
Smart specialization driving globalization of small and middle-sized companies in the Finnish region of Ostrobothnia

The article highlights five challenges in learning Smart Specialization: First, regional governance means to make difficult decisions in a number of fields which are at the core of economic development, welfare and human well-being. Allocation of resources has to be done in a transparent way, which creates legitimacy. At the same time, Smart Specialisation calls for regions to prioritize and be pro-active in promoting explorative and experimental strategies of growth. Secondly, experimentation means to work for co-evolution between analysis, partnering and integration of stakeholders into work plans and pilot actions. Third, experimentalist approaches can benefit from transnational learning from other regions. Fourth, it means to dive into complexity and dynamics surrounding the entrepreneurial discovery process and the innovation ecosystems, as well as fifth, to manage multi-level governance and interactions with national policies. This learning has led to a new understanding of the challenges of the regional innovation ecosystem, and a smart strategy. In this strategy small and medium sized businesses are seen as core actors in diversifying the regional export base. Furthermore, establishing policy instruments fostering regional connectivity and building new export-oriented value chains, where SMEs are enabled to collaborate with focal large enterprises constitute key outcomes of the strategy.

Este artículo destaca los cinco retos del aprendizaje de la Especialización Inteligente: 1) la gobernanza regional significa adoptar decisiones difíciles en un determinado número de ámbitos del desarrollo económico, del bienestar y del bienestar humano. La asignación de recursos debe realizarse de forma transparente, lo que crea legitimidad. Al mismo tiempo, la Especialización Inteligente solicita a las regiones que prioricen y sean más proactivas en la promoción de estrategias experimentales de crecimiento; 2) la experimentación significa trabajar en el análisis, colaboración e integración de los stakeholders en los planes de trabajo y acciones piloto; 3) los planteamientos experimentales pueden beneficiarse del aprendizaje transnacional de otras regiones; 4) Especialización Inteligente significa indagar en la complejidad y dinámica del proceso de descubrimiento empresarial y de los ecosistemas de innovación; y 5) una gobernanza de múltiples niveles e interacciones con las políticas nacionales. Este aprendizaje ha desembocado en una nueva comprensión de los retos del ecosistema de innovación regional, y en una Estrategia Inteligente. En esta estrategia, las pequeñas y medianas empresas son las protagonistas en la diversificación de la base regional exportadora. Asimismo, establecer herramientas políticas que fomenten la conectividad regional y construir nuevas cadenas de valor orientadas a la exportación, donde se permita a las pymes colaborar con grandes empresas, representan los resultados clave de la estrategia.

*Artikulu honek Espezializazio Adimentsuaren ikasketaren bost erronkak azpimarratzen ditu: 1) eskualde-gobernantzak erabaki zailak hartzen ditu garapen ekonomiakoaren, ongizatearen eta giza-ongizatearen muinean dauden zenbait alorretan. Baliabideen esleipena era garden batean egin behar da. Horrek zilegitasuna sortzen du. Era berean, eskualdeek hazkunderako estrategia esperimentalen promozioa lehenestea, eta jardun horiekiko proaktiboagoak izatea, behar du Espezializazio Adimentsuak; 2) esperimentazioak analisiaren, lankidetzaren eta ekintza-pilotuen eta lan-planen integrazioaren arteko eboluzio bateratu baterantz lan egiten du; 3) planteamendu esperimentalek beste eskualde batzuen nazioarteko ikasketatik onurak atera ditzakete; 4) Espezializazio Adimentsuak berrikuntza-ekosistemen eta enpresa-aurkikuntzaren prozesuaren inguruko dinamika eta konplexutasuna aztertzen ditu; eta 5) maila eta politika nazionalekin lotutako elkarreagin antzeko gobernantza. Ikasketa prozesu horrek eskualdeko berrikuntza sistema ulertzeko era berri bat ekarri du. Baita ere, estrategia adimentsu bat. Bertan, enpresa txikiak eta ertainak eskualdeko oinarri esportatzailearen dibertsifikazioaren protagonista direla jotzen da. Are gehiago, strategiaren emaitza nagusiak dira ETE-*ei* enpresa handiekin era puntual batean lankidetzan aritzea ahalbidetuko dizkien, eta eskualdeko konektibitatea eta esportaziora bideratutako balio-kate berriak eraikitzea sustatuko dituzten politiken tresnak ezartzea.*

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Keywords: smart specialization, entrepreneurial discovery process, internationalization, small and mid-sized companies, transnational learning.

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1. INTRODUCTION

The Region of Ostrobothnia is a small and open economy. The region is heavily affected by globalization owing to a high export propensity. The core of the export base is a sophisticated energy cluster. Currently, around 70% of the gross value output of the Vaasa energy cluster is exported. The export sector has generated viable regional suppliers and other down-stream effects, making Ostrobothnia among the top regional economic performers in Finland. Hence, maintaining international competitiveness is key to regional economic development and forms the focal point for policy strategies.

However, maintaining international competitiveness is increasingly challenging as regions are currently undergoing an industrial revolution that has been labelled Indus-

try 4.0. The industrial revolution is not only driven by global competition, it is also a conscious European policy to re-industrialize Europe. Moreover, it has become evident that the work on regional policy development must include a global perspective as globalization has direct and tangible regional effects. In this transformation, successful economic development is increasingly dependent on the regional capacity to learn and to adapt to new and much more demanding policy requirements.

The Region of Ostrobothnia has designed a development instrument, which since 2012 has recurrently been used for smart specialization planning and monitoring. This article sheds light on experiences gained in implementing smart specialization strategies in the region. In particular, the article poses the following research question: What are our experiences in applying this instrument to promote entrepreneurial discoveries which are relevant for the SMEs meeting the challenge of globalisation.

As shown in Figure 1 below, this overarching research question sets focus on a learning process that consists of the following themes: Co-creation of analysis and strategy, discovery of ecosystem complexity, transnational learning and multilevel governance. This learning process occurs both inside the region by involving key stakeholders and outside the region by involving external actors through transnational learning and by maintaining relations to the Finnish government.

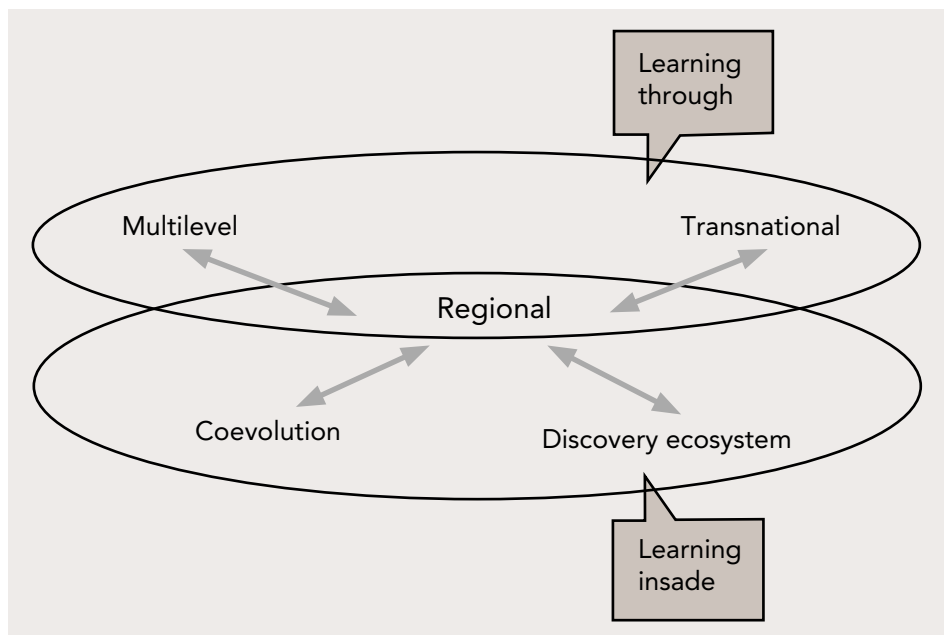
A core finding put forth in this article is the significance of diversification through small and medium-size companies. That is, what at first sight appeared to be a region whose future is in the hands of a few big corporate actors driving innovation to a surprisingly large extent relies on small- and middle-sized companies. This finding has led to new and more focused policy measures in the region.

Recapitulating the main ideas behind the policy of smart specialization, the roots are in the work the «Knowledge for Growth» group within the European Commission (Foray 2014). All regions in Europe should identify the key activities and areas of technological domain where they have a competitive advantage and focus their regional policy accordingly. The novelty that differentiates smart specialization from previous innovation and industrial policies is the entrepreneurial discovery process (EDP). The EDP has its roots in the Austrian Economics (Kirzner 1977) and implies a systematic process in which market participants, entrepreneurial researchers and public sector actors (Foray 2015) acquire more complete and accurate knowledge through joint interaction. Accordingly, applied in Smart Specialization, the focus in EDP is on relations in the triple helix (Etzkowitz-Leydesdorff 2000), in other words, interaction between knowledge producers in universities as well as public and private sector entrepreneurs.

Capturing the full benefits of the EDP requires it to become a continuous process where stakeholders are kept engaged in the refinement of the priority areas and the policy instruments. A review on how the regions understand the concept is made by Roman-Nyberg-Fellnhofer (2018) in a survey on the differ-

ent approaches in Finland. On the European level, the smart specialisation platform in Seville makes a corresponding survey (Marinelli-Perianez, 2017). Both surveys points to differences among regions in the approach to the EDP and in the penetration of the thinking.

Figure 1. KEY COMPONENTS OF REGIONAL GOVERNANCE



Source: Own elaboration.

The EDP requires a new and more proactive role of actors in the public sector (Morgan, 2017) and, thus, changes in current ways of acting. This to begin with, successful strategies of smart specialization start with an insight regarding the need for policy changes among policy-makers, including a new pro-active role for regional institutions. This change is likely to be gradual, moving from a mind-set where policy-makers in the regional institutions look upon themselves as implementers of the directives of the state towards engaging in a discovery process.

Another core challenge in S3 regional governance aiming at increased global market competitiveness is a transition from the traditional logic of resource distribution based on political consensus building. Instead, there is a need for a more proactive process of entrepreneurial discovery, where allocation of money is based on analysis leading to discoveries of new opportunities.

Finally, this transformation requires new ways of gathering information, analysing, discussing and knowing what is going on in the innovation ecosystem. In other

words, analysis with high granularity and a grasp of the complexity and dynamics of the ecosystem. Hence, it can be argued that a core precondition for the re- definition of the role of regional institutions into a more pro-active position is the need for better analysis.

Transformation of regional governance is a pre-condition for strategies promoting global market competitiveness. Smart specialization and resilience are closely connected in a world of global competition. The dynamics of the competitiveness is the key for success as no market success is perpetual as seen in Finland by the fall of Nokia. The OECD identifies governance as one of the four areas that drive resilience. According to the OECD, resilience is promoted by clear leadership and management, strategic and integrated approaches, public sector skills, and open and transparent governments (OECD, 2016). Resilience crucially depends on complex networks (World Economic Forum, 2013). Governance supporting innovation ecology complexity, through more and deeper connections, also contributes to economic resilience. This by fostering a continuous technological up-grading, niche-policies with product diversification and entrants of new actors on the international market.

Table 1. **KEY CHALLENGES AND QUESTIONS RELATED TO IMPLEMENTING SMART SPECIALISATION STRATEGIES**

Where?	How?
Inside the region	Co-creation of analysis and strategy. Is it possible to mobilise stakeholders through co-creation of analysis, partnership building and development of roadmap (gap analysis)?
	Discover ecosystem complexity. How can we use a gap analysis methodology to develop a deeper understanding of innovation ecosystem complexity, dynamics and potential new stakeholders, like small and medium sized businesses?
The external context of the region	Transnational learning. How can we use transnational learning to support this process?
	Multi-level governance. Can this process be supported by the national level?

Source: Own elaboration.

One might think that the role of the Regional Council could be easy and straight forward: to stimulate the transformation and growth by pin-pointing different development needs and direct funding to those that may trigger the innovation process. However, there are differences among regional stakeholders on core development challenges. The role of learning is important because it may

lead to a shared conceptual understanding enabling conclusions on strategies and measures of industrial transformation.

The discussion above highlights problems of sectoral fragmentation and a regime of resource distribution through political mitigation. In contrast to political mitigation, smart specialization means to make new priorities and consequent resource allocation. Table 1 outlines four specific challenges in breaking with the «old regime».

The article is structured as follows. Based on lessons learnt in planning and monitoring smart specialization, the article begins by introducing the reader to four key components underlying regional governance and the implementation of smart specialization strategies (see Figure 1). The second section describes the learning process towards discovering a development tool for smart specialization planning in the region of Ostrobothnia. This section highlights that the analysis is not a separate phase but an on-going triple helix dialogue between policy-makers, industrial innovation leaders and innovation researchers. Section two also describes some key characteristics of the regional innovation system alongside current challenges. Section three presents how the learning process occurs inside the region by involving key stakeholders. This section also outlines current findings on key changes in the regional innovation ecosystem pertaining to globalization and digitalization. Section four takes an external perspective and describes transnational learning and multi-level governance as means for implementing smart specialization strategies. The concluding part of the article addresses the formulation of policies for smart specialization that may drive the globalization of SMEs.

2. CHALLENGES IN S3 REGIONAL GOVERNANCE

A core precondition for the re-definition of the role of regional institutions into a more pro-active position is the need for better analysis. In some regions, the analysis has been a separate stage which is carried out by an external expert, and then put aside and kept away from implementation. However, in Ostrobothnia, work on the analysis started with cooperation between regional authorities and innovation policy researchers at the university.

Before the Smart Specialization initiative in 2012, there were several well-informed analyses of Ostrobothnia, such as the AMCER-project (AMCER 2013). The analysis within the AMCER project pointed out that the region had a sophisticated level of innovation, and a globalized innovation system driven by large business. At the same time, the region had a potential of improvement, through better relations between various actors in the innovation system. Accordingly, with regard to the regional smart specialization strategy, the initial focus of the analysis was the strong export products of the strong clusters and the over-all connectivity between helices. This was measured through the 2013-2015 surveys and provided an important platform for dialogue.

The focus and method in the initial phase (2012-13) was mapping of network connectivity inside the triple helix, measured through a survey-based gap-analysis between triple helix actors combined with focus group meetings. It was repeated, with some modifications, in 2015 and substantially revised in 2017, and supplemented with closer in-depth qualitative interviews with leading industrial actors.

This change of method of analysis reflects a combination of deeper triple-helix connections, which in turn also makes a more informed and pro-active policy approach possible. In addition to this internal learning in the region the process was supported by transnational learning involving regional external networks.

The learning process involves the public sector but also supports the internationalization of SMEs through communication of the discoveries on the critical factors for success in internationalization and by providing backing for corresponding capacity enhancement.

1.1. Characteristics of the regional innovation system

The point of departure for the strategic work and triple-helix dialogue was the AMCER-project where the innovation systems of nine European regions were benchmarked. Following the distinctions made by Cooke (Cooke 2004, AMCER 2013) Ostrobothnia had a globalized innovation system driven by large business. The AMCER- project puts business expenditure on R&D as 90.1% of total expenditure in 2008 while latest figures from Statistics Finland sets the corresponding figure at 82.3% for 2016. This situation is not uncommon where the innovation system is dominated by vertically well-integrated MNEs that risk functioning like an enclave in the regional economy.

Ostrobothnia is fortunate to have a number of large international companies that are located in the region's energy cluster (e.g. ABB, Wärtsilä, Danfoss, and The Switch). Large companies within the energy sector, have a central role in the region's innovation system by accounting for a great part of the research and innovations actions (AMCER report, 2013, p.93). In addition to energy, Ostrobothnia also has leading companies with large down-stream effects in the boat building industry where companies are using composite technology (e.g. Baltic Yacht and Nautor) and have a long and successful history as exporters on a global market. In the industry, abrasive technology innovations have an important role in Ostrobothnia with leading companies such as Mirka Ltd. being a niche-market leader and could be labelled as a hidden champion.

However, most companies fall into the category of small- and medium-sized companies (SMEs). Overall, the sector is shaped by large enterprises supported by clustered supply chains of often dependent SMEs. The large firms use sub-contractors extensively and up to 30% of the value added from the export is created in SMEs.

The challenge for development consists in deepening and widening of the export base. There is a continuous need for technological up-dating but also of the SMEs moving up the value-chain and in some case to surpass the large MNEs and become independent exporters.

From an internationalization perspective, a high connectivity between actors in the regional innovation system is also of importance. Business network research emphasizes that companies internationalize by creating positions in foreign networks. Accordingly, internationalization is defined a continuous process where companies gradually internationalize by increasing commitment to new and existing members of the company's business network (Johanson & Vahlne, 2009, 13). Thus fostering an increased connectivity among the companies enhances the internationalization process of SMEs in the region.

1.2. **The challenge of fragmentation**

In the smart specialization process the triple-helix dialogue has revealed that the companies are concerned with issues linked to a transformation towards Industry 4.0, value-chain challenges and its implications on the industrial organization, including public policy measures. This is a challenge for regional innovation policy structure in Ostrobothnia that is based on connections between participants from various kinds of stakeholder groups.

Municipalities, state governmental units, development agencies and companies have their representation in the group responsible for designing regional innovation policy. This has led to a situation where the objectives of the innovation policy are commonly approved, but it has been difficult to find a common approach and to form a functional innovation strategy. A wide range of different perspectives makes strategic decisions difficult when determining regional innovation policy. In practice the participants have found a consensus which easily allows discussion-decision making, but commitment and forming innovation policy is more challenging.

An increased globalized world adds pressures on the ways of working and requires a new understanding as a base for coordinating the efforts. Innovation based growth is driven by knowledge-networks not institutions. Hence a focus on the capacity challenges will serve to diminish the fragmentation of resources and in some cases even the rivalry among institution.

3. **LEARNING INSIDE THE REGION**

3.1. **Co-evolution and co-creation of analysis**

In order to respond to the challenge of designing a development instrument to be used for smart specialization planning and monitoring, the Regional Council of

Ostrobothnia formed in 2012 a regional partnership mainly consisting of regional universities. The report of the 15-month project or the solutions to the problem was named «The Ostrobothnian Model of Smart Specialisation» (Virkkala et. al., 2014) and builds on the role of networks in the creation and diffusion of new knowledge by triple-helix interaction and dialogue.

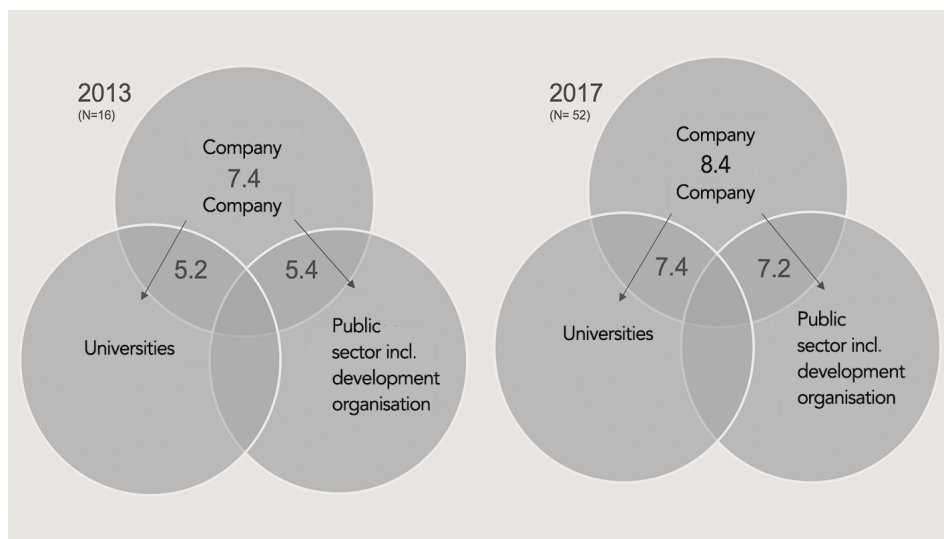
In brief, the phases of the process include a survey to the regional triple helix stakeholders (businesses, universities/research institutes and public sector organisations), interviews, and gap analyses and focus seminar. The aim is to identify the expectations and experiences of different stakeholder groups in relation to the interaction and collaboration towards other stakeholder groups. The gap is the difference between expectations and experiences. The «connectivity tool» provides information about the bottlenecks between different collaboration aspects. The focus seminar is organized as a joint event at the end for different stakeholder groups to plan together actions how to improve the current bases of collaboration regarding the bottleneck areas. The smart specialisation projects are implemented to reduce the bottlenecks in the regional innovation system. The process is repeated every second year, which also facilitates monitoring of the results achieved and to develop further measures to improve the regional ecosystem. A more detailed description of the connectivity tool is available in a recent work by Virkkala *et al.* (2017).

It is worth noting that there are three different innovation models in use in the companies in Ostrobothnia (Björk-Johansson 2017). To a certain degree large companies handle their innovation processes in-house. In addition to this there are companies that cooperate on innovation with other companies on the same level. Finally, there are companies who have innovation processes together with sub-contractors and customers. Data collected in the on-going LARS project (see www.lars-project.eu) indicate that strategies of globalization are enabled by two complimentary innovation ecologies (1) some large, medium sized and small companies are deeply integrated in transnational triple helixes, with innovation cooperation with foreign companies, national champions and regional firms, combined with innovation cooperation with regional, national and international universities; (2) other small and medium sized firms innovate through regional, national and international cooperation with other firms. In both cases, relations with regional universities and public sector institutions are positively correlated with strategies of globalization. These findings by Mariussen et al. (2018) suggest that globalization strategies of small- and medium sized energy companies in Ostrobothnia are consistent with Foray's (Foray 2015) theory of entrepreneurial discoveries seen as cooperation between researchers, public sector actors and firms. These innovators are able to draw upon integrated regional, national and transnational triple helixes.

Both in 2013 and 2017 connectivity between companies (7.4 in 2013 and 8.4 in 2017) was higher than connectivity between companies and universities. The

most striking difference is the increased importance of the triple helix for companies. Company – university connectivity increased from 5.2 in 2013 to 7.4 in 2017. Company – public sector connectivity increased from 5.4 to 7.2. The experience working with the Model during three rounds of interviews and discussions in 2013, 2015 and 2017 has extended the understanding in the regional innovation system and permitted more targeted actions based on evidence. However, the biggest impact of applying the model is in encouraging reflection among stakeholders on innovation partnerships, which in turn prompts closer triple helix connectivity. The model with a structured triple-helix dialogue can be seen as a method of entrepreneurial discovery because it helps to improve regional innovation cooperation by presenting the bottlenecks affecting it and by focusing support on the biggest issues. The dynamics of gap indices can be seen as a process of economic self-discovery. Table 2 illustrates the steps taken in this process and the methodological conclusions.

Figure 2. **COMPARISON OF TRIPLE HELIX CONNECTIVITY IN 2013 AND 2017 FROM A COMPANY PERSPECTIVE**



Note: The data in 2017 consists of 53 personal interviews, 11 respondents represent large firms and 41 represent SMEs. In 2013, 16 respondents were interviewed of which 3 respondents represented large firms and 13 SMEs.

Source: Regional Council of Ostrobothnia.

To this date three rounds of interviews and focus group meetings have been conducted based on the experience of the previous rounds. Based on this process and an expanding network of informants, it was possible to go further with an in-depth analysis in 2017.

Table 2. THE LEARNING PROCESS IN PLANNING FOR SMART SPECIALISATION

The process gap-analysis and focus group meetings					
Year	Stakeholder- interviews	Focus- group discussions	Observations	Conclusions	
2013	Closed format interview guide with numerical value	In Vaasa (energy, maritime solutions) and Pietarsaari (boat-building fur- industry).	<p>The questionnaire lengthy but well understood by business less by public sector.</p> <p>Generally well received.</p> <p>Valuable contact with stakeholder, focus group meeting good but demanding.</p> <p>Companies hesitate to "open-up" with other companies</p>	<p>Simply the questionnaire, structural information may be omitted.</p> <p>Focus group meetings may be complemented with other information gathering</p>	
2015	Simplified questionnaire by e- mail.	In Vaasa (energy, maritime solutions) and Pietarsaari (boat-building fur- industry)	<p>E-mail questionnaire miss the control of the interview situation.</p> <p>Face-to-face interviews with company leaders builds trust, works well but is resource demanding.</p>	<p>To pool 2013 and 2015 observations for more stable conclusions.</p> <p>To elaborate the questionnaire to receive more information on issues considered important by stakeholders.</p> <p>To make an in-staff LFA-analysis for attributing "gaps" to policy measures-</p>	
2017	Closed format and semi-structured personal interviews	On-going	Well-received, semi- structured questions high- lights findings on transfer to industry 4.0 and the challenges faced	Unclear whether this is a new trend or if the earlier dialogue did not sufficiently capture it.	

Source: Own elaboration.

3.2. Discoveries of innovation ecosystem complexity and dynamics

This section presents some of the key changes in the innovation ecosystem that are revealed in the study conducted 2017. These findings pertain to two main themes: globalization and digitalization including industry 4.0.

The MNEs and the small and middle-size companies in the value-chain work in a global environment. In this environment the conditions are rapidly changing both as a consequence of market- and policy-driven factors. The results show that globalization affects all actors in the value chain. That is, global requirements and competition facing large global companies is carried through the value chain. For example, large exporters are increasingly setting the same demands of problems solving on their suppliers. One of the interviewed suppliers stated:

«Central changes such as globalization and digitalization affect everyone in the same way because you are more and more built together like a business network. You work in the same project and the requirements are the same for everyone».

Hence, to drive the internationalization of SMEs it is important to maintain a continuous triple-helix dialogue which identifies central changes in the business environment. In addition, within this dialogue it is important to identify how these changes will affect the relationships and the expectations between the actors in the regional innovation eco-system. Then again, within the monitoring of the regional smart specialization strategy it is important to communicate these changes to different type of actors.

Furthermore, the MNEs note that global requirements seeking to enhance efficiency in the value chain will to a greater extent form the relationship between the MNEs and the regional SMEs. These requirements pertain for example to longer payment terms, reduction of invoices, and higher quality standards. One of the respondents concluded:

«Global requirements will increase due to the fact that we are part of a global organization where all kinds of «lines of conduct» are set. This is the case, not only for us, but also for other large firms. These requirements will direct influence SMEs for example regarding payment terms given».

These results signal that globalization continuously leads to higher requirements and expectations on regional SMEs. Moreover, as SMEs in Ostrobothnia are facing the same challenges as the large companies there is a need to invest in state-of-the-art technology and advanced production methods. These requirements signal, in turn, the need for smaller suppliers in the region to grow in order to act as suppliers in the future. Moreover, with regard to the limited home market, there is a need to increase the international activities of the SMEs in the region. Consequently, to drive the internationalization of SMEs in the value chain it is important to focus

on the internationalization of small and medium-sized suppliers in the value and how these suppliers could internationalize through large firms in the region.

The results also show an increased demand for more comprehensive solutions delivered by suppliers. In a similar vein, MNEs highlight the need to streamline the purchasing process and to limit the number of invoices being handled. The requirements lead to an increased need among smaller actors to cooperate with each other in order to respond to the demands e.g. towards a common large customer:

«Large firms want to invoice a few firms who in turn manage to put together subcontractors in their own business network. It is an international trend which we have noticed. Here we would have an opportunity to get more business if we had the ability (to create cooperative networks between subcontractors in the region), since buyers want bigger and more complete solutions than before. In this sense, cooperation between subcontractors in the region is absolutely necessary if we want to deliver larger entities».

Nevertheless, if successful this will imply a closer cooperation in the value chain where partners are more difficult to substitute. Vice versa if not successful this will imply that the added value is generated outside the region. Consequently, there a need to establish cooperative networks between subcontractors in the region in order to drive the international of SMEs.

Both the consolidation of be regional procurement and the growth requirement set strains on the financing and the changing invoicing conditions. Our finding is that there are differences in how the SMEs are working with these issues.

Finally, in parallel with global sourcing, the results highlight local manufacturing as a growing trend and opportunity. The respondents underline that it is in particular value to be (physically) close to innovation partners. Proximity enhances quality, time efficiency and reduces the risks of mistakes. Accordingly, proximity adds value especially if subcontractors deliver unstandardized components and if subcontractors are engaged in product development activities. Moreover, digital transformation increases the need for faster development cycles and quick transfer from technology and product development activities to profit¹. In line with these results, expectations on cooperation with actors in the regional innovation system are likely to increase with digital transformation.

Compared to previous results in 2013 and 2015, the 2017 dialogue round shows that companies in the energy cluster increasingly experience the need to invest in R&D linked to new technologies like automation, robotics, internet-of-things, 3D-printing and digital linking of different stakeholders in the value-chain. One the one

¹ Koponen, L. (2017) The view of Finnish CTOs on the latest R&D, available at: https://static1.squarespace.com/static/557153fee4b0463792c32c2b/t/59f03e012aeba59449b1d282/1508916750028/CTO_Survey_results_October_2017.pdf

hand, the digitalization acts as a basis for many of the changes that the companies express that they will be facing in their business environment within the forthcoming five years. On the other hand, the perceived importance of smart grids, advanced production methods and advanced materials for innovation and growth has increased among the respondents (see Table 3).

Table 3. IMPORTANCE OF KEY ENABLING TECHNOLOGIES FOR INNOVATIVE DEVELOPMENT IN OSTROBOTHNIA

(Scale 1-10 1= small importance 10= big importance)

Technology	Importance (2013)			Importance (2017)		
	N	Today	In 20 years	N	Today	In 20 years
Renewable Energy	28	7.1	9.5	49	8.2	8.7
Smart Grids	44	7.0	8.9	47	8.0	9.1
Advanced Production Methods	39	7.4	8.8	50	8.1	9.0
Advanced Materials	38	6.3	8.0	42	7.1	8.5

Source: Regional Council of Ostrobothnia.

In the interview discussions, particularly advanced productions methods are described as a means for maintaining not only production in the region in the face of a price competition but also R&D activities. However, advanced production methods and digitalization are also outlined as a field in which the region could excel and that could be the source of a future dynamic competitive advantage.

This advantage could in the future be based on a larger variety of products and services. This would imply a change where the exporters increasingly are moving from being providers of components to be providers of solutions and software. Apart from that this will require increased customer proximity it will also alter the added value produced to contain a larger service component. In creating this service component external digitalization is seen as a way to create added-value in the service production. Particularly the large and the middle-size companies is seeing themselves as undergoing a change in this respect. For example, in describing the opportunities of digitalization, one of the respondents representing a large manufacturing company in region concluded:

«We are looking at the whole ecosystem today and how we can help our customers do their business smarter».

Hence, digitalization creates a scope for new business that may strengthen the value-chain but may also provide scope for new actors inside or outside our region.

However, the results also reveal that small companies tend to take an internal perspective on the challenges and opportunities of digitalization. Among small companies the purpose of digitalization is described in terms of enhancing productivity, quality and cost efficiency. Regarding digitalization and industry 4.0, smaller companies priorities enhancing production performance over adding value to customers.

These results show that there is a need to also increase companies' knowledge regarding how digitalization and a transfer towards industry 4.0 change the sales logic and provide opportunities for developing value added services to existing customers:

«With digitalization it is more likely that also SMEs are forced to take responsibility for services provided. It is necessary to think about 'what is my service business regarding these metal parts that I supply?'. Is it the fact that I have them in my warehouse, that I can in an easy and a fast way exchange them, or is that they can be easily tracked?».

In a similar vein, there is a need to enhance knowledge on how digitalization and a transfer towards industry 4.0 could lead to a stronger partnership and position in the value chain for supplies. And, ultimately how value-added services based on digitalization could lead not only to cost-efficiency but also revenue growth.

Furthermore, the results indicate that the companies' perceived important of other companies in the region as innovation partners have increased. In line with these results, the study shows that companies have higher expectations on cooperation with other companies in the region (see Table 4).

Table 4. **PERCEIVED EXPERIENCES AND EXPECTATIONS ON COOPERATION BETWEEN COMPANIES**

Cooperation activity	N T=16	Expect ations	Experi ences	Gap	2017			
					N T=52	Expect ations	Experi ences	Gap
Cooperation regarding development of new technologies, products and services with other companies in the region of Ostrobothnia	12	8.2	6.9	-1.3	38	8.7	7.1	-1.6

Note: Scale from 1 (low) to 10 (high) measuring experiences and expectations of different cooperative activities between companies in the region. The gap is calculated based on the difference between experiences and expectations.

Source: Own elaboration.

The interview discussions reveal two important factors that underlie the increase in expectations illustrated in Table 4. First, the results show that digitalization and industry 4.0 increase the importance of and expectations on cooperation in innovation activities between customers and suppliers. On the one hand, digitalization and industry 4.0 increase requirement on for example traceability of components and used materials, detailed and efficient flows of information in the value chain as well as real-time information. There is also a need for more interlinked systems between suppliers, customers and end-customers. Based on these changes, the respondents note that there is a need to find new systems and means of cooperation between customers and their suppliers. On the other hand, the respondents describe that suppliers are increasingly expected to give their own input and value-added in product development processes. One of the interviewed suppliers concluded:

«We notice that customers' knowledge decreases. New people enter who may not even have knowledge about their end product. In many cases we become more of an expert on their products than they are themselves. This is a general trend that we have noticed among many customers. We feel that we need to take more responsibility of their products than what they do themselves. This is also the case in Finland. We don't mind this, since we see it as an opportunity to tie our customers even stronger to us».

Second, the results show that there is an increased demand for more comprehensive solutions and processed products as well as for larger entities. This finding also explains increases in expectations on cooperation regarding development of new technologies, products and services with other companies in the region (see Table 4).

Overall, Industry 4.0 is both an opportunity and a threat. It is a regional desire to have as many growth oriented companies as possible. The analysis of the outcome is mixed. Some SMEs are embracing the development others are not. However, one conclusion of the dialogue is that policy measures are an important role as a trigger of the development. Finally, the results highlight the significance of diversification through small and medium-size companies. That is, what at first sight appeared to be a region whose future was in the hands of a few big corporate actors driving innovation, relies to a large extent on small- and medium sized companies.

4. LEARNING THROUGH EXTERNAL RELATIONS

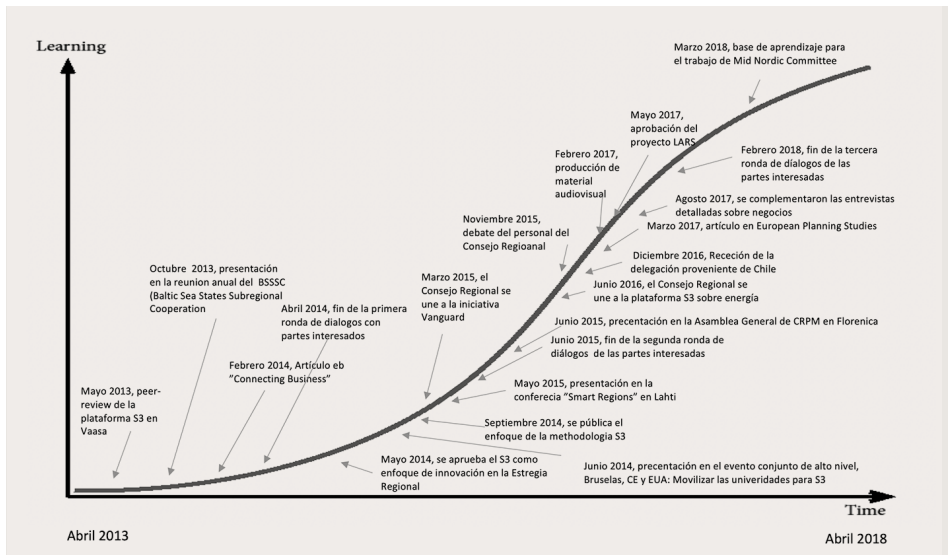
4.1. Transnational learning

The implementation of a regional smart specialization strategy in Ostrobothnia can be illustrated as a learning curve towards making better and more informed policy decisions. Figure 4, illustrates the accumulated learning over time and shows «milestones» in this work during a five year period. As shown in Figure 4

the policy process consists of a combination of learning activities in Ostrobothnia and on a European level.

A starting point for this process occurred in May 2013 when a peer-review workshop was organized in cooperation with the Smart Specialization Platform. In this regional workshop the Ostrobothnian approach was reviewed. Another milestone in the policy process occurred in May 2014 when Smart Specialization was approved as a part of the Regional Strategy for the period 2014–2018. These two events created the conditions to deepen and widen the process of smart specialization.

Figure 4. **MILESTONES IN THE SMART SPECIALIZATION LEARNING IN OSTROBOTHNIA**



Note: Figure 4 raises three questions: 1) has a policy learning occurred as indicated; 2) what is the content of this learning and 3) has this contributed to a change in the policy?

Source: Own elaboration.

Considering the policy learning on the Y-axis we may separate between four levels of learning: 1) individual learning; 2) organization level; 3) stakeholder level; 4) EU-level. These levels should not be seen as sub-sequential but as interrelated over time.

On an individual level learning has occurred, as more and more people, institutions and companies are involved in planning and monitoring smart specialisation strategies. The «building blocks» in place for EDP through smart specialization and transnational learning have contributed to learning at an organizational level as experiences and knowledge are no longer person-bound. The «Ostrobothnian Model of Smart Specialisation» includes a format and formal routine for EDP and three consecutive dialogue rounds has been implemented and documented.

On stakeholder learning we may note from figure 2 that the companies have a higher esteem of their triple-helix innovation partners compared with previous periods. This is seen as higher scores in connectivity. The finding supports the argument that learning has occurred on a stakeholder level.

On a European level there has been an extensive dialogue and communication of the findings. For instance this article has been a reflection process for the authors and it is hoped that it also will stimulate reflections among the readers. There has been previous corresponding communication and dialogue with European practitioners of smart specialisation. Findings of the learning process have been communicated through thematic publications for instance, Roman-Nyberg-Fellnhofer (2018), Kristensen I.-Teräs J.-Rinne T. (2018), Mariussen (Mariussen *et al.* 2016, 2018), Johnson-Virkkala (2016), Teräs-Mäenpää (2016). The Ostrobothnian model has also been presented in various S3 conferences in the 2012-2014 period, when regions were developing their programs.

Finally, to the question if transnational learning also has contributed to a policy change, we may note that the core of S3 is in the discovery concept and it has its roots in Austrian Economics. Hence the learning has been around policy formulation for innovation, contributing to economic growth². This represents a change in focus. The Regional Councils in Finland are political organisations governed by a politically elected board. In appointing the boards and also in articulating the demands the political parties function as gatekeepers. Working with policy formulation for economic growth, through S3, is well-seen. Still issues passing the gates are often linked towards distribution of resources and mitigation between different interest groups.

The conclusions are that challenges linking to the on-going globalisation, would not have been initiated through a regional political process. Smart specialisation and transnational learning have provided the conceptual framework and platform for addressing these challenges. The Regional Council is now focusing more clearly on issues relating to triple-helix connectivity. In the conclusions of this article the current policy outcome of this process is described. The learning process continues as new challenges will require new conclusions.

4.2. Challenges in the smart specialisation multi-level governance

Finland has a centrally lead innovation system. In the analysis of the Finnish innovation governance Sabel and Saxenian (2008) concludes that there is a need to decentralise with the purpose of economic diversification through entrepreneurial discoveries. This has not occurred to date, but policies are centrally led where the regions provide input into a formally common agenda. The multitude of perspectives results in that strategies, in practise, are implemented with a sufficient degree of flexibility to encompass different perspectives.

² It has been estimated that 80% of the economic growth is generated by innovations (Cooke-Boekholt-Tödling 2000).

This hamper concluding on discoveries and on measures needed for stimulating innovation-based growth. We have argued that entrepreneurial discoveries are about learnings and we may separate between individual and organisational learning. Frequent evaluations of policy measures and contacts result in learning among individuals but this is not sufficiently transferred into an organisational learning and collective conclusions on how to combine different policy instruments i.e. avoid fragmentation of policies.

This would be vital for addressing emerging challenges described in the section 3 on discoveries in this article. The policy in Finland encourages regional specialisation but there is no national policy framework for smart specialisation. This should be remedied for as a common terminology and a structured process is vital for organisational learning.

The smart specialisation approach includes an enlarged innovation concept where experience-based innovations are considered as a complement to science-based innovations. Typically for Ostrobothnia is doing-using-interaction innovation mode, where innovations are driven by business networks and customer proximity.

This has the potential to enrich and inspire science-and-technology based research. Diffusion of the findings of vertically well-integrated MNEs provide important in-sights, particularly as it has been pointed out that there is a need to further internationalise the Finnish innovation system. The small size of Ostrobothnia enhances proximity among actors which leads to a both smooth and informal access to the perspectives of large vertically well-integrated companies.

A better strategy of developing organizational learning would be to create a formalized, national strategy for smart specialisation. This would include a format for interaction with the regions with the purpose of concluding on discoveries world serve to facilitate the learning curve going from individual learning to organisational learning. The organisational learning would moreover serve as a coordinating framework and decrease policy fragmentation.

5. **CONCLUSION ON HOW SMART SPECIALIZATION IS DRIVING GLOBALIZATION OF SMALL AND MIDDLE-SIZED COMPANIES IN OSTROBOTHNIA**

Technological changes may enable new growth but also make current industrial production obsolete. The industry 4.0 is not only a market-driven change but it is also a conscious European policy that strives towards the re-industrialization of Europe. Hence a key the task for the regional government is to formulate a strategy driving industry 4.0 and globalization. The findings of this article show that this is a learning process as traditional ways of working becomes obsolete. In this context small and medium size companies are crucial stakeholders as they are mostly affected by this development. This constitutes both an opportunity and a threat.

The regions that successfully accommodated the change will reap the benefits of the technological revolution while the regions that do not address the challenge are likely to lose competitiveness. In regions with sophisticated innovation ecosystems the change is more likely to occur spontaneously. This leaves the more peripheral regions with a less developed ecosystem with a much larger challenge in formulating a pro-active policy. Adding to the challenge is the fact that both human and financial resources are also much less in peripheral regions.

Our findings finding in section 5 indicates that transnational learning is a crucial enabler in focusing the agenda of the Regional Council for these challenges. Table 5 below shows the answers to the questions raised in Table 1.

Table 5. **KEY FINDINGS ON FORMULATING POLICIES FOR SMART SPECIALISATION DRIVING GLOBALISATION**

Where?	Key findings and answers
Inside the region	Co-creation of analysis and strategy. Yes, it is possible to co-create analysis, partnership building and development of roadmap through dialogues between policy-makers, industrial innovation leaders and innovation researchers.
	Discover ecosystem complexity. Yes, we succeeded in developing this method further to reach a deeper understanding of innovation ecosystem complexity, dynamics and potential stakeholders through in-depth interviews, dialogues and analysis. Through this process, the analysis grows a higher granularity, scope and depth, as new details of the complex regional innovation ecosystem, and the on-going transformations this eco-system are going through are put in place.
The external context of the region	Transnational learning. The conclusions are that the challenges that are linked to the on-going globalization would not have been initiated through a regional political process. Smart specialization and transnational learning has provided the conceptual framework and platform for addressing these challenges.
	Multi-level governance. The relation to the Finnish government is an unsolved issue.

Source: Own elaboration.

The learning process on the challenges facing the small and medium size companies has to this date resulted in the following policy output. A focal point has been policy measures to foster vertical B2B knitting around multinational enterprises.

The policy is aiming at increasing the competitiveness and broadening the export base by strengthening the core and supportive processes around the value chains in the smart specialisation strategy. In this way the policy contributes an export-led diversification of the regional economy. In practice this means addressing value chain

development. Fostering vertical B2B knitting around the focal multinational enterprises implies successively bringing emerging SMEs up to the challenges faced on the international market.

Policy instruments that have been at the Regional Councils disposal are the ERDF-program and ERM-program³. Within the programs the following objectives have been addressed:

- Digital solutions in small and middle-size companies.
- Strengthening the public research laboratories national and international networks.
- Value-chain formation, helping small- and middle-size companies forming larger export, chains with the purpose of attending larger customer requests.
- Capacity enhancement in small- and middle-size companies with the purpose of customer problem solving.

The measures have been designed to bridge gaps in the innovation eco-system based on the findings in the structured dialogue with the triple-helix partners.

The vision for the policy is to be a «connected region» i.e. to have a close proximity among the stakeholders. This is in itself also aimed to foster SME internationalisation. The same vertically well-integrated networks of large exporters also pave the way for internationalisation and climbing in the value chain of new entrants, if the stakeholders are well connected.

The connectivity analysis is challenging and with the purpose of strengthening the regional capacity, the LARS-project was launched in October 2017. The project, being a pilot, is working within the Interreg Baltic Sea program and brings together the triple-helix networks of eleven partners, in the fields of energy, bio- and circular-economy, around the Baltic Sea. The purpose of the project is to create a «critical mass» by extending the regional innovation network by transnational learning. Vaasa Energy Business Innovation Centre (VEBIC) is a multi-disciplinary research platform which is founded by the University of Vaasa together with its industrial partners in Vaasa. VEBIC concentrates on research of wider business and societal impacts of new energy technologies.

The Innolab platform provides an open innovation environment combining research open innovation and user innovations. The platform works around innovations and commercialization, crowd financing and user-driven business.

The digital economy is a multi-disciplinary and open research platform. The activities of the platform focus on digitalization in organization and industry, data

³ Finnish acronym for the program for forecasting structural change.

business and information security and similar issues driven by the technological change.

Concluding on the results of the policies we consider two perspectives, first has the umbrella of smart specialization been relevant to the development and second how can we conclude that the measures undertaken have been driving the internationalization of the SMEs.

In the case without the umbrella of smart specialization there would likely be a knowledge «trickle-down» in the regional value-added chain. Alternatively, the MNEs would resort to global sourcing due to that the regional suppliers are not able to meet global requirements.

Without smart specialization there is no framework for concluding on policies and hence the accumulation of knowledge would be bound to tacit knowledge and personal relations, leading to fragmented and ad hoc interventions.

The smart specialization intervention built on gap-analysis of the innovation networks enables the region to accumulate knowledge and thus formulate a better intervention. By using the policy instrument in solving bottle-necks, the policy is reinforcing the spontaneous learning process in the value-added chain. Thus supporting a dynamic development based on entrepreneurial discoveries.

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