



INTERREGIONAL INTERACTION IN THE CONDITIONS OF DIGITALIZATION: ANALYSIS OF PROGRAMMES OF THE EUROPEAN UNION (EU) FOR SUPPORTING COOPERATION ACROSS BORDERS IN THE CONTEXT OF THE PROXIMITY THEORY DEVELOPMENT

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ABSTRACT

Objective: The article provides a comprehensive review on theoretical and empirical research in the field of interregional cooperation. **Methods:** The empirical basis of the study is represented by the European Framework Programmes for Research and Technological Development, the set of programmes of the European Union (EU) for supporting cooperation across borders, the Strategy for Spatial Development of the Russian Federation for the Period up to 2025, the results of the survey “Competitive Cooperation between Territories” (Institute of Economics of the Ural Branch of the Russian Academy of Sciences, Russia). **Results:** Within the framework of the proximity theory, which serves as a theoretical basis for interregional interaction, we consider the approaches to the definition of this category, summarize the types and forms of interregional cooperation, the tools by which interregional interaction is carried out, as well as key factors (drivers) contributing to its strengthening, deepening and development and the main barriers that hinder and/or reduce the intensity of interregional cooperation. **Conclusion:** In the context of digital transformation special attention is paid to cognitive proximity, which manifests itself in the creation of information and knowledge networks and to the concept of macro-region as an economic subspace for closer interregional cooperation.

Keywords: Proximity theory. Cognitive proximity. Digital economy. Spatial development. knowledge networks.



A INTERAÇÃO INTERREGIONAL NO CONTEXTO DA CIFROVERSÃO: UMA ANÁLISE DOS PROGRAMAS DA UNIÃO EUROPÉIA PARA APOIAR A COOPERAÇÃO TRANSFRONTEIRIÇA NO CONTEXTO DO DESENVOLVIMENTO DA TEORIA DA PROXIMIDADE

RESUMO

Objetivo do estudo: O artigo apresenta uma revisão detalhada da pesquisa teórica e empírica no campo da cooperação inter-regional. **Metodologia:** A base empírica do estudo é representada pelos Programas-Quadro Europeus de Pesquisa e Desenvolvimento Tecnológico, o conjunto de programas da União Européia (UE) para apoiar a cooperação transfronteiriça, a Estratégia de Desenvolvimento Espacial da Federação Russa para o Período até 2025, os resultados do estudo "Cooperação Competitiva de Territórios" (RU ACR, Rússia). **Resultados:** A teoria da proximidade, que serve como base teórica para a cooperação inter-regional, considera as aproximações para a definição desta categoria, resume os tipos e formas de cooperação inter-regional, as ferramentas pelas quais a cooperação inter-regional é implementada, e como fatores-chave (impulsionadores) que contribuem para seu fortalecimento, aprofundamento e desenvolvimento, e as principais barreiras que dificultam e/ou reduzem a intensidade da cooperação inter-regional. No contexto da transformação digital, deve ser dada atenção especial à proximidade cognitiva manifestada nas redes de informação e conhecimento e ao conceito da macrorregião como um subespaço econômico para uma cooperação inter-regional mais estreita. **Conclusões:** A transformação digital que agora está ocorrendo e afetando todas as áreas da sociedade terá um impacto direto na forma como a cooperação inter-regional será realizada.

Palavras-chave: Interação inter-regional. Teoria da proximidade. Proximidade cognitiva. Economia digital. Desenvolvimento especial. Redes de conhecimento. Macrorregião.

1. INTRODUCTION

In 2007 Song discussed regionalization as a process whereby regions of the world take joint steps to address global challenges. The author concluded that the more global the world becomes the more incentives the regions have to connect with each other. Song (2007) pointed to the transformation of the world into a "system of regions", mentioning such trends as inter-regionalism and trans-regionalism. Other authors later observed a certain contradiction between globalization and "territorialisation", which may be understood as the development of regional "knowledge-intensive regional clusters" (Cecere, Corrocher, 2015).

Several events of the first half of 2000s in the global politics (terrorist attacks in the USA, the UK, Spain) complicated research in the field of cross-border cooperation:



there is a conflict between positive synergetic effects of interaction and the need to protect the security of states by closing borders (Scott, 2017). Torre & Rallet believe that, despite the globalization of the economy, the proximity between actors still plays a significant role. Decisions taken at the global level are often characterized by uncertainty, therefore, they need to be adapted at the local level (Torre, Rallet, 2005).

Minakir (2019, p. 967) refers to the need for the perception of the country's economic space as a "system of interacting economic regions", rather than as a simple sum of regions allocated by administrative means. Stroeve et al. note that spatial inequality encourages regions all over the world to cooperate. They argue that such partnership programmes, which promote "polycentric development" and strengthen cooperation between regions, are at the core of all EU strategic documents.

A similar system is currently being established in Russia (Stroeve et al., 2018). In February 2019, the Government of the Russian Federation approved The Strategy for Spatial Development of the Russian Federation for the Period up to 2025 (Government of the Russian Federation, 2019). The Strategy ensures strengthening of interregional cooperation within the newly created macro-regions.

2. MATERIALS AND METHODS

The empirical basis of the study is represented by the European Framework Programmes for Research and Technological Development (Science Europe, 2021), the set of programmes of the European Union (EU) for supporting cooperation across borders through project funding INTERREG (European Commission, 2021), the Strategy for Spatial Development of the Russian Federation for the Period up to 2025, the results of the survey "Competitive Cooperation between Territories" carried out by the Institute of Economics of the Ural Branch of the Russian Academy of Sciences in 2019 (Vazhenina, Vazhenin, 2020).

General scientific dialectical and quantitative research methods, including analysis, synthesis, systemic and holistic approach, retrospective, evolutionary, monographic, comparative logical analysis, content analysis of scientific literature and empirical sources, as well as methods of generalization and systematization were used as a methodological basis for the study.



3. RESULTS

Summarizing the theoretical framework for interregional cooperation, we should note that most authors refer to classical theories of international trade (whose provisions are transferred, with certain limitations, but without significant losses, to relations between regions) and location theory as theoretical foundations of interregional cooperation (Table 1).

Table 1: Theoretical Framework for Interregional Cooperation

Theoretical foundations of interregional cooperation	Source (authors)
Theories of international trade as the theoretical basis for interregional cooperation (theory of absolute and comparative advantages, Hexher-Olin's theory)	Regional'naya ekonomika i prostranstvennoe razvitie [Regional economics and spatial development] (Limonov et al., 2019)
The theory of absolute and comparative advantages as theoretical basis, with the following theories of interregional cooperation: classical location theories (J.H. von Thünen, W. Launhardt, W. Christaller, A. Weber); the concept of Middle Europe by F. Naumann; M. Porter's theory of competitive advantages of certain territories; P. Krugman's new economic geography; cluster theories	Mezhregional'noe ekonomicheskoe sotrudnichestvo: sostoyanie, problemy, perspektivy [Interregional economic cooperation: State, problems, perspectives] (Lukin, Uskova, 2016)
Agglomeration theory (H. Richardson), the center-periphery theory (J. Friedmann), and the theory of innovative environments (GREMI)	Sistemnaya diagnostika problem razvitiya periferijnyh territorij agrarno-industrial'nogo regiona [System diagnostics of peripheral territories development problems in agrarian-industrial region] (Kazakov, 2020)
The proximity theory	Proximity and innovation: A critical assessment (Boschma, 2005); The scientific trajectory of the French school of proximity: Interaction and institution-based approaches to regional innovation systems (Carrincazeaux et al., 2008)

A special place among the theories describing interaction between regions is occupied by the proximity theory. The proximity theory is a branch of regional science established in the 1990s in France (Carrincazeaux et al., 2008) as an attempt to study the effects arising from interregional cooperation and the manifestations of the latter (Minakir et al., 2014).



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As noted by Boschma (2005), in the 1990s representatives of the French School of Proximity Dynamics first began to talk about the fact that proximity can be analysed and measured not only in geographical terms. In this regard, we shall dwell in more detail on the proximity theory. In total Boschma refers to five dimensions of proximity (Table 2).

Table 2: The main dimensions of proximity

Dimensions of proximity	Main features
Geographical proximity	physical distance between actors; its presence may facilitate the exchange of knowledge between organizations, but geographic proximity alone does not guarantee that such exchange will take place
Institutional proximity	the commonality of macro- and micro-level institutions as well as the existence of common values; actors share every or part of social and economic institutions
Organizational proximity	the degree of interconnectedness of organizations located in cooperating regions; it can be either a control of one organization over another or a link between the units of one organization; when regions are organizationally connected, interregional hierarchical management structure emerges
Social proximity	the interrelation of actors based on mutual trust and commitment; is directly related to the ability of organizations to obtain new knowledge and introduce innovations, since well-established connections often help to transfer tacit knowledge
Cognitive proximity	the ability of actors of interregional cooperation to exchange knowledge, learn from each other, and adequately understand and perceive information

Geographical proximity can be successfully replaced by other forms, mainly cognitive, to which Boschma (2005) attributes a leading role in interactive learning processes. Cappellano & Rizzo's study stresses the importance of considering the role played by the four dimensions of proximity (geographical, cognitive, social, and institutional) in cross-border regional economic integration (Cappellano, Rizzo, 2019).

Torre and Rallet understand organizational proximity (contrasted with geographical proximity) as the ability of members of one organization to interact with each other. They note that the members of one organization are united by a common system of values and a common logic of economic behavior and decision making (Torre, Rallet, 2005). However, too strong organizational structure can lead to a loss of flexibility and bureaucratization, and too weak - to a lack of mutual control between actors. As well as too high a degree of institutional proximity prevents the emergence



and development of new ideas, and too low excludes the possibility of effective social ties between actors (Boschma, 2005).

In the context of the economy digitalization the main attention is paid to the network forms of interaction between territories and cognitive proximity of regions. The lack of cognitive proximity leads to the inability of actors to understand each other. Too high cognitive proximity can reduce the motivation of some actors to acquire new knowledge, as well as lead to an undesirable leakage of knowledge (Boschma, 2005).

In the context of the research networks establishment, we can also refer to technological and cultural proximity, with cultural proximity playing an important role – scholars note its positive impact on the expansion of research collaboration between regions, while geographical proximity, on the contrary, may have a negative effect (Cecere, Corrocher, 2015).

Thus, at present, the theory of proximity is gradually occupying a special place in several theories describing the interaction of regions. The key role in modern conditions is assigned to cognitive proximity, which in the context of the economy digitalization is capable to replace or complement geographic proximity and to strengthen or change the role of other forms of proximity.

Then, we should consider interregional cooperation in the context of proximity theory and its dimensions (Gorochnaya, 2021; Haug, Race, 1998; Krinichansky, 2013; Lukin, Uskova, 2016; Medeiros, 2018; Melnikova, 2019; Moskovkin et al., 2020; Scott, 2017; Stryabkova et al., 2019; Uyarra et al., 2018; Vazhenina, Vazhenin, 2020) (Table 3).



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Table 3: Interregional cooperation in the context of proximity theory and its dimensions

		Interregional cooperation				
		Definitions	Subjects	Types and forms	Tools and drivers	Barriers
Dimensions of proximity	Geographical proximity	relations between subnational regions, located in a relatively small geographical area, which occurs both directly at borders and over longer distances	- local, regional, and national authorities;	- cooperation at the local level; - interregional cooperation; - cross-border cooperation; - transnational cooperation;	- economic globalization; - increasing visibility of individual regions; - regional growth poles (points) and hubs; - benchmarking;	- different level of economic potential; - the traditional sectoral approach to the development of regional economy; - lack of support from the federal and regional authorities; - the subordination of regional authorities to the federal centre;
	Institutional proximity	policy project implemented at the subnational level by actors from government and civil society to benefit from joint initiatives in various spheres	- "intermediate bodies" that have at their disposal funds allocated to the development of territories and/or industries;	- "institutes for development", coalitions, etc.; - joint infrastructure projects; - strategic alliances; - joint business projects;	- advisory organizations that allow to coordinate regional policy; - standard setting.	- insufficient participation of political forces; - lack of trust between potential partners;
	Organizational proximity	a system of relations between "subjects of cooperation in various regions" that arise due to "division and specialization of labor" and "location of productive forces."	- regional associations, enterprises, households, and individual entrepreneurs;	- clusters; - agglomerations;	- the creation of interregional clusters; - desire to strengthen positions on consumer markets;	- insufficient participation of regional and national stakeholders; - dominance of competitive relations instead of cooperation;
	Social proximity	in addition to economic space, interregional cooperation occurs in the demographic, social,	- the individuals and community;	- cooperation agreements between individual actors ("players");	- exchange of positive experience and practices, - joint solution of socio-	- underdeveloped legislative framework;



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Cognitive proximity	environmental, and legislative spaces			economic problems.	- socio-cultural (language) barriers
	<ul style="list-style-type: none"> - mutually beneficial cooperation of territories, which does not exclude the competition between them; - coordination and collaboration between regions (within one or more countries) in co-creation, financing and/or management of a development strategy in innovation 	<ul style="list-style-type: none"> - non-profit organisations: agencies, research institutes; 	<ul style="list-style-type: none"> - international networks of national, regional, and local actors. 	<ul style="list-style-type: none"> - information exchange; - transfer of knowledge and technology; - growing demand for new expensive technologies. 	<ul style="list-style-type: none"> - poor understanding of the necessity to cooperate; - lack of clearly defined cooperation objectives and/or the asymmetry of goals;

Interregional economic cooperation is characterized by several positive and negative effects (Ezcurra, Rios, 2019; Uskova, Lukin, 2014; Vazhenina, Vazhenin, 2020) (Table 4).

Table 4: Positive and negative effects of interregional economic interaction

Positive effects	Negative effects
<ul style="list-style-type: none"> - the consumer market of the participating regions receives an additional inflow of goods from among those that are not produced in the regions themselves; - producers receive a stable inflow of raw materials and components; - demand on intra-regional markets is stimulated; - intraregional markets for products are being diversified; - territorial economic barriers hampering the movement of products, investments and human resources between participating regions are being eliminated; - economic space expansion; - reduction of administrative barriers; - development of inter-territorial integration; - increased economic mobility; - strengthening and maintaining trust in society; - adding new and protecting existing competitive advantages; 	<ul style="list-style-type: none"> - some territories become 'dependents' of more developed regions; - organization and maintenance of cooperation requires additional, often quite high costs; - high differentiation in the development of territories remains.



- the improvement of the quality of management structures in those regions, which neighbour and cooperate with regions, where the authorities work more efficiently.	
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4. DISCUSSION

Previously, we have established the leading role of cognitive proximity in interregional cooperation. Next, we will discuss an important spatial planning tool for strengthening (due to geographical proximity) other dimensions of proximity, especially cognitive proximity – knowledge and research networks created within specific territorial units – macro-regions.

Covering the EU experience in spatial planning, Krinichansky highlights the creation of so-called Euroregions – special territorial units consisting of several regions, each of which does not lose its administrative borders, but at the same time transfers some management functions to the sub-regional level. This spatial structure is compared with macro-regions allocated on the territory of Russia, but the author highlights that the effectiveness of the latter remains low (Krinichansky, 2013).

The monograph by Bellini & Hilpert notes that the establishment of partnerships between cities, along with joint transport, environmental, etc. policies in the border regions marked a transition to a new vision of Europe. The borders between states are losing their importance, since interregional and international projects are being actively implemented (Bellini, Hilpert, 2013). It is also stressed in (Bellini, Hilpert, 2013) that it is not enough just to announce the establishment of a macro-region: Europe needs a truly productive cooperation between regions, in which each region and the actors within it are ready not only to make the most of the emerging benefits of cooperation but also to contribute to it. Scholars point to the uncertainty of the political status of macro-regions as one of the problems (Bellini, Hilpert, 2013). The EU experience shows that the transition from formal determination of a macro-region to its functioning as a special territorial unit is always quite difficult. At the same time, European macro-regional strategies do not imply adoption of new legislation and allocation of additional financing – the concept's idea is to redistribute resources already available to regions more efficiently. It is emphasized that usually regions differ considerably in the level of development (Chilla, Streifeneder, 2018).



The similar problems can be easily identified in Russia. Another problem for Russia is the fact that the allocation of macro-regions is not always justified and reasonable, which does not have a positive impact on interregional cooperation (Minakir et al., 2020). It should be noted that using the methods of spatial econometrics (spatial lag model and spatial error model) to analyze the connectivity in Russian economic space shows that, firstly, there are no significant changes in the degree of connectivity in the dynamics, and secondly, the strongest relationships are still observed between neighbouring regions – the importance of geographic proximity remains extremely high (Kolomak, 2019).

The paper (Uskova, Lukin, 2014) considers interregional cooperation as a factor of regional economic growth; it emphasizes the importance of creating a system of its motivation. In addition, it is noted that regional authorities should determine the perspective directions of interregional trade and economic relations in terms of partner regions and specific products. It is necessary, according to the authors, to identify those industries, which are most dependent on interregional trade (Uskova, Lukin, 2014).

According to Stroeve et al. (2018), tools to regulate interregional cooperation in Russia are limited. Referring to management experience abroad, they mention creation of specialized institutions (e.g., in the USA, Germany, France). Lukin & Uskova (2016) also suggest the creation of "interregional service marketing center", which would coordinate trade, financial and information logistics flows, as an optimal solution for regions planning to activate their interregional connections. To analyse the efficiency of interregional cooperation in the region, Lukin & Uskova suggest conducting a survey among the CEOs of regional enterprises. During the survey CEOs note those activities that seem to be most effective in development of interregional cooperation from their point of view (creation of a "state information portal", investment support for projects, organization of events and training seminars, establishment of special administration structures that would be responsible for coordinating the interregional cooperation) (Lukin, Uskova, 2016).

Nikolaev and Makhotaeva discuss the creation of interregional clusters as a tool to develop interregional cooperation. According to them, clusters create additional opportunities for the regions to improve the dynamics of their socio-economic development (Nikolaev, Makhotaeva, 2016). Naumov suggests methodical approach



consists in searching for "sources of investment potential formation" of regions, i.e., development priorities. As a result of the research the author identifies several priority economic activities for Russian regions, and forms four potential clusters of interregional cooperation (Naumov, 2019).

But we should strengthen that the previously adopted approaches to regional innovation systems and clusters, as noted in (Uyarra et al., 2018), have recently been reinterpreted, because under conditions of extra-regional connectivity via global value chains, regions can no longer be considered as closed spaces – their development depends directly on decisions made in other regions as well. Regional growth poles (points) and hubs increase the connectivity of the region with others, since they act as centers of innovation diffusion – they are also studied as special instruments of interregional cooperation (Cecere, Corrocher, 2015; Golova, Sukhovoy, 2019). As it is proved in (Martinus et al., 2019) (the case of Japan), innovation processes are possible not only in large agglomerations, but also in so-called peripheral regions, provided that these regions are sufficiently connected to the centers of innovation activity.

The European Framework Program serves as a tool for the establishment of research networks that strengthens academic cooperation between EU member states and individual regions. The development of complex modern technologies, platforms, etc. is impossible without joint actions of actors (public and private organizations), each of which has its own share of necessary knowledge (Cecere, Corrocher, 2015). The multi-level and multi-stakeholder approach to managing research and innovation in regions has been identified as an important milestone in the transition to regional development strategies that consider interregional linkages (Uyarra et al., 2018). Berman et al. (2019) (in the case of Italy) particularly emphasize the two-way orientation of innovation connectivity, noting that domestic actors use knowledge created outside the country, while foreign actors turn to knowledge created inside the country.

The creation of research networks contributes to an increase in knowledge exchange and diffusion of information between the regions where the member organizations of such networks are located (Cecere, Corrocher, 2015). Academic cooperation, as noted in (Haug, Race, 1998), promotes the exchange of resources between scientific and educational organizations and at the same time stimulates interregional cooperation. The role of universities and their academic staff, who are



actively involved in academic collaborations, in creating research networks (Benneworth, Fitjar, 2019) and, as a result, in the transfer of knowledge from large scientific centers to peripheral regions, is emphasized (Atta-Owusu, 2019). Russian scholar Bochko introduces the concept of "research forces of society", giving them the status of an economic growth factor. Bochko (2019) notes the uneven distribution of the research forces of society on the territory of the Russian Federation ("the departure of [...] science from [...] regions" to the central territories) and justifies the need to expand research activities on peripheral territories. Kutsenko & Eferin identify on the territory of Russia the so-called "safe harbors", which are the regions located in a significant geographical distance from economic centers and large agglomerations ("whirlpools"). Low level of interregional cooperation in this case leads to slower development of "safe harbors", and to lower speed of socio-economic transformations (Kutsenko, Eferin, 2019).

As for the possible crucial and growing impacts of the current digital revolution on proximity initially this factor was considered mainly from the point of view of solving coordination problems (Rallet, Torre, 2017). As a result, ICTs were presented only as a means of communication, allowing economic agents to coordinate their actions in different places better (Galliano et al., 2011). This has given rise to a discussion about the ability of ICTs to offset the limitations of physical proximity partially to support certain interactions (Aguiléra et al., 2015). More radical and, at the same time, more naive works have raised the question of completely overcoming the limitations of geographical proximity through ICT (Cairncross, 1997; Gottmann, O'Brien, 1992). Criticism of this thesis (Morgan, 2004; Torre, Rallet, 2005) led to the appearance of many theoretical and empirical works of the 90s.

However, in the above sources, the influence of digital technologies is considered somewhat limited, since the problems of coordination are investigated only within the framework of production or innovation processes and new generations of technologies that bring profound changes in attitude to space are not considered. Currently, the impact of digital technologies and markets stimulates the development of multilateral coordination of participants in interregional interaction based on platforms, the transformation of interregional relations in space and time in connection with the development of mobile communications, remote joint presence, and the introduction of other aspects of mobility. Considering the influence of the latest



generation of digital technologies on spatial and temporal representations of proximity Bernela, Ferru and Rallet (2019) proposed a new concept of proximity: "proximity on the move", at the junction of mobility and proximity.

According to Blanutsa, soon, the economy will exist in the form of multiple information flows, and therefore its efficiency will be directly related to the performance, speed, and other parameters of data transmission networks. Referring to the trends of the modern spatial economy to form agglomerations and clusters, Blanutsa suggests that economic activity will be concentrated in areas with the most developed digital economy ("territorial digital platforms"). Establishing info-communication links between such areas (points of economic space) in the context of digital transformation is the most modern and promising form of cooperation, i.a. within the national borders (Blanutsa, 2019). Melnikova refers to the urban and virtual spaces as to an integration environment. The author believes that in the context of the economy digitalization it is the virtual connectivity of the country's economic space, provided by data transmission networks, that starts to play a crucial role. In this regard, the author considers a "smart city" to be an important concept, which is understood as a city limited by a certain territory but "not limited in the network space" (Melnikova, 2019).

Analyzing the positive effects of digitalization in developed countries, Zvereva et al. (2019) note that, at the same time, in developing countries the impact of digitalization on national development is either negligible or non-existent. Auzan (2019, p. 13) believes that at least some of the changes (primarily institutional) brought about by digitalization can be used "to fulfil the potential for competitiveness". It has been noted in (Bobylev et al., 2019) that despite the undoubted importance of digitalization for the development of the modern economy, its importance "in the context of the transition to sustainable development" should not be exaggerated.

5. CONCLUSION

In this article we have analyzed the interregional cooperation (approaches to its definition, its forms and types, theoretical framework, tools, drivers, and barriers) in the context of the proximity theory development and digitalization.

Interregional cooperation is a special type of inter-territorial relations. It is economic (as well as social, political) cooperation between regional actors located in



different regions of one country or neighboring countries, through which regions achieve common strategic goals. Cooperation can take place either between individual actors or in a more systematic form (e.g., cooperation agreements). Scholars point to interregional clusters and agglomerations as special forms of interaction; they also refer to network forms of cooperation.

Speaking about the actors and beneficiaries of interregional cooperation, the authors point mainly to these categories: authorities, business structures, non-profit organizations, and associations. Interregional cooperation is most effective only if all these groups work together.

Summarizing the analyzed literature devoted to the key elements of the concept of interregional cooperation, we should note that the authors usually mention information exchange, development of joint strategic documentation, as well as the creation of specialized structures coordinating the interaction process among its tools. In research on interregional cooperation much attention is paid to interregional clusters and growth poles. Scholars characterize them as centers for concentration of knowledge, competencies, and innovative technologies.

Factors of both external (e.g. economic globalization) and internal environment (search for new local markets, joint access to knowledge and technologies) are mentioned as the main drivers of interregional cooperation.

Among the barriers that create obstacles to effective cooperation are the level of economic potential of regions, insufficiently articulated and asymmetrical goals of cooperation, and a low level of participation of key stakeholders in the processes related to interregional cooperation.

In the context of globalization and digitalization, cooperation between territories is carried out through networking and is primarily regarded as an exchange of knowledge, information, and technology. Effective cooperation is possible only between regions that have a sufficient degree of autonomy in decision-making.

The creation of knowledge networks that increase the cognitive proximity between regions is possible within macro-regions – special territorial units, which were created in the EU economic space. Russia is currently at the beginning of the process of their establishment, and it is important for it to consider the experience of those countries in which the establishment of macro-regions and knowledge networks began earlier.



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REFERENCES

Aguiléra, A., Lethiais, V., Rallet, A. (2015). Spatial proximity and intercompany communication: Myths and realities. *European Planning Studies*, 23(4), 798-810. <http://dx.doi.org/10.1080/09654313.2014.979137>

Atta-Owusu, K. (2019). Oasis in the desert? Bridging academics' collaboration activities as a conduit for global knowledge flows to peripheral regions. *Regional Studies, Regional Science*, 6(1), 265-280. <http://dx.doi.org/10.1080/21681376.2019.1590230>

Auzan, A.A. (2019). Cifrovaya ekonomika kak ekonomika: Institucional'nye trendy [Digital economy as an economy: Institutional trends]. *Vestnik Moskovskogo universiteta. Seriya 6. Ekonomika [Moscow University Economic Bulletin]*, 6, 12-19.

Bellini, N., Hilpert, U. (Eds.). (2013). *Europe's changing geography*. London: Routledge, 224. <http://dx.doi.org/10.4324/9780203383711>

Benneworth, P., Fitjar, R.D. (2019). Contextualizing the role of universities to regional development: Introduction to the special issue. *Regional Studies, Regional Science*, 6(1), 331-338. <http://dx.doi.org/10.1080/21681376.2019.1601593>

Berman, A., Marino, A., Mudambi, R. (2019). The global connectivity of regional innovation systems in Italy: A core-periphery perspective. *Regional Studies*, 54(5), 677-691. <http://dx.doi.org/10.1080/00343404.2019.1672865>

Bernela, B., Ferru, M., Rallet, A. (2019). The impact of digital technologies on perceptions of proximity. *Research Papers in Economics*. hal-02053306. Available from: <https://hal.archives-ouvertes.fr/hal-02053306/document>

Blanutsa, V.I. (2019). Cifrovaya ekonomika Sibiri: Territorial'nye platformy dlya klasterov [Digital economy of Siberia: Territorial platforms for clusters]. *Aktual'nye problemy ekonomiki i prava [Actual Problems of Economics and Law]*, 13(3), 1343-1355. <http://dx.doi.org/10.21202/1993-047x.13.2019.3.1343-1355> (in Russ.).

Bobylev, S.N., Solovyeva, S.V., Palt, M.V., Khovavko, I.Yu. (2019). Indikatory cifrovoj ekonomiki v celyah ustojchivogo razvitiya dlya Rossii [The digital economy indicators



within the sustainable development goals for Russia]. *Vestnik Moskovskogo universiteta. Seriya 6. Ekonomika* [Moscow University Economic Bulletin], 4, 24–41.

Bochko, V. S. (2019). The scientific and research forces of society and their development in the regions. *Economy of Region*, 15(3), 644-658. <http://dx.doi.org/10.17059/2019-3-2> (in Russ.).

Boschma, R. (2005). Proximity and innovation: A critical assessment. *Regional Studies*, 39(1), 61-74. <http://doi.org/10.1080/0034340052000320887>

Cairncross, F. (1997). *The death of distance*. Boston: HBS Press.

Cappellano, F., Rizzo, A. (2019). Economic drivers in cross-border regional innovation systems. *Regional Studies, Regional Science*, 6(1), 460-468. <http://doi.org/10.1080/21681376.2019.1663256>

Carrincazeaux, C., Lung, Y., Vicente, J. (2008). The scientific trajectory of the French school of proximity: Interaction and institution-based approaches to regional innovation systems. *European Planning Studies*, 16, 617-628. <http://doi.org/10.1080/09654310802049117>

Cecere, G., Corrocher, N. (2015). The intensity of interregional cooperation in information and communication technology projects: An empirical analysis of the framework programme. *Regional Studies*, 49, 204-218. <http://doi.org/10.1080/00343404.2012.759651>

Chilla, T., Streifeneder, T. (2018). Interrelational space? The spatial logic of the macro-regional strategy for the Alps and its potentials. *European Planning Studies*, 26(12), 2470-2489. <http://doi.org/10.1080/09654313.2018.1532493>

European Commission. (2021). INTERREG: European Territorial Co-operation. Available from: https://ec.europa.eu/regional_policy/en/policy/cooperation/european-territorial/ Accessed: 20 Jul. 2021.

Ezcurra, R., Rios, V. (2019). Quality of government in European regions: Do spatial spillovers matter? *Regional Studies*, 54(8), 1032-1042. <http://doi.org/10.1080/00343404.2019.1665644>

Galliano, D., Roux, P, Soulié, N. (2011). ICT intensity of use and the geography of firms. *Environment and Planning A*, 43(1), 67-86. <http://doi.org/10.1068/a43167>

Golova, I.M., Sukhovey, A.F. (2019). Differenciaciya strategii innovacionnogo razvitiya s uchetom specifiky rossijskih regionov [Differentiation of innovative development strategies considering specific characteristics of the Russian regions]. *Ekonomika regiona* [Economy of Region], 15(4), 1294–1308. <http://doi.org/10.17059/2019-4-25> (in Russ.).

Gorochnaya, V.V. (2021). Horizontal interregional relations in the border area of the European part of Russia: State and prospects in the period of geo-economic



turbulence. *Economics. Information Technologies*, 48(1), 5–16. <http://doi.org/10.52575/2687-0932-2021-48-1-5-16> (in Russ.).

Gottmann, J., O'Brien, R. (1992). Global financial integration: The end of geography. *The Geographical Journal*, 159, 101. <http://doi.org/10.2307/3451523>

Government of the Russian Federation. (2019). The Strategy for Spatial Development of the Russian Federation for the Period up to 2025. Available from: https://www.economy.gov.ru/material/directions/regionalnoe_razvitie/strategicheskoe_planirovanie_prostranstvennogo_razvitiya/strategiya_prostranstvennogo_razvitiya_rossiyskoy_federacii_na_period_do_2025_goda/ Accessed: 20 Jul. 2021.

Haug, G., Race, J. (1998). Interregional cooperation in higher education in Europe. *Journal of Studies in International Education*, 2(2), 3-34. <http://doi.org/10.1177/1028315398002002002>

Kazakov, M.Yu. (2020). Sistemnaya diagnostika problem razvitiya periferijnyh territorij agrarno-industrial'nogo regiona [System diagnostics of peripheral territories development problems in agrarian-industrial region]. PhD Thesis Summary. Belgorod State National Research University, Belgorod, 52 (in Russ.).

Kolomak, E.A. (2019). Ocenka prostranstvennoj svyaznosti ekonomicheskoy aktivnosti rossijskih regionov [Estimating spatial coherence of economic activity in Russian regions]. *Region: ekonomika i sociologiya [Region: Economics and Sociology]*, 4, 55-72. <http://doi.org/10.15372/REG20190403> (in Russ.).

Krinichansky, K.V. (2013). Politiko-ekonomicheskie aspekty formirovaniya modeli regional'nogo razvitiya v Rossii [Political and economic aspects of shaping the regional development model in Russia]. *Regional'naya Ekonomika: Teoriya i Praktika [Regional Economics: Theory and Practice]*, 7, 2-12 (in Russ.).

Kutsenko, E., Eferin, Y. (2019). "Whirlpools" and "Safe Harbors" in the dynamics of industrial specialization in Russian regions. *Foresight and STI Governance*, 13(3), 24-40. <http://doi.org/10.17323/2500-2597.2019.3.24.40>

Limonov, L., Jikharevich, B., Oding, N., Rusetskaya, O. (Eds.). (2019). *Regional'naya ekonomika i prostranstvennoe razvitie [Regional economics and spatial development]*. Vol. 1. Moscow: Urait, 319.

Lukin, E., Uskova, T. (2016). Mezhregional'noe ekonomicheskoe sotrudnichestvo: Sostoyanie, problemy, perspektivy [Interregional economic cooperation: State, problems, perspectives]. Vologda: VolRC RAS, 148. (in Russ.).

Martinus, K., Suzuki, J., Bossaghzadeh, S. (2019). Agglomeration economies, interregional commuting and innovation in the peripheries. *Regional Studies*, 54(6), 776-788. <http://doi.org/10.1080/00343404.2019.1641592>

Medeiros, E. (Ed.). (2018). *European territorial cooperation: Theoretical and empirical approaches to the process and impacts of cross-border and transnational cooperation in Europe*. Cham: Springer, 269. <http://doi.org/10.1007/978-3-319-74887-0>



Melnikova, T.B. (2019). Model of the Russian regions' economic integration: Structure and performance criteria. *Economy of Region*, 15(4), 1063-1076. <http://doi.org/10.17059/2019-4-8> (in Russ.).

Minakir, P.A. (2019). Rossijskoe ekonomicheskoe prostranstvo. Strategicheskie tupiki [Russian economic space: Strategic impasses]. *Ekonomika Regiona [Economy of Region]*, 15(4), 967-980. <http://doi.org/10.17059/2019-4-1> (in Russ.).

Minakir, P.A., Demyanenko, A.N., Polterovich, V.M. (Eds.). (2014). *Ocherki po prostranstvennoj ekonomike [Essays on spatial economics]*. Khabarovsk: ERI FEB RAS, 272 (in Russ.).

Minakir, P.A., Isaev, A.G., Demyanenko, A.N., Prokapalo, O.M. (2020). Ekonomicheskie makroregiony: Integracionnyj fenomen ili politiko-geograficheskaya celesoobraznost'? Sluchaj Dal'nego Vostoka [Economic macroregions: An integration phenomenon or a political geographic rationale? Far Eastern Russia case]. *Prostranstvennaya ekonomika [Spatial Economics]*, 16(1), 66–99. <http://doi.org/10.14530/se.2020.1.066-099> (in Russ.).

Morgan, K. (2004). The exaggerated death of geography: Learning, proximity, and territorial innovation systems. *Journal of Economic Geography*, 4(1), 3–21. <http://doi.org/10.1093/JEG/4.1.3>

Moskovkin V.M., Divinari A., Gorbunova E.I. (2020). Quantitative analysis of cluster initiatives in Russian regions. *Economics. Information Technologies*, 47(3), 459–472 (in Russ.)

Naumov, I.V. (2019). Issledovanie mezhregional'nyh vzaimosvyazej v processah formirovaniya investicionnogo potenciala territorii metodami prostranstvennogo modelirovaniya [Investigation of the interregional relationships in the processes of shaping the territories' investment potential using the methods of spatial modelling]. *Ekonomika Regiona [Economy of Region]*, 15(3), 720–735. <http://doi.org/10.17059/2019-3-8> (in Russ.).

Nikolaev, M.A., Makhotaeva, M.U. (2016). Mezhhregional'nye klasteri kak instrument ekonomicheskogo razvitiya territorij [Inter-regional clusters as a tool for economic development of territories]. *Nauchno-Tekhnicheskie Vedomosti SPbGPU. Ekonomicheskie Nauki [St. Petersburg State Polytechnical University Journal. Economics]*, 1(235), 47-57 (in Russ.).

Rallet, A., Torre, A. (2017). Geography of innovation, proximity and beyond, in: H. Bathelt, P. Cohendet, S. Henn, L. Simon (eds.), *The Elgar companion to innovation and knowledge creation*. Edward Elgar Publishing, 840. <http://dx.doi.org/10.4337/9781782548522.00036>

Science Europe. (2021). European Framework Programmes for Research and Technological Development. Available from: <https://www.scienceeurope.org/our-priorities/eu-framework-programmes/> Accessed: 20 Jul. 2021.



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OF THE EUROPEAN UNION (EU) FOR SUPPORTING COOPERATION ACROSS BORDERS IN THE CONTEXT
OF THE PROXIMITY THEORY DEVELOPMENT

Scott, J.W. (2017). Cross-border, transnational, and interregional cooperation, in: International encyclopedia of geography: People, the earth, environment and technology. Wiley, 1-10. <http://dx.doi.org/10.1002/9781118786352.wbieg0616>

Song, W. (2007). Regionalisation, inter-regional cooperation and global governance. *Asia Europe Journal*, 5, 67-82. <http://dx.doi.org/10.1007/s10308-006-0094-y>

Stroev, P.V., Vlasyuk, L.I., Makar, S.V. (2018). Upravlenie razvitiem makroregiona: Yuzhnyj polyus rosta [Macro-region development management: Southern growth pole]. *Ekonomika. Biznes. Banki* [Economics. Business. Banks], 2(23), 109-123 (in Russ.).

Stryabkova, E.A., Kulik, A.M., Kogteva, A.N., Lyshchikova, J.V., Chistnikova, I. V. (2019). Interregional interaction among the regions of the Central Black Earth Macroregion in the Russian Federation. *International Journal of Innovative Technology and Exploring Engineering*, 8(8), 3228-3234.

Torre, A., Rallet, A. (2005). Proximity and localization. *Regional Studies*, 39(1), 47-59. <http://doi.org/10.1080/0034340052000320842>

Uskova, T.V., Lukin, E.V. (2014). Interregional cooperation: Appraisal and prospects of development. *Studies on Russian Economic Development*, 25(5), 514–522. <http://doi.org/10.1134/s1075700714050128>

Uyarra, E., Marzocchi, C., Sorvik, J. (2018). How outward looking is smart specialisation? Rationales, drivers and barriers. *European Planning Studies*, 26(12), 2344–2363. <http://doi.org/10.1080/09654313.2018.1529146>

Vazhenina, I.S., Vazhenin, S.G. (2020). Konkurentnoe sotrudnichestvo territorij v sovremennom ekonomicheskom prostranstve [Competitive cooperation between territories in the modern economic space]. *Ekonomika Regiona* [Economy of Region], 16(2), 406-419. <http://doi.org/10.17059/2020-2-6> (in Russ.).

Zvereva, A.A., Belyaeva, Z.S., Sohag, K. (2019). Impact of the economy digitalization on welfare in the developed and developing countries. *Economy of Region*, 15(4), 1050-1062. <http://dx.doi.org/10.17059/2019-4-7> (in Russ.).

