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Digital Divide of Rural Territories in Russia

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Abstract

Information and communication (ICT) technologies cause profound changes in social and economic phenomena. The initial stage of their diffusion is accompanied by complex and contradictory effects. One of these effects is the growing inequality in access to information and the newest technological achievements. The digital divide leaves vast social groups outside the progressive mainstream. Studies show that agribusiness and rural territories most severely suffer from digital discrimination. It consequently results in declining profitability and competitiveness of the agrarian sector and, furthermore, a growing gap between the quality of urban and rural life. To control the negative process, the primary task is to obtain a clear notion of the current tendencies. The study describes a qualitative method of analysis that can be used to measure the digital divide in rural territories.

Keywords

Digital divide, access to information, socioeconomic development, rural areas, agriculture's contribution to rural development.

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Introduction

Contemporary economic and social development is in many aspects depending on the diffusion of digital technologies. It is expected that innovations will stimulate revolutionary growth of productivity and, as a result, will improve the quality of life. However, the process of digital transformation is not homogeneous in time and space.

The digital divide, unequal access to information and communication technologies, has given rise to new social and economic problems. Vast rural territories in Russia are far behind urban centers in their level of digitalization. Among various factors influencing the inequality, ‘it is… the location factor that can be considered the most relevant” (Šimek et al., 2011). The rural Russian population (over 37 million people) does not benefit from innovations. Only 52.5 % of the rural population uses e-government services (HSE, 2018), less than 10% are involved in e-commerce. The analysis of digital competencies in agrarian companies shows that there is a lack of specialists and modern technologies, which leads to a relatively higher level of production costs and a tendency to lose competitive advantages in the local and global markets. Without access to professional databases, newest software and information services, agrarian companies are deprived of the main factors of success (Shepherd, 2018; Štůsek et al., 2017; Vaněk et al., 2010). Agriculture serves as a key factor contributing to rural development. Unsatisfactory economic results of the agrarian sector provoke long-term negative consequences in the socioeconomic and demographic development of the rural territories. Over time the digital divide will lead to a profound disproportion of opportunities in urban and rural territories, new waves of migration, and further degradation of the agricultural provinces.

Governmental programs are aimed at preventing negative tendencies. The programs include investments in infrastructure, educational projects and other measures of support. In the last three years, the effectiveness of the programs has become a question of discussion. One of the barriers to positive results is the methodological problem of acquiring data for further analysis and decision making. Federal programs rely on average statistical data about the tempo of digital diffusion. The average indicators are attributed

to large provinces with thousands of inhabitants and with a highly diverse local environment. One of the core problems is that there is no adequate system of analysis and measurement which could give a realistic vision of the variety. Numerous local areas keep degrading without proper support and investment. Effective control demands appropriate methods of measuring the level of digitalization. The purpose of the research is to improve strategic decision-making to support the socio-economic development of the rural territories and the agrarian sector.

Materials and methods

The research was focused on the problem of the digital divide in the Ryazan region of Russia. The Ryazan region lies to the south-east from Moscow. It is a comparatively large territory with a 65% share of land used for agricultural production (Table 1).

Half of the population lives in the administrative center, Ryazan. The region is divided into 25 local areas. The lowest population density among the local districts is a little more than 5.6 people per square kilometer. Statistics show the continuing formation of a mono-centered region with vast depopulated territories around the administrative center. The tendency grows stronger in the course of industrial and digital transformation. Agriculture is the main branch of regional economics. However, the level of agriculture value added per worker decreases at an average annual rate of 1.7 % since 2006.

The R&D expenditures in the agrarian sector have diminished from 5.1% to 0.1-0.05% of the gross regional product within the period of the last 15 years. Nowadays the innovations are concentrated in telecommunication and the industrial spheres, whereas the production of agricultural machinery ceased to exist in the late 90´s of the 20th century.

The access to information resources via the Internet has become the compensating mechanism for the agrarian producers. At the same time, the lack of digital competencies prevents agrarian producers from the successful implementation of advanced innovations. This leads to a further stagnation of the agricultural sphere. While the output of industrial production is expected to gain a 34% growth in 2025 due to digitalization, agriculture reduces its tempo of development.

The research of social and economic development at the scale of regional districts includes statistical analysis of various criteria. The approach reveals several faults in the traditional methodology. To understand the actual level of digitalization it is necessary to start with a study of general tendencies of development and the choice of key criteria of analysis.

Scientists and scientific institutions face the problem of evaluating digital transformation, digitalization maturity index, the Gini coefficient of Internet penetration and other characteristics of the worldwide phenomenon. Academic research of the last 10-15 years shows that the problem of the digital divide has not yet found an all-accepted solution (Yu et al., 2015). Most researchers state that such factors as the penetration of Internet technologies, digital literacy, technical competence, and other criteria show the stratification of society growing stronger and giving rise to new forms of inequality (López and Farzan, 2017). The digital divide influences the quality of life in the digital

	Region / Country	Area, sq km	Agricultural land, sq km	Agricultural land as a share of land area, %	Agriculture value added per worker in constant prices of 2010, US dollars	Population, persons
1	Czech Republic	77,220	34,890	45.2	24,739	10,625,695
2	Slovakia	48,080	18,860	39.2	52,970	5,447,011
3	*Ryazan region*	*39,605*	*25,695*	*65.0*	*31,857*	*1,114,137*
4	Switzerland	39,516	15,160	38.4	27,846	8,516,543
5	Netherlands	33,690	17,960	53.3	80,984	17,231,017
6	Belgium	30,280	13,508	44.6	65,294	11,422,068
7	Armenia	28,470	16,768	58.9	n/a	2,951,776
8	Israel	21,640	5,320	24.6	94,454	8,883,800
9	Slovenia	20,142	6,175	30.7	21,840	2,067,372

Source: Ryazan Statistics (2018), World Data Atlas (2019)

Table 1: The Ryazan region in comparison with several sample countries (2018).

economy and works as an obstacle to opportunities and development (Mossberger, 2003). The variety of approaches to estimate the digital divide is the result of the multiple basic concepts of digital competencies, or digital literacy (Chetty et al., 2018). International practices are focused either on the economic or on the social and cultural factors in their methodology of estimating the digital divide.

The digital divide in the Ryazan region appears as the result of uneven course of economic development due to such factors as quality of soil, water resources, mineral reserves, distance from the administrative center, unequal accessibility of the Internet, differences in skills and knowledge, the demographic structure of the population.

To compensate disparity in development it is necessary to take into account the specific institutional and social factors of development. The municipal authorities together with scientific institutions continue their attempts of introducing an adequate system of evaluation that will show the dynamics of digitalization in the local areas. The limitation factor is the lack of raw statistics at the scale of local areas. The federal system of evaluating informational and technological literacy and Internet access is based on the data obtained from the administrative center of the region. Each local area has individual systems of monitoring which are not integrated into one total database. The official publication of the obtained data takes two years. The system is under correction; hence the resources for this research include reports of local authorities and the database of the Ryazan Regional Statistics Bureau.

The recent research resulted in an evaluation of 10 dimensions that show the intensity of the digital divide across the local areas. The sample factors include those that illustrate the level of investments in the ICT sphere, the popularity of digital technologies in the business community, the availability of high-speed Internet access, and the level of digital competencies. The integral coefficient of inequality is at the level of 3.83. The qualitative measurement of the digital transformation of the economic and social life includes the procedure of normalization. The normalized value for each local area is calculated as $X = R(x)/R(n)$, where $R(x)$ is the dimension of the local area and $R(n)$ is the target level for the region. In the research, it is assumed that the target level of digitalization in the agrarian sphere cannot be measured with the same dimension as in the industrial sphere. The target is measured as the maximum level observed in a particular period.

The target levels for the rural territories in 2018 were the following (Ryazan Statistics, 2018):

- P1, Internet users per 1000 people - 174;
- P2, small e-business companies per 10 thousand people, number of registered companies - 89;
- P3, the number of highly qualified ICT specialists - 25;
- P4, the volume of capital investment (not including federal or municipal budget investments) per 1 person, roubles - 26647;
- P5, the number of organizations using digital technologies - 24;
- P6, personal computers per 100 staff members, having access to the Internet - 12;
- P7, organizations using the Internet in e-commerce - 5;
- P8, organizations with Internet speed over 256 kilobit per second - 9;
- P9, organizations using special computer programs - 8;
- P10, organizations using special systems of cybersecurity – 16.

Average regional levels are used to estimate the gap in the digital development of particular areas. The procedure includes evaluation of the digitalization indicator (DI) which shows the relative level of ICT (information and communication technologies) diffusion. The indicator is calculated as a sum of normalized values.

Results and discussion

The acquired data about the 10 criteria makes it possible to evaluate the digitalization indicator for the 25 rural areas of the Ryazan region. The analysis shows that the dimensions vary from 0.33 to 0.53 (Table 2). Low levels of particular dimensions may serve as signals for decision-makers.

As indicated in Table 2 the digital divide between the rural and urban territories is considerable. Several exceptions are indicating the growing innovative potential in particular areas (Dronov et al., 2016).

The maximum level of the integral indicator equals 0.75 whereas the minimum is 0.31. It reveals

the fact of deep inequality across the local areas. The digital divide may thus get a qualitative measure.

#	Local Areas	DI integral 2018	DI rural 2018
1	Alexandro-Nevsky	0.43	0.46
2	Chuchkovsky	0.42	0.36
3	Ermishinsky	0.40	0.46
4	Kadomsky	0.42	0.35
5	Kasimovsky	0.67	0.53
6	Klepikovsky	0.60	0.34
7	Korablinsky	0.49	0.41
8	Mikhailovsky	0.65	0.33
9	Miloslavsky	0.46	0.37
10	Pitelinsky	0.38	0.38
11	Pronsky	0.67	0.43
12	Putyatinsky	0.40	0.33
13	Ryazanskiy	0.71	0.40
14	Ryazhsky	0.53	0.44
15	Rybnovsky	0.64	0.41
16	Sapozhkovsky	0.33	0.39
17	Sarayevsky	0.58	0.43
18	Sasovsky	0.31	0.37
19	Shatsky	0.54	0.38
20	Shilovsky	0.75	0.48
21	Skopinsky	0.36	0.49
22	Spassky	0.55	0.36
23	Starozhilovsky	0.46	0.37
24	Ukholovsky	0.37	0.34
25	Zakharovsky	0.50	0.38

Source: Own research and processing

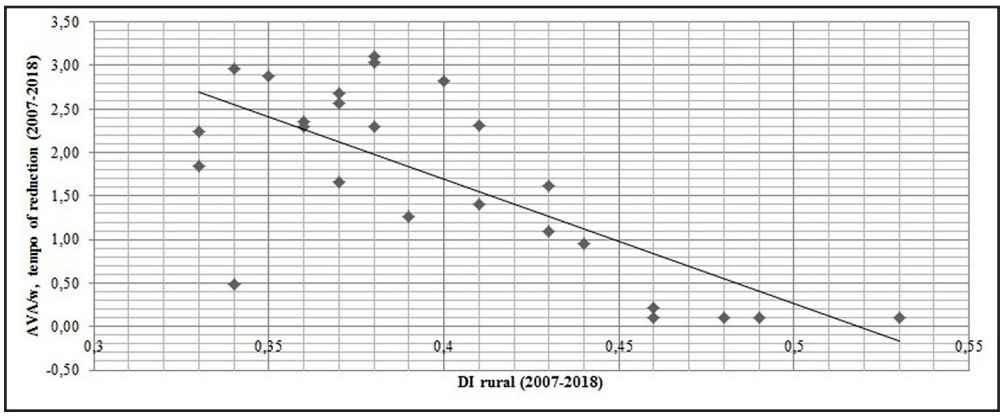
Table 2: Digitalization indicators of Ryazan rural areas compared to integral dimensions.

The integral dimension of the digital divide may include more criteria if the regional system of monitoring becomes more effective. However, the 10 dimensions estimated in this research can already prove useful for preliminary analysis.

The process of digitalization does not prominently influence either the level of profitability in the production of the raw goods or the number of companies in agriculture (within the period of observation 2007-2018). However, it is now possible to state that there is a well-observed shift in the choice of products in those areas that tend to upgrade their business with digital innovations in technology, marketing, or production organization. The statistical analyses showed a negative correlation (-0.73 on average) between the digital index and the tempo of reduction of the ‘agriculture value added per worker (AVA/w)‘, measured as the geometrical mean (Figure 1).

The total tendency to produce less added value leads to a gradual degradation of the potential for sustainable development. The state support of agriculture is still in the phase of ‘aggressive investments‘, stimulating the extensive growth of the production of the raw goods to grant food security. The analysis shows that it is necessary to change the priorities and to stimulate changes in the qualitative characteristics of the produced goods and the level of the added value. The areas of the Ryazan region with more intensive usage of digital innovations are more open to modern instruments of analysis, sources of information, new technological ideas, and more effective production management. What is more important, these areas have the potential to provide young specialists and highly qualified professionals with a proper level of life conditions.

To interpret the results of the analysis, the DI measurements may be divided into several groups including leaders, followers and slowly developing rural areas. The group of leaders is located closer



Source: own research and processing

Figure 1: Agriculture value added per worker and the digital index of the rural territories.

to the administrative center. These areas have a higher level of infrastructural and institutional development. These areas attract investors and qualified specialists. It makes the process of IT technologies diffusion more effective. The group of slowly developing areas shows a very low density of population and a lack of investments.

The multi-criteria analysis of digitalization makes it possible to work out an appropriate instrument of measurement and comparison. The list of dimensions includes data from open resources which makes the process of monitoring dynamic and effective. Such an approach may become a practical tool for analyzing tendencies and perspectives of economic and social development.

Better understanding the local diversity will improve the results of governmental programs and prevent negative tendencies in deepening the inequality between the rural and the urban population. More intensive digitalization of rural territories will create an environment of equal life opportunities and, therefore, stimulate positive economic and demographic changes in rural areas.

Conclusion

The Russian federal program of digital transformation is aimed at the rapid growth of productivity both in the industrial and agrarian spheres. However, the synergetic effect from innovations can be obtained only in case of emerging efforts of all the minor elements in the socio-economic system of the country.

A permanent monitoring of digital diffusion is an obligatory string of effective management and choice of preventive and stimulating measures. Without a new scientific approach to analytics, it is impossible to identify the barriers to progressive changes in the agrarian sector of economics. Digital agriculture changes the quality of rural life. New technologies stimulate the profitability of agribusiness and attract investments to the agrarian sector. Nevertheless, scientific research shows that digitalization may cause negative social effects, “intensify exploitation and deepen both labor and spatial marginalization” (Rotz. 2019) without an adequate system of controlling and navigating the vector of innovative development.

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