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Digital Transformation of Rural Areas in the Conditions of Innovative Development of the Western Sector of the Russian Arctic

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Abstract. Complex natural-climatic and spatial-geographical conditions, which comprehensively characterize the Arctic as a zone of absolute discomfort, create systemic barriers to the introduction of digital technologies necessary for levelling the risks of population preservation. Of particular strategic importance for the Arctic zone of the Russian Federation are rural territories that provide a presence in the vast and sparsely populated space of the Russian Arctic, including in the areas of exploitation of key deposits of mineral and biological resources. The aim of the article is to analyze the directions of digital transformation of regional development that promotes innovative development of rural territories in the Western sector of the Russian Arctic (on the example of the Arkhangelsk Oblast and the Nenets Autonomous Okrug). Along with comparative analysis of scientific publications and content analysis of normative legal documents, a systematic review of strategic planning documents and indicators assessing the level of digitalization of the Arkhangelsk Oblast and the Nenets Autonomous Okrug with a special focus on the quality of life of the population was carried out. The analysis showed that digitalization processes react sensitively to the political and socio-economic situation, primarily the COVID-19 pandemic, economic recession and sanctions restrictions. The priorities of regional policy in the field of digital transformation have been identified, and insufficient attention to rural areas in this matter has been revealed. Under the concept of regional development “center–periphery”, the gap in the degree of development of digital ecosystems between urban and rural settlements is expected to increase, but the lack of official statistical indicators does not allow assessing its depth. Promising areas of state policy in the digital economy include systematic formation of digital competencies of the population, since digital literacy is the most important prerequisite for obtaining significant socio-economic effects of digitalization, as well as increasing the level of technical equipment of organizations, including through the expansion of subsidy programs for purchase of technical equipment used to provide goods, works and services of a socially oriented nature for the population.

Keywords: *Russian Arctic, digitalization, innovative development, digital economy, digital transformation, Arctic zone, regional development*

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Introduction

In accordance with the Decree of the President of Russia No. 204 dated May 7, 2018 “On national goals and strategic objectives for the development of the Russian Federation until 2024”¹, the task of digital transformation of priority sectors of the economy and social sphere was set and the national program “Digital economy of the Russian Federation” was launched². One of the priority areas was the introduction of digital technologies and platform solutions to improve the quality of life of the population. The key objective of the state policy in the field of digitalization is to achieve technological and digital equality of the constituent entities of the Russian Federation. For the Arctic region, this creates the necessary prerequisites for innovative development and partial levelling of the risks of population preservation due to the insufficient level of development of social, logistical and information infrastructure and the high costs of its creation and maintenance, sparse population, remoteness and inaccessibility of settlements, natural and climatic conditions, which comprehensively characterize the Arctic as a zone of absolute discomfort. This creates systemic barriers to the implementation and development of digital technologies in this region. Therefore, its level of digitalization is still insufficient and is changing at a much more moderate pace compared to other regions of the Russian Federation.

The Arctic zone of the Russian Federation (AZRF) is of strategic importance for ensuring national energy, industrial, food and military security of the country. Its territory is 3,754.6 thousand km² (about 22% of the total territory of Russia). The average population density is 0.88 people per km². This is a consequence of the fact that the most of the population (2,147.7 thousand people) is concentrated in urban areas, where only 39 towns and 43 urban-type settlements are located. Despite the fact that only about 11% of the population of the AZRF live in rural areas, these territories are of particular strategic importance. They provide a presence in the vast and sparsely populated space of the Russian Arctic, including in the areas of development of key deposits of mineral and biological resources. Moreover, this is a multinational region with a rich cultural heritage and traditional economic activities of indigenous peoples. Therefore, the preservation of the rural population of the Arctic Zone of the Russian Federation is one of the important tasks of state policy. Improving the quality of life of its residents through the use of information and communication

¹ Decree of the President of Russia No. 204 dated May 7, 2018 “On national goals and strategic objectives for the development of the Russian Federation until 2024”. URL: <http://kremlin.ru/acts/bank/43027> (accessed 01 September 2024).

² National Program “Digital Economy of the Russian Federation” dated July 28, 2017 No. 1632-r. URL: <http://static.government.ru/media/files/9gFM4FHj4PsB79I5v7yLVuPgu4bvR7M0.pdf> (accessed 01 September 2024).

technologies (ICT) in pursuance of the Decree of the President of the Russian Federation No. 474 dated July 21, 2020 “On the national development goals of the Russian Federation for the period until 2030” is one of the priority areas of economic development. The creation of a digital platform for managing the development of settlements as one of the activities within the framework of the preparation of the Strategy for the spatial development of Russia will contribute to improving the efficiency of decision-making in the field of integrated socio-economic and spatial development of cities and settlements of the AZRF.

The aim of the article is to analyze the directions of digital transformation of regional development, contributing to the innovative development of rural areas of the Western sector of the Russian Arctic (with a special emphasis on the Arkhangelsk Oblast and the Nenets Autonomous Okrug — NAO). This will make it possible to analytically comprehend the strategic approaches to digitalization and assess the expected effects of the implementation of digital economy initiatives to improve the quality of life of the rural population, as well as to determine the prospects for expanding digitalization practices in these Arctic regions. One of the key research objectives of this study is to answer the question of how strategic initiatives and regional projects are aimed at the development of rural areas (including through the development of information and communication infrastructure, the introduction of digital services, the formation of digital competencies of the population).

Theoretical approaches to the study of directions of digital transformation of rural areas in the Arctic region: methodology and research methods

Digital transformation as a process of introducing innovative technologies to improve the management system both at the level of organizations and in the sphere of public administration has become a popular subject of research over the past two decades. The introduction of digital technologies is assessed by researchers in terms of socio-economic effects at both the meso- and macro-levels and fits into the logic of perceiving these innovations as one of the important spatial factors in the theories of cumulative growth [1, Kuznetsova O.V.] of the regional economy. At the same time, this is quite consistent with the concept of changing technological structures [2, Perez K.], according to which the digital transformation of socio-economic systems is caused by a paradigm shift in the leading factors of production. Already within the framework of the previous — the fifth (1980–2020) — technological structure, the introduction of ICT into the system of socio-economic relations became the leading driver of economic development. At the next stage, these innovative technologies predetermine the logic of development of the global economy and give it a new impetus, which will become the basis for increasing the competitiveness of regions [3, Tapscott D.; 4, Brynjolfsson E., Kahin B.].

One of the conceptually important areas of foreign research in the field of regional economics is the study of the digital transformation of rural areas, namely, the analysis of the implementation of digitalization and automation to solve applied problems in the economy and social sphere in rural areas. Digitalization is widely used to manage water and land resources (using sen-

sor and controller systems, as well as artificial intelligence technologies — AI), crop and livestock management (using remote sensing systems, digital twins, unmanned technologies, machine vision, IoT), farm and supply chain management (using information management systems, e-commerce, Internet marketing, social media, online education) [5, Brunori G.].

In addition to works devoted to the direct implementation of technologies, a major area of research is the study of the consequences of digitalization for rural areas, including their impact on the quality of life. Digital transformation affects all key areas of society: economy (organization and management of production, value chains, sales markets), environment (impact on ecosystems, use of natural resources, risk management, animal health), public administration (regulatory control, including product certification, interaction of the population with public authorities), social sphere (access to public services, social interactions, access to information, social capital, labor market, education, medicine, etc.) [6, Rolandi S., Brunori G., Bacco M. et al.].

In the context of various aspects of the quality of life of the rural population, most of the published works are focused on the positive impact of digital technologies [6; 7, Ruiz R.]. Digitalization can provide tools for managing diversified agricultural systems, optimizing resource use, reducing the volume of physically difficult and routine work, simplifying administrative tasks, improving communication, and predicting risks. Automation in agriculture can significantly facilitate the life of agricultural producers, creating new employment models [8, Rotz S., Gravely E., Mosby I. et al.]. Internet marketing and digital platforms will provide small farms with access to markets. Digital technologies also contribute to improving product quality through certification and improved quality management. Digital solutions (websites, online applications) can simplify interaction with government agencies and various bureaucratic procedures. Automated information collection systems create conditions for increasing the effectiveness of state regulation of the economy (for example, through the system of compensation for damages in emergency situations).

Studies also show that the Internet facilitates the dissemination of information within rural communities and between settlements, increasing the connectivity of Arctic regions [9, Abildgaard M.S., Ren C., Leyva-Mayorga I. et al.; 10, Warf B.] and improving the quality of life of the indigenous population. Social media contribute to the development of local identity, a sense of belonging to the local community, and increase the social, economic, and political inclusion of the local population [11, Ye L., Yang H.]. The development of information and communication technologies creates conditions for the development of the labor market and expansion of opportunities for the rural population to form an offer on the world market [12, Coates K.S.] and increase its adaptation to changes in the context of globalization [13, Young J.C.], which is especially valuable for retaining youth in the Arctic region. Digitalization through telemedicine, e-commerce and online learning has a positive effect on the availability of these services for the rural population. IoT technologies enable patients to independently provide themselves with some types of assistance [14, Philip L., Roberts A., Currie M. et al.].

A review of foreign studies shows that, despite the opportunities that digital transformation creates for the development of rural areas, it is a factor that has a negative impact on the quality of life. Digitalization of various services can limit personal contacts between people, thereby contributing to the atomization of communities. For example, the introduction of digital social services may result in fewer visits of support services to the elderly and other vulnerable groups, thereby increasing their social isolation [14, Philip L., Roberts A., Currie M.]. Another risk is the growth of imbalances in the labor market and social tension, due to the widening gap between high-tech and low-skilled jobs [8, Rotz S., Gravely E., Mosby I. et al.]. The use of robotic systems in agriculture creates new ethical challenges [15, Sparrow R., Howard M.]. In general, the widespread use of digital technologies can lead to an increased dependence of the population on digital service providers who control the technologies and the information collected through them [16, Salemin K., Strijker D.].

In the context of the consequences of digital transformation, an important aspect of this issue in the scientific literature is the readiness of rural areas for digitalization. The rural world is diverse, and the formulation of strategies and specific solutions in the field of digitalization depends on such factors as remoteness from large urban centers, availability of digital competencies, readiness to accept new technologies, level of infrastructure development [17, Wolski O.]. Another important aspect is the formation of digital competencies among the rural population [18, McMahon R., McNally M.B., Nitschke E. et al.] and ensuring their cyber security [19, Salminen M., Morris L.].

The implementation of digital technologies in rural areas requires a comprehensive solution, taking into account the accumulated experience of digitalization [20, Saunavaara J., Kylli R., Salminen M.] and the creation of “smart” cities. One example of such an initiative is the diffusion of the “Smart Village” innovation [21, Zavratin V., Kos A., Stojmenova Duh E.; 22, Spicer Z., Goodman N.] in six large regions, namely East Africa, West Africa, South Asia, Southeast Asia, South America and Central America, the Caribbean, and Mexico. It is based on an integrated approach to providing access to energy in rural areas with the involvement of government and commercial organizations. It should be noted that this experience is not being implemented in the Arctic region. However, its implementation in the AZRF conditions would be an interesting solution, allowing for the creation of “model” settlements with modern digital ecosystems by analogy, in particular, with Scandinavian countries [23, Randall L., Berlina A.]. This experience would be unique both for the Russian Arctic and for the North of Canada [24, Coates K., Holroyd C.] and Alaska and would reduce the significant gap in the development of digital technologies in rural areas compared to urban ones.

In the Russian Arctic, the digital transformation process is developing in line with global trends in the regional digitalization and faces the same barriers as other Arctic regions (primarily Alaska and northern Canada), natural and climatic conditions, spatial vastness and sparse population of which are particularly close to the realities of rural areas in the AZRF. Russian studies of ru-

ral digitalization have not yet become widespread. The challenges, trends and potential of digital transformation of the Arctic region as a whole [25, Egorov N.E., Kovrov G.S., Tishkov S.V.], its features in comparison with non-Arctic regions of Russia [26, Gladkikh E.G., Romanova I.N.] and methodological approaches to assessing the level of digital economy development in the AZRF [27, Byvshev V.I., Panteleeva I.A., Uskov D.I. et al.; 28, Kuratova L.A.] are being more broadly discussed. As a rule, urban and rural areas are not differentiated in studies; only an assumption is made about the digital inequality of the Arctic regions. Published works are mainly devoted to methodological approaches to assessing the level of formation of the digital environment and readiness for digitalization of rural areas [29, Sovetova N.P.], evaluation of the development of digital infrastructure in rural areas, reviews of the state of digitalization of rural areas in some regions of the Russian Federation [30, Kasimova Zh.V., Kasimov A.A.], opportunities for developing interaction between the population and state and municipal authorities in the digital environment [31, Karaseva A., Gavrilova K., Vasilyeva V. et al.], accessibility of education in remote settlements of the Russian Arctic [32, Dyadik N.V., Chapargina A.N.], including for indigenous peoples. The expansion of digitalization is considered as one of the tools to restrain the migration outflow of the working-age population from the rural areas of the Arctic Zone of the Russian Federation [33, Ljovkin V.E., Detter G.F., Tukkel J.L. et al.]. Key attention is paid to the potential of innovative ICT for digital transformation and monitoring the state of the transport and logistics infrastructure of the Arctic region, which ensures spatial connectivity, sustainable development [34, Didenko N.I., Skripnyuk D.F., Cherenkov V.I. et al.] and food security of remote settlements. Despite the fact that certain aspects of digitalization of rural areas related to education, healthcare, social and logistics infrastructure are fragmentarily covered in the works of researchers, a comprehensive assessment of the impact of digital transformation on the quality of life of the rural population in the AZRF has not been carried out.

As part of our study, along with comparative analysis of scientific publications and content analysis of regulatory legal documents, systematic analysis of indicators assessing the level of digitalization of the regional economy was conducted with a special emphasis on the quality of life of the population of the subjects of the Western sector of the Russian Arctic — the Arkhangelsk Oblast and the Nenets Autonomous Okrug, territorially bordering each other, but having significantly different conditions for the implementation and development of digital systems. The main sources of information were data from the Federal State Statistics Service, the Government of the Arkhangelsk Oblast, as well as regulatory documents governing activities in the Arctic zone of the Russian Federation.

Legal regulation of digitalization of rural areas in the economy and social sphere in the Arkhangelsk Oblast and the Nenets Autonomous Okrug

Legal regulation of the digital economy and public relations formed during the implementation and introduction of digital solutions into various spheres of society can be decomposed into two levels. The first is the level of transformation of institutions and legal norms, primarily in fed-

eral legislation. The implementation of the processes of “digitalization of law” and the creation of legal conditions for the effective and safe implementation of elements of the digital economy is the prerogative and subject of jurisdiction of the federal government (Article 71 (i) and (m) of the Constitution of the Russian Federation)³. The Russian Federation is currently implementing the federal project “Regulatory framework for the digital environment” within the framework of the national program “Digital economy of the Russian Federation”⁴. The objectives of the project include the development and promotion of the adoption of regulatory legal acts promoting the development of the digital economy, as well as the regulation of cross-cutting issues related to digital legal relations for various branches of legislation (identification of subjects of legal relations in the digital environment, electronic document management, data circulation, Internet of things, standardization of technologies, etc.)⁵.

The second level is the level of strategic planning and formation of specific mechanisms for the implementation of digital environment solutions. For the most part, this block is consolidated by both federal and regional by-laws. The basic profile document today is the Decree of the President of the Russian Federation No. 203 dated May 9, 2017 “On the Strategy for the development of the information society in the Russian Federation for 2017–2030”⁶, which regulates the main terms of the sphere, such as information society, digital economy and others.

The Russian President’s instructions of 31 December 2020 became a catalyst for the intensification of normative regulation of strategic planning in the field of digitalization at the level of the constituent entities of the Russian Federation. Due to these instructions, digital transformation strategies were adopted in many regions of the country by September 2021. Thus, in the Arkhangelsk Oblast, the “Strategy for the digital transformation of key sectors of the economy, social sphere and public administration of the Arkhangelsk Oblast” was adopted⁷, approved by the order of the Government of the Arkhangelsk Oblast No. 344-rp dated August 10, 2021. In the Nenets Autonomous Okrug, the “Strategy for the digital transformation of the economic sectors,

³ Constitution of the Russian Federation. URL: <http://www.constitution.ru/10003000/10003000-5.htm> (accessed 26 August 2024).

⁴ Decree of the President of the Russian Federation of May 9, 2017 No. 203 “On the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030”. URL: <https://base.garant.ru/71670570/> (accessed 26 August 2024).

⁵ Regulatory framework of the digital environment. Ministry of Economic Development of the Russian Federation. URL: https://www.economy.gov.ru/material/directions/gosudarstvennoe_upravlenie/normativnoe_regulirovanie_cifrovoy_sredy/ (accessed 02 September 2024).

⁶ Decree of the President of the Russian Federation of May 9, 2017 No. 203 “On the Strategy for the Development of the Information Society in the Russian Federation for 2017–2030”. URL: <https://base.garant.ru/71670570/> (accessed 01 September 2024).

⁷ Order “On approval of the strategy for digital transformation of key sectors of the economy, social sphere and public administration of the Arkhangelsk Oblast for the period until 2024” dated August 10, 2021 No. 344-rp. URL: <https://docs.cntd.ru/document/578060723> (accessed 02 September 2024).

social sphere and public administration of the Nenets Autonomous Okrug”⁸ was approved by the Resolution of the Governor of the NAO No. 55-pg dated August 30, 2022. The term of these strategies was determined until 2024. In the future, they are planned to be extended. The documents describe in detail the priorities and objectives, problems and challenges, expected results of the digital transformation of the Arkhangelsk Oblast and the Nenets Autonomous Okrug. The strategies provide for the implementation of projects related to education, science, healthcare, urban development, transport and logistics, public administration, social sphere, and construction. The beneficiaries of the strategy are all categories of the population of the subjects, including rural residents.

On the basis of the content of the documents, it is possible to highlight the problems of rural areas and projects planned for implementation in the Arkhangelsk Oblast and the Nenets Autonomous Okrug. The application of modern digital technologies in the fields of education, healthcare, and public administration has the potential to significantly reduce existing problems and create a more accessible environment for citizens. However, it is worth noting that the digital transformation strategy of the Arkhangelsk Oblast looks more attractive for rural areas: it highlights more problems and projects for the development of digitalization in the regions. The strategy of the Nenets Autonomous Okrug is more focused on the development of economic sectors for urban residents.

In this context, it is also worth mentioning the Strategies for socio-economic development (hereinafter referred to as the SED Strategy)⁹ of both the Arkhangelsk Oblast until 2035 and the Nenets Autonomous Okrug until 2030¹⁰. Both documents were adopted in 2019 and take into account digitalization processes to varying degrees. The SED Strategy of the Arkhangelsk Oblast includes the “Digitalization of healthcare” project, aimed at improving the quality of medical care and its availability for all residents of the Arkhangelsk Oblast by expanding the use of information and telecommunication technologies, as well as the “Digital infrastructure of industry” project, designed to ensure accelerated digitalization of the industrial and transport and logistics complexes of the Arkhangelsk Oblast¹¹. The topic of digitalization is separately addressed in the “School education” project in the context of overcoming the problems of technological lag of general education organizations in the region, including their connection to high-speed Internet. As part of the process of modernizing rural settlements in the Arkhangelsk Oblast, the SED Strategy sets out the tasks of increasing the level of broadband Internet access throughout the Arkhangelsk Oblast, in-

⁸ Resolution on approval of the “Strategy for digital transformation of economic sectors, social sphere and public administration of the Nenets Autonomous Okrug”. URL: <https://docs.cntd.ru/document/406224772> (accessed 26 October 2024).

⁹ Strategy for socio-economic development of the Arkhangelsk Oblast until 2035. Arkhangelsk, February 18, 2019. No. 57-5-OZ. URL: <https://dvinaland.ru/gov/iogv/minec/strategy/#cookies=yes> (accessed 02 September 2024).

¹⁰ Strategy for socio-economic development of the Nenets Autonomous Okrug until 2030. URL: <https://dfei.adm-NAO.ru/strategicheskoe-planirovanie/proekt-strategii-socialno-ekonomicheskogo-razvitiya-neneckogo-avtonomn/> (accessed 02 September 2024).

¹¹ Strategy for socio-economic development of the Arkhangelsk Oblast until 2035. Arkhangelsk, February 18, 2019. No. 57-5-OZ. URL: <https://dvinaland.ru/gov/iogv/minec/strategy/#cookies=yes> (accessed 02 September 2024).

cluding in hard-to-reach rural settlements, and organizing a remote system for providing social services to hard-to-reach settlements¹². In general, the digital economy is identified as one of the priority sectors of the Arkhangelsk Oblast economy.

The SED Strategy of the Nenets Autonomous Okrug sets digital transformation of the region's economy and social life as one of the strategic goals in the field of digital economy development¹³. The document provides a systematic approach to the implementation of the stated goal. Several major tasks are highlighted, such as accelerated implementation of digital technologies in the economy, social sphere, state and municipal administration; increasing the number of organizations implementing technological innovations; increasing the volume of attracted investments in high-tech and innovative projects; developing digital skills of the population and promoting the training of specialists in the field of information technology; ensuring coverage of the population with broadband Internet access; creating conditions for providing the rural population with affordable telecommunication technologies.

To date, the implementation of the designated strategic tasks in the field of digital economy in the Arkhangelsk Oblast and the Nenets Autonomous Okrug is carried out through a program and project mechanism. The general scheme is as follows: four regional projects are being implemented within the framework of the national program "Digital economy" — "Information infrastructure", "Information security", "Digital technologies" and "Digital public administration"¹⁴. In the Arkhangelsk Oblast, these projects are linked to the State Program of the Arkhangelsk Oblast "Digital development of the Arkhangelsk Oblast"¹⁵. In the Nenets Autonomous Okrug, only the "Information infrastructure" project is linked to the State Program of the Nenets Autonomous Okrug "Information society of the Nenets Autonomous Okrug"¹⁶.

On the basis of the analysis of existing strategies, programs and projects of the Arkhangelsk Oblast and the Nenets Autonomous Okrug, it should be concluded that there are no specialized acts regulating the processes of digitalization of rural areas. The specification of acts is determined by the criterion of "digits" rather than by spatial and territorial conditionality. An illustrative example is the state program of the Arkhangelsk Oblast "Comprehensive development of rural territories of the Arkhangelsk Oblast"¹⁷, which does not reflect the issues of digital development of these territories. At the same time, the regulation of various aspects of the formation of digital

¹² Strategy for socio-economic development of the Nenets Autonomous Okrug until 2030. URL: <https://dfei.adm-nao.ru/strategicheskoe-planirovanie/proekt-strategii-socialno-ekonomicheskogo-razvitiya-neneckogo-avtonomn/> (accessed 02 September 2024).

¹³ Ibid.

¹⁴ National Program "Digital Economy". URL: https://dvinland.ru/gov/national_projects/digital/#cookies=yes (accessed 02 September 2024).

¹⁵ State Program of the Arkhangelsk Oblast "Digital Development of the Arkhangelsk Oblast". URL: <https://dvinland.ru/budget/programs/27#cookies=yes> (accessed 02 September 2024).

¹⁶ State Program of the Nenets Autonomous Okrug "Information Society of the Nenets Autonomous Okrug". URL: <https://dfei.adm-nao.ru/proektnyj-ofis/pasporta-regionalnyh-proektov/cifrovaya-ekonomika/> (accessed 02 September 2024).

¹⁷ State program of the Arkhangelsk Oblast "Comprehensive development of rural territories of the Arkhangelsk Oblast". URL: <https://docs.cntd.ru/document/462645039> (accessed 02 September 2024).

infrastructure and digital economy in the region is concentrated in the specialized state programs of the Arkhangelsk Oblast. For example, the integration of the service “Unified card of a resident of the Arkhangelsk Oblast” and the achievement of the indicator of increasing the share of mass socially significant services available in electronic form are included in the already mentioned state program “Digital development of the Arkhangelsk Oblast”¹⁸. The State Program of the Arkhangelsk Oblast “Development of healthcare in the Arkhangelsk Oblast” plans the project “Creation of a unified digital healthcare circuit on the basis of the unified state health information system”¹⁹. The State Program of the Arkhangelsk Oblast “Development of education and science in the Arkhangelsk Oblast” includes the project “Digital educational environment”²⁰.

Thus, the regulatory framework for issues of digitalization of rural areas in the economy and social sphere in the Arkhangelsk Oblast and the Nenets Autonomous Okrug is integrated into the hierarchy of federal strategic planning documents and the system of implementation of national projects, in particular, the “Digital economy of the Russian Federation”. The relevant measures for the application and implementation of digital solutions in remote and sparsely populated areas are provided for in the specialized state programs of the constituent entities.

Digital development of the Russian Arctic: system of regional development indicators

The creation of an integrated digital platform for managing the digital development of regions requires the implementation of an effective system for monitoring indicators that assess the achievement of target indicators and the dynamics of digitalization of settlements in various areas. Conceptually, the digitalization of the economy is considered as a tool for transforming the process of interaction between the state, corporate sectors and households [35, Khalin V.G., Chernova G.V.]. To assess the level of digitalization of regional development and the readiness of the digital infrastructure, various methodological approaches are used, which mainly propose the systematization of statistical indicators and their processing in the form of integral indices [36, Jovanovic Milenkovic M., Brajovic B., Milenkovic D. et al.], assessed by the Ministry of digital development, communications and mass media of the Russian Federation [37, Safiullin M.R., Elshin L.A., Abdukaeva A.A. et al.]; as well as the system for monitoring the digitalization of regional economic systems of the Moscow school of management SKOLKOVO²¹, etc.

Analysis of the comparability of the indicators of digital development of the Arctic Zone of the Russian Federation with the indicators assessing the regional development of digital technologies in accordance with the strategies of the constituent entities of the AZRF allows stating their

¹⁸ State program of the Arkhangelsk Oblast “Digital development of the Arkhangelsk Oblast”. URL: <https://dvinaland.ru/budget/programs/27#cookies=yes> (accessed 02 September 2024).

¹⁹ State program of the Arkhangelsk Oblast “Development of healthcare in the Arkhangelsk Oblast”. URL: <https://dvinaland.ru/budget/programs/?CODE=01> (accessed 02 September 2024).

²⁰ State program of the Arkhangelsk Oblast “Development of education and science in the Arkhangelsk Oblast”. URL: <https://dvinaland.ru/budget/programs/?CODE=02> (accessed 02 September 2024).

²¹ Monitoring of regional informatization of the Ministry of Digital Development, Communications and Mass Media of the Russian Federation. URL: <https://digital.gov.ru/ru/documents/4949/> (accessed 23 March 2024).

methodological inconsistency. In general, the system of indicators at the federal and regional levels is focused on describing the conceptual model of interaction between three key stakeholders in the process of digitalization of the economy: government, business and society (Fig. 1).

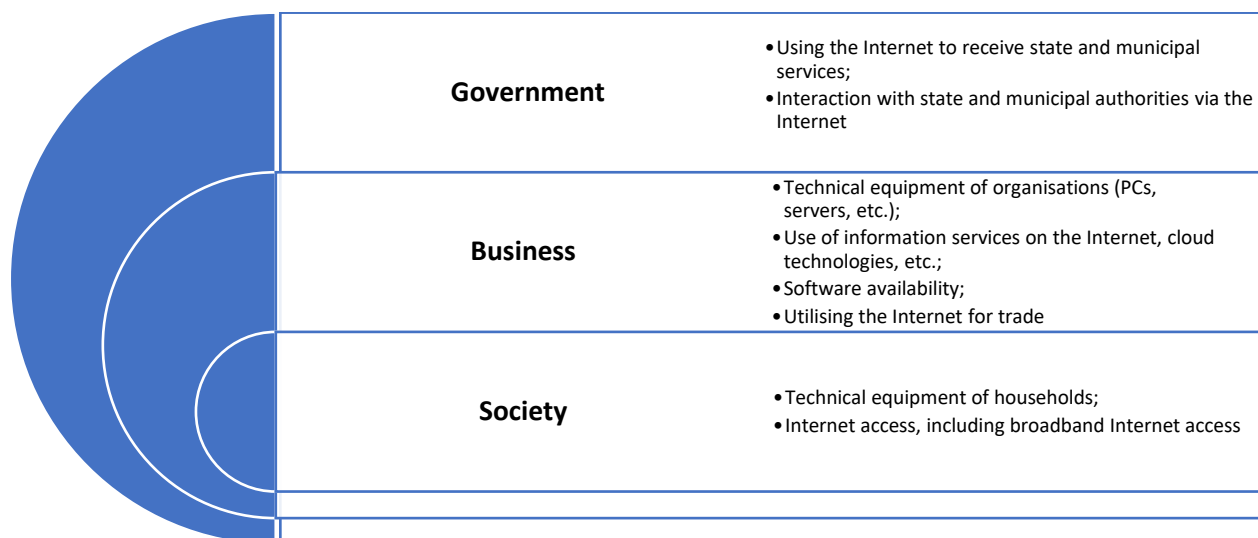


Fig. 1. Conceptual model of the system of leading indicators of digitalization of regional development in the Arctic Zone of the Russian Federation.

On the website of the Federal State Statistics Service, the characteristics of the leading indicators of digitalization of the economy of the Arctic Zone of the Russian Federation are focused on assessing the availability of ICT and technical equipment of households and organizations; less attention is paid to the availability and quality of state and municipal services for both individuals and legal entities (Table 1)²².

Table 1

System of leading indicators of digitalization of the economy in the Arctic zone of the Russian Federation in 2016–2023

Indicator	2016	2017	2018	2019	2020	2021	2022	2023
Share of households with a computer in the total number of households, %	84.8	74.8	83.8	80.3	80.1	77.4	76.6	77.4
<i>For reference: Russian Federation</i>	74.3	74.4	72.4	69.4	72.1	72.6	73.0	71.2
Share of households with access to the Internet, %	84.0	76.6	86.4	84.0	86.6	87.3	89.1	89.1
<i>For reference: Russian Federation</i>	74.8	76.3	76.6	76.9	80.0	84.0	86.6	87.9
Share of households with broadband access to the Internet, %	73.9	72.8	80.1	81.3	81.6	85.2	87.3	88.7
<i>For reference: Russian Federation</i>	70.7	72.6	73.2	73.6	77.0	82.6	85.5	87.3
Share of population actively using the Internet, %	82.9	82.9	88.4	88.5	88.6	90.3	90.5	91.4
<i>For reference: Russian Federation</i>	71.5	74.1	79.3	81.4	84.1	87.3	89.8	91.5
Share of population not	0.2	0.6	0.3	0.5	0.3	0.2	0.2	0.7

²² Statistical information on the socio-economic development of the Arctic zone of the Russian Federation. URL: https://rosstat.gov.ru/storage/mediabank/arc_zona.html (accessed 01 September 2024).

using the Internet for security reasons, %								
<i>For reference: Russian Federation</i>	0.5	0.6	0.4	0.5	0.4	0.4	0.3	0.3
Share of the population using the Internet to order goods (services), %	38.0	44.1	55.9	57.0	51.3	61.0	62.1	69.8
<i>For reference: Russian Federation</i>	23.1	29.1	34.7	35.7	40.3	46.6	53.7	61.3
Number of personal computers, thousand pcs.	347.8	333.1	350.5	352.5	411.7	429.1	448.0	*
Number of personal computers with access to the Internet per 100 employees of organizations, pcs.	27	27	29	29	32	35	35	*
Expenditures on the introduction and use of digital technologies, bln. rub.	29.9	27.2	23.5	24.1	36.4	42.7	53.2	*
Share of organizations using broadband Internet access, %	82.5	83.0	85.3	86.1	62.6	74.7	79.1	*
Share of organizations that had a website in the total number of organizations surveyed, %	46.3	47.0	49.9	50.5	41.3	42.4	42.6	*
Share of organizations that used the Internet to place orders for goods (works, services), %	46.2	43.8	44.5	44.2	38.7	39.6	40.1	*

In general, it should be noted that the digitalization indicators of the AZRF are higher than the average indicators in the Russian Federation. This demonstrates the effectiveness of the implementation of state policy on the introduction of digital economy initiatives in the Arctic region. Nevertheless, the dynamics of indicators in the AZRF shows an ambiguous increase in the level of technical equipment of households (an increase in the number of personal computers by 100.2 thousand units in 2016–2022 with a simultaneous decrease in the share of households with personal computers) and the increasing popularity and availability of the Internet among individuals in the AZRF, including for ordering goods (services) online (almost twice as much). This situation probably reflects the all-Russian trend of replacing personal computers with mobile devices²³.

At the same time, the outpacing growth rates of the need to use ICT among the population do not quite correspond to the dynamics of their development in organizations, as evidenced by the decrease in the share of organizations that used broadband Internet access (by 3.4 percentage points), had a website (by 3.7 percentage points), used the Internet to place orders for goods (works, services) (by 6.1 percentage points). The development of information infrastructure has created a favorable environment for the development of the digital economy, trade turnover and the labor market. It is worth noting that the regional markets of retail trade in goods and services in the AZRF using Internet technologies remained rather inert and did not respond to the in-

²³ The share of families with computers has decreased — Rosstat. URL: <https://360.ru/news/tehnologii/snizilas-dolja-semej-s-kompjuterami-rosstat/> (accessed 09 September 2024).

creased demand of the population for online resources. On the contrary, there was a downward trend in the share of organizations that had a website (by 3.7 percentage points) and used the Internet to place online orders (by 6.2 percentage points). This correlates with the all-Russian downward trend in the indicators after the peak values of 2019^{24, 25}.

The dynamics and level of indicators of digitalization of regional development in different regions of the Arctic Zone of the Russian Federation are predetermined by the spatial-geographical, natural-climatic, socio-economic and ethno-cultural features of the territories. The Arkhangelsk Oblast and the Nenets Autonomous Okrug, located in the Western sector of the Russian Arctic, are characterized by spatial vastness and a significant predominance of rural areas with a low population density and the concentration of more than 70% of the population in cities and urban settlements. This creates favorable conditions, increases the effect of the introduction of digital technologies for the urban population and makes the process of digitalization of rural areas socially significant, but extremely costly.

The total area of the Arkhangelsk Oblast (excluding the Nenets Autonomous Okrug) is 589,913 km². As of January 1, 2024, there are 67 municipalities in the Arkhangelsk Oblast, including 26 first-level (7 urban okrugs; 15 municipal okrugs, 4 municipal districts); 41 second-level (6 urban and 35 rural settlements). As of January 1, 2024, the population is 955,848 people, including the urban population of 746,545 people (72%), the rural population — 209,303 people (28%)²⁶. The population density is 1.69 people/km². The main part of the industrial and social infrastructure is concentrated in urban settlements, since the socio-economic development of the Arkhangelsk Oblast is mainly based on the development of the forestry complex, mechanical engineering (shipbuilding industry) and the infrastructure of commercial ports. This predetermines a reasonable shift of emphasis on the development of digital economy initiatives, primarily in cities and urban settlements, thereby implementing the concept of regional development “center–periphery”, which has become one of the leading in the development of the Arctic region.

The Nenets Autonomous Okrug is an independent subject of the Russian Federation, most of which is located beyond the Arctic Circle. It includes the Kolguyev and Vaygach islands, the Kanin and Yugorskiy peninsulas. The total territory of the okrug is 176.7 thousand km². This is the most sparsely populated region in the Arctic Zone of the Russian Federation with a population of 42,224 people²⁷ and a population density of 0.24 people/km². The NAO has one city (Naryan-Mar), one urban-type settlement (Iskateli) and 42 rural settlements. As in the Arkhangelsk Oblast, most

²⁴ Unified Interdepartmental Information and Statistical System. The share of organizations with a website on the Internet, in the total number of organizations. URL: <https://www.fedstat.ru/indicator/43528> (accessed 09 September 2024).

²⁵ Unified Interdepartmental Information and Statistical System. The share of organizations using the Internet to place orders for goods (works, services), in the total number of organizations. URL: <https://www.fedstat.ru/indicator/43530> (accessed 09 September 2024).

²⁶ Federal State Statistics Service. The permanent population of the Russian Federation by municipalities as of January 1, 2024. URL: <https://rosstat.gov.ru/compendium/document/13282> (accessed 04 May 2024).

²⁷ Ibid.

of the population is concentrated in urban areas (72.8%²⁸). While the main branches of industry, providing the formation of the gross regional budget (oil and gas production), are located in the Timan-Pechora oil and gas basin, there are also about 80 deposits of construction materials (sand, gravel, clay) outside the urban areas. Reindeer herding, dairy cattle breeding, greenhouse farming and potato growing are being developed on agricultural lands.

In accordance with the strategic planning documents of the Arkhangelsk Oblast and the Nenets Autonomous Okrug, there is a shift in emphasis to the digital development of economic entities. The share of organizations using ICT (2007–2018), digital technologies (since 2019) in the Arkhangelsk Oblast and the Nenets Autonomous Okrug in 2007–2022 is shown in Fig. 2–3. Compared to the Russian average²⁹, the Arkhangelsk Oblast and the Nenets Autonomous Okrug as a whole demonstrate a comparable or higher level of digitalization: for example, the share of organizations using personal computers (2022: Arkhangelsk Oblast — 82.8%, Nenets Autonomous Okrug — 80.1%, Russian Federation — 77.5%), local area networks (2022: Arkhangelsk Oblast — 60.1%; Nenets Autonomous Okrug — 54.7%, Russian Federation — 47.9%). Comparable values were shown by the share of organizations using fixed-line Internet (Arkhangelsk Oblast — 76.3%; Nenets Autonomous Okrug — 74.7%, Russian Federation — 75.1%). The use of mobile Internet by organizations of the Arkhangelsk Oblast (45.4%) significantly exceeded the same indicator for the Nenets Autonomous Okrug (32.6%) and the Russian average (36.4%). Besides, the organizations of the Arkhangelsk Oblast showed a higher level of Intranet use (AO — 34.3%, NAO — 28.3%, RF — 26.9%) and Extranet (AO — 22.9%, NAO — 14.0%, RF — 19.3%). Statistics record lower indicators of the Arkhangelsk Oblast and the NAO compared to Russia as a whole in terms of the share of organizations that had a website on the Internet (AO — 44.1%; NAO — 43.4%, RF — 47.4%).

²⁸ Federal State Statistics Service. Population by gender by constituent entities of the Russian Federation as of January 1, 2022 (taking into account the results of the 2020 All-Russian Population Census). URL: https://rosstat.gov.ru/storage/mediabank/Bul_chislen_nasel-pv_01-01-2022.pdf (accessed 16 July 2024).

²⁹ Share of organizations using information and communication technologies. URL: [https://02.rosstat.gov.ru/storage/mediabank/IKT-2022\(1\).pdf](https://02.rosstat.gov.ru/storage/mediabank/IKT-2022(1).pdf) (accessed 16 July 2024).

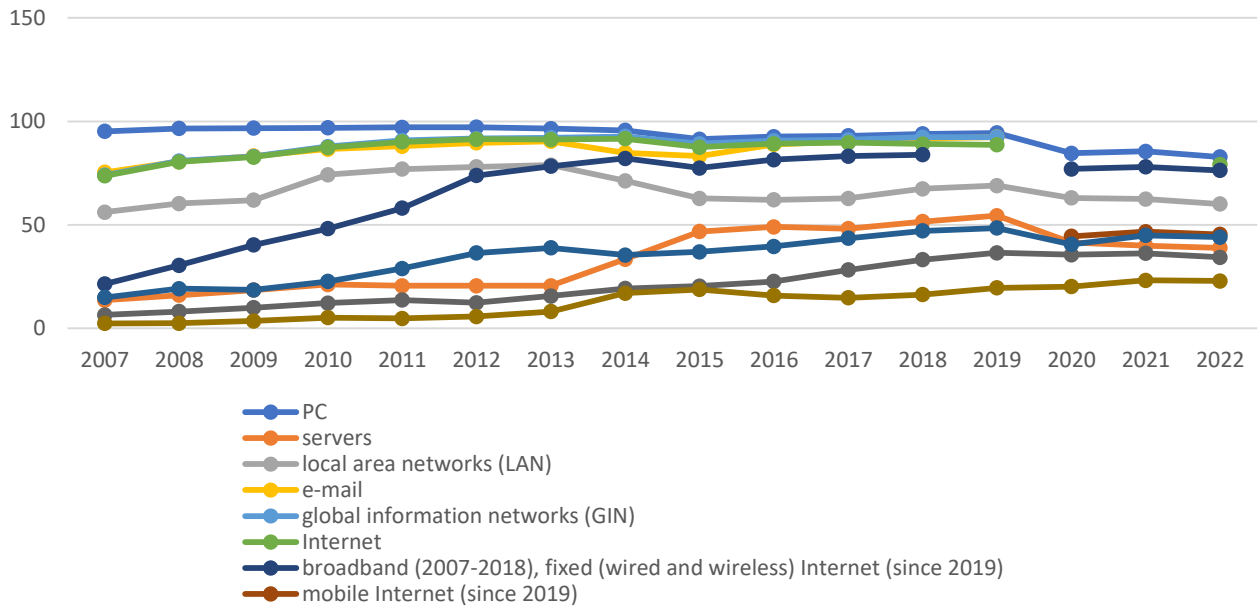


Fig. 2. The share of organizations using information and communication technologies (2007–2018), digital technologies (since 2019) in the Arkhangelsk Oblast, 2007–2022 ³⁰.

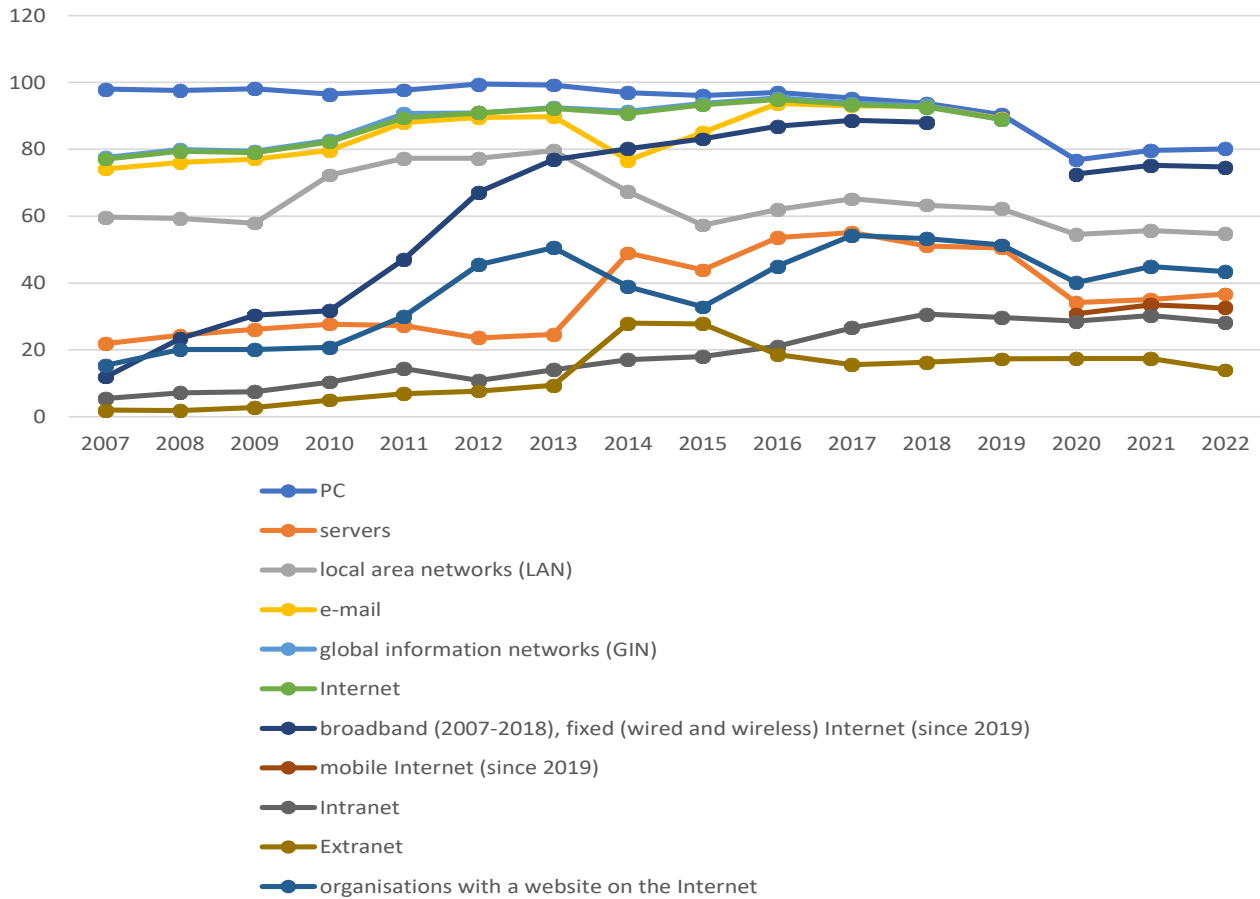


Fig. 3. The share of organizations using information and communication technologies (2007–2018), digital technologies (since 2019) in the Nenets Autonomous Okrug, 2007–2022 ³¹.

³⁰ Department of the Federal State Statistics Service for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. ICT Indicators. URL: <https://29.rosstat.gov.ru/ict111> (accessed 01 September 2024).

³¹ Department of the Federal State Statistics Service for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. Database for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. URL: <https://29.rosstat.gov.ru/databases> (accessed 01 September 2024).

This can be partly explained by the structure of the economy of the northern regions, including a significant share of small and medium-sized businesses: as of October 10, 2024 — 33,590, of which 33,509 were small and micro enterprises, including 23,160 individual entrepreneurs³² (this is quite consistent with the all-Russian trend: the number of SMEs is 6.37 million enterprises, of which 4.2 million are individual entrepreneurs, 2.2 million are legal entities). The industry structure of both regions determines the operation of large mining and manufacturing enterprises in them, which, of course, are actively introducing and developing digital technologies. However, in the context of a crisis in the economy and rising costs due to galloping inflation, small businesses are not ready for new costs for implementing digital technologies, which are associated with long payback periods (as a rule, at least a year). In this case, it would be advisable to introduce programs for partial subsidization of these activities for small and medium-sized businesses (SMEs). At the same time, the lack of interest in the use of digital technologies in both regions can be explained by the completely natural focus of small businesses on local markets (often even within the boundaries of populated areas) and the lack of need to promote their products, goods and services in the Internet space. We admit a wider range of additional reasons hindering the development of digital technologies among SMEs in the Arkhangelsk Oblast and the Nenets Autonomous Okrug, but they require confirmation in the framework of field research (sociological surveys and expert interviews).

The coronavirus pandemic had a similar impact on the equipment with intangible assets (IA), that is, the use of special software by organizations (Fig. 6–7), reducing the popularity of even highly sought-after software for SMEs for managing purchases and sales. Organizations left the minimum intangible assets sufficient to meet the requirements of the law: reference and legal systems and software products for financial transactions in electronic form.

³² Ministry of Economic Development and Industry of the Arkhangelsk Region. Small and Medium Entrepreneurship. URL: <https://dvinaland.ru/gov/iogv/minec/entrepreneurship/> (accessed 09 September 2024).

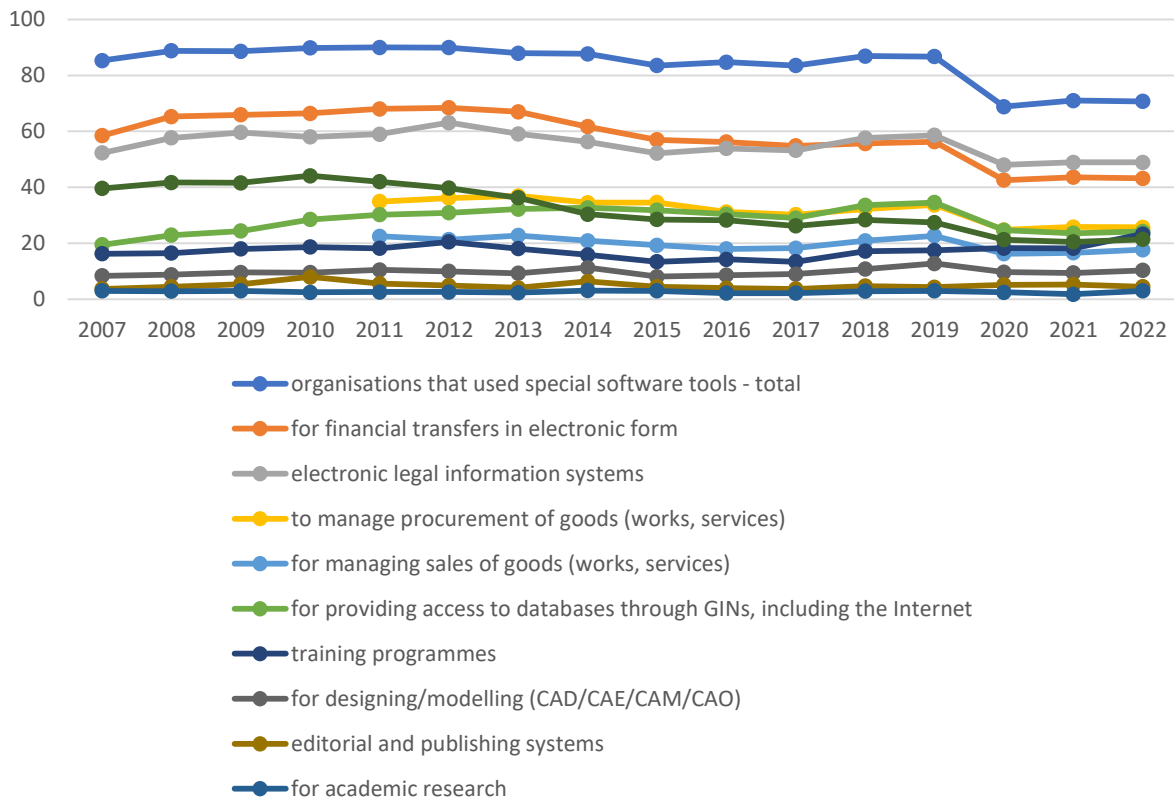


Fig. 4. Level of intangible asset provision — the share of organizations using specialized software (as a percentage of the total number of surveyed organizations) in the Arkhangelsk Oblast, 2007–2022³³.

In contrast to the Arkhangelsk Oblast, where, starting from the pandemic period, there was a stagnation period of the level of organizations' equipment with IA, in the Nenets Autonomous Okrug there was a tendency to increase the level of provision with special software tools. However, the equipment with fixed assets and intangible assets supporting the introduction of digital technologies in the region still lags behind the all-Russian level, but practically coincides with similar indicators for the AZRF: for example, in 2022, the share of organizations using broadband Internet access in the Arctic Zone of the Russian Federation was 79.1%, in the AO — 76.3%, in the NAO — 74.7%; the share of organizations with a website on the Internet in the AZRF was 42.6%, in the AO — 44.1%, in the NAO — 43.4%.

Thus, the introduction of digital technologies in the Arkhangelsk Oblast and the Nenets Autonomous Okrug is sensitive to changes in the political and socio-economic situation in the country and the Arctic region. The slowdown of digitalization of the economy occurred during the coronavirus pandemic and has generally entered a stagnation stage at the moment, without having time to reach a sufficient level of profitability to ensure investment in the modernization and renewal of fixed assets, increasing the technical equipment of organizations. Under the conditions of sanctions, many software products are unavailable and additional financial investments are required to acquire intangible assets, which turns out to be very difficult in the context of growing inflation and an increase in the cost of borrowed funds due to an increase

³³ Department of the Federal State Statistics Service for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. Database for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. URL: <https://29.rosstat.gov.ru/databases> (accessed 01 September 2024).

in the key rate of the Central Bank of Russia. An appropriate solution would be to introduce measures to support SMEs and partially subsidize projects for technical modernization and digitalization of small businesses.

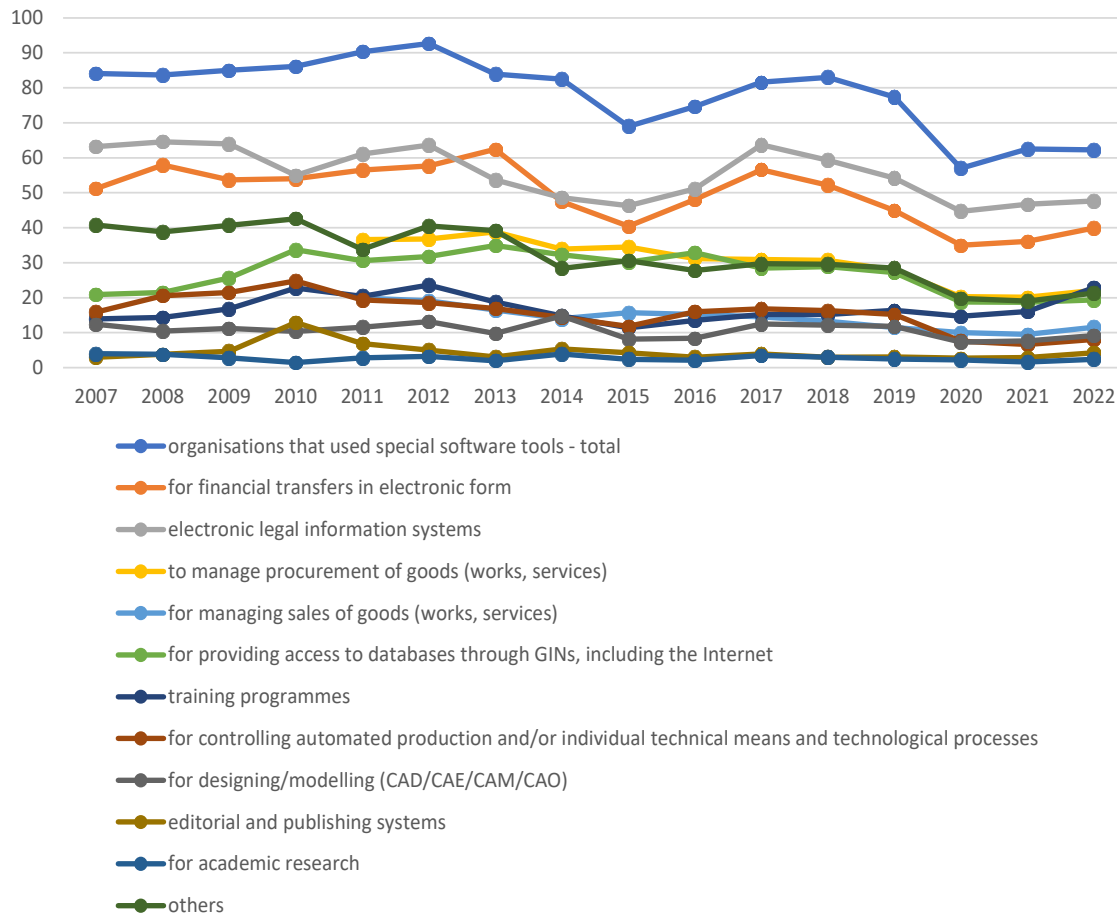


Fig. 5. Level of intangible asset provision — the share of organizations using special software (as a percentage of the total number of surveyed organizations) in the Nenets Autonomous Okrug, 2007–2022³⁴.

The limitation of our study is due to the inaccessibility of official statistics data separately for rural areas, which does not allow us to fully understand the digitalization processes in rural areas of the Arctic Zone of the Russian Federation as a whole and in the Arkhangelsk Oblast and the Nenets Autonomous Okrug in particular.

Regional projects for digitalization of rural areas in the Arkhangelsk Oblast: problems and prospects

Digitalization plays a crucial role in bridging the urban-rural divide and improving the quality of life in rural areas. The main instruments of digital transformation in the Russian Federation in 2018–2024 were the national projects, the key one of which was the National Program “Digital economy”. Within the framework of this national project, as well as the state program of the Arkhangelsk Oblast “Digital

³⁴ Department of the Federal State Statistics Service for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. Database for the Arkhangelsk Oblast and the Nenets Autonomous Okrug. URL: <https://29.rosstat.gov.ru/databases> (accessed 01 September 2024).

development of the Arkhangelsk Oblast”³⁵, four regional projects were implemented in the region: “Information infrastructure”, “Information security”, “Digital technologies”, “Digital public administration”.

Digitalization is also a cross-cutting theme for regional policy. Financing of the activities of the Strategy for digital transformation of key sectors of the economy, social sphere and public administration of the Arkhangelsk Oblast for the period until 2024 is provided for in a number of state programs of the Arkhangelsk Oblast³⁶: “Development of healthcare in the Arkhangelsk Oblast”, “Development of the transport system of the Arkhangelsk Oblast”, “Development of education and science in the Arkhangelsk Oblast”, “Economic development and investment activity in the Arkhangelsk Oblast”, “Social support of citizens in the Arkhangelsk Oblast”, “Promotion of employment of the population of the Arkhangelsk Oblast, improvement of working conditions and safety”, “Improvement of public administration and local self-government, development of civil society institutions in the Arkhangelsk Oblast”, “Provision of high-quality, affordable housing and engineering infrastructure facilities to the population of the Arkhangelsk Oblast”, “Environmental protection, reproduction and use of natural resources of the Arkhangelsk Oblast” and “Formation of a modern urban environment in the Arkhangelsk Oblast”.

It is worth emphasizing that rural areas, despite their more vulnerable position in comparison with urban districts in terms of digitalization development, were not singled out for “special production” in regional state programs and projects. However, within the framework of the federal project “Information infrastructure” of the national project “Digital economy”, measures were taken to create a communications infrastructure in small and hard-to-reach settlements, including the construction of land-based communication channels and the placement of base stations of cellular operators (the so-called project for eliminating digital inequality in accordance with the contract of the Ministry of digital development of Russia with PJSC Rostelecom). As a result of the project, 64 settlements in the Arkhangelsk Oblast with population from 100 to 500 people were connected to cellular communication, and 113 settlements with similar population got free access to the Internet using Wi-Fi access points.

An analysis of individual regional projects (Table 2) implemented from 2018 to 2024 showed that key attention was paid to the development of information and communication infrastructure, as well as ensuring access to state and municipal services in digital form. Among the three key elements of the digital transformation strategy (ICT infrastructure, digital services, digital competencies), the least emphasis in regional projects is placed on the latter. Only the project passports for the projects “Information security” and “Creation of a unified healthcare circuit on the basis of the unified state health information system” contain training events for employees of the regional executive authorities and medical workers, respectively.

³⁵ State program of the Arkhangelsk Oblast “Digital development of the Arkhangelsk Oblast”. URL: <https://docs.cntd.ru/document/462645471> (accessed 30 September 2024).

³⁶ Order “On approval of the strategy for digital transformation of key sectors of the economy, social sphere and public administration of the Arkhangelsk Oblast for the period until 2024” dated August 10, 2021 No. 344-rp. URL: <https://docs.cntd.ru/document/578060723> (accessed 02 September 2024).

Table 2

Typology of digitalization activities in regional projects of the Arkhangelsk Oblast (2018–2024)

Regional project	Activities		
	Development of ICT infrastructure	Providing access to state and municipal services in digital form	Development of digital competences
Information infrastructure ^{37, 38}	+	+	-
Information security ³⁹	+	+	+
Digital technologies ⁴⁰	+	-	-
Digital public management ⁴¹	+	+	-
Digital education environment ^{42, 43}	+	-	+
Creation of a unified healthcare circuit on the basis of the unified state health information system ⁴⁴	+	+	+
Digital culture ^{45, 46}	+	-	-
Employment promotion ⁴⁷	+	-	-

The development of digital competencies of the population of the Arkhangelsk Oblast is carried out within the framework of the regional program “Improving the level of financial literacy of the population and developing financial education in the Arkhangelsk Oblast”. The goal of the

³⁷ Passport of the regional project “Information infrastructure (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/c3d5899ea0081e55d48e1a965800b4e5/default/?&> (accessed 09 September 2024).

³⁸ Report on the progress of the regional project for the second quarter of 2024 “Information infrastructure (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/c3dfcced217619ed6a177a54fa469ce7/default/?&> (accessed 09 September 2024).

³⁹ Passport of the regional project “Information security (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/787a0379cfeb5cd9721b6fe36d1115d0/default/?&> (accessed 09 September 2024).

⁴⁰ Passport of the regional project “Digital technologies (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/44f4c085e3a80893f85ae7ee3ec4ac75/default/?&> (accessed 09 September 2024).

⁴¹ Passport of the regional project “Digital public management (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/0b49c7e4812332cf83e7de46cb8ae601/default/?&> (accessed 09 September 2024).

⁴² Passport of the regional project “Digital education environment (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/40253064617c6a928327729c5052b384/default/?&> (accessed 09 September 2024).

⁴³ State program of the Arkhangelsk Oblast “Development of education and science of the Arkhangelsk Oblast”. URL: <https://dvinaland.ru/budget/programs/?CODE=02> (accessed 02 September 2024).

⁴⁴ Passport of the regional project “Creation of a unified healthcare circuit on the basis of the unified state health information system (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/35ea34f595a56ea677486b0426eeb6cf/default/?&> (accessed 09 September 2024).

⁴⁵ Government of the Arkhangelsk Oblast. National project “Culture”. URL: https://dvinaland.ru/gov/national_projects/culture/#cookies=yes (accessed 09 September 2024).

⁴⁶ Report on the progress of the regional project for the second quarter of 2024 “(25) Digitalization of services and formation of the information space in the field of culture (“Digital Culture”) (Arkhangelsk Oblast)”. URL: <https://office.dvinaland.ru/docs/pub/c8787fd54221983a3698247114900342/default/?&> (accessed 09 September 2024).

⁴⁷ Resolution “On the state program of the Arkhangelsk Oblast “Promoting employment of the population of the Arkhangelsk Oblast, improving working conditions and safety” dated October 8, 2013 No. 466-pp. URL: <https://docs.cntd.ru/document/462604790> (accessed 09 September 2024).

program (to promote the formation of key elements of financial culture (values, attitudes and behavioral practices), expanding practical skills and experience in making financial decisions that contribute to the financial well-being of the population of the Arkhangelsk Oblast⁴⁸) does not explicitly imply the formation of digital competencies, but its passport indicates the growth of “digital inequality” in the generational context and the growth of cyber fraud threatening national security among the challenges. According to the report on the implementation of the program, 4.3 thousand events on financial literacy were held in 2023, covering 101.1 thousand non-unique participants⁴⁹. However, most of the events were held in urban areas, practically not covering rural areas.

The non-profit sector of Arkhangelsk Oblast is involved in improving the digital literacy of the population to a limited extent, but training is mainly provided to residents of urban settlements. The Arkhangelsk regional public organization for the development of computer sports and digital technologies is implementing a series of projects to develop digital competencies among elderly people in Arkhangelsk, Nyandoma, Plesetsk, Koryazhma and Kotlas, as well as children from orphanages in Arkhangelsk^{50, 51, 52}. As part of the project “People’s university of the silver age” of the Northern (Arctic) Federal University, classes are held for people aged 60 and over on how to use a smartphone and protect themselves from cybercriminals⁵³.

Thus, the main share of state policy measures in the field of digitalization in the Arkhangelsk Oblast is aimed at developing the information and communication infrastructure in the region and ensuring access of the population and legal entities to state and municipal services. However, only a few regional projects and programs provide for measures to develop digital competencies of the population, and therefore, in further planning of state policy in this area, it seems necessary to provide a comprehensive solution to this problem, since digital literacy is the most important prerequisite for obtaining significant socio-economic effects of digitalization.

⁴⁸ Resolution “On approval of the regional program of the Arkhangelsk Oblast “Increasing the level of financial literacy of the population and developing financial education in the Arkhangelsk Oblast” dated August 21, 2014 No. 33-pp. URL: <https://docs.cntd.ru/document/462609613> (accessed 09 September 2024).

⁴⁹ Results of the implementation of the regional program of the Arkhangelsk Oblast “Increasing the level of financial literacy of the population and developing financial education in the Arkhangelsk Oblast” (hereinafter referred to as the Program) for 2023. URL: <https://vk.com/@minfin29-itogi-realizacii-regionalnoi-programmy-arhangelskoi-oblasti> (accessed 09 September 2024).

⁵⁰ Arkhangelsk regional public organization. AROO for the development of computer sports and digital technologies. URL: <https://aresf.ru/> (accessed 09 September 2024).

⁵¹ Governor’s Center of the Arkhangelsk Oblast. Projects. Project “Digital Mentor” URL: <https://грантыгубернатора.проразвитие29.рф/public/application/item?id=e7c1cdd6-e440-4125-8724-9437cf9b1d24> (accessed 01 October 2024).

⁵² Governor’s Center of the Arkhangelsk Oblast. Projects. Project “Digital Youth of Body and Soul”. URL: <https://грантыгубернатора.проразвитие29.рф/public/application/item?id=48f163fd-330b-4486-b778-06775f0951ae> (accessed 01 October 2024).

⁵³ People’s University of the Silver Age (NARFU). URL: https://vk.com/nusv_narfu (accessed 01 October 2024).

Conclusion

The spatial vastness, geographical remoteness, inaccessibility and sparse population of many rural areas in the Arkhangelsk Oblast and the Nenets Autonomous Okrug limit the possibilities of creating a social infrastructure that would ensure the quality of life of the local population at the all-Russian level. Digital technologies make it possible to partially compensate for the impact of these spatial-geographical and natural-climatic factors and provide the population with access to state and municipal services, information, goods, and create conditions for the formation of a convenient and accessible digital ecosystem of state and municipal management of rural areas in these Arctic regions.

Despite the fact that the digitalization indicators for the Arctic zone of the Russian Federation as a whole and for the Arkhangelsk Oblast and the Nenets Autonomous Okrug in particular correspond to and exceed the national level, high costs of technical equipment and software products create risks for the digital transformation of organizations. Accordingly, increasing the level of technical equipment of organizations selling goods, works and services to the population of the Arctic regions should become one of the priority measures for the development of rural infrastructure in the Arkhangelsk Oblast and the Nenets Autonomous Okrug. It would be advisable to introduce programs for partial subsidies and compensation for the costs of acquiring technical equipment used to provide goods, works and services of a socially oriented nature to the population.

An analysis of legal regulation, a system of indicators of advanced innovative development reflecting the level of digitalization, and a set of regional projects aimed at developing the digital economy allows us to conclude that insufficient attention is paid to the development of digital technologies in rural areas. Rural areas are not singled out as a separate object of digital transformation, with the exception of the project to eliminate digital inequality, which provides for the creation of communications infrastructure in small and hard-to-reach settlements, including in the Arkhangelsk Oblast. A promising continuation of the research of regional policy in the field of digitalization can be the analysis of the activities of digital transformation managers in the regions of the AZRF, which allows assessing the quality of management in this area, including in relation to rural areas [38].

Taking into account the lag of rural areas in the level of digitalization compared to urban settlements and their strategic importance for the AZRF, it is proposed to provide for appropriate measures at the level of national and regional projects and programs. In addition, at the level of strategic planning documents and project activities, it is necessary to ensure an increase in the digital literacy of the rural population as one of the key conditions for digital transformation.

Due to the lack of digitalization indicators for rural areas in official statistics, it is currently impossible to assess the depth of the gap in the level of digital technology development between urban and rural settlements. The development of scientifically based recommendations for rural

areas of the Arctic Zone of the Russian Federation requires field research, which can be a logical continuation of this article.

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