An integrated approach to digitalization of rural areas as a condition for their sustainable development

A Kasimov, N Provalenova*, D Parmakli and W Zaikin

Department of Organization and Management, Nizhny Novgorod State Engineering and Economic University, 22 a Oktyabrskaya Street, 606340, Knyaginino, Russian Federation

*E-mail: provalenovanv@ngieu.ru

Abstract. To improve the quality of life of the population living in rural regions, it is necessary to introduce digital technologies in all spheres of life, thereby providing greater opportunities for remote receipt of services. Today, due to the lack of Internet connectivity, rural regions are unattractive for living, the population prefers to live in cities. As a result, the older part of the population is concentrated in rural regions, which can lead to desertification of such regions in the future. This problem is relevant not only for Russia, but also for other countries, which is why so much attention is paid to the digitalization of rural regions at the state level. In view of this, the purpose of the study is to determine the factors that hinder the digital transformation of regions, and the measures that contribute to this process. The article focuses on the need for an integrated approach to the digitalization of rural regions, which consists in simultaneously creating a digital infrastructure, increasing the digital competence of the population and the availability of digital services.

1. Introduction
Currently, in many domestic and foreign studies, the sustainable development of rural regions is conditioned by the possibility of providing various digital services (education, health, leisure) in these regions, which are not available to rural residents today [1-3]. At the same time, a number of research works raise the question of possible consequences of the use of digital technologies in rural regions [4-5]. On the one hand, digital technologies ensure the efficiency of goods and services production; on the other hand, manufacturers become dependent on digital service providers [5]. Nevertheless, digitalization helps to prevent the depopulation of rural sector by attracting investments and people to rural regions [6]. In addition, it involves rural sector in social interaction network, which in modern conditions is a requirement for formulation and reproduction of human capital [7]. In addition, remote provision of services compensates for the remoteness of rural settlements from the center, providing their residents not only with wider opportunities for self-employment, but also for finding new markets for agricultural products [8]. Accordingly, digitalization is an important condition for the sustainable development of rural regions.

Today, there is a steady trend of population decline in rural regions, due to both their natural decline and migration outflow. Thus, over the past five years, the number of rural residents has decreased by 701,100 people. Over the past year alone, 130,900 people have died, and more than 62,000 rural residents have moved to other regions.

One of the reasons for such migration is the lack of Internet connectivity. It is the availability of...
Internet access that has become a critical condition for securing young people in rural regions. Therefore, providing rural regions with access to the Internet will create an attractive living environment, which, firstly, will affect the migration outflow of rural residents to cities, and, secondly, will help attract citizens to rural settlements, which is especially important during an unfavorable epidemiological situation. Thus, remote technologies allow you to work remotely, thereby enabling urban residents to live in more favorable conditions during the pandemic.

In this regard, the purpose of the study is to determine the factors that hinder the digital transformation of regions, and the measures that contribute to this process.

2. Methodology
China has achieved some success in introducing remote services in rural regions, where a state policy is being implemented to create a “Taobao Village” in order to reduce rural poverty. The basis of the economy of such villages is the sale of manufactured products through large online stores.

Since 2013, China has been systematically working to identify regions whose residents are below the poverty line, where the state further supports the implementation of various programs aimed at the development of such regions. At the same time, the effectiveness of the work of municipalities is estimated depending on the reduction of the poverty level. The main regions of state support should be highlighted: training rural residents to trade using remote technologies, subsidizing production provided that the poorest local residents are employed.

Rural regions can be classified as “Taobao Village” if at least 10% of the population of such an area is involved in online trading, or the volume of online sales is at least 1,600,000 USD, or the number of online stores is at least 100 [9]. Moreover, recently there has been a tendency in China to unite several villages into a Taobao city.

The largest online store serving the village of Taobao is AliBaba Group, which invests in the construction of infrastructure in rural regions (roads, service centers), and also promotes the training of rural residents in the basics of working in online stores.

As a result, there is an increase in the well-being of people living in rural regions, the social infrastructure is being improved, the migration outflow of young people to cities is slowing down, who have seen new opportunities for developing their business in these regions.

The result of the measures taken by the Chinese government was an increase in the number of fixed broadband Internet users in 2019 by 42% compared to 2015, and the turnover of telecommunications services by 62.9%. At the same time, there is an annual increase in the volume of sales of goods via the Internet, accounting for 20.7% of the total retail sales of consumer goods in 2019, which is 2.3% higher than in 2018.

Based on the experience of China, e-commerce plays an important role in the digital transformation of regions, providing greater opportunities for both selling agricultural products and buying goods that are inaccessible to rural residents.

Currently, the Russian Federation is implementing a national project “Digital Economy of the Russian Federation”, which provides for the creation of a stable and secure telecommunication infrastructure, accessible to all households, while it is assumed that predominantly domestic software will be used. So, due to the implementation of program measures until 2024, all social infrastructure facilities should be provided with the possibility of broadband access to the Internet, and the share of households with such an opportunity should increase to 97%.

As a result, by 2021, about 90 thousand educational organizations, paramedic and obstetric centers, administrations of rural settlements, police departments, fire stations and other socially significant objects should get access to the network. During the auction, 16 operators were involved in this process, among which one of the largest is PJSC Rostelecom, which occupies an important position in the public communications network in Russia. This operator should spend more than 36% of the allocated budget funds, in second place is JSC ER-Telecom Holding (25%).

In addition, a program is being implemented to eliminate the digital divide between urban and rural settlements, which is aimed at providing rural settlements with a population of 250 to 500 people with
Internet access points. The first positive experience of rural digitalization in the Russian Federation already exists. So in 2018, on the territory of one of the rural settlements of Khabarovsk Territory in the Far East, an innovative ecosystem was created that provides the rural population with telecommunications services, covering education, medicine, government services, business and leisure, which allowed rural residents to use the same services as residents of large cities.

As practice shows, the provision of settlements with Wi-Fi access points with a radius of 150 meters does not allow free use of digital services due to the dispersed location of residential buildings.

We also note that within the framework of the federal target program for the integrated development of rural regions, the share of rural households provided with the Internet should be increased to 85%. At the same time, it lacks targets for the development of telecommunications, which makes it difficult to monitor the implementation of this indicator.

The underdeveloped digital infrastructure of rural settlements in Russia leads to the fact that they are significantly behind cities in terms of inclusion in the information space, which contributes to digital inequality. Thus, according to the Ministry of Communications and Mass Communications, the level of broadband Internet access penetration in these regions does not exceed 20%. At the same time, only “ensuring equal conditions for the development of communication types (related to information infrastructure), the same set of services with a single quality standard will eliminate the information inequality of urban and rural regions”.

The current situation is explained by the high costs of building fiber-optic communication lines with a low density of the rural population.

At the same time, the digitalization of rural regions is not only about creating the necessary information infrastructure, it also requires solving other problems – the illiteracy of most residents and the rather high price of technology implementation [10]. So, the main reason hindering the informatization of rural regions is the quality of human capital, characterized by computer illiteracy, a narrow range of information needs, conservatism in the perception of innovations, etc.

Despite the fact that the share of rural residents connected to the Internet is increasing annually, amounting to 74.6% in 2019, the growth rate of this indicator is less than among urban residents (figure 1).

![Figure 1. The share of the rural population using the Internet information and telecommunications network, %](image-url)

In addition, the rural population has no motivation to use digital technologies, as evidenced by the
data of the Federal State Statistics Service (figure 2). Thus, 64.4% of rural households that do not have access to the Internet do not see the need for this, 21.6% noted high costs for connecting to the network and only 13.4% of households do not have the technical ability to connect to the Internet.

At the same time, only 23.8% of Internet users in 2019 ordered goods and services remotely. Among them, the largest share falls on the age group from 20 to 40 years, the share of older users (55 years and older) is less than 14%. It should be noted that in 2019, 67% of rural Internet users received services from the authorities in a remote format.

For several years, the most accessible mobile devices for accessing the Internet were mobile phones, laptops are used by 16.6%, and tablets – 6.4%.

At the same time, modern mobile devices allow a user who does not have a high level of digital skills to easily download and install software. However, only 55.4% of rural households use mobile devices to access the Internet, which may indicate that the rest do not have devices with the ability to connect to the Internet (figure 3). While in China, most remote services are provided using smartphones.

**Figure 2.** Reasons for non-use of the Internet by households in rural areas in 2019, %.

**Figure 3.** Distribution of households by type of devices for accessing the Internet in rural areas in 2019, %.
3. Results and discussion

Thus, the following factors hindering the development of digital technologies in rural regions can be identified: significant capital investments and high payback periods for the construction of fiber-optic communication lines, especially for regions with low population density; low solvency of the rural population, which does not allow paying for expensive equipment and making monthly payments for telecommunications services; lack or insufficient development of digital skills among the rural population, which does not make it possible to use all the advantages of the Internet. In addition, important factor is the lack of motivation among a significant part of the rural population to receive services in a digital format, which is explained by the high proportion of elderly people in the total rural population. Although this category of citizens need more services provided by the Internet, it makes it possible to communicate, pay for services, and make an appointment with a doctor. In old age, it is more difficult for a person to master something new, and most part of such users are simply afraid of digital technologies.

Accordingly, an integrated approach to the digitalization of rural regions is needed, which consists in the simultaneous development of the system of services received by the rural population through the Internet, which leads to the introduction of affordable digital products in rural regions, an increase in the level of digital literacy of the rural population, which is also confirmed by foreign studies. Thus, the study of the European Rural Development Network “Smart and Competitive Rural Areas” notes the need to simultaneously solve the problems of providing rural regions with broadband infrastructure, introducing digital services and increasing digital literacy in order to obtain the best economic effect from investments in information infrastructure [11].

![Figure 4. The level of digital skills of the population of rural areas in 2019, %.

Despite the fact that the necessary information infrastructure will be created in rural regions, due to the lack of knowledge of the rural population about the possibilities of digital technologies in terms of improving their quality of life, it may be less in demand, and, accordingly, rural regions will not be able to get that economic and the expected social impact. At the same time, the availability of infrastructure and digital technologies does not guarantee their use; they require the rural population to have at least basic digital skills. At the same time, according to the Institute for Statistical Studies and Economics of Knowledge of the Higher School of Economics, only 16% of the rural population has a level of digital skills at the basic level (figure 4).

Consequently, at the regional level, it is necessary to create an educational environment that would contribute to an increase in the level of digital competencies of the rural population, including conducting seminars, digital literacy courses on the basis of educational organizations operating in rural regions, as well as outreach work with the rural population aimed at increasing digital culture of service consumption. In addition, local governments should promote the development and support of a
A volunteer movement that can help villagers to receive digital services. Special attention should be devoted to the development of educational programs for the elderly, so that it takes into account the peculiarities of the perception of information by such category of citizens.

At the same time, state support for scientific research is needed to solve the problem of accessibility of digital technologies for rural regions, which implies the development of an appropriate system of grant support in this area.

Ultimately, in modern conditions, due to the low profitability of the provision of information and telecommunication services in rural regions, state support for the digital transformation of rural regions is necessary, including within the framework of ongoing projects and programs, where indicators of achieving goals for rural regions should be separately identified.

4. Conclusion

Thus, the main factors hindering the development of digital technologies in rural regions are the lack of digital infrastructure due to the high cost of construction, digital illiteracy of a large part of the rural population, which makes it impossible to use all the advantages of the Internet.

At the same time, the availability of infrastructure and digital technologies does not guarantee their use; they require the rural population to have at least basic digital skills. In addition, a large part of rural residents have no motivation to use the Internet, they do not see the advantages that digital technologies may offer.

Accordingly, comprehensive approach to digitalization of rural regions is needed, which consists in the simultaneous development of the system of services received by the rural population through the Internet (education, health, culture, business), which leads to the introduction of affordable digital products in rural regions, increasing the level of digital literacy of the rural population.

Thus, only an integrated approach to solving the problems of digitalization of rural regions, taking into account the peculiarities of the spread of digital technologies in these regions, will allow them to get involved in the process of digital transformations.

References

[1] Shamin A, Frolova O, Shavandina I, Kutaeva T, Ganin D and Sysoeva J 2020 Problems and prospects in Russia advances in intelligent systems and computing. Smart Villages 1114 480 doi: 10.1007/978-3-030-37737-3_41
[2] Zaballos G A 2019 The Impact of Digital Infrastructure on the Sustainable Development Goals: A Study for Selected Latin American and Caribbean Countries (Washington: Inter-American Development Bank) p 457
[3] Mogogi S, Chukwuere J, Lubbe Sam and Klopper R 2018 Problems around accessing information in rural communities. Alternation: Interdisciplinary. Journal for the Study of the Arts and Humanities in Southern Africa 25 214 doi: 10.29086/2519-5476/2018/v25n1a10
[4] Olkhovikov K, Korobeynikov A, Zarubina E, Zhuravleva L and Ruchkin A 2021 Digitalizing rural areas: A traditional context. IOP Conf. Ser.: Earth Environ. Sci. 699(2021) 012047 doi: 10.1088/1755-1315/699/1/012047
[5] Rolandi S, Brunori G, Bacco M and Scotti I 2021 The digitalization of agriculture and rural areas: Towards a taxonomy of the impacts. Sustainability 13(9) 5172 doi: org/10.3390/su13095172
[6] Rodrigues M and Franco M 2021 Digital entrepreneurship in local government: Case study in municipality of Fundão, Portugal. Sustain. Cities Soc. 73 45 doi: 10.1016/j.scs.2021.103115
[7] Podgorskaya S and Schitov S 2021 The role and importance of social capital in rural development. E3S Web Conf. 273(2021) 08072 doi: 10.1051/e3sconf/202127308072
[8] Amirova E F, Zolkin A L, Podolko P M, Baldina E I and Kosnikov S N 2021 Analytical review of issues of creation of the agro-digital cooperation platform as an economic mechanism for sustainable development of agricultural production. E3S Web Conf. 254(2021) 10003 doi: 10.1051/e3sconf/202125410003
[9] Wang X and Denisov V 2019 Trends of development of electronic commerce in China. *PACIFIC RIM: Economics, Politics, Law* 1 60 doi: org/10.24866/1813-3274/2019-1/51-60

[10] Salemink K, Strijker D and Bosworth G 2017 Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *J. Rural Stud.* 54 360 doi: org/10.1016/j.jrurstud.2015.09.001

[11] *Smart and Competitive Rural Areas*, European Network for Rural Development in the 2014-2020 programming period, available at https://enrd.ec.europa.eu/enrd-thematic-work/smart-and-competitive-rural-areas_en