Digitalization impact on social and economic development of territory (Russian regions)

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ABSTRACT

The development of the digital economy is a powerful lever that increases the country's competitiveness, improves the quality of life of its population, and ensures economic growth and national sovereignty. In this regard, the digital economy can be considered as a priority vector for an enhanced social and economic development of any country. The relevance of the research topic is determined by the need to improve and modernize the system of state regulation to enhance the process of digitalization. This article analyzes the process of digitalization in various fields of social and economic life and the system of public management, in particular. The analysis is based on data for the city of Moscow, the city of Saint-Petersburg, the Republic of Tatarstan, the Republic of Bashkortostan, and the Saratov Region. The article presents the methodology proposed by the authors for analyzing the process of digitalization, i.e. implementation of digital and information technologies. The analysis involves the calculation of integral indexes, content analysis of regional development strategies, and correlation-regression analysis. The authors conduct a comparative analysis of the introduction of digital technologies in various fields of the social and economic life of the population in the Russian regions, investigate the features of the introduction of digital technologies in the field of public management, and analyze the impact of the digitalization process on the economy of Russian regions. Based on the calculation of subindexes for the success of the digitalization process in the fields of social and economic life and the system of public management, an integral index for the development of digital technologies is obtained, leaders and outsiders are defined, and the main trends and problems in this area are identified.

Keywords: digitalization process, digital economy, digitalization of public management system, Digital Technology Index

Introduction

At the current stage of development, the introduction of digital and information technologies covers all fields of social and economic life. This is a long and complex process of transformation of production, management technologies, and information resources into a form suitable for the effective use of digital technologies in all fields of human life [1, 2]. At the

same time, many scholars (Ardolino M. et al) highlight the obvious benefits derived from the digitization process. These benefits include improving the reliability of data collection, systematization, transmission, and analysis; reducing the cost and simplification of communications; creating a system for interacting people and business processes vertically and horizontally. [3]

The process of digitalization is now under the close attention of scholars and expert communities [4]. According to J.Nasbite, the digitalization is a megatrend of economic development, which is based on the cybernetic methods, management tools, instruments for the analysis of big data, and artificial intelligence. [5] The level of development of the digital economy becomes a decisive factor in increasing the competitiveness of the territory as a whole and directly affects the improvement of the quality of life of its population [6]. Many other authors such as N.Ahmad and P.Schreyer, [7] P.A.Balcerzak and

B.M.Pietrzak, [8] R.Bucht and R.Hicks [9] also investigate this topic.

There are different definitions of the digital economy. The British Computer Society (BCS) defines it as an economy based on digital technologies, doing business in markets that rely on the Internet. [10] According to the World Bank, the digital economy represents a new paradigm of accelerated economic development based on real-time data exchange. [11] The UK Government emphasizes that the digital economy is the production of digital equipment, publishing, media production, and programming. [12] A similar idea is reinforced by K.Kelly, who considers communication in the new conditions as digital technologies and means of communication, therefore, argues that communication is the economy itself. [13]

There are various indexes for evaluating the digitization process: ICT Development Index (IDI), published annually by the International Telecommunication Union (ITU); International Digital Economy and Society Index (I-DESI), calculated by the Directorate-General for Communications Networks, Content and Technology of the European Commission; and IMD World Digital Competitiveness Ranking, calculated by the IMD Business School (Switzerland). In the later, Russia was ranked 38th in 2019. Finally, there is a Bloomberg Innovation Index by the Bloomberg Agency, which has ranked Russia 27th in 2019.

Based on the information provided above, we can draw several conclusions. Even though Russia actively uses digital technologies for effective governance and there is some progress in the introduction of digital technologies, the country is still not among the leading countries in the development of the digital economy. It is necessary to gain momentum and rapidly develop and introduce processes that have been successfully applied in the most developed countries and that provide positive results. The potential benefits of the digital transformation are significant, as it contributes to reducing costs, and optimizing processes in the economy improves the quality of customer service by taking into account personalized ordering, increasing the target audience, and using social networks and Internet resources. This endorses the relevance of the study.

Methods

Russia has not yet developed uniform standards for assessing the digital development for the country, in general, and for its regions, in particular. In our opinion, it is necessary to analyze the process of digitalization comprehensively, studying it in various fields of social and economic life and the system of public management.

Digital public management is the transition to the electronic interaction of citizens with different levels of government: local, regional, and national. However, its implementation contains a risk that the digitalization of public management will become a goal in itself and will be limited to minor changes in the processes of government activity. It is important to ensure that these changes lead to an increase in the quality of the government's activities for its main beneficiaries – citizens. To analyze the current situation, we calculate an integral index consisting of two subindexes: "The development of digitalization in the fields of social and economic life" and "The development of digitalization in the public management system".

Note that the study involves five study objects: the city of Moscow, the city of Saint Petersburg, Republic of Tatarstan, Republic of Bashkortostan, and Saratov Region. The selection of cities/regions for the study was carried out in such a way as to cover regions from different groups: leading regions and outsider regions, which were highlighted in 2017 at the Regional Information System Development Council of the Ministry of Digital Development, Communications and Mass Media of the Russian Federation. The Council has ranked the Russian regions according to the information society development levels. In the ranking, the city of Moscow, the Republic of Tatarstan, and the Republic of Bashkortostan were among the top ten regions and were ranked the 1st, 4th, and 7th, respectively; the city of Saint Petersburg, although not included in the group of leaders, was ranked the 11th place; the Saratov Region was ranked 51st out of 83, which means that the region can be considered as one of the lagging regions in terms of information society development levels.

The indexes are calculated according to the selected criteria for the period from 2013-2018, based on the following formula: $i = x1/(x0)$, where $x1$ is the value of the reporting (current) period, and $x0$ is the value of the base period.

The final indexes for each block are calculated as an arithmetic average for 6 years, and the integral subindex on "The development of digitalization in the fields of social and economic life" is determined. The calculations are made based on the selected parameters for 7 blocks:

1) in the field of housing services utilities, the following parameters, assessing the comprehensiveness of information posted on the portal of the state information system, are used: the share of posted services (agencies and organizations), the share of posted buildings, the share of posted of metering devices, the share of posted customer accounts, and the share of posted payment documents;

2) in the field of transport infrastructure, the number of stationary complexes of road cameras, the number of mobile complexes of road cameras, the share of roads for which the quality of cleaning is monitored in automatic mode are analyzed;

3) in the field of public safety, we consider the share of the population covered by the system for providing emergency service calls to a single number "112" based on the integrated national information system" GLONASS+112»;

4) in the field of communication, we analyze the costs of information and communication technologies, the share of electronic document management in organizations, the share of personal computers and access to the Internet by the households, the number of registered mobile devices per 1000 inhabitants;

5) in the field of environmental safety, an indicator of implementation of innovations that ensure an increase in environmental safety in the production of goods, works, services are used;

6) in the field of education and culture, the share of students of state educational organizations that keep electronic diaries and journals, the share of cultural institutions connected to information systems that automate the work of institutions, and the share of central public libraries connected to an automated library information system are measured;

7) in the field of healthcare, the share of medical organizations connected to the e-health system is considered.

Similarly, the second subindex on "The development of digitalization in the public management system" is calculated, using the following measures:

1) the share of local and regional government institutions that use the interagency electronic interaction system in providing public services;

2) the share of multifunctional centers providing public services;

3) the share of citizens receiving public services in the electronic form;

4) the share of electronic document circulation in the public authorities;

5) the share of government services provided in the electronic format.

For a more in-depth qualitative analysis of the implementation of digital technologies in the field of public management, the respective regulatory and legal framework of the Russian cities and regions is analyzed. Moreover, the authors conducted a content analysis of the following main strategic documents of the five cities and regions concerning their focus on the process of digitalization and the development of the digital economy:

− The social and economic development strategy of the city of Moscow for the period up to 2025;

− The social and economic development strategy of the city of Saint Petersburg for the period up to 2030;

− The strategy of social and economic development of the Republic of Tatarstan for the period up to 2030;

− The strategy of social and economic development of the Republic of Bashkortostan for the period up to 2030;

− The strategy of social and economic development of the Saratov Region for the period up to 2030.

All these measures were included in the integrated subindex "The development of digitalization in the public management system".

Results

Based on the analysis of the degree of implementation of digital technologies in various fields of social and economic life, we come to the following conclusions. There is a gap in the level of digitalization development between different cities and regions. The highest results are observed for the city of Moscow, which is a leader in the introduction of digital technologies. The lowest results among the considered cities/regions are observed for the Saratov Region, with the index values remaining at or below average for the most fields of social and economic life. The difference between the highest and lowest indexes is 0.32. Indexes for the city of Saint Petersburg, the Republic of Tatarstan, and the Republic of Bashkortostan vary in the range from 0.5 to 0.7. We should also emphasize that all indexes for the regions participating in the study exceed the 0.5 marks and, therefore, represent higher-than-average results. The final subindex is presented in Figure 1.
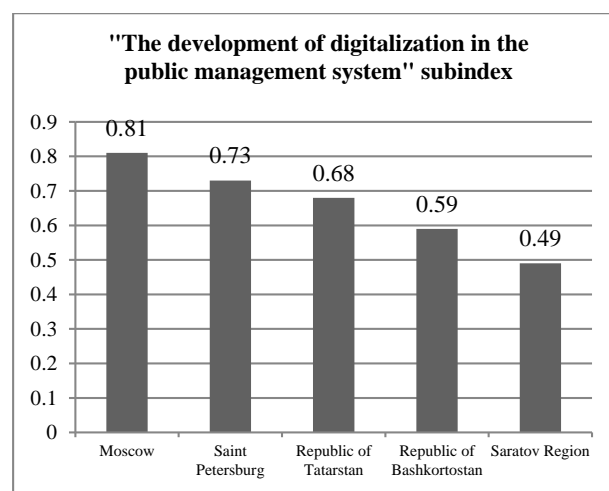

Figure 1. "The development of digitalization in the public management system" subindex

Considering the governance, it is necessary to note that the following local and regional projects are being implemented in all regions of Russia:

− digital public management;

− digital technology;

− information security;

− human resources for the digital economy;

− information infrastructure;

− single digital healthcare platform based on the unified state information system;

− modern digital educational environment;

− digital of services and formation of information space in the field of culture.

The analysis of the regulatory framework of the five cities/regions allows us to draw the following conclusions. The earliest strategic documents in the field of digitalization were created in the city of Saint Petersburg. The concept of "Strategy of Saint Petersburg's transition to an information society" was first prepared in 1999. The largest number of regulatory documents in the field of digitalization is observed in the Republic of Tatarstan. In the region, the following documents have been implemented or are still active:

1) Open Tatarstan State Program "Development of information and communication technologies in the Republic of Tatarstan" (2014-2022, previously 2011-2013);

2) Integrated Program "Electronic Tatarstan" (2005-2010), whose purpose is to ensure a sustainable social and economic development of the Republic of Tatarstan and to improve the quality of life of the population through the introduction and widespread use of innovative information and communication technologies, the creation of a unified information space;

3) Resolution of the Cabinet of Ministers of the Republic of Tatarstan "On the unified interdepartmental electronic document management system" (dated 31.12.2009);

4) Law of the Republic of Tatarstan "On information systems and information system development in the Republic of Tatarstan" (dated 13.11.2007 with the amendments of October 13, 2018).

5) "Development of information system in healthcare" subprogram of the State Program "Development of healthcare of the Republic of Tatarstan for the period up to 2021".

The city of Moscow has the lowest number of existing regulatory documents - 1.

Based on the analysis of the development of digitalization in the public management system, we come to the following conclusions: the leader in the development of digital technologies in the field of public management is the Republic of Tatarstan, the index of the Republic is 0.94. This result is confirmed by several factors: a high level of regulatory support, achieved goals under government programs, a standardized system of indicators for various areas of digitalization, etc. The final results are presented in Table 1.

Table 1. Summary of "The development of digitalization in the public management system" subindex

№	City/Region	Index for statistical indicators	Index for regulatory support	Index for content analysis results	"The development of digitalization in the public management system" subindex
1	City of Moscow	0.74	0.25	0.14	0.38
2	City of Saint Petersburg	0.71	0.5	0.71	0.64
3	Republic of Tatarstan	0.82	1	1	0.94
4	Republic of Bashkortostan	0,81	0,75	0,71	0,76
5	Saratov Region	0.5	0.5	0.29	0.43

As shown in Table 1, the index values for the following two regions fall in the range from 0.6 to 0.8: the city of Saint Petersburg (0.64) and the Republic of Bashkortostan (0.76). The lowest results for the development of digital technologies in the field of public management belong to the city of Moscow and Saratov Region, the values of the indexes equal to 0.38 and 0.43, respectively.

We propose the following hypothesis: with a high level of digital technologies in the field of public management, the level of digitalization in all spheres of life increases. Therefore, the value of the "The development of digitalization in the fields of social and economic life" subindex should exceed "The development of digitalization in the public management system" subindex.

We perform a comparative analysis of the two subindexes to find out the relationship between the two (see Figure 2).
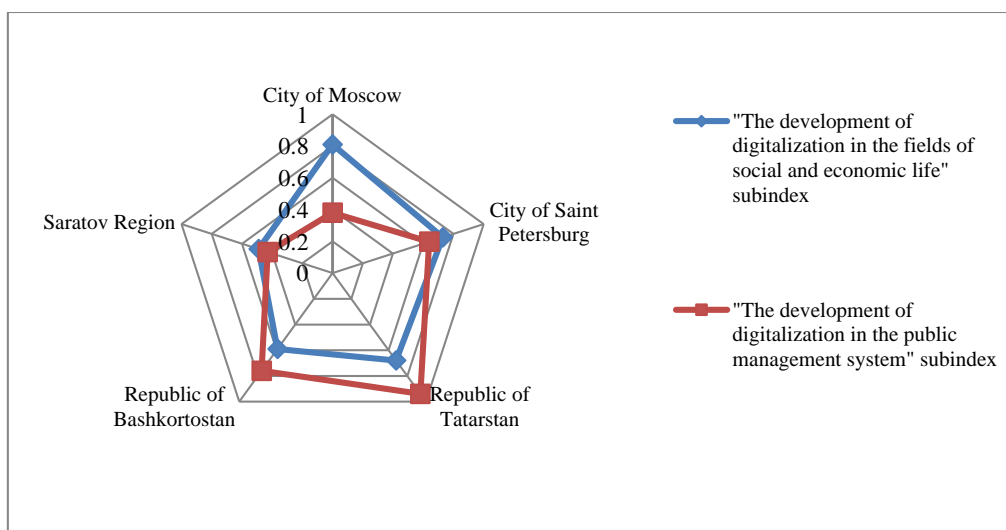

Figure 2. Comparative analysis of subindex values for the cities/regions

This assumption was confirmed only in the cases of the Republic of Tatarstan and the Republic of Bashkortostan. In the Saratov region, the values of subindexes are approximately the same (0.49 and 0.43). For the cities of Moscow and Saint Petersburg,

the value of the "The development of digitalization in the fields of social and economic life" subindex significantly exceeds the value of the "The development of digitalization in the public

management system" subindex. This is probably due to the high population density in these cities.

Thus, we find that not in all cases there is a direct relationship between the level of the public management system and the level of digitalization in the fields of social and economic life.

Discussion

The resulting integral indexes for the development of digital technologies in the considered cities/regions are presented in the diagram below (see Figure 3).
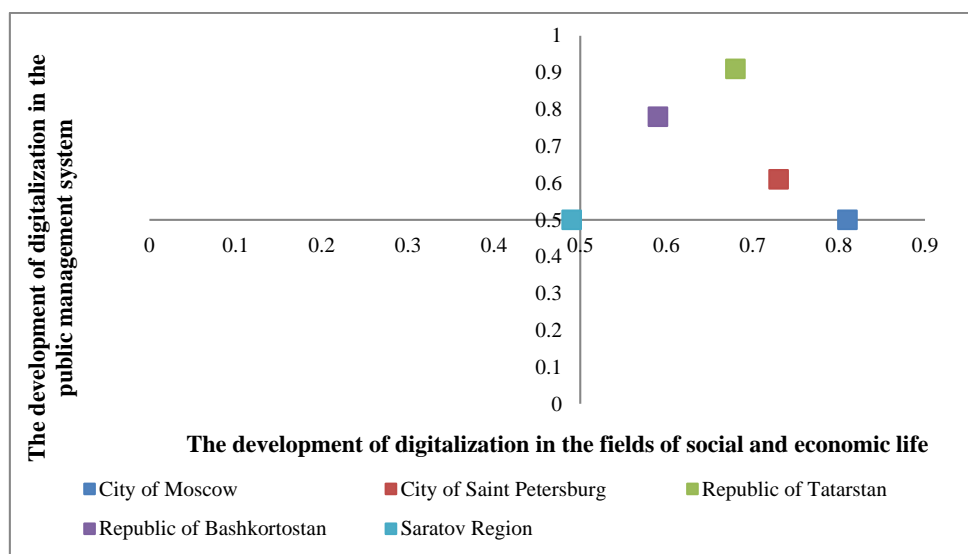

Figure 3. The results of the evaluation of the level of digitalization

The figure shows that the highest results are obtained for the Republic of Tatarstan. The city of Saint Petersburg and the Republic of Bashkortostan display relatively good levels of digitalization development. In the case of the city of Moscow, the situation is ambiguous: the level of digitalization in the public management system is relatively low, whereas the level of digitalization in the spheres of life is quite high. According to the results of the study, the outsider is the Saratov Region, which has most of its indexes below or equal to 0.5.

Further, to identify the relationship between the process of digitalization and the economic development of regions, a correlation and regression analysis is performed.

The following variables are used as dependent variables in the correlation-regression analysis: the proportion of households with a personal computer (Y1), the Internet usage by the

population (Y2), and the number of registered mobile devices per 1000 inhabitants (Y3).

The variables X are represented by:
1) unemployment rate;
2) per capita monetary income of the population;
3) fixed capital investments;
4) the volume of shipped goods of own production, works and services performed;
5) retail trade turnover;
6) wholesale trade volume;
7) developed advanced production technologies;
8) the volume of innovative goods, works, and services.

Table 2 presents the results of correlation and regression analysis of Russian cities/regions for those indicators for which dependencies were found.

№	The dependent variable	The independent variable, correlated with Y	The strength of the relationship on the Chaddock scale	The importance of Student's Test	The quality of the model on Fisher's Test	The significance of R–Statistics
			City of Moscow			
1	The proportion of households with a personal computer (Y1)	Retail trade turnover (X5)	High	Not significant	Low	Not significant
2	Internet usage by the population (Y2)	The volume of wholesale trade (X6)	Very high	Significant	Good	Significant
3	Number of registered mobile devices per 1000 inhabitants (Y3)	Per capita monetary income of the population (X2)	Very high	Significant	Good	Significant
			City of Saint Petersburg			
1	The proportion of households with a personal computer (Y1)	No correlating factors	-	-	-	-
2	Internet usage by the population (Y2)	Investments in fixed capital (X3)	Very high	Significant	Good	Significant
3	Number of registered mobile devices per 1000 inhabitants (Y3)	No correlating factors	-	-	-	-

Table 2. Results of the correlation and regression analysis of Russian regions

Republic of Tatarstan						
1	The proportion of households that had a personal computer (Y1)	Developed advanced manufacturing technologies (X7)	High	Not significant	Low	Not significant
2	Internet usage by the population (Y2)	The volume of wholesale trade (X6)	Very high	Significant	Good	Significant
3	Number of registered mobile devices per 1000 inhabitants (Y3)	The volume of wholesale trade (X6)	High	Not significant	Low	Not significant
Republic of Bashkortostan						
1	The proportion of households with a personal computer (Y1)	Per capita monetary income of the population (x2)	Very high	Significant	Good	Significant
2	Internet usage by the population (Y2)	Retail trade turnover (X5)	Very high	Significant	Good	Significant
3	Number of registered mobile devices per 1000 inhabitants (Y3)	Unemployment rate (X1)	High	Not significant	Low	Not significant
Saratov Region						
1	The proportion of households with a personal computer (Y1)	The volume of wholesale trade (X6)	Very high	Significant	Good	Significant
2	Internet usage by the population (Y2)	Retail trade turnover (X5)	Very high	Significant	Good	Significant
3	Number of registered mobile devices per 1000 inhabitants (Y3)	No correlating factors	-	-	-	-

Conclusion

As a result of correlation and regression analysis, various dependencies between the factors of digitalization development and the economic indicators of regions are identified. The analysis suggests that the development of digital technologies, in general, contributes to the development of regions.

Over the past 6 years, from 2013 to 2018, there has been a positive trend in the introduction of digital technologies in various fields of social and economic life in the Russian regions included in the study. Only one region – the Saratov Region – demonstrates moderate results. This can be explained by the fact that the Saratov Region is currently experiencing a deep stagnation and near-to-zero growth. The region takes bottom positions in many national rankings (for example, birth rates ranking, etc.), suffers from several acute environmental problems, and has low investment attractiveness**.**

Acknowledgments

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