial, innovative and efficient manner to generate benefits for society and citizens, use surpluses mainly to achieve social goals, and accomplish its mission through the way in which it involves workers, customers and stakeholders affected by its business activity. (EU, 2012, p.23)

It needs to be noted that in the research literature, social entrepreneurs and social entrepreneurship have been emphasized, whereas SEs as entities or 'communities of practice' have received far less attention, although this would better reflect the current broader understanding of innovation.

This paper follows the notion that solutions to social problems often demand fundamental transformations in political, institutional, economic and cultural systems. SEs may be seen as a way to catalyse social transformations well beyond solutions to the initial problems. SEs may create innovative solutions to immediate social problems and mobilize the ideas, capacities, resources and social arrangements required for sustainable social transformations (Alvord, Brown, & Letts, 2004). However, in general, SEs are rather small, act at a local level and depend on public funds. It is obvious that SEs need the support of the external environment and a wide range of resources in order to fulfil the expectations as sources of sustainable innovations. Alvord et al. (2004) identified how strategies intended to generate social transformation have focused on cultural, economic or political arenas. To foster cultural change implies, for example, reshaping cultural assumptions about the roles and appropriate behaviours involved in taking initiative, solving problems and influencing key decisions. Economic interventions focus on, for example, lending money and enhancing productivity. Political transformation may be leveraged, for example, by education and influencing decision-making.

For SEs to foster socially sustainable innovations in a RIS, the somewhat obscure and even contrasting expectations for SEs should be recognized and the relations between other stakeholders and actors revised. Various kinds of arenas are needed to reinforce entrepreneurial and economic performance or social innovations and regional renewal. The economic development is influenced by external barriers and driving forces, such as legal and taxation frameworks, public policies and budgets, demographic developments and unemployment rates. The promotion and development of SEs have been noted to involve several policy sectors, such as social, employment and industrial policy (Heckl et al.,

2007), and concerning RIS and sustainable social innovations, even more actors such as regional development agencies, business advisors, R&D institutions and political functions. The dynamism of interaction between the different parties also needs to be considered.

Figure 1 presents the conceptual framework for the study of the role of SE in a RIS. It summarizes the general objectives of RISs that are steered by regional innovation strategies, and the characteristics and aims of SEs presented in the SE definitions. The circle in the middle of Figure 1 presents as a space the potential that SEs possess to contribute to the RIS objectives and includes the expectations of SEs presented in the research literature and policy discussions.

Research design

The aim of this study is to explore whether and in what way SE is communicated as an innovative solution and as a source of innovations for economic and development activities in regional strategy documents. Regional business and innovation-related documents were, therefore, found to be the most useful data for this research purpose. The data cover all the regions in Finland. They consist of the latest regional innovation and business strategies (22), applications to the Innovative Cities programme (the new national innovation programme) (18) and the final proposals of the leading city regions (5) to the Innovative Cities programme. These regional strategies and Innovative Cities programme applications express the region's future goals concerning economic development and the means to achieve these goals. The regional innovation and business strategies used were the latest operative strategies available at the time the data were collected (December 2013). The strategies have varying time spans within the time frame of 2005–2025. The Innovative Cities applications are from 2012, and the final proposals are from 2013.



Figure 1. Summary of the conceptual framework.

Continental Finland consists of 18 NUTS3 level regions. Administratively these regions are federations of municipalities and are located between the state and municipal levels. The regions are obliged to form regional strategies as well as their implementation programmes. These strategies and implementation programmes are very general by nature. Strategies concerning innovation and business activities are produced at the municipal or city region levels. As these documents were found to be more fruitful for the purposes of this study than the general regional strategies, innovation and business strategies from all major city regions were chosen as the most suitable data for this study, representing the strategies of RISs within the Finnish context.

The study utilized the qualitative content analysis method in which data are categorized inductively, and the goal is to reduce the data into manageable segments in order to understand the phenomenon (Miles & Huberman, 1994; Morgan, 1993). Qualitative content analysis is regarded as a flexible method for analysing text data and includes several different analytical approaches ranging from more interpretive analyses to strict textual analyses (Hsieh & Shannon, 2005). The approach was chosen based on the theoretical and substantive interests of the researchers and the research problem. Data structuring was not based on predetermined categories, but the categories were developed and defined inductively during the research process. The inductive approach is typical for qualitative content analysis. However, as Srivastava and Hopwood (2009) note, categories do not emerge on their own but are driven by what the inquirer wants to know and how the inquirer interprets what the data are telling him/her according to subscribed theoretical frameworks, subjective perspectives, etc.

The data were first read through using specific search words (in their different forms) that have been translated into English and are listed in Table 1. This was done in order to effectively find the text that relates to the research theme. These parts were then analysed in relation to the aims of the strategy. The identified text parts were divided into two categories: the ones that had explicit references to SEs and the ones that contained the 'spirit' of the social perspective on business and regional development. The 'spirit' was detected from the data based on the summary of the conceptual framework and the expectations of SEs in RIS context presented in Figure 1. In order to explore the themes of SE in RISs within Finnish regional strategies, the findings will be illustrated on a map and as descriptions of how the 'spirit' of the social perspective and SEs is connected to the strategic aims of different regions. These will be discussed in the context of RISs and innovation policy.

Results

Explicit references to SEs

Explicit references to SEs in the strategies are few. Only two explicit references were found in the regional strategies of Kuopio and Lappeenranta. The city of Kuopio has created an employment action plan that focuses on developing social employment. Lappeenranta's

Table 1. Search words.

Change	Innovation	Societal
Employment	Renewal	Society
Entrepreneurship	Responsibility	Sustainable
Inclusion	Social	Working life

strategy involves establishing an SE as one of its objectives under the larger theme of ‘urging active working life and education’.

The Innovative Cities programme applications also contained two explicit references. Pori’s application emphasizes the role of Diaconia University of Applied Sciences as a central organization in SE-related research and development work in Finland. Pori’s application is the only document among all the research data where the concept of SE is defined. The definition is:

Social enterprises work for social good. With the help of their business they strive to solve social or ecological problems and to further social objectives. Social enterprises use more than half of their profit for producing social good that matches with their objectives and business idea. Their business model is also characterized by their customer orientation, investing in workers’ wellbeing and transparency of their business.

However, Pori’s document fails to view SEs in a broader regional and social context and only views them as a field of expertise of a specific educational organization. Oulu’s Innovative Cities application and final Innovative Cities proposal only mention a specific enterprise, labelled an SE, that helps start-ups find premises and organize events.

Thematic references to social perspective on business and regional development and their regional scope

The data contained many more parts connected to the spirit of the social perspective on business and regional development compared to explicit references to SEs. These parts were analysed in the context of the strategic objectives they were connected to. The map in [Figure 2](#) illustrates how the spirit of the social perspective is connected to different strategic objectives in different regions. The map shows the NUTS 3 regions in Finland, and the dots represent the main urban areas within these regions. Regions that did not have a clear connection between the thematic references to SEs and strategic objectives were not examined further; however, those regions are included as dots on the map to highlight the fact that our data covered all the regions and main urban areas. The strategic objectives of the eight regions having thematic references to SEs are explained below.

In Kajaani, Kuopio and Lappeenranta, the social perspective is connected to the objective of increasing employment in the regions. In Kajaani, the third sector (non-governmental organizations or NGOs) is encouraged to implement more business-like activities and is seen as a new path to entrepreneurship. The third sector is also seen as a provider of healthcare and well-being services in the future; therefore, its preconditions for growth and employment are to be developed. The city of Kuopio has created an employment action plan that focuses on developing social employment. One of the objectives is better coordination of social employment initiatives and funding. In Lappeenranta, one of the aims is to establish an SE and to include social criteria in public procurement standards.

In the metropolitan area around Helsinki, the social perspective is brought out, especially in the context of urban planning. The metropolitan area is said to emphasize communality, which becomes visible in participatory urban planning, a strong ‘we spirit’ and new housing solutions. Advanced urban planning is connected to attracting a workforce to the region. In Oulu, a certain SE is named as one of the actors that provides

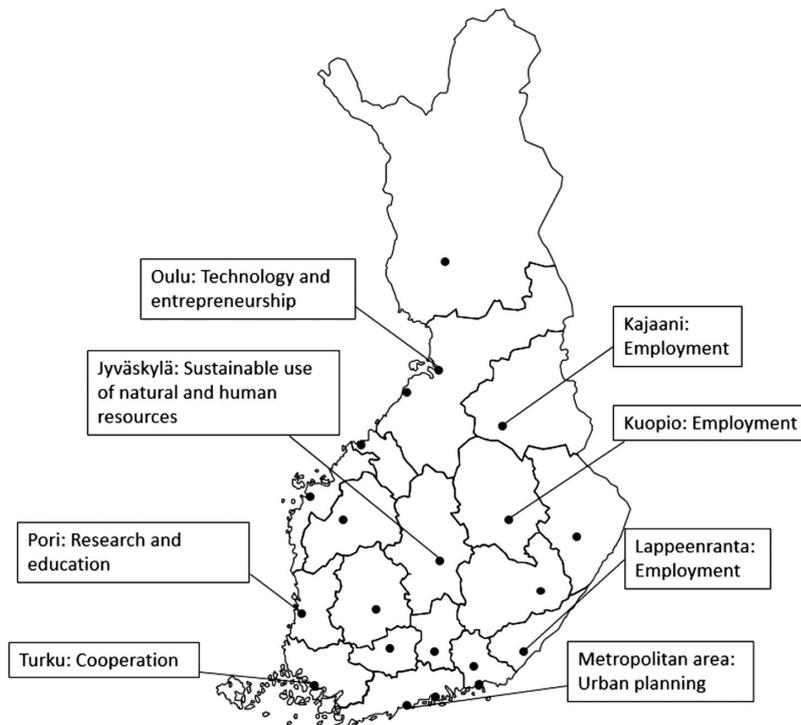


Figure 2. Strategic objectives of the regions and the social perspective (Map base: National Land Survey of Finland, 2014).

premises and arranges events for other enterprises in their early stages. Oulu aims at retaining its image as a 'smart' technology centre, and innovative technologies are utilized to create new services for individuals and communities. Communities are also regarded as sources of innovations in the form of technology development and testing. Social responsibility, quality criteria and purchase know-how are seen as ways to further the operational preconditions of enterprises and their fair treatment in these procurement processes.

In Jyväskylä, the social perspective is connected to the overall objective of the strategy that focuses on sustainability and the wise use of both natural and human resources, called 'resource wisdom'. In addition to an ecological and economic dimension, this resource wisdom is said to have a social dimension in the form of human resources. This social perspective is also considered in public procurement. Jyväskylä is known as the higher education centre of sport and health studies in Finland because of the University of Jyväskylä's Faculty of Sport and Health Sciences. Thus, the strategy highlights exercise and overall physical and mental well-being as important factors in a balanced work life and in maintaining human resources.

Pori's Innovative Cities application was indeed the only one to include a definition of SE. SEs are primarily presented in the context of the region's strengths in education and research, instead of highlighting specific strategic objectives or presenting them as

potential solutions to specific societal problems or as sources of innovations. Pori's Diakoniam University of Applied Sciences has been one of the central actors in Finland in the research and development of SEs. The regional units of the University of Turku and the University of Tampere in Pori also plan to do research in the area of social innovation at the interface of the private and public sectors. Some of the references to the social aspects are related to management issues and employees' well-being. The importance of cooperation in all fields of development is emphasized in Turku's strategies. Doing and creating things in cooperation with different partners are regarded as essential in order to learn, renew and create new solutions. The importance of social innovations in conjunction with technological innovations is also brought up.

The emphases of the social perspective on business and regional development

In almost half of the regions where the social perspective is connected to the strategic objectives, the thematic references were connected to the objective of increasing employment. SEs and new solutions emerging from the third sector are seen as possible future solutions in terms of the objectives of creating new jobs and developing employment activities. The current very challenging economic situation, including increasing youth unemployment, forces regional authorities to seek entirely new solutions, and social employment is regarded as a possibility not yet fully utilized. It is unfortunate that SEs are still strongly related only to employment objectives instead of being viewed as solutions to other societal problems and as sources of innovations. Moreover, they are regarded as WISEs only, instead of being seen from a broader perspective vis-à-vis societal change.

In Pori and to some extent in Jyväskylä, the societal perspective is closely related to the presence of educational and research organizations. These organizations are an essential part of RISs. They operate in regions as part of the knowledge creation subsystem and in interaction with the knowledge exploiting subsystem (Autio, 1998). Although SEs are mentioned in the context of these educational and research organizations, they are not connected to the broader strategic objectives. It can be argued that the existing knowledge and research results concerning SEs are not yet exploited in regional development activities in practice.

Resources, sustainability and responsibility were the frequently used terms when discussing societal impacts. The themes of resource exploitation, sustainability and responsibility are rather vague and overarching and are also related to the current broader economic and political discourse and objectives. Putting them into practice is the true challenge of the future.

Figure 3 presents the conceptual framework complemented with a summary of the results. As the conceptual framework reflects the discourse related to the concepts of RIS and SE, the results attempt to bring this to the level of more concrete and materialized processes and practices. Identified and utilized potential refers to the potential of SEs to contribute to RIS objectives that have been recognized and also utilized regionally. However, according to our research, this potential is not identified in every region and is utilized in even fewer. Identified but not yet utilized potential refers to the strategies where the social perspective is present in the form of thematic references that were discussed above. However, SEs are not yet recognized as potential contributors to the

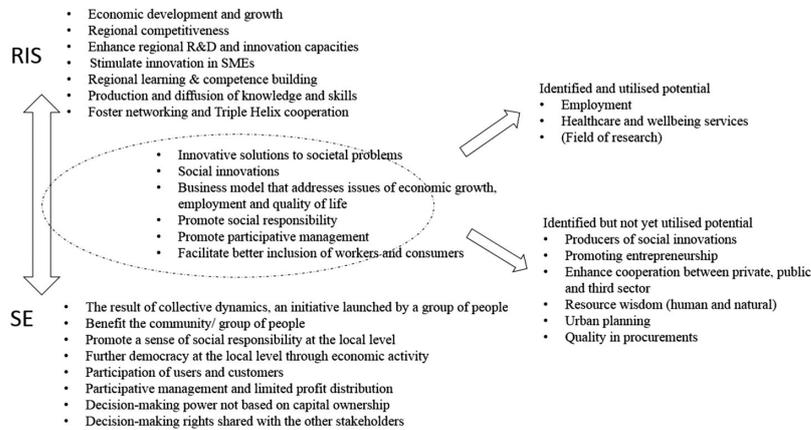


Figure 3. Identified and utilized/unutilized potential of SEs to contribute to RIS objectives.

policy objectives related to these themes. These themes appear to have strategic importance for RISs and their development since they are included in the regional strategies. They also have a strong social perspective, which again indicates that SEs could be potential contributors.

The thematic references to the social perspective in the regional strategies indicate that the social perspective is viewed as a strategically important aspect for regional development. SEs as concrete contributors to development goals are not yet recognized. For example, strategies discuss communities, but these are not connected to entrepreneurial activities. Communities in the sense of developing and testing platforms are seen as a source of, for example, information, not as potential independent actors and producers. The social aspect of entrepreneurship and economic activity is still handled at a rather vague discursive level, instead of more materialized processes in a specific (regional) context.

Discussion: implications for innovation systems and policy

Chell, Nicolopoulou, and Karataş-Özkan (2010, p. 491) highlighted the need to ‘tie in’ entrepreneurship with social, cultural, civic and political considerations:

Social enterprise presents the society with choices. For example, the prioritization of individualism, much of which may be seen as self-centred and self-serving, contrasted with collectivist solutions where building and developing communities is key to social and economic welfare and wellbeing. In these ways, social enterprise poses ethical dilemmas for governments, industries and individuals.

The results presented above are discussed in the context of these systems and of how these transformations could be better incorporated into RISs as statements, declarations and actions.

As discussed earlier, the Finnish innovation policy is a strongly growth-oriented policy investing in science and technology-based innovations and internationalization. SEs contribute to socially sustainable development in their entrepreneurial activities and could thus be regarded as a part of sustainable innovation policy (Pelkonen, 2009). Sustainability

has become a global megatrend as the limits of ecosystems and societies have become obvious. The need to focus on sustainability and sustainable solutions in all fields of activities, and the tridimensional (economic, ecological and social) character of sustainability were evident also in the studied strategies, but SEs were not seen as potential contributors to sustainability objectives. SEs are not related to a particular sector but can cross a variety of sectors and thus also contribute horizontally to sustainability objectives across sectors. Incorporating SEs as part of RISs, particularly as enterprises contributing to sustainable development, could also help bring SEs from the margin to acknowledged actors of regional entrepreneurial and innovation networks.

In recent years academic discussions on RISs have focused on themes such as learning (see e.g. Cooke, 2014), related variety (see, e.g. Asheim et al., 2011; Uotila et al., 2012) and platform development (see, e.g. Cooke, 2012b; Harmaakorpi, 2006; Harmaakorpi, Tura, & Melkas, 2011). Building social capital is an important objective for innovation platforms. SEs as collectivist solutions and communities can contribute to increasing social capital among regional actors. SEs can also increase the variety of regional innovation potential by creating new courses of action for the regional system. Thus far, the literature on sustainable innovation policies has focused on new clean technologies limiting the discussion to environmental sustainability (see, e.g. Foxon & Pearson, 2008; Nill & Kemp, 2009). SEs can have a specific role when broadening the discussion to cover also social and economic sustainability (without neglecting the intertwined nature of these three aspects of sustainability). Incorporating SEs as part of RISs could promote innovating in different ways, contributing to the target of social sustainability. The development of the SE is viewed as a small step towards the realization of social sustainability. So far, a lot has been written about the concepts of SE and social sustainability. However, the link between the two concepts has been discussed far less often (Khan et al., 2015).

SEs as a form of entrepreneurial activity still remain unfamiliar to many. Regional (and national) research and development organizations can act as advocates and raise awareness of the opportunities of SEs as well as provide information and support for early stage SEs. As Heckl et al. (2007) have noted, SEs are often small and depend on public funding. Legislation and taxation are examples of barriers that can significantly hinder their development. Thus, the promotion and development of SEs concern several policy sectors, such as social, employment and industrial policy, which make removing bottlenecks of SE development also an issue for national-level policies.

Conclusions

This paper emphasizes the potential of SEs in innovation, employment, social cohesion and mobilizing human capital in new ways. Regional innovation and business strategies show that the increasingly common themes of new kinds of entrepreneurship, well-being and responsibility have been acknowledged widely at the regional policy level. SEs could have a special role in regional innovation activities and in realizing new innovation policies, such as regional smart specialization strategies. Having a regional innovation strategy for smart specialization is an *ex ante* condition for receiving funding from the Structural Funds for research and innovation investments in 2014–2020 (European Commission, 2011). Creating these smart specialization strategies for regions provides a good opportunity to explore the potential of SEs to contribute to development objectives and

sustainability. The challenge lies first in defining SE and in making it clear and visible in society and in perceiving it not as a project or workshop activity focusing on employing marginalized people, but as a sustainable entrepreneurial activity that has its own role in regional innovation and business ecosystems.

The results show that the spirit of the social perspective on development, innovation and business is present in regional policy documents, but SEs are not viewed explicitly as potential contributors to development objectives. Current business and business support environments are used to traditional enterprises. Growth strategies at all policy levels (local, regional, national and supranational) emphasize entrepreneurship and employment. As to the objectives of growth, SE is directly connected to employment, innovation, entrepreneurship and extending work careers with the help of flexible forms of work and entrepreneurship. However, when taking into account the limited natural and human resources of our planet and societies, policies should aim at steering the focus from growth by any means towards sustainable development. In the innovation policy context, this means adopting the ideas of sustainable innovation policy. Our paper contributes to the regional development theory by arguing that the RIS theory and innovation and development policy based on the RIS approach include areas and objectives where principles of sustainability could be better incorporated and where SEs, in particular, could contribute to the objectives.

The main argument of this paper is that Finnish RISs – as reflected in their central policy instruments, regional strategies – still maintain a rather traditional growth-oriented focus instead of reflecting and promoting the objectives of sustainable innovation policy on a larger scale. We note that SEs hold unused potential in answering the expectations concerning RIS, particularly the social ones, and SE as a concept sustains both entrepreneurship and innovation and an alternative type of sustainable innovation policy. As to the regional innovation policy's practical side, the vision of how to encourage SEs in regional development should be enriched. The focus could be widened from employment purposes to other social, economic and environmental aspects. SEs alone cannot generate social transformation. At the core are cooperation structures to bring together public, private and third-sector organizations to encourage sustainable development and innovation. As noted by Chell et al. (2010), SE presents society with choices. Future research should focus on choices and transformations, inter alia. More research is needed on how these social transformations aiming at sustainable development arise; how they can be supported by different policy means and what choices these transformations require from the society.

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Publication IV

Rinkinen, S., and Mäkimattila, M.

The use of foresight information in small and medium-sized enterprises – the role of intermediary organisations

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The use of foresight information in small and medium-sized enterprises – the role of intermediary organisations

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Abstract: In order to successfully compete in the market, firms have to keep track of the changes in the operational environment and use this information in their innovation processes. Future-oriented information is gathered by various agents, but firms still struggle to find relevant information and transform it into profitable businesses and innovations. Intermediary organisations play an important role in the interfacing of knowledge producers and knowledge exploiters. This paper studies the role of intermediary organisations in promoting the use of foresight information in small and medium-sized enterprises. A qualitative case study approach is used. The study emphasises the importance of interpreting foresight information through communicative processes and combines these ideas at the system level, providing new insights not only on the theoretical level but also for developing the innovation policy practice.

Keywords: foresight information; intermediary organisations; intermediation; small and medium-sized enterprises; SMEs; innovation; knowledge; regional innovation system; innovation policy.

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1 Introduction

Given the rapid pace of global change, it is crucial for firms to keep track of the changes in the operational environment. In the early phases of the innovation process, acquisition and use of external knowledge are critical success factors, and thus the development of new sharing activities and methods to enhance knowledge management and creation are needed (Bergman, 2005). Organisations at both the national and regional level produce and collect foresight information, but this information is not extensively utilised in small and medium-sized enterprises (SMEs).

SMEs form the basis of both national and regional economic activity (http://ec.europa.eu/enterprise/policies/sme/index_en.htm), even though large enterprises appear to dominate regional systems. The starting point for foresight activities in the case of SMEs is distinctly different from that of larger firms, and thus the former should also be discussed separately when researching the issue. More emphasis should be placed on investigating the special characteristics of SMEs and the challenges they face when using foresight information. The mechanisms of disseminating new information should be better examined in order to inform policy actions.

The amount of literature on the use of foresight knowledge on an enterprise level is vast (see e.g., Ansoff, 1980; Costanzo, 2004; Ilmola and Kuusi, 2006; Coates et al., 2001, Kameoka et al., 2004; Miles, 2010; Battistella and De Toni, 2011). However, the use of foresight knowledge in an SME-specific context has not been as widely studied. Furthermore, the gap between knowledge generation, knowledge exploiting systems, and the channels through which new knowledge filters to the SME level have rarely been studied. Major and Cordey-Hayes (2000) argue that intermediary organisations play a central role in disseminating foresight information to SMEs, and encourage intermediaries to take foresight culture to their SME contacts and SMEs to strengthen their intermediary links in order to improve both competitiveness and innovation in the economy.

The aim of this paper is to study the role of intermediary organisations in promoting the use of foresight information in SMEs. Intermediary organisations are a part of the regional innovation support infrastructure and are also the practical realisers of regional innovation policies. The research question set for this study is: What is the role of intermediary organisations within regional innovation systems in promoting the use of foresight knowledge in SMEs? Answers to this question were sought by using previous literature and by conducting a regional case study within a Finnish setting.

2 Theoretical background

2.1 Interpreting foresight information for meaningful innovation knowledge in SMEs

SMEs are often described innovative and agile, and they play an important part in the economy, although large firms are often more visible in discussions. SMEs are also a natural part of a large firm's R&D, production and service networks and are seen as important sources of innovations (Gray, 2006; Major and Cordey-Hayes, 2000). However, SMEs have also been identified as responsive instead of proactive.

Inertial issues, such as unwillingness to renew, limited resources and skills, ignoring available foresight information, have often been associated with SMEs. Such generalisations might stem from characteristics other than firm size, such as ownership and entrepreneurial characteristics (Kellermans et al., 2012; Grundström et al., 2012; Nordqvist and Melin, 2010; Hausman, 2005; Gray, 2006). SMEs are a rather heterogeneous group with different backgrounds and skills, and this should be considered when analysing their foresight and innovation activities (Mäkimattila et al., 2012).

SMEs might lack the resources and time to look beyond their immediate short-term needs, which also impacts their approach to future-oriented information. They want knowledge that is both discrete and concrete, while foresight knowledge is often strategic and abstract rather than operational and tangible (Major and Cordey-Hayes, 2000). Literature and previous studies also suggest that SMEs are strongly reliant on the attitudes, education, skills and expertise of their personnel (Atherton and Hannon, 1995; Major and Cordey-Hayes, 2000; Gray, 2006) and therefore individual factors have an important influence on firms' foresight culture. SMEs often lean on strong individual entrepreneur and family drivers, and these aspects (e.g., Pieper and Klein, 2007; Zellweger et al., 2012) also influence the development of anticipatory and innovation cultures in many SMEs. Characteristics like longitudinal and temporal transgenerational aspects affect multilevel interpretation of future-oriented information and this requires good knowledge from intermediaries about the core organisation. Gathering information and translating it to knowledge may be challenging for organisations and individuals with different viewpoints, like SMEs with short-term business prospects and intermediaries with typically more political interests related to long-term evolution. When discussing the information and knowledge in foresight activities, it is useful to point out that data in meaningful context can become information; when critically analysed in relation to other pieces of relevant information and when interpreted in a certain context, this information can be transformed into knowledge (Uotila et al., 2012). Various studies (Major and Cordey-Hayes, 2000; Kaivo-oja, 2006; Kaivo-oja and Martinen, 2008) have focussed on the challenge of dissemination and absorption of available foresight information. Ahlqvist et al. (2012) have noted that a common problem with foresight exercises is that the produced information, no matter how relevant, remains in the project reports and lacks an action-oriented interpretation among actors and stakeholders. Ahlqvist et al. (2012) also discuss the importance of fostering systemic capacities in an organisation, like an anticipatory culture that builds on anticipatory agency for strategic capabilities needed for future orientation within a changing business landscape.

Major et al. (2001) discuss instilling foresight culture to firms in the UK by connecting it with the strategy literature and regarding foresight as a core competence. They highlight the critical importance of the tacit knowledge of small companies' individual managers. Major et al. (2001) recognise individuals' foresight competence as a factor that affects the development and existence of an organisational foresight culture, but leave unanswered the question of how individuals' inclinations are transferred into firms' foresight systems.

An organisation's ability to value, assimilate and apply new knowledge is often discussed based on Cohen and Levinthal's (1990) absorptive capacity (AC). Zahra and George (2002) developed the concept further and suggested that there is a need for a

special social interaction mechanism between assimilation and transformation processes. The AC of individual members [Cohen and Levinthal, (1990), p.131] should be emphasised. SMEs have less labour and fewer connections than bigger corporations as well as fewer personnel to manage certain tasks or interpret information from, for example, a marketing or engineering perspective. Often SME procedures are rather straightforward, involving less discussion and fewer alternative interpretations of information available and related to decision-making (Mäkimattila et al., 2012). Godkin (2010) discusses the concepts of insight and action inertia: insight inertia occurs when the management does not observe and interpret cues from the external environment in time, and action inertia arises when managerial response to environmental activity is too slow or the information gathered is inadequate to generate actions and results beneficial to the organisation. These inertia issues are strongly related to the foresight culture of the firm.

As Cohen and Levinthal (1990) have argued, firms and individuals can understand, absorb and implement external knowledge only when it is close to their own knowledge base. Reordering knowledge opens up new possibilities of transformation by challenging what is known and what is not (Kuusi and Hiltunen, 2011). In this reordering of knowledge, the interpretation phase is the key step of the foresight process. Horton (1999) argues that a third party is essential for interpretation. Third-party intervention is needed to facilitate the creative thinking of those involved in the process, to help investigate difficult questions and to understand what this information means in a specific context.

2.2 Innovation intermediaries in regional innovation systems

The systemic approach to innovations has highlighted that organisations interact in various ways while refining information for businesses in a changing environment (Håkansson and Olsen, 2011; Johannessen, 2009; Berkhout et al., 2010; Maula et al., 2006). Some studies focus on socio-technical transitions (e.g., Geels and Schot, 2007) that also link complex system theory aspects to transition arenas (Loorbach, 2007), and others focus on innovation systems with different perspectives and theory origins (Hekkert and Negro, 2011; Coenen and López, 2010; Markard and Truffer, 2008; Nieminen et al., 2011; Geels, 2014). In regional innovation studies, for instance, it has been pointed out that it is important to organise around anticipatory activities to form AC, link different types of actors and build a suitable culture for foresight and innovation activities (Uotila et al. 2012, Uotila, 2008; Uotila and Ahlqvist, 2008; Ahlqvist et al., 2012; Mäkimattila et al., 2012).

A regional innovation system (RIS) can be regarded as a geographically bounded system of several innovation networks. RISs consist of two subsystems: the knowledge generation and diffusion subsystem that covers various institutions responsible for the production and diffusion of knowledge and skills, and the knowledge application and exploitation subsystem that consists of companies and their clients, suppliers, competitors and industrial partners (Autio, 1998). Intermediary organisations work at the intersection of knowledge producers and knowledge exploiters inside the RIS and are a part of its innovation support infrastructure (Smedlund, 2006). These third-party organisations can be public, non-profit or private (Klewitz et al., 2012, Lynn et al., 1996).

Howells (2006) has synthesised the existing literature on intermediation and proposes the following definition [Howells, (2006), p.720] of an intermediary organisation: ‘an organisation or body that acts as an agent or broker in any aspect of the innovation process between two or more parties’. Brokering creates ties between otherwise distant groups of actors (Burt, 2004). Howells (2006) has also defined ten different innovation intermediation functions, of which the first three are directly linked to the use of foresight information; foresight and diagnostics, scanning and information processing; and knowledge processing and combination/recombination.

For SMEs, intermediary organisations serve as a means to gain access to information outside their own organisational boundaries. Collaborating with an intermediary organisation can enhance an SME’s innovation capacity, enable understanding of new external information via information processing, and facilitate the assimilation of external knowledge to the firm context (Klewitz et al., 2012).

In the model that positions an intermediary subsystem within an RIS (Uotila, 2008; Uotila and Ahlqvist, 2008), the subsystem plays a vital role in the contextualisation of foresight information, and intermediary organisations are seen as system-level information brokers. The model combines the concepts discussed above: absorptive capacity and information brokering. The model is conceptual in character and has not yet been studied in a practical context. This study utilises this conceptual model as a framework and provides practical evidence of the need for an intermediary subsystem that acts as an information broker between knowledge-generating and knowledge-exploiting subsystems.

3 Research design

To understand the role of intermediary organisations in promoting the use of foresight information in SMEs, a case study approach was used. The case study method, in the words of Yin (2009, p.4), ‘allows investigators to retain the holistic and meaningful characteristics of real life events’, and several scholars find it well suited to social science research (Eisenhardt, 1989; Voss et al., 2002; Flyvbjerg, 2006; Yin, 2009). It typically combines multiple sources of evidence and data collection methods (Eisenhardt, 1989; Yin, 2009).

The data for this study was collected during a wider research process. The data consisted of SME workshop observations, interviews and questionnaire responses. The gathered data was qualitative in nature. The research group found that to gain a deeper understanding of the use and interpretation of foresight information, more user insights and information on the working processes were needed. Accordingly, qualitative case data gathered from real-life situations was obtained. The aim was not to build a universal theory but rather study the role of intermediary organisations as links between knowledge producers and exploiters. The case study method has been criticised because it is limited by investigators’ preconceptions, but Eisenhardt (1989) argues that just the opposite is true. Reconciling evidence across cases and types of data, and juxtaposing different realities, enhances thinking and generates theory with less researcher bias (Eisenhardt, 1989). The data used in this study is presented and itemised in more detail in Table 1.

Table 1 Study data

<i>Case</i>	<i>Participants</i>	<i>Method</i>	<i>Date</i>
SME workshops	4 participants from SMEs, 5 experts from intermediary organisations	Facilitated participative methods	October 2011
	8 participants from SMEs, 4 experts from intermediary organisations	Presentation	April 2012
Interviews	8 national-level foresight experts	6 semi-structured interviews	January–March 2012
	4 entrepreneurs	4 semi-structured interviews	November 2012
Questionnaire	136 experts working within the CoE Programme	Questionnaire	June 2012

Two foresight workshops, organised by a Finnish regional science and business park – which is also one of the realisers of the national Centre of Expertise Programme¹ – were held in autumn 2011 and spring 2012. The aim of the workshops was to facilitate interaction and collective interpretation of signals presented to the participants. They were organised for SMEs interested in clean-tech business in Russia. These workshops were observed by altogether three researchers.

To obtain another perspective into the research problem, eight leading Finnish authorities in using foresight for innovation were interviewed. The first two interviewees were selected by the research group; after that, the pyramiding strategy (von Hippel et al., 2009) was used to identify the top Finnish experts in this field. Semi-structured interviews were carried out and questions covered foresight culture in Finland, how foresight information is collected on a national level, how foresight is used among SMEs and the methods used in interpreting foresight information. The official titles of these experts are listed in Table 2. Later in 2012, four separate SME interviews were carried out in order to collect more detailed information about entrepreneurs' insights on foresight. All interviews were recorded and transcribed.

Table 2 Interviewed foresight experts

1 Foresight manager	2 Senior research scientist
3 Ministerial adviser	4 Consultant
5 Senior researcher	6 Leading specialist
7 Director of information society development	8 Regional development manager

In June 2012, a questionnaire was sent to experts working within the Centre of Expertise Programme. The experts were asked open-ended questions about the ways they have helped SMEs find new business opportunities, acquire foresight information and interpret this new information. The question-specific response rate varied between 16.5% and 8.6%. These response rates were considered satisfactory, since information was received from most (15 out of 22) centres of expertise and from 11 out of 13 competence clusters.

Triangulation was used to validate the interpretations gained though by the observations, transcribed interviews and the responses of the questionnaire. The

interpretations were also considered in light of previous literature and discussed among the research group several times during the research process.

4 Analysis and results

4.1 SMEs' needs for foresight information

The data supports the idea (emerging from previous studies) that lack of resources and high operational pressure are the main challenges to using foresight information in SMEs. Entrepreneurs are mostly seeking very concrete information about new technologies, trade cycles, market changes, customers and competitors from trusted sources in their social networks. This type of short-term foresight information is seen as important for decision-making. Long-term foresight information is perhaps seen as too abstract and too distant from everyday activities, since SMEs are obviously more interested in very close-to-practice types of and customised information that is relevant to their current activities. Information is also often interpreted from this short-term operational perspective, and alternative cues are not taken into account (see also filters by Ansoff, 1984; Ilmola and Kuusi 2006).

The interviewed entrepreneurs perceived foresight information as short-term specific information about changes related to an operational business environment. The desired information is mainly short-term information about market changes. For example, one of the interviewed entrepreneurs listed what they sought as foresight information: information about possible future changes in laws that might have affect their business, information about price changes, information about international markets and raw material production and information about rival products. SMEs find that they have to be able to right away select the relevant information for their business from a vast amount of information.

“The way I see it, is that acquiring foresight information, you do nothing with it even if it was...even if you had a databank that has all the information, but if you can't pick what is relevant for you from there, then the databank is useless.” (Interviewed Entrepreneur 1)

SMEs utilise foresight knowledge in business operations and decision making, and this knowledge is mostly intuition-based and easy-to-assimilate, gained from SMEs' close networks or public sources. Many SMEs do not even perceive foresight information as useful for their business. As one of the foresight expert interviewees put it,

“Some SMEs unfortunately don't even feel that they do or need foresight, especially if they have a strict subcontractor role. It's enough for them that they deliver enough screws and sometimes they have to deliver more screws. SMEs are a very challenging field in this sense.” (Senior Research Scientist)

SMEs seem to be challenged by the characteristics of strong individuals impacting the anticipatory culture through operational participation and management, or board decisions and ownership, which affects the interpretation of information and actions taken. Most of the SMEs encounter some sort of discontinuous stage because of succession and ownership changes, and thus, cultural issues are often deep rooted. These social constraints also influence the sourcing of external information and the valuation of their providers.

4.2 *Intermediary organisations as information disseminators*

Survey responses indicated that the centres of expertise have several ways to disseminate foresight information to firms. The most common is to offer it in the form of publications, newsletters, e-mails, on webpages or simply by calling entrepreneurs who might be interested in certain types of foresight information. In addition, different kinds of seminars and workshops are also organised for local SMEs. National-level experts notice the importance of intermediary organisations within RISs as intermediators between knowledge producers and knowledge exploiters.

“Yes, I would see the role of intermediary organisations as very important when diffusing it (foresight information). And especially bringing it to the firm level and suitable for their (SMEs’) needs. This would be very very important.”
(Foresight Manager)

All the interviewed entrepreneurs call for assistance from intermediary organisations to find the appropriate foresight information. It seems that entrepreneurs have a very clear idea of what kind of future-related information they want and need, and they would be happy to have an external actor who could collect this information for them to use in their strategic decision making. Entrepreneurs do not mention having difficulties utilising foresight information once it is acquired, nor do they mention foresight knowledge as a source of innovation. This again shows that entrepreneurs see foresight as practical information that is applicable to the current situation but an alternative interpretation or a deeper processing of the information for an innovation context is missing.

4.3 *The role of intermediary organisations in SMEs’ foresight processes*

According to the survey responses and the observations made during the workshops, intermediaries seem to have good tools for disseminating information, but the tools to analyse and interpret this information in order to facilitate further processing or alternative interpretations are few in number.

When queried about the means and methods used to analyse and interpret foresight information, survey respondents of the centres of expertise offered few or vague answers, such as: “By inviting best experts to have presentations in events”. Some of the respondents said that the interpretation phase is the firms’ own responsibility, and they do not have further knowledge about their means and methods. Even so, more specific methods were also mentioned: using the futures research methods, applying service design tools, creating scenarios and discussing with entrepreneurs new thoughts rising from foresight information. One of the respondents also mentioned the need for knowledge brokers in these processes: “There needs to be an interpreter in between, especially if the information is university-based, it is too difficult for SMEs to find what is relevant for them, it is too theoretical”.

The national-level interviewees stated that it would be important to get entrepreneurs to think and process not-so-easily-assimilated information as well, in order to challenge their current thinking and knowledge structures and to find new innovation potential. This is also where the intermediary organisations could offer help in the form of tools, facilitators and knowledge brokers.

“Us futures researchers, we have the bad habit of in a way creating these different future images and future paths, but what they mean in practice in decision making, that is left open. And it is quite a big leap to take over that trench by the SME alone.” (Senior Researcher)

“You mentioned this disruptive and this surprising (foresight information), this is kind of what we have also discussed as a challenge, how to get, in some situations, them (entrepreneurs) to explore these more distant (bits of information).” (Foresight Manager)

During one of the SME workshops, an entrepreneur had a very critical view about the presented future signals, which led to a lively discussion with another participant. Their first interpretations of the signals differed greatly, and after the discussion, they both ended up with entirely different interpretations from those they had in the beginning. This is a good example of how actively communicating and sharing thoughts with others can enhance one’s own thinking and absorption of new knowledge, and how information first regarded as simple and explicit can, after deeper processing, yield alternative interpretations.

4.4 Summary of the results

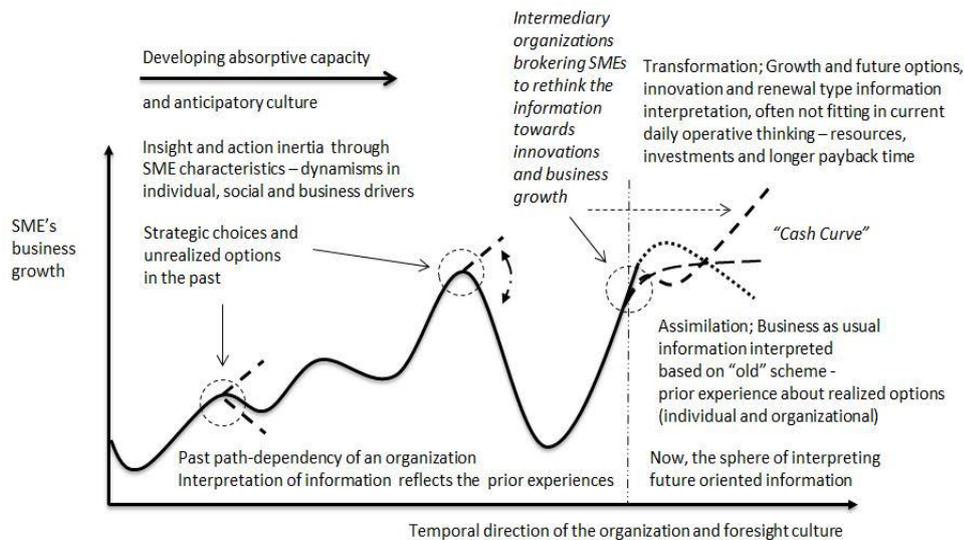
Collecting and using foresight information is challenging for SMEs for several reasons: time, money, skills, attitudes and personal characteristics. According to the interviewed entrepreneurs, SMEs turn to their immediate business environment, their suppliers, customers and competitors for finding new information. However, because of limited resources, knowledge is sought in close networks and a more widespread search is often avoided. Responses also indicate that SMEs want easy-to-assimilate information tailored to their specific needs, and to that end they seem willing to outsource their foresight processes. However, this is a rather difficult task, first because of the context dependency and AC needed, and secondly because it is impossible to specify to someone beforehand to filter what is meaningful and what is not.

The studied intermediary organisations appear to have several ways to disseminate foresight information to local entrepreneurs. They produce, collect and share information about latest research, new technologies, market changes or international business environments. What is lacking, however, are the tools to help entrepreneurs analyse and interpret this new information in their own business context.

On the basis of our findings, we propose that intermediary organisations could also provide more tools for transformation processes instead of just offering information that is easy to assimilate to current business operations – which rarely results in growth-producing innovations (see Figure 1). Our results support the views concerning SME characteristics in using foresight information discussed in previous studies, but we would like to emphasise the need to find alternative interpretations for the presented foresight information and signals. When new information challenges to current thinking and knowledge structures, it needs in-depth processing and interpretation that are relevant to the SMEs’ contexts. The very first interpretation is often the one that leads to assimilating the information to current business operations (the future cash curves resulting in decline or minor growth in Figure 1), and only deeper processing leads to renewal and growth (the rising future cash curve in Figure 1). The breaking point for future business

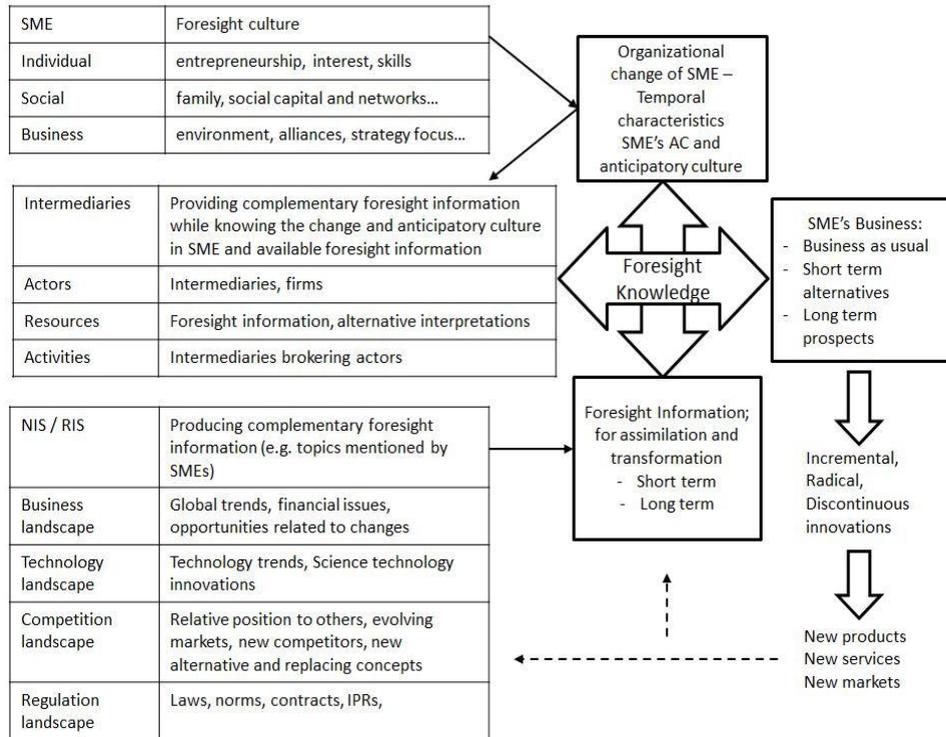
opportunities is when information about new technologies, for example, is available. This is the phase where intermediary organisations’ brokering functions can help SMEs rethink about the information to proceed towards innovations and business growth. The need for brokering functions and for rooting a new type of foresight culture in SMEs were identified from the results of this study.

Figure 1 Adopted from Ahlqvist et al. (2012), and modified to illustrate the phenomenon in an SME innovation context



Intermediary organisations are important information disseminators, but in order to enhance more thorough information processing, they should be able to offer platforms for communicating, sharing thoughts and interpreting future-oriented information. These platforms, whether they are facilitated innovation sessions or monthly foresight-related gatherings of local entrepreneurs or something completely different, should foster interpretation processes and creative thinking. Organisations contributing to the use of foresight information and adoption of continuous anticipatory culture in SMEs should involve those who offer not only external information but also an understanding of the SME context relevant to this information and the means to fruitfully facilitate information processing. Innovation intermediaries should also seek to understand the SMEs’ foresight culture and its different dimensions (individual, social and business; see Figure 2); how it could be developed and how it affects foresight practices and information brokering. Identifying organisations that are most appropriate to function as innovation intermediaries depends greatly on the regional organisational structure, but such organisations could include regional technology and business parks, and research and development organisations. The foresight information that is processed within SMEs is affected by and comprised of all these above-mentioned elements; the organisational change and the foresight culture of the SME in question, intermediary organisations and their functions, and the available foresight information produced within the national and regional innovation systems (see Figure 2).

Figure 2 The anticipatory change in an SME and its environment



5 Discussion and conclusions

National-level foresight information producers and diffusers are often quite distant from local enterprises. As such, regional innovation systems need regional intermediaries that can offer platforms for knowledge transformation processes that are fuelled by communication. Major and Cordey-Hayes (2000) believe that when it comes to foresight, policymakers should place more emphasis on enhancing foresight culture in intermediaries instead of focusing on SMEs. On the basis of our results, we would like to add that it is essential for SMEs to adopt a certain type of foresight culture so that they understand the importance of interpretation of foresight information and benefit from it innovation-wise.

In intermediary organisations, it is the role of knowledge brokers within the innovation systems that should be emphasised. Parjanen (2012) studied innovation sessions as sources of new ideas for firms and emphasised the role of brokering during innovation sessions. Innovation and knowledge brokers facilitate thinking ‘outside the box’ during the process of idea generation. Parjanen et al. (2011, p. 943) suggest that

“A system producing future-oriented information and knowledge must support the knowledge brokerage system so that the brokers will acquire the kind of information and knowledge that they can feed into innovation networks as they operate as regional facilitators of practice-based innovation operations.”

Interactive and communicative innovation sessions are an example of methods that could be used for deeper processing of foresight information. Our study supports Uotila's (2008) idea that an intermediary subsystem within an RIS serves as a knowledge broker between the knowledge generating and knowledge-exploiting subsystems.

For an innovation intermediary, it is necessary to understand the heterogenic nature of SMEs and their different temporal states that influence the facilitation and interpretation processes. According to our results, the role of intermediary organisations is often that of information disseminators rather than active information brokers. Using foresight information in SME innovation processes requires high AC on the part of the innovating organisation, which communication, different methods and brokering functions can facilitate. Because of the nature of foresight information and the limited resources in SMEs, the role of intermediary organisations in knowledge transformation processes is important. Rethinking and reinterpreting information is not so much dependent on resources but on the 'rethinking' support and encouragement that smaller enterprises do not necessarily have access to in their own organisations. This is where intermediaries can offer support in foresight information processing and developing a foresight culture within SMEs. Supporting a more communicative and active way of using foresight information and knowledge can be seen as a part of a wider policy model where future-oriented thinking is emphasised.

Interesting insights can be gained from this study for practical SME management and research. Most of the existing discussion on strategy revolves around handling foresight and innovation separately – which is not the case in a systemic context. Typically strategy-oriented foresight is seen from a rather long-term perspective, at least three to five years forward depending on industry. A systemic approach challenges this thinking, although there might be rather long stable periods and then sudden drastic and surprising changes, which are very difficult to anticipate even just before their occurrence (e.g., spring 2014, incidences in Russia). The management at SMEs has to make anticipatory decisions, and though a large amount of information is available, it is not possible to analyse everything within the available timeframe and with the embedded uncertainties. With SMEs, the management can often be based on personal 'intuition' (see also Dane and Pratt, 2007) of the entrepreneur either because of the entrepreneur's experience in the business field or because of scarcity of resources. This learning-based model works as long as circumstances remain the same, but is challenged when the business environment and rules in the innovation landscape change suddenly. SME management often reflects prior decision making, with both social and business impacts, and acts based on those previously learned lessons. When the interpretation and decisions are often made based on previous schema, future orientation is challenged. Intermediaries and groups facilitated by them could support interpretation of foresight knowledge in SME so that the SMEs can utilise their strengths, like agile and innovative responses to changes.

This study contributes to the theoretical discussion of using foresight information and the role of regional intermediary organisations in SME contexts. In practice, these results can be used when framing the functions of regional intermediary organisations or formulating future innovation policies that take into account the multidimensionality of information and knowledge-transferring mechanisms.

There are several types of intermediary organisations, roles and functions, which differ in significant ways. Our focus was on intermediaries that regard knowledge transfer and innovation facilitation as one of their core functions. Future research could

also expand the investigation to other intermediary organisations. Furthermore, the case study characteristics of this study may have an effect on the generalisability of the results. When probing deeper into foresight knowledge, the multifold relevance of knowledge and the types of interaction and methods needed to interpret and exploit foresight information should be examined in greater depth. Within a policy context, the mechanisms of supporting regional knowledge brokering also serve as an interesting avenue for future research.

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Notes

- 1 The Finnish Centre of Expertise Programme (CoE Programme) was used as an example of intermediary organisations actively involved in information and knowledge sharing and processing. The CEP is a fixed-term national program that includes 22 regional centres of expertise and 13 competence clusters. The centres operate under regional science and technology parks and development organisations.

Publication V

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**Policy framework for supporting business ecosystems and niche development through
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Policy Framework for Supporting Business Ecosystems and Niche Development through Innovation Policy
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Abstract: Changes in the global operational environment have had an effect on the way firms cooperate and compete, how innovations are created, and how new businesses are born and grow. Lead firms build ecosystems around them in which different companies cooperate to create more value for end customers. Traditional value chains have changed to value networks, and competition happens between different business ecosystems rather than between individual firms. New business ecosystems and technology innovations created within ecosystems and ecosystem niches are important for economic development and potential contributors to wider technological and societal transition processes. However, research on the implications that innovation policy has on the ways new business and innovation ecosystems emerge and evolve is still rather scant. This study, through a literature review, examines the potential of using the ecosystem approach to develop new technology and niche innovation that work as drivers for wider sociotechnical transitions, and based on empirical case study material, this study sketches the basic elements of innovation policy that supports business ecosystem and niche development. The aim of this study is to hybridise 'Moorean' theory of business ecosystems and their development with 'Geelsean' theory of sociotechnical transitions for the basis of new type of innovation policy. The findings suggest that, due to the characteristics and nature of activities within business ecosystems, they are potential seedbeds for niche development and radical innovations. Business ecosystem birth and evolution can be supported with ecosystem-based innovation policy, which is based on, for example, feeding variation, looking for the unknown and unexpected, and platform development through, for instance, public procurement. Supporting pilots, demo phases, and rapid prototyping are also some ways to enhance business ecosystems and niche development. This study contributes to both theory and practice of innovation policy. It provides a new perspective for innovation policy based on the concepts of business and innovation ecosystems connected to theory on sociotechnical transitions. The results of this study offer a framework for formulating the practical innovation policy operations that support new business and niche development.

Keywords: business ecosystem, innovation ecosystem, innovation policy, entrepreneurship, niche innovation, innovation platform

1. Introduction

The ecosystem concept has been used increasingly in a business and innovation context (Hwang, 2014; Majava et al, 2013). Gobble (2014) suggested that this trend perhaps reflects a change in the way we think about business and innovation and the changes in the global operational environment. For example, it has been acknowledged that competition happens often between business ecosystems rather than between individual firms or clusters (Hearn and Pace, 2006; Moore, 1993). At the same time, new technological niche innovations are needed for new solutions, for example, in energy production, to ensure sustainable growth and social well-being. However, changes in the operational environment also change the ways these small-scale innovations can grow and develop into comprehensive new solutions which are capable of challenging the old sociotechnical configurations. Innovation policy can be utilised to help create and spread new innovations, but research on the implications that innovation policy has on the ways new business and innovation ecosystems emerge and evolve is still rather scant. Innovation policy still is often based on cluster development and cluster-based operations.

Previous literature has presented some suggestions for innovation policy that supports ecosystems. For example, Moore (1993), who was the first to bring the ecosystem analogy over to business and innovation studies, emphasised the need to ensure that competition among ecosystems remains fierce and fair instead of supporting failing ecosystems. Clarysse et al. (2014) suggested, for example, that public procurement policies may work as a stimulus to create new business ecosystems and that large companies could play a bigger role in

nurturing ecosystem development regionally than they currently do. Despite the implications of innovation policy presented in recent studies, no comprehensive framework for innovation policy that supports ecosystem development has been presented before.

The research question set for this study is: How can business ecosystem and niche development be supported through innovation policy? The aim of this study is to answer these questions by (1) examining the potential of the ecosystem approach for new technology and niche innovation development through a literature review and (2) sketching the basic elements of an innovation policy that supports the ecosystem based on empirical case study material. This study contributes to both theory and practice of innovation policy. The aim of this study is to hybridise 'Moorean' theory of business ecosystems and their development with 'Geellean' theory of sociotechnical transitions for the basis of new type of innovation policy. The study provides a basis for creating a new type of innovation policy that is based on the hybridisation of theories of business ecosystems and multi-level sociotechnical transitions. For innovation policy practice, the results of this study offer a basis on which to build and formulate the practical innovation policy operations that support new business ecosystem and niche development.

2. Literature Review

2.1 Business Ecosystems and Niche Innovations

Applying the ecosystem concept to a business context was first drafted by James F. Moore in 1993. He stated that competition had changed from the traditional head-to-head situation and that this change should be examined in a new way. Moore (1993) stated that firms should be seen as a part of an ecosystem, where companies cooperate, compete, and co-evolve capabilities around a new innovation instead of just being seen as a part of a certain industry. Business ecosystems are dynamic self-organising networks, in which various complementary assets and knowledge pools are combined and co-evolve, which makes these ecosystems potential producers of radical innovations as a result of expertise combinations. Innovation processes and value creation in ecosystems are based on open innovation and co-creation (e.g., Durst and Poutanen, 2013; Moore, 2006). By opening up their innovation processes to outside contributors, business ecosystems can create an organisational form of distributed creativity. Also, in addition to the system of production, the ecosystem approach takes into account the system of use (Autio and Thomas, 2014).

Business ecosystems have a leader — which Iansiti and Levien (2004) call a 'keystone organisation' — whose role is valued by the rest of the ecosystem members. The leader acts as a platform provider to other ecosystem members. It provides an open platform on which other members can build, innovate, and thus, help increase the customer value of the ecosystem products and services (Adner and Kapoor, 2010; Iansiti and Levien, 2004; Teece, 2007). Leadership also helps ecosystem firms develop common goals and invest in a shared future (Iansiti and Levien, 2004; Nambisan and Baron, 2013). Ecosystems cross a variety of industries and contain several ecosystem domains (Iansiti and Levien, 2004). Specialised new ventures that are developed within ecosystems but that do not fit with the core functions of the ecosystem also may develop independent specialised niches around them (Moore, 2006; Zahra and Nambisan, 2011).

Business ecosystem and innovation ecosystem concepts often are discussed in parallel. Wright (2014) separates these concepts by pointing out that business ecosystems also include the customer's side, which is often absent in innovation ecosystems. In addition, an innovation ecosystem can be viewed as a wider concept that also includes the political, economic, and technological environment. The innovation ecosystem concept also brings out the dependence on complementary innovations. A characteristic of innovation ecosystems is their ability to produce new niches. Niches are developed by unexpected collisions producing serendipity. Radical niches play an important role in sociotechnical transitions that tackle 'wicked problems' deriving from the macro-level changes. Sociotechnical transitions are radical innovations in structures, mind-sets, and practices that involve actors from different sectors, domains, and scale levels (Loorbach et al, 2010). Transitions are taking place in an interplay between three levels: changes at the landscape level that exert pressure on the existing sociotechnical regime; radical niches that may challenge the existing regime; and radical niches that may act as 'seeds for change' in times of regime destabilisation (Geels, 2002; Geels and Schot, 2007). Examples of sociotechnical transitions are, for example, transitions in mobility systems, communication, health care, and energy production. Transitions cannot be planned nor controlled, but they

can be initiated, supported, and accelerated with, for instance, practical actions and policy measures (Loorbach and Rotmans, 2006).

Innovation processes and value creation in business ecosystems are based on open innovation and co-creation, and therefore, these ecosystems are able to address new business domains (Moore, 2006). Furthermore, the radical openness, complementary industries, and the cooperative, complex, and self-organising nature of business ecosystems create a fertile ground for the birth of new technological niches and start-up populations, compared to, for example, traditional national or regional clusters that are built around a certain industry and related businesses in which the knowledge inside and essential to clusters is highly specialised (Porter, 1998; Porter, 2000).

Ecosystem niches can act as seeds for change when the current regime is experiencing destabilisation due to macro-level landscape changes, such as climate change and population ageing. These niches function as local breeding spaces and spaces of experimentation for radical innovations and new technologies where they can develop further and grow (Kemp et al, 2001). Radical innovations are created in niches, while existing regimes are able to produce mainly incremental innovations (Geels, 2002). When the transition of the technological regime is considered desirable, niches can be managed strategically to provide protected spaces for promising new technologies and their supporting social networks to develop (Kemp et al, 2001). These niches can be managed by firms, governments, and other social actors, and ecosystems as networks of firms and other actors can provide an easy access to cooperation partners, funding parties, and potential customers.

2.2 Ecosystem-Supporting Innovation Policy

Innovation theory and policy learning are an integrated, co-evolving, and interactive process (Mytelka and Smith, 2002). Sotarauta and Srinivas (2006) took an evolutionary perspective on economic development policy and studied the co-evolution of intention and emergence, specifically, how policy co-evolves with spontaneous economic development. They stated that we should understand the co-evolution of policy and development to prevent policies from disconnecting themselves from the actual local needs. For example, innovation policy in Finland, for a long time, has been based on cluster development rather than on ecosystem development, though business logics have changed due to the Internet economy, and openness, cooperation, and networked value-creation structures have been emphasised. Although business and innovation ecosystem literature has increased drastically, the policy suggestions offered by this literature are still rather scant.

Ecosystems consist of several, often rather small, firms. This makes policies related to the role of small and medium-sized enterprises in innovation and economic development relevant for ecosystem-supporting policies. Moore (2006) sees business ecosystems as potential sources of new entrepreneurship and, therefore, argues that helping ecosystems address new 'opportunity spaces' is important for a society that hopes to attract entrepreneurs and be innovative. Mason and Brown (2014) discuss how to support these entrepreneurial ecosystems by public policies and emphasise the need to create different policy approaches for different kinds of ecosystems and to use holistic implementation of these policies. Ecosystems can be supported by policies that are a blend of top-down and bottom-up policies. The involvement of major businesses in the bottom-up initiatives is also of special importance (Mason and Brown, 2014). As the dynamism and complexity is characteristic of business ecosystems, policy approaches also need to evolve over time and respond to the different maturity phases of ecosystems.

Based on their study of knowledge and innovation ecosystems in Flanders, Belgium, Clarysse et al. (2014) argue that policy has focused too much on bilateral links rather than on an ecosystem approach. They also note that large firms are important collaboration partners for start-ups, and attracting these potential keystone organisations to join ecosystems is important for regional business ecosystem development. Clarysse et al. (2014) also suggest that large public companies could be encouraged to take a bigger role in nurturing innovative start-ups in the region. The same research also emphasises the need to link regional knowledge ecosystems better with regional business ecosystems. Despite the wide business and innovation ecosystem related research and these suggestions for innovation policies based on the ecosystem perspective, a wider policy framework for innovation policy that supports ecosystems is still lacking. This study seeks to fill the gap between the business and innovation ecosystem research and the policy perspective on the ecosystem development.

3. Research Methods

This study was conducted using a multiple case study approach to examine different types of ecosystems as seedbeds for new innovations and their formation, functioning, and evolution. The data were gathered within a research project consisting of several case studies examining spatial business ecosystems and local innovation platforms. The innovation policy focused study was part of the larger project ensemble. The case study approach is found to be especially appropriate for new topic areas (Eisenhardt, 1989; Yin, 2009). The chosen research approach allowed the investigation of real-life ecosystems, retaining a holistic view of the research problem, and utilising multiple sources of evidence and data-collection methods (interviews, observations and literature and internet sources). The purpose of the multiple case study approach was not to compare the case ecosystems to each other, but rather to use them to complement each other in order to gain a wide view of the phenomena and the different phases of business ecosystem evolution.

The case studies do not focus solely on business ecosystems as, for example, Moore (1993; 2006) defined them but rather on the spatial, social, economic, and political setting wherein business and innovation ecosystems are developed and evolve over time. The case studies were chosen to represent both a successful international business ecosystem, an emerging business ecosystem and technology focused smart card innovation platforms that work as seedbeds for potential new business ecosystems.

The case studies were conducted between January 2014 and July 2015. Both methodological and investigator triangulation was utilised during the research process. The case studies, data, and results were discussed among the research group throughout the research process. Also, a workshop where the case study findings were discussed in innovation policy context among the whole research group was organised in June 2015. The innovation policy focused analysis was conducted between June 2015 and December 2015. More detailed information on the case studies are presented in Table 1. In addition to the case study data, additional data was gathered to complement the case study data. These data consist of policy-level interviews (n = 8) and an innovation policy panel discussion with five Finnish innovation policy experts. Both the interviews and the panel discussion were conducted in May 2015.

Table 1. Case studies and related publications

Case study	Publication
The San Diego Health and Life Science Ecosystem	Majava et al 2014, 2016, forthcoming
The Finnish Winter Road Maintenance Ecosystem	Leviäkangas et al 2014, 2015
Smart Card Platforms	Kinnunen et al 2015

4. Summary of the Findings

Using multiple sources of data enabled the examination of business ecosystems and innovation platforms comprehensively and from different perspectives. Case study data offered a view to real-life ecosystems and their activities and the public sectors' ways and possibilities to enhance/hinder ecosystem development. The complementary interview material and notes from the panel discussion offered a wider policy perspective and context to which reflect the case study results and make policy related conclusions. The summary of the findings present the key policy focused findings identified based on the empirical material.

Ecosystems are by definition self-organising and complex systems, which also makes them potential platforms for radical innovations and niche development. Niches are developed by unexpected collisions that produce serendipity. The interview material that was collected by interviewing eight Finnish top-level innovation policy experts suggested that an ecosystem-based innovation policy calls for the intentional mixing of different fields, feeding variation, and looking for the unknown and unexpected. Combining specialised knowledge bases and finding new solutions from the intersections of different fields requires cooperation and openness in innovation processes. Also, users and citizens can be utilised in these processes, not only for feedback and as testers, but also as co-creators. In terms of innovation policy, feeding variation and looking for the unknown

also could mean increased flexibility, the ability to support fields directly (note: not specific industries or clusters), and mixes of fields showing growth potential. Both the analysis of interviews and the case material led to the conclusion that ecosystem-based innovation policy cuts across different policy sectors, such as industrial policy, energy policy, education policy, and economic and employment policy.

The development of San Diego's health and life science ecosystem is a good example of the role of strong research organisations. The University of California of San Diego and the most established research institutions in the region were identified as some of the key actors of the ecosystem. Radical innovations can be the result of pure serendipity or persevering research and development work within research organisations or firms. For innovation policy, this means that both long-term research and development (R&D) work, as well as fast trials and experiments, should be funded. Ecosystems evolve through trials and experimentation, which requires a new kind of experimentation culture that, according to the interviewees, also could be enhanced through policies:

'So, I would, very strongly, instead of this planning culture and roadmap culture, go for experimentation culture. Let's try different things in real world with real people whether they are citizens or end users or companies. But let's try what works and what doesn't and let's build structures where under the label of experimenting we also allow failures and are ready to cut the path if it is not successful. And at the same time we should be ready to allocate resources very quickly to areas showing growth potential.' Interviewee 1

'...When again this evolutionary model means that we promote diverse experiments and diversity, and then we have to have the ability to analyse and evaluate the results of these experiments and make choices based on them and learn from them. (We should) choose the best experiments for further development, persevering...this public-private type of development and then abandon the unsuccessful experiments.' Interviewee 7

Policies can enable and support the adaption of this culture by offering platforms for co-development and support pilots, demo phases, and rapid prototyping that lead to new innovations. The smart cards case study that focused on smart cards in public transportation in terms of diffusion and externalities provided good examples of the utilisation of technological platforms to enable innovation and co-development between various organisations (see Kinnunen et al, 2015). Public procurements could be better utilised to foster these trials and pilots by offering resources and demand for solutions that also have wider scalability. The importance and the potential of fostering ecosystem development and co-development between different actors through public procurements were emphasised especially in the findings of the winter road maintenance ecosystem case study. In their case study report Leviäkangas et al (2015: 29) note, for example, that *'procuring from ecosystems is actually one the most efficient ways of turning the societal values into market values'*.

As seen in the case studies, especially the San Diego health and life science ecosystem case, and the ecosystem literature, lead firms play a key role in ecosystem evolution. These large and leading organisations are in a key position in ecosystem development to open up their development platforms for other contributors and possibilities for new ventures. When opening up their R&D activities and innovation platforms for outside contributors, these firms can benefit themselves and also other ecosystem members. For start-ups and other small firms, it might be crucial for their success and growth to gain access to business ecosystems led by large firms and to be a part of their value-creation network. This type of ecosystem-based thinking in lead firms calls for a new type of strategic thinking from firm management. The case studies' ecosystems showed that innovation ecosystems are not always managed with top-down hierarchical systems, although the role of the leading keystone organisation or company is prominent. The management of the ecosystem is more of a peer-to-peer type of management, wherein the leading organisation sets the direction and formats the common strategy. As these ecosystems are self-organising entities, it is not the role of policy to manage them through funding mechanisms, programmes, or public organisations. The role of policy could be an enabler rather than a manager.

In response to the so-called 'wicked problems', such as climate change, that have a significant effect on societies at large, legislation also can be used to direct developing innovative ecosystems based on new technology around certain fields (such as green energy and cleantech). Ecosystem-based policy is not about picking the winners. Instead of choosing specific industries or actors, policy makers can choose certain wider

and cross-cutting fields from which new collisions and innovations potentially can be developed and the wider societal challenges to which new solutions are sought.

5. Discussion and Conclusions

Innovation policies have been aimed at supporting development, such as cluster development. However, the changes in the global and national innovation environments call for a new type of innovation policy approach that takes into account the development mechanisms of business ecosystems. A good idea and a new innovation alone can go far, but building an ecosystem around it or connecting it to an existing business ecosystem can further its implementation and new applications. Business ecosystems work as seedbeds and nurture new technology niches. Radical innovations that can challenge existing technological regimes that are sustained by different societal groups are created within these niches (Geels, 2002). Ecosystem-supporting policy is aimed at supporting the development of new innovation platforms, new emerging ecosystems, and assisting in ecosystem renewal. Ecosystem-based policy actions also have an effect on niche development potential within ecosystems as well as on creating new ecosystems around technology start-ups. Ecosystem-supporting innovation policy perceives the need for constant evolutionary change. According to Geels (2002), radical innovations break out by following trajectories of niche-cumulation. The growth from niche to regime level occurs gradually as new innovations are used in subsequent application domains. Developing a suitable business ecosystem around new products or services or connecting them to existing ecosystems may provide a fertile ground for growth. Geels (2002) notes that policy also plays a role in the selection environment of technological evolution. For example, laws and regulations can be utilised to hinder the development of certain untraditional and unexpected technologies or business models. New innovations can develop into political questions as they start to challenge existing structures and industries.

Business ecosystems which operate according to old operational models and produce mostly incremental innovations are also important, as due to the nature of their activity, they can help create new niches, sustain them alongside their core activities, and utilise them in ecosystem renewal. Through business ecosystems, new technological innovations are connected more easily to existing technological systems, as radical innovations are rarely successful on their own. As Moore (2006: 32) notes: 'For every advance there are complementary innovations that must be joined in order for customers to benefit.' Geels (2002) has argued that breakthroughs of radical innovations are based on technological add-on and hybridisation, which means that new innovations physically link up with established technologies.

This study offers suggestions for the basis of innovation policy that supports ecosystem and niche development based on multiple case studies and additional material. The suggestions can be summarised briefly as follows:

- intentional mixing of different fields;
- feeding variation and looking for the unknown and unexpected;
- platform development, for example, through public procurement;
- supporting pilots, demo phases, and rapid prototyping;
- utilising legislation to direct developing ecosystems based on new technology around certain fields; and
- supporting cross-cutting fields showing potential for new collisions and radical innovations.

This study presents the basic elements for innovation policy that supports ecosystem and niche development. Future research could focus on the practical implications and potential policy tools for different contexts and policy levels (national, regional, and local). Furthermore, future research also could widen the perspective offered here by combining it to transition management and transition policy research and to explore what the role of ecosystem development is as a new business logic in sociotechnical transitions (see also Walrave et al, 2013). Our study utilised material from case studies focusing on business ecosystems and innovation platforms. Gaining more knowledge about certain types of ecosystems that are in different development phases could help deepen the analysis and provide more focused policy implications.

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Publication VI

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Business and innovation ecosystems – innovation policy implications

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Business and Innovation Ecosystems: Innovation Policy Implications

Abstract: The concepts of the business ecosystem and innovation ecosystem have become highly utilized in business and innovation studies. However, research on the innovation policy implications of these concepts and the ways ecosystems emerge and evolve is still rather scant. This study utilized a multiple case study approach to study real-life business and innovation ecosystems in an innovation policy context. Based on the case study findings and other empirical data, the key elements of ecosystem-based innovation policy were outlined. Business and innovation ecosystems are strongly self-organizing and the role of the public sector is to support their self-renewal capacity. Ecosystem-based policy approach consists of elements such as a testing and experimentation culture, funding through public procurement and the positive questioning of existing procedures, and it crosses the traditional policy boundaries. Adopting the ecosystem perspective in policy making requires interaction between different policy fields and levels.

Keywords: business ecosystem; innovation ecosystem; innovation platform; innovation policy; case study

1 Introduction

The use of the word *ecosystem* outside of an ecological context has increased drastically, especially in the business world (Hwang, 2014; Majava et al., 2013), which perhaps reflects a change in the way we think about business and innovation (Gobble, 2014). Papaioannou et al. (2007) have criticized the increasing use of the ecology approach and ecosystem concept in innovation studies. They argue that since knowledge and innovation are historically developed social processes of cooperation and conflict they cannot be discussed and studied as harmonious processes of natural adaptation to the changing conditions of the environment. Business and innovation ecosystems are by definition self-organizing and emergent systems, which also makes intentions to influence them through public policy questionable. However, the policy problems related to the changes in global as well as national operational environments and modern societies as a whole are extremely complex and call for new policy approaches. Hämäläinen (2015) argues that the complexity gap in policy, which stems from the gap between the complexity of the policy problem and the variety of the corresponding governance arrangements, can be closed with new governance solutions including, for example, participation, collective learning processes, interaction and cooperation among stakeholders, and diversity and experimentation. Innovation ecosystems are highly complex by nature, involving, for example, entrepreneurs, researchers, venture capitalists, and public and civic sector actors. The study of business and innovation ecosystems takes into account this complexity instead of studying these ecosystems merely as harmonious processes of natural adaptation. A study by Hämäläinen (2015)

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focuses on the governance solutions to the wicked problems of societies but it also presents a basis for creating an evolutionary perspective on policy that can also be utilized when framing ecosystem-supporting innovation policies. Also, Sotarauta and Srinivas (2006) have shown that economic development (as an emergent process) and policy (as intentional actions) co-evolve and that policy can influence future development through strategic adaptation, instead of only being adaptive and reactionary in nature (as it often is).

It has been acknowledged that competition happens between business ecosystems rather than between individual firms or clusters (Moore, 1993; Hearn and Pace, 2006). The amount of research on business and innovation ecosystems is rapidly increasing but research on the policy implications of these concepts is still rather scant. We have gained understanding about how business and innovation ecosystems are developed, how they evolve and what type of actors they consist of through several studies, but there is still a lack of understanding about the role of the public sector and public policies and how they can support the birth of new ecosystems and their growth and renewal. The research question set for this study is: How can innovation ecosystem development be supported by means of innovation policy?

The study contributes to current innovation policy theory by bringing an important and contemporary business and innovation concept to innovation policy research and examining it empirically in an innovation policy context through multiple case studies. Furthermore, in addition to the theoretical contribution, the study has a clear practical contribution as well. The results of the study present the practical implications of applying the ecosystem approach in innovation policy at national and regional levels. These implications are not designed or targeted to a specific national or regional setting – rather, the emphasis has been on providing a basis for applying the ecosystem approach in any nation or region.

The data has been gathered within a research project consisting of several case studies examining spatial business ecosystems and local innovation platforms. The case studies do not focus solely on business ecosystems as, for example, Moore (1993; 2006) has defined them but rather on the spatial, social, economic and political setting wherein business and innovation ecosystems are developed and evolve over time. The case studies do not examine ecosystems at an enterprise level but rather at a system level, focusing on the observations and findings that have connections to the policy level. Also, additional data has been gathered to complement the case study data.

The aim of this paper is to present the innovation policy implications of the ecosystem case studies. The purpose is not to provide specific policy guidelines for innovation policy regardless of context but to sketch a basis for innovation policy that takes into account the nature of business and innovation ecosystem development and bring out the distinction between this type of innovation policy and the currently applied policy approaches. After the introduction section, the paper presents a literature review opening up the recent discussion around business and innovation ecosystem concepts, including the innovation policy context. The third section presents the research design and includes short descriptions of the case studies. The fourth part summarizes both the case study findings from an innovation policy perspective and the policy implications of these findings. This is followed by the fifth section that discusses the results of the study in the light of previous literature. The last section presents some concluding remarks.

2 Ecosystems and innovation policy

The rise of the internet economy has led to changes, including those in business logic. The changes in operational environments and competition have shifted from head-to-head competition to competition between different value networks. In the 1990s James F. Moore (1993) was the first to bring the ecosystem analogy over to business and innovation studies. Although the business ecosystem concept has been adopted in academic literature quite recently, it has quickly gained popularity and is increasingly used when discussing business collaboration (Majava et al., 2013). However, despite of the wide adoption of the ecosystem concept in academic literature, these theoretical underpinnings have thus far failed to construct a coherent theoretical framework (Thomas and Autio, 2014).

According to Moore (1993), firms should not be seen as a part of an industry but as a part of an ecosystem wherein companies cooperate, compete and co-evolve capabilities around a new innovation. He defines a business ecosystem as ‘a type of a business network, a collaboration to create a system of complementary capabilities and companies’ (Moore, 2006). Typically these network relationships are loose, which makes ecosystems adaptable as fruitless connections can be cut and new ones formed at a rather fast pace (Iansiti and Levien, 2004). Basically, a business ecosystem can be opened up to all possible contributors and participants, and thus create an organizational form of distributed creativity. Ecosystems cross a variety of industries and contain several ecosystem domains (Iansiti and Levien, 2004). Ecosystems may also consist of independent niches that can be developed within an ecosystem by specialized new ventures (Moore, 2006; Zahra and Nambisan, 2011).

A business ecosystem has a leader, or as Iansiti and Levien (2004) put it, a *keystone organization*, whose role is valued by the rest of the ecosystem members. The lead firm provides an open platform that offers solutions to other members and on the basis of which other firms can build and innovate in order to increase the customer value of the ecosystem products and services (Iansiti and Levien, 2004; Teece, 2007; Adner and Kapoor, 2010). A substantive subset of the literature proposes platforms as the coordinating artefact that the lead firm uses, but Autio and Thomas (2014) also note that although a successful platform typically has an ecosystem surrounding it, not every ecosystem needs to have a platform at its core. The leadership role of the leading organization enables ecosystem firms to invest in a shared future and common goals bind the ecosystem members together (Iansiti and Levien, 2004; Nambisan and Baron, 2013).

The ecosystem concept differs from the other network-centric constructs – such as clusters, innovation networks and industry networks – by its inclusion of both producers and users, including complementary asset providers and customers (Autio and Thomas, 2014). In addition to its broad-based coverage, an ecosystem is also distinguished by its focus on value co-creation. In an innovation context the ecosystem concept comes close to the open innovation concept in not limiting the actors (the potential co-innovators and co-creators) to internal R&D actors and functions (Durst and Poutanen, 2013).

The business ecosystem and innovation ecosystem concepts are often discussed in parallel and without making a clear distinction between the concepts. Compared to innovation ecosystems, business ecosystems include the customer side that is often absent in innovation ecosystems (Wright, 2014). An innovation ecosystem can be viewed as a

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wider concept that also includes the political, economic and technological environment. The innovation ecosystem concept brings out the dependence on complementary innovations. According to Wessner (2007) an innovation ecosystem is based on the concept of a national innovation system (see e.g. Freeman, 1987; Lundvall, 1992; Nelson, 1993). However, the ecosystem approach takes, for example, market mechanisms better into account than the traditional innovation systems approach, which emphasizes the role of non-market institutions (Papaioannou et al., 2007). Ecosystems are brought to discussions also to emphasize the complex nature of innovations and innovation activities and the interaction and interdependency between different actors. Gobble (2014) summarizes that the central idea of the innovation ecosystem concept is a kind of radical openness to collaboration and sharing, and an awareness of the ecosystem the organization inhabits, which can lead to new opportunities for growth.

Based on their literature review, Durst and Poutanen (2013) state that a better conceptual understanding of innovation ecosystems is essential in order to benefit from the analogy and suggest better conceptual linking between innovation and ecosystem literature in the future. Yawson (2009) has built a framework – the Ecological System of Innovation – for national innovation policy. Yawson's model consists of four phases: (1) the definition of national innovation goals, (2) defining the national innovation requirements, (3) gap identification and a solution space and (4) prioritizing the components of the innovation system. Yawson's work provides an architectural model for policy planning with several tools to be used in different policy-building phases.

Regardless of the vast amount of ecosystem literature published during recent years, policy suggestions offered by business ecosystem literature are still rather scant. Moore (1993) pointed out that from the ecological perspective it is not desirable or wise to support failing ecosystems but, rather, it is better to ensure that the competition among ecosystems is fierce and fair. It is fairly obvious that, as ecosystems consist of several (often rather small) firms, policies should draw special attention to the role of small firms in innovation, economic growth and employment. Wessner (2004) lists some innovation ecosystem policy lessons based on experiences from the United States. He advises focusing innovation programmes on the individual entrepreneur, basing government fund granting on a competitive basis, improving markets by encouraging private initiatives, fostering a culture of innovation and matching policies to market realities. Moore (2006) also stresses the importance of ecosystems being able to address new business domains. He argues that helping ecosystems (for example, with financing) to address new 'opportunity spaces' is important for a society that hopes to attract entrepreneurs and be innovative. Mason and Brown (2014) discuss the role of policy in supporting these entrepreneurial ecosystems especially. One of their conclusions is that, despite sharing various common characteristics, every ecosystem is unique and therefore every ecosystem also needs a different policy approach, and policy implementation has to be holistic. Since ecosystems are dynamic and complex by nature, policy approaches also need to evolve over time and according to the maturity phase of the ecosystem. According to Mason and Brown (2014) ecosystem-supporting policies should be a blend of top-down and bottom-up policies, wherein the involvement of major businesses is also important in the bottom-up initiatives.

Clarysse et al. (2014) have studied knowledge and innovation ecosystems in Flanders, Belgium, and provided policy implications based on their study. First, their analysis suggests that policy has overall focused too much on bilateral links rather than on an ecosystem approach. They also suggest that public procurement policies may provide an

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important stimulus to the creation of business ecosystems and that, since the importance of a leading anchor company is acknowledged, large public companies could be encouraged to play more of a leading role in nurturing ecosystem development in the region. It is important to bring and attract large corporations into the ecosystem and collaborate with innovative start-ups because a healthy business ecosystem requires both a healthy keystone organization and healthy innovative start-ups (Clarysse et al. 2014). They also suggest developing policy initiatives and incentives to stimulate the development of financial support networks.

Durst and Poutanen (2013) have reviewed research on innovation ecosystems in order to derive success factors supporting the implementation of them. The success factors are related to resources, governance, strategy and leadership, organizational culture, human resources management, people, technology, partners and clustering. These success factors concern the innovation ecosystem as a whole, not just individual organizations. The factors include, for example, continuous investments in infrastructure, systematic risk assessment, clear role assignment, and openness to failure and chaos, which can also be seen as relevant for innovation policies supporting innovation ecosystem development.

A critique of the ecosystem analogy to innovation has been presented by Papaioannou et al. (2007) in their evaluation of the knowledge ecology concepts and the related implications for innovation systems theory. They remind us that knowledge and innovation need to be looked at in the context of the historically founded processes of economic and social development. They argue that the innovation ecosystem concept fails to capture the complexity of the socially dynamic environment of knowledge and innovation, and therefore merely provides a simplistic explanation of economic and social evolution. Peltoniemi and Vuori (2004) direct their critique at policy efforts to support ecosystem development. They bring out the notion that if we follow the theory of ecosystems as complex, self-organizing and self-sustaining systems, then no government interventions should be needed for them to survive in global markets.

3 Research design

The study utilized the multiple case study approach. The case studies formed a larger project wherein the aim was to study different types of ecosystems as seedbeds for new innovations and to study their formation, functioning and evolution. The purpose of the multiple case study approach was not to use the cases for comparison between different types of ecosystems but rather use them to complement each other in order to gain a wide enough view of the phenomena. The innovation policy related research was part of this project ensemble and utilized the data and results gained from the case studies. The case study approach allowed the investigation of real-life ecosystems, retaining a holistic view to the problem and utilizing multiple sources of evidence. The case study approach is found especially appropriate in new topic areas (Yin, 2009; Eisenhardt, 1989). One criticism of the case study approach is related to generalizing on the basis of an individual case or a few cases. It might also seem difficult to summarize and develop general propositions on the basis of specific case studies. However, Flyvbjerg (2006) argues that the case study may in fact be central to scientific development, via generalization, as a supplement or alternative to other methods.

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The research process is presented in figure 1. The case studies were conducted between January 2014 and July 2015. The case studies, and their data and results were discussed among the research group throughout the research process, but the more thorough innovation policy – focused on analysis of the case studies – was conducted between June 2015 and September 2015.

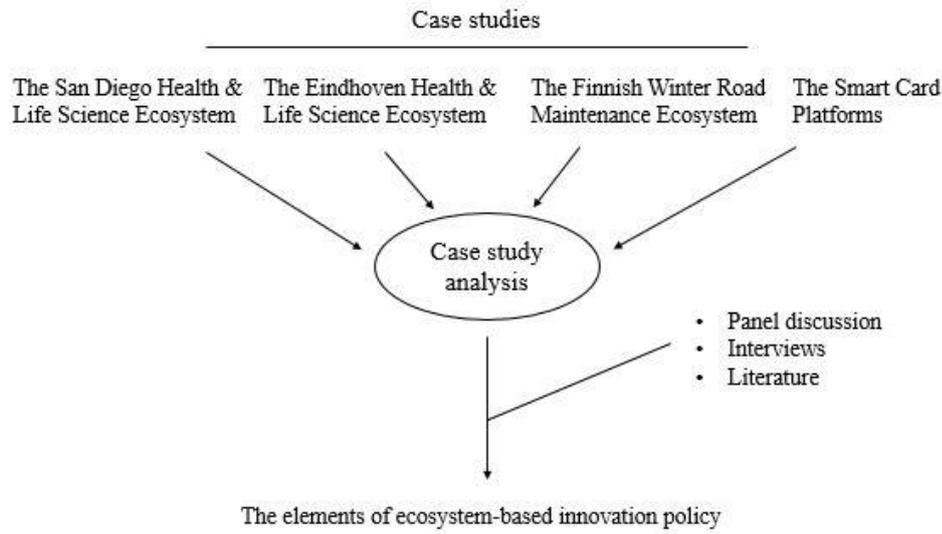


Figure 1. The research process

The lessons learned from the case studies and their policy implications were also discussed among the research group in a workshop organized in June 2015. The case study data was supplemented with interviews of Finnish innovation policy experts and a panel discussion among five innovation policy experts. This additional data helped to put the case study results into a Finnish innovation policy context as the interviewees and panellists represented different policy level expertise and organizations closely related to Finnish innovation policies. The case studies are not elaborated on in detail here as it is not the purpose of this paper and additional information about the case studies can be accessed through other research papers. However, as our study is based on these empirical case studies and the analysis of the case study results, the cases are presented very briefly below to get a grasp of the case ecosystems.

3.1 Case study 1: The San Diego Health and Life Science Ecosystem

The first case study focused on the study and analysis of the health and life science ecosystem of San Diego in the US. The San Diego ecosystem was studied as a spatial business ecosystem focusing on the different actors and their roles within the ecosystem, ecosystem growth drivers and growth inhibitors, the role of trust among the ecosystem

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actors and the evolution of the ecosystem. The ecosystem consists of more than 600 companies operating in San Diego. An important part of the ecosystem is the regional programme called CONNECT that was originally founded as a part of University of California San Diego (UCSD) in 1985. The programme is designed to catalyze the creation of innovative technology and life sciences' products by linking innovators, investors and entrepreneurs with the needed resources. The case study results that are especially related to the role of CONNECT in the ecosystem are presented in an article by Majava and his co-authors (2015).

3.2 Case study 2: The Eindhoven Health and Life Science Ecosystem

The second studied ecosystem was also a spatial business ecosystem focused on health and life science business, located in Eindhoven in the Netherlands. The region currently houses approximately 825 businesses that are active in the health sector, including large multinationals like Philips Healthcare. What also made Eindhoven an interesting case study is its reputation as one of the world's leading open innovation environments. The High Tech Campus – hosting only Philips Research buildings in the past – now hosts over 100 companies and over 8000 high-tech people, forming an open innovation ecosystem that is completed by service providers and research institutes. The case study focused on the ecosystem actors, growth drivers and growth inhibitors, the Brainport Development concept and its role in the ecosystem evolution, the roles of the Eindhoven University of Technology and the High Tech Campus, and the overall evolution of the ecosystem.

3.3 Case study 3: The Finnish Winter Road Maintenance Ecosystem

The third case study focused on a Finnish winter road maintenance ecosystem, an emerging sectoral and national business ecosystem in Finland. The core of the ecosystem consists of a group of Finnish companies and their expertise and know-how related to winter road management. The ecosystem actors cover a variety of companies, ranging from meteorological observation technologies to winter maintenance equipment supply, and meteorological services and service concepts. Along with the different ecosystem actors and their roles, the case study focused on the risks and revenues of sharing, collaboration and the possibilities of accessing new markets and on whether public innovation support mechanisms play any role in these. The case and its results have been opened up in more detail by Leviäkangas and his co-authors (2014; 2015).

3.4 Case study 4: Smart Card Platforms

The last case study examined smart card platforms in public transportation. These technology platforms were examined as sources of innovations and in terms of diffusion and externalities. The study included four different smart card platforms: Octopus (in Hong Kong and parts of China), Oyster (in the Greater London area), EasyCard (in the Greater Taipei area and other parts of Taiwan) and OV-chipkaart (in the Netherlands).

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The study on these smart card platforms produced new knowledge on the development, successful implementation and diffusion of technology platforms for innovations in a spatial context. As new business ecosystems are built around new platforms – like these technology-based smart card platforms – understanding the success factors, and growth enablers and growth inhibitors is also important for policies aiming at supporting new-platform development and growth. A more detailed description of the case study and its results is presented in an article by Kinnunen et al. (2015).

4 The innovation ecosystem concept in innovation policy framework

4.1 Case study findings

The case studies presented above examined spatial business and innovation ecosystems and platforms. The case study findings presented here are a summary of all four case studies and present the findings relevant from an innovation policy perspective. The findings based on additional data (interviews, the panel discussion and the literature) are merged to these case study findings in the next section.

Ecosystem enterprises form the basis of all business and innovation ecosystems. The role of a lead firm / keystone organization is significant, especially in the beginning of the ecosystem's development. In more mature spatial innovation ecosystems the ecosystem is still formed around a central node that can, in addition to a large firm, be another type of organization (like the CONNECT programme in San Diego). The following are essential for ecosystem evolution and growth: fostering an entrepreneurial culture, accelerator and incubator organizations, gaining access to venture capital and angel investors, and providing mentoring programmes for start-ups. An incubator organization can also work as an important trust enabler among ecosystem actors.

Much of the case study research focused on innovation platforms within ecosystems – on one hand on wider innovation platforms within spatial innovation ecosystems and, on the other hand, on innovation platforms within business ecosystems. These platforms can be seen as a 'common space' – usually provided by local company or organization – that brings local actors together, promotes networking and works as a base for ecosystem development. The platform is built around a certain node in the network whether it is a private firm, development organization, university or a research institution. It is essential to get the key players to commit to platform development from the beginning. In the case studies, and especially in the health and life science ecosystems, universities and research institutes often act as the ecosystem platform provider due to the nature of the knowledge needed in these ecosystems. These platforms work as seedbeds for ecosystem growth and new start-up activity. Universities and research centres are some of the most important growth drivers of an ecosystem and platforms for new discoveries that acquire research funding, create new knowledge and technologies, and train new talent.

Health and life science ecosystems are based on analytical knowledge (Asheim et al., 2011) that is produced in universities and research institutions. However, as these high-tech fields are dependent on basic research and scientific knowledge, many innovation ecosystems (like the winter road maintenance ecosystem in the case studies) are based on synthetic knowledge that refers to activities wherein innovation takes place through the application or novel combinations of existing knowledge. The university–industry links are also highly relevant for synthetic knowledge but they are more in the field of applied

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research and development than in basic research (Asheim et al., 2011). Know-how, new technologies and innovations – and especially their utilization and application – are at the core of these innovation ecosystems. Cooperation with and between firms could be encouraged and promoted, for example through public procurement models as these currently (at the moment in Finland at least) do not encourage firms to collaborate, co-create and share information. The innovation aspect could be better connected to procurement models and processes, and innovative procurement models could also be financially supported and risk-taking enabled within these models. Rewarding new ideas and trials could also be included in the procurement models.

For spatial innovation ecosystems a well-functioning top-down led triple-helix cooperation (that brings together universities, industrial actors and the government) is needed to enable a bottom-up quadruple helix (see e.g. Carayannis and Campbell, 2009; McGregor et al., 2010; Lindberg et al., 2014; Markkula, 2014) that is based on individuals. Quadruple-helix cooperation also involves citizens as users and innovators in development and innovation work. Public service providers, such as hospitals, schools and public transportation, can provide test beds and piloting platforms for firms and access to end-users.

In the case of ecosystems, the public sector acts as a gatekeeper that sets the rules for ecosystem operations and competition through laws and regulations. In ecosystem studies it was noticed that it is important for ecosystem development and evolution that each member of the ecosystem identifies its role within the ecosystem and acts accordingly. The public sector and policy actors can act as enablers, facilitators, sponsors and regulative actors but not as business actors, which ought to also be taken into account in public-private cooperation. Public actors and organizations can provide a platform for cooperation and development – as well as other bases for ecosystem development and start-up activity – but the business actors, start-ups, SMEs and large enterprises are the ones driving the business side as the ecosystems start to emerge.

The case studies also bring out the importance of entrepreneurial culture and cooperation culture in the region, as well as the importance of the quality of life as an important factor that both attracts a highly-skilled workforce and entrepreneurs to the region and makes them stay in the region, thus helping to maintain the entrepreneurial ‘buzz’. Trust is an important enabler of cooperation and therefore also very important for the ecosystem’s success.

4.2 Ecosystem-based innovation policy

After analyzing the case studies, the findings were analyzed in the light of current innovation policy principles and mismatches between these two were observed. On the basis of the case findings and observed mismatches, principles for an innovation policy that takes into account the ecosystem characteristics and supports the ecosystem’s birth, growth and renewal were sketched. These principles are presented in table 1 and opened up in more detail below.

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Table 1. The elements of ecosystem-based innovation policy

Innovation ecosystem characteristics	The elements of ecosystem-based innovation policy
Complex and self-organizing	Innovation orchestration & facilitation; funding
Niche development	The flexibility to directly support fields showing potential and growth
Finding innovation potential from interfaces and unexpected combinations; complementary innovations	Intentional mixing; looking for the unknown and unexpected
Ecosystem management; the keystone organization's role; peer-to-peer management	Providing platforms for development; fostering ecosystem formation through public procurement
Global business ecosystems based on local/regional innovation ecosystems	Access to successful global ecosystems
Complex and self-organizing	Leaving room for serendipity; flexible projects to ensure dynamism
Open innovation; co-creation; users	Quadruple Helix cooperation
Trial-based; experimental; rapid prototyping in the real world	Experimentation culture; offering platforms; supporting pilots; trials and demo phases
Complex and self-organizing	Prioritizing the fields from which innovative collisions are expected but without defining what those collisions are and who collides
Rapid changes; new courses of action	Constant feedback mechanisms; cutting off failing trials and feeding the successful ones

The most prominent characteristic of innovation ecosystems is their complex and self-organizing nature. This has several innovation policy implications. First, the complexity and self-organizing nature of ecosystems requires that policies orchestrate and facilitate innovation through, for example, funding, public procurements, providing development platforms, and through laws and regulations. In the past, innovation policies have striven to avoid a 'picking-the-winners policy', which has led to developing rather dispersed funding mechanisms that provide a little for many but often not enough for anyone to be able to do long-term work and develop radical innovations. Ecosystem-based innovation policy is able to prioritize the fields from which innovative collisions are expected but without defining what those collisions are and who collides. Also legislation can be used to help develop successful ecosystems around certain fields, such as green energy and cleantech.

Innovation policies have traditionally used vast amount of resources in ex-ante and ex-post evaluation. As ecosystems change rapidly and take new courses of action, traditional heavy evaluation is mostly ineffective. From the ecosystem perspective more flexible and constant feedback mechanisms are needed in order to be able to cut off failing trials and feed the successful ones in time. This also signifies the end of traditional and (in the current environment) ineffective planning culture, project culture and

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roadmap culture. Ecosystems evolve through trials and experimentation, which requires a new kind of experimentation culture. Policies can enable and support the adaption of this culture by offering platforms in which these trials can be carried out and that support the pilots, demo phases and rapid prototyping that lead to new innovations.

Characteristic of innovation ecosystems is their ability to produce new niches. Niches are developed by unexpected collisions producing serendipity. Therefore an ecosystem-based innovation policy calls for the intentional mixing of different fields and looking for the unknown and unexpected, and as a result it also calls for the flexibility to directly support fields (and mixes of different fields) showing potential and growth.

Cooperation in, for example, regional innovation systems has been based on triple-helix cooperation bringing together organizations and representatives from universities, industries and the government. However, for ecosystems, users – alongside the other firms, research organizations and public sector representatives – are also an important group from a cooperation perspective as the roles and boundaries of producers and users have been obscured. Therefore quadruple-helix cooperation that also includes users and citizens as cooperation partners in open innovation processes is relevant for ecosystem development.

Although ecosystems are first and foremost global, their basis often lies in spatial local or regional innovation ecosystems. Developing innovations that have scalability is important in order to gain access to global ecosystems. Keystone organizations are often the key to these ecosystems, which makes it important to nationally and regionally develop innovation ecosystems that also attract large foreign enterprises in the sense of investments and cooperating partners.

The role of the public sector is to help develop activities that lead to the birth of commercial business ecosystems. Ecosystem management differs from, for example, traditional cluster management. Innovation ecosystems are not top-down, managed hierarchical systems, although the role of the leading/keystone organization or company is prominent. The management of the ecosystem is more of a peer-to-peer type of management wherein the leading organization sets the direction and formats the common strategy. The role of innovation policy in this is to help provide platforms for co-development and foster ecosystem formation through, for example, public procurement. It is not the role of policy to manage ecosystems through funding mechanisms or public organizations or programmes. The development of new innovations happens on different kinds of development platforms within the ecosystems. In this context the role of policy is not direct steering through, for example, traditional cluster programmes but orchestrating and enabling innovation, for example, by directing public procurements to enable the birth of new ecosystems and by strengthening the self-renewal capacity of existing ecosystems.

5 Discussion: The ecosystem perspective on innovation policy

The findings and research results presented in this paper support many of the policy conclusions of ecosystem research presented in literature. First, our study suggests a new approach to innovation policy that focuses on supporting innovation ecosystem development. Though our study focuses on innovation policy, it should be noted that (as Mason and Brown [2014] also note) policy implementation has to be holistic and that the

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ecosystem-based policy approach, as a wider policy approach, encompasses all policy fields, instead of only encompassing traditional innovation policy. Also Clarysse et al. (2014) call for an ecosystem approach to policies supporting the development of new business and innovation ecosystems. Hämäläinen's study (2015) focuses more on this wider perspective and the overall governance challenges wherein the evolutionary perspective on policy could be found useful. However, Hämäläinen's suggestions for governance solutions are also very applicable to the basis of ecosystem-based innovation policy and our study can be viewed to contribute to this previous research by presenting an ecosystem-based policy framework specifically in an innovation policy context.

Clarysse et al. (2014) present several of the policy implications of their study on business and knowledge ecosystems. They bring out the possibilities of public procurement to provide important stimulus to the creation of new ecosystems and also the importance of a leading anchor company in ecosystem development. Our study supports these conclusions. Public procurement can act as an important push for ecosystem development if procurement models are built to support cooperation and co-development. Although an ecosystem can also be built around another type of a node than a large enterprise, the role of large enterprises in ecosystem development is still prominent. Seeing their role more as a part of wider ecosystem(s) might help develop new business ecosystems around them. However, this is often more of a management issue rather than policy issue.

Connecting the ecosystem concept to innovation policy has been criticized based, for example, on the idea that if business and innovation ecosystems are by definition self-organizing and self-sustaining systems, then no government intervention is needed for them to survive and succeed. However, we argue that the role of the public sector in ecosystem development is not trivial or diminishing but in fact it can be significant or increasing, for example, through public procurements. Supporting ecosystems does not mean supporting ecosystems that do not seem to make it on their own and keeping alive dying industries but rather it means speeding up ecosystem development, feeding activities that produce raw material for new ecosystem beginnings and supporting early stage success. The criticism has its point in that when an ecosystem works well on its own, policy interference is not desirable. Policy tools can be useful in providing platforms for co-development and co-creation, speeding up the growth and development of successful new ecosystems and supporting ecosystem renewal.

Although ecosystems are not as bound to a certain location or region as, for example, industrial clusters are, the importance of proximity has not died out. Regions create and provide the basic circumstances and a springboard for ecosystem birth and early development. Mason and Brown (2014) state that, as every ecosystem is unique, the policy approaches targeted to ecosystems should be tailored according to each individual ecosystem. It is fairly obvious that it is not always easy or even possible to tailor national-level policies for each existing and emerging ecosystem. The role of regional and local level policies could be significant for ecosystem development as they can be more easily adapted to ecosystem needs.

6 Conclusions

Based on our research, the trend of competition happening more often between business and innovation ecosystems, instead of between individual firms, does not mean that the

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role of public policies is diminishing. When supporting ecosystem development, the prior role of the public sector is to act as an orchestrator, facilitator, enabler and platform provider. This role is carried out through different policy tools including, for example, funding, public procurements, providing development platforms, and also through laws and regulations that can help develop activities that lead to the birth of commercial business and innovation ecosystems.

The birth and evolution of business and innovation ecosystems can be supported by adopting a new type of policy approach that takes into account the nature and characteristics of innovation ecosystems that do not match with, for example, traditional cluster development. Although the focus in this ecosystem approach is on innovation policy, the ecosystem approach extends to several policy domains and should therefore be regarded as a cross-cutting policy approach. The core elements of ecosystem-based innovation policy differ in many ways from the traditional innovation policy elements. Ecosystem-based innovation policy is more about:

- funding through public procurement than individual projects
- orchestrating, enabling and facilitating than direct steering
- network facilitation than traditional cluster or network management
- quadruple-helix cooperation than triple-helix cooperation
- experimentation culture than planning culture

A lot of academic papers on business and innovation ecosystems have been published during the past decade or so. Although some of these previous research papers present implications from the policy perspective also, a more coherent description of (innovation) policy supporting ecosystem development has not yet (at least to our knowledge) been presented. The study contributes to both theory and practice. It furthers the somewhat underdeveloped (Thomas and Autio, 2014) theory on innovation ecosystems by widening the perspective to an innovation policy context and at the same time bringing a new perspective to innovation policy research. Although the elements of ecosystem-based policy presented here are more general guidelines and principles rather than detailed tools and advice for policy planners and practitioners, they still have relevance as guiding information and advice for policy planning and practice at different policy levels.

Though the multiple case study approach offers a wider perspective to business and innovation ecosystems than, for example, a single case study, some caution is needed when making generalizations based on the results. However, as the aim of this study is to provide an overall view of the elements of which ecosystem-based innovation policy consists, rather than to provide detailed advice on and tools for putting the principles of ecosystem policy into practice, the multiple case study approach (complemented with interviews, the panel discussion and the literature) was found to be a suitable research approach. It should also be borne in mind that the used policy approaches should take into account the context in which it is applied (including the history, unique regional characteristics, current policy etc.).

This paper presented the basic elements of ecosystem-based innovation policy in a general policy context. Future research could examine these elements in specific context, for example, in the European Union's supranational innovation policy and in a funding context. From the policy-makers' perspective it would be useful to examine what could be the most effective policy tools for different types of regions or nations in order to implement ecosystem-based innovation policy. Also, it would be useful to gain

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knowledge of the experiences from regions that possibly already have policy tools that are based on some of the elements presented in this paper.

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