ATLANTIS PRESS

Advances in Economics, Business and Management Research, volume 105

1st International Scientific and Practical Conference on Digital Economy (ISCDE 2019)

Development of interregional cooperation in the field of innovation in the context of digitalization

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***Abstract* — The current development trend of all modern socio-economic systems is digitalization. The aspects of digitalization are firmly included in almost all areas of society, and the economy is stepping up its movement in the digital direction and becoming digital. Digitalization in Russian conditions is manifested in the following aspects: access to the Internet and various purposes of using network technologies; the demand for special software for solving production, organizational and economic problems; e-commerce development; implementation of cloud services; providing organizations with specialists in the field of information and communication technologies. Digitalization is gradually blurring the boundaries between companies, sectors of the economy, and even geographic regions. The article discusses the possibilities of interregional interaction of the subjects of the Russian Federation in the innovation sphere in the context of digitalization based on European experience in the development of the concept of «smart specialization». Based on the studied practice of interregional cooperation according to the model of the «four-link spiral of innovation», types and levels of interregional interaction are identified. The proposed model for the implementation of innovative policies at the regional level based on the construction of internal and external network connections on the principles of partnership and cooperation allows us to justify the need to use a digital platform as a tool to support interregional interaction.**

Keywords* — *digital economy, the concept of «smart specialization», inter-regional cooperation, digital platform

I. INTRODUCTION

Digital technologies promote active change of habitual forms and methods of economic activity of various systems. Business is changing not only for individual companies-industries, regions and entire States are changing. This process involves primarily the most developed countries, where the points of growth of the digital economy are high-tech industries and progressive territorial entities. But over time, all players of the world market will have to enter the digital society. Russia has its own practical examples in the field of digitalization. The national program «Digital economy of the Russian Federation» for the period up to 2024 is one of 12 projects. It includes six Federal projects: regulation of the digital environment, information infrastructure, personnel for the digital economy, information security, digital technology and digital public administration [1]. The «Strategy for the development of the information society of the Russian Federation for 2017-2030» defines the categorical apparatus and basic features of the digital economy: «the Digital economy is an economic activity in which the key factor of production is data in digital form, processing large volumes and using the results of analysis of which, in comparison with traditional forms of management, can significantly improve the efficiency of various types of production, technologies, equipment, storage, sale, delivery of goods and services» [2].

The digitalization of the country is not possible without the digitalization of its regions and individual economic entities. The success of the digital course, in our opinion, largely depends on the successful implementation of regional projects for the development of the digital economy, which provide for the priorities of the national program and local solutions related to such areas as infrastructure, personnel and education, digital public administration. Therefore, we consider relevant to the study issues related to the effective implementation of the elements of the regional digital economy. In this article we will pay special attention to the problems of interregional cooperation in the field of innovation.

Currently, there is a lack of research in the scientific literature regarding the impact of inter-regional cooperation on regional development in the context of digitalization. There is no adequate system of indicators giving comprehensive information about the current and future state of interregional ties, their dynamics. It is important to understand the problems of interregional cooperation of regions in the process of their innovative development. With this in mind, an attempt was made in the article to analyse the specific role, tasks and possibilities of interregional interaction of the subjects of the Russian Federation in the innovation sphere in the context of digitalization. The use of a digital platform is proposed as an instrument for implementing interregional cooperation. This is a modern digital technology with great potential for the transformation and development of many areas and directions of human socio-economic activity.

II. BACKGROUND OF THE DEVELOPMENT OF INTER REGIONAL COOPERATION IN THE INNOVATION SPHERE

The traditional approach involves the consideration of possibilities for cooperation of regions from an economic point of view, as a mechanism to stimulate the domestic market and increase domestic demand; diversifying the economy and reducing barriers to moving resources; provide the consumer market with goods not produced in the territory of the region and local producers, sustainable supply of raw materials and components. The basic aspects of inter-regional cooperation are the following: division of labor with subsequent exchange of its results; spatial growth, uneven allocation of resources and growing competition as sources of specialization of the territory; direct relationship between the efficiency of allocation of factors of production and productivity. Each region is a complex socio-economic system consisting of interrelated elements (subsystems), acting as a kind of integrity. In addition, the region as a system is part of another system (a higher hierarchical level), which serves as an external environment for it. In this regard, the management of the development of the regional system is determined as its constituent subsystems and systems of a higher order, in particular the country as a whole [3].

In our opinion, the current development of regions in the digital economy should be not just socio-economic, but also innovative. The scale and pace of diffusion of the technologies of the fourth industrial revolution and the new technological order necessitate the transformation of innovation policies at the regional level. In the new environment, countries and regions that support exclusively domestic producers and «closed innovations» risk not taking full advantage of the opportunities offered by the digital economy. Territories that seek interaction and are open to the external environment will gain new comparative advantages. In this regard, inter-regional cooperation in the innovation environment is of particular importance in the era of disruptive influences [4].

Historically, innovation processes are concentrated, as a rule, only in a certain territory of the country and do not cover all its regions. Hence, there is a significant differentiation of regional economic systems in terms of their innovative development, which is confirmed by various statistical sources and ratings [5]. The development of the potential of territorial relations will largely solve the problem of regional disunity and create opportunities for breakthrough to those regions that initially do not have the necessary conditions for the creation and implementation of innovations. Geographical proximity of regions is not a prerequisite for cooperation. In this case, the key prerequisites for interregional cooperation are the following: the interest of the parties; the presence of the necessary competencies of the subjects of interaction; result orientation; the presence of clear contractual relations.

The importance of close cooperation between regions on the creation and dissemination of innovations is noted in the European concept of «smart specialization». It is currently the EU's key policy mechanism in supporting innovative development [6]. The principal conditions for the implementation of the European concept of «smart specialization» are presented in fig. 1.

According to the principles of the concept, an in-depth analysis of the region's position in the national and global economy is carried out to select the priorities of innovation policy. There is also a need to assess existing links with other regions and countries. Once priorities for regional development have been identified, potential opportunities for cooperation with other regions in related industries for knowledge sharing and other additional benefits are continuously sought. For these purposes, a special electronic resource – a map of regional competencies of European regions, which also successfully solves the problem of duplication in the specialization of different regions. At the same time, the authorities at the national and supranational levels provide active institutional and financial support for the development of interregional cooperation.

One example of cooperation between European regions in the field of innovation is the formation of a joint innovation strategy of Berlin and Brandenburg. The main directions of implementation of the chosen strategy are the development of international cooperation, exchange of knowledge and obtaining additional funding. The joint work is carried out in five sectoral areas: energy, information and communication technologies, Biomedicine and pharmaceuticals, transport systems technology and optics. This combined innovation strategy has been successfully implemented since 2007 [7].

Within the framework of this study, the experience of cooperation between Russian regions was studied. It was difficult to identify the analogy of Russian practices to European ones due to the lack of such examples. Cooperation between Russian regions is mostly limited to holding various conferences, forums for the exchange of experience and search for investors. This kind of interaction is certainly important, but insufficient in the context of the development of the digital economy.

Each region has certain characteristics (natural, economic, social), is unique in its own way and has competitive advantages. Being unique in its specialization, the region cannot be limited only by the conditions of its comparative advantages. With a certain potential, such a region is able to gain an additional network effect from cooperation with other regions and reach a new level of competitiveness. In modern conditions, stable competitive advantages are replaced by cyclical states of superiority. It is not the long-term retention of the achieved competitive advantages that comes to the fore, but the constant search for new ways to ensure an adequate position in the network interaction. Interregional networking and cooperation also creates synergies for the development of the national economy as a whole. This should be taken into account in the development of regional and interregional policies, as well as in the conduct of regional and interregional studies.

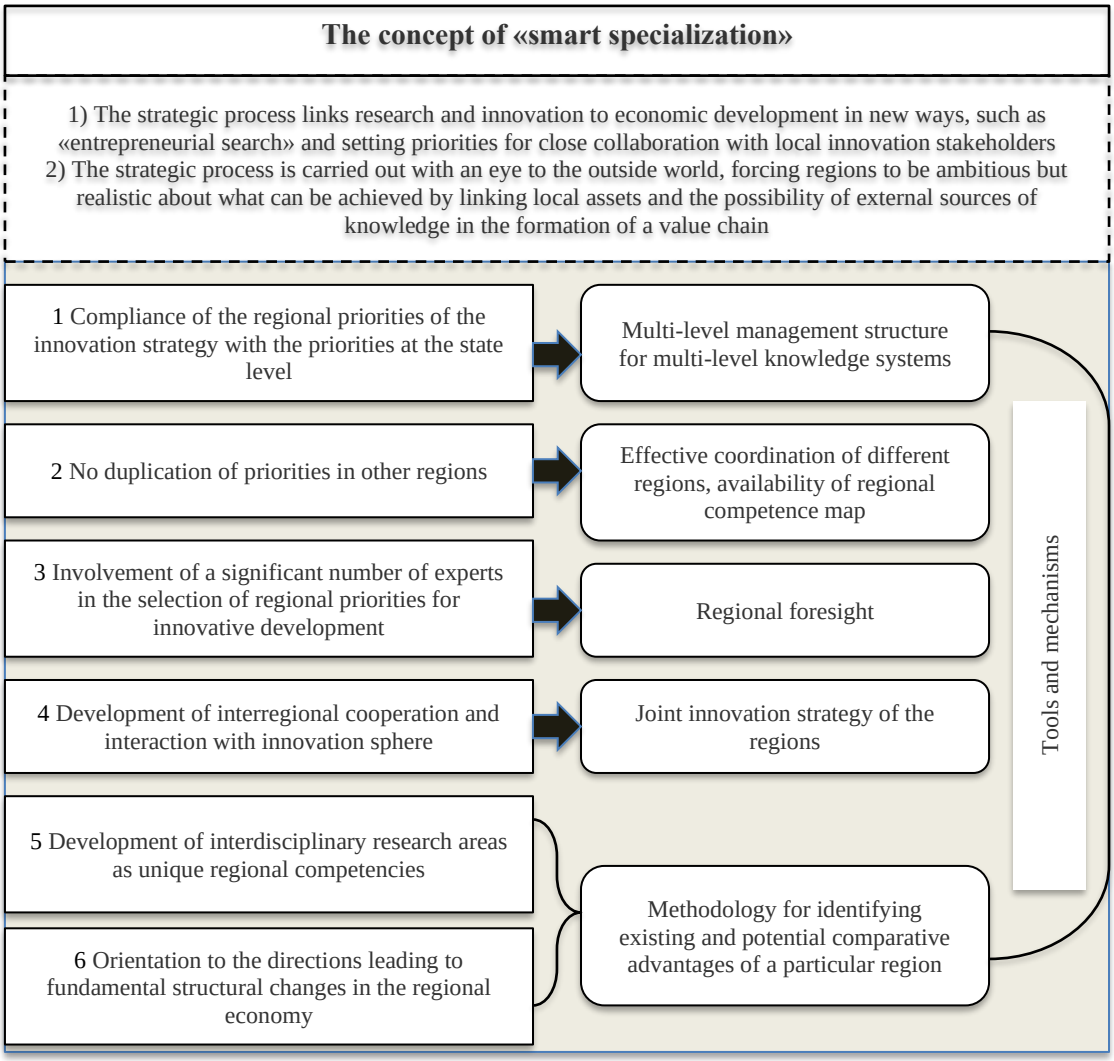

Fig.1. Fundamental conditions for the implementation of the European concept of «smart specialization»

III. Research aspects of interregional cooperation in the field of innovation

The article attempts to identify the needs for the interaction of stakeholders (agents of innovation), according to the model of «four-link spiral of innovation» at the interregional level, as well as to identify the types and levels of interregional interaction. The sources of data were academic literature devoted to the issues of innovative development of territories, comments of specialists in foreign and Russian sources of information, as well as the results of personal conversations of the authors with experts and representatives of agents of the innovation sphere. Interviews with representatives of business and science took place in the first half of 2019 in full-time and part-time forms. The discussion topics and key issues are presented in Table 1.

Expert opinions were used to confirm and justify the theses of the article, which is exploratory in nature and contains a conceptual analysis of certain aspects of interregional cooperation in the field of innovation. We tried to identify the main objectives of interregional cooperation from the perspective of each group of agents of the innovation environment as participants in the innovation process in the region (Table 2), as well as to identify the types of interregional cooperation:

- *scientific* (holding of scientific conferences, forums, festivals; participation in grants and research projects; search and support of talented youth for involvement in scientific work; search and support of innovative projects in the field of high technologies and high-tech products);
- *production* (promotion and implementation of the latest innovative achievements; creation of production cooperation and contracting; strengthening of the value chain; support of specialists and innovators);
- *educational* (training, retraining and advanced training of personnel in demanded competencies; implementation of new educational programs based on the use of advanced educational technologies;

intensification of the exchange of methodological materials and developments; organization and development of youth cooperation);

- *consulting* (implementation of information, methodological, legal, expert, management support of interregional projects).

TABLE I. TOPICS FOR DISCUSSION AND KEY ISSUES

Thematic cluster	Key issues for discussion
1 Challenges of the digital economy	- digitalization as a vector of innovative growth; - technologies of creation, processing, exchange and transfer of information; - demand for information and communication technologies; - barriers to the use of digital technologies
2 Development of the region in the digital economy	- the main problems of the digital region; - penetration of digital technologies into the business environment; - risks of innovation; - competition and competitive advantages of the region
3 Intra-regional interaction	- agents of the innovation environment (participants of the innovation process in the region); - objectives of intraregional cooperation; - information and communication process in the innovation sphere; - the result of cooperation for the participants of the innovation process
4 Inter-regional interaction	- objectives of inter-regional cooperation; - forms of interaction for the innovation sector; - types and levels of interaction between regions; - effects of cooperation

In the course of the study the following principles of interregional partnership and cooperation in the field of innovation were formulated:

- *goal orientation* (cooperation is determined by a system of goals (strategic, tactical, operational), reflecting the priorities of innovative development of the territory);
- *consistency* (targets and the mechanism of implementation of the strategy should be integrated into the overall system of relations between all participants of the innovation process);
- *innovation* (cooperation should develop innovation processes of participants and / or contribute to the creation and dissemination of innovations);
- *flexibility* (cooperation should take into account the possibility of changing the external environment, and therefore adjusting the goals, objectives, strategy and mechanism of its implementation);
- *performance* (collaboration should involve an overall result that can be reflected through a system of indicators linked to goals);
- *synergy* (cooperation should ensure the achievement of a synergistic effect, which consists of the potential of the partner regions);
- *mutual benefit* (cooperation should be based on the mutual interest of all participants in the innovation process and is based on economically sound forecasts);
- *competence* (cooperation should create conditions and opportunities for the formation of new (missing) and development of existing competencies);
- *openness* (cooperation should facilitate the exchange of knowledge and technology needed to create and disseminate innovation, including through the «open innovation» model).

TABLE II. OBJECTIVES OF INTERREGIONAL COOPERATION

Agents of the innovation sphere	Objectives of cooperation
1 Government authority	- expansion of economic space; - reduction of risks and institutional constraints; - restoration and development of economic sectors, development of production and territorial clusters; - implementation of infrastructure projects; - effective environmental management and environmental safety
2 Business community	- development of inter-sectoral cooperation; - new chains of business interaction (supply, technological process, sales, logistics); - exchange of knowledge and technology; - joint innovation and investment projects; - creation of a climate of social and ethical business and healthy competition
3 Science and education	- exchange of experience and information (educational, methodological, scientific and educational character); - student exchange; - new joint educational programs for the development of the necessary competencies; - scientific and educational collaborations for search and implementation of innovations; - development of grant and project activities in the field of innovation
4 Civil society	- growth of employment; - growth of welfare of the population; - development of tourism on the basis of historical, cultural, architectural and natural diversity; - labour exchange aimed at increasing labour mobility - development of information cooperation

Based on the objective necessity of close interaction of various regional economic systems, a model of implementation of innovation policy at the regional level based on building networks based on the principles of partnership and cooperation is proposed (fig. 2). The formation of the network can be considered the result of the gradual building of contacts between the participants of the innovation process.

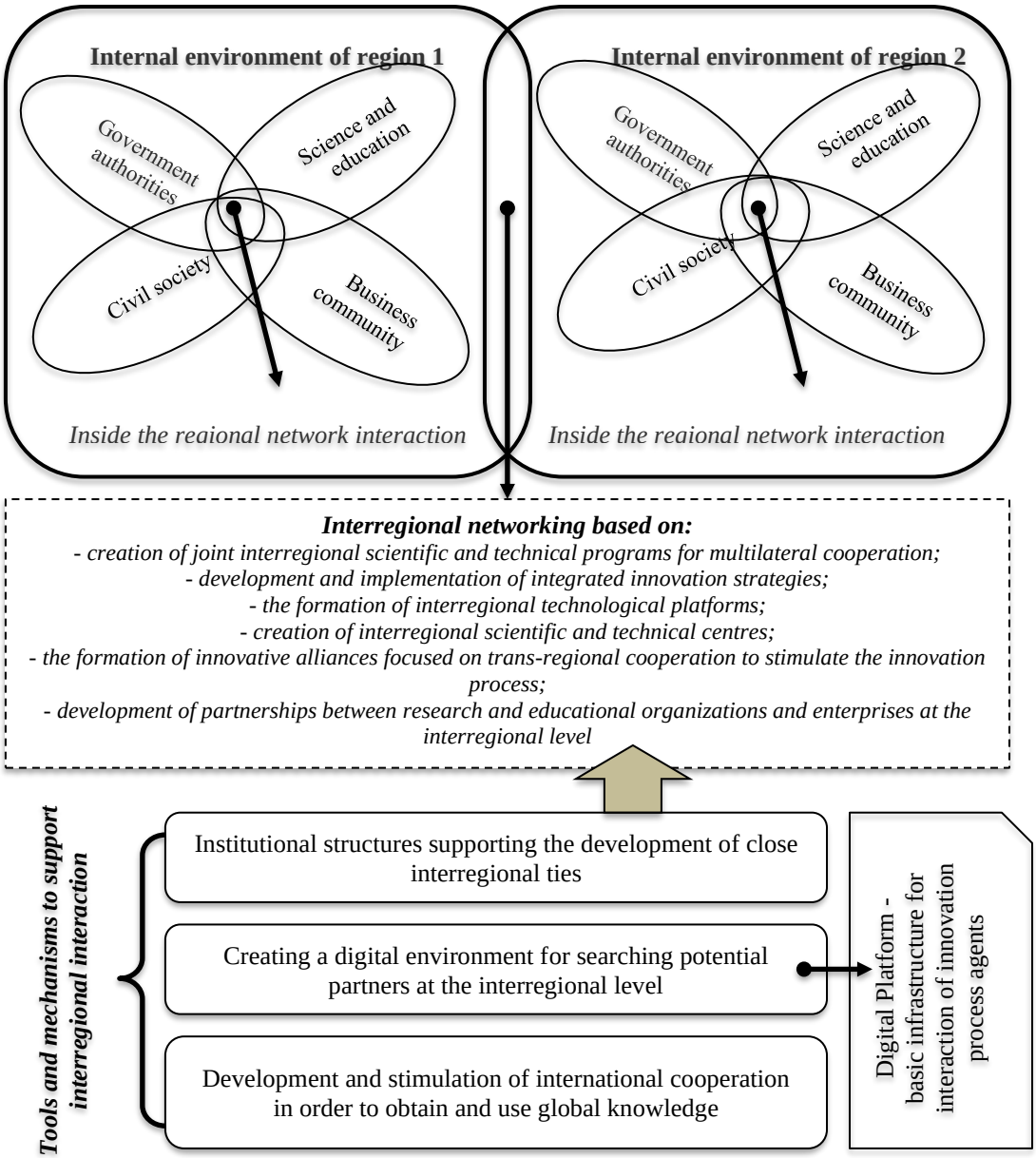

Fig. 2 Model for the implementation of innovative policies based on the construction of internal and external network relations on the principles of partnership and cooperation

Modern digital technologies allow to organize interregional cooperation on the basis of distributed teams in the digital environment. A productive digital environment is characterized by increased openness, an atmosphere of mutual understanding, cooperation, readiness to reach consensus, and active support groups.

On the basis of the studied information, within the framework of the study, we identified logical levels of development of interregional cooperation, which are formed chronologically, based on the accumulated experience of building partnerships between territories in the field of innovation:

- Level 1- *information* (implies interaction on the basis of information exchange between the participants of the innovation process at the interregional level);
- Level 2- *expert* (involvement of component agents of innovation sphere from other regions as experts to solve current and strategic issues of territory development);
- Level 3- *project* (joint development and implementation of projects in various fields: research, education, innovation, production, infrastructure, based on mutually beneficial cooperation and partnership and risk sharing);

- Level 4- *integrated* (formation of integrated structures in the field of innovation at the interregional level; joint implementation of the interregional innovation strategy).

Participating in various interregional interactions, the region not only forms its history of partnership and accumulates experience of cooperation, but also moves from level to level. In the foreseeable future, the integrated level seems to be the highest. It solves the problems of innovative development of regions in the digital economy to a greater extent, since it involves the implementation of not just joint projects, but an interregional strategy of innovative development.

IV. DIGITAL PLATFORMS FOR INTERREGIONAL COOPERATION DEVELOPMENT

The digital platform should become a support tool for the development of interregional cooperation in the field of innovation for any level. The essence of the platform approach is that the participants of the innovation process are able to share knowledge and use the urban environment as a «living laboratory» [8]. These are new formats of interaction that stimulate a culture of open innovation, communication and partnership. Therefore, we consider it expedient to use the platform as a mechanism for coordinating open innovation activities for interregional cooperation, which will give the innovation process a clear structure and help to identify possible effects.

We can note the growing interest in studying the issues of innovative development of territories in the digital economy. However, the works devoted to interregional cooperation in the digital environment are few and contain General provisions. Nevertheless, the image of the digital platform for the purposes of our study emerges (fig. 3)..

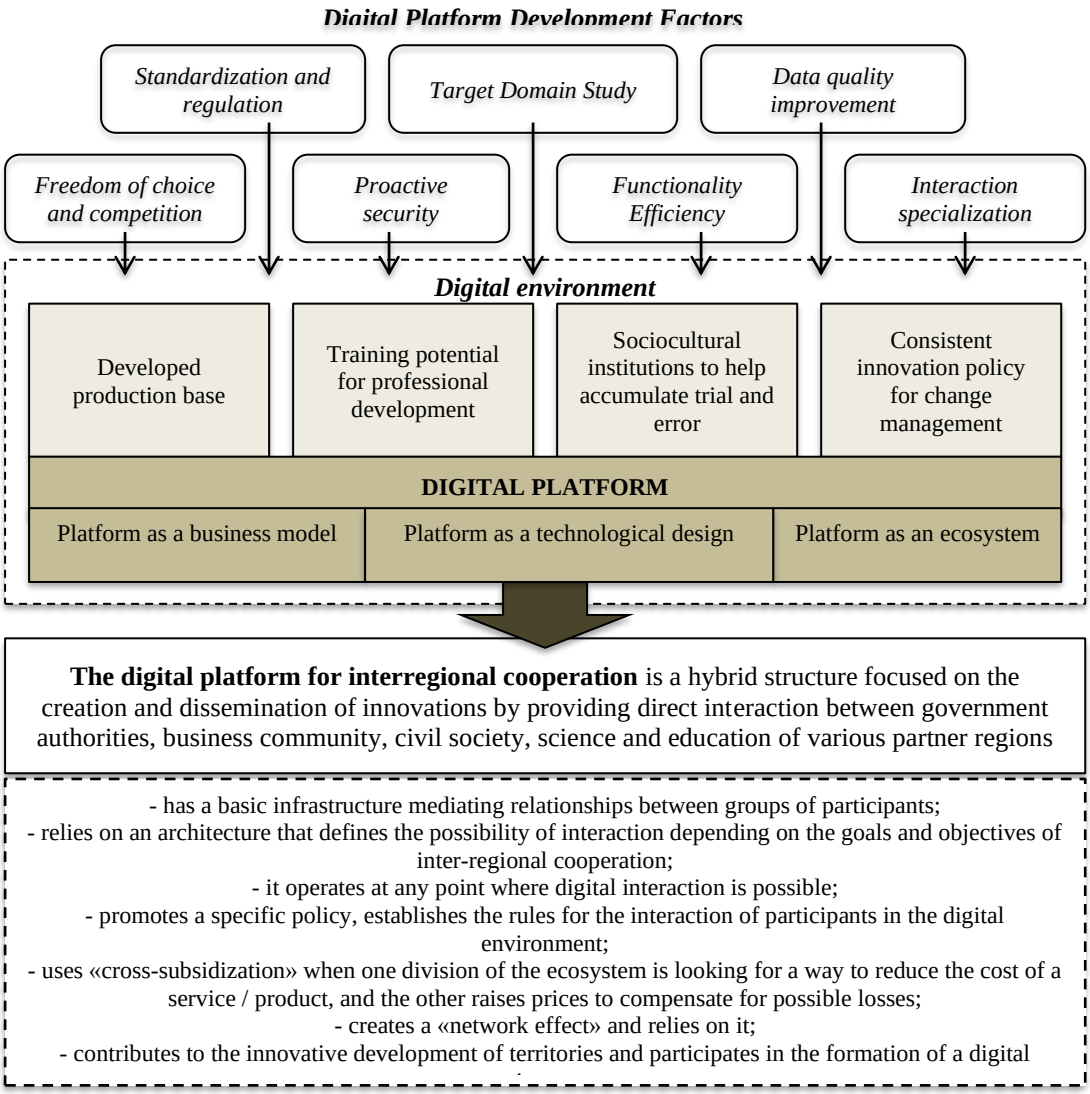

Fig. 3 The essence of a digital platform to support interregional interaction

We will assume that the platform for interregional cooperation is a basic infrastructure that mediates the relationship between different groups-agents of the innovation sphere and simplifies the task of recording and storing data [9]

A striking example of such a digital platform is the smart specialization Platform created on the basis of the joint research centre of the European Commission, which is a source of external knowledge for the EU regions. It is tasked with providing information, methodological and expert support to national and regional authorities, as well as promoting mutual learning and interregional cooperation [10]. Based on this European experience, it is possible to formulate the main tasks to be solved by the digital platform for the development of interregional cooperation:

- creation and maintenance of information Bank of data on regions of the Russian Federation, on the basis of the existing statistical information and ratings;
- networking of innovation process participants;
- involvement of specialists for joint development;
- accumulation of trial and error experience;
- clarification and correction tasks of innovative activities of agents of the innovation sphere;
- creation and maintenance of mechanisms for monitoring, control and evaluation of interaction results;
- design of the organizational structure with a clear division of processes between the participants;
- creating a certain style of communication with a hierarchical system and the development of horizontal links;
- integration of elements of the innovation system of the territory.

The initiator of the innovation process, which requires interregional cooperation, can be any agent of the innovation sphere. Based on the objectives of each group, this study proposes to conditionally consolidate their role in the digital environment of the platform based on the concept of common factors of innovative development:

- developed production base as a platform for trial and error (business community);
- training potential for professional development (science and education);
- socio-cultural institutions to stimulate the accumulation of experience of trial and error (civil society);
- consistent innovation policy for change management (government authorities).

The result of this study, the following results were obtained: analyzed the role, challenges and opportunities of interregional cooperation of constituent entities of the Russian Federation in the sphere of innovation in terms of digitization; studied European practices and the experience of cooperation between Russian regions; according to the model, «four-link spiral of innovation» at the interregional level the types, levels and principles of interregional cooperation are identified; the proposed model implementation of innovation policy based on the construction of internal and external network ties on the principles of partnership and cooperation; the main features of the digital platform as a tool to support interregional cooperation in the digital economy are defined.

V. SUMMARY

The main objectives of interaction of regional economic systems in the field of innovation are: transfer of knowledge; expansion of the list of suppliers, contractors and partners; access to promising markets and strengthening of existing positions; solutions of innovative problems faster and on the basis of risk sharing with partners; attraction of additional investments and obtaining additional income. Regions can use different models of partnership depending on the goals and opportunities. The choice of models today is extensive, but the effectiveness of interregional cooperation is largely determined by the competence of all four agents of the innovation process (government authorities, business community, science and education, civil society), as well as existing support tools at the national level. In this regard, the formation of partnerships at the interregional level should be preceded by an in-depth analysis and forecast assessment of the expected results of joint activities. The basis of relations between the regions should be specific projects designed for a certain period with the expected effect in the field of innovation.

Thus, one of the most important areas of implementation of regional innovation strategies should be the strengthening of interregional relations and the development of international cooperation in order to obtain the effect of cooperation in the policy of openness of innovation. Such an approach would avoid regional isolation and make it possible to draw on the existing accumulated experience, knowledge and resources of other economic actors. A key element of any interaction is the collection of huge amounts of data, and the platform provides an ideal information and communication mechanism for this.

The indicators of adequacy of decisions that contribute to the achievement of the following effects: economic, social, modernization, communication, humanitarian, network, synergetic, economies of scale/coverage can serve as a guide in the analysis of the results of cooperation. This aspect can be considered as one of the directions of further research. Another direction, in our opinion, can be the study of the features of distributed work for interregional cooperation in the field of innovation from the perspective of the platform approach of the digital environment.

This article was prepared in the framework of the project 19-010-00144 on the theme «Management of innovative development of territories: the concept of «smart specialization» in Russian context», with the support of the Russian Foundation for Fundamental Research.

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