Advances in Economics, Business and Management Research, volume 156
2nd International Scientific and Practical Conference on Digital Economy (ISCDE 2020)

Strategic Guidelines for the Development of Information and Digital Technologies of the Subjects of the Macroregion: Investment Aspect

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ABSTRACT
The article provides an overview of existing strategic documents of the federal and regional levels on the development of information and digital technologies in the constituent entities of the Russian Federation. The main strategic guidelines and volumes of investments for the implementation of projects in this area have been determined. It shall be noted that, depending on the level of regions (and countries), these strategies provide for different use of information technologies, which predetermines different amounts of funding, based on the capabilities and readiness of entities to implement them in the context of existing differentiation. The article is aimed to examine the investment aspects of the development of information and digital technologies in the subjects of the UFD and substantiate their development strategies. The leading research method is the system-object approach, as well as generally accepted methods of analysis and synthesis. The article presents the analysis results and evaluation of a number of indicators facilitating the objective assessment of the strategic development of the macroregion in the studied area, due to the investment in it.
Keywords: *macroregion, information technology, digital technologies, investments, information technology development strategies, regional digital projects*

1. INTRODUCTION

Economic development and economic growth are determined by the degree and intensity of the development of high-tech sectors of the economy. In the twenty-first century, the development of information and digital technologies becomes the basis of these industries, which build the basis for changing all industries and types of economic activity. The relationship and influence of informatization on economic development have been proven in many previous studies [1,2,3]. It is these technologies that determine the possibilities and boundaries for the deployment of new mechanisms for managing the development of regions and the interaction of economic entities therein.

The need to consider and compare the strategic guidelines for the development of information and digital technologies in the regions of the Russian Federation, especially from an investment point of view, is primarily due to the prevailing picture of the development of Russian regions, which is characterized by the presence of strong differentiation and an increasing gap between regions [4,5]. It is important not only to understand and regulate the flow of investment resources in the constituent entities of the Russian Federation, but as well to correctly distribute these flows between regions, considering the capabilities of each constituent entity of the Russian Federation, since there is a strong positive relationship between the intensity of investment and the effect of informatization [1].

Given the importance and complexity of developing strategies for the development of macroregional entities in a rapidly changing external environment, the elaboration of the investment aspects of regional strategies also has its own difficulties. The investment process, which is based on forecasting the market situation for information and digital technologies, requires research and assessment of many alternative solutions and their further adjustment [6]. Information and digital technologies, being one of the tools for increasing the competitiveness of regions, lead to significant changes in the development of the entire society. Pursuant to the work of Silin Ya.P. and Animitsa Ye.G., they [7] allow to provide for the integrated development of regions, ensuring the acceleration of this development.

2. METHOD OF RESEARCH

The methodology is represented by a set of procedures allowing to achieve the main goal of the research and form conclusions about the object of research. Considering the importance of the development of information and digital technologies, as one of the decisive factors in the intensive development of regions, a system-object approach to research can be proposed. This approach involves considering the system as a functional object, the

functioning of which is due to the functions of a higher-level object [8]. This approach which we applied to systematize the events and programs implemented in the regions of the UFD in the field of strategic development of information and digital technologies allows to differentiate them. The differentiation criterion can be a system of indicators that characterizes the different levels of development of regions.

In order to ensure the reliability and relevance of the research, analytical methods were used that provide for the collection, processing of statistical information, generalization, and interpretation of the data obtained. These methods allow to identify the factors that affect the current state of the use of information and digital technologies in the regions, as well as their investment. In this study, we selected the regional digitalization index, the proportion of households with broadband Internet access, the specific indicators of broadband Internet access per 100 people, the proportion of regional budget expenditures per 1 person, and predicted estimates of investment volumes within the framework of implemented strategies.

Also, the work used tabular and graphical methods of data visualization.

The subjects of the UFD were taken as the object of research.

3. RESULTS

The differentiation of regions existing at the present stage pursuant to the level of their socio-economic development demonstrates different possibilities for the implementation of innovations in different fields of activity. A study conducted by the authors earlier revealed that in the UFD the highest level is inherent in the Yamal-Nenets and Khanty-Mansi Autonomous Okrugs, which is due to the growth of investment attractiveness of these entities in view of their importance at the world level as resource regions [9]. The growing differentiation also leads to a certain digital inequality of regions, mostly due to the lack of accessibility of information technologies (by which the authors mean the speed and cost of the Internet). In this regard, overcoming the digital inequality in the presence of the regions' readiness and the possibility of using information and digital technologies actualizes the issues of investing in this area within the framework of achieving the strategic goals of regional development.

Let us consider the results of a study performed by the National Research University Higher School of Economics [10] in terms of infrastructure reflecting the use of the Internet by the population of our country (Table 1).

Table 1 Analysis of the telecommunications infrastructure of the subjects of the UFD pursuant to the data of 2019 [10]

Subjects	Broadband Internet subscribers per 100 people, units		Specific share of households with the broadband. Internet access, %
	Fixed	Mobile	
Russia	22.3	96.4	73.6
UFD	25.3	98.2	73.5
Kurgan region	21.4	95.2	56.0
Sverdlovsk region	25.6	91.6	74.3
KMAO	23.4	112.6	83.2
YaNAO	23.6	131.2	93.9
Tyumen region	26.1	105.8	66.3
Chelyabinsk region	26.8	91.9	73.4

The results presented in Table 1 indicate the good positions of the UFD in comparison with the average Russian values. The specific indicator of the number of broadband subscribers in the context of fixed and mobile Internet exceeds the values in Russia. Moreover, a significant contribution to the formation of this indicator is made by the KMAO-Yugra, YaNAO, and the Tyumen region. The share of households with broadband access in the total number of households in the Urals Federal District on average coincides with the average Russian value of this indicator, the Kurgan and Tyumen regions are "lagging behind" here.

A digitalization index reflecting the intensity of the use of digital technologies has been developed for business (table 2) [10].

Table 2 Business digitalization index

Subjects	Business digitalization index	The specific weight of organizations using digital technologies, in the total number of organizations, %		
		Broadband Internet	ERP systems	Electronnic sales
Russia	31	86	21.6	15.4
UFD	23	83.5	14.9	16.5
Kurgan region	27	85.6	16.7	13.9
Sverdlovsk region	22	75.4	9.1	19.8
KMAO	28	85.4	19.2	14
YaNAO	28	86.7	19.3	8.7
Tyumen region	26	83.8	17.5	15.7
Chelyabinsk region	28	84.6	20	18.6

This table indicates different preferences in the choice of information and digital technologies by regions. Thus, the Sverdlovsk and Chelyabinsk regions are the leaders in the UFD in terms of the use of such a tool by businesses as electronic sales (the average indicator is 19.8% and 18.6% of organizations, respectively, compared to the national figure of 15.4%). In terms of the use of ERP systems, all subjects of the UFD are lagging behind, not a single region showed an excess of the average Russian indicator, which in general influenced the lower values of the business digitalization index in the Federal District. The multidirectionality of the obtained indicators is determined by the different economic specialization of the regions, and the demand of leading enterprises for information and digital technologies.

Pursuant to research conducted by the National Research University Higher School of Economics [10,11], the share of the investments in fixed assets of the ICT sector (pursuant to 2019 data) is 3.9% of the total investment in fixed assets of all organizations in the Russian Federation and these investments amount to RUR 753,3 bln. However, the contribution of this sector (which pursuant to the HSE is RUR 2,443 bln.) to the development of the economy is growing and takes from 0.3% to 15.8% in the country as a whole in various types of activities. The IT-market volume is growing steadily and pursuant to the TAdviser portal, the market growth for the 2014-2018 period amounted to 19.2% (from RUR 286 bln. in 2014 to RUR 341 bln. in 2018). [12]. Pursuant to the IDC analytical company (International Data Corporation), which is also referred to by the TAdviser portal, in 2019, the volume of the IT service market increased by 8% (compared to 2018) and amounted to USD 5.57 bln. (or RUR 369 bln.).

The main strategic documents for the development of information and digital technologies in the Russian Federation at the federal level are: Strategy for the Development of the Information Society in the Russian Federation for 2017 - 2030 [13]; National development goals of the Russian Federation for the period up to 2030 [14]; national project "National Program "Digital Economy of the Russian Federation" [15]; The strategy for the development of the information technology industry in the Russian Federation for 2014 - 2020 and for the future until 2025 [16]. Moreover, a departmental project of the Ministry of Construction of Russia "Smart City" is currently underway and a federal project "Digital Region" is under development (revision date 2021). Each constituent entity of the Russian Federation develops its own strategic documents for the development of information and digital technologies that contribute to the development of the region's digital economy.

So within the framework of the departmental project "Smart City", municipalities of three subjects of the UFD are involved: Sverdlovsk region, Chelyabinsk region, and KMAO (table 3).

Table 3 The list of pilot municipalities of the departmental project of digitalization of the urban infrastructure "Smart City" [17]

Region	Number of municipalities
Sverdlovsk region	4
Chelyabinsk region	5
KMAO	3
Total:	12

Herewith, in September 2019, the Ministry of Construction decided not to allocate funding for projects of municipalities and not to redistribute funds from other national projects. Currently, this project is an opportunity to exchange successful practices and the implementation of development standards approved by the Ministry of Construction. Funding is possible only through the official competition "Best Municipal Practice", where from 2020 an additional nomination "Modernization of the urban infrastructure through the introduction of digital technologies and platform solutions (Smart City)" has been introduced.

The main federal funding for the development of information and digital technologies currently takes place within the framework of the federal project "Digital Technologies" through tenders held by the Russian Fund for the Development of Information Technologies. As part of the activities of this fund, two competitions were held to finance domestic companies for the development and implementation of information and digital technologies in the territories (Table 4).

Table 4 Results of contests of the Russian Fund for the Development of Information Technologies [18]

Contest	Contest results, number of companies	Distribution by region	Funding volume
Grants for the implementation of projects to develop domestic software and increase its share in a digital environment	5	Moscow (2 projects) Samara region Saint Petersburg Moscow **Sverdlovsk Region**	From RUR 10 mln to RUR 500 mln per project
Grants as state support for projects for the implementation of domestic products, services and platform solutions based on "end-to-end" digital technologies in the constituent entities of the Russian Federation	13	Moscow (2) Perm Territory Republic of Tatarstan (4) Belgorod Region Samara Region (3) Republic of Udmurtia Ivanovo Region	The total amount is not more than RUR 3 bln. Herewith, 1 grant amount is not more than RUR 1 bln.

The results of the allocation of grants show a weak spread of federal funds across the regions of the Russian Federation, the main concentration of funds occurs in the western part of Russia. Among all the subjects of the UFD, only within the framework of one competition, funds were allocated to a company from the Sverdlovsk region for the development and implementation of information and digital solutions in the territory of this subject. Thus, the existing investment support within the framework of national goals is mainly concentrated again only in those regions of the country, which are traditionally points ("locomotives", "poles") of growth of the Russian economy.

In Russia, the problem of implementing the national strategic goals of all subjects of the Russian Federation and the formation of regional strategic guidelines for the development of information and digital technologies is quite acute. Thus, in 2019, the analytical center of the Government of the Russian Federation prepared an analytical report on the development of projects in the field of digital economy in the regions of the Russian Federation [19]. Pursuant to the data collected from the presented 79 constituent entities of the Russian Federation, only 34 constituent entities have developed or are developing relevant projects. Based on the analysis, it can be determined that in the UFD only three subjects (Sverdlovsk region, Chelyabinsk region and KMAO) have identified their priority industries and end-to-end technologies within digital projects.

As part of the implementation of strategic tasks, the authors compiled a summary table of the projected volumes of financing for projects for the development of information and digital technologies of the subjects of the UFD until 2024 (table 5).

Table 5 Amount of financing of projects for the development of information and digital technologies of the subjects of the UFD in the framework of the implementation of strategic documents

Subjects of the UFD	Funding for regional projects, RUR mln	Share of the region in the total cost of the UFD, %
Sverdlovsk region	463.07	1.38
Chelyabinsk region	892.23	2.65
Kurgan region	29.00	0.09
Tyumen region	1,165.55	3.46
KMAO	1,883.79	5.60
YaNAO	29,211.39	86.82
Total:	33,645.03	100%

The largest share of financial resources in the UFD falls on the YaNAO (86.82%), due to the large volumes of funding for the education system and training for the digital economy. The smallest funding was in the Kurgan region.

In the context of regional projects being implemented, the distribution of funds by the subjects of the UFD is as follows (Fig. 1)

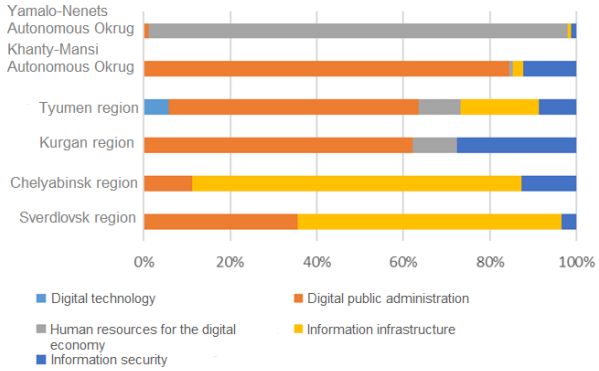

Figure 1 The share of investments of the subjects of the UFD on the main projects for the deployment of information and digital technologies, %

The analysis of the distribution of investments shows that the uneven distribution of attention of the subjects on regional digital projects, so only the Tyumen region is invested in the development of the Digital Technologies project. The main attention and financing of all subjects of the UFD is concentrated on the project of "Digital State Administration", which in the current realities distorts the demand for technologies in the regions. The positive aspect of financing is that each subject of the UFD develops technologies in the field of information security.

The implementation of strategic objectives for the development of digitalization in the regions led to an increase in ICT budgets in 2019 compared to 2018. Herewith, the growth of expenses in the UFD, pursuant to CNews analytics [20], amounted to 89%, while in the Russian Federation as a whole, this indicator exceeded 35.3% (Table 6).

Table 6 Expenses on ICT by subjects of the UFD, RUR mln.

Subject	Regional expenditures on ICT, RUR mln		The change, %
	2019	2018	
Sverdlovsk region	2,738.7	977.4	180.2
Tyumen region	2,475.8	1,346.1	83.9
YaNAO	2,306.4	924.4	149.5
KMAO	1,985.9	1,701.4	16.7
Chelyabinsk region	1,171.5	674.3	73.7
Kurgan region	261.4	162.5	60.9
Total for the UFD	10,939.7	5,786.1	89.1
For reference:			
Russia	161,389.5	119,312.9	35.3

The exceeding of indicators in the UFD is ensured by the Sverdlovsk region and the YaNAO, which have increased their activity in this area.

Per person, the expenses of the subjects are in the range from RUR 290.4/person (Kurgan region) to RUR 4,612.8/person (YaNAO) (Fig. 2).

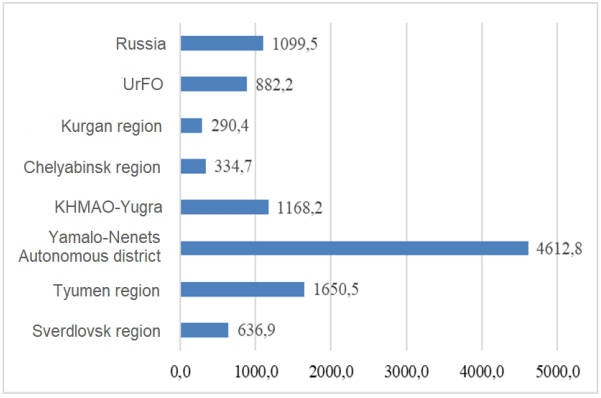

Figure 2 Expenses of the subjects of the UFD on ICT on average per 1 person, RUR/person

The data in the figure indicate a significant excess of the specific indicator for the YaNAO (RUR 4,612.8/person),

which is more than 4 times higher than the national average values. In our opinion, a significant excess of expenses in the YaNAO in comparison with other subjects of the UFD occurs due to the dispersal of the population across the territory of the subject, which necessitates increased costs for the formation of a system of information and digital technologies.

4. DISCUSSION

The issue of research and differentiation of information and digital technologies today can be considered open and not worked out, since there is no official differentiation of these concepts, in research these concepts are interchanged. Herewith, it is worth noting that information technologies determine the process of informatization, digital technologies are the basis of the digitalization process. In the absence of a practical category of "digital technologies", the category of "information technology" is defined by researchers as a factor in the formation of the digital economy [21]. The distinction between digitalization and informatization processes is also a fairly debatable topic [22]. But it is impossible to disagree with the opinion of M. Gilbert, that, within the period from the 1970th till present, these are the different long waves in the continuously developing information era [23]. Also, pursuant to the author, the digitalization stage begins at the moment when the volume of use of electronic information exceeds the volume of use of analog information. Therefore, it is possible to note that digitalization is a transition from mechanical and analog electronic technology to digital electronics [7], but in practice, existing technologies cannot be divided into information or digital technologies pursuant to this classification.

The phased implementation of the strategy for the development and use of information and digital technologies provides for their various uses in accordance with the needs of the regions and depends on the level of their development. Pursuant to N. Roztocki, H. R. Weistroffer [24], it is necessary to consider various factors that provide a positive impact of ICT on the social-and-economic development of regions and the effect of investment. However, specific results may vary since they depend on the level of development of countries (regions), existing infrastructure, culture and government regulation in this area. Herewith, and in many countries, the infrastructure and business culture necessary for the development of ICT are none [25]. The authors also point to the significant role of ICT in the development of infrastructure, and here we can make a reference to the works of Rosenstein-Rodan, the author of the "big push" theory, who substantiated the need for priority investment in the development of infrastructure, which is a kind of an "actuator" ("push") for the development of the main types activities [26].

Aspects of the positive impact of investment in ICT on the economy are considered in the work of S. Samoilenko, K.-M. Osei-Bryson [27], where the authors proposed a methodology for assessing the relationship between investment in ICT and productivity growth. The object of the study is countries with economies in transition, because pursuant to the authors, the link between investment in ICT and GDP growth in developed countries is already proven. The authors use the concept of "white and black boxes", the components of which have varying degrees of transparency when conducting research.

Despite the fact that the demand for information and digital technologies is characterized by positive dynamics (although in the conditions of COVID-19 there has been a change in the structure of demand), nevertheless, the National Research University Higher School of Economics specialists express concern that direct measures of state support without a favorable institutional environment will not lead to increase the innovative activity of enterprises and stimulate mass demand and off-budget investments [28]. Moreover, the planned growth of federal budget expenditures within the framework of the implementation of the strategic priorities for the development of this area may "distort the market behavior of companies, reduce the quality of investments." Researchers express concern that in the face of a shortage of breakthrough developments, relatively weak projects will receive state support, and even significant injections from budgets will not be able to form a high-quality supply of digital technologies in a short time, thereby creating a risk of overestimated expectations.

5. CONCLUSION

Investment management at the regional level requires the development of a strategy aimed at mobilizing resources in priority areas, one of which is the field of information and digital technologies. The importance of the introduction of these technologies, due to their importance in the development of regions, as one of the tools to increase their competitiveness, requires certain investments.

In accordance with the need to achieve the national development goals of Russia, it is necessary to strengthen the involvement of all constituent entities of the Russian Federation in the ongoing changes and to create investment opportunities for the development of all regions. This paper presents the results of the implementation of projects for the development of the studied infrastructure in the context of the subjects of the UFD, which shows the different role of regions in the implementation of strategic priorities of Russia.

The authors' assessment of strategic benchmarks and determination of investment security allows to understand the development trajectory of the UFD, as well as allows to assess the possible negative consequences of potential changes caused by the introduction of information and digital technologies. The researches [29] confirm existence of problems and barriers at use of these technologies in the territory as there is a serious need of understanding of all arising effects for regions. Herewith, investing in the digitalization of the territory will inevitably entail the need to invest in infrastructure in order to radically modernize it [28], which in turn affects all sectors of the economy.

Moreover, it shall be noted that the innovative component of this process inevitably leads to a negative social effect. The projects for the development of information and digital technologies implemented in the subjects within the framework of strategic documents require, in our opinion, careful revision in order to overcome possible negative consequences.

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