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The Current State and Development of Small Innovative Technology Companies in the Arctic Regions of North-Western Russia

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Abstract. The article examines the current state of development of small innovative technology companies in the Arctic regions of North-Western Russia. Statistical surveys, questionnaires and in-depth interviews were conducted to identify the most promising forms of support for innovation in small innovative companies, allowing for the differentiation of mechanisms to maximize the effects of regional support measures. The basic factors influencing the interaction of business and science within the framework of technological innovations are presented. The analysis allows identifying current problems and difficulties that hinder the implementation of effective innovations: weak human resources potential of the Arctic regions; low interest of small and medium-sized enterprises in innovations. In order to form the innovative infrastructure of the Arctic regions, it is important to adopt regional programs for the development of cluster formations, especially industrial ones, as well as to develop projects aimed at mobilizing the innovative potential of the regions and including them in the strategy of socio-economic development of the territories. Accordingly, to implement these intentions, it is necessary to carry out coordinated work on a range of issues. It is required to develop a legislative framework for the creation of innovative spaces, industrial, environmental and tourist territorial clusters. At the same time, the introduction of new types of activities by small innovative companies requires the creation of a comprehensive list of organizations supplying innovative products that are in demand by residents of the Arctic zone, with the application of appropriate preferences.
Keywords: *innovations, small businesses, innovation development institutions, innovative infrastructure, special economic regime, Arctic zone of Russia*

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Introduction

In the current conditions, when innovative activity is one of the main priorities of the state policy, the most important factor in the development of the regional economy is the innovative development of economic entities of any forms of ownership [1, Lukashenok T.R.; 2, Korobov S.A.,

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Epinina V.S.; 3, Khetagurova Yu.I.; 4, Alekseev A.A.]. For the Arctic territories, the development of innovative activity is critically important. This is due to the need to implement advanced technological solutions in the extractive sector of the economy [5, Pilyasov A.N.], including for ensuring environmental safety [6, Cherepovitsyn A.E.], as well as, for example, in the formation of transport corridors [7, Tsvetkov V.A.]. The harsh climate of the Arctic territories also requires innovative approaches to the processes of organizing environmental monitoring in order to minimize environmental risks [8, Kachur A.N.]. Obviously, this is far from an exhaustive list of human activities in the Arctic where it is advisable to implement innovations. In general, the competitiveness of the socio-economic territorial systems of the Arctic depends on innovative activity [9, Druzhinin P.V.]. At the same time, small innovative and technological companies make a significant contribution to these processes. In this regard, the study of various approaches to the development of small innovative companies in the Arctic zone of North-Western Russia is a highly relevant scientific and practical task [10, Yeaple R.; 11, Tirpak T.M., Miller R., Schwartz L.].

The works of S.L. Ivanov [12], V.P. Klavdienko [13], S.V. Terebov [10], M. Kautonen [14] and others [15; 16] are devoted to the problems of entrepreneurship development in the innovation sphere, as well as interaction between the scientific and educational spheres at the regional level. At the same time, the authors focus on solving the problems of small and medium-sized innovative companies in the field of scientific and technological development [17; 18; 19]. However, despite the significant amount of research conducted, there is an obvious discrepancy in the development of methods for determining criteria and evaluating the effectiveness of interaction between structures that support the innovation process. Consequently, the development of small and medium-sized scientific and service innovation companies is particularly important.

Data collection and analysis methodology

The aim of the study is to assess the level of innovative development of enterprises and to identify promising forms of support for the Arctic regions. The objectives of the study are: determining the structure of innovative technology enterprises by industry, assessing the level of their innovative (technological) development strategy, assessing the level of innovative development of enterprises based on their type of activity, and identifying promising forms of support in the innovation sphere.

Data for subsequent analysis was collected using questionnaires and interviews. The respondents for the interviews included 25 experts from government agencies in the field of small innovative entrepreneurship, as well as heads of research and scientific and educational organizations. The questionnaire consisted of the following sections.

Questionnaire

SECTION 1: GENERAL INFORMATION

1.1. Name of the enterprise: _____

1.2. Location of production (district, town, region):_____

1.3. Full name of respondent:_____

1.4. Position of respondent: _____

1.5. I would like to receive the survey results: Yes □ / No □

1.6. Preferred method of contacting you:

— Phone: _____

— Email: _____

SECTION 2. INNOVATIVE DEVELOPMENT

2.1. Does your company have a strategy for innovative (technological) development?

□ Yes

□ No

2.2. If there is a strategy, how would you assess its effectiveness over the past 3–5 years? What benefits has it brought to your company?

□ The existing strategy has significantly increased revenue or profit over the past 3–5 years

□ The development of the strategy has enabled the launch of a sufficient number of projects to achieve the goals of innovative development

□ The development of the strategy has enabled targeted promotion and development of the main product

□ Other (specify):_____

2.3. Rate your company according to the following characteristics

(from 1 — “the development of this area of the company's work is extremely insufficient at present” — to 5 — “this area of work is developing very well”):

Characteristics	1	2	3	4	5
Organization of production, management and development strategy					
Personnel policy (employee qualifications, motivation)					
Quality and range of products/services					
Use of modern technologies, equipment, and information systems; implementation of innovations					
Market demand for products					
Innovativeness of products, services or technologies used					

2.4. What forms of support do you consider most important for innovative activities (currently and in the future)?

(Rate the importance of each form of support on a scale of 1 — not important at all; 2 — slightly important; 3 — moderately important; 4 — very important; 5 — extremely important)

(multiple answers possible)

Form of support	Score				
	1	2	3	4	5
Subsidies to reimburse part of the costs (expenses) related to innovation activities (including the cost of purchasing fixed assets directly used to create innovative products)					

Subsidies to cover part of the interest rate on commercial bank loans					
Provision of budgetary credit resources					
Assistance in attracting extra-budgetary funds					
Joint public-private financing of innovation					
Venture capital investment					
Regional state order for innovative products					
Tax incentives					
Guarantees for bank loans					
Assistance in insuring commercial risks					
Other financial instruments (specify)					
Obtaining information, analytical, legal, and methodological materials on innovation activities from the administration					

Form of support	**Score**				
	1	**2**	**3**	**4**	**5**
Providing information on potential innovation investors					
Providing information on potential innovation buyers					
Providing information on new innovative products					
Other informational support (specify)					
Assistance in participation in exhibitions, conferences, seminars, and presentations of innovative projects					
Assistance in product certification					
Assistance in obtaining patents for innovative products					
Assistance in marketing research					
Arctic instruments — Arctic hectare, Arctic mortgage, preferential economic regime instruments (specify)					
No support required					

2.5. Indicate which instruments of state support or support from development institutions you have used:

(multiple answers possible)

□ RVC

□ Skolkovo

□ Bortnik Foundation (Innovation Promotion Fund)

□ Industry Development Fund

□ VEB

□ Subsidies from the Ministry of Economic Development of Russia

□ Subsidies from the Ministry of Industry and Trade of Russia

□ Regional programs

□ Other (specify): _____

SECTION 3: EFFECTS OF INNOVATION IMPLEMENTATION

3.1. What is the main strategic goal you are trying to achieve by implementing modern innovative technologies at your enterprise?

□ Growth in production, sales and revenue as the main factors of the enterprise's financial stability

□ Reduced likelihood of risks

□ Reduced amount of routine work for employees, freeing up human resources for more important and creative tasks

□ Reduced operating expenses by downsizing the staff

□ Gradual transition of the company to comprehensive automation of all business processes

□ We do not set a specific goal, but are guided by the fact that innovation will have a positive effect in any case

□ We trust the experience of our international colleagues in this field and have the financial capacity to purchase foreign innovative technologies for implementation at our enterprise

Other goals:_____

Representatives of 171 companies, grouped by industry, participated in the survey. The survey was conducted from July to October 2024 (Table 1).

Table 1

Industries of companies participating in the survey [1]

Construction, engineering and telecommunications services	Trade and service enterprises	Scientific research and consulting	Extractive and manufacturing industries	Information technology and automation	Other	Total
26	23	30	30	38	24	171
15.2%	13.4%	17.6%	17.6%	22.2%	14.0%	100%

The general population in the study is a list of small and medium-sized innovative companies in the Arctic regions of North-Western Russia (218 companies) [20, Tishkov S.V.]. The sample of representatives was selected randomly: the sample constitutes 80% of the total population [20, Tishkov S.V.].

Research results

The survey results highlight the need for innovative development among small and medium-sized companies in the Arctic. Most enterprise representatives responded in the survey that they have an innovative development strategy. In addition to an innovative development strategy, the majority of Arctic innovative enterprises (56.1% of the total number of respondents) emphasize the importance of developing their own innovation programs. For most companies, innovation is primarily focused on the application of information technology, including IT and AI development, the implementation of new software, and the automation and digitalization of production and technical processes.

According to the managers of innovative companies, the main factors in the field of innovation are: “increased competitiveness”, “optimization of production processes”, “technological development”, “improved quality”, and “increased productivity”. With an effective approach and development of innovation, enterprises are able to ensure the production of high-tech equipment and the professional development of employees. Every third company (39.8% of all

[1] Source: compiled by the authors on the basis of survey data.

respondents) is engaged in the commercialization of intellectual property and its implementation in production.

More than half of the company representatives indicated that management is directly involved in the development of innovation at their company. The remaining respondents (49.7% of the total number) found it difficult to answer the question of how important innovation is to company management. In conditions of uncertainty and restrictions, the majority of Arctic companies surveyed (87.1%) prefer to collaborate with Russian manufacturers offering technological and digital solutions for innovative developments. As part of the survey, Arctic small and medium-sized companies with a strategy assessed their success in achieving innovation goals over the past 3–5 years (Table 2).

Table 2

Assessment of the effectiveness of the innovative development strategy over the past 3–5 years, taking into account the company's type of activity [2]

Type of activity / Assessment of the effectiveness of the innovative (technological) development strategy over the past 3–5 years	Construction, engineering and telecommunications services	Trade and service enterprises	Scientific research and consulting	Extractive and manufacturing industries	Information technology and automation	Other	Total
The strategy enabled targeted promotion and development of the main product	36.4%	47.1%	17.4%	30.4%	34.6%	40%	33.3%
The strategy enabled the launch of a sufficient number of projects	13.6%	5.9%	65.2%	39.1%	46.2%	40%	36.5%
The strategy enabled a significant increase in revenue or profit over the past 3–5 years	50%	47.1%	17.4%	30.4%	19.2%	20%	30.2%
	100%	100%	100%	100%	100%	100%	100%

Analysis of the survey results (Table 2) shows that most companies in the fields of scientific research, extractive and manufacturing industries use their strategies primarily to launch new and promising innovative projects (65.2%, 39.1%, and 46.2%, respectively) [20, Tishkov S.V.]. In trade, construction, engineering, and telecommunications services, the presence of a strategy largely enables companies to increase profits (47.1% and 50%, respectively) [20, Tishkov S.V.]. In this regard, the use of various methods for applying the innovative (technological) development strategy should be emphasized.

During the survey, respondents assessed the level of enterprise development, taking into account the type of activity (Table 3).

[2] Note: closed-ended question, one option, % of all companies with a strategy. Source: compiled by the authors on the basis of survey data.

Table 3

Level of enterprise development by type of activity [3]

Level of enterprise development / Type of activity	Innovativeness of products, services or technologies used	Market demand for products	Use of modern technologies, equipment, information systems, implementation of innovations	Quality and range of products / services	Personnel policy (employee qualifications, motivation)	Organization of production, management and development strategy
Information technology and automation	4.1053	4.2895	4.3684	4.3158	4.1316	3.8947
Extractive and manufacturing industries	4.2667	4.2667	4.4333	4.3333	4.0667	3.9
Scientific research and consulting	4.1	4.1667	4.3667	4.1667	4.0333	3.5333
Trade and service enterprises	4.3043	4.3913	4.3913	4.3043	4.0435	3.4783
Construction, engineering and telecommunications services	4.2083	4.2917	4.0833	4	4.0833	3.7917
Other	3.9615	4.1154	4.2308	4.3462	4.2692	3.8077
Total	4.152	4.2515	4.3216	4.2515	4.1053	3.7485

Based on the assessment results, it should be emphasized that all of the areas mentioned are highly developed. This can be explained by the fact that only innovative companies were included in the sample. The significant level of development confirms the availability of certain resources in such companies and demonstrates the high potential of the innovation sector [20, Tishkov S.V.].

Companies readily use various instruments of state support for the development of the innovation sector (Table 4) [20, Tishkov S.V.].

Table 4

Instruments used to support innovation activities [4]

Instruments to support innovation activities	%
Subsidies from the Ministry of Economic Development of Russia	9.6
VEB	4.2
Industry Development Fund	10.2
Bortnik Foundation (Innovation Promotion Fund)	22.3
Skolkovo	15.7
RVC	7.8
Subsidies from the Ministry of Industry and Trade of Russia	6.6
Regional programs	64.5

Moreover, the majority of companies (64.5%) use various regional programs for their innovation activities, which allows them to strengthen regional specificity and mitigate competition

[3] Note: Closed question, average score for each criterion, where 1 — the area is insufficiently developed, 5 — the area is highly developed. Source: compiled by the authors on the basis of survey data.
[4] Source: compiled by the authors on the basis of survey data.

between regions. According to the survey results, the geographical location of companies has little impact on the current level of innovation development.

The study analyzed the interaction of enterprises with scientific, educational and research organizations, as well as with government authorities. As a result, the most popular forms of support for the innovative activities of enterprises were identified (Fig. 1).

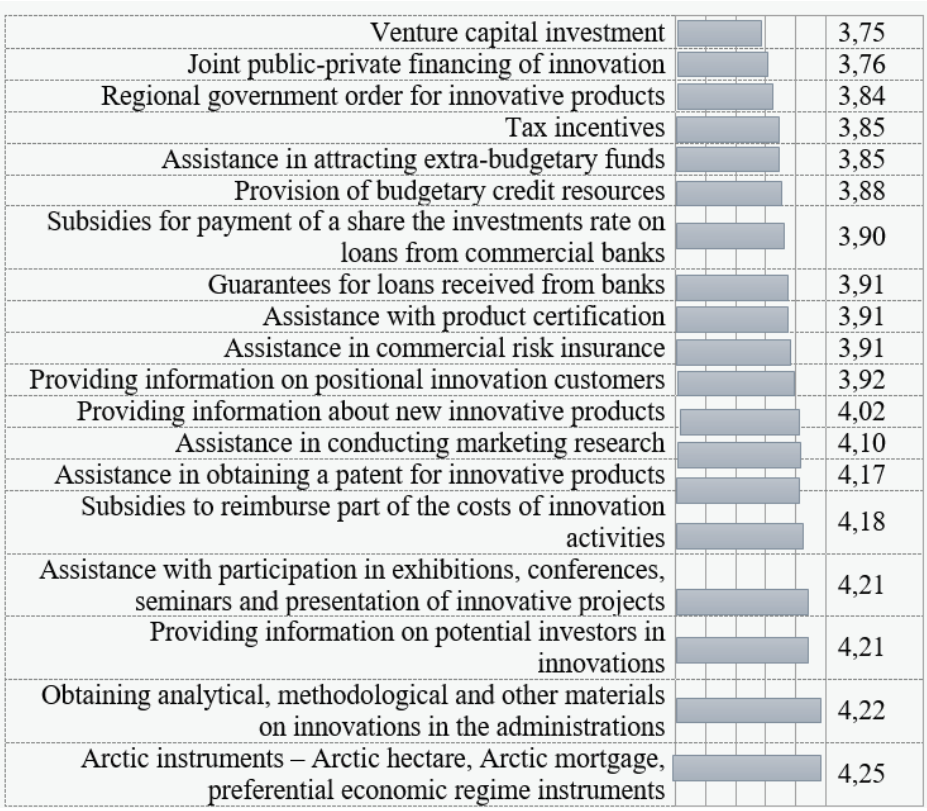

Fig. 1. Relative level of demand for forms of support in the innovation sphere (5-point scale).

The majority of enterprise representatives participating in the survey confirmed that the main goal of strategic development is to obtain a positive effect from innovations in the future. A quarter of respondents (24.6%) use innovative activities for transitioning enterprises to comprehensive automation of all business processes (Table 5) [20, Tishkov S.V.].

Table 5

What is the main strategic goal you are trying to achieve by implementing modern innovative technologies at your enterprise? [5]

The role of innovation as a strategic goal	Percent
Innovation will have a positive effect in any case	44.4
Gradual transition of the enterprise to comprehensive automation of all business processes	24.6
Reduced operating expenses by downsizing the staff	0.6
Freeing up human resources for more important and creative tasks	10.5
Reduced likelihood of risks	2.9
Increase in production, sales and revenue as the main factors of the enterprise's financial stability	17

[5]Source: compiled by the authors on the basis of survey data.

Conclusion

The results of the study showed a high rating of the innovative and production activities of small and medium-sized companies in the Arctic region. This fact once again confirms that the innovative activities of small and medium-sized enterprises can contribute to significant growth both in a specific area and in the region as a whole [6, 7] [22, Araujo D., Diego R., Reis A. et al.; 23, Adner R., Feiler D.; 24, Talmar M., Walrave B., Podoynitsyna K.S. et al.; 25, Hannah D., Eisenhardt K.M.; 26, Jacobides M.G., Cennamo C., Gawer A.; 27, Kubus R.]. The structure of innovative and technological enterprises by industry was determined. The most representative group included enterprises operating in the field of information technology and automation. The smallest group consisted of enterprises in the field of trade and services. At the same time, according to the representatives of the surveyed companies, the level of innovative development was high in all identified areas. The assessment revealed that the most popular forms of support for innovative activities of enterprises were Arctic support instruments, such as the Arctic hectare, Arctic mortgages, and other preferential measures, which can be considered as confirmation of their effectiveness. Moreover, almost half of the surveyed companies consider innovative activity to be unconditionally positive and necessary for the gradual transition of the enterprise to comprehensive automation of business processes.

The field of activity of small innovative companies influences the methods of creating and applying strategies for innovative (technological) development, which requires the development of approaches to supporting innovation, taking into account the specifics of the work of organizations in a particular region [28, Falk M., Figueira de L.; 29, Ortega-Argilés R., Voigt P.].

Preferential economic regime measures include the impact of innovation system components on the national level and on sectoral consequences in the economies of Arctic regions. They also involve the integration of ESG factors and innovation-related institutions, thereby increasing the science intensity of Arctic zone residents. These measures contribute to economic diversification and stimulate the development of innovation infrastructure for the expanded reproduction and capitalization of innovations.

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