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CROSS-BORDER DIGITALIZATION OF THE WESTERN BORDER OF RUSSIA: POTENTIAL AND PROSPECTS

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Border regions are significant geostrategic territories, which long-term sustainable development is one of the priorities of Russia's national security. The specificity of their economic-geographical position necessitates the development and implementation by the authorities of special governance approaches aimed at finding a balance between the openness and barrier function of the state border. One of the most common tools for the spatial development of border areas is the sustainable cross-border cooperation with the regions of neighboring countries using various froms of cross-border cooperation, incl. focused on the generation and diffusion of innovations. The covid-19 coronavirus pandemic, having become a truly global challenge of our time, has made significant changes not only in the policies of many countries regarding the border, but also in the functioning of already established cross-border regions. The impossibility of fully implementing the previous formats of interethnic and interregional interaction has necessitated the search for new forms of cooperation, primarily based on the use of rapidly developing digital technologies. This led to the growth of academic and practical interest in substantiating the mutual effects of digitalization, innovation and internationalization for the regions. This article is devoted to assessing the potential and prospects of cross-border digitalization of the Western borderland of Russia. The objectives of the study were to identify the gap between border regions in the level of accessibility and penetration of digital technologies, as a significant condition for the formation of cross-border digital connections. The object of study is 15 subjects of the Russian Federation and 17 regions of NUTS 2 neighboring states. Using geoinformation and statistical methods of analysis, a typology of regions by the value of the digitalization index is proposed, with the allocation of leaders, moderate and lagging regions, and an assessment of their spatial location relative to the state border. Possible reasons for the current digital inequality, primarily of a socio-economic nature, are discussed. The determining role of the institutional factor in realizing the potential of cross-border digitalization has been substantiated. It is concluded that political efforts for digital convergence in the western direction are being undertaken only between Russia and Belarus, although further intensification is required.

Keywords:
border region, digital divide, cross-border digital space, internationalization, innovation, digital transformation, Internet coverage

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Introduction and problem setting

The rapid development of ICT innovations has had a positive impact on revamping both high-tech and traditional areas of the economy, triggering the process of digitalization. Some countries have already launched initiatives to implement a digital transformation model based on the Fourth Industrial Revolution technologies as a driver of socio-economic development. These are Industrial Internet (US), Industry 4.0 (Germany), Internet+ (China), etc. [1]. In the debate on globalization and digitalization, Russian and international researchers [2; 3] have identified digital data and information as the principal resources for economic growth in the 21st century, calling them 'new oil'.

The digital agenda is seen as a priority by major supranational associations.[1] At the forefront are digital inclusion and universal Internet access; stronger international digital cooperation based on the principles of digital trust and security; cybersecurity and the protection of human rights in the global digital space; the introduction of legislation in the area; AI development[2] [4; 5].

The outbreak of the coronavirus pandemic in 2020 fueled the debate on digital transformation at various governance levels and gave impetus to national and international initiatives on e-government, digital economy, online communications and secure data sharing [6]. Restrictions imposed by many governments to prevent the spread of Covid-19 and mitigate its consequences contributed significantly to the process. In the new environment, sustainable economic development strategies are increasingly based on combining the approaches of internationalization, innovation and digitalization [7]. This creates the need for new forms and tools of cooperation.

The problem of digital transformation is particularly acute in the border regions [8] involved in cross-border regionalization. The closure of national borders as the Covid-19 infection rate started to grow undermined the socio-economic and political sustainability of some long-established cross-border regions. A study [9] of two cross-border regions in Northern Europe notes that the asymmetry of regional policies implemented by the national authorities on both sides of the border in the early months of the pandemic created tension in local border communities, corroding trust between actors amid growing nationalist sentiment.

[1] Such as the United Nations (UN), the Eurasian Economic Union (EAEU), the Organisation of Economic Co-operation and Development (OECD), the European Union (EU), the Group of Twenty (G20), BRICS, Association of South East Asian Nations (ASEAN), etc.
[2] Roadmap for Digital Cooperation: recommendations of the High-level Panel on Digital Cooperation, 2020, Report of the Secretary-General No. A/74/821, UN General Assembly. URL: https://documents-dds-ny.un.org/doc/UNDOC/GEN/N20/102/53/PDF/N2010253.pdf (accessed: 07.08.2021).

Polish-German border regions [10] also showed a lack of coherence in multi-level cross-border crisis response management. The authors of the study emphasize the role of cross-border digital initiatives, which, along with civil society actors, made it possible to preserve the existing bilateral ties, especially those in culture and education.

Much of the current research on digital globalization and integration assesses the economic effect of these processes [3]. However, the spatial and institutional features of digitalization in border regions remain poorly understood. There are few studies into inter-regional digital disparities and their impact on socio-economic dynamics in border regions.

Focused on the formation of unified transboundary digital spaces across Russian borders, this study aims to contribute to the concept of digital cross-border cooperation by describing the conditions necessary for its development. The article evaluates digital disparities between the border regions of European Russia and the neighbouring states and how they unlock their potential for westward cross-border digitalization. This hypothesis is based on the assumption that the huge gap between border regions in the availability and penetration of digital technologies will stymie the intensification of cross-border digital connections and, eventually, the formation of a common digital space.

Methods

The study used data on 15 border territories of the Russian Federation (the Murmansk, Leningrad, Pskov, Kaliningrad, Smolensk, Bryansk, Kursk, Belgorod, Voronezh, Rostov regions, the Republics of Karelia and Crimea, the Krasnodar region, the cities of St Petersburg and Sevastopol) and 17 NUTS 2 regions of the neighbouring states: Norway (Northern Norway), Finland (Northern and Eastern Finland, Southern Finland), Estonia, Latvia, Lithuania (Central and Western Lithuania), Poland (Warmińsko-Mazurskie and Pomorskie Voivodeships), Belarus (the Vitebsk, Mogilev and Gomel regions), Ukraine (the Chernihiv, Sumy, Kharkiv, Lugansk, Donetsk and Kherson regions) (see Fig. 1).

A comparative assessment of digital disparities between these regions was carried out by analyzing two groups of indicators:

— digital infrastructure development: I1 is mobile network coverage, %; I2 network coverage for 4G, %; I3 the share of households with access to the Internet from home, %; I4 the share of households with broadband Internet access, %;

— Internet penetration rate: I5 is the share of regular Internet users, %; I6, the share of people making online purchases of goods and services for personal use, %.

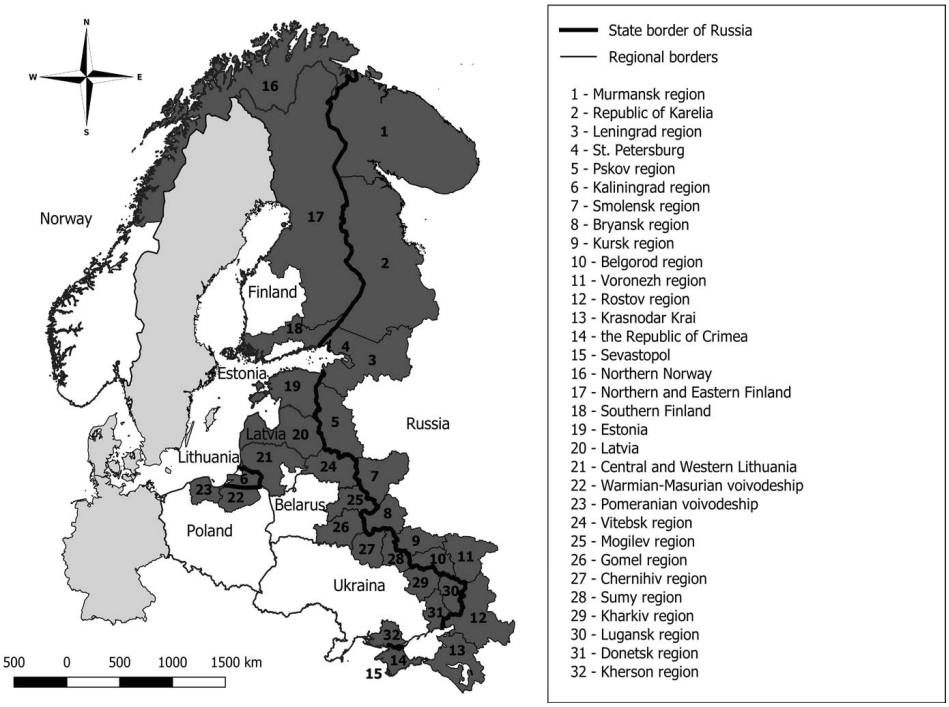

Fig. 1. Border regions of European Russia
and the neighbouring countries as from 26.10.21

Source: prepared by the author.

Those measures were chosen that were regularly applied in assessing the digital divide between regions (used in 164 regions of 27 EU countries [11]). Another selection criterion was the applicability of the indicators in evaluating the potential for digital transformation and transboundary digitalization of border regions, as reported in earlier studies into the problem.

Firstly, the availability of modern digital infrastructure in a region is considered a major transformational factor [12]. The development of ICT has a positive impact on employment, per capita gross domestic product (GDP) and innovations in the economy [13; 14]. An analysis of data from 135 countries shows [15] that a 10 per cent increase in mobile broadband penetration leads to a 0.8 per cent GDP growth slowing down over time. The penetration of fixed broadband goes hand in hand with that of mobile Internet, ushering in an information society [16; 17]. Modern Internet standards have a stimulating effect on business due to higher speeds, affordability, better connectivity and reduced time costs. This effect was

described in a study focusing on the growth dynamics of Bangladeshi companies when switching from the 3G to 4G standard. It seems possible to extrapolate these findings to developed countries embracing 5G technology [18].

Secondly, an important factor in transboundary digitalization is the efficiency and frequency of digital technology use in border regions, reflecting the level of Internet penetration. Increased public access to information and communication technologies, combined with improved digital skills and competencies, create a sustainable user community, which ultimately benefits the competitiveness of businesses and public institutions [19]. The results of a study [20] conducted in Russia's Vologda region show that permanent Internet users participate more actively in the digital economy than other population groups do because of their greater confidence in digital literacy and trust in the virtual space. A similar trend is observed among business entities. It has been noted [21] that the export activity of firms increasingly depends on both the adoption of digital technology (Internet, wireless communications, mobile technology, etc.) and digital capabilities, including the accumulated digital experience.

Table 1 presents a calculation methodology and data sources for the indicators analyzed.

Table 1

Digital disparity indicators in the border regions of European Russia and neighbouring countries

Indicator	Calculation methodology	Data source
I1	Percentage of the territory covered by at least one wireless cellular standard from major operators as of September 2021	Calculated using QGIS tools based on data from the websites of major providers Finland: DNA (www.dna.fi), Elisa (elisa.fi/kuuluvuus/) Norway: Telia Norge (www.telia.no), Teienor (www.telenor.no), Ice (www.ice.no) Estonia: Tele2 (tele2.ee) Latvia: LMT (karte.lmt.lv) Lithuania: Telia Lietuva (www.telia.lt) Poland: Orange Polska (www.orange.pl) Belarus: A1 (www.a1.by), MTC (www.mts.by), Life (life.com.by) Ukraine: Lifecell (www.lifecell.ua), Vodafone (www.vodafone.ua) Russia: Tele2 (tele2-online.com), Beeline (beeline.ru), MTS (mtsru.ru), Megafon (megafon.ru), Volna Mibile (volnamobile.ru), the latter operating in the Republic of Crimea and Sevastopol

The end of table 1

I2	Territories covered by 4G from major operators, percentage of a region's total area as of September 2021	For the regions of Norway, Finland, Lithuania, Latvia, Estonia: Eurostat [3] Russia: Rosstat [4] Ukraine: State Statistics Service of Ukraine [5]; Ukrainian Internet Association [6]; Growth from Knowledge analytical company [7] Poland: Statistics Poland [8], Eurostat [9] Belarus: National Statistics Committee of the Republic of Belarus [10]
I3	Regional data are from 2020 (the data for Ukraine are based on 2018 Internet subscriber figures).	
I4	Regional data are from 2020 (for Belarus, the national average is used; the data for Ukraine are based on 2018 Internet subscriber figures)	
I5	Regional data are from 2020 (for Belarus, the national average is used; the data for Ukraine are based on 2018 Internet subscriber figures)	

[3] Regional digital economy and society. Database: General and regional statistics, 2021, *Eurostat*. URL: https://ec.europa.eu/eurostat/data/database (accessed 02.09.2021).

[4] Targets of Russia's Innovation Development Strategy 2020, 2021, *Rosstat*. URL: https://rosstat.gov.ru/folder/14477 (accessed: 02.09.2021).

[5] Status and development of communications 2018. SSC of Ukraine, 2018. URL: http://www.ukrstat.gov.ua/operativ/operativ2018/zv/srz/xls/srz_2018_u.xlsx (accessed 19.08.2021).

[6] Дослідження інтернет-проникнення в Україні III квартал 2019 року, 2019. InMind Factum Group Ukraine, *Интернет Асоціація України*. URL: https://inau.ua/proekty/doslidzhennya-internet-audytoriyi (accessed: 19.08.2021).

[7] 17 % українських онлайн-покупців здійснюють більше 20 покупок на рік: інсайти e-commerce ринку 2019, 2019, *Growth from Knowledge*. URL: https://www.gfk.com/ru/insights/online-shopping-2019 (accessed: 23.08.2021).

[8] Information society in Poland in 2020, 2020, *Statistical Office in Szczecin*, Centre for Science, Technology, Innovation and Information Society Statistics, Warszawa, Szczecin. URL: https://stat.gov.pl/en/topics/science-and-technology/information-society/information-society-in-poland-in-2020,1,7.html (accessed 19.08.2021)

[9] Regional digital economy and society. Database: General and regional statistics, 2021, *Eurostat*. URL: https://ec.europa.eu/eurostat/data/database (accessed 02.09.2021)

[10] Information society in the Republic of Belarus. A statistical book, 2021, Minsk, National Statistical Committee of the Republic of Belarus. URL: https://www.belstat.gov.by/upload/iblock/719/7199f71a6c5b80265d51141c9bbeaf39.pdf (accessed: 29.08.2021).

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I6	Regional data are from 2020 (for Belarus, the national average is used; the data for Ukraine are based on 2018 Internet subscriber figures).	

Source: prepared by the author.

Table 2 shows the values of pairwise correlation coefficients between indicators I1—I6.

Table 2

A matrix of pairwise correlation coefficients between significant indicators of digital disparities between border regions

Indicator	I1	I2	I3	I4	I5	I6
I1	1	—	—	—	—	—
I2	0.819	1	—	—	—	—
I3	0.464	0.352	1	—	—	—
I4	0.124	0.270	0.517	1	—	—
I5	0.115	0.209	0.672	0.856	1	—
I6	–0.049	0.032	0.385	0.761	0.850	1

Source: prepared by the author.

To calculate the total index of border region digitalization for assessing digital disparities and potential for transboundary digitalization, indicators I2, I3 and I6 were selected, whose pairwise correlation coefficients are insignificant. The normalized values of the selected indicators were obtained for each region:

$$\overline{\Pi i} = \frac{\Pi_i - \Pi_{imin}}{\Pi_{imax} - \Pi_{imin}} \cdot$$

The overall index value was computed as the arithmetic mean of the normalized values of I2, I3 and I6.

Results

The results of a geoinformation analysis (Fig. 2) revealed digital disparities between the border regions of European Russia and its neighbouring countries.

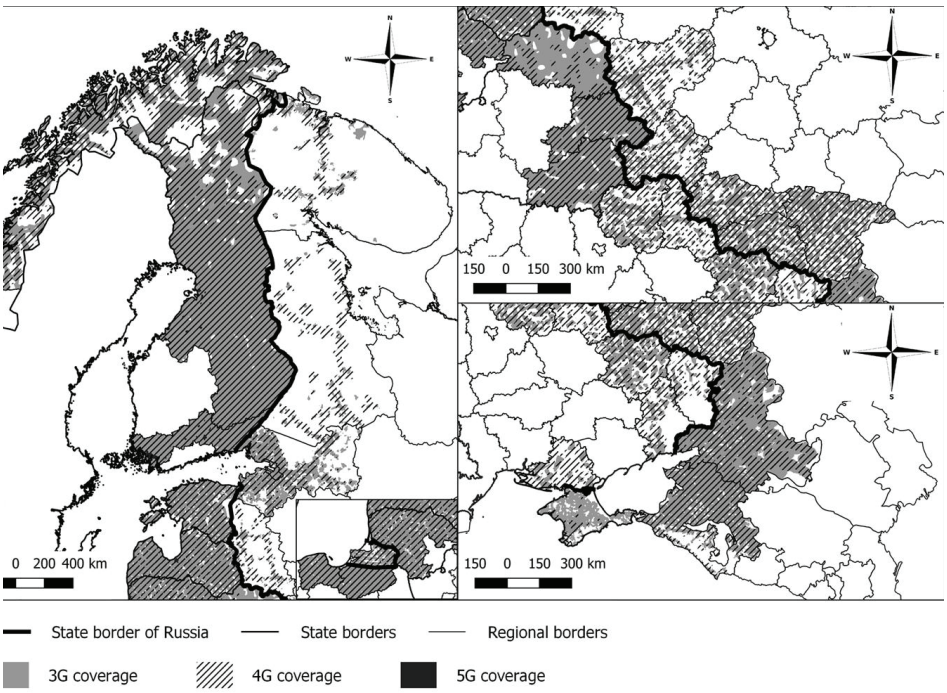

Fig. 2. Internet coverage of Russia's western borderlands and the neighbouring countries, 2021

Source: prepared by the author (for the data sources, see Table 1).

Of the 32 study regions, 13 had over 90 per cent network coverage; 15, between 50 and 90; four, below 50. The leaders were the Polish regions (Warmińsko-Mazurskie and Pomorskie Voivodeships), Russia (St Petersburg) and Finland (Southern Finland), with over 98 per cent coverage. Internet accessibility was the lowest in the north-western border regions of Russia (the Republic of Karelia, the Murmansk and Pskov regions) and Ukraine (the Donetsk and Lugansk regions). 3G and 4G standards were available in all the study regions, whilst 5G was only present in Finland (Oulu region) and Lithuania (Klaipeda region). 4G was the dominant cellular standard in all the areas, except for Belarus' Vitebsk region and Russia's Republic of Crimea.

Mobile Internet coverage density in the border regions had a significant impact on the Internet penetration of households; the correlation coefficient between I1 and I3 was 0.464. The study regions of Norway, Finland, Poland, Estonia,

Latvia, Lithuania and Russia's St Petersburg had relatively high rates of household access to the Internet from a home computer, with 80 per cent enjoying a broadband connection (Fig. 3). The border regions of Ukraine (Kherson, Sumy, Donetsk and Luhansk) lagged far behind the leaders in terms of household Internet access.

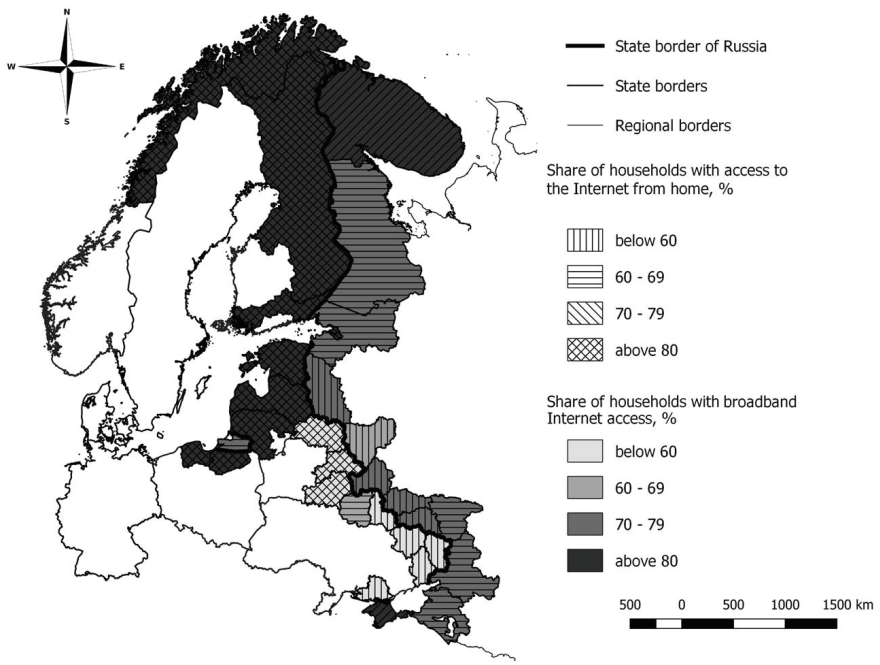

Fig. 3. Digital infrastructure development in border regions of European Russia and the neighbouring countries, as from 26.10.21

Source: prepared by the author (for the data sources, see Table 1).

The level of digital penetration reflects the readiness of the population to settle into a wide range of digital routines, including online interactions with public institutions, which are crucial for the formation of a common cross-border digital space. Stable Internet access stimulates the frequent use of online tools by the population of border regions (the correlation between I3 and I5 is 0.672 and between I4 and I5 is 0.856). The most active Internet users were in Northern Norway (95 per cent), Southern (95 per cent), Northern and Eastern Finland (92 per cent), and the least active (below 70 per cent) in the Ukrainian regions (Fig. 4). The leaders in the percentage of uses ordering goods or services online for personal use were the Russian regions (St Petersburg, the Murmansk region, the Republic of Crimea, Sevastopol) and Northern Norway.

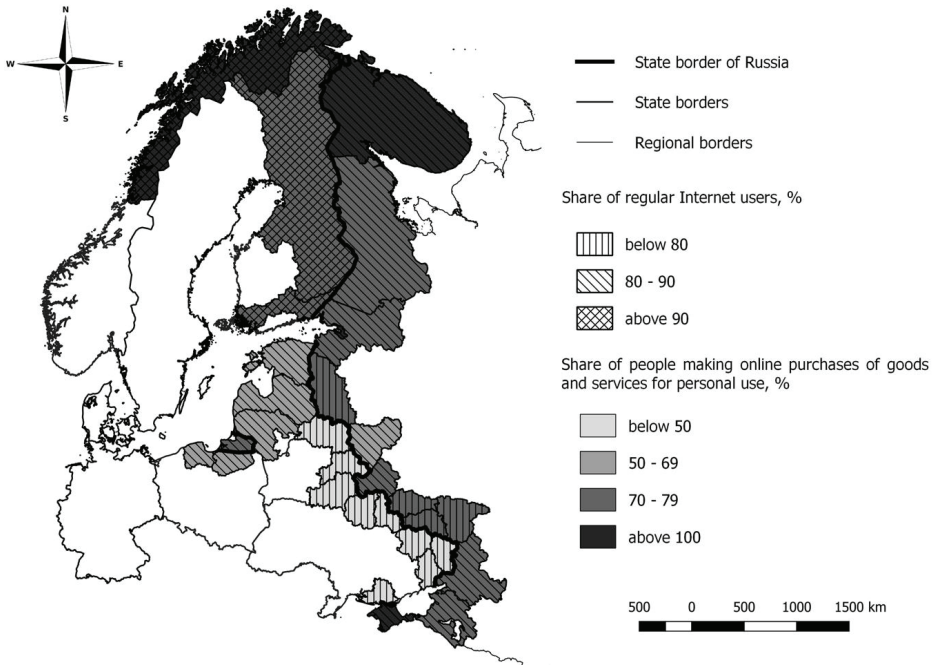

Fig. 4. Internet penetration in the border regions
of European Russia and the neighbouring states

Source: prepared by the author (for the data sources, see Table 1).

Table 3 and Figure 5 show the distribution of border regions of European Russia and its neighbouring countries based on the selected indicators and the overall digitalization index.

The first group, Leaders, included nine regions with an overall index value above 0.7: Southern, Northern and Eastern Finland; Northern Norway; Estonia; Latvia; Russia's St. Petersburg and Voronezh regions; Poland's Pomeranian and Warmian-Masurian voivodeships. These territories, including Norway's and Finland's far north, had a rather developed digital infrastructure and a high Internet penetration rate. This group was the most homogeneous: the interregional gap as regards the study indicators ranged from 1.2 to 1.6. Three regions ranked high for all the indicators; six had above-median values of most of the indicators (I2 77.7 per cent; I3 69.8 per cent; I6 70.6 per cent). Eight out of the nine regions ranked above average for I2 and I3; five regions of the first group, for I6.

Table 3

Differentiation of the values of indicators comprising the overall digitalization index, by border region groups

Group (index value range)	Number of regions	I2			I3			I6		
		maximum	average	minimum	maximum	average	minimum	maximum	average	minimum
Leaders (0.7-1)	9	99.0	92.1	76.4	100.0	89.2	68.5	87.0	71.6	56.0
Average performers (0.5—0.69)	14	92.1	68.9	8.7*	86.1	69.1	47.8	84.2	69.1	42.2
Underperformers (0-0.49)	9	69.7	48.4	20.4	85.2	54.2	38.1	76.5	43.9	34.0

Comment: I2 is network coverage for 4G; I3, the percentage of households with access to the Internet from a home computer; I6, the percentage of people making online purchases of goods and services for personal use. The 'average' is calculated as the average median value. *The value for Russia's Murmansk region having areal Internet coverage in the most urbanized territories.

Source: prepared by the author.

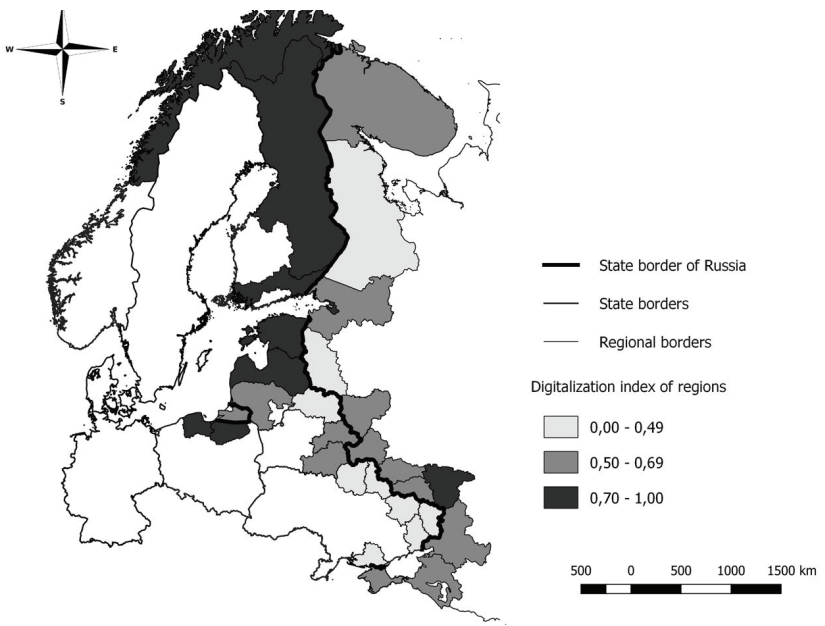

Fig. 5. A typology of border regions at Russia's western borders according to digitalization index values, as from 26.10.21

Source: prepared by the author.

The first group, Leaders, included nine regions with an overall index value above 0.7: Southern, Northern and Eastern Finland; Northern Norway; Estonia; Latvia; Russia's St. Petersburg and Voronezh regions; Poland's Pomeranian and Warmian-Masurian voivodeships. These territories, including Norway's and Finland's far north, had a rather developed digital infrastructure and a high Internet penetration rate. This group was the most homogeneous: the interregional gap as regards the study indicators ranged from 1.2 to 1.6. Three regions ranked high for all the indicators; six had above-median values of most of the indicators (I2 77.7 per cent; I3 69.8 per cent; I6 70.6 per cent). Eight out of the nine regions ranked above average for I2 and I3; five regions of the first group, for I6.

The second group, Average Performers, comprised 14 border regions with overall index values between 0.5 and 0.69: Central and Western Lithuania, most of Russia's western borderlands (the Rostov, Belgorod, Bryansk, Kursk, Leningrad, Smolensk, Murmansk, Kaliningrad regions, Krasnodar Krai, the Republic of Crimea and Sevastopol) and Belarus's Gomel and Mogilev regions. This group was more heterogeneous than the first one. There is wide variation in the Internet coverage density. The Murmansk region ranked the lowest at 0.8 per cent: there was 4G coverage only along major roads and larger settlements, due to patchy industrial development and settlement patterns. A considerable degree of urbanization translates into a high Internet penetration rate. Thus, the Murmansk region was classified as an Average Performer. Overall, the regions in the second group lagged behind in the spatial development of digital infrastructure, yet the availability of the latter in the most densely populated areas ensured relatively high Internet usage figures.

The group of Underperformers included nine border regions with overall index values below 0.5. These unimpressive results stemmed from a combination of a low Internet coverage density and an insufficient Internet penetration rate. This group comprised the Ukrainian regions (Chernihiv, Kharkiv, Kherson, Sumy, Donetsk and Luhansk), Belarus' Vitebsk region and Russia's Republic of Karelia and Pskov region.

Discussion

The difference in integrated digitalization index values of the study regions of Russia and the neighbouring states was computed using the above typology of regions to evaluate the potential for transboundary digitalization in Russia's western borderlands (Table 4).

Table 4

Digital disparities between the border regions of European Russia and the neighbouring states, as from 26.10.21

Russian region	ODI	Border regions of the neighbouring countries / ODI	Average ODI variation, factor*
Murmansk region	0.53	Northern Norway: 0.91 Northern and Eastern Finland: 0.83	1.64
Republic of Karelia	0.45	Northern and Eastern Finland: 0.83 Southern Finland: 0.89	1.88
Leningrad region	0.61	Southern Finland: 0.89	1.38
St Petersburg	0.92	Estonia: 0.79	1.09
Pskov region	0.43	Estonia: 0.79 Latvia: 0.72 Belarus' Vitebsk region: 0.38	1.75 1.12
Kaliningrad region	0.68	Poland's Warmian-Masurian Voivodeship 0.78 Poland's Pomeranian Voivodeship: 0.79 Central and Western Lithuania : 0.60	1.15
Smolensk region	0.56	Belarus' Vitebsk region: 0.38 Belarus' Mogilev region: 0.60	1.26
Bryansk region	0.60	Belarus' Mogilev region: 0.60 Belarus' Gomel region: 0.59 Ukraine's Chernihiv region: 0.35 Ukraine's Sumy region: 0.10	1.02 3.84
Kursk region	0.58	Ukraine's Sumy region: 0.10	5.78
Belgorod region	0.63	Ukraine's Sumy region: 0.10 Ukraine's Kharkiv region: 0.27 Ukraine's Luhansk region: 0.10	4.90
Voronezh region	0.76	Ukraine's Luhansk region: 0.10	6.20
Rostov region	0.69	Ukraine's Luhansk region: 0.10 Ukraine's Donetsk region: 0.10: 0.14	5.81
Krasnodar Krai	0.63	Ukraine's Donetsk region: 0.14	4.37
Republic of Crimea	0.54	Ukraine's Kherson region: 0.27	2.02
Sevastopol	0.69		2.59

Comment: ODI stands for the overall digitalization index. *The average ODI difference reflects the total digital disparity between the bordering region at the stretch of the national border belonging to the given Russian region.

Source: prepared by the author.

The above findings made it possible to distinguish three types of border territories in Russia's western borderlands according to the level of digital disparities.

The characteristic of the *first* type was a rather insignificant (less than twofold) disparity between the border areas, with the Russian regions lagging behind. These were the border territories in the North-West of Russia, including the Republic of Karelia, the Murmansk, Leningrad, Pskov and Kaliningrad regions and the neighbouring territories of Norway, Finland, Estonia, Latvia, Lithuania and Poland.

Similarly, the *second* type included border regions with less than a twofold variation but with Russian regions showing stronger performance. These were the Russian-Belarusian borderlands (Russia's Smolensk, Pskov, Bryansk and Belarus' Gomel, Vitebsk, Mogilev regions) and St Petersburg, which were more digitalized than the neighbouring regions of Southern Finland and Estonia.

The *third* type comprised the Russian-Ukrainian borderlands showing a more than twofold disparity in digitalization, with the Russian territories having the edge over the neighbours. The most complex situation was in Ukraine's Luhansk and Donetsk regions.

An analysis of earlier studies into the causes of the digital divide (see [11]) points to the paramount importance of the socio-economic factor of economic well-being. A high per capita income means rapid deployment of ICT infrastructure and the development of human capital necessary to create demand for digital technologies. Asymmetry in the population distribution by size, education level and socio-demographic characteristics (age, gender, nationality, etc.) is somewhat less influential. Thus, one might conclude that the digital divide in the European part of Russia's borderlands essentially reflected the existing socio-economic disparity between the border regions.

When assessing the potential for the formation of transboundary links, socio-economic disparities between regions turn out to be a positive factor; this has been confirmed by research into what makes cross-border cooperation and mobility sustainable [22; 23]. Since interactions at a cross-border level are more complex than at a national level, their long-term viability is a result of natural internal stimuli reinforced by the comparative advantages of the other party. External factors, such as funding through intergovernmental programs, can also act as drivers of cross-border cooperation. But when their influence stops, cross-border ties tend to weaken [22]. This raises the question about the degree of digital proximity between border regions requisite for strong cross-border digital links. This holds for the economy, public administration and social life.

Since a favourable legal environment is a crucial factor in digital transformation in developed and developing countries [11; 24], and strong good-neighbourly ties between states are of paramount importance for closer integration between border communities, the cross-border digitalization of Russia's borderlands would be impossible without reducing inter-country institutional disparities. The pronounced barrier function of the state border and the lack of dialogue on a common digital space make cross-border cooperation less attractive; the interest in its implementation flags, and the focus shifts towards strengthening intra-country ties.

A lack of political agreement in managing cross-border territories in the face of increasing national cohesion through digitalization can negatively affect cross-border cooperation, as was demonstrated by the Norwegian-Swedish and Finnish-Swedish regions during the pandemic [9]. Yet, transnational openness in managing border regions within the model of open, digitally empowered government is seen as an effective mechanism for promoting cross-border cooperation and unlocking its digital potential [25].

Although efforts to converge national digital spaces are underway between Russia and the EAEU countries as part of the Digital Agenda 2025,[11] their pace is slow.[12] Moreover, there have been difficulties in harmonizing legal systems in other areas as well [26]. At Russia's western frontiers, Belarus is the principal digital partner. A study of socio-economic dynamics in the Dnieper-Dvina transboundary region [27] points to a failure to see digitalization as a tool to improve the cohesion of the border territories and exploit their economic potential as regards information exchange and cross-border contacts in the B2C and B2B areas. The authors of the research conclude that, in the existing framework conditions, the development of the Internet and digital technologies slows down entrepreneurial and consumer activity. Another unwanted consequence is labour migration between the Smolensk, Vitebsk and Mogilev regions as access to the more attractive metropolitan markets of Moscow and Minsk becomes easier.

[11] On the key issues on the EAEU agenda 2025, 2017, Decision of the Superme Eurasian Economic Council. No. 12 of 11 October 2017. URL: http://www.eurasiancommission.org/ru/act/dmi/workgroup/Documents/Основные%20документы/Решение%20ВЕЭС%20№12_Основные%20направления%20реализации%20цифровой%20повестки%20ЕАЭС.pdf (accessed 29.08.2021).

[12] Mishustin warns of the consequences of holding up digitalisation in EAEU, 2021, *TASS*, Alma-Ata, 5.02.2021. URL: https://tass.ru/ekonomika/10629905 (accessed 05.08.2021).

Some European countries bordering on Russia, including Belarus and Ukraine, take part in the EU4Digital initiative[13] launched by the EU in 2016 to harmonize and integrate its digital markets with those of the Eastern Partnership countries. The cooperation extended to legislation, digital data collection, public administration, the regulation of electronic communication networks and services, cybersecurity, the creation of scientific and educational communities. Ukraine was involved in five projects of the Initiative with a total funding of over 28m euros. Belarus participated in three projects worth 2.8m euros. These digital integration processes at Russia's borders raise concerns as the initiatives involving the country are rather weak. Firstly, this situation desynchronizes the digital agendas of Russia and its neighbours. Secondly, it creates conditions in which Russia may be excluded from the wide spectrum of international digital cooperation due to significant differences in national digital ecosystems. Thirdly, there are tensions regarding economic, political, social, cultural and other aspects of digitalization.

Main conclusions

Digital regionalization is the burgeoning process of convergence between digital spaces of border regions, followed by the formation of unified digital transboundary regions. The latter, while inextricably linked to traditional forms of cross-border interactions, has specific organizational features, which call for additional political efforts on the part of the national governments of neighbouring states to elaborate a joint digitalization program. A necessary priority is creating favourable framework conditions for digitally empowered cross-border cooperation, namely the harmonization of laws [28], lowering tariff and non-tariff barriers to digital trade [29] and increasing the accessibility of the Internet and digital technologies for border communities, particularly through the development of ICT infrastructure and the promotion of digital literacy.

This study revealed disparities between the border regions of Western Russia and the neighbouring countries as regards the proposed digitalization index. However, for many regions, this variation was less than twofold. One can conclude that these territories have the infrastructure and human resources necessary for transboundary digitalization. Yet, the existing framework conditions pose an obstacle to unlocking the digital potential of the borderlands. Political support for digitally transforming transboundary cooperation in Russia's western borderlands has been provided only along the Russian-Belarusian stretch of the border

[13] EU4Digital comprises four programmes (EU4Digital, EU4Digital Broadband, EU4Digital Cyber and EaPConnect) and a number of other projects, 2022, EU4Digital. URL: https://eufordigital.eu/ru/discover-eu/the-eu4digital-initiative/ (accessed 27.01.2022).

as part of the EAEU digital development agenda. I believe that the intensification of institutional process in this direction is promising; it can provide a solid base for the formation of digital transboundary regions between Russia and Belarus. At the same time, the trend towards the convergence of the digital spaces of Ukraine, Belarus and the EU poses a potential threat against the background of the anti-Russia agenda promoted by the West.

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