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

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29 **Abstract**

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

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

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

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

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60 **1. Introduction**

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62 The emergence of Arctic into political, business and research agendas has not yet been followed by
63 commonly shared definitions of key concepts. This lack of jointly defined framework has made different
64 analyses of the Arctic as a context¹ far too limited when considering the magnitude of economic potential
65 embedded in various raw material resources and other arctic endowments. Incoherent² – and sometimes
66 even biased – specification of the Arctic itself is hindering qualified and proper analysis of the Arctic as a
67 business context, but in addition to this inconvenience there are justified concerns expressed about the
68 Arctic competence and expertise required to enable utilization of Arctic potential – how to secure
69 development of sufficient know-how and competitive innovations when relevant agents are not able to clarify
70 the essence of the Arctic?

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

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

80 Finland can be seen as an Arctic nation which is especially highlighted by the national authorities
81 (Prime Minister's Office, 2013). However, some definitions only focus on the most northern parts of Finland
82 as they correlate the Circumpolar Arctic definitions (Glomsrød, S., Aslaksen, I., 2009). This definition issue
83 differentiates Finland from other Arctic nations and complicates the formation of shared Arctic agenda. This
84 problem can be distinguished in the European decision making level as well, since, depending on the actor,
85 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.

86

87 **2. Analytical approach**

88

89 This paper consists of three overlapping layers. The first layer is the phenomenological³ approach to
90 the Arctic region. Here the Arctic is presented as a composition of different features of which some do
91 emerge in other regions whereas some features or combinations of them are truly and exclusively Arctic.
92 This approach enables the identification of various trends possibly affecting the Arctic and these trends
93 combined with existing information of different large-scale investment projects forms the essence of what can
94 be defined as the Arctic potential.

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

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

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

109 Three-layered specification of the Arctic enables the in-depth analysis of the Arctic potential and
110 moreover it can be exploited to detect the possible – and even quite plausible – gaps between demand and
111 supply for Arctic specialization. This formulation can also be beneficial when for example assessing the
112 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.

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

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

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

125

126 **3. Material and methods**

127

128 Research material used in this paper are the final reports from The Finnish Funding Agency for
129 Innovation's (Tekes) strategic opening *SMARCTIC Roadmap to a smart Arctic specialization* (Thule institute
130 2014) and The Council of Oulu Region's funded project *Arctic business and research, development and
131 innovation (RDI) -activity in the Northern Ostrobothnia* (Hintsala and Myllylä 2015). In order to illustrate the
132 background of the material, methodological framework of the SMARCTIC project is presented involving the
133 innovation policy roadmapping (IPRM) process and a strong prospective trend (SPT /SP trend) approach in
134 the future analysis.

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

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

143 called PESTE categories of trends (Political, Economic, Social, Technological and Environmental)
144 (Kamppinen et al., 2002) in the Arctic region, which can be seen as strong prospective trends. This literature-
145 based analysis was linked methodologically to the future workshop concept, which is the typical participatory
146 foresight method with Delphi methodology. Altogether 24 trends were chosen for examination where project
147 research team and other experts performed a trend analysis of these chosen trends. In the first stage of the
148 foresight workshop⁴, presented SP trends and four thematic expert groups evaluated the most important SP
149 trends affecting the theme of each work package. The second phase of the workshop involved the evaluation
150 of the impacts of SP trends on the development of thematic clusters and development. Last phase of the
151 workshop process focused on discussion about different projects, networking activities and potential new
152 broader future projects. There were about 50 experts participating in the project workshops at the campus of
153 the University of Oulu. The total number of experts was 31 who delivered the formal interview format. The
154 table 1 reports the number of participants and their expertise background at the SMARCTIC foresight
155 workshop.

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

167 Considering the multidisciplinary group of experts that participated in abovementioned activities, it is
168 rather straightforward to assume that the research data used in this paper is adequately qualified and forms
169 a convincing base for analysis. Since the raw data has not been used *per se* and the analyses in this paper
170 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.

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

173

174 **4. Results**

175 **3.1 Arctic features and trends**

176

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

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

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

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

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

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

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

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

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

223

224 **3.2 Arctic strategies – paths and roadmap**

225

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

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

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

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

243

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

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

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

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

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

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

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

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

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

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

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

307

308 **3.3 Arctic business – operationalization and opportunities**

309

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

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

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

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

- 334 • Oil & Gas
- 335 • Renewable energy
- 336 • Mining industry
- 337 • Metal industry
- 338 • Marine industry and logistics
- 339 • Bioeconomy
- 340 • Construction
- 341 • Infrastructure
- 342 • Cleantech
- 343 • ICT
- 344 • Tourism
- 345 • Human (living / working)

346

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

350 significant. One estimate is that investment projects starting before 2020 in the Barents region are in total 58-
351 81 billion euros (Rautajoki, 2015). It is notable that even if the Arctic potential is not fully realized, there still
352 would be substantial investments (Mikkola and Käpylä, 2013).

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

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

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

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

381

382 **5. Discussion**

383

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

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

399 Highlighted topics related to the Arctic are challenges related to climate change, protecting sensible
400 environment and indigenous empowerment. These can also be seen as political level drivers in economic
401 development of the region (Arctic Council webpage). As Käpylä and Mikkola (2013: 10-11) point out there
402 has been often overlooked element in the Arctic economic discourse: neglecting of the magnitude of the
403 effects of global climate change. The linkage between climate change and Arctic business potential can be
404 seen as an ambiguous one. Changing climate affects the Arctic business potential and realized business
405 activities can affect the climate change (Käpylä and Mikkola 2013). Neglecting sustainability approach in
406 practical Arctic business may lead into staggering contrast between widely accepted global visions towards
407 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

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

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

421 If the Arctic potential is defined by the Arctic investment projects, it is possible to define the role of the
422 business activities as a two-fold one⁶. First, business solutions (products and services) are required to make
423 these projects happen and secondly, business activities are required to secure the success of ignited
424 projects. Thus, grouping of the Arctic business activities can be such that (1) the core of Arctic business is
425 related to Arctic resources (e.g. natural resources, tourism). This core business is supported by (2) specific
426 products, operations and services that are based on Arctic know-how. In this second category, Arctic
427 element can be understood as an additional component. Furthermore, as the Arctic core business and
428 necessary support activities evolve, a sort of (3) generic business framework emerges to respond to various
429 needs of the core businesses. The importance of Arctic expertise can be regarded as minimal with these last
430 kind of business activities. From this grouping results from the SMARCTIC project appears to emphasize the
431 second group of business activities.

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

⁶ See e.g. Hintsala et al., 2015.

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

438 Using the Oulu region as an example of regional Arctic activities, it is apparent that observed
439 reluctance of local companies to participate in the Arctic projects deserves attention. There is strong
440 evidence for the existence of high-level competence and know-how in e.g. ICT in Oulu region (see Salo
441 2014) and this advantage could be exploited also in the Arctic cases. Even the application areas have been
442 identified and to some extent the business models have been created. However, the actual business
443 activities have remained diminutive and companies' ability to interpret the Arctic business opportunities has
444 not improved. So far, this phenomenon has been identified but explanation for and the relevance of this
445 finding should be studied further.

446

447 **6. Conclusion**

448

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

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

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

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

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

473 Even though the Arctic area offers significant growth possibilities and potential, the overall Arctic
474 development is difficult to forecast. There are drivers for uncertainty and so called wild cards⁷ which can
475 change the direction of trends that are connected to the development of the area. However, the factors of
476 uncertainty do not reduce the fact that increasing cooperation between relevant stakeholders is required. To
477 conclude, the current situation as observed from Oulu region's perspective reflects that alternative futures for
478 the Arctic competences are in resemblance with two extreme ends of strategic Arctic pathways – either the
479 Arctic will follow the spearhead path or the fading Arctic path. To make other identified Arctic pathways
480 credible and attractive alternatives for operational decision making, a systematic and continuous dialogue
481 between regional and national level and between regional agents needs to be intensified. Collaborative
482 actions seem to require more effective actions from public sector actors in mediation between different
483 parties as well as bringing balance to otherwise business-oriented discourse in operational level. It is difficult
484 to perceive how dispersed private agents could be able to form a common understanding about operations in
485 the Arctic area without determined public policy making and rigorous research.

486

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