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Arctic Potential – Could more structured view improve the understanding of Arctic business opportunities?

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Abstract

The increasing interest towards the Arctic has been witnessed during the past decades. However, the commonly shared definitions of the Arctic key concepts have not yet penetrated national and international arenas for political and economic decision making. The lack of jointly defined framework has made different analyses related to the Arctic quite limited considering the magnitude of economic potential embedded in Arctic.

This paper is built on the key findings of two separate, yet connected projects carried out in the Oulu region, Finland. In this paper's approach, the Arctic context has been defined as a composition of three overlapping layers. The first layer is the phenomenological approach to define the Arctic region. The second layer is the strategy-level analysis to define different Arctic paths as well as a national level description of a roadmap to Arctic specialization. The third layer is the operationalization of the first two layers to define the Arctic business context and business opportunities.

The studied case from Oulu region indicates that alternative futures for the Arctic competences and business activities are in resemblance with only two of the four identified strategic pathways. Introduction of other pathways to regional level actors as credible and attractive options would require additional, systematic efforts.

Keywords: Arctic trends, Innovation policy roadmapping, Arctic business opportunities, Content analysis

1. Introduction

The emergence of Arctic into political, business and research agendas has not yet been followed by commonly shared definitions of key concepts. This lack of jointly defined framework has made different analyses of the Arctic as a context[1] far too limited when considering the magnitude of economic potential embedded in various raw material resources and other arctic endowments. Incoherent[2] – and sometimes even biased – specification of the Arctic itself is hindering qualified and proper analysis of the Arctic as a business context, but in addition to this inconvenience there are justified concerns expressed about the Arctic competence and expertise required to enable utilization of Arctic potential – how to secure development of sufficient know-how and competitive innovations when relevant agents are not able to clarify the essence of the Arctic?

When considering the Arctic as a context, it is necessary to identify features separating this context from other contexts. Moreover, this contextual approach can be complemented with phenomenological approach enabling operationalization of the key Arctic features. Only after the identification of Arctic features combined with understanding of the Arctic phenomena, it is possible to address the main questions concerning the Arctic.

In this paper, one attempt to specify and clarify abovementioned incoherence is presented. This paper is built on the key findings of two separate, yet connected projects carried out in the Oulu region, Finland. The goals of these projects were to explicate the role of the Arctic from Finnish perspective, identify the key trends affecting the Arctic context and eventually to investigate the business potential of the arctic region.

Finland can be seen as an Arctic nation which is especially highlighted by the national authorities (Prime Minister's Office, 2013). However, some definitions only focus on the most northern parts of Finland as they correlate the Circumpolar Arctic definitions (Glomsrød, S., Aslaksen, I., 2009). This definition issue differentiates Finland from other Arctic nations and complicates the formation of shared Arctic agenda. This problem can be distinguished in the European decision making level as well, since, depending on the actor, the Arctic is perceived as circumpolar Arctic or European Arctic (Stepien, A.,2015).

[1] In this paper, the context refers specifically to business context unless stated otherwise.

[2] Arctic has various definitions see e.g. perception of the whole of Finland as an Arctic country in Finland's Strategy for the Arctic Region vs. e.g. Definition of Circumpolar Arctic in Glomsrød, S., Aslaksen, I., 2009. The Economy of the North 2008.

2. Analytical approach

This paper consists of three overlapping layers. The first layer is the phenomenological[3] approach to the Arctic region. Here the Arctic is presented as a composition of different features of which some do emerge in other regions whereas some features or combinations of them are truly and exclusively Arctic. This approach enables the identification of various trends possibly affecting the Arctic and these trends combined with existing information of different large-scale investment projects forms the essence of what can be defined as the Arctic potential.

The second layer of chosen approach is the strategic approach. This approach contains definitions of different Arctic paths as well as a national level description of a roadmap to Arctic specialization. Strategic layer needs to be in compatible with the definition of the Arctic in the first layer.

The third layer takes into consideration the business context. The organizational level analysis requires operationalization of not only the Arctic features described in the first layer but also the strategic level options from the second layer. Once the enterprise level description is completed and expressed as a somewhat traditional market analysis, the picture of the Arctic as a business context is completed.

The synthesis of the aforementioned layers forms a logically coherent and operational tool to assess such a multidimensional phenomenon as the Arctic. This approach ensures that all relevant factors – shared definitions, governmental, upper-level strategies and the level of business development – are not only recognised and explicated but connected to each other as well. For instance, identifying Arctic agenda from the political decision making requires that there is a shared understanding of the essence of the Arctic, whereas capturing the effects of the national strategies to Arctic business opportunities requires that the Arctic business context is adequately defined.

Three-layered specification of the Arctic enables the in-depth analysis of the Arctic potential and moreover it can be exploited to detect the possible – and even quite plausible – gaps between demand and supply for Arctic specialization. This formulation can also be beneficial when for example assessing the somewhat sluggish responses and unexpectedly slowly growing interest of companies from Oulu region

[3] In this paper, the Arctic phenomena are interpreted from the views of the experts and specialists who participated in different stages of the studied projects.

toward the Arctic business opportunities. In other words, a more structured view of the Arctic is supposed to alleviate challenges in mapping the variety of economic potential and business opportunities.

Hence, the purpose of this paper is to present a novel way to collect, combine and organize seemingly scattered information so that the Arctic becomes a more tangible and operational concept. In addition, this procedure summarizes and elaborates the recent key findings about Arctic opportunities, different national and industry level strategic alternatives as well as a variety of operational level enablers and obstacles of business related to the Arctic specialization.

Due to selected approach, this paper focuses on the Arctic from Finland's perspective. Moreover, the intention is to investigate whether this selected approach performs adequately even with the quite limited case. Therefore, the data used in this paper is mainly based on the documentation of the aforementioned projects. If functional and applicable, this approach can be subsequently expanded to research activities covering larger geographical areas and exploiting more versatile data.

3. Material and methods

Research material used in this paper are the final reports from The Finnish Funding Agency for Innovation's (Tekes) strategic opening *SMARCTIC Roadmap to a smart Arctic specialization* (Thule institute 2014) and The Council of Oulu Region's funded project *Arctic business and research, development and innovation (RDI) -activity in the Northern Ostrobothnia* (Hintsala and Myllylä 2015). In order to illustrate the background of the material, methodological framework of the SMARCTIC project is presented involving the innovation policy roadmapping (IPRM) process and a strong prospective trend (SPT /SP trend) approach in the future analysis.

Methodologically, results presented in this paper are based on quite a loose and somewhat eclectic application of content analysis combined with elements of grounded theory approach. It is noteworthy that the writers have been involved in projects forming the source of information here and hence it can be argued that ethnographical touch cannot be avoided. The chosen research strategy was to label, classify, categorize and synthesize material and to find common, descriptive denominators covering the multifaceted theme of the Arctic.

In the SMARCTIC project critical strong prospective trends were identified up to the year 2030, in some cases up to 2050. The background report of SMARCTIC project identified and described relevant so

called PESTE categories of trends (Political, Economic, Social, Technological and Environmental) (Kamppinen et al., 2002) in the Arctic region, which can be seen as strong prospective trends. This literature-based analysis was linked methodologically to the future workshop concept, which is the typical participatory foresight method with Delphi methodology. Altogether 24 trends were chosen for examination where project research team and other experts performed a trend analysis of these chosen trends. In the first stage of the foresight workshop[4], presented SP trends and four thematic expert groups evaluated the most important SP trends affecting the theme of each work package. The second phase of the workshop involved the evaluation of the impacts of SP trends on the development of thematic clusters and development. Last phase of the workshop process focused on discussion about different projects, networking activities and potential new broader future projects. There were about 50 experts participating in the project workshops at the campus of the University of Oulu. The total number of experts was 31 who delivered the formal interview format. The table 1 reports the number of participants and their expertise background at the SMARCTIC foresight workshop.

During the SMARCTIC project also the innovation policy roadmapping (IPRM) (Ahlqvist et al., 2012) was applied as an analytical framework. IPRM links R&D results to systemic policy context and to forward-looking policy design. IPRM method integrates the approach of technology roadmapping – including e.g. enabling technologies, markets and drivers – with the perspectives of policies and its instruments. Process is targeted to include multiple participants and different interests. The policy analysis in the project was completed by a consultant company MDI Public as a separate analysis on the preparation and contents of Finland's Strategy for the Arctic Region (Prime Minister's Office, 2013). In the analysis, challenges for strategy implementation and different strategic paths for the implementation were outlined constituting the basis for the systemic level of the IPRM process. The roadmapping process consisted of three phases including scoping (brainstorming workshops, construction of thematic mindmaps), renerating (technology surveys, interviews, patent analysis, roadmapping workshops) and outputs (reporting and seminar).

Considering the multidisciplinary group of experts that participated in abovementioned activities, it is rather straightforward to assume that the research data used in this paper is adequately qualified and forms a convincing base for analysis. Since the raw data has not been used *per se* and the analyses in this paper are based on the final reports of the projects, the validity and reliability of the analyses are secured by

[4] The applied method of workshops is intended to diminish the problems with subjective definitions of the terms and topics. See e.g. Dufva and Ahlqvist, 2015.

closely inspecting the project activities and experts' involvement in these activities as well as by pervasive transparency in methodology and analyses presented in this paper.

4. Results

3.1 Arctic features and trends

There are several different definitions of the Arctic according to whether one relies on physical, geographical, political or administrative characteristics. For operational purposes, defining the Arctic is a crucial step. The Arctic can be interpreted through special conditions or as a location in which the operation takes place or where the operation is directed to.

Special conditions were divided to four categories in the *Arctic business and RDI-activity in the Northern Ostrobothnia* project: opticality (e.g. light, fog), variation of temperatures (e.g. cold, ice, and sensitive nature), natural resources (e.g. forest, minerals, water) and activity and culture (e.g. long distances, arctic cooperation). The special factors can be seen as the core of business activities (e.g. natural resources) or they can be factors of nature which require adaptation and sometimes specialization (e.g. darkness). In order to create new business opportunities in the Arctic region, concrete challenges of the Arctic environment should be linked to new business ideas and business model potentials (Myllylä 2013).

Together with defining Arctic, identification of various trends possibly affecting the Arctic and these trends combined with existing information of different large-scale investment projects form the essence of what can be defined as the Arctic business potential.

Based on the SMARCTIC workshop analyses, the main SP PESTE -trends relevant for business potential in the Arctic region were (1) SP trends related to technological change (35 mentions), (2) SP economic trends (28), (3) SP environment and sustainable development trends (27), (4) SP social trends (19) and (5) SP political trends (19).

According to the SMARCTIC participatory foresight workshop 11 of the most important SP trends in relation to Arctic business potential and emerging business opportunities in the sub-group of PESTE SP trends (number of mentions) are presented in the figure 1. Rising raw material prices is the most emphasised as a critical trend having impacts on business opportunities evaluation. Important thing to notice is that in short run the prices of raw materials may display sharp variation and the long run trend may be more stable – in the long run (up to years 2030 or 2050) the direction of the trend – upward or downward – is more

meaningful. There was some variation in different foresight working groups, because of the different sizes of the groups. The result of the SMARCTIC foresight workshop was observed to be in resemblance with other findings in Arctic and global research activities (Wilenius and Kurki, 2012; Myllylä, 2012; Smith, 2011).

Foresight analysis in the SMARCTIC project is in the background in defining what drivers of the change are and what business potential in the Arctic is. General observation based on expert assessment made in SMARCTIC workshops is that important issues related to business potential and business planning are Arctic mobility, distributed systems, modularity of innovations and solutions, ubiquitous sensors and blue water cluster. The role of research institutions and universities was seen important factor in boosting co-operation with companies and enabling new innovations to enter the markets.

Interpreting the results from the expert panels creates an image of the Arctic as a combination of special conditions of which some or a combination of them can be regarded as unique Arctic features. Simultaneously, experts representing the so-called Finnish Arctic stakeholders do regard some properties as dominantly Arctic even though it is obvious that same conditions exist and have impact outside of the Arctic region (e.g. long distances). This finding can be a reflection of incomplete conceptualization of the Arctic. Therefore, a common, reasonably general and shared definition of the essence of the Arctic would be useful.

Classification of the results from SPT approach can be executed in several ways. First, the top 11 trends can be divided into external and internal trends – some trends are seen as mainly resulting from activities outside of the Arctic, whereas some depend on the decisions and operations inside. Secondly, trends can be classified as technological or social trends, reflecting the difficulty in addressing the Arctic issues as a mixture of practical and political decision-making. Thirdly, trends can be classified by their linkage to the so-called core and supporting or enabling activities – some trends are more directly linked to Arctic resources and some are linked to the activities enabling or improving the exploitation of resources.

3.2 Arctic strategies – paths and roadmap

Once the essence of the Arctic is articulated it is reasonable to consider various strategical approaches to the Arctic issues. The defined Arctic – as a phenomenon or as a context - is a logical framework for scoping the strategy and directing development activities to key competence areas. Therefore, the link between joint, common understanding of the Arctic and strategical considerations should be strong. The close cooperation between research and business actors is essential to ensure continuity from the Arctic

phenomena to strategic operations – this cooperation most probably requires consistent mediation which usually is seen as a public sector activity.

There were four different Arctic strategy paths defined in the SMARCTIC project and a vision for Finland's position was created as well. Paths are intended to illustrate the scene and shed light into possibilities, and therefore they should not be interpreted as explicit directions or realistic interpretation of future development. The innovation policy analysis carried out generated four different strategy paths to concretise the vision presented in Finland's Strategy for the Arctic region (Prime Minister's Office, 2013). These paths are the following:

- Path 1 – Spearhead strategy: **Arctic marine technology and maritime transport**
- Path 2 – Flying geese approach: **Emerging Arctic pathways**
- Path 3 – **Culture of Arctic experimentation**
- Path 4 – Snowdrift strategy: **Fading Arctic business**

The first path is a hypothetical strategy in which Finnish actors would focus their perspective on Arctic opportunities and challenges entirely to serve – in this case – the needs of marine technology and maritime transport. This path is a focused and narrow strategy emphasising traditional competences of Finland in ship building and maritime industry. The second path presents a wider scope of Arctic research and business opportunities related to the Arctic area and especially Arctic sea. This path elaborates the needs generated from near-by markets – to secure the exploitation of the Arctic resources requires strategic actions to enable living and working in the Arctic environment.

The third path stands for focusing on creating infrastructure, tools and innovation policy that enable experimentation supporting rapid and flexible commercialisation of new technologies and services of applications in traditional and emerging sectors in the Arctic. In practice this means living labs, piloting environments, fast prototyping, cross-breeding of sectors and ideas, as well as test beds. For example, focus can be on user-centered open innovation environment (living labs) or more on creating platforms for experimentation of large development projects (test beds).

The fourth path is based on the presumption that Arctic potential remains unrealised. In this path the Arctic is not seen as a focus area, but rather as an additional element in competence development. This path reflects the necessary solutions to enable endurable conditions for everyday activities in the Arctic since Finland is an Arctic country. Therefore, the needs of businesses and households create a demand for certain

Arctic solutions. On the other hand, this path explicates one, quite typical way of specialization by the accumulation of the knowledge of managing the Arctic conditions. It is quite plausible that market niches for solutions designed for harsh conditions could be found globally from other demanding contexts such as mountain areas or tropic.

These paths should be seen as potential or possible ways to develop Arctic competences and paths can be seen as complementary rather than exclusive in the future. Only path four can be seen as an alternative approach, because it is based on the what-if scenario that Arctic potential is not realized.

Simultaneously with strategy paths, a strategic roadmap was created for Finland in the SMARCTIC project outlining the development taking place in the Arctic operational environment and marking out the path for Finland's Arctic vision (Fig. 2). The suggested timescale of the roadmap is fifteen years, but because a series of events cannot be tied to fixed points in time, time axes are intentionally left open. Different elements of the roadmap were not prioritised.

The roadmap consist of four elements. *Landscape drivers* describe global changes and developments affecting the Arctic area. Drivers are factors that support or promote the development of the vision for example by creating demand to certain know-how, products or services. The positive effect of a driver may end at some point in time or it can gradually fade out to the background. For the roadmap some key drivers were selected based on trend analysis described in the chapter 3.1 and literature survey. *Operational environment* describes the economic activities, needs and markets, in the Arctic area. Highlighting global warming, the deposits of natural resources and geographical location next to sea routes linking the area to the global markets. *Strategic challenges* describe the challenges identified in relation to the implementation of Finland's strategy for the Arctic region (Prime Minister's Office, 2013). Fourth layer in the roadmap is *paths for Arctic strategy implementation* identifying the possible strategy paths combining the Arctic operational environment, competences and innovation policies (mentioned above).

A part of the roadmap process was to make analysis related to these paths from the perspective of Arctic competence in relation to on-going technological needs. There was no clear and accepted definition of Arctic competence, because Arctic competence was not defined solely in relation to geographical region. Based on a formulated view made in the analysis of the workshops, a layered structure of Arctic competences is developed where competences are divided into three classes which are *competences related to Arctic conditions*, *applied technology competences* and *cross-sectional technology competences*. These competences have different weight in the above-mentioned strategy paths. Applied technology

competences are emphasised in the paths 1 and 2, the first one being narrower and more focused than the second one. Third path, Culture of Arctic experimentation, is not selective on the competences, but highlights the importance of combining wide range of different competences to find new solutions. In the fourth path, Snowdrift strategy, competences are not developed related to Arctic strategy umbrella, but the development is seen taking place in relation to other technology fields, based on existing activities and regional needs and possibilities.

From a conceptual perspective, the strategic experiments executed in the SMARCTIC project serve as a first step of operationalization of the Arctic from the defined essence of the phenomenon itself. Defined paths and strategic roadmap display the definition of the Arctic to some extent. It is not too complicated to interpret the general outlines of the Arctic strategic alternatives from aforementioned findings. However, it should be noted that from business opportunities' point of view the emphasis is laid on the enabling and supportive innovations and services – even with the spearhead path, the main focus of the development is on the technology and business opportunities that mainly serve the so-called Arctic core potential.

To conclude, the second layer of the approach applied in this paper is compatible with the first layer (i.e. the definition of the Arctic) and strategic alternatives reflect not only the Arctic phenomena but also the identified trends – up to the classification of the trends presented in the previous chapter.

3.3 Arctic business – operationalization and opportunities

The third and final layer of applied approach in this paper consists of the operationalization of the Arctic concept to the business framework. This completes the description of the Arctic as a business context. In order to connect a rather phenomenological composition of the Arctic and high-level strategic considerations to actual economic activities some additional limitations and refinements are required.

After recognizing possibilities and defining strategic level perceptions at the national level, the idea of Arctic specialization must be brought closer to operative activities. At this point, the Arctic potential must be observed at a regional level. Here, the observatory platform is the Oulu region and relevant features and trends can be identified by observing the investments and investment opportunities in the Barents region. This is one way to identify business opportunities and can act as a background for analysing how specialization in the Oulu region does reflect the demand for Arctic expertise.

In Finland, Northern Ostrobothnia (used in some contexts as a synonym for Oulu region) extends across the country from the Gulf of Bothnia coast to the Russian border. It is a growing and developing region that has a population of more than 400 000 persons (8% of the Finnish population). The population is well educated and has the lowest average age (38,2) of all the regions in the country. The total population of the principal city Oulu and its surrounding districts is nearly 250 000. Oulu is known for its high-tech expertise and electronics companies. The few more densely populated centres in the area have significant industrial facilities specialized in the field of wood processing, steelworks, chemistry and electronics industry. Both agriculture and forestry still represent essential sources of income in the rural areas. (Council of Oulu region webpage).

In *Arctic business and RDI-activity in the Northern Ostrobothnia* project industries were categorized by the estimated relevance of the Arctic issues to each industry. Main selection criteria were connected to the future investments, currents procurements, trends and Arctic conditions. In addition, sustainable usage of natural resources and application and development of new technologies were also considered. Industries identified to be connected to the Arctic were as follows:

- Oil & Gas
- Renewable energy
- Mining industry
- Metal industry
- Marine industry and logistics
- Bioeconomy
- Construction
- Infrastructure
- Cleantech
- ICT
- Tourism
- Human (living / working)

It can be argued that in practice the Arctic business context and business potential is likely to be dominated by the demand of natural resources. Thus, when considering the defined Arctic industries businesses related to construction and infrastructure, energy and mining and metal industry are especially

significant. One estimate is that investment projects starting before 2020 in the Barents region are in total 58-81 billion euros (Rautajoki, 2015). It is notable that even if the Arctic potential is not fully realized, there still would be substantial investments (Mikkola and Käpylä, 2013).

The current state of business in the Arctic activities reflect mostly the strategic paths 1 and 4. Tekes Arctic Seas programme (webpage) and Arctic Marine Testing, Training and Research Center (ArcMaTe) initiative (Ramboll Management Consulting, 2015) and long traditions in maritime industry are observable illustrations of Path 1. Whereas companies from the Oulu region are operating mainly in a few sectors and the so-called arctic business is an addition to their other activities – responding to the demand by their customers even in the Arctic context and hence reflecting path 4.

Path 2 - Emerging Arctic pathways - can be seen highlighted in different reports and surveys where Arctic trends and special conditions are analysed and not yet realized at the operational level. In the SMARCTIC project there were four thematic areas in which groups of experts elaborated potential applications and foreseen challenges. Business context related to this path can be assessed to have more significance to some industries – such as bioeconomy, ICT, cleantech and human development – than to others. To utilize mentioned new pathways, new platforms are needed for commercialization of innovations (mentioned in path 3). However, at the current state this can be regarded as a minor activity and the so-called north-centered innovations are not seized (Coates and Poelzer, 2014).

The business context defined as the composition of observed operational activities and identified opportunities does display the Arctic as a framework in transition. The strategic pathways that are built on the essence of the Arctic explicate high-level alternatives and strategic roadmap depicts logical framework for actions at a national level. However, when taken to the level of business the scope diminishes and even, when analysed at a regional level, the number of industries having Arctic interests can be large, it does not necessarily reflect determined focus on Arctic context. Interestingly, results presented here are actually converging to strategic paths that represent extreme ends of scale – the identified business context reflects either a spearhead strategy or fading Arctic strategy. If left solely to industries to decide, the Arctic business context from the Oulu region's perspective is likely to follow the path 4 since activities referring to path 1 are based on publicly funded projects and paths 2 and 3 have only a few observable proceedings. Even though the assessment of the desirability of this observed setting is beyond the scope of this paper, it is apparent that business actors (companies and their shareholders) do consider a great variety of factors when making

strategic decisions – the Arctic dimension emerges to strategic considerations most effectively when it is concretised as e.g. diminishing costs or increasing revenues.[5]

5. Discussion

Layered approach built on project materials offers a systematic view to Arctic business context. It is noteworthy that especially social and environmental (e.g. climate change, sensible nature) issues, which are the apparent drivers for interests toward the Arctic and actually are part of the applied PESTE analysis, tend to remain rather obscure elements when considering operationalization of the Arctic strategies. The quite traditional orientation in business considerations can be seen as somewhat surprising and seems to require further studying since one could expect that especially environmental issues would be key drivers also in practical business decision making. The first and second layers do emphasize the aforementioned issues but in the third layer their relevance is significantly smaller. Is this finding an outcome from individual stakeholders' inability to address these complex and intangible topics or is it from conscious, business oriented decisions?

New wave of high level political interest towards the Arctic rose in the 21st century, especially after growing interest to prospects of Arctic oil and gas and rapid melting of ice (Jensen and Hønneland, 2015). The Arctic council has granted observation status to twelve non-Arctic states, China, Japan and South Korea among others, in 2013 (Arctic Council webpage). After SMARCTIC project Russia's geopolitical interests' transition towards north has been strongly highlighted as a one important trend (Hintsala and Myllylä, 2015).

Highlighted topics related to the Arctic are challenges related to climate change, protecting sensible environment and indigenous empowerment. These can also be seen as political level drivers in economic development of the region (Arctic Council webpage). As Käpylä and Mikkola (2013: 10-11) point out there has been often overlooked element in the Arctic economic discourse: neglecting of the magnitude of the effects of global climate change. The linkage between climate change and Arctic business potential can be seen as an ambiguous one. Changing climate affects the Arctic business potential and realized business activities can affect the climate change (Käpylä and Mikkola 2013). Neglecting sustainability approach in practical Arctic business may lead into staggering contrast between widely accepted global visions towards sustainable future and heavily resource oriented Arctic business where environmental issues have only

[5] See Niemelä, S. & Hintsala, H., 2016. for more detailed coverage of these issues

marginal position. Is the Arctic seen as a resource reserve for fading fossil energy sources or as a forefront for developing new innovations to battle against the climate change?

SMARCTIC project provided a technology-based roadmap analysis on a national scale. Scaling this roadmap to the regional level and building regional systems of Arctic innovation can be challenging. Operationalisation of the Arctic potential and developing local innovation systems seem to need a national collaboration and coordination with local authorities and companies or e.g. existence of a strong regional and market-led perspective. Regional dynamics of innovation have been analysed in many studies (e.g. Hatakenaka et al. 2006) and this can also be a suitable analytical framework for future examinations related to the Arctic business. With the SMARCTIC project, it seems that lacking support from national level to regional level activities does not help to operationalize new alternatives presented in paths 2 and 3. Understanding geographical scaling can be identified as a critical element in the innovation landscape and the challenge lies in the information transfer from one scale to another in a way that is avoiding unnecessary overlaps (Ahlqvist and Inkinen 2007:6).

If the Arctic potential is defined by the Arctic investment projects, it is possible to define the role of the business activities as a two-fold one[6]. First, business solutions (products and services) are required to make these projects happen and secondly, business activities are required to secure the success of ignited projects. Thus, grouping of the Arctic business activities can be such that (1) the core of Arctic business is related to Arctic resources (e.g. natural resources, tourism). This core business is supported by (2) specific products, operations and services that are based on Arctic know-how. In this second category, Arctic element can be understood as an additional component. Furthermore, as the Arctic core business and necessary support activities evolve, a sort of (3) generic business framework emerges to respond to various needs of the core businesses. The importance of Arctic expertise can be regarded as minimal with these last kind of business activities. From this grouping results from the SMARCTIC project appears to emphasize the second group of business activities.

Besides the large-scale investment projects, there are business opportunities for numerous regional companies. However, developing specific products, operations and services for Arctic conditions as such without direct linkage to the resource sector is not well-adopted. This issue was raised by Coeates and Poelzer (2014) identifying why so little activity has been made related to capitalizing new technologies in

[6] See e.g. Hintsala et al., 2015.

Arctic conditions: *"Companies are loathe to invest the necessary money on the comparatively tiny Arctic population"*. This finding is at accordance with the path 4 from SMARCTIC project.

Using the Oulu region as an example of regional Arctic activities, it is apparent that observed reluctance of local companies to participate in the Arctic projects deserves attention. There is strong evidence for the existence of high-level competence and know-how in e.g. ICT in Oulu region (see Salo 2014) and this advantage could be exploited also in the Arctic cases. Even the application areas have been identified and to some extent the business models have been created. However, the actual business activities have remained diminutive and companies' ability to interpret the Arctic business opportunities has not improved. So far, this phenomenon has been identified but explanation for and the relevance of this finding should be studied further.

6. Conclusion

In this paper, the Arctic context has been defined as a composition on three layers. Three-layered specification of the Arctic enables the analysis of the Arctic potential and moreover, it can be exploited to detect gaps between demand and supply for Arctic specialization. This structured view reveals those emerging technologies that can be applied in Arctic conditions and business opportunities emerging from specific Arctic competences. Formulation can also be beneficial when for example assessing the somewhat sluggish responses and unexpectedly slowly growing interest of companies from Oulu region toward the Arctic business opportunities.

Methodologically, the approach or construct presented in this paper is most of all a synthesis of different methodological paths. The projects and their documentation offered a sufficient empirical background to illustrate the functionality and applicability of the developed approach. As is shown in this paper, the presented approach containing three different but closely linked layered are helpful when elaborating a rather complex entity such as Arctic. Moreover, this paper demonstrates that this approach seems promising when analysing gaps between high-level strategies and realised activities.

On a national level, a definition of Arctic expertise is necessary in order to scope the strategy and allocate resources to key competence areas. Since activities in the Arctic can bear considerable risks for a single economic agent, it is important to have close cooperation between research and industries.

Additionally, a combined environmental scanning and technology foresight process would support this collaboration.

So far, companies from the Oulu region have not been actively participating in various major investment projects in the Arctic – this phenomenon has led to speculate reasons for the observed behaviour. Even though it is possible that reasons for this inactivity can be found in strategical decisions of companies, it is equally plausible that there exists information shortages and asymmetries. To eliminate the latter cause, there is a need for well-established and attractively organised information gateways, supporting the continuously improving meeting of the needs and the potential.

Even though the Arctic area offers significant growth possibilities and potential, the overall Arctic development is difficult to forecast. There are drivers for uncertainty and so called wild cards[7] which can change the direction of trends that are connected to the development of the area. However, the factors of uncertainty do not reduce the fact that increasing cooperation between relevant stakeholders is required. To conclude, the current situation as observed from Oulu region's perspective reflects that alternative futures for the Arctic competences are in resemblance with two extreme ends of strategic Arctic pathways – either the Arctic will follow the spearhead path or the fading Arctic path. To make other identified Arctic pathways credible and attractive alternatives for operational decision making, a systematic and continuous dialogue between regional and national level and between regional agents needs to be intensified. Collaborative actions seem to require more effective actions from public sector actors in mediation between different parties as well as bringing balance to otherwise business-oriented discourse in operational level. It is difficult to perceive how dispersed private agents could be able to form a common understanding about operations in the Arctic area without determined public policy making and rigorous research.

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