REVEALING THE INNOVATION POTENTIAL IN THE BALTIC SEA REGION: A COMPARATIVE ANALYSIS

LARS WP3 Report
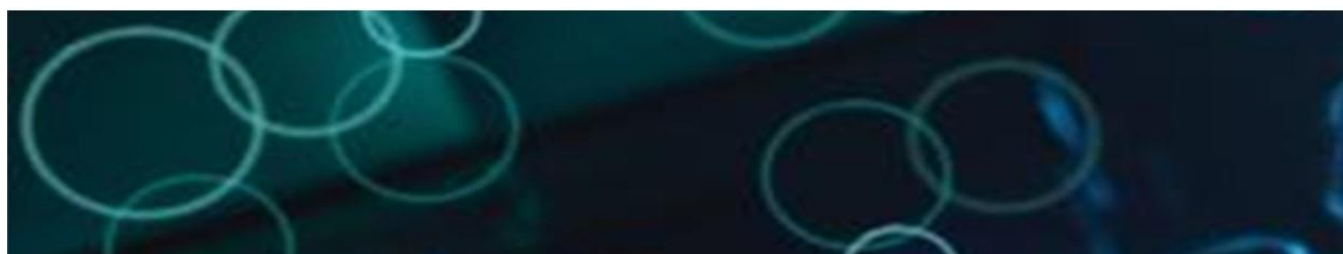
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CONTENTS

1. INTRODUCTION

1.1. The project and its aims

The LARS project attempts to help the public sector operating within various institutional frameworks to support innovation processes in their regions, and to connect innovation networks across and beyond the borders of regions. LARS is looking for improvements in public sector policies, supporting innovation.

LARS project partners have selected important or emerging value chains for their innovation strategies, analyzed the selected value chains and their relevant stakeholders, conducted surveys on connectivity and functioning of the innovation networks, and organized focus group meetings to verify and discuss findings through structured dialogues.

This report describes, analyses and compares the findings of surveys based on the interviews made by LARS partners. The comparative analysis is based on the numerical data delivered in the partner reports. Data contains 141 interviews with carefully selected companies, public organisations, universities and NGOs. This is supplemented with qualitative analysis from interviews, partner reports and focus group meetings, where the quantitative data were verified by the informants, explanations of findings were discussed, and seen in context with outcomes of stakeholder and value chain analysis.

The bridge from these interviews to a strategy of policy innovation comes through expectations, experience and importance of relations. We use measurements of importance to identify the structure of networks, and measurements of expectation and experience to identify how our informants relate to them and try to improve them. Gaps may be differences between expectations and experiences in specific relations inside a region. Gaps are points of tension and frustrations, where actors may be willing and able to act, initiate pilots, closing the gap. Informants in the same region may, for several good reasons, experience their positions within their networks, their gaps and their region in very different ways. After all, they have different positions. Different regions have different structures. Their strengths may also be explained in different ways, with different indicators.

The aim of this report (written by Åge Mariussen, Antti Mäenpää & Seija Virkkala, with help from Teemu Saarinen) is to find selection criteria for good practices in regional innovation policies, which can be used as one input by LARS partners when they are selecting good practices. Based on good practices, and matching them, LARS can initiate pilots.

Sometimes, innovation is done inside firms with no or limited external assistance. However, well-functioning innovation processes rely on wide reaching networks of innovation. This is why connectivity between companies, universities, public organisations and NGOs is a precondition for well-functioning systems of innovation. We refer to the fields where networks between and within different societal institutional areas develop as quadruple helices.

The triple-helix (TH) model (Leydesdorff and Etzkowitz, 1998; Etzkowitz and Leydesdorff, 2000, Virkkala et al, 2017) is used to describe both dynamic interaction between universities, companies and public

organisations and institutional continuity which functions in different ways. Helices follow different codes of conduct. Universities, as scientific systems, communicate and function in accordance with the code of true/false, companies in accordance with the code of profit/loss, and the public sector in accordance with the code of right/wrong. By adding the fourth helix, civil society, we refer to various types of NGOs. They may be regional, national and international. The triple-helix models with the fourth helix is called Quadruple helix (QH) model (Carayannis et al. 2012).

In order to measure the networks, we used three core concepts: importance, expectation and experience. Usually, if an external actor or institution in your helix or a different helix is seen as important, and if you have high expectation, as well as good experience from your relation, the connectivity is good, and it is likely that the partner is contributing to your innovation. Some regions are characterized by high levels of connectivity, both inside the region and into wider areas. If experience and expectation are close to each other, the relation is good and functioning on a high level. Other relations are characterized by various forms of gaps between expectations and experiences. As shown in this report, there can be several types of gaps.

The concept "region" has different meaning in different parts of the Baltic Sea Region. In Norway, Sweden and Finland, regions are institutionalized political-administrative entities covering large geographical areas, within the context of national states, which are similar to a German Land. There is an on-going debate on reforms regarding the division of responsibilities and power between these levels. Our German partner, Hamburg, is a city region with a high level of autonomy, within the context of a large federal state, the German Federal Republic. The institutional arrangements defining these German relations are stable. Baltic countries are autonomous states, with a rather weakly developed regional level. In this instance, national data is sometimes treated as regional data, in order to make comparisons. In this report, we are referring to these different units as "regions", and we use comparisons between them in order to discover good practices and problems, driving policy innovations.

In moving from individual level data with a lot of variation to a more generalized understanding of the deeper patterns of frustrations, tensions and gaps in regions and networks, we use well-known statistical methods reducing variation, like means and factor analysis. In this way, we can discover differences between regions.

According to LARS approach good practices on regional innovation policies/innovation systems are defined by the features of specific value chains, the features of relevant stakeholders in terms of urgency, legitimacy and power, as well as connectivity between the relevant stakeholders (regional, national and international), gaps between expectations and experiences. The challenges of connectivity in innovation systems and innovation policies depends on the same dimensions/factors, and our aim is to explore this phenomena.

In the next chapter we present the process of gathering, analyzing and verifying the data by partners, after that in the chapter 3 the summary of partner reports and quadruple helix connectivity. We analyse the data gathered by partners in chapters 4-7 especially from the perspective of good practices in connectivity of innovation policy. In chapter 4, we present and compare the stakeholder analyses made by

partners. The rich interview data with very many dimensions of quadruple helix relationships will be analysed statistically in chapters 5-7.

In different chapters, we will focus on different parts of the data, and the data from different analytical levels and perspectives. We use mostly factor analysis, which helps us to summarize the dimensions and find possible underlying patterns of quadruple helix (QH) relationships. In the chapter 5, the focus is in partner importance across helixes and LARS regions based on the means of absolute values given by the respondents. In chapter 6, we use factor analysis to summarize the partner importance variables, and we examine the link between partner importance and expectations of the QH relationship with the help of factors analyses and correlation matrices. Expectations are seen as a driving force in an innovation system. The chapter also examines the dynamism in QH network, and introduces indicators measuring the strength of the relationships, the quality of relations and the tensions in relations of QH network. Chapter 7 introduces the good practice descriptions and the descriptions of development challenges made by partners. Chapter 8 summarizes the comparative analysis per helices and per LARS regions and makes suggestion for selection criteria for good practices based on the statistical analysis on indicators on characteristics and tensions of the QH networks. It also responses to the question what is the potential for innovation in the LARS regions.

1.2. Description of the partner regions

Before comparative analysis based on LARS data, it is useful to describe the case study regions with the help of official statistics, in order to understand where they stand regarding some key characteristics. Teemu Saarinen has kindly provided this analysis section 1.2 for this study.

One way to look at the regions is their size (Figure 1.1). In terms of population, the countries of Latvia (1,9 million) and Lithuania (2,8 million) are the largest, followed by the city-state Hamburg (1,8 million). The rest of the LARS partner regions are much smaller in population (0,2–0,3 million), and of same size.
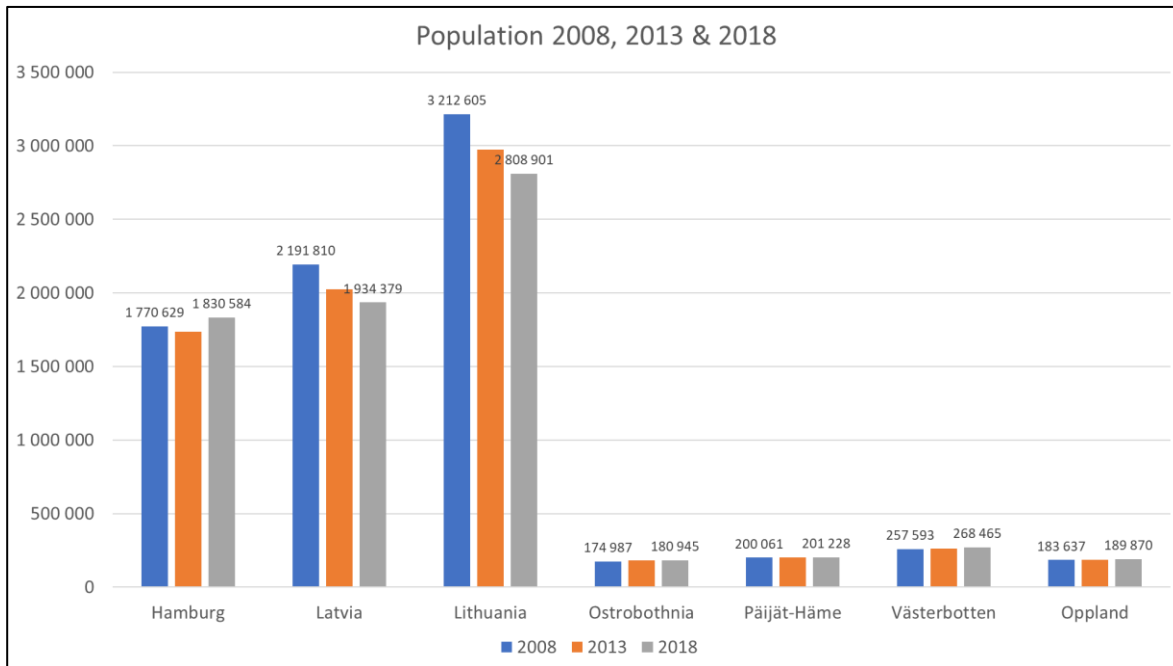
Figure 1.1. Population in LARS partner regions in 2008, 2013 and 2018 (Eurostat 2019c)

Perhaps the most striking development has been the shrinking of population in the two Baltic countries; Latvia has lost 12 percent and Lithuania 13 percent of their population in just ten years. Population in Hamburg has grown 3 percent in the same time, although there was a small drop in population in 2013 compared to 2008. Population in Ostrobothnia and Oppland has also grown 3 percent. Päijät-Häme shows less than one percent population growth, whereas in Västerbotten population has grown 4 percent. We can conclude that the population changes have been minor except the Baltic countries.

One way to look at the case study regions is also via accessibility (see Figure 1.2), which has been previously analysed in ESPON programs. This data is available through S3 Platform (2019). As has been stated (ESPON 2013b: 50): "…Population in all destination regions is weighted by the travel time to go there. The weighted population is summed up to the indicator value for the accessibility potential of the origin region. All indicator values are expressed as index." The calculations are explained below.

Figure 1.2. Multimodal accessibility in the areas in 2006 (ESPON, data accessed through S3 Platform 2019)

According to ESPON (2013a: 10), Multimodal accessibility is calculated through three generic types of accessibility (travel cost, cumulated opportunities, and potential) indicator, which can be calculated for any mode. In Europe, the frequency of transport routes for road, rail and air are calculated. Modal accessibility indicators can be summed into one indicator expressing the combined effect of alternative modes for a location. There are essentially two ways of intermodal transport. One is to select t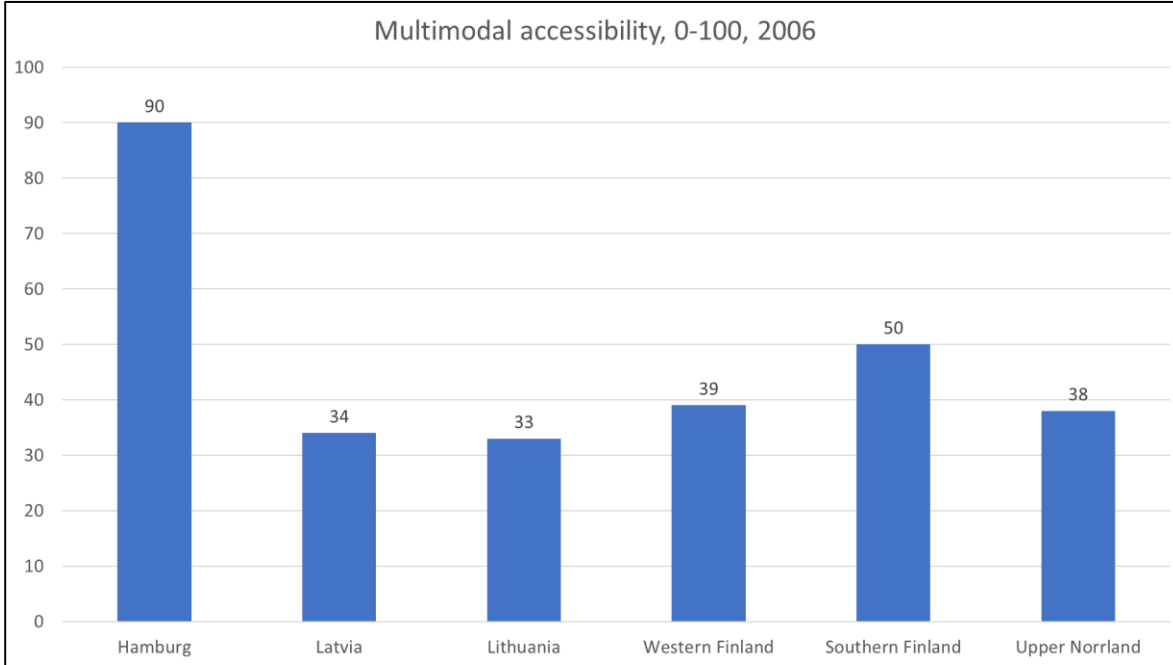he fastest mode and ignore slower modes. Another way is to calculate an aggregate accessibility measure combining the information contained in the modal accessibility indicators by replacing the generalised cost c_{ij} by the 'composite' generalised cost:

$$\bar{c}_{ij} = -\frac{1}{\lambda} \ln \sum_m \exp(-\lambda c_{ijm})$$

c_{ijm} is the generalised cost of travel by mode m between i and j and λ is a parameter indicating the sensitivity of travelers to travel cost. This formulation of composite travel cost is superior to average travel cost because it makes sure that the removal of a mode with higher cost (i.e. closure of a rail line) does not result in a – false – reduction in aggregate travel cost. This way of aggregating travel costs across modes is theoretically consistent only for potential accessibility. (ESPON 2013a.)

Multimodal accessibility, or how easy it is to get to the area, reflects the geographical location of the regions. Accessibility potential indicators are based on the assumption that the attraction of a destination increases with size and declines with distance or travel time or cost. Therefore, both size and distance of destinations are taken into account. Population in the destination regions reflect the size, travel time the impedance. (ESPON 2013a.)

The accessibility potential indicators reflect the relative competitive position of European regions towards European destinations. Hamburg is in its own league with a score of 90 out of 100, showing its place in the centre of the Europe. Southern Finland is second with a score of 50 out of 100, owing to its proximity to the capital region of Finland. The rest of LARS partner regions are closely bundled with scores ranging from 33 to 39 out of 100, likely due to their more distant locations and less dense infrastructure networks. However, special mention regarding the size of analytical units needs to be made. As can be seen, Ostrobothnia, Päijät-Häme and Västerbotten are part of a larger geographical areas, Western Finland, Southern Finland and Upper Norrland, because data is only available at NUTS 2-level. Oppland is altogether missing from this data.

After examination the size and relative location of case study regions, it is useful to look at the people living in the regions, in order to see what sort of talent lies within different partners. This can be studied, for example, through statistics about higher-level education, which draws interesting findings (see Figure 1.3). Lithuania is number one in terms of percentage of working age population (ages 25 to 64) with a higher-level education, with an impressive score of 95 percent. Latvia, Western Finland (including Ostrobothnia), Southern Finland (including Päijät-Häme) and Upper Norrland (including Västerbotten) are all in a close range between 89 and 91 percent. Hamburg is at 85 percent and Hedmark and Oppland is at 79 percent.
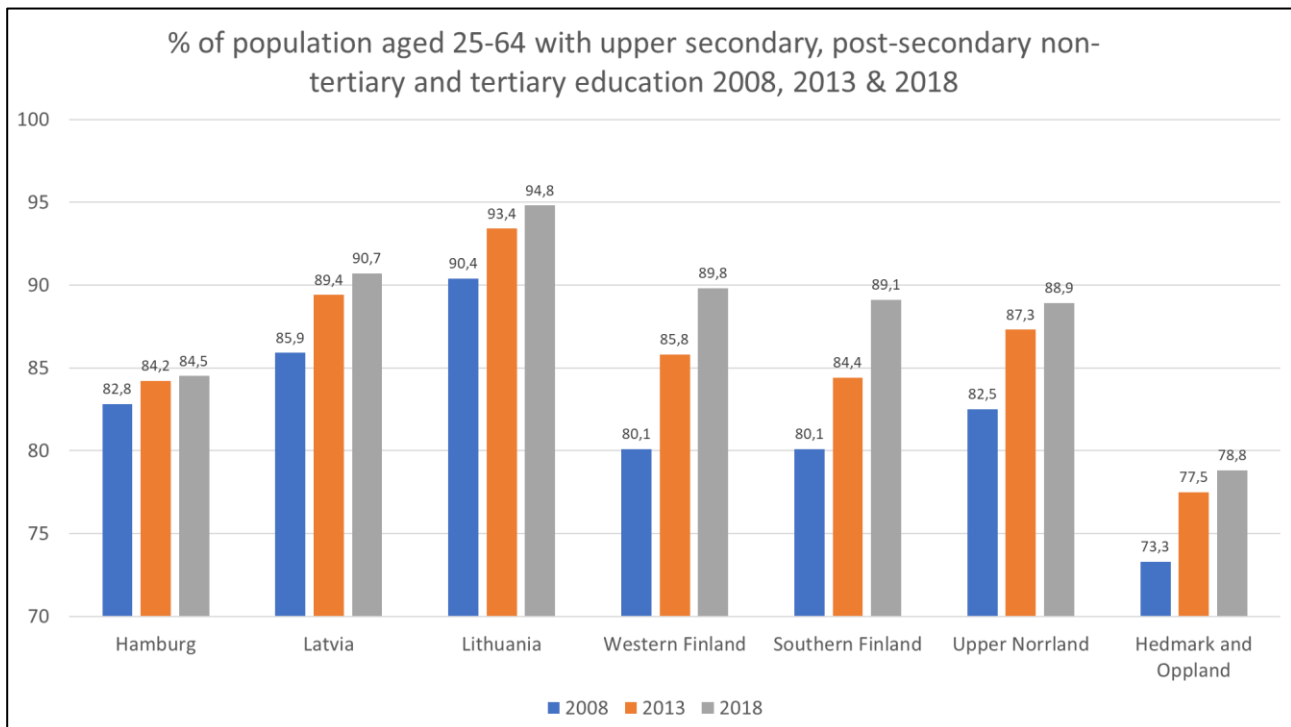

Figure 1.3. Percentage of population in the LARS partner regions in the ages of 25 to 64 with upper secondary, post-secondary non-tertiary and tertiary education in 2008, 2013 and 2018 (Eurostat 2019d)

The share of population with a higher-level education has been increasing in all case study regions. The biggest jump has occurred in the Finnish areas, with Western Finland increasing from 80 percent to 90 and Southern Finland increasing from 80 to 89. Smallest increase has been in Hamburg, from 83 to 85 percent. Hedmark and Oppland has the overall lowest numbers, although they are also increasing in a moderate pace.

In terms of just tertiary education (Figure 1.4), there are four regions, which are close to each other, with percentage of working age population with tertiary education ranging from almost 40 percent to little over 42 percent. These include both Finnish areas, as well as area surrounding Västerbotten (Upper Norrland) and Lithuania as a whole. The rest three regions range from 34 percent to 37 percent. Western Finland is a close number one with a little over 42 percent, followed by Lithuania with a little under 42 percent. Latvia is a bit surprisingly the lowest score considering the high number in the larger education level comparison, with a little under 34 percent. This means that Latvia´s education is mostly non-tertiary –based.
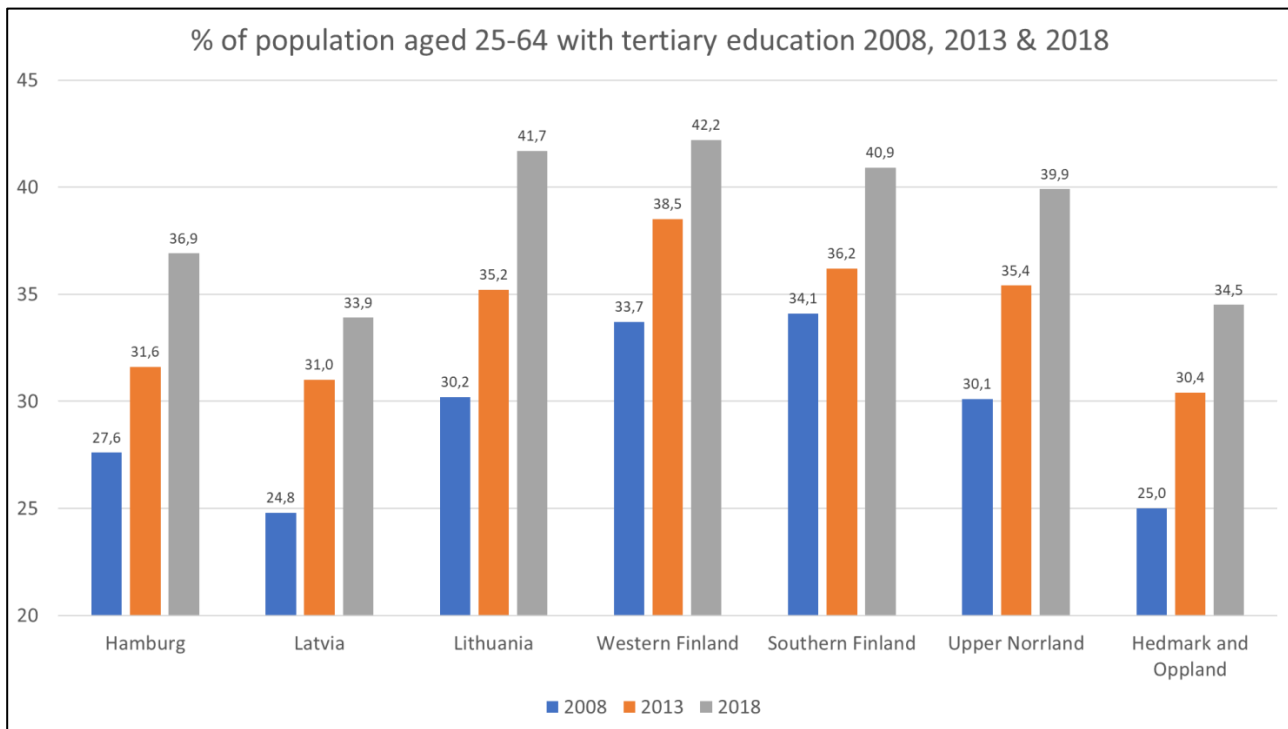
Figure 1.4. Percentage of population in the areas in the ages of 25 to 64 with tertiary education in 2008, 2013 and 2018 (Eurostat 2019d)

The share of population with tertiary education has increased in all regions in the last ten years. The pace has been slowest in Finland, owing to the already high numbers of 2008. Lithuania and Hedmark and Oppland show largest increases, with both increasing 38 percent. Hamburg, Latvia and Upper Norrland have all increased also by over 30 percent.

We can study the creativity of people in different regions with the help of data from European Social Survey (ESS), which is available at S3 Platform benchmarking data (2019). This data consists of responses of people about how important do they consider new ideas, when scale is from one to six. Lithuania is in clear lead with a score of 3 out of 6. The rest of the responses are between 2,6 and 2,7 out of six. This might indicate that creative qualities are valued most in Lithuania, or their education enhances creative thinking. Overall the scores were little lower than medium level on a scale from 1 to 6. Data from Oppland is unfortunately missing regarding this quality, but all other regions were included.

Educational and future talent needs of the regions can also be studied through sectoral distribution of employment (Figure 1.5), which shows the similarities and differences between the regions. Public administration is a large employer in all areas, in the Nordic areas it is the largest employer. Wholesale and retail is another major employer, it is the largest employer in Hamburg and in the Baltic states.
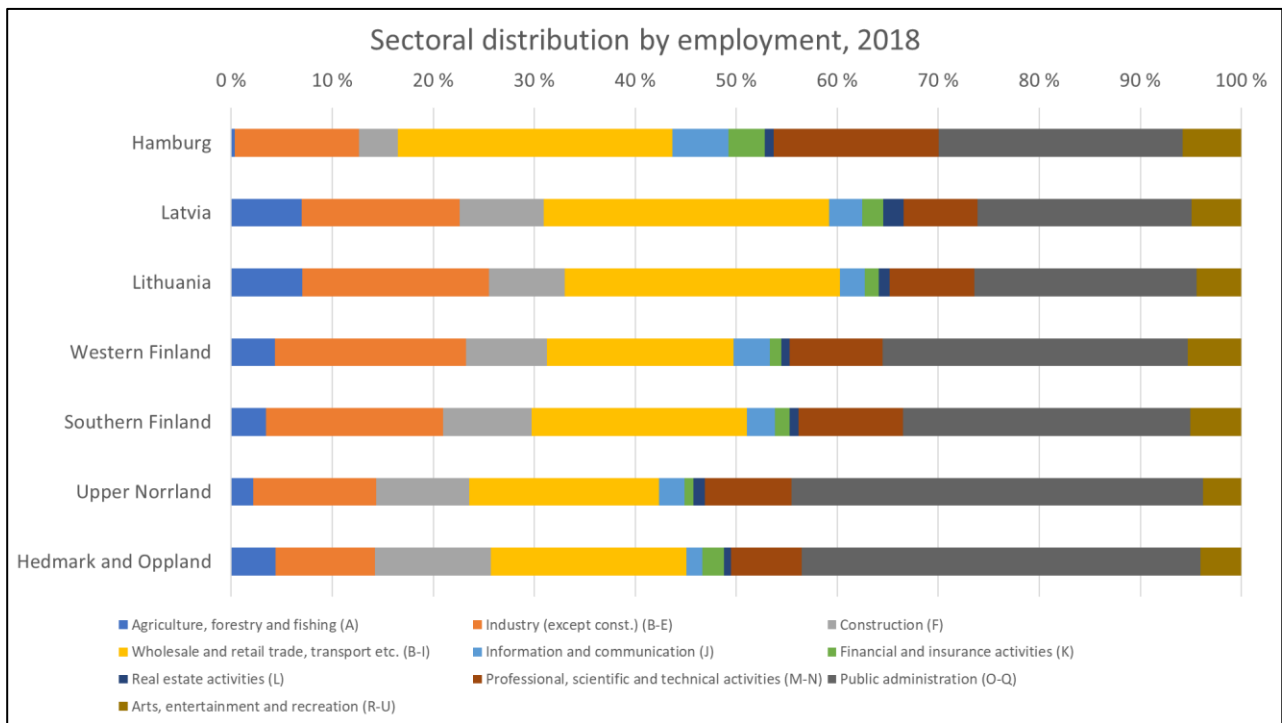
Figure 1.5. Employment in the areas by sector in 2018 (Eurostat 2019a)

Agriculture, forestry and fishing is especially strong in Latvia and Lithuania, as well as in Hedmark and Oppland, whereas it is almost non-existent in Hamburg. Industry is biggest sector in Lithuania and in both Finnish case regions, as well as in Latvia (to a little lesser extent). All case study regions have some industry, whereas Hedmark and Oppland has the lowest share of industry. Construction is significant in Hedmark and Oppland, as well as in Hamburg.

Information and communication is an important employer in Hamburg, which has twice as large share of overall employment than the next largest share (Western Finland). Similarly, financial and insurance activities employ more in Hamburg than in any other area, more than twice of the share compared to the second largest share (Hedmark and Oppland). Real estate activities employ relatively most in Latvia. Professional, scientific and technical activities employ most in Hamburg, followed by Southern Finland, Upper Norrland and Western Finland. Arts, entertainment and recreation employ quite similarly across all areas.

Industrial sectoral distribution of employment varies notably between the regions (see Figure 1.6). Mining and quarrying is the largest industrial employer in area surrounding Västerbotten (Upper Norrland), whereas in other areas it is small or nonexistent. Food, drinks and tobacco is the largest employer in Hedmark and Oppland, and important in Latvia, Lithuania and both Finnish areas. It is less significant in Upper Norrland and nonexistent in Hamburg. Textiles, apparel and leather is significant in Latvia and Lithuania, and small or nonexistent in other areas. Wood, paper and printing is the largest employer in Latvia and Southern Finland, and significant in all areas other than Hamburg.

Figure 1.6. Industrial employment in the areas by sector in 2016 (Eurostat 2019e)

Chemical, pharmaceutical, rubber, plastic and petroleum is significant in Hamburg, and small in other areas. Non-metallic mineral products is small in all areas except Hamburg where it is nonexistent. Basic metals and metal products is significant in Nordic areas and small in other. Electric, electronic, computer and optical equipment is largest in Hamburg and Finland, smaller in others. Machinery is the largest employer in Western Finland, and significant in Southern Finland and Hamburg. It is less significant in

Upper Norrland, and small in other areas. Transport equipment is very significant in Hamburg, somewhat significant in Nordic areas, and small in Baltic States. Other manufacturing is the largest employer in Hamburg and Lithuania, and it is varyingly significant in others.

We can lastly look at the international elements of the regions, especially regarding their export rates. Data has been taken from Eurostat (2019b) regarding GDP and the export rates have been taken from relevant national statistical agencies (Finnish Customs 2019, Statistics Norway 2019, Central Statistical Bureau of Latvia 2019, Statistics Lithuania 2019, and Federal Statistical Office 2019). Please note differing years, as export data was available only for certain years. As can be seen from Figure 1.7, total exports from the regions as percentage of the GDP are the largest from Lithuania, with almost 63 percent; Ostrobothnia is second with almost 45 percentage. Based on this value, it would seem that Lithuania, Ostrobothnia, Latvia and Hamburg have good international connections, but the companies of Päijät-Häme and Oppland are directed more towards domestic markets. Unfortunately, data is missing from Västerbotten.
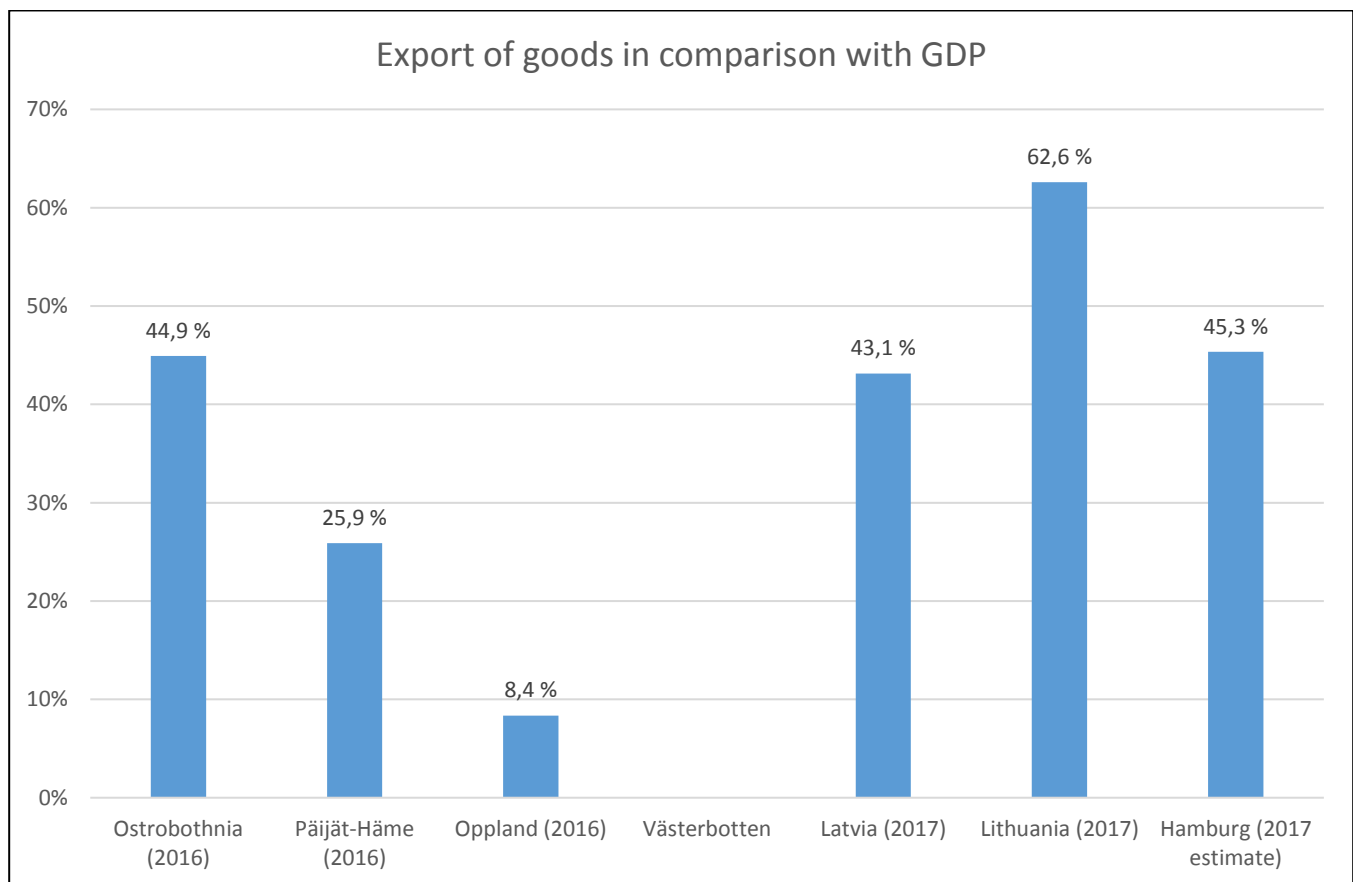
Figure 1.7. All exports from the regions as a percentage of GDP in 2016 or 2017 (Data accessed from national statistical centres and Eurostat 2019b)

This analytical regional comparison gives us an understanding of the regions and therefore prepares us for closer inspection of the innovation systems in the regions. However, before this there is a need to go through the process and methodology of the study, in order to explain our calculations and the process, which we used to gather them.

2. PROCESS, DATA AND METHOD OF ANALYSIS

2.1. Stakeholder analysis and selection of interviewees

Stakeholder analysis in WP3 has been made by the LARS partners. Stakeholder analysis is based on a business strategy approach. The point of departure is which stakeholders a firm should consider as important to its strategy, or salience. Salience means who counts. In LARS, we have adapted this method to value chains, and not just a single firm.

We are looking at their potential role in developing value chains through the following main dimensions (attributes):

(1) **the urgency** is the stakeholder's claim on the value chain. Urgency calls for immediate attention or pressing action. (Mitchell et al., 1997). The dynamics of a value chain is caused by the need to enhance productivity through search for optimal allocation of resources. This urgency is creating a power game between powerful and less powerful, dependent actors.

(2) **the legitimacy** of the stakeholder's relationship with the value chain. Legitimacy is, according to Suchman (1995: 574): "a generalised perception that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions." It is socially accepted structures or behaviors. NGOs and public authorities may be concerned with harmful pollution in a value chain, and challenge its legitimacy. Likewise, successful industries may have a high legitimacy, because they provide growth and employment.

(3) the stakeholder's **power** to influence the development of the value chain. Power is a relationship among social actors in which one social actor A can get another actor B to do something that B would not have otherwise done. Powerful stakeholders may be companies or institutions which control money, knowledge, rules, decisions, or other crucial resources.

Actors in different positions in the value chain are exploring new technologies or innovations that can satisfy the definitive stakeholders in better ways. They may do that together, in innovation cooperation. Through exploration, actors may grow unique forms of knowledge and create domains that are more competitive. They may be able to grow more power, and diversify their markets.

These three main dimensions make it possible to define 7 types of stakeholders. This typology help us to classify stakeholders in latent, expectant, and definitive (Figure 2.1).

Dependent stakeholders may rely on only one powerful "customer", and they may be easy to replace, because the knowledge they apply is easy to access. They are likely to focus on protection against potential competitors, and they might see innovation cooperation as a threat. Networks in value chains characterized by many dependent actors are likely to be centralized. Dependent actors compete to obtain and maintain their positions, and they may demand attention, legitimacy, and urgency.
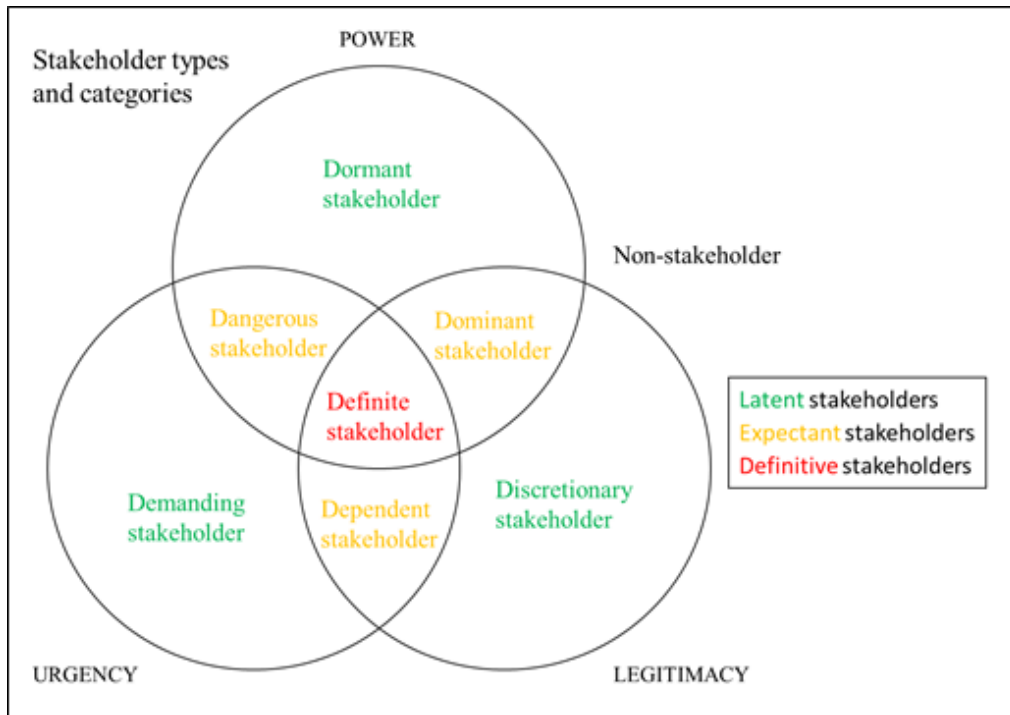
Figure 2.1. Stakeholder typology used in LARS (Mäenpää 2019; based on Mitchell et al. 1997)

Powerful actors, like multinational companies (MNCs) and other large global, national or regional champions may control value chains and be **dominant stakeholders**. They have the power and legitimacy to define how a good product looks like. They define the roles of their subcontractors, they write the contracts, they evaluate their subcontractors and they are able to replace them, if they do not fulfill the requirements of the contract. Their support may be crucial. Dominant stakeholders set standards, allocate resources and make decisions, providing legitimate rules (like environmental regulations and product standards).

Dormant stakeholders have power, but lack legitimacy and urgency. These may be multinational companies who may not have any interest in developing the surrounding region but focus more on their core activities. **Demanding stakeholders** on the other hand have urgency but lack power and legitimacy. These stakeholders are eager to be involved but lack the resources and stature to be heard. Smaller companies might be such stakeholders.

Public authorities may be **discretionary**, they may or may not get involved, and they may choose to be neutral and follow general rules. Indeed, this neutral position is often seen as the ideal. Discretionary public authorities may apply rules, regulations and other policies which create problems. Since they do not care, they might not even know what they are doing.

Different stakeholders may also become **dangerous**. Powerful companies may just move their investments elsewhere, invest in competitors. Dangerous stakeholders are also activists (competing firms, NGOs or regulators) who compete with the value chain, or challenge its legitimacy.

The stakeholders, who are driving innovation, are at the core of the intersections between helices. They are the **definitive stakeholders**, able to mobilize some legitimacy and power, and combine it with urgency. There is also a possibility that a stakeholder has no power, legitimacy or urgency and is a non-stakeholder (Virkkala & Mariussen 2018; Mitchell, Agle & Wood 1997).

Stakeholder analysis was made in partner regions in order to select a **stratified sample of stakeholders** to be interviewed, and to classify stakeholders according their attributes. A stratified sample represented different helices, levels of chosen value chains, as well as strong and weak stakeholders. Each partner filled a template provided by University of Vaasa regarding stakeholders' position in the terms of power, legitimacy and urgency in the value chain (Table 2.1.)

Selection criteria for the stratified sample according to the guidance:

First, all quadruple helix stakeholders should be represented. The partners choose 3-5 respondents from the helices: public organisations, universities, and NGOs. NGOs are a non-profit organisation that operates independently of any government, typically one whose purpose is to address a social or political issue. Environmental organisations are clearly NGOs. According to that definition farmers unions and business associations are NGOs since interest organisations are non-profit organisations.

Second criteria was the levels of value chain: the respondents represented different levels of value chain (this was based on value chain analysis made in period 1). Some of the chosen stakeholders represented more than one level of value chain. For instance, some companies have activities in many levels of the value chain. Also public organisations and universities can have activities in many levels of the value chain.

Third criteria was to choose both strong and weak stakeholders. To distinct between strong and weak stakeholders might be important for selecting companies, but also moderate companies were chosen. All stakeholders were analysed in order to understand their role in value chain.

The stakeholders have attributes urgency (interest, how eager the stakeholder is to participate), legitimacy (the legal authority or authority based on knowledge/experience) and power along value chain (the resources of the stakeholder), and these notions were defined by different helices in the context of LARS:

Urgency

Companies: interest to innovation, not only to new orders, interest to work with innovation co-operation;

Universities: motivation, interest and possibility to take account the development/need of value chain specific innovation in the education and research;

Public organisations: interest to include value chain specific issues as priorities in development strategies and direct the resources to the development of the value chain;

NGOs: claims to value chain, for example environmental, local, residents, consumers.

Legitimacy

Companies: the activities of the stakeholder are desirable or proper from the point of the value chain/innovation co-operation;

Universities: the education and research programs of the universities match to the value chain**;**

Public organisations: preparation, decisions and implementation of development programs;

NGOs: relation to value chain, for example environmental, local, residents, consumers, etc.;

Power

*Companie*s: defining the contracts, specifying product standards;

Universities: power to implement education and research activities;

Public organisations: setting rules and norms for value chain and innovation networks;

NGOs: ability to affect value chain, for example environmental, local, residents, consumers, etc.

To measure urgency, legitimacy and power of the stakeholder a scale from 0-2 were used in which**,**
0 = stakeholder with no urgency, stakeholder with no legitimacy, stakeholder with no power,
1 = stakeholder with some urgency, stakeholder with some legitimacy, stakeholder with some power,
2 =stakeholder with high urgency, stakeholder with high legitimacy, powerful stakeholder.

In this way the strong (definitive) and weak (latent) stakeholders were defined.

Table 2.1. Stakeholder analysis in LARS partner region (template for partners)

Stakeholder	Value chain level	Stakeholder's role in value chain/innovation network			Why ?
		Urgency	**Legitimacy**	**Power**	
Company 1					
…					
Company N					
Public org. 1					
…					
Public org. N					
University 1					
…					
University N					
NGO 1					
…					
NGO N					

2.2. Mapping QH connectivity - Interview processes in partner regions

The aim of the interviews was to map innovation networks in chosen value chains in the partner regions and especially to find out the bottlenecks of the functioning of the network as well as the development challenges. This was done by mapping the quadruple helix connectivity between the stakeholders with the help of gap analysis in which the expectations and experiences are measured towards each helix and this provides data for viewing the connections between helices.

Gap analysis is part of connectivity analysis regarding innovation networks and has been developed at the University of Vaasa (Virkkala, Mäenpää & Mariussen 2014 and 2017; Virkkala 2019, Mäenpää 2019; Mariussen et al. 2019) in cooperation with Regional Council of Ostrobothnia (Johnson &Virkkala 2016; Johnson, Dahl & Mariussen 2019). The idea of co-operation of triple helix actors is originally from Etzkowitz and Leydesdorff (1998, 2000) and quadruple helix cooperation from Caryannis et al. (2012) and RIS3 guide (Foray et al. 2012).

Connectivity means that three sets of variables: importance, expectations and experiences are correlated. The interesting question where we can look for pilots is deviations from connectivity. (Table 2.2) The data enabled us to construct three indicators of innovation potential:

1. **Connectivity.** A high level of importance, expectations and experiences, with small gaps be-tween expectations and experiences, indicates that the partner has a high connectivity seen as good practice, from which other partners might learn. Similarly, a generally low level across all indicators might mean a weakly integrated or fragmented regional helix (low connectivity).

2. **Gaps in important relations**. A high level of importance, expectations and experiences, with gaps between expectations and experiences, indicates that the quadruple helix actors have a need for policy improvement. They have a certain urgency, which may drive innovation.

3. **Disruptive relations**. A high level of importance, combined with low levels of expectation and experience or big gaps indicate a lacking or potentially harmful relation between helices, where a deep gap or a missing relation between helices might disrupt innovations.

Table 2.2. The stakeholder analysis and gap analysis

Stakeholder analysis	Legitimacy (and power)	Urgency	Power, weak legitimacy
Gap analysis	High connectivity, small gaps	Gaps in important relations	No or disruptive relations
Type of stake-holder	Dominant (powerful and legitimate)	Definitive, potential driver of innovation	Dangerous (demanding and dormant)
System charac-teristics	Static, in balance at high level	Dynamic, un-balanced	Fragmented, static

University of Vaasa prepared and provided for all partners 1) structured interview questionnaire with clear definition of the basic concepts (see Appendix); 2) Introductory letter describing the aim of LARS project and the aim of the interview and confidentiality of the interview process; 3) template, in which the partners filled the data and findings of the survey (same for all partners); 4) the preliminary findings and analysis of partner's data in a comparable form, and 5) a video, which explained the calculations.

2.2.1. The interview questionnaire

The interview questionnaire measured the relationships of respondents (which represented companies, public organisations, universities and NGOs) in innovation network. (Appendix). A partner of a respondent was defined as any organisation, which is crucial for organisation's work, with which it has contacts more or less regularly from time to time. Relations to partners may be formalized through contracts and/ or they may result from mutual understanding. Partners may in various degrees share the same or mutually supporting objectives. Partners are important to the innovation activities of responded organisation. Twelve different type of relationships for one respondent were measured. First, a distinction between four types of possible partners were made:

1. Companies, such as service providers, suppliers and customers;
2. Public organisations, such as municipalities, ministries, public agencies, and international institutions (EU, UN, etc.);
3. Universities, which perform research, education, and knowledge dissemination;
4. Non-governmental organisations (NGOs), which are usually non-profit interest organisations and operate on issues regarding business, environment, social security, public policy, education (chambers of commerce, farmer´s union, forest owners association, business associations, cluster organisations, etc.) There are also international NGO´s, such as Committee of the Regions, European Cluster Collaboration Platform. All organisations were categorized by their main activities.

Second, the partners locate at three geographical levels: regional, national and international. However, Lithuania and Latvia have in LARS context only national and international levels.

The respondents reported the number of partners and their importance by helices (companies, public organisations, universities, NGOs) and geographical levels (regional, national, international) by utilizing tables into which they entered the number of partner and, in another table, their importance on a scale from 1 – 10 (from lowest to highest, and using 0 to denote no connection).

The majority of the questionnaire dealt with the gaps, which are the differences between expectations and experiences of relationships. The model is based on the idea that the driver of change in a relationship between two actors is the tension between expectations, which may be confirmed and strengthened, or frustrated. The gap between the values of expectations and experiences was then used as an input in a structured dialogue in focus groups in which companies, universities, public organisations and NGOs participated. Gap analysis helped stakeholders to identify problems and set up parameters for dialogues that help to resolve them.

Cooperation in the survey refers to activities in which both sides are genuinely interacting with one another. For example, we do not consider purchasing a product, or granting assistance to be cooperation if there is no dialogue between the actors (for example planning, mutual project, etc.)

Expectations = what the cooperation should be in ideal situation/what you want it to be. This was measured with a value/meaning: 10-9 Very high expectations, 8-7 High expectations, 6-5 Average expectations, 4-3 Low expectations, 2-1 Very low expectations, 0 = no expectations

Experiences = the cooperation in practice which was measured with following scale: 10-9 Very good experiences, 8-7 Good experiences, 6-5 Average experiences, 4-3 Bad experiences, 2-1 Very bad experiences, 0 = no experiences

The individual relationships for instance the relationships between companies and their partners (in company, public organisation, university and NGO helices) were measured regarding the dimensions of the cooperation like regarding production networks (logistics, parts, services; process innovations), innovation network (design, testing, marketing; product innovations), future ventures (events, learning seminars, work relating to long-term exploration of business opportunities).

The relationship between public organisations and their partners were measured with dimensions of cooperation in regional development (infrastructure, logistics, land-use), cooperation regarding innovation network (business development, employment affairs, advice i.e. work surrounding the products/services/research) and cooperation regarding future ventures (events, education, knowledge/export-oriented activities i.e. cooperation in developing innovative/inspiring environment).

The relationship between universities and their partners were measured with dimension of cooperation in education (mutual courses, visiting lecturers, student project), cooperation in development (testing, common projects, work surrounding the products/services/research), and cooperation in research (analytics, new solutions & concepts and other work relating to long-term exploration of opportunities).

The relationships between NGOs and their partners were measured with dimensions of cooperation in regional development (land-use, logistics, environmental consultation), cooperation in product/service development (consumer testing, and work surrounding the products/services/research) and cooperation regarding future ventures (common events etc. relating to long-term exploration of opportunities).

For all relationships (with companies, public organisations, universities and NGOs) there were also open questions like for relationships to companies:

- Could you briefly explain your reasoning for the marked expectations/experiences regarding companies:
- Some good examples of cooperation with companies:
- Biggest challenges regarding cooperation with companies:

The introductory letter emphasized the confidentiality of the survey. The responses were completely anonymous and could not be traced back to the respondent. The results are used in the comparative analysis with other summaries from LARS project partners in order to promote transnational learning.

2.2.2. Interview processes in partner regions

The partners translated the interview guide and introductory letter to their interview languages. The partners interviewed at least 3 respondents from each helix (public organisations, companies, universities, NGOs) and made 13–23 interviews per region, companies being the biggest helix (stakeholder type) group, and NGOs the smallest. Public organisations and universities were equally represented in the whole interview data of LARS (Table 2.3). The interviews functioned, both as a method of data collection for the connectivity analysis, and as engagement of (quadruple helix) stakeholders to cooperate in partner regions.

Table 2.3. Number of interviewed respondents in LARS regions

Region	Number of interviewed respondents	Interviewed company respondents	Interviewed university respondents	Interviewed public organisation respondents	Interviewed NGO respondents
Ostrobothnia	22	9	5	5	3
Lithuania, LAEI	13	4	3	3	3
Oppland	24	14	3	3	4
Västerbotten	17	5	5	4	3
Päijät-Häme	23	9	5	6	3
Latvia	14	4	3	4	3
Hamburg	14	5	3	3	3
Lithuania, LIC	14	5	3	3	3
Total	141	55	30	31	25

2.2.3 Analysis of the data: Template for partners for the findings of the survey

In order to compare the connectivity of quadruple helix actors in different value chains and findings of the survey, university of Vaasa provided an excel table in which the partners could fill the findings of the survey. University of Vaasa planned a calculator on this data in order to count the averages of expectations and experiences as well as the gaps regarding different aspects and types of relationships.

To engage the partners for filling the data and using the comparable data based on calculator university of Vaasa prepared a video on guidance. The teaching video explained the figures and the power point templates. This made possible to have more similar and comparable data analysis.

University of Vaasa provided the tools to count the number and importance of the partners of different helices, as well as the expectations and experiences concerning the relationships i.e. the gap analysis (biggest gaps and good practices).

2.3. Verification of analysed data and engagement of stakeholders - Focus group meetings

The idea of focus group meetings is to gather important stakeholders, discuss on the innovation network and its functioning and relevant gaps, as well as the ways to bridge them. In these meetings, the data gathered with interviews, especially the gaps between expectations and experiences in cooperation between QH actors, were presented to relevant stakeholders in order to verify the findings of analysis. Focus group meetings are structured dialogues on gap indexes, on problems in connectivity between helices and on possible good practices in cooperation between different QH actors. They based on the interview data, but they were also part of dissemination of findings as well as engagement of relevant stakeholders to transnational learning in the context of LARS.

At least one focus group meeting was organized in every partner region (between end of 2018 and beginning of 2019). According to the reflection of the participants, the meetings helped the partners and relevant stakeholders to 1) find good practices, 2) find and verify bottlenecks of the innovation system, and 3) identify what gaps are relevant and important and should be bridged in the partner regions. The focus group meetings also created social proximity between quadruple helix (QH) actors, which is important for the next phases of LARS project.

Participants of the focus group meetings were both interviewed stakeholders and other relevant stakeholders. Participants were key persons and organisations in the selected value chains. The number of participants varied from 7 to 23 per partner region. However, some partners combined focus group meeting and verification of interview data from selected value chains with broader strategy seminars (Västerbotten, Oppland).

In the meetings, the gap analysis was presented in the form of tables and figures. The partners directed questions concerning the truth and relevance of the gaps to participants. For instance, the tables of the

number of partners by companies, universities, public organisations and NGOs in the region, the importance of partners by helix and by region, and biggest gaps in the network, and in helices were presented. Discussion was invoked on relevant relations and their explanations. The participants suggested reasons for gaps and the possible relevance of the gap (*is it a problem? If it is a problem, should it be bridged?).* It was also important to find out measures, actions or change of mind, that participants suggest to bridge the gaps. According to the responses of the participants in focus group meetings this was useful and they indicated also positive opinion on transnational benchmarking.

In addition, good practices in the quadruple helix network were identified. The good practice is a relation, which involves several helices and is working well. Besides the quantified tables also responses in the open question were used to identify the good practices, and the participants had views to their relevance. Participants evaluated the focus group meetings and the ideas of LARS and gap analysis as useful. Also partner who organized the meetings got more understanding on why something is working or is not working, i.e. explaining of the gaps and good practices.

The partners added the reports of focus group meetings in their final reports. These reports consists of the stakeholder analysis, information on interview process, gap analysis and report on focus group meetings. The reports are the basis for comparative analyses of connectivity in the chapters 5, 6 and 7 of this report. They will also be the basis for good practice analysis and transferability analysis, as well as report on the challenges of connectivity between stakeholders in partner regions.

2.4. Data and method of analysis

The LARS data consists huge amount of variables, which can be combined in different ways.The responses in the questions in the questionnaire can be quantified as variables, which have different values (for instance between 0–10).

The data gathered by the questionnaire is based on interviews of 141 individual respondents in the LARS regions. Every respondent replied on his/her relationships towards partners in all 4 helices in 3 different spatial units (regional, national and international). Altogether, we had 12 relations per value chain, but in Lithuania and Latvia the regional level were not counted, so there were altogether 8 relationships (Figure 2.2). However, not all respondents had relationships towards other stakeholders in all helices and all spatial levels. The values of these relationships (expectation, experience) were treated as zero.
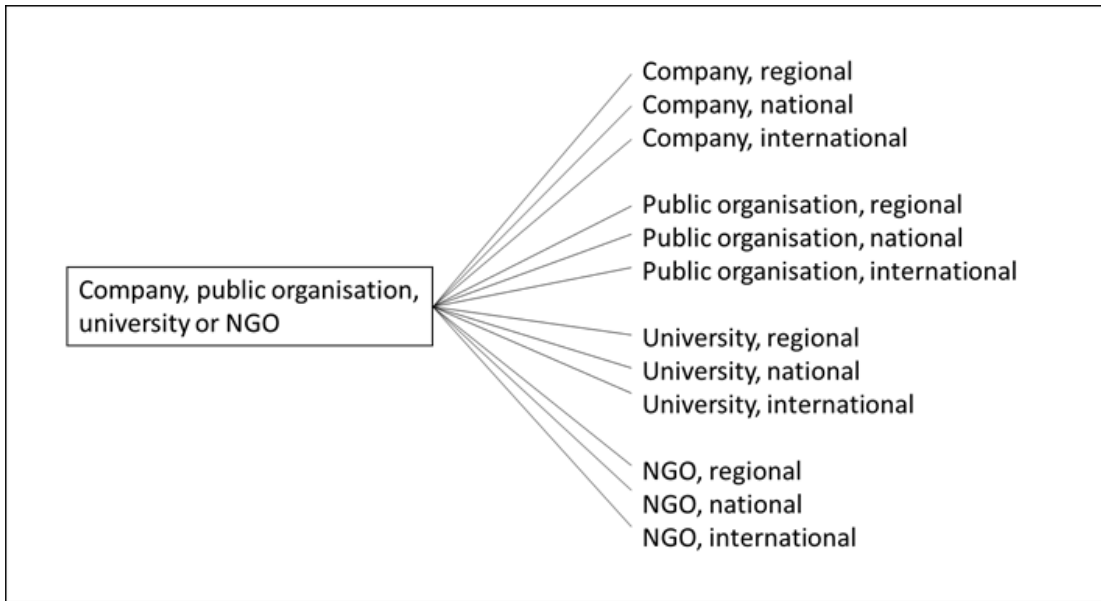
Figure 2.2. Network relations studied in LARS project

There were at least 3 respondents per helix, which meant that there was a minimum of 12 interviews per partner region. In most of this analysis, we treat this individual data as *means* of the values of the relationship per helix and per spatial unit. Since we have summarized the answers it is question of average of relationship of the actors in the specific region and helix towards other helix actors (including the own helix and region of the interviewed).

Baltic countries have only national levels but we have used their national values as (proxy for) regional level. Lithuania and Latvia have therefore same values for relationships both in regional and national levels. In this way, the number of statistical units (LARS partner region) remains the same in all dimensions, helices and spatial levels. We could have treat the three cases in Lithuania and Latvia as own class during the analysis but that would have made the analysis even more complicated. The second possibility would have been to define the values for regional level in Lithuania and Latvia as zero.

LARS partner regions are treated as statistical units. Each variable (like expectation toward companies in production network) has 8 values across regions (cases, statistical units). The questionnaire was quite detailed, since every individual relationship between actors in different helices and spatial units was still differentiated, which resulted a statistical data base more than 100 basic variables.

In order to summarise and generalise the rich data, we have used factor analysis and SPSS-statistical program. Using factor analysis, we can reduce the variation and get more generalised understanding of the patterns of expectations and experiences and the related gaps in the measured networks. Factor is a new variable, which has been formed based on the existing variables through correlation matrices of other variables of the data. From LARS data, we can build many new variables through correlation matrices. Factor analysis helps us also to reveal the underlying patterns on hidden correlations. It is also inductive to generate abstract variables from many empirical variables and their values. We need

new variables for instance to operationalise and measure the abstract concept of quadruple helix connectivity (see Chapter 6). The new variables or factors have been made by combining the existing variables. It is also important to know if for instance the gaps are big or low towards relationships to important stakeholders. It might be more crucial to have a big gap towards important stakeholders (QH actors) than towards less important one. This means that we examine correlation between importance of stakeholder and features of its relationship like expectation and experience, as well as tensions in the relationship (gaps).

We aim to find and visualize the differences between LARS regions across different variables (and factors build on the variables). We use factor analysis to maximize the differences between regions. The differences can be concretely seen in the distances of the diagrams. In the diagrams the values of the cases (regions, statistical units) are not absolute values from the questionnaire, instead the values are related to the context and depend on the comparison. We use different types of maps (Heat maps) and diagrams. Some of the diagrams in the chapters are showing the distribution of the values of variables (and factors as variables) and the deviation of the regions (cases, statistical units) from the mean value of the variable. This means that there are positive and negative deviations of the means, and the sum of these values are 0.

The data has also limitations, since it is based only on 141 interviews, and some helices in the LARS regions and value chain are represented only via three interviews. Second, the values are based on subjective evaluations of the interviewees regarding expectation and experience of the relationship and importance of the partner. However, we have tried to guide the interviewers to use common scales. Third, the use of means reduces the variations but this limitation we approach adding some scatter diagrams to see the variations in the data.

3. SUMMARY OF PARTNER REPORTS

3.1. Sustainable energy and environmental technology in Västerbotten as a QH case
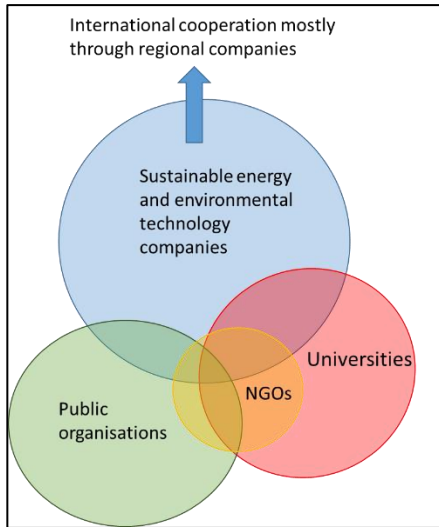
Sustainable energy and environmental technology companies in Västerbotten have good connections to universities and even consider them to be more important innovation partners than other companies. Companies are more internationally oriented than actors in other helices and their international contacts are the route to connect the cluster globally. Companies have gaps towards public organisations regarding collaboration in regional development and have also gaps in their relations to international universities, due to high expectations. Some of these issues were noticed to relate to time issues as well as living in "different worlds" to some point.

Universities in the region have no major gaps and are mostly cooperating with regional partners, with the exception of national public organisations, which were more important than regional public organisations. Universities seem to be very important partners to regional companies.

Public organisations are overall strong regarding their power, legitimacy and urgency, but actors in other helices consider national and international level public organisations to be more important than regional public organisations. One exception is NGOs, which do not consider international public organisations to be more important than regional ones. Public organisations have some gaps regarding future ventures with regional companies, as well as with national public organisations regarding innovation networks.

NGOs are not considered to be very important innovation partners by other helices. However, NGOs consider actors in other helices at regional and national level to be important partners for them, Universities and public organisations are the most important partners for NGOs. Most of the gaps are related

to cooperation with other NGOs in regional or product/service development. There is also one positive gap between NGOs and international NGOs regarding future ventures.

3.2. Grain cluster in Päijät-Häme as a QH case
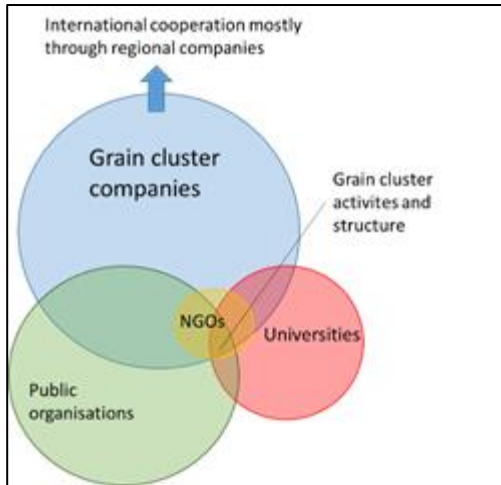
Many grain cluster companies are international and export oriented, but have good connections to national and regional level. Cooperation between companies seems to be in good level. Public sector is not seen as an innovation partner but more like actor that enables and supports innovation. Regional universities on the other hand have not been able to meet the needs of companies. NGOs were not considered necessary or important for companies. This also shows in low expectations and experiences towards NGOs. NGOs are more seen as knowledge providers than innovators. Biggest gaps towards companies were related to innovation activities, as public organisations and NGOs feel that they have not been involved enough.

University level research and education regarding food and beverage industry is not present in Päijät-Häme region. This is probably one reason for lacking cooperation with companies. However, regional cooperation between universities is working well. Cooperation with public organisations is seen as problematic, because lack of funding has created new challenges for universities. Respondents from universities said that NGOs could be one solution to promote widely circular economy related innovations, for example by citizen associations and promoting common knowledge about food value chain. There was a relative large gap in regional level regarding development between universities.

Public organisations should be more proactive and communicate more often to the companies. This was one of the reasons for the largest gap, which was concerning regional development between small companies and public organisations in regional level. However, companies were also mentioned to be unwilling to share discoveries with public organisations. Criticism was also pointed towards other public organisations, as their practices were considered slow and rigid. Public organisations are having big

expectations on NGO's role in innovation activities (sharing results in developing), but lack experiences on cooperation.

In NGO's point of view companies do not understand (or take into account) the value of forecasting strongly enough, and via that the value of NGO's in innovation processes. It was also said that NGOs are surprisingly far from universities actions. Public organisations do not see the role of NGOs as clear as biggest gap towards NGOs in future ventures was from them. The Grain Cluster model (different joint projects, marketing, joint discussion and seminar events) is itself a good practice and it works well connecting companies, public actors and via them universities and research institutes and NGO's. All the members are equal and everybody have "one vote" despite of the size of the company. Cooperation opportunities are searched and implemented within the rules of competition laws.

3.3. Energy technology cluster in Ostrobothnia as a QH case
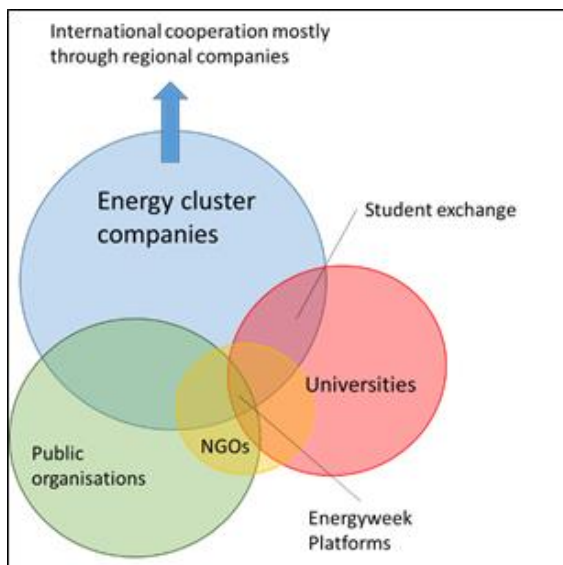
Companies form the center of innovation activities and global connections. They are important for other helices and most connections are towards companies. Especially company-company links are important, as there are many local subcontractors. However, subcontractors feel that they might be even more involved than they currently are and need more data from global companies to remain competitive in future. Especially global companies are skilled at using student input in their development and use strategic planning to make the most out of this flow of new ideas.

Universities are important partners mostly to global companies, as smaller companies do not see cooperation with universities to be useful for them. Mostly issues between universities and companies are related to the different mind-sets, where universities aim for publications and companies seek more concrete solutions. Universities are also said to lack proper facilities, especially robotics and IoT laboratory was mentioned to be important in the future. Universities lack relations to international research field.

Public organisations have more cooperation with various sizes of companies and are not content with the cooperation between local companies and universities. Public organisations would need more input regarding strategic development of the region and this dialogue is largely missing. Public organisations are not using students' ideas for development as much as companies do.

Local NGOs are in a sense an extension of energy cluster companies, as they are primarily developing the energy sector directly or indirectly and organize Energyweek-event annually, which gathers energy cluster specialists from all over the world together. NGOs see local companies and public organisations as most important partners.

All actors are cooperating during Energyweek event and the cooperation has been increasing overall. New platforms developed by University of Vaasa, Wärtsilä and Wasa Innovation Center can be seen as proofs of this development, which has already spurred more dialogue between different helices.

3.4. Wood cluster in Oppland as a QH case
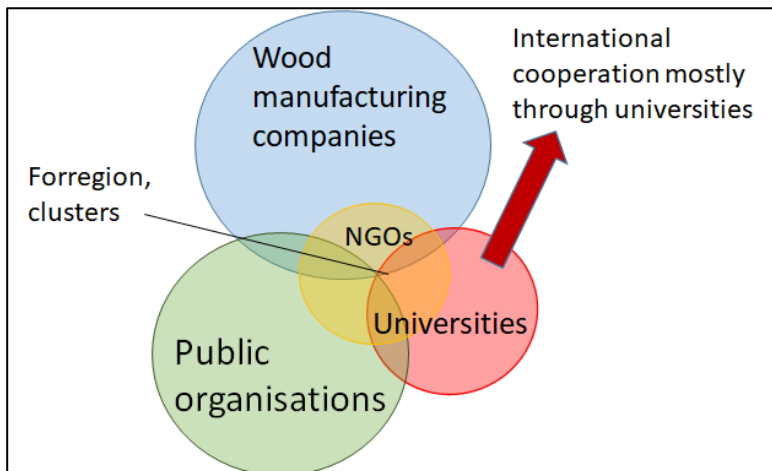
Wood manufacturing companies mostly cooperate with other companies and therefore wood manufacturing can be considered to be company-driven QH. Companies consider universities to live on their own world and focus only on big EU projects, whereas companies wish to focus on more practical issues and prefer national level cooperation more. According to companies, public organisations are trying to help, but different instruments form a "jungle" which makes it very difficult for them to cooperate. NGOs have been more useful for enhancing collaboration.

Regional universities lack to some extent the wood manufacturing experience, but are otherwise powerful and for example capable of handling international projects. They suffer from an image issue, as they are not considered to be important for wood manufacturing companies. Universities have high expectations towards other partners in innovation and development but these have not been able to meet their expectations.

Public organisations provide companies with funding opportunities but companies tend to avoid them, because they feel the system to be complex. Overall, public organisations have some gaps in cooperation between companies and universities, especially regarding innovation or development.

NGOs have high gaps towards public organisations, who they consider to be poorly coordinated and lacking actions instead of words. Good examples of QH collaboration include clusters, but also Forregion, which is a project, where regional companies are visited by experts, who help them to discover a good research partner. They act as knowledge brokers.

3.5. Advanced manufacturing in Lithuania as a QH case
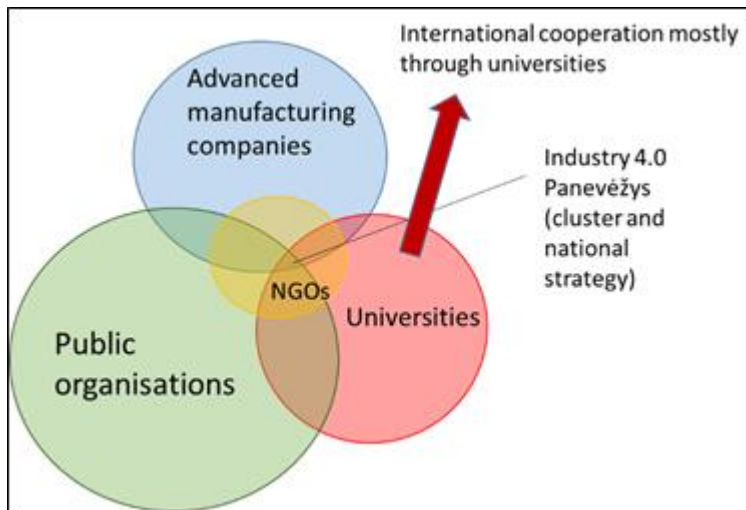
Advanced manufacturing companies are mostly cooperating among themselves. They do not see much value in cooperation between other helices. They also have high expectations for cooperation with other companies in general. Smaller companies are seen to be more easy to approach than bigger companies, as big companies usually have their own R&D departments, therefore they do not need to buy these services from external actors. Public organisations and universities are also seen as important partners, but they follow their own logic, which makes it difficult for companies to cooperate with them. Overall, the QH of advanced manufacturing industry in Lithuania can be considered to be company driven.

Universities are seen as valuable partners regarding education, as they educate new professionals to the field. However, their R&D efforts are not directly applicable to business purposes according to companies. They also lack the ability to sell their expertise.

Companies are encouraged to cooperate with universities, for example via research funding programs (vouchers to buy R&D services from unis), but companies still see this option too difficult, as universities live on their on their own world. Universities are well connected internationally.

Public organisations are powerful national entities, but lack cooperation among themselves, which makes it difficult to cooperate with them. One needs to contact several ministries in order to get deci-sions. Public organisations are seen important actors for establishing positive mindset for innovations and entrepreneurship, but they seem to be passive towards companies. Centralised governance was seen to be one hindrance for development as there are no regional or local public entities who might be contacted.

NGOs have little direct power, but have been able to establish forums for dialogue and even participated in developing national 4.0 strategies and can be thus considered to be in very important role in the future development of the industry.

3.6. Metal industry in Latvia as a QH case
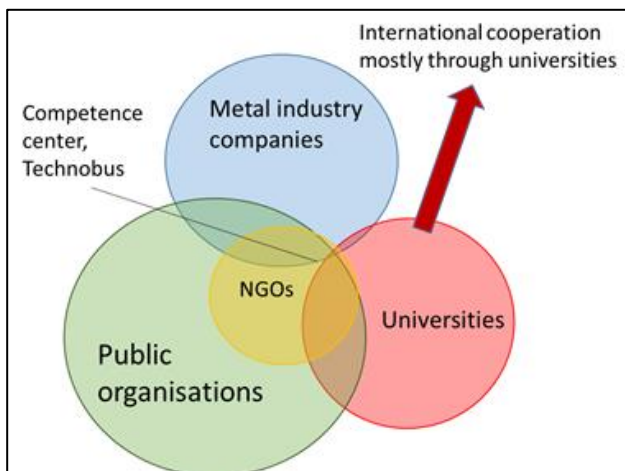
Companies in metal industry are mostly cooperating with international companies. National level coop-eration between companies is not common as they are considered to be rivals. They also see value in cooperation with public organisations, as they are considered to be important for developing a better business-climate. Universities are valued for their education, but their research is not considered to be relevant for companies. Companies consider NGOs to be important but still too inactive. Overall, metal industry is company-driven QH.

Universities are well connected internationally to other universities and have advanced R&D, but have less cooperation with other actors. They would like to have more cooperation, but have not managed to gain trust from the companies.

Public organisations are considered to be important by other partners and they have power and legitimacy, but mostly cooperate among other national public organisations. They have many connections to other helices as well.

NGOs consider public organisations to be the most important partners, as they are trying to influence their decision-making, but also other actors are important as NGOs are trying to be as an intermediary between other actors. They mostly operate in national level, where their focus is. Some interesting developments have included teaching activities where metal industry has participated via "schoolbus" which includes a laboratory and helps in developing future workers in the field, as well as a competence center to help educating new people for the industry.

## 3.7. Bioeconomy in Lithuania as a QH case
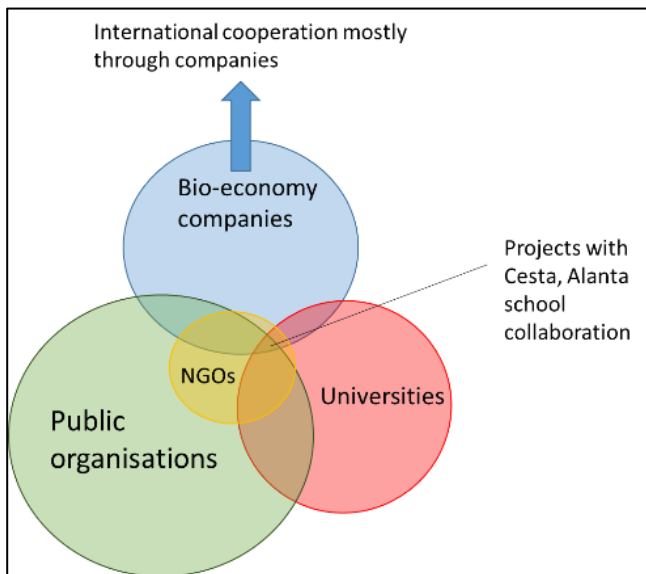
For companies most important innovation partners are other companies, national public organisations and universities. Greatest mismatch among collaboration expectations was found at national level between companies and public organisations and between companies and NGOs. Biggest gaps in collaboration with companies were presented by NGOs who feel that they are not welcomed to join the innovation activities. Companies have highest experiences in operating on international level, so they act as a main route to international collaboration.

Universities consider all innovation partners to be important both at national and international level, except international public organisations and NGOs. Overall finding propose that weakest cooperation with academia exist with NGOs and other scientific institutions both at national and international levels in all three fields, i.e. education, development and research, whereas medium gaps were issued by companies, universities and NGOs.

Ministries stated high importance of innovation partners among other ministries at national and international levels, also science representatives and NGOs at national level. However, Lithuanian ministries stated companies at national level being less than medium importance innovation partners. Non-existence of ministries' international innovation partners were found among companies, academia and NGOs. Very huge collaboration gaps with public organisations was found by NGOs both at national and international levels in all three listed fields.

NGOs consider other NGOs, public organisations, science representatives and companies at national level as important, whereas international level was not that important overall. Limitations in cooperation are especially evident in case of NGOs, both at national and international levels were non-existence of innovation partners limit their potential to learn and increase their role in overall development. NGOs highlighted the existence of huge collaboration gap with companies in the field of innovation network both at national and international levels. Very limited amount of innovation partners in general are found at international level among almost all quadruple helix parties.

3.8. Circular economy in Hamburg as a QH case
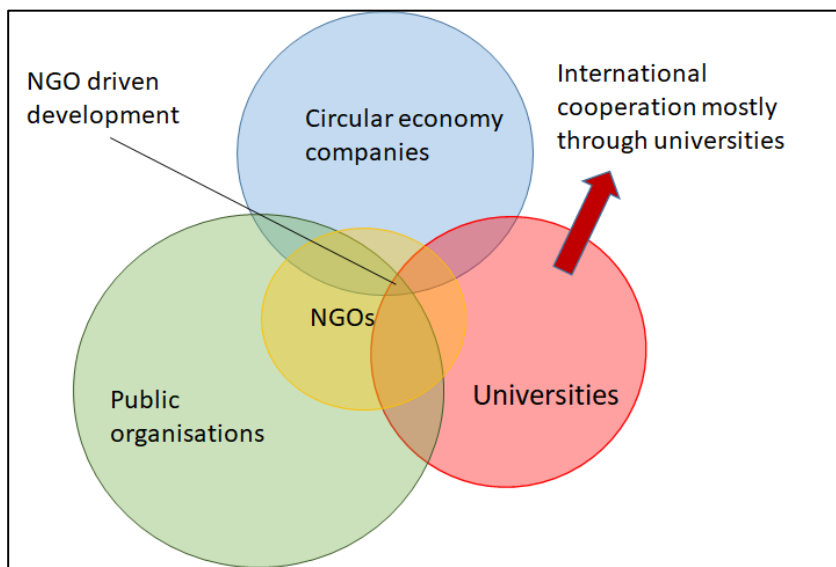
Circular economy companies in Hamburg are not very interested in cooperation with other partners, regardless of the helix or geographical level. Companies' expectations and experiences are in general low and there are no large gaps. Cooperation with companies is most important for public organisations and least important for other companies.

Hamburg is a federal state and therefore has powerful public organisations. This is discussed as one reason for the gap on national level at cooperations between public authorities, as well as bureaucracy. Cooperation with public organisations are in general very important for other helices, but least important for companies. Cooperation between public organisations in regional development and innovation networks on regional and on national level show the biggest gaps. Public organisations have the highest expectations according to their cooperations with other public organisations.

Universities in the region participate actively in different international consortiums and projects and therefore form a strong hub for international knowledge. However, cooperation between universities and companies is low in general. Universities in Hamburg are also not too keen to cooperate on national level, as many universities are competitors in international funding opportunities and biggest gaps relate to this national level cooperation with other universities. Universities have good experience in cooperations with public organisations, public organisations' experience with such kind of cooperations are not as good, but on an average level. Universities also lack experiences with NGOs, although the other way around the cooperation is on average level.

NGOs were considered to be important innovation partners in the region and the region might be described as NGO-driven innovation system in circular economy. All organisations except universities see NGOs as important partners on a regional level. On the other hand, NGO see universities as important partners for cooperation on regional level, like all other organisations. NGOs are very well integrated in the innovation network. They are working as drivers for the innovation process. Biggest gaps measured in the data for Hamburg are on NGOs cooperation with companies regarding production networks on a regional level, and regarding innovation networks on regional and national level.

4. STAKEHOLDER ANALYSIS

As described in previous chapters, the partner regions made stakeholder analysis regarding their respondents. Stakeholder analysis was targeted to related industries and value chains, in order to gain more understanding regarding the regional differences. On one hand, it may be easier for public organisations to develop a region if it only has weak stakeholders. On the other hand, powerful stakeholders can lend their hand while making changes. They can also present a threat, especially if powerful stakeholder who lacks legitimacy try to control regional development. Therefore, it is insightful to examine the situation in partner regions, in order to take into consideration the role of regional stakeholders, and encourage them to participate into the development process later in the project, when good practices as well as pilots are concerned.

The basic assumption was that interviewed stakeholders were part of the analysis, but it also included important stakeholders, who were not part of the interviews. Therefore, stakeholder analysis is giving us an idea of overall regional situation, but is not directly showing the interviewed respondents or their organisations. However, all partner regions have verified that their sample of respondents is representative in respect to size of companies, type of public organisations, universities and NGOs of the related value chain in the region.

However, it needs to be stated, that there may be big variation in the reports on conduction of stakeholder analysis. LARS partners very well know some stakeholders, whereas others are perhaps known only by their name and therefore understanding of the stakeholders legitimacy, power and urgency is based on more general knowledge.

As explained, stakeholders were categorised by their legitimacy, power and urgency and member of the project partner organisations, who know the local actors best, made the categorisation. In total, there were three possible values: 0, if stakeholder had no legitimacy, power or urgency; 1, if stakeholder had some legitimacy, power or urgency; or 2, if stakeholder had lots of legitimacy, power or urgency. Legitimacy is measuring how related the actor is towards the value chain/industry, power is measuring the stakeholder financial or political power to get what it wants and urgency is measuring how eager the stakeholder is to make a change.

In Figure 4.1 we can see, that companies have been scored quite low regarding their legitimacy, as have NGOs. Päijät-Häme and Västerbotten have the highest legitimacy regarding companies. NGOs were considered to have low legitimacy in both Lithuanian cases, Latvia and Päijät-Häme, whereas Hamburg, Ostrobothnia and Västerbotten considered them highly legitimate stakeholders. One explanation to this can be the focus of NGOs, as they may operate on more genera level and do not directly work on the related fields, or may be otherwise not well established yet in the eyes of other helices. Västerbotten has high legitimacy regarding all their helices, so their stakeholders are well related to sustainable energy and environmental technology. Interestingly, public sector in Lithuanian bio sector (LIAE) and universities in Latvian metal industry, Lithuanian robotics industry (LIC) and Ostrobothnian

energy technology sector were considered fully legitimate stakeholders. Overall, universities were considered most legitimate stakeholders for the partner regions, so they must be focused on studying the related industries.
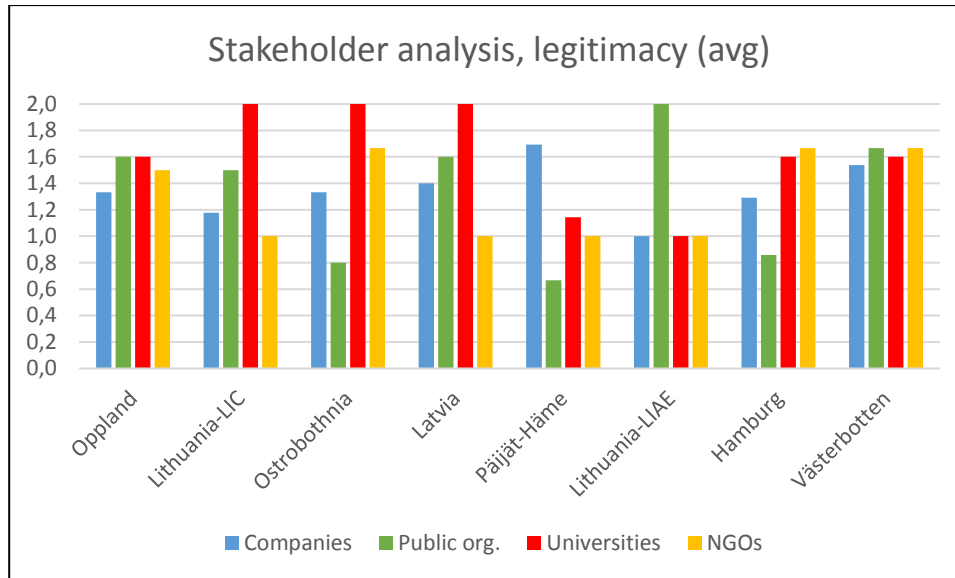

Figure 4.1. Stakeholder legitimacy in different helices

In Figure 4.2 we can see that most powerful stakeholders tend to be public organisations. This is quite understandable, as 4 out of 8 partner regions have public organisations with legislative powers (Latvia, both Lithuanian cases and Hamburg). Interestingly, universities are the weakest stakeholders in the partner regions, followed by companies. Weak power is not necessarily stating about the size of the stakeholder, but may reflect on how active the stakeholders are in developing the region. This may also explain the high score on public organisations overall. Västerbotten seems to have high power in all helices, so their stakeholders seem to be able to make a change in society if necessary. Latvia also seems to have powerful NGOs and universities overall. Most interesting numbers are probably related to NGOs, as they are considered the second powerful helix in the partner regions. This may be explained through their profiles, as some of them are development agencies and interest organisations who may be powerful lobbyers. Against this background, the power aspect of stakeholders becomes more understandable.
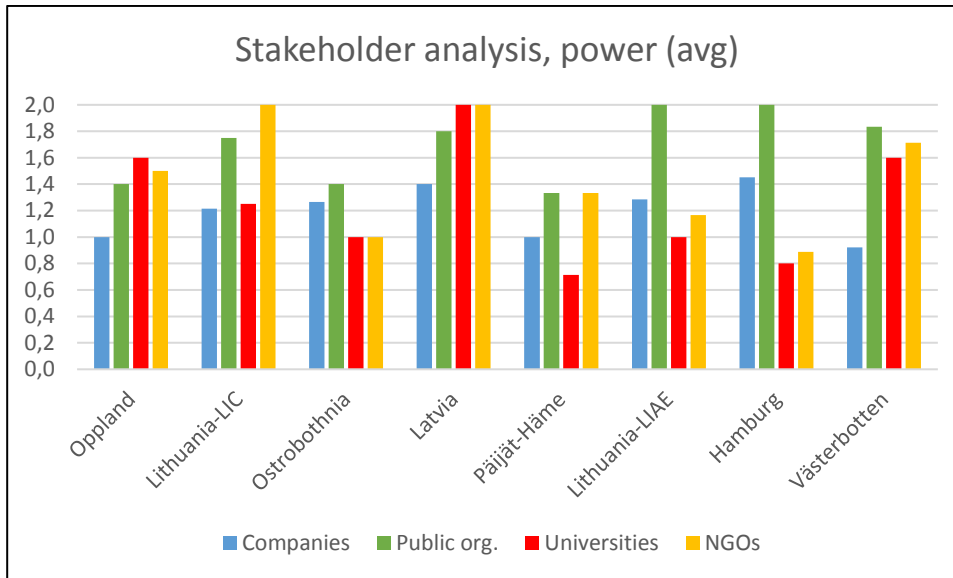
Figure 4.2. Stakeholder power in different helices

Figure 4.3 shows the urgency of different stakeholders. Public sector seems to be most eager to act, and this is followed by NGOs and universities, whereas companies have the least reason to be urgent in their activities. Once again this makes sense, as public sector and NGOs are more likely to operate in development activities, whereas universities and companies have their own every-day tasks. In Lithuanian robotics industry (LIC) there are urgent NGOs, public organisations and universities, but companies seem to be less urgent. Västerbotten seems also to have urgent stakeholders, so the region seems to be looking for changes.
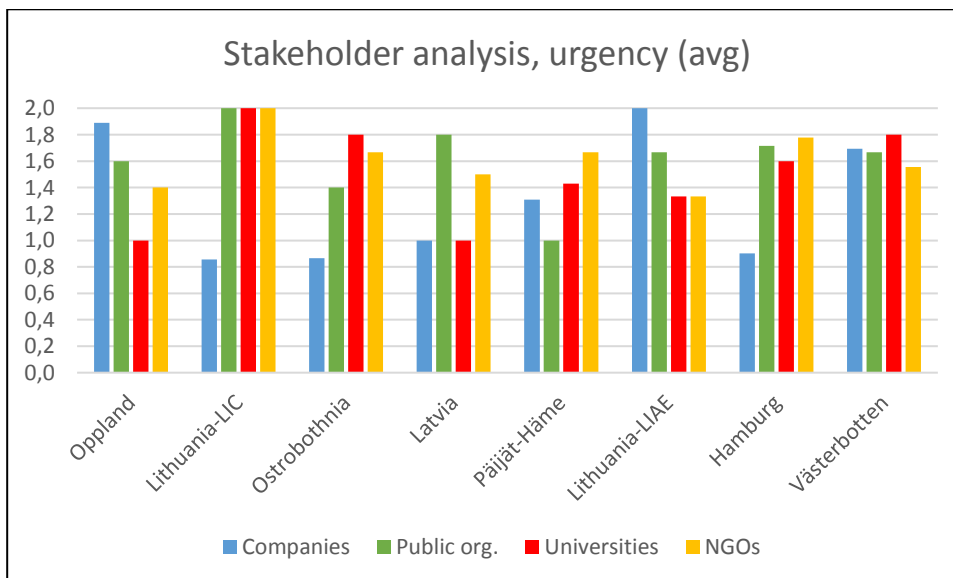

Figure 4.3. Stakeholder urgency in different helices

In Figure 4.4, one can see clearly that universities were considered to be most legitimate stakeholders, whereas public organisations were the most urgent and powerful of the stakeholders.
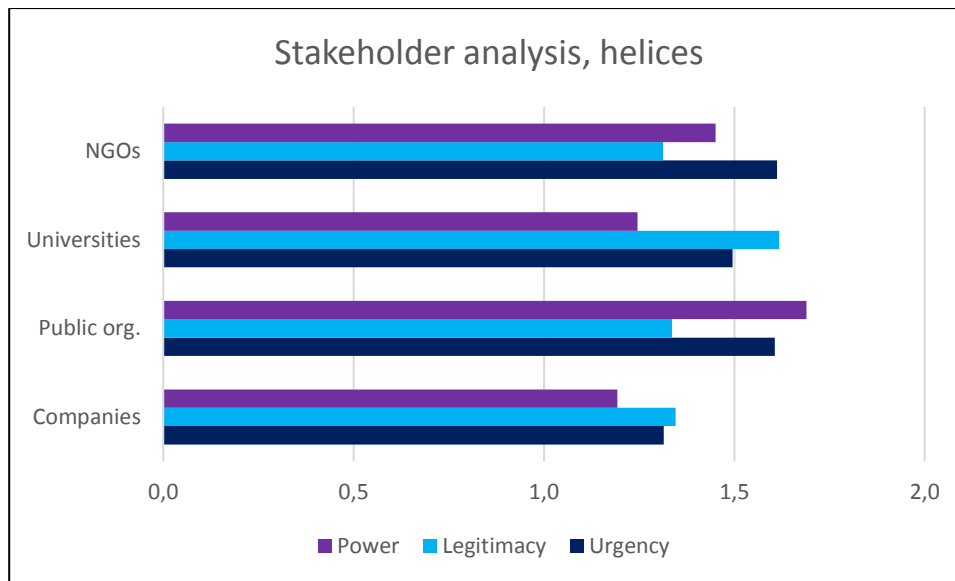

Figure 4.4. Legitimacy, power and urgency of all the stakeholders

5. PARTNER IMPORTANCE

The previous chapter has analysed the importance of stakeholders in the terms of power, legitimacy and urgency in LARS regions. It was based on the evaluation of partners, not by interviewees. The evaluation of partners was used when selecting the respondents to be interviewed. This chapter focuses on the answers of partner importance in the questionnaire.

In the questionnaire the respondents evaluated the importance of their partners by helices (companies, public organisations, universities, NGOs) and geographical levels (regional, national, international) on a scale 1-10. In order to study importance of partners, we count the means of the values of variables of importance per helix and per region. We can study partner importance from many perspectives: from the point of LARS regions, from the point of individual helices, or from the point of all helices.

What follows, we first examine the means of variables of importance per regions and per helices (Figures 5.1–5.12). After that, we summarise the overall importance of helices and geographical levels in all LARS regions, and specify the importance of different helix actors across regions.

The heat maps in the figures 5.1–5.12 present the findings based on means of variables. The heat maps can be interpreted so that the darker the color the more important the partner in relation to other helices and LARS regions. Dark red is highly important partner for the respondents, white has no importance.

5.1. Importance of regional quadruple helix actors

Figures 5.1–5.4 present the importance of regional level stakeholders as innovation partner across regions and helices.

Figure 5.1 presents the importance of regional companies for other QH actors and we can notice that regional companies are important innovation partners for universities in all partner regions. However, this attraction is not always reciprocal. Regional companies are also generally important partners for companies with exception of Hamburg and in some extent Latvia. Especially important other regional companies are for companies in bioeconomy value chain in Lithuania, and for energy technology companies in Ostrobothnia. Also for public organisations regional (national) companies are highly important except for bioeconomy in Lithuania. For NGOs, regional companies seem to be generally relatively important, except in Oppland. Indeed, in Oppland and Hamburg the companies mostly work on their own and are not too keen to cooperate with other helices. In Latvia and Ostrobothnia companies were seen as important innovation enablers, as they have connections to several other helices. Especially Ostrobothnia can be considered as a company driven innovation system. Regional company-company relations are important in four regions: Lithuania (bio), Ostrobothnia, Päijät-Häme and Lithuanian robotics sector. In Ostrobothnia and Päijät-Häme, regional companies are highly important or important for all helix actors.
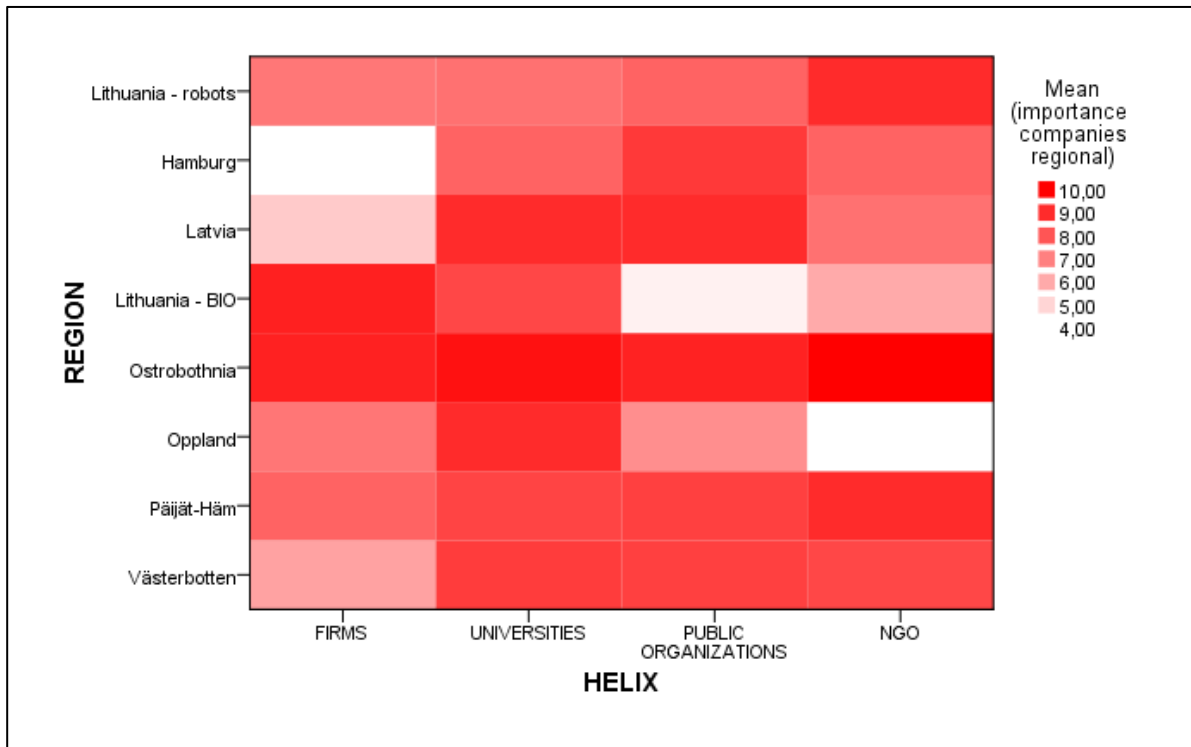
Figure 5.1. Importance of regional companies as cooperation partners across helices and region

We can make similar comparison of importance of public organisations for the actors in different helices and regions (Figure 5.2). Regional public organisations are highly important cooperation partners for public organisations, which reflect their networking and common planning issues. Regional public organisations are highly important also for universities, although this importance is not as strong in Oppland and Päijät-Häme. For companies regional public organisations are not very important, with the exception of Lithuanian biogas sector. Indeed, in Lithuanian biogas sector all helix actors scored high importance for regional (national) level public organisations and asked for more active public organisations in general. This was also the case in Latvia, where public organisations were considered important innovation enablers and thus were expected a lot. In Oppland, public organisations are not seen as important innovation partners with the exception of other public organisations. On Lithuania's robotic sector the companies' expectations are high for more activities from public organisations, but cooperation is currently mostly avoided as public organisations are not seen as efficient partners, who understand the needs of the companies.
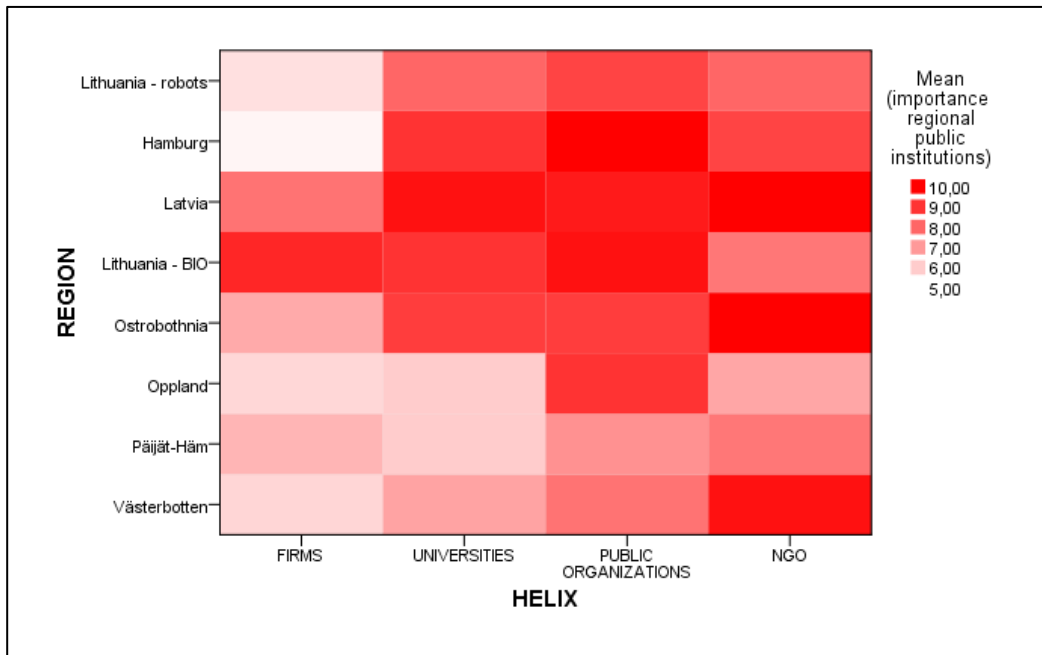
Figure 5.2. Importance of regional public organisations as cooperation partners across helices and regions

The helix actors, except by the companies in Hamburg and almost all helices in Oppland, generally consider regional universities to be important innovation partners. In addition, Latvia and Lithuania (robot) have weak connections between companies and regional (national) universities. In Lithuania (bio), Västerbotten and Ostrobothnia, regional universities are quite strongly appreciated by all (Figure 5.3).
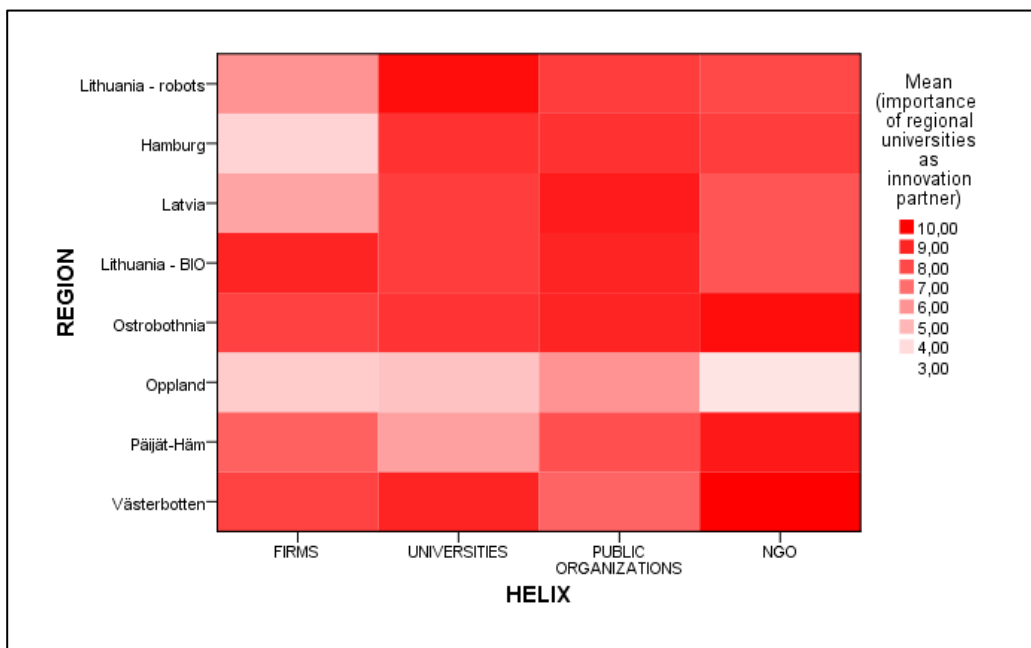

Figure 5.3. Importance of regional universities as innovation partners across helices and regions

Regional NGOs are relatively important in other regions, but not very important in Oppland, Päijät-Häme and Västerbotten.(Figure 5.4). Regional NGOs are generally seen as important innovation partners by other NGOs. Universities in LARS regions seem to have big variation on importance of regional NGOs. NGOs are especially eager to cooperate with other actors in Latvia. Hamburg has powerful NGOs, which are appreciated as innovation partners. In Lithuania (bio), the NGOs were considered to be still a little immature due to the fairly new democracy and economy. In Päijät-Häme and Oppland NGOs are engaged more occasionally, when needs arise to hear from consumers. In Ostrobothnia NGOs are very relevant development agencies and therefore are considered important for the energy technology sector.
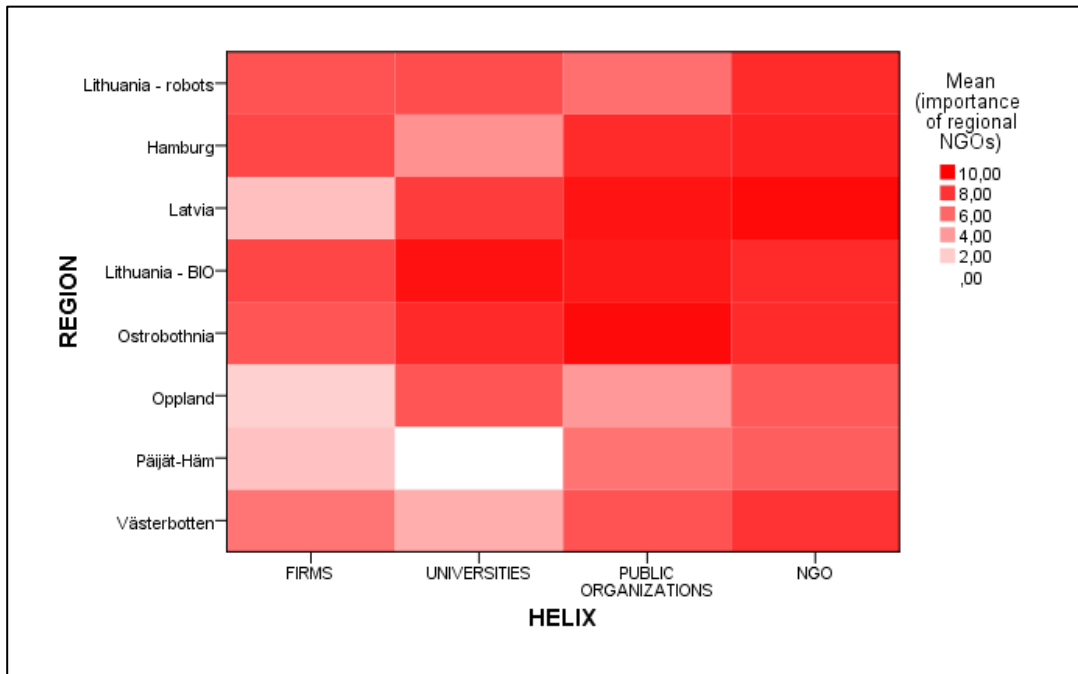

Figure 5.4. Importance of regional NGOs as innovation partners across helices and regions

5.2. Importance of national quadruple helix actors

The next four figures present importance of different national level helix actors across helices and LARS regions. In these figures the values of importance for Lithuania (bio), Lithuania (robotics) and Latvia are the same as in the above four figures but we present their values also in figures 5.5–5.8 to see them in the context of the whole LARS data. Figure 5.5 presents the importance of national companies for the interviewees and we can notice that national companies are generally important partners for companies except in Hamburg and in some degree in Latvia and Oppland. Oppland has a strong wood cluster, where regional collaboration is more common, which may offer some explanations for this. All helix actors in Päijät-Häme appreciated national companies as important. Similar picture can be noticed in Lithuania (robotics), Ostrobothnia and Västerbotten.
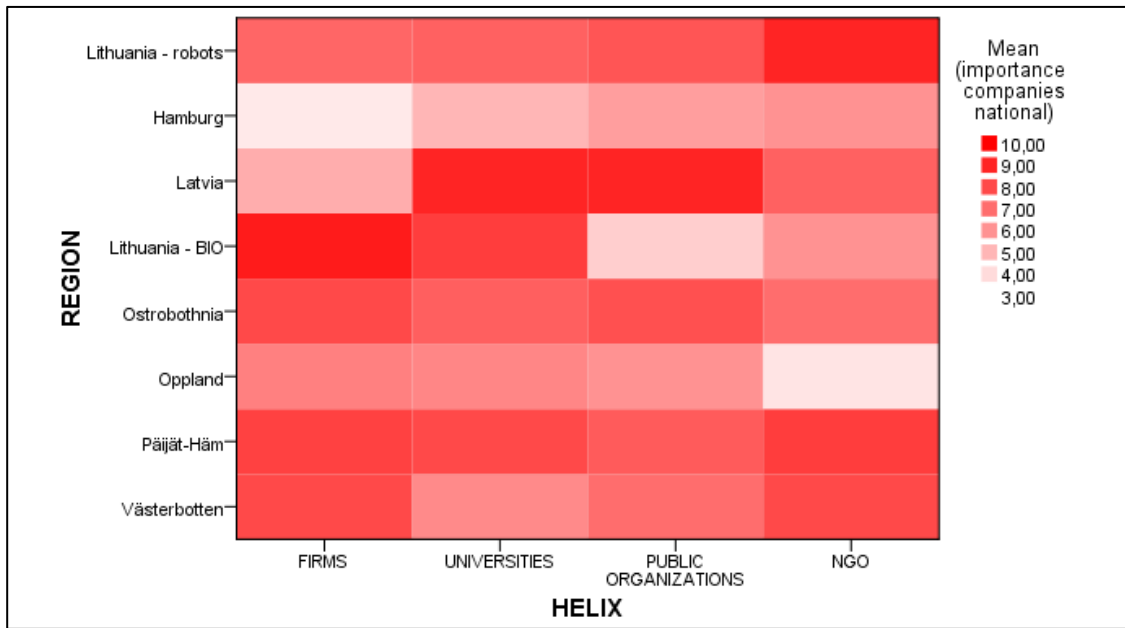
Figure 5.5. Importance of national companies as innovation partners by helices and by regions

National public organisations are seen generally as highly important for the interviewed stakeholders, except for companies in Hamburg (Figure 5.6). In Oppland, only public organisations evaluated national public organisations as important, other helices saw national public organisations as average importance. Generally, public organisations and NGOs saw national public organisations more important than the interviewed companies in LARS regions.
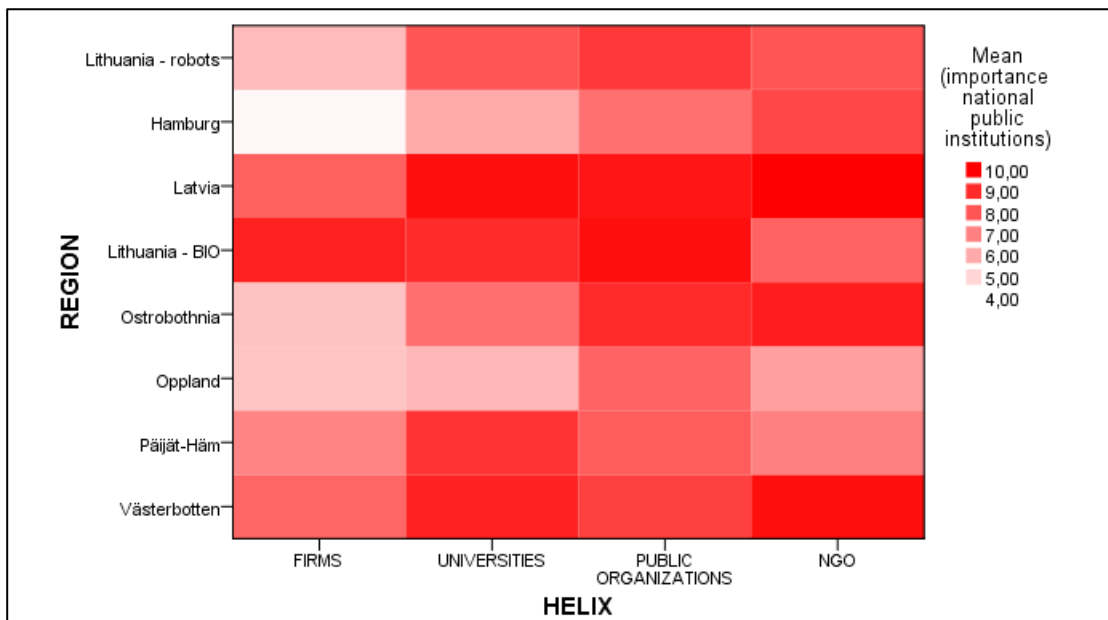

Figure 5.6. Importance of national public organisation as innovation partners by helices and by regions

Companies in Hamburg and public sector in Oppland do not consider national universities as important innovation partners. (Figure 5.7). Companies in Lithuania (bio) and Västerbotten relate most to national universities. In relation to other helices, university respondents generally saw national universities as more important partners than other helices.
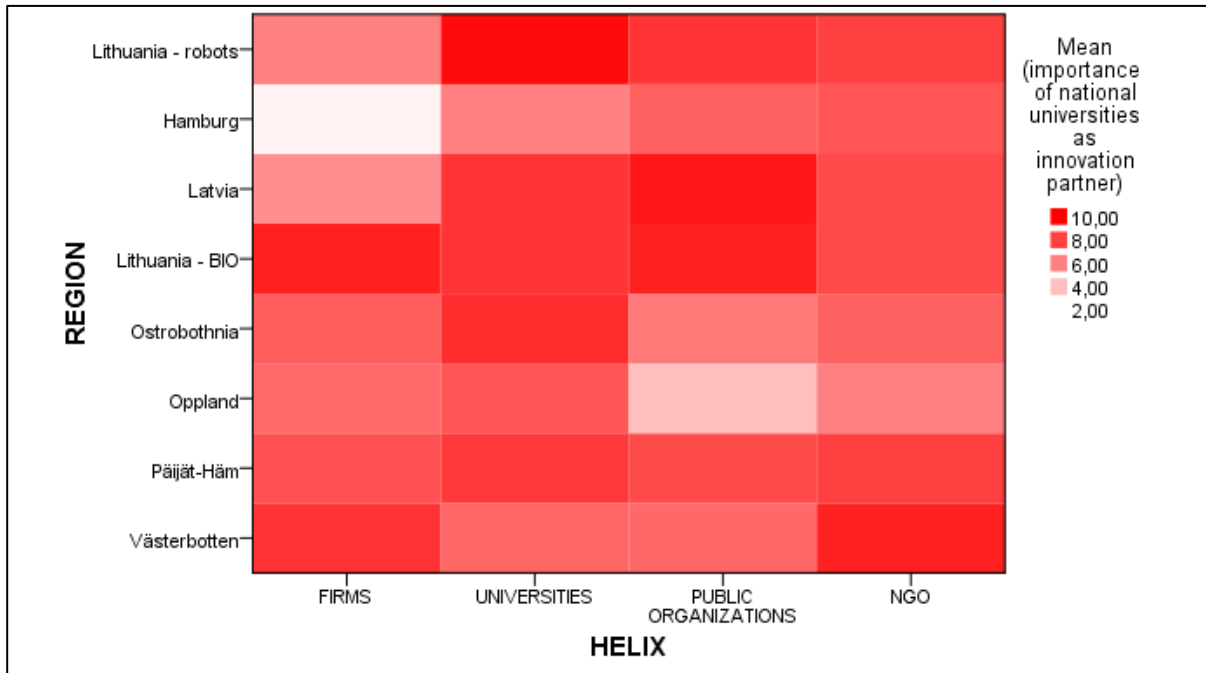

Figure 5.7. Importance of national universities as innovation partners by helices and by regions

National NGOs are generally not seen as important as other national level QH actors (Figure 5.8). They are appreciated generally by NGOs as cooperation partners. Lithuanian bio sector universities and public organisations, as well as Latvia´s public organisations also considered them as very important.
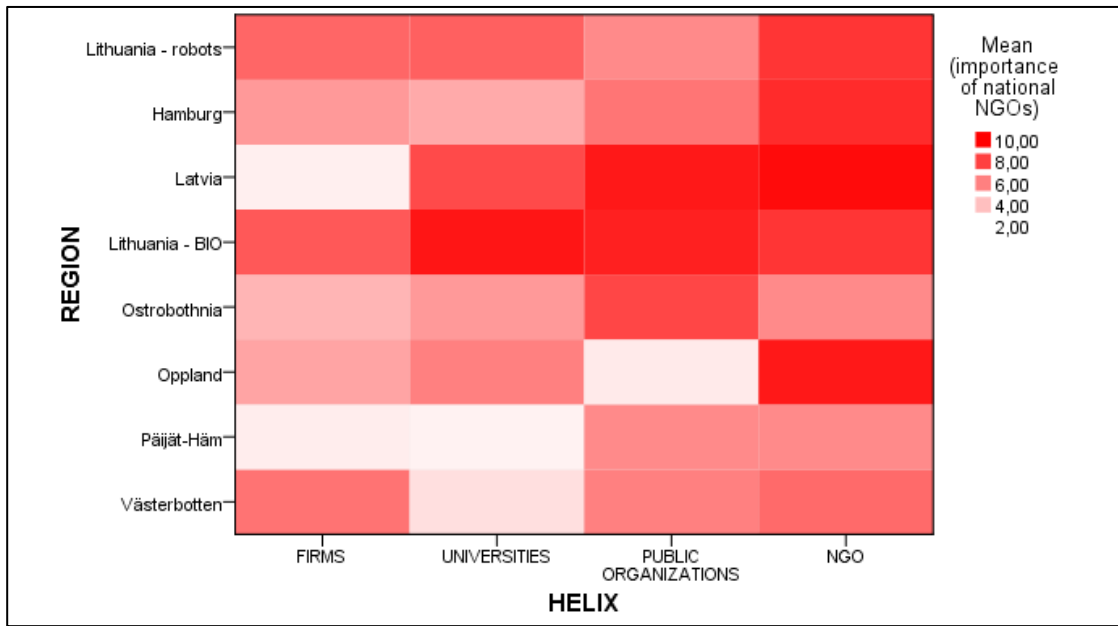
Figure 5.8. Importance of national NGOs as innovation partners by helices and by regions

5.3. Importance of international quadruple helix actors

Figures 5.9–5.12 present the importance of international partners for the interviewed actors. Especially companies in Latvia, Lithuania (bio), and Västerbotten evaluated international companies as important. International companies were regarded important or highly important by universities in Lithuania (bio) and Latvia. In general, public organisations and NGOs did not consider international companies as important partners (Figure 5.9.)
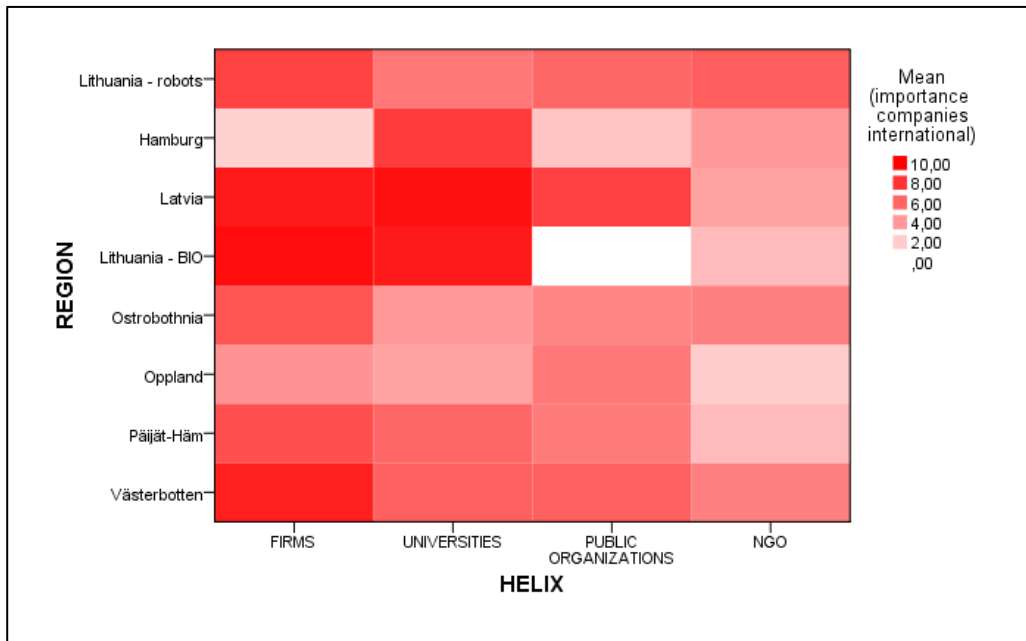
Figure 5.9. Importance of international companies as innovation partners by helices and by regions

Actors in Västerbotten and Latvia (except companies) regard international public organisations important or highly important innovation partners, and they are appreciated also by actors in Lithuania (bio). Universities and other public organisations were most likely to mention their importance (Figure 5.10).
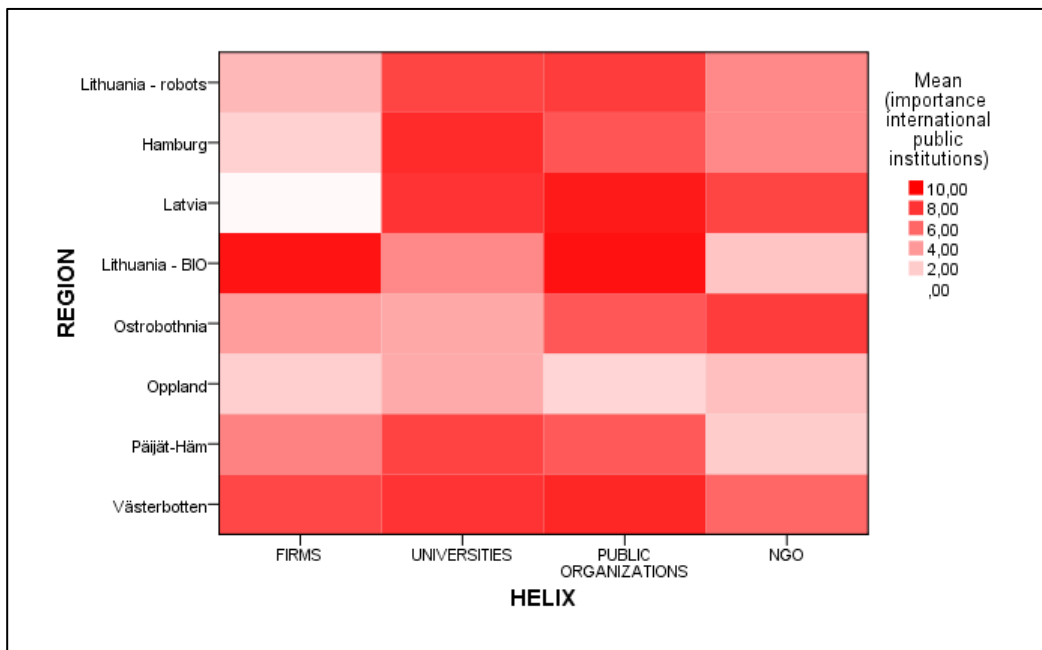

Figure 5.10. Importance of international public organisation as innovation partners by helices and by regions

Universities in all LARS regions regarded international universities as very important innovation partners (Figure 5.11). In Lithuania (bio) and in Västerbotten and in some extent in Ostrobothnia companies have links to international universities but they might be isolated companies integrated in a global value chain or the companies can be potential gates to international links. International universities are not very important cooperation partners for companies in Hamburg and Latvia.
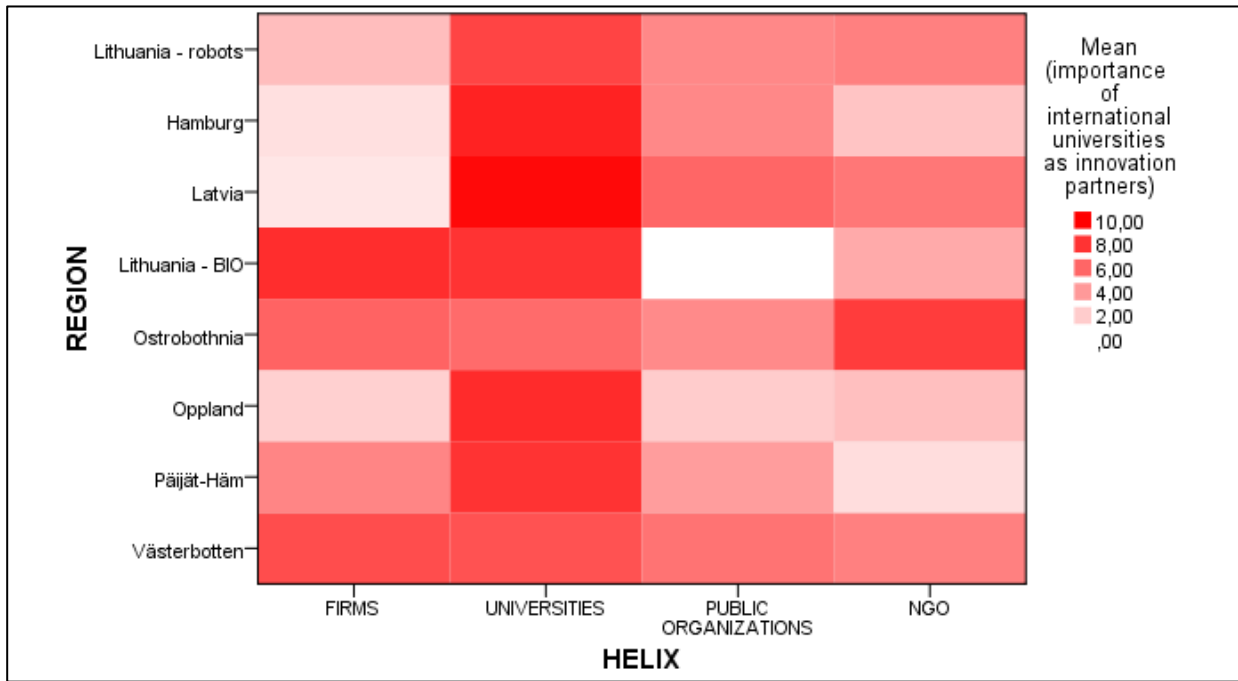

Figure 5.11. Importance of international universities as innovation partners by helices and by regions

International NGOs were seen important by universities in Hamburg and Latvia, as well as by NGOs generally (Figure 5.12).
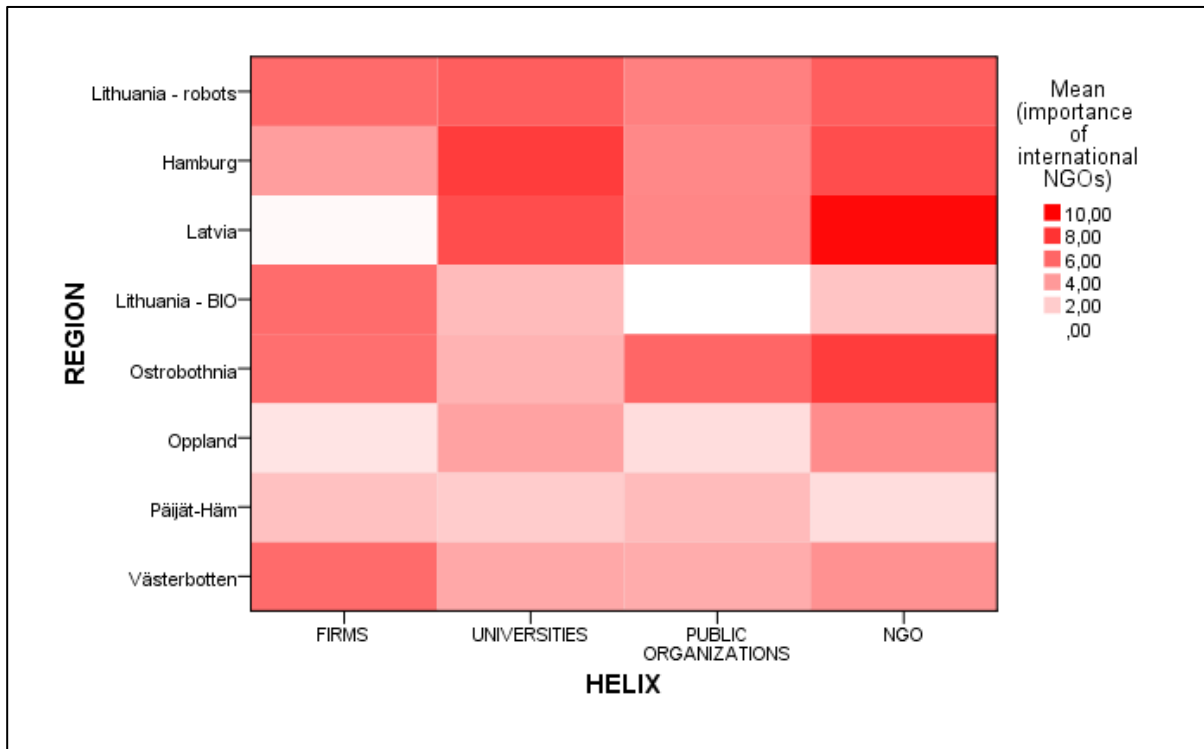
Figure 5.12. Importance of international NGOs as innovation partners by helices and by regions

We can sum the above figures saying that by all helix actors the cooperation with own helix actors seems to be important.

When summarizing the overall importance of helices and geographical levels in all LARS regions, we can notice that the regional companies and public organisations are most important partners for the respondents and NGOs in general are less important partners. Companies are important, but they might relate more to their own business than offering something for the cooperation with other helices (Figure 5.13). However, the most important partner varies across the regions.
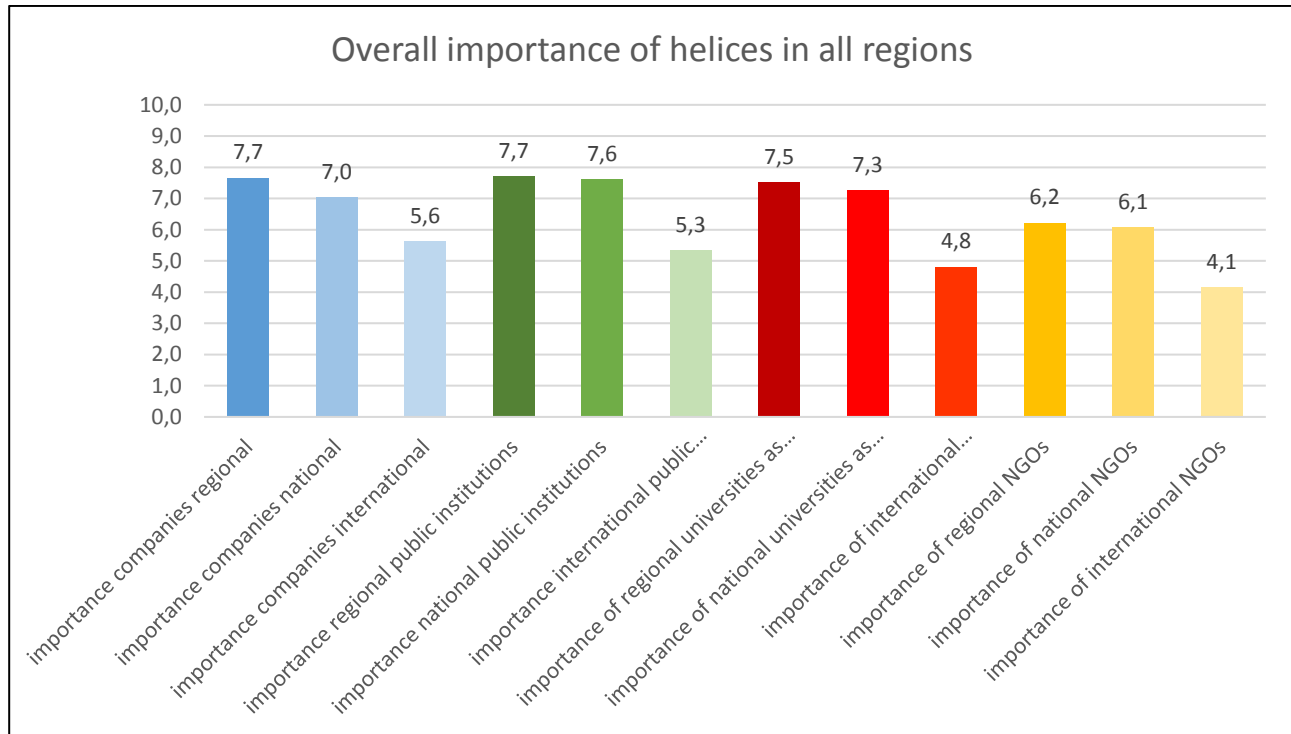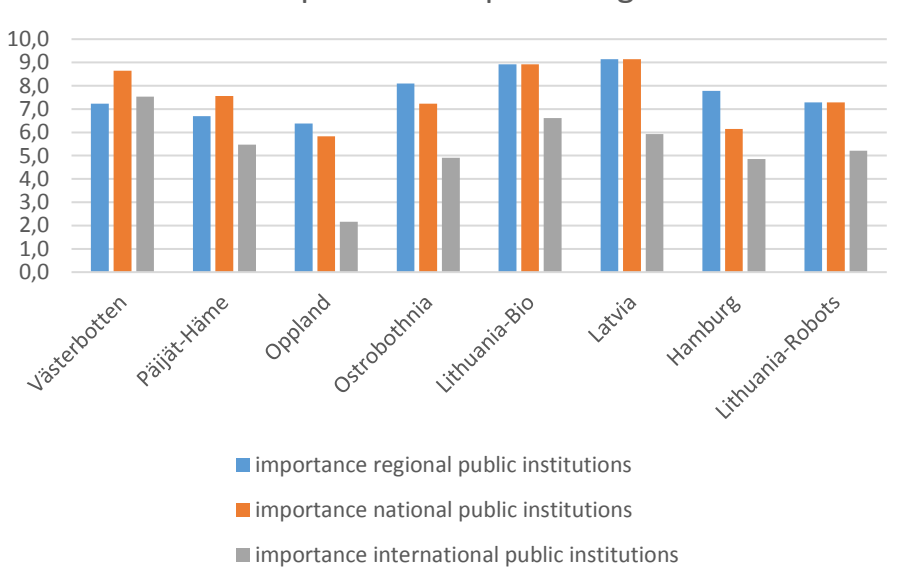
Figure 5.13. Importance of helices across all regions, average of the values

The importance of helices is divided further in the Table 5.1, which shows the importance of helices and geographical levels across LARS regions. Interestingly national public organisations are most important partners in Västerbotten, Lithuanian bio sector, Latvia and Hamburg, whereas regional companies are most important partners in Päijät-Häme, Oppland and Ostrobothnia. Lithuanian robotics sector considers national companies and universities as their most important partners.

Table 5.1. Importance of helices in LARS regions	
HELIX	IMPORTANCE OF HELIX IN THE REGIONS
THE PUBLIC SECTOR The point of departure of LARS is partners in the public sector. The public sector is dynamic, it may relate to other actors across wide gaps, and it has resources. The figure shows that the public sector is particularly important in three regions: Lithuania (bio), Latvia and Västerbotten. National level public organisations are more important than regional ones in Västerbotten and Päijät-Häme.	**Importance of public org.** importance regional public institutions importance national public institutions importance international public institutions

Companies
Companies are likely to profit from various forms of improved quadruple helix connectivity. High levels of quadruple helix connectivity mean close relations between NGOs, universities and public sector organisations, with potential spill over to firms. However, firms are also tightly controlled by expectation and experiences created by their markets

Measurements of importance reveal that regional companies are most important in all regions. Overall companies are considered to be important partners in all regions, especially in Ostrobothnia and Päijät-Häme

Importance of companies

- importance companies regional
- importance companies national
- importance companies international
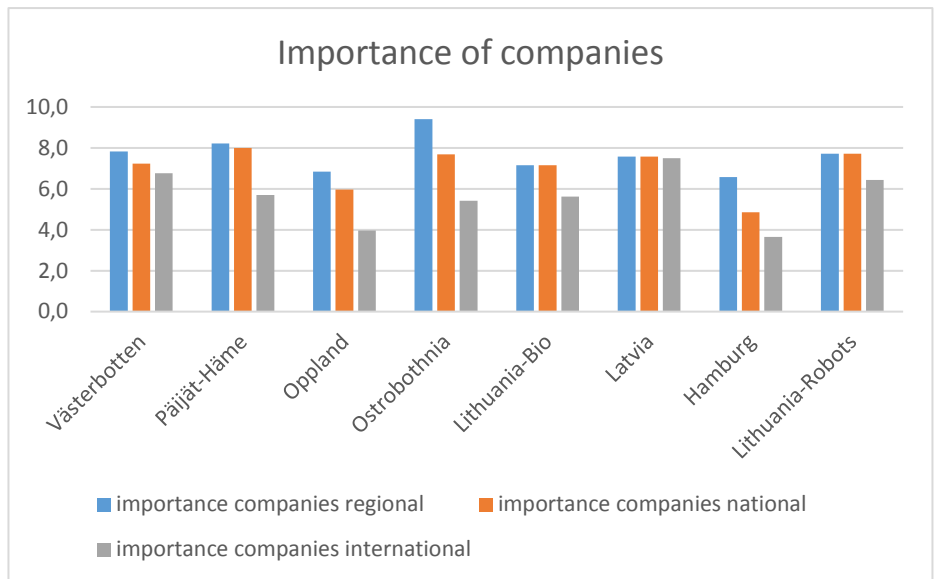
NGOS

NGOs may have a large span of attention to other helixes. They may operate in relations where there are gaps between expectation and experiences, as well as tensions. They may also relate pro-actively to a broad range of moderately important stakeholders. They may have close relations to universities and the public sector, and act as intermediaries. NGOs are especially important in Lithuanian Bio sector and Ostrobothnia
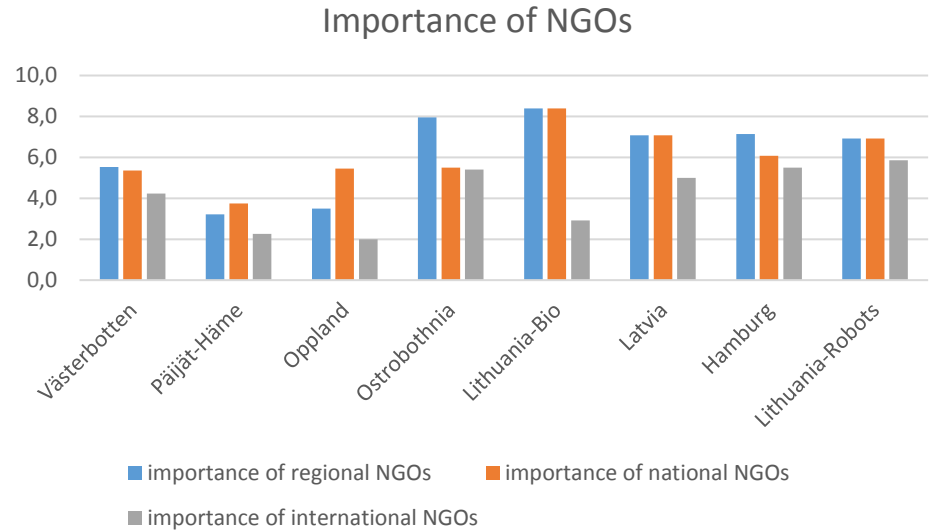
Importance of NGOs

- importance of regional NGOs
- importance of national NGOs
- importance of international NGOs

UNIVERSITIES

Universities are dynamic and outward-looking institutions, which can relate to and work pro-actively within relations with large gaps to other helixes. They have legitimacy and may be crucial stakeholders. The figure shows, that universities are important in Lithuania (bio), Västerbotten and Ostrobothnia

Overall importance of universities

- importance of regional universities as innovation partner
- importance of national universities as innovation partner
- importance of international universities as innovation partners
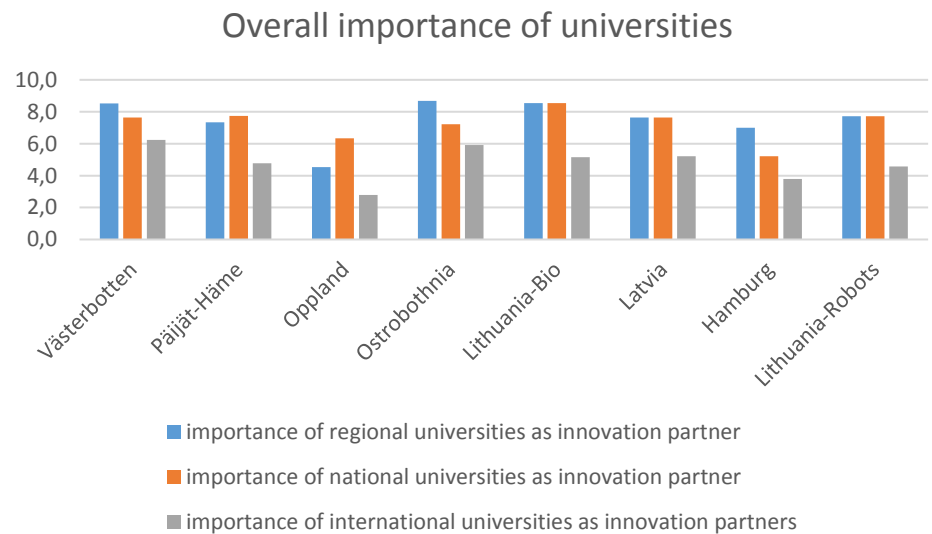
6. DYNAMISM IN QUADRUPLE HELIX NETWORKS

In previous chapters, we have studied the importance of innovation relationships with the help of respondents providing scores on a 1 to 10 scale. The questions cover importance, expectations, experiences and gaps in relations (difference between expectations and experiences). The informant is also asked to provide assessment of relations which are specified across several dimensions, as well as assessments of different geographical levels: regional, national and international.

But how important are actually quadruple helix relations in innovation processes, and who are likely to be able to improve them?

It is possible to innovate without external relations. Firms, NGOs, public organisations and universities may rely more or less on external relations. As we have seen in previous chapters, differences in the importance of external relations in processes of innovation depend on the region and helix where the respondent is located. We expect that our respondents give replies which are more or less based on unique, individual factors. As we will see below, this generates a lot of variation. Looking across these individual variations, it is possible to discover deeper patterns where general factors, that are shaping innovation networks, come into play.

We can now use the information provided by our informants to discover these patterns. We do that through indicators generated by factor analysis. A factor analysis is designed to remove the noise of individual specific replies, and discover deeper patterns, factors. A factor analysis creates new variables based on selected survey questions, by taking away variation. The scales generated by factor analysis are not 1-10, as in the questionnaire scores. They are based on comparisons between respondents along a new variable where the average is 0. A respondent with positive value on a factor measuring importance means that he or she have assigned higher importance than average respondents. A negative value does not mean no importance, it means that the importance is lower than average compared to other respondents. Note that negative factor scores may well reflect medium high scores on importance, such as 5 or 6.

The IMPORTANCE indicator is based on all questions of importance in the survey across regions, geographical levels and helices (N=141). This is done by SPSS using the factor analysis procedure. The result of this calculation is showed in section 6.1.1, with a comparison of helices and regions on the IMPORTANCE indicator.

We also calculated one importance indicator for each helix. The IMPORTANCE COMPANIES indicator shows how important all 141 informants across all regions and helices regard innovation cooperation with regional, national and international companies. Since we now have all the 141 respondents on the same, comparative scale, we can compare how respondents from different helices and regions look upon innovation cooperation with companies. In section 6.1.2, we compare this between helices and regions. We did the same for the three other helices as well (see sections 6.1.3, 6.1.4 and 6.1.5).

In this comparison, we present the scores of factors as boxplots. These boxplot statistics, generated by the SPSS, give median value of the factor score, as well as an indication of variation around the median. A boxplot shows five statistics (median, minimum, first quartile, third quartile, and maximum). Note that the values on the boxplot scales are scores on the indicators generated through the factor analysis, and not the 1–10 scores on the survey. A median is the middle value. Average is more heavily influenced by extreme cases.

This analysis is extended through two new factors. EXPECTATION is based on a selection of the main indicators of expectations in the survey through an SPSS factor analysis, across helices and geographical levels. A high level of expectation means that the relation is strong. GAPS are factors based on differences between expectations and experiences across several indicators.

The discussion on importance, expectations and gaps opens up for an understanding of differences between helices in the way they relate to external innovation partners. This chapter documents a difference between companies and other helices in terms of the ability to accept large gaps in important relations. This opens up for a discussion of agility when it comes to improving the quadruple helix.
Where do we expect to find agile actors, able to learn from good practices and go in the direction of pilots? This discussion is continued in the final part of this chapter.

6.1. Importance

There are different ways of measuring importance of quadruple helix relations. The indicator we use here reflects the best fit across all regions and geographical levels (regional, national, international).

6.1.1. Importance of the quadruple helix

Figure 6.1 below shows how important the quadruple helix is for informants from different helices. Half of the respondents in the helix are within the range of the blue column. The line inside the blue column is the median value of the score. The thin line is the range between maximum and minimum.
The figure shows that quadruple helix relations are regarded as more important for informants in universities, public organisations and NGOs than in firms. However, among firms there is a broad variation, some firms regard the quadruple helix as important, while others do not to the same extent.

Similarly, the figure below (Figure 6.2) show the distribution of IMPORTANCE across regions. The quadruple helix seems to be more important in Latvia and Lithuania BIO, and somewhat less important in Oppland, Hamburg and Päijät-Häme. As we have seen, Oppland and Päijät-Häme is more weakly equipped with universities and has somewhat weaker NGOs as other regions.
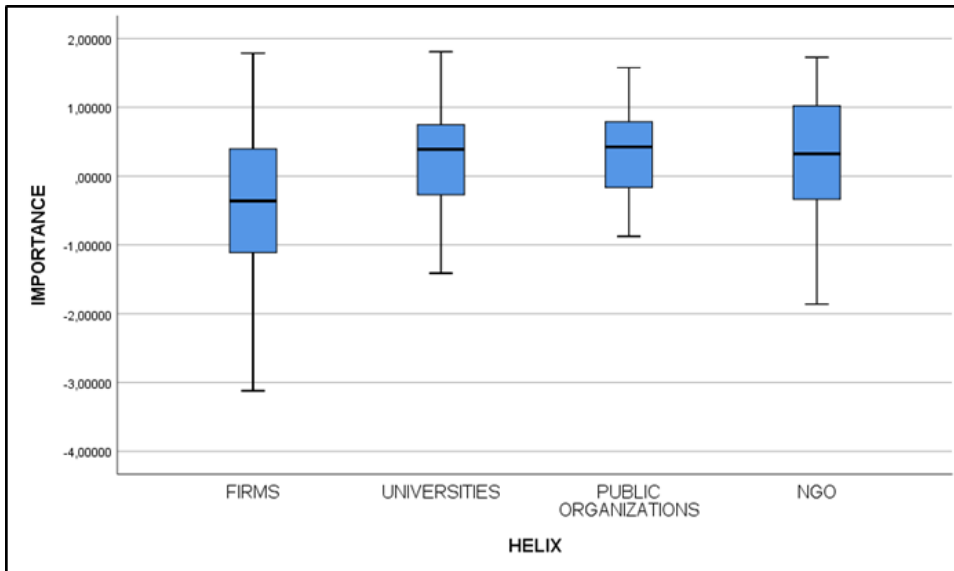
Figure 6.1. Importance of quadruple helix relations across helices
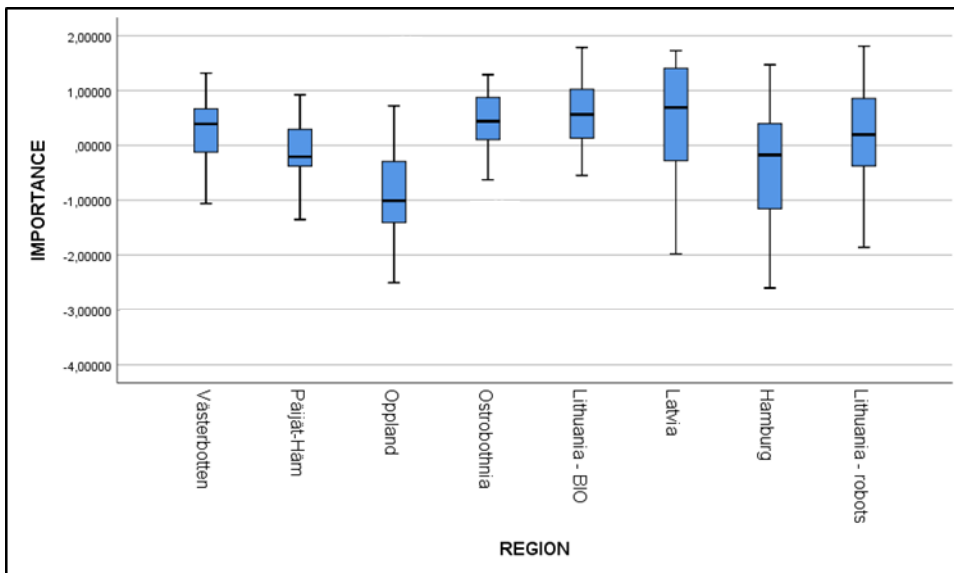
Figure 6.2. Importance of quadruple helix relations across regions

We have also measured IMPORTANCE for each of the helices.

6.1.2. Importance of companies

The figure 6.3 below shows importance of companies as innovation partners across helices. Companies are regarded as important innovation partners in all helices.

The figure 6.4 shows importance of companies across regions. Measured in this way, companies are least important in Hamburg. There are different opinions of companies in Oppland, Lithuania BIO and Latvia.
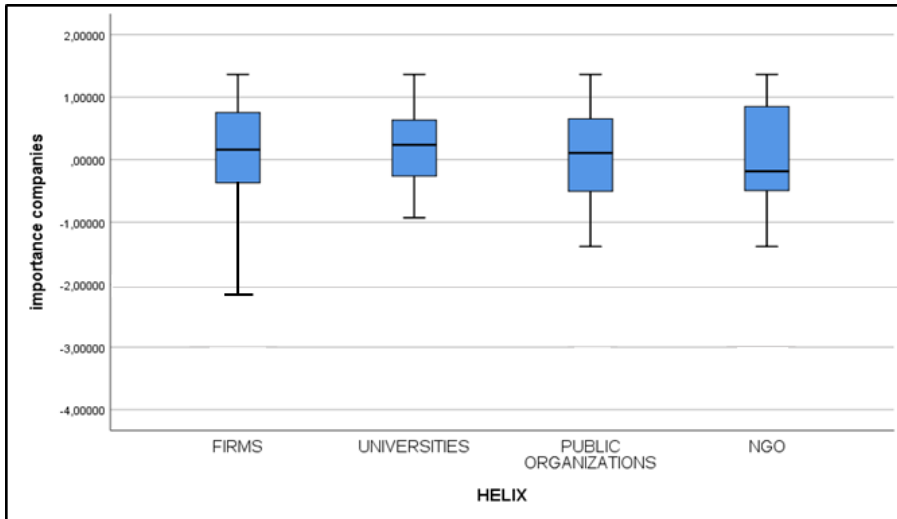
Figure 6.3. Importance of companies across helices
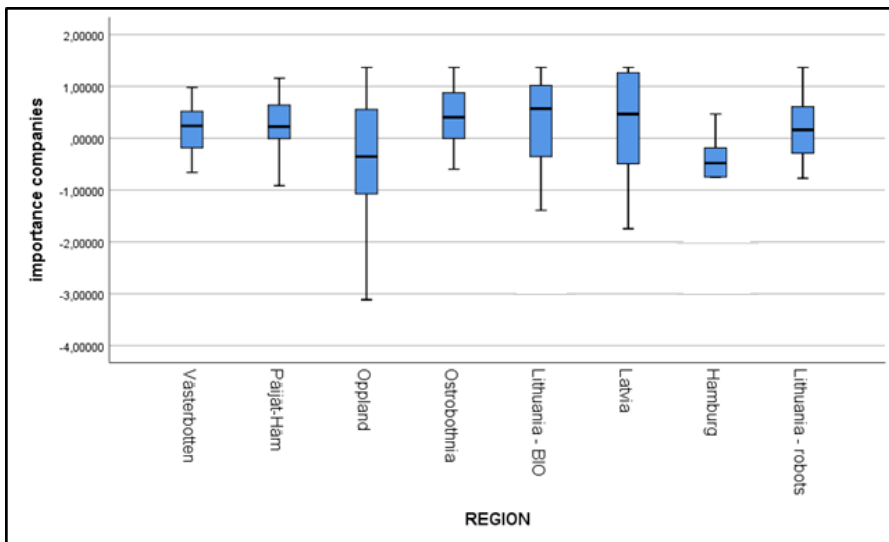
Figure 6.4. Importance of companies across regions

6.1.3. Importance of public organisations

Public organisations are more important for universities, NGOs and other public organisations than for companies (Figure 6.5). They are highly important in Latvia and Lithuania BIO, and relatively less important in Oppland. (Figure 6.6).
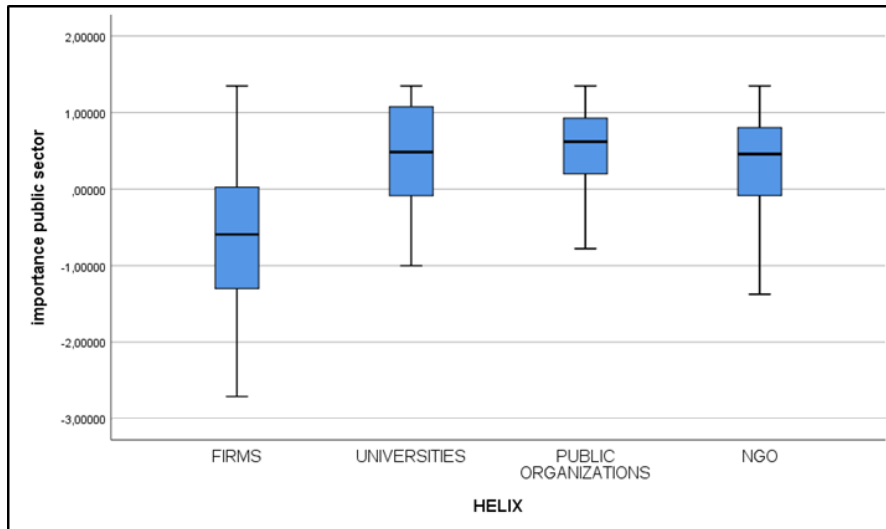
Figure 6.5. Importance of public organisations across helices
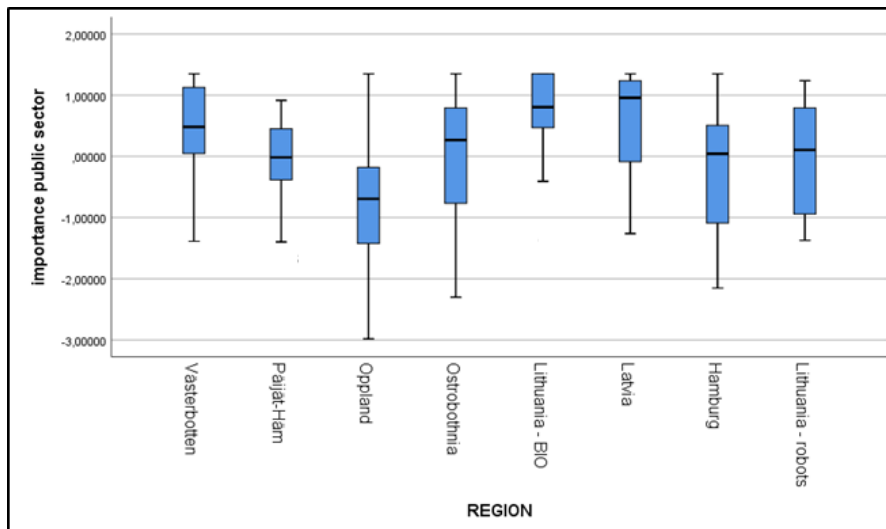
Figure 6.6. Importance of public organisations across regions

6.1.4. Importance of NGOs

Figure 6.7 shows that NGOs are important to other NGOs, and to public organisations. They are also important to some companies and universities. There is a broad range of opinions on the importance of NGOs among companies. They are important to some, but not all.
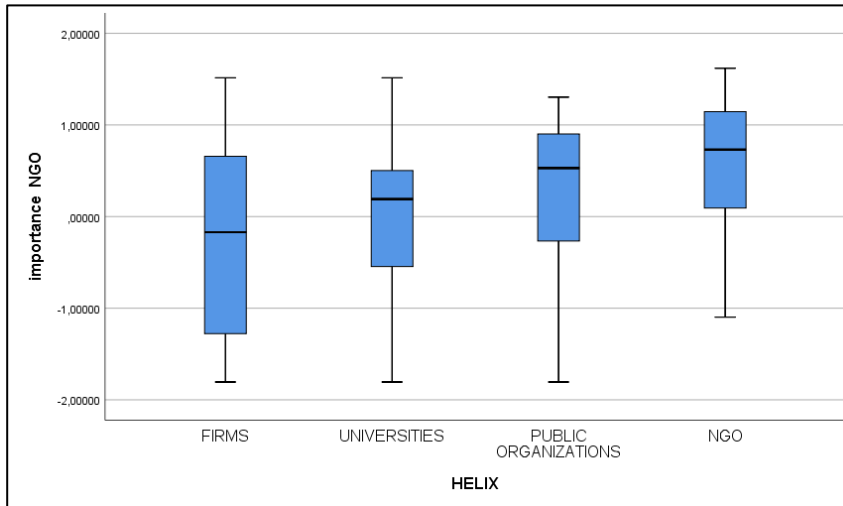
Figure 6.7. Importance of NGOs across helices

There is a debate on the significance of NGOs in Oppland and Päijät-Häme. There are also differences of opinion in Latvia and Hamburg, but here the importance of NGOs is recognized (Figure 6.8).
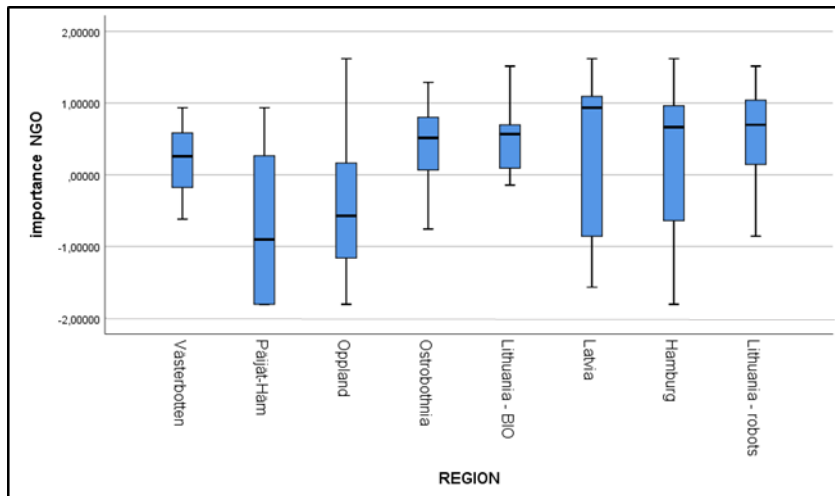
Figure 6.8. Importance of NGOs across regions

6.1.5. Importance of universities

Figure 6.9 illustrates that universities are important to other universities. There is a variety of opinions of the importance of universities among companies. As we have seen before, universities, public organisations and NGOs are connected.
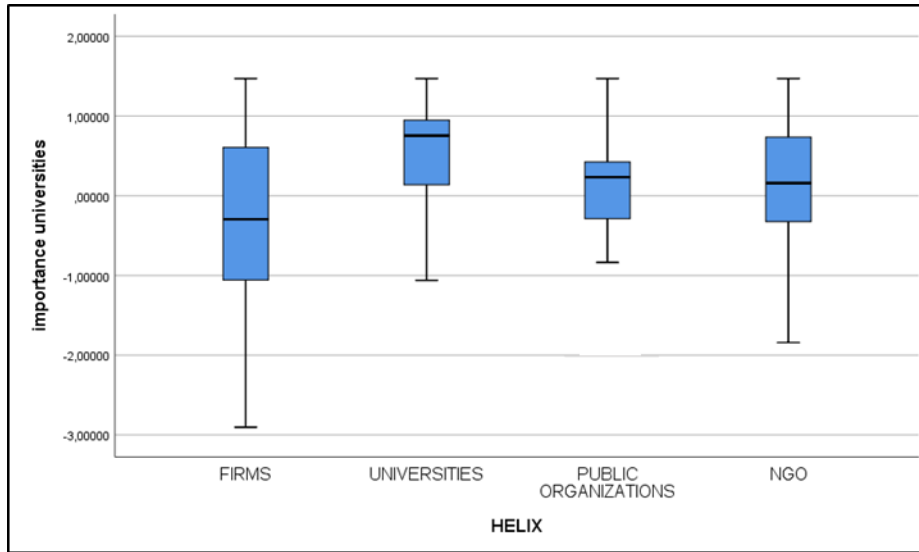
Figure 6.9. Importance of universities across helices

Universities are somewhat less important in Oppland and Hamburg that in other regions (Figure 6.10). We will go back to these findings in Chapter 8 in discussion of each region more specifically. We will now return to the question of what this data may tell us about sources of change.
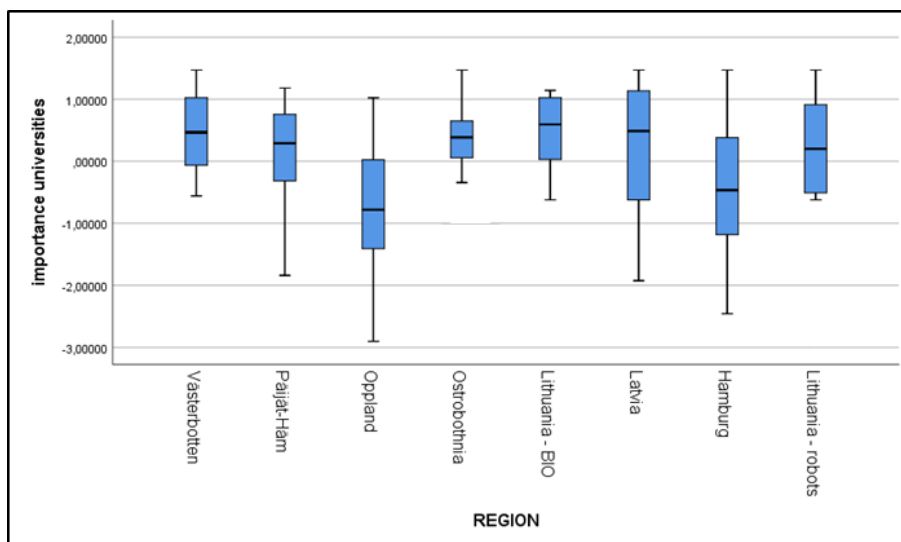
Figure 6.10. Importance of universities across regions

6.2. Sources of change: Importance, expectations and gaps

Important relations are at the core of networks of innovation.

In a stable system, we would expect that important relations also are characterized by high expectations and equally matching, good experiences. Here, gaps between expectations and experiences are expected to be low, or close to 0. In other, less important relations in stable systems, gaps might be higher. In other words, in a stable system, the correlation between expectations and importance is high. In a dynamic system, we would expect that there are tensions in Important relations. These tensions will be visible as gaps between expectations and experiences. Expectations in important relations are likely go down. The correlation between expectations and importance are somewhat lower.

Figure 6.11 shows correlations between expectations and importance across helices. The value 1 would indicate that expectations and importance are equal. Value 0 would indicate that expectations and importance are independent of each other.

If we assume that most firms have uncertainties in their market relations, they are not very happy about tensions in their relations to other parts of the quadruple helix. The figure shows that firms have a high positive correlation between expectations and quadruple helix importance. This means that in order to integrate firms within quadruple helix network of innovation, the networks needs to be predictable and able to provide the right kinds of interaction with firms, satisfying high expectations. Put differently, firms are not likely to attach importance to unstable university partners, NGOs or public sector institutions.

NGOs are on the other end of this scale. NGOs often have clients, members or opponents characterized by high levels of tensions or conflicts. Similarly, public institutions and universities often exist in environment where they may allow themselves to have frustrations (differences between expectations and experiences) creating gaps.
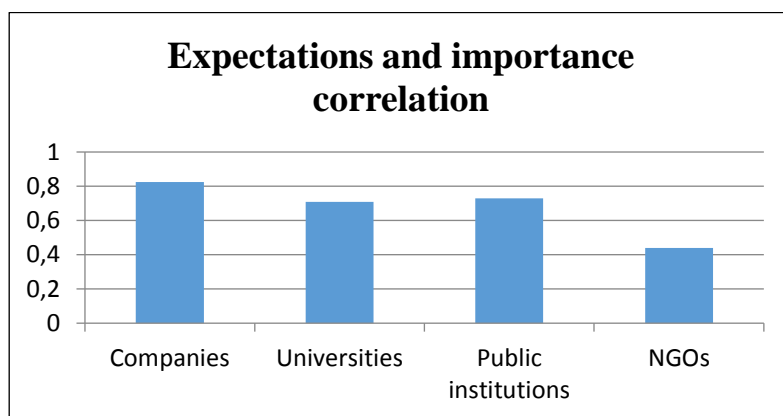
Figure 6.11. Correlation between expectations and importance across helices (N=141).

These differences are illustrated in the plot below (Figure 6.12), which shows expectations (the vertical axes) as a function of importance (the horizontal axis). Dots are respondents and color of dots indicates helix. The exponential blue line going up shows the relation between importance and expectations for companies. The orange NGO line is almost flat for important relations above 0.

NGOs can be seen as dynamic actors, able and willing to relate to relations characterised by tensions and dynamism, whereas companies need to know what to expect in order to relate to the quadruple helix.

NGOs may operate in relations where there are gaps and tensions between expectations and experiences. They may also relate pro-actively to a broad range of moderately important stakeholders. They may have close relations to universities and the public sector, and act as intermediaries. NGOs may be seen as potentially urgent actors with core positions in pilots. NGOs could also be pilots (see Chapter 8).

Companies are likely to profit from various forms of improved quadruple helix connectivity. High levels of quadruple helix connectivity mean close relations between NGOs, universities and public sector organisations, with potential spill over to firms. However, firms are also tightly controlled by expectations and experiences created by and in their markets, and they are unlikely to take a leading role as urgent stakeholders promoting quadruple helix connectivity themselves.

Universities and regional institutions are somewhat in-between.

Figure 6.12 Scatter diagram of expectation and importance, by helix

These findings can also be confirmed if we look at the gaps between expectations and experiences.

6.3. Identifying the potential for innovation through gap analysis

There are extreme values with high gaps for moderate importance as well as important relations. High gaps in important relations are a good indication that the system is evolving fast, there is a tension which is driving towards change.

If we simplify the IMPORTANCE indicator into three values, low, moderate and high, and take the average of gaps, the mean, we get the following picture. Figure 6.13 shows average (mean) gaps for high, moderate and low levels of importance in LARS data (n=141). The mean is influenced by extreme values. In general, across all helices, gaps are large for important relations and small for un-important relations. This is a dynamic system.
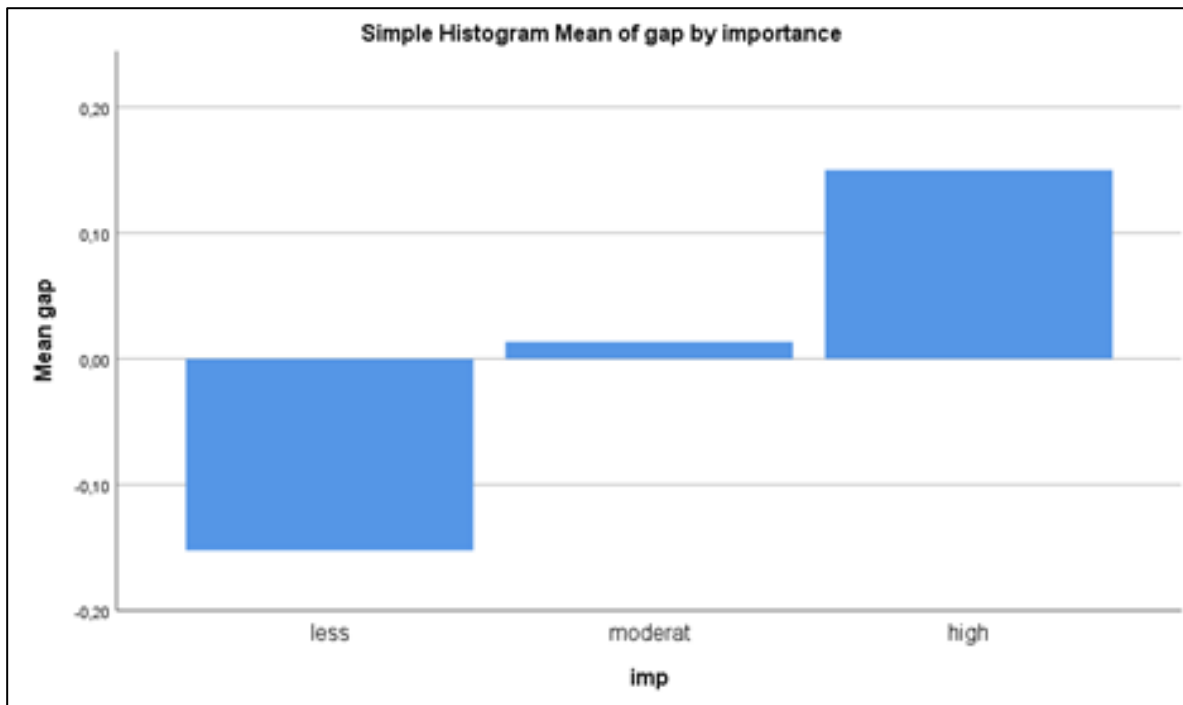
Figure 6.13. Mean gaps across IMPORTANCE indicator (n=141)

The mean is influenced by a few extreme values. If we look for the main trend, the mode, which is the most common value, we exclude the extreme values, and we get a picture of a slowly improving, stable system (see Figure 6.14 below). In this picture, we get **small gaps in important and less important**

relations, and moderate gaps in moderately important relations. This opens up for incremental improvements within the context of a stable system.
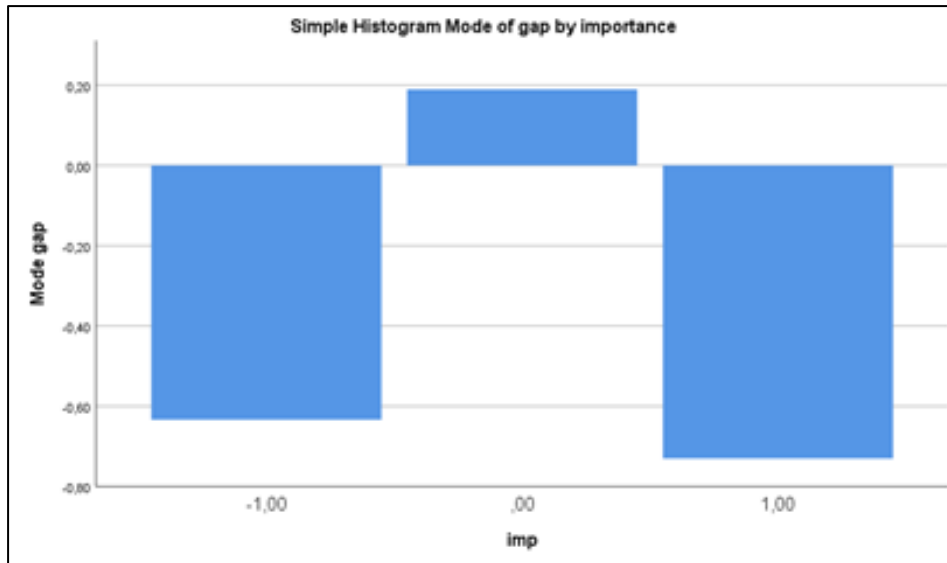
Figure 6.14. Mode of gaps across IMPORTANCE indicator

If we look for mean gaps seen from the position of firms, the picture is like in Figure 6.15 (below). Here the highest gaps are among the median important relations. Compared to the three other helices, gaps are small for important and less important relations.
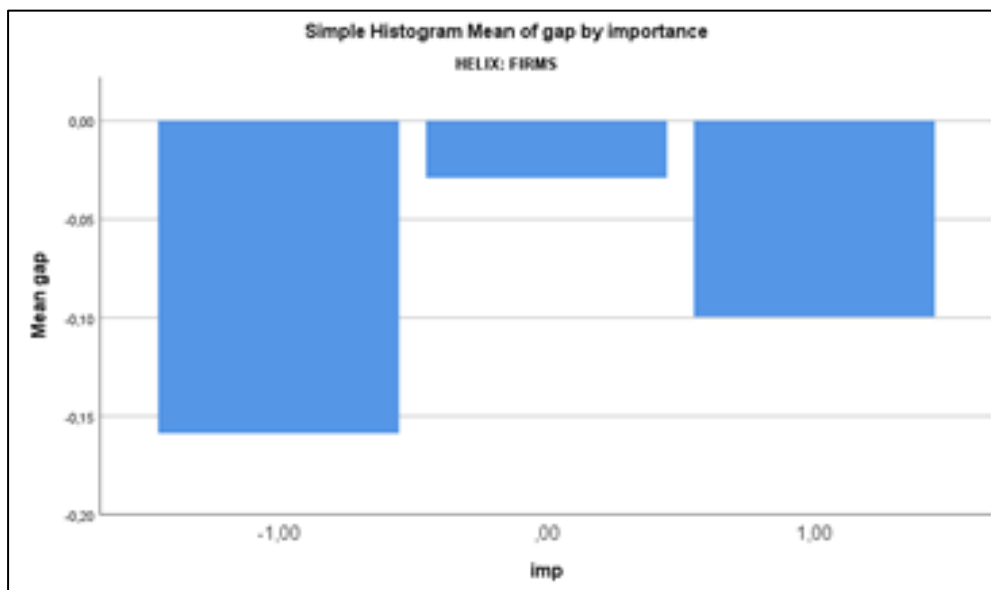
Figure 6.15. Mean gaps by importance of companies (towards and by companies)

The low gaps in highly important relations confirm the plot for firms in Figure 6.12, with an exponential relation between expectations and importance for firms.

As we would expect, this is different when it comes to universities (Figure 6.16):
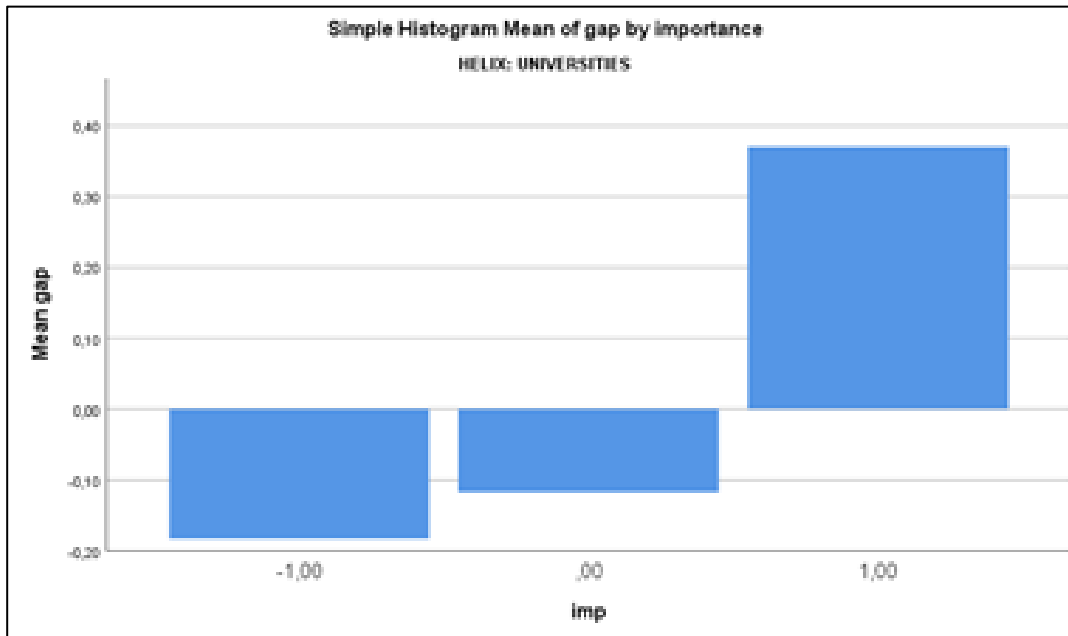
Figure 6.16. Mean gaps by importance of universities (toward and by universities)

Universities have high gaps in important relations. These gaps confirm the findings in Figure 6.10, with a downward slope in expectations in important relations. Universities experience low moderately high expectations and even lower experiences (large gaps) in their important relations.

This ability to relate to other partners across gaps is an indication that universities are likely to be potentially agile actors in the quadruple helix. This pattern is repeated when it comes to public sector organisations (Figure 6.17. below):
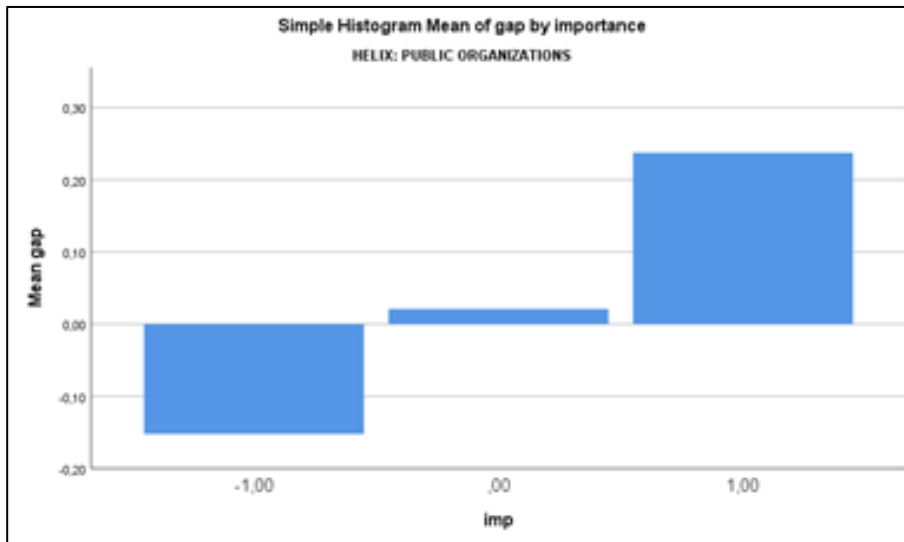
Figure 6.17. Mean gaps by importance of public organisations

Here, there are high gaps in important relations and smaller gaps in less important relations.

For NGOs this is a bit different (see Figure 6.18 below). NGOs have high gaps both for important and moderately important relations. The explanation for this is indicated above. NGOs have important relations to partners, but at the same time, their expectations are moderate and their experiences may be frustrating (high gaps).
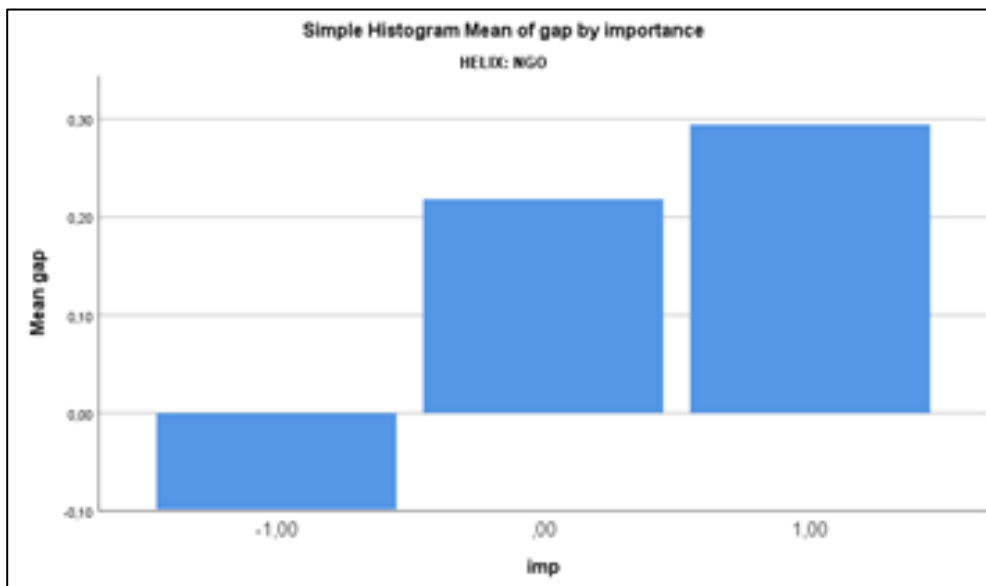
Figure 6.18. Mean gaps by importance of NGOs

6.4. Summary discussion: How dynamic are quadruple helices?

In this chapter we have identified certain main factors which can help us to move in the direction of a more general picture of stability, dynamics and agility in quadruple helix networks.

1. Companies may grow highly important relations with high expectations and low gaps between expectations and experiences in quadruple helix networks of innovation. Seen from a company perspective, a well-functioning quadruple helix network should be able to demonstrate a high level of predictability. To put this somewhat differently, companies tolerate frustrations or dis-appointments to a somewhat lesser extent than other helices. Accordingly, they may in general be expected to have moderate to low levels of agility, when it comes to improving disintegrated networks and transforming systems of innovation.

2. NGOs are on the opposite end. They have a way of operating where they regularly go into im-portant partner relations with tensions. They expect to be frustrated. Seen in relation to system dynamics, they are likely to have a high level of agility, in the sense that they might be able to work with tensions and improve failing relations.

3. Universities and public organisations are in-between. Similar to NGOs, they can also operate across institutional divides, where expectations and experiences do not always co-inside. They have a moderate to high level of agility.

4. There is a considerable variation among respondents within regions and helices, when it comes to ways they regard importance, expectations and gaps. This is promising, because it makes it possible to discover opening for actors who can be mobilized to learn from good prac-tices and go in the direction of pilots.

7. DESCRIPTION OF GOOD PRACTICES AND CHALLENGES OF PARTNER REGIONS

A good practice is a policy, institution, structure, project, policy measure, local culture, way to act or cooperate across the helices that has led to regional connectivity, and more cohesive regional innovation system. In a good practice actors work, discuss and connect all four helices or at least two helices. These connection activities clearly improve the functioning of innovation networks. Good practices may lead to a better coordination of the regional innovation system, and they are good solutions in terms of regional development and development policy, and actors in other partner regions could possibly learn from them. The LARS method is applied to search for social innovation, and innovation systems can be directed to solve societal and environmental challenges.

In LARS context, good practice is a relationship in which a gap between expectation and experience is small. It can be:

·   a strong relation with high level of both expectation and experience, or
·   a relationship with low expectation and low experience.

A development challenge is a situation in which there is big gap in the relationship. This is often due to high expectation and low experience in relation. When helices are isolated, the networks spread inside their own helix, the innovation system is disconnected or fragmented, and quadruple helix integration (connectivity) is low. The more helices overlap and interact with one another, the more connected the region is according to LARS approach.

Both good practices and development challenges are more crucial if the actors with the relationship are important stakeholders in regional innovation system.

This chapter is based on the partner reports and presentations of partners in project meeting in Lillehammer on their good practices and development challenges (not so good practices). First we look at the good practices which our partner regions have presented us. These have been compiled into Table (7.1).

Table 7.1. Preliminary ideas for good practices according to LARS partners (partner reports and presentations in Lillehammer 4.4.2019)

Päijät-Häme circular economy (CE)	1.Company driven grain cluster with loose and free cooperation. Sharing of knowledge and defining common goals in the network. 2.RIS3 stakeholder group of CE priority, CE road map for PH.

Lithuania, biogas LAEI	1.Company CESTA (biogas plant), wide personal and international (company) network. 2.Alanta school of technology and business. Biogas from manure and crop residues, activities in business creates possibilities for students. (combining helices of universities and business in concrete activity?)
Oppland	1.FORREGION research based competence brokers for SMEs so that they could use more R&D in their innovation work, building capacity, more dialogue with research and development institutes. 2.Norwegian Centre of Expertise Raufoss (NCE Raufoss). An industrial cluster that serves as the national competence centre for light-weight materials and automated production in Norway. They develop other clusters. 3. Norwegian Wood Cluster, a business cluster for forest- and wood mechanical industry and wooden construction. 4.Ottadalen massivtre (CLT – cross laminated timber). A small regional cluster with focus on innovation in construction of houses and cabins based on local forest resources (pinewood).
Lithuania (advanced manufacturing, robotics)	1.One NGO created a cluster and initiated the cooperation between main players in Lithuania. It helped to make the sector more visible. 2.Establishment of annual regional forum in Panevezys which started the transformational process of the region strategy. Quadruple-Helix cooperation. 3.Establishment of national digitalization initiative Pramone 4.0 (Industry 4.0). Quadruple-Helix cooperation.
Latvia, metal	1.Business NGOs (associations, clusters) exchanging information - trading missions, exhibitions, local events, etc. 2.Company projects addressed to universities to solve specific needs of companies. This good practice is driven by the companies but universities also play a big role to implement this type of good practice. 3. Internships between universities and companies – but not only for students but for academic personnel and employees of company.
Ostrobothnia, energy technology	1.Open research platforms by universities (like VEBIC, Vaasa energy business innovation centre). 2.Cooperation between companies and universities regarding the engagement of students is quite profound in energy cluster. Global companies engage students through courses, project works and thesis work. 3.Different educational packages like on IoT and robotics are currently developed to serve the needs of companies. 4.The idea of thematic "seeds" or introductory videos, which show the regional expertise as well as introduce the related stakeholders would be beneficial for any region. 5.Learning from gap analysis and structured dialogues in thematic focus group meetings in improving regional innovation system ("Ostrobothnian model of smart specialisation")
Hamburg, Circular economy	Citizen driven innovation activities (strong and important NGOs)

Västerbotten	Sustainable energy and environmental technology collaboration as good practice

As can be seen from the Table 7.1, there are various types of good practices, in which quadruple helix actors participate in different ways. We can find different types of good practices depending on the main actor in the practice:

- University driven good practices (platforms in Ostrobothnia)
- Public organisation driven good practices (Forregion in Oppland)
- Company driven good practices (clusters or value chains in Päijät-Häme, Lithuania (bio), Västerbotten, Lithuania (robotics), Latvia)
- Citizen driven (NGO driven) good practices (Hamburg, Lithuania (robot))

Good practices can also be viewed through the concrete activities. Most of them are related to networking and collaboration, which serves as a basis for knowledge brokering and mutual development through projects and other activies. These include the different helices in partner regions and their collaboration practices, as well as Opplands Forregion-project, which links researchers and companies in order to start university-industry collaboration activities. Ostrobothnia´s university driven platforms and introductory videos, which describe the regions potential partners and activities can also be categorized as networking activity. Västerbotten and Hamburg have presented topic areas for good practices, which provide a starting point for looking at good practices in more detail. Overall, we could say that good practices are describing ways to collaborate more and in new ways.

If one inspects good practices more closely, they usually involve only a couple of helices. For example, NGOs in Lithuanian robotics sector have managed to engage with cluster activities, but mostly these are companies working within the field. In Ostrobothnia, platform collaboration is aimed towards everyone, but often companies cooperate with universities. Opplands FORREGION –project is public sector initiative, but aims to foster collaboration between companies and universities. Hamburg has citizen driven development, but companies like to work on their own. Similar story opens up in Latvia, as ministeries are happy about the cooperation with others, but other helices seem to think otherwise. Päijät-Häme has a well organized cluster, but companies are mostly the ones who participate in it actively. As can be seen, there are already very promising collaboration activities, but the one thing missing is true quadruple helix cooperation, where everybody are involved. Especially NGOs seem to be struggling, as they lack funding or legitimacy, which makes them appear non-interesting in companies eyes.

This leads us to development challenges, where one can easily see that some of the issues are taking care of by existing activities, but more could be done to foster mutual collaboration. This is evident in several cases, which are compiled in Table 7.2.

Table 7.2. Possible development challenges according to LARS partners (partner reports and presentations in Lillehammer 4.4.2019)

Päijät-Häme circular economy	Grain cluster model works, but it's more or less cooperation model between companies. Companies want to increase the cooperation with universities and with public sector. One representative of public sector has been invited Regional Development Company Ladec Ltd. NGO role should be more important in the future. Consumers are and will be more and more demanding and they are interested of the origin of food and beverages.
Oppland	Too little research based innovation, competences - good practices suggested from Oppland response these development challenges.
Lithuania (biogas)	Broad field of discussion how to develop biogas production in Lithuania with the help of a smart specialization strategy, by sharing national practices and good international experiences. Cooperation of Alanta school of technology and business with national government.
Lithuania, advanced manufacturing	NGOs do not have a lot of resources for implementing these studies, also they would like to get more money for travel to various meetings, and to organize more conferences/trainings which are significant for strengthening ties with industry players. More discussion between universities and companies.
Ostrobothnia energy technology	Companies are engaging regional developers and they consider the region to be important for their future as well. However, they should discuss more with public organisations, as communication is not working as well as it could. Partners regarding this sort or public-private discussion could also be useful.
Latvia	Companies are not taken into consideration as much as they should be. Public organisations consider cooperation to be good, when other helices consider it challenging.
Hamburg	Companies lack of cooperation with other helices.
Västerbotten	Regional development challenges between companies and public organisations.

Especially two helices seem to be missing from the local networks, public organisations and NGOs. This is interesting as sometimes both of these actors carry on development-related tasks, and can be considered important for establishing a functional and open innovation system. Public organisations are often important funders for new activities, whether they are multi-national EU projects or new small-scale businesses, or they may provide SME consultation services, or otherwise develop the region. In many partner regions, public organisations were considered to be important innovation partners and their role was seen ultimately as that of innovation enabler.

NGOs were on the other hand seen as knowledge brokers and developers, who help in enabling more overlapping activities altogether. It would therefore seem that activities which engage public organisations or NGOs might be the right step forwards. On the other hand, we have project partners who have

ongoing activites already on NGOs (Hamburg and Lithuania (robotics)) and they would benefit from company engagement-activities. However, from all the answers, there was not a single region which was entirely happy about the current situation, but all regions are geared towards more mutual collaboration. Therefore activities which drive towards quadruple helix activites can be considered to be especially beneficial activities for all the regions.

In the next chapter we will combine this data with the summary of the findings of comparative analysis, and especially the findings of the QH integration of LARS regions.

8. CONCLUSIONS AND SUGGESTIONS FOR SELECTION CRITERIA FOR GOOD PRACTICES

So how should a LARS pilot be organized? One way is to look at the LARS regions and where are they good at. One can also look for biggest gaps in order to understand the challenges of regions and look for practices, which help to bridge the largest gaps (Figure 8.1). This way regions may also learn good practices from one another and practice transnational learning.
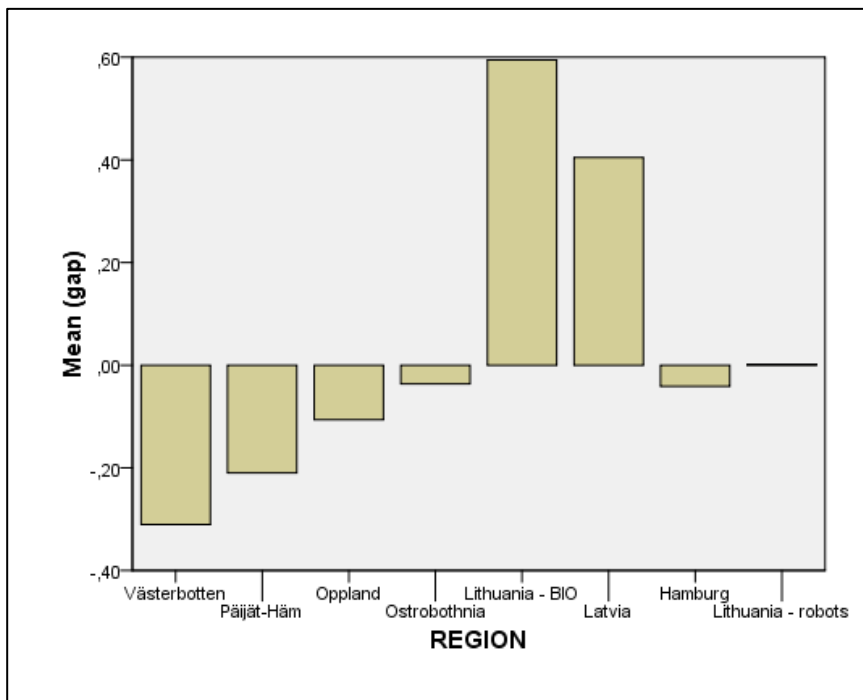
Figure 8.1. Mean GAPS across regions. GAP is an indicator summarizing gaps of many dimensions and variables of LARS data with the help of factor analysis

Gaps may be a source of urgency. Regions with large gaps are likely to be more dynamic and able to innovate than regions with small gaps. If gaps are small, the innovation system might be more stable and harder to change. The region with the highest gaps is Lithuania (bio) and the region with the lowest gaps is Västerbotten. Västerbotten might be seen as a stable system, which operates on a high level of achievement. They may have something to learn others, but maybe they will have a hard time finding improvements in what they are doing themselves?

We approach the question of pilots (good practices) from the point of different helix actors, their cooperation and integration:

1.   **Co-creation within the quadruple helix**. The point of departure of LARS is partners in the public sector. The public sector may be dynamic, but it might also be quite static. It may relate to other actors

across wide gaps, and it has resources. The public sector might be seen as one of the actors providing urgency in promoting new solutions. However, all helices have actors with a fairly good mix of power, legitimacy and urgency, as well as resources which might be used to build the pilot. The pilot must be co-created by actors in the quadruple helix. Co-creation means that other actors from other helices need to be a part of the journey.

2.   **Quadruple helices** have both closely knit networks with high levels of stability as well as tensions, gaps and dynamism which open for change. Accordingly, pilots could be both incremental improvements as well as more radical transitions.

Figure 6.2 shows the importance of quadruple helix relations across regions.

The regions with the highest levels of IMPORTANCE have more integrated networks than regions with low score (Oppland and Hamburg). Different levels of network integration should be taken into consideration is discussing innovation strategies. Oppland has several good practices, which seems to be well adapted to their situation as a relatively fragmented region. They work with NGOs to promote better cluster organisations and connections between research and small firms.

Regions with high level of quadruple helix integration (high score on IMPORTANCE) may be able to inspire regions with low levels.

3.   **Companies** are likely to profit from various forms of improved quadruple helix connectivity. High levels of quadruple helix connectivity mean close relations between NGOs, universities and public sector organisations, with potential spill over to firms. However, companies are also tightly controlled by expectation and experiences created by their markets, and they are unlikely to take a leading role as urgent stakeholders promoting quadruple helix connectivity themselves.

Companies are important in Ostrobothnia, Latvia and Päijät-Häme.

Figure 6.4 shows the importance of companies across regions.

4.   **NGO**s may have a large span of attention to other helices. They may operate in relations where there are gaps between expectation and experiences, as well as tensions. They may also relate pro-actively to a broad range of moderately important stakeholders. They may have close relations to universities and the public sector, and act as intermediaries. If they are missing, maybe they could be created. NGOs may be seen as potentially urgent actors with core positions in pilots. NGOs could also be pilots.

NGOs are important in Latvia, Hamburg and Ostrobothnia. They play different roles, and may be related in a variety of ways to pilots.

Figure 6.8 shows the importance of NGOs across regions.

5.   **Universities** are dynamic and outward-looking institutions, which can relate to and work proactively within relations with large gaps to other helices. They have legitimacy and may be crucial stakeholders, but do not expect that they have power to raise resources. Universities are important in Västerbotten, Lithuania (bio) and in Ostrobothnia.

Figure 6.10 shows the importance of universities across regions.

The findings in comparative analysis is one input in the selection of good practices in LARS by the partners. Table 8.1 summarizes the good practices presented in partner reports, and compares the network features of regions with the indicators of comparative analysis. We emphasize especially indicators in which the specific region has shown a strong achievement to other LARS regions.

Compared to the other LARS regions, **Päijät-Häme** shows second smallest gaps compared to other LARS regions, which means relatively static and good working system of network. The integration in the QH network is average compared to other LARS regions. Many other figures of the indicators built in the comparative analysis shows average for Päijät-Häme. Companies and universities are important for other partners and the regional innovation network is company driven. Expectation toward companies regarding production network is relatively high. We have used in the table, means of variable expectation toward production network, companies, but for other regions/examples we have summarized many dimensions and made indicators.

Lithuania (bio) shows big mean gaps between expectations and experiences by stakeholders toward QH actors compared to other LARS regions. This might be due to very high expectations by stakeholders. Especially the expectations toward research dimension of university are high. In LARS context, large gaps are not disadvantage, instead the tensions in relations are the driving force for the change, and this can be seen as a dynamic system. In Lithuania (bio), NGOs are relatively important helices and the gaps from NGOs toward other helices are high.

In **Oppland**, regional companies are more important to QH actors than in other LARS regions. Oppland has good working regional network of companies, but the whole QH networks seem to be fragmented (low score of indicator IMPORTANCE than other LARS regions). Oppland has high gaps between companies and universities, but as we saw in Lillehammer, the regional actors (public organisations) have been responsive to this gap with the project FORREGION.

In **Lithuania** (advanced manufacturing, robotics), the experiences regarding cooperation of QH actor with international companies are very high compared to the other LARS regions. The relations with international companies seem to be the general strength of Lithuania (advanced manufacturing). In addition, NGOs are important stakeholders. The mean gap is average compared to other LARS regions. The integration of the QH network is about average. The biggest gaps seem to be NGOs towards companies regarding innovation networks and NGOs towards universities in development and research.

In **Latvia**, the mean gap is high compared to the other LARS partners, but this might be because of the high expectations of QH actors. The mean of expectations toward companies and toward NGOs are higher than in other LARS regions. The large gaps and especially large expectations might be incentive

to change, which create dynamism in the system. The QH network in Latvia is highly integrated and most integrated LARS region (highest score in indicator IMPORTANCE). Public organisations and NGOs seems to be most important helices. The biggest gaps seem to be in different dimensions and geographical levels in relationships with NGOs.
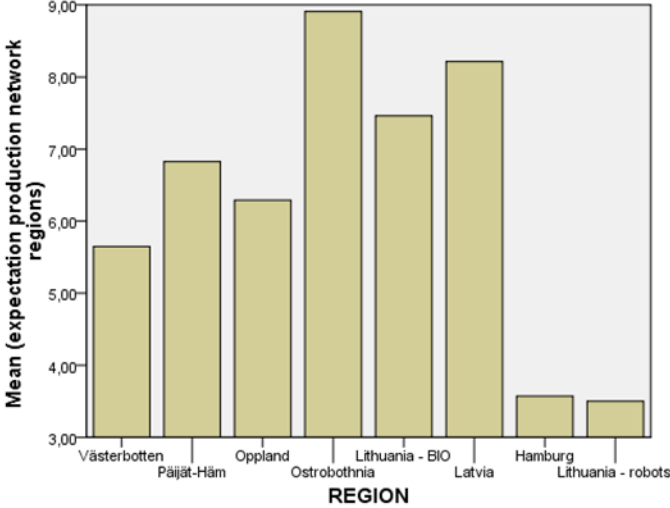
The companies are more important partners for the QH actors in **Ostrobothnia** than in other LARS regions. The QH network in Ostrobothnia is quite integrated compared to other LARS regions, the gaps are average in LARS data.

In **Hamburg**, NGOs and public organisations are more important than in other LARS regions. The gaps are average compared to other LARS regions. The biggest gaps seem to be in relationship between NGOs and companies on regional level and between regional and national public organisations. The QH network is fragmented compared to other LARS regions. The indicator describing the importance of universities show lower score than in other LARS regions, but the importance of companies is about average.

In **Västerbotten**, the gaps are smallest and experiences in relationships of QH actors (all geographical level) are highest. The strength of Västerbotten are global market achievements. It seems to be a stable system with high expectations and high experiences of QH actors. University and public sector are most important helices. The QH network of Västerbotten is highly integrated (the second integrated in LARS regions). Companies have gaps towards public sector in regional development, NGOs towards other NGOs in regional development.

(In the table below we use means rather that medians. Means takes extreme values into account, and at the same time, they make it easier to see differences between regions. Some figures are accordingly different from those presented in chapter 6, where we used medians.)

Table 8.1. Potential building blocks for pilots in LARS regions

Päijät-Häme, circular economy Good practices: 1.Company driven grain cluster with loose and free co-operation. Sharing of knowledge and defining common goals in the network. 2.RIS3 stakeholder group of CE priority, CE road map for PH.	Strong achievements: Expectation towards companies, production network (mean) **Mean (expectation production network regions)** — **REGION** (Västerbotten, Päijät-Häm, Oppland, Ostrobothnia, Lithuania - BIO, Latvia, Hamburg, Lithuania - robots)
Strengths: Regional network Important helices: companies, universities Gaps: Highest gaps are from public organisations towards NGOs and universities towards public organisations in regional level and regarding future ventures	

Lithuania, bioeconomy

Good practices:
1.Company CESTA (biogas plant), wide personal and international (company) network
2.Alanta school of technology and business (biogas from manure and crop residues), activities in business creates possibilities for students.
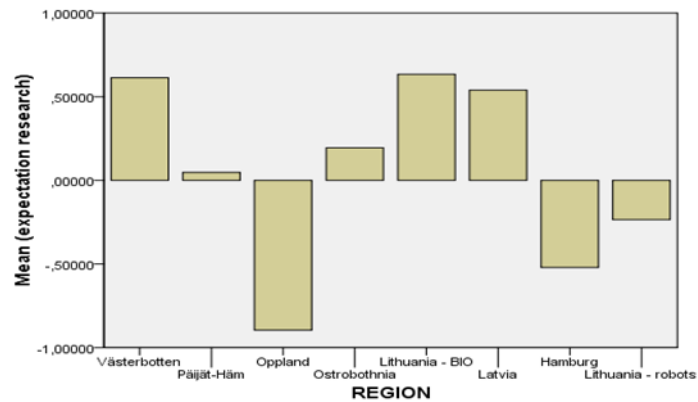
Expectations towards research (mean)

Strengths:
Research/ university

Important helices:
NGO

Highest gaps:
From NGOs towards other helices regarding all aspects and geographical levels

Oppland, wood construction Good practices: 1.FORREGION research based competence brokers for SMEs 2.Norwegian Centre of Expertise Raufoss (NCE Raufoss).. 3. Norwegian Wood Cluster, 4.Ottadalen massivtre (CLT – cross laminated timber).	 Importance of regional companies (mean)
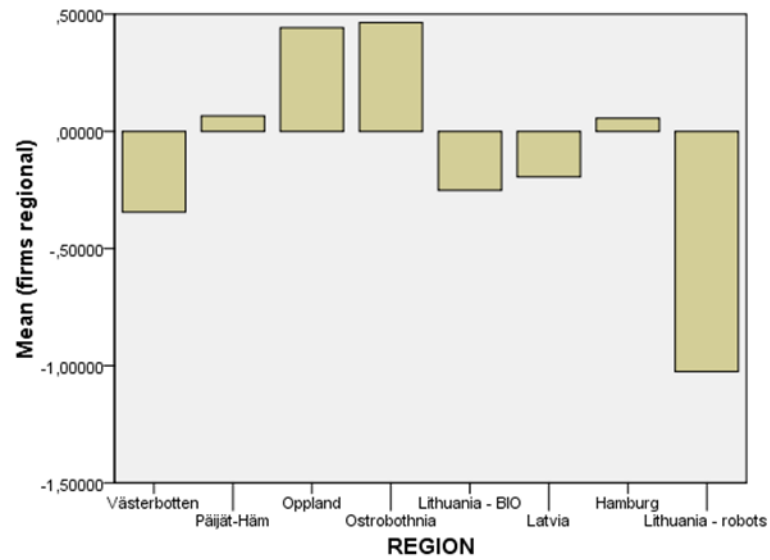
Strengths:
Regional networks of firms

Important helices:
regional firms

Highest gaps:
From universities towards companies regarding production networks and towards companies and public organisations regarding future ventures

Lithuania, advanced manufacturing, robotics

Good practices:
1.One NGO created a cluster and initiated the cooperation between main players in Lithuania.
2.Establishment of annual regional forum in Panevezys which started the transformational process of the region strategy.
3.Establishment of national digitalization initiative Pramone 4.0 (Industry 4.0).
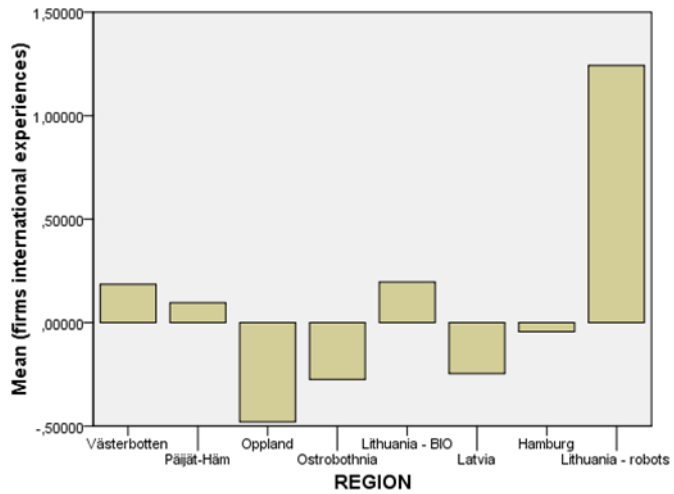
Experiences of international companies (mean)

Strengths:
global firms

Important helices:
NGO

Biggest gaps:
NGOs towards companies regarding innovation networks and NGOs towards universities in development and research

Latvia, metal industry

Good practices:
1.Business NGOs (associa-
tions, clsuters) exchanging
information - trading mis-
sions, exhibitions, local
events, etc.

2.Company projects ad-
dressed to universities to
solve specific needs of com-
panies. This good practice is
driven by the companies but
universities also play a big
role to implement this type of
good practice.

3. Internships between uni-
versities and companies –
but not only for students but
for academic personnel and
employees of company.
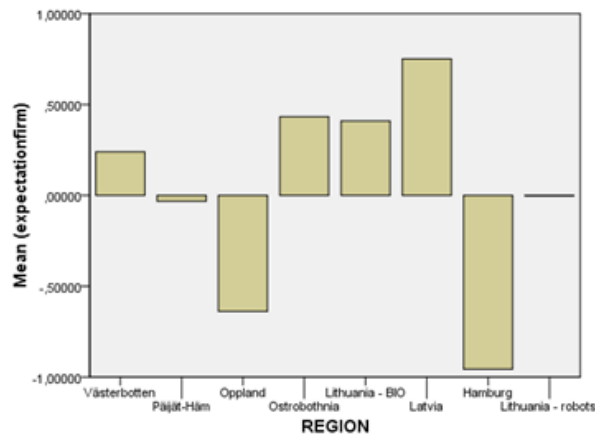
Expectations towards companies (mean)
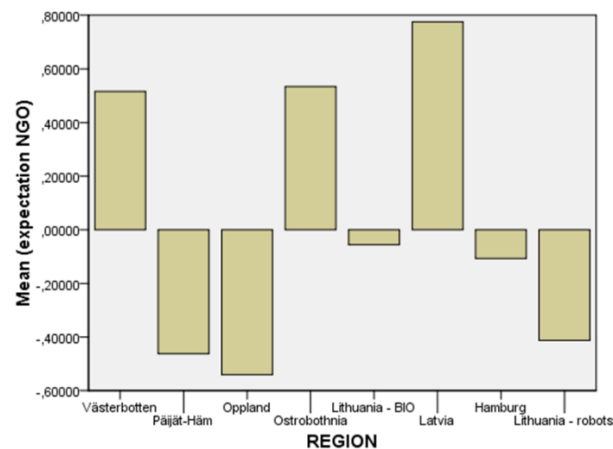
Expectations towards NGOs (mean)

Strengths:
Expectations firms and NGOs

Important helices:
public sector, NGO

Biggest gaps:
NGOs towards companies, universities and public organisations in almost all aspects , especially on international level. companies towards NGOs in all aspects and especially on national level

Ostrobothnia, energy technology

Good practices:
1.Open research platforms by universities
2.Cooperation between companies and universities regarding the engagement of students
3.Educational packages developed to serve the needs of companies.
4.Learning from gap analysis and structured dialogues in thematic focus group meetings
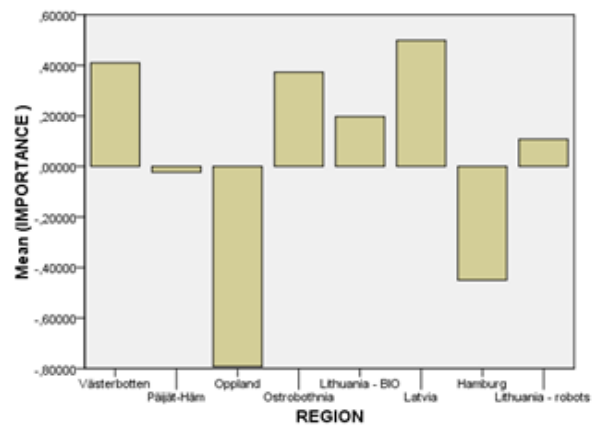
Importance of QH integration (mean)

Strengths:
QH integration combined with regional networks

Important helices:
company, university, NGO

Biggest gaps:
public organisations towards companies and universities regarding all aspects on regional level; small companies towards global companies in production and innovation networks

Hamburg, Circular economy

Good practices:
1. Regional level universities are an important partner for NGOs, other universities and public organisations.
2. Universities have also good cooperations on international levels.
3.NGOs are strong on a regional level and important partners for all other organisations including companies
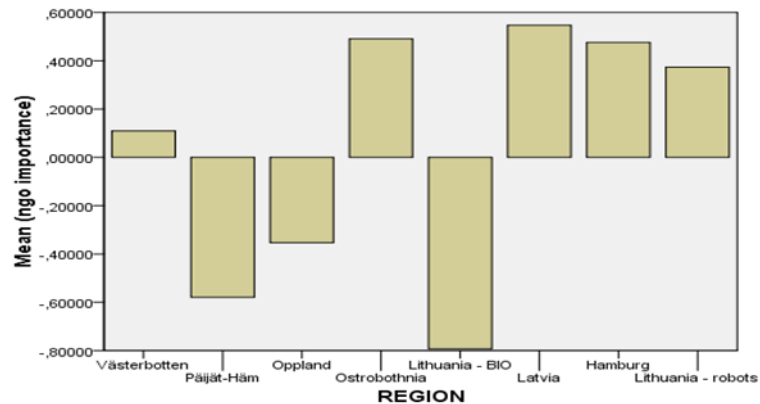
Importance of NGOs (mean)

Strengths:
NGOs

Important helices:
NGOs, public sector

Biggest gaps:
NGOs towards companies regarding production and innovation networks on regional level, public organisations and universities towards similar helices on national level

Västerbotten, sustainable energy and environmental technology Good practices: 1. Cluster cooperation	 Mean (EXPERIENCE) chart Experiences (mean)
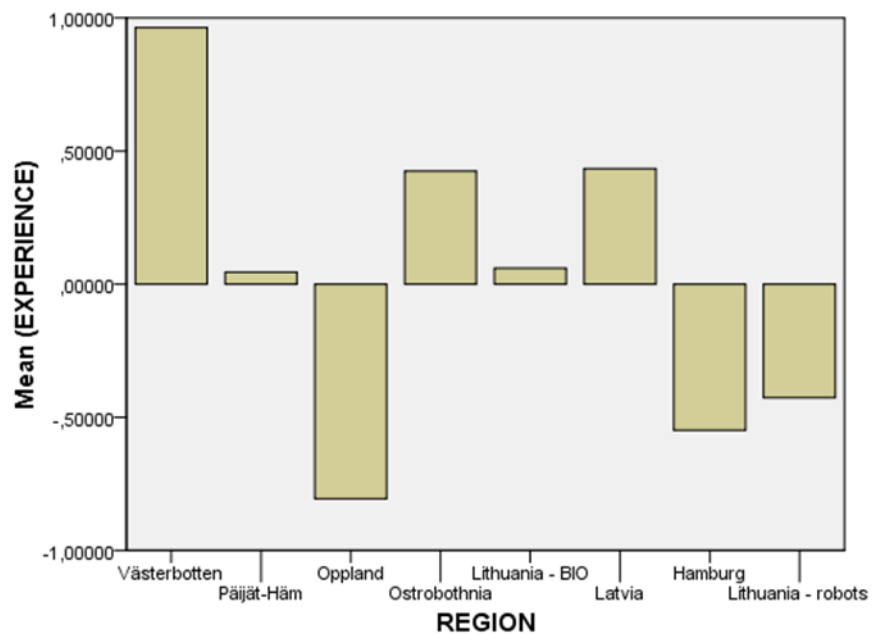
Strengths:
global market achievements

Important helix:
university, public sector

Biggest gaps:
Companies towards public sector in regional development on all geographical levels, NGOs towards other NGOs in regional development

So what? As a conclusion of the analysis, we response to the question what is the potential for innovation in LARS partner regions?

1. **Quadruple helix connectivity, measured through the IMPORTANCE indicator is good for business**. We have documented that there is a positive relation between high levels of connectivity and firm expectation and experiences. High levels of importance means that networks both within and between the helices are relatively strong. We are talking about well-connected NGOs, universities, public sector institutions, as well as networks between companies, some of them regional and some global. These successful relations between helices in regions with high score on IMPORTANCE may be a source of good practices. *How do they do it?*

2. **Strong firms may be bridges for weaker firms into the quadruple helix**. Networks between companies and the three other helixes in regions characterized by high scores on IMPORTANCE are often enabled through strong firms who are well connected with other firms, in the region and/ or globally. This might indicate that leading, globally connected firms could, together with NGOs, work as bridges for smaller companies into universities. *Can this bridging mechanism be replicated elsewhere?*

3. **Variation inside regions: learning may go both ways**. Regions with high levels of integration may have sectors and firms, which are quite similar to regions with lower score. Regions with middle or low scores on IMPORTANCE, such as Oppland and Päijät-Häme are aware of their challenges. They work in different ways to improve connectivity. A typical pattern is public sector support to NGOs, such as FORREGION, which supports knowledge brokering, where sharing a cup of coffee while discussing needs for product improvement is a basic tool connecting researchers and small firms. *Advanced experiences in fragmented regions is a potential source of learning for all.*

4. **Learning capabilities: large gaps in important relations**. Large GAPs compared with high scores on IMPORTANCE are possible indicators of regions, which are going through dynamic change, and are in need of good practices from other regions. Large GAPs might also signal missing relations, or relations with disruptive institutional actors who might block progress. *Regions with high gaps and high level IMPORTANCE have a potential for innovation. They deserve attention.*

5. **Transferring is transforming**. A good practice is always created inside a context. For instance, a specific form of cooperation between universities, NGOs and firms in a highly connected region may to a certain extent depend on the presence in the region of leading firms, working as bridges to smaller firms. Or maybe not? Maybe there are practices, which can be taken out of the context where it was created, and modified or changed in a way that makes it fit into a different, more fragmented value chain? This means that transnational learning must be seen as a process where good practices and its context are studied in order to see if something similar to it might be adapted in a different context. This means that the taken-for-granted contexts supporting the practice must be codified and brought on the table for discussion. *When the good practice is described analytically, outside of its original context, it is also possible to see how it may be modified, and adapted to a different context.*

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LARS

Learning Among Regions on Smart Specialisation

Questionnaire

The LARS project attempts to help the public sector in supporting innovation processes in their regions and to connect innovation networks across regions. It helps to find improvements in public sector policies, supporting innovation and cooperation. In order to improve regional innovation networks, all project partners are conducting surveys similar to this one.

You were chosen as a respondent because you are one of the key persons regarding the chosen fields. The questionnaire measures your collaboration between various actors. We will use your responses to improve innovation policies and discover good practices. The aim is to analyse these findings and later invite you to focus group in order to come up with solutions with how to improve innovation.

LARS-project is mostly financed by Interreg Baltic Sea programme and coordinated by Regional Council of Ostrobothnia. If you wish to know more, you can find more details from:

https://www.lars-project.eu/

Confidentiality

We want to assure you that responses are completely anonymous and cannot be traced back to the respondent. Your responses are also combined with those of many others and only used in a summarized form to further protect your anonymity.

The results are only going to be used to aid the development work of the region of Ostrobothnia and are also compared with other summaries from LARS project partners in order to promote transnational learning. Data will be processed anonymously in a summarized form and stored without identification details by the University of Vaasa and Regional Council of Ostrobothnia.

Any acquired data shall be processed and stored according to the new European General Data Protection Regulation (GDPR) entered in the force May 25, 2018.

1. Basic information, interviewer fills in (used simply for identification and not part of the question-naire**):**

Respondent:	
Position in organisa-tion:	
Organisation:	
Size of organisation: Revenue/staff	
Products/services:	

A partner is any organisation, which is crucial for your organisation's work, which you are in contact with more or less regularlyfrom time to time. Relations to partners may be formalized through contracts and/ or they may result from mutual understanding. Partners may in various degrees share the same or mutually supporting objectives. Partners are important to the inno-vation activities of your organisation.

We willmake a distinction between four types of possible partners:

- **Companies**, such as service providers, suppliers and customers.
- **Public organisations**, such as municipalities, ministries, public agencies, and interna-tional institutions (EU, UN, etc.).
- **Universities**, which performresearch, education, and knowledge dissemination**.**These also include universities of applied sciences and other higher education and research institutes, which may be also privatively owned.
- **Non-governmental organisations (NGOs)**, which are usually non-profit interest or-ganisationsand operate on issues regarding business, environment, social security, public policy, education (chambers of commerce, farmer´s union, forest owners associ-ation, business associations, cluster organisations etc.) There are also international NGO´s, such as Committee of the Regions, European Cluster Collaboration Platform, etc.

Some organisations may be hybrid, which are mutually owned by public organisations, univer-sities and companies etc. These organisations might be categorized by their **main activities**, either as public or private entities or NGO´s. These organisations are crossing the boundaries and therefore very important for connecting the actors.

Companies refer, for example, to service providers, suppliers, customers and owners/subsidiaries.

2. Question regarding cooperation with companies

a) How important are companies as innovation partners for your organisation:

How important are companies as innovation part-ners for your organisation:	Scale: 0, 1-10
at the regional level	
at the national level	
at the international level	

b) Cooperative activities with companies

Aspect of coopera-tion	Regional coopera-tion		National cooperation		International coopera-tion	
	Expecta-tions	Expe-riences	Expectations	Experi-ences	Expecta-tions	Experiences
Cooperation regarding production network(lo-gistics, parts, services) *Concrete cooperation on a daily basis (pro-cess innovations)*						
Cooperation regarding innovation net-work(design, testing, marketing) *Work surrounding the products/services/re-search (product innova-tions)*						
Cooperation regarding future ventures (events, learning semi-nars) *Work relating to long-term exploration of busi-ness opportunities*						
Value/meaning: 10-9 Very high expectations, 8-7 High expectations, 6-5 Average expectations, 4-3 Low ex-pectations, 2-1 Very low expectations, 0 = no expectations 10-9 Very good experiences, 8-7 Good experiences, 6-5 Average experiences, 4-3 Bad experiences, 2-1 Very bad experiences, 0 = no experiences **Cooperation** here refers to activities in which both sides are genuinely interacting with one another. For ex-ample we do not consider purchasing a product, or granting assistance to be cooperation if there is not some sort of dialogue between the actors (for example planning, mutual project, etc.)						

Expectations = what the cooperation should be in ideal situation/what you want it to be.

Experiences = the cooperation in practice.

3. Could you briefly explain your reasoning for the marked expectations/experiences regarding companies:

4. Some good examples of cooperation with companies:

5. Biggest challenges regarding cooperation with companies:

Public organisations refer, for example, to municipalities, ministries, public agencies, and international institutions (EU, UN, etc.).

6. Question regarding cooperation with public organisations

a) How important are public organisations as innovation partners for your organisation:

How important are public organisations as innovation partners for your organisation:	Scale: 0, 1-10
at the regional level	
at the national level	
at the international level	

b) Cooperative activities with public organisations

Aspect of cooperation	Regional cooperation		National cooperation		International cooperation	
	Expecta-tions	Expe-riences	Expecta-tions	Experi-ences	Expecta-tions	Experi-ences
Cooperation in regional development (infrastructure, logistics, land-use) *Concrete cooperation*						
Cooperation regarding innovation network (business development, employment affairs, advice) *Work surrounding the products/services/research*						
Cooperation regarding future ventures (events, education, knowledge/export-oriented activities) *Cooperation in developing innovative/inspiring environment*						
Value/meaning: 10-9 Very high expectations, 8-7 High expectations, 6-5 Average expectations, 4-3 Low expectations, 2-1 Very low expectations, 0 = no expectations 10-9 Very good experiences, 8-7 Good experiences, 6-5 Average experiences, 4-3 Bad experiences, 2-1 Very bad experiences, 0 = no experiences **Cooperation** here refers to activities in which both sides are genuinely interacting with one another. For example we do not consider purchasing a product, or granting assistance to be cooperation if there is not some sort of dialogue between the actors (for example planning, mutual project, etc.)						

> **Expectations** = what the cooperation should be in ideal situation/what you want it to be.
>
> **Experiences** = the cooperation in practice.

7. Could you briefly explain your reasoning for the marked expectations/experiences regarding public organisations:

8. Some good examples of cooperation with public organisations:

9. Biggest challenges regarding cooperation with public organisations:

Universities refer, for example, to entities which perform research, education, and knowledge dissemination*.* These also include universities of applied sciences and other higher education and research institutes, which may be also privatively owned.

10. Question regarding cooperation with universities

a) How important are universities as innovation partners for your organisation:

How important are universities as innovation partners for your organisation:	Scale: 0, 1-10
at the regional level	
at the national level	
at the international level	

b) Cooperative activities with universities

Aspect of cooperation	Regional cooperation		National cooperation		Internationalcooperation	
	Expectations	Experiences	Expectations	Experiences	Expectations	Experiences
Cooperation in education(mutual courses, visiting lecturers, student projects) *Concrete cooperation*						
Cooperation in development(testing, common projects) *Work surrounding the products/services/research*						
Cooperation in research(analytics, new solutions & concepts) *Work relating to long-term exploration of opportunities*						
Value/meaning: 10-9 Very high expectations, 8-7 High expectations, 6-5 Average expectations, 4-3 Low expectations, 2-1 Very low expectations, 0 = no expectations 10-9 Very good experiences, 8-7 Good experiences, 6-5 Average experiences, 4-3 Bad experiences, 2-1 Very bad experiences, 0 = no experiences **Cooperation** here refers to activities in which both sides are genuinely interacting with one another. For example we do not consider purchasing a product, or granting assistance to be cooperation if there is not some sort of dialogue between the actors (for example planning, mutual project, etc.) **Expectations** = what the cooperation should be in ideal situation/what you want it to be. **Experiences** = the cooperation in practice.						

11. Could you briefly explain your reasoning for the marked expectations/experiences with universities:

12. Some good examples of cooperation with universities:

13. Biggest challenges regarding cooperation with universities:

Non-governmental organisations (NGOs), are usually non-profit interest organisations and operate on issues regarding business, environment, social security, public policy, education (chambers of commerce, farmer´s union, forest owners association, business associations, cluster organisations etc.) There are also international NGO´s, such as Committee of the Regions, European Cluster Collaboration Platform, etc.

14. Question regarding cooperation with NGOs

a) How important are NGOs as innovation partners for your organisation:

How important are NGOs as innovation partners for your organisation:	Scale: 0, 1-10
at the regional level	
at the national level	
at the international level	

b) Cooperative activities with NGOs

Aspect of cooperation	Regional cooperation		National cooperation		International cooperation	
	Expectations	Experiences	Expectations	Experiences	Expectations	Experiences
Cooperation in regional development (land-use, logistics, environmental consultation, etc.) *Concrete cooperation*						
Cooperation in product/service development(consumer testing, etc.) *Work surrounding the products/services/research*						
Cooperation regarding future ventures (Common events, etc.) *Work relating to long-term exploration of opportunities*						

Value/meaning: 10-9 Very high expectations, 8-7 High expectations, 6-5 Average expectations, 4-3 Low expectations, 2-1 Very low expectations, 0 = no expectations

10-9 Very good experiences, 8-7 Good experiences, 6-5 Average experiences, 4-3 Bad experiences, 2-1 Very bad experiences, 0 = no experiences

Cooperation here refers to activities in which both sides are genuinely interacting with one another. For example we do not consider purchasing a product, or granting assistance to be cooperation if there is not some sort of dialogue between the actors (for example planning, mutual project, etc.)

Expectations = what the cooperation should be in ideal situation/what you want it to be.

Experiences = the cooperation in practice.

15. Could you briefly explain your reasoning for the marked expectations/experiences with NGO´s:

16. Some good examples of cooperation with NGO´s:

17. Biggest challenges regarding cooperation with NGO´s:

18. Number of innovation partners

How many innovation partners do you have (exact amount)	Companies	Universities	Public organisations	NGOs
at the regional level				
at the national level				
at the international level				
Categories for the amount: 0, 1-10, 11-20, 21-50, over 50 **Regional cooperation** refers to cooperation with partners, which are located in the same region. For example regional state offices and regional offices of national institutions are regional. **National cooperation** refers to cooperation with partners, which are located in the same country, but outside your region. **International cooperation** refers to cooperation with partners, which are located in a different country.				

Optional: You can also name some of your partners