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DEVELOPMENT OF THE INFORMATION SOCIETY: EXPERIENCE OF RUSSIAN REGIONS

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ABSTRACT

Goal: The study aims to assess the level of development of the information society in the regions of Russia. The use of digital technology is gaining relevance in many areas and dramatically simplifies the life of a modern person. This has become the basis for the formation of the information society, in which information and digital technology contribute to the emergence of qualitatively novel socio-economic conditions of life. The study of the information society is carried out mainly with regard to each state, while the study of its formation and development in individual regions of the country remains less researched. In this connection, the present study attempts to examine the dynamics of the development of the information society in various regions of Russia. **Methods:** The study is based on the mathematical method of calculating normalized indicators, the calculation of integral scores, the ranking and comparative analysis of data, and the method of classification. The information society in the selected regions of Russia is examined in terms of the dynamics of change, the status of its individual aspects, and the overall level of development achieved. **Results:** The results of the assessment and comparative analysis lead to the following conclusions. The development of the information society in each region of Russia has its own specifics. It is extremely difficult to identify common universal trends or patterns of its development in different constituent entities of Russia. **Conclusion:** In this context, of particular relevance is the development of a regional, rather than national, digitalization policy. The main directions for a regional policy should be determined in accordance with the peculiarities of the dynamics of information society development in the specific socio-cultural and economic environment of the region. Furthermore, it is crucial to consider the key issues and overall state of the region's information society achieved to date compared to other territories.

Keywords: Information society; Region; Regional policy; Digitalization; Digital technologies; Internet.

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DESENVOLVIMENTO DA SOCIEDADE DA INFORMAÇÃO: EXPERIÊNCIA DAS REGIÕES RUSSAS

RESUMO

Objectivo: O estudo visa avaliar o nível de desenvolvimento da sociedade da informação nas regiões da Rússia. A utilização da tecnologia digital está a ganhar relevância em muitas áreas e simplifica dramaticamente a vida de uma pessoa moderna. Esta tornou-se a base para a formação da sociedade da informação, na qual a informação e a tecnologia digital contribuem para a emergência de condições sócio-económicas qualitativamente novas de vida. O estudo da sociedade da informação é realizado principalmente em relação a cada estado, enquanto o estudo da sua formação e desenvolvimento em regiões individuais do país continua a ser menos investigado. A este respeito, o presente estudo tenta examinar a dinâmica do desenvolvimento da sociedade da informação em várias regiões da Rússia. **Métodos**: O estudo baseia-se no método matemático de cálculo dos indicadores normalizados, no cálculo das pontuações integrais, na classificação e análise comparativa dos dados, e no método de classificação. A sociedade da informação nas regiões seleccionadas da Rússia é examinada em termos da dinâmica de mudança, do estatuto dos seus aspectos individuais, e do nível global de desenvolvimento alcançado. **Resultados**: Os resultados da avaliação e da análise comparativa conduzem às seguintes conclusões. O desenvolvimento da sociedade da informação em cada região da Rússia tem as suas próprias especificidades. É extremamente difícil identificar tendências ou padrões universais comuns do seu desenvolvimento em diferentes entidades constituintes da Rússia. **Conclusão**: Neste contexto, de particular relevância é o desenvolvimento de uma política de digitalização regional, em vez de nacional. As principais orientações de uma política regional devem ser determinadas de acordo com as peculiaridades da dinâmica de desenvolvimento da sociedade da informação no ambiente sócio-cultural e económico específico da região. Além disso, é crucial considerar as questões-chave e o estado global da sociedade da informação da região alcançado até à data em comparação com outros territórios.

Palavras-chave: Sociedade da informação; Região; Política regional; Digitalização; Tecnologias digitais; Internet.

1 INTRODUCTION

Digital technologies have become an integral part of the modern world. Their use is gaining importance in many areas of society: in economic relations of sale and purchase (Alvarenga et al., 2020; Garcia-Teruel, 2020; Geissinger et al., 2019), public administration and the provision of state and municipal services to the population (Androniceanu et al., 2020; Henman, 2020; Matheus & Janssen, 2020), the management of socio-economic processes (Badii et al., 2021; Baudier et al., 2020; Ma & Wu, 2020), education and health care (Sharma et al., 2020), energy efficiency issues (Tagliabue et al., 2021; Wu et al., 2019; Zekić-Sušac et al., 2021), and so forth. From the position of an individual, this dissemination of information and

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communications technology (ICT) has many advantages: faster communication, the ability to receive state and municipal services at a convenient time without unnecessary paperwork, a wider range of goods, and no queues when making purchases, and more. In particular, P. Baudier, C. Ammi, and M. Deboeuf-Rouchon (2020) in their study of the effects of digital technology on students reveal that the use of ICT in the household had the best impact on student productivity and performance. In view of this influence of digitalization, an information society can be defined as a society in which information and information processing technologies provide a significant improvement in the economic and sociocultural conditions of people's lives (President of the Russian Federation, 2017).

However, it is vital to understand that the development of the information society requires special preparation and effort both on the part of citizens and the government. Firstly, there is a need for specialized technical tools for working with digital information: personal computers, various mobile devices, Internet access, special software for working with data, etc. Meanwhile, as noted by J. Schou and A.S. Pors (2019), unequal access to or lack of these tools becomes a factor that further aggravates socio-economic inequality. This fact brings to the fore the active participation of the state in the digitalization process (Boin et al., 2020; Gabryelczyk, 2020; Kirillova et al., 2022).

Secondly, digitalization assumes the formation of a special culture in society. The public has to have particular information skills, show not just the capability but the desire to buy goods online in addition to regular stores, have access to electronic state and municipal services, and so on. That is, society itself has to be able to work with information and be interested in using digital technology to do so (Van Wart et al., 2019).

For these reasons, the study of the modern information society and public policy aimed at its development becomes ever more pressing. However, we can note that the study of the information society and digitalization issues is mainly focused on individual states, while the study of its formation and development in specific regions of the country remains much less studied, although no less relevant due to regional differences. Therefore, the present study attempts to examine the dynamics of the development of the information society in separate regions of Russia.

2 METHODS

Within the framework of this study the development of the information society is

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considered in the context of such regions of Russia as the Republics of Bashkortostan, Mari El, Mordovia, Tatarstan, Udmurtia, and Chuvashia. Historically, republics as a type of Russia's constituent entities have had more opportunities for development due to their national and cultural features. For this reason, the republics often have different experiences of development and are of greater interest for the study of socio-economic processes, including the formation of the information society.

One of the basic regulatory acts currently regulating the process of digitalization in the Russian Federation is the Strategy for the development of the information society in the Russian Federation until 2030 (President of the Russian Federation, 2017). This document and its goals define the basic indicators of the development of the information society in Russia and its regions. Official statistics that comprehensively describe the state of the information society in the country are collected annually according to these indicators. Consequently, in order to compare the state of the information society in the different regions of Russia, these indicators and statistical information for each of them are used as the main data. To assess the dynamics of the development of the information society in Russian regions, we reviewed the data for 2015, 2018, and 2020 (Federal State Statistics Service, n.d.).

For a comprehensive assessment of the level of development of the information society in the Russian regions, statistical indicators were classified into the following thematic blocks:

- Internet access and opportunities for its use (this block includes indicators showing whether the population has Internet access and the required gadgets – personal computers, smartphones, etc.);
- Information skills (this thematic block comprises indicators that demonstrate citizens' ability to process information in the form of text, video, tables, etc., i.e., to work with the required software);
- The use of digital technology in different life situations (this covers information about whether the population of Russian regions uses ICT to shop for goods and services and to pay for them, to access state and municipal services);
- Reasons for not using information technology (this block considers the data on why some people have so far been reluctant to use the Internet and digital technology).

Due to the differences in the level and orientation of the indicators used, their normalization was carried out. This procedure was conducted using the Pattern method, which brought all the indicators to a single uniform form and a common scale

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of measurement in the range [0;1], with 1 being the highest value of the indicator among the regions (Eremeeva et al., 2021). This method involves the normalization of quantitative indicators and their recalculation according to the following formulas:

$$X_{ij}^{*} = \frac{X_{ij}}{X_{ij}^{max}} \quad (1)$$

The above formula is applied if the highest indicator value is best, or:

$$X_{ij}^{*} = 1 - \frac{X_{ij}}{X_{ij}^{max}} \quad (2)$$

if the lowest indicator value is optimal.

In these formulas, in which X_{ij}^{*} – the normalized i-th indicator of the j-th region in a separate study period (year), X_{ij} – the value of the i-th indicator of the j-th region in the given year, and X_{ij}^{max} – the maximum value of the i-th indicator among the regions in the given period (year).

As previously noted, the statistical indicators were divided into different thematic blocks. For each of the blocks, the intermediate subindex of the region was calculated according to the formula:

$$I_{ij} = \frac{\sum X_{ij}^{*}}{n} \quad (3)$$

where: I_{ij} – the separate thematic subindex of the region in the separate studied period (year), X^{*}_{ij} – the normalized i-th indicator of j-th region included in the subindex, and n – the number of standardized indicators used in calculating the subindex. The described method for calculating subindices for each of the thematic blocks brings their values to a common scale in the interval [0;1] regardless of the number of indicators used and their direction.

For a more in-depth analysis of the status of the information society and its individual aspects, the study also examined the mean scores of each region for each thematic block, which were calculated as the arithmetic mean of the region's scores for a particular thematic block over the entire time period under evaluation.

The final integral score of each region for a certain period of time was calculated as

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the arithmetic mean of all its thematic subindices. Since the integral assessment was calculated for each region of the Russian Federation as of 2015, 2018, and 2020, we were able to assess both the dynamics of the information society development in each region and to compare the regions with each other.

Finally, the ranking method was applied to assess the attained level of information society development. The ranking was conducted in descending order from the first highest rank, assigned to the region with the highest average integral score for all periods considered, to the sixth lowest rank. This allowed for a final comparison of the regions, considering all the indicators of different thematic blocks and their changes over the analyzed time period.

3 RESULTS

The mathematical normalization of statistical indicators and the calculation of regional subindices on their basis produced the following results (Table 1).

Table 1. Subindices of information society development in the regions of Russia

Thematic blocks	**Republic of Bashkortostan**			**Mari El Republic**			**Republic of Mordovia**		
Time period	**2015**	**2018**	**2020**	**2015**	**2018**	**2020**	**2015**	**2018**	**2020**
Internet access	0,66	0.86	0.88	0.70	0.41	0.70	0.66	0.67	0.64
Information skills	0.62	0.68	0.83	0.81	0.69	0.91	0.74	0.75	0.55
The use of digital opportunities	0.41	0.62	0.69	0.35	0.70	0.67	0.42	0.66	0.75
Reasons for not using the Internet	0.58	0.28	0.26	0.47	0.41	0.12	0.43	0.46	0.18
Final integral score of the region	**0.57**	**0.61**	**0.67**	**0.58**	**0.55**	**0.60**	**0.56**	**0.64**	**0.53**

Continuation of Table 1.

Thematic blocks	**Republic of Tatarstan**			**Udmurt Republic**			**Chuvash Republic**		
Time period	**2015**	**2018**	**2020**	**2015**	**2018**	**2020**	**2015**	**2018**	**2020**
Internet access	0.87	0.95	0.67	0.65	0.73	0.70	0.69	0.70	0.68
Information skills	0.74	0.68	0.86	0.86	0.69	0.83	0.86	1.00	0.94
The use of digital opportunities	0.76	0.83	0.85	0.42	0.71	0.78	0.77	0.87	0.83
Reasons for not using the Internet	0.48	0.40	0.39	0.79	0.02	0.42	0.47	0.41	0.23
Final integral score of the region	**0.71**	**0.72**	**0.69**	**0.68**	**0.54**	**0.68**	**0.70**	**0.75**	**0.67**

The calculated regional subindices by individual thematic blocks suggest that the indicators of information society development are unstable, and that it is extremely difficult to identify common trends in their development. This entails the instability of the final integral score of each region, which can be clearly observed in Figure 1.

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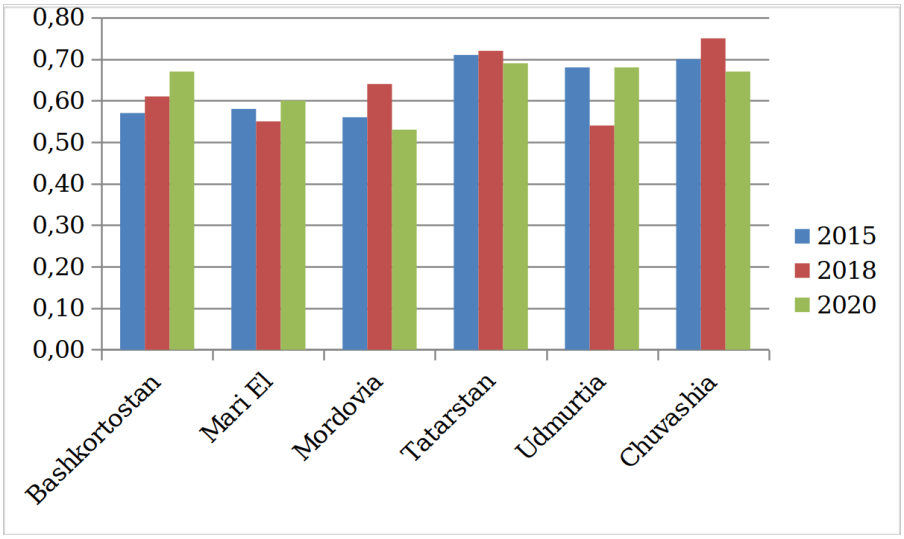

Figure 1. Changes in the integral assessment of information society development in Russian regions

The figure readily demonstrates that a steady increase in the score, indicating the gradual development of the information society, is observed only in the Republic of Bashkortostan. In other regions, the state of the information society and the dynamics of its changes are diverse. Moreover, it is hardly possible to identify common trends relevant to all regions or to a particular group of regions. This observation confirms that the development of the information society in different constituent entities of Russia proceeds differently and requires dissimilar involvement of the authorities.

As part of the study, analysis was carried out not only with respect to individual regions, but also by time periods. Its results are graphically presented in Figure 2.

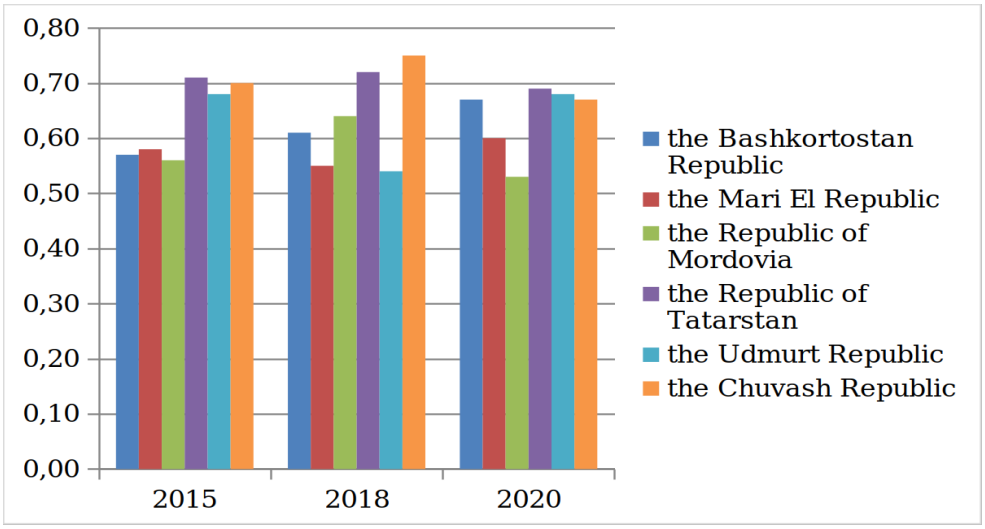

Figure 2. Changes in the integral assessment of information society development in Russian regions across different time periods

The abode figure also suggests that common trends in the development of the

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information society are difficult to identify within the studied time frame. There are no general downward or upward trends characteristic of the selected period. This finding also confirms the presence of peculiarities in the development of the information society in various regions of Russia, regardless of the general trends of digitalization and the formation of an information society in the Russian Federation.

Due to the specific features of the development of the information society in each of the studied regions, we conducted a more thorough analysis of the scores of various information society aspects in each region. The strengths and weaknesses of each region's information society were identified by calculating the mean values of the thematic subindices. The results of the calculations are provided in Table 2.

Table 2. Mean value of the subindices of information society development in Russian regions

	Bashkortostan	Mari El	Mordovia	Tatarstan	Udmurtia	Chuvashia
Internet access	0.8	0.6	0.66	0.83	0.69	0.69
Information skills	0.71	0.8	0.68	0.76	0.79	0.93
The use of digital opportunities	0.57	0.57	0.61	0.81	0.64	0.82
Reasons for not using the Internet	0.37	0.33	0.36	0.42	0.41	0.37

The information in Table 2 suggests a conclusion that particular problems of digitalization remain unsolved. This has implications for the level of development of the information society in the regions. According to the urgency of the problems, the regions can be conditionally divided into three groups:

- Regions in which problems with Internet access remain more acute – the Republics of Mari El, Udmurtia, and Chuvashia. Access to digital technology is influenced both by financial difficulties (the high cost of Internet connection in the Republic of Mari El) and technical challenges (technical problems of Internet connection in the Udmurt and Chuvash Republics);
- Regions whose populations are challenged by a lack of information and digital skills – the Republic of Mordovia. This region also experiences technical problems with Internet access. However, the residents of the Republic themselves note that so far people are more likely to reject ICT and the Internet due to a lack of digital skills;
- Regions where people have not yet fully realized the benefits of digitalization – the Republics of Tatarstan and Bashkortostan. There the share of citizens not using the Internet is lower than in other constituent entities of Russia and gradually reduces even further. However, among those who eschew ICT, the main reason for not using

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the Internet remains the personal disinterest of a part of the population, despite the possibilities of digitalization. This fact can be interpreted as an indirect indicator that the benefits of digital technology are not yet understood by this group.

The described difficulties and shortcomings affect the final score of information society development in some regions of Russia, which is shown in Table 3.

Table 3. Final assessment of the development of information society in Russian regions

	2015	2018	2020	Mean integral score	Rank
Republic of Bashkortostan	0.57	0.61	0.67	0.6141	4
Mari El Republic	0.58	0.55	0.60	0.5783	5
Republic of Mordovia	0.56	0.64	0.53	0.5758	6
Republic of Tatarstan	0.71	0.72	0.69	0.7067	1
Udmurt Republic	0.68	0.54	0.68	0.6333	3
Chuvash Republic	0.70	0.75	0.67	0.7042	2

From the information presented in Table 3, we can note that the scores of the regions do not differ markedly: all the scores fall within the interval (0.57: 0.71). This testifies to the general and inevitable trend of digitalization in Russian society. Yet the conditions and opportunities of digitalization vary from region to region, which gives grounds for rating the scores and, accordingly, for classifying the regions, i.e. identifying the groups with roughly the same level of development of the information society. In this way, we can distinguish the following groups: the Republics of Tatarstan and Chuvashia, which have relatively high levels of information society development (a score of 0.71), the Republics of Udmurtia and Bashkortostan with an average level (a score of 0.62), and the Republics of Mari El and Mordovia at a relatively low level (a score of 0.58).

Notably, these groups differ from the classification of the regions by the most prominent problems in the development of the information society. This fact also demonstrates that trends in information society development vary across the regions of Russia. This is the reason why it is difficult to pinpoint common problems that most strongly affect information society development and, consequently, provide universal suggestions for overcoming them through a targeted public policy.

4 CONCLUSION

The following results were obtained as a result of the study:

Firstly, the modern digital environment invariably leads to the formation of an information society in every region of Russia. That being said, the trends and level of

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information society development considerably vary across Russian regions. For this reason, as demonstrated by the comparative analysis of the regions by time periods, separate aspects, and the overall level of information society development attained, it turns out to be extremely difficult to detect common patterns and models of the development of the information society in the regions of Russia.

Secondly, it is not easy to identify common patterns and relationships between the level and trends of information society development and the associated problems of Russian regions. For instance, the Republics of Tatarstan and Bashkortostan have approximately the same levels of citizens' access to the Internet and digital information skills. Yet despite these similarities, the level of digital technology use by the population is much higher in Tatarstan as compared to Bashkortostan. Thus, the general levels of information society development are markedly different in the two regions, which may relate not so much to digitalization as to the overall sociocultural and economic differences.

Overall, it can be pointed out that so far the regions of Russia have significant discrepancies in the most topical problems of information society development. Meanwhile, these problems have varied effects on the ultimate level of digitalization. For this reason, identifying general universal models for state regulation or measures relevant for the digitalization of all regions of the country appears to be not only challenging but inexpedient.

Thirdly, since the information societies of individual regions have their distinctive characteristics, as well as due to the chaotic nature of changes of the information society in the studied time frame, the most topical issue appears to be the development of regional policies focused on the development of the information society. In this, the main directions of regional policy need to be defined in accordance with the peculiarities of the dynamics of information society development in the specific socio-cultural and economic environment of the region. Furthermore, it is crucial to consider the key issues and overall state of the region's information society achieved to date compared to other territories.

The development of such policies at the level of each region will allow for creating an information society in which information and digital technology would truly create qualitatively new economic and sociocultural conditions of life.

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