

**ICEST 2021****II International Conference on Economic and Social Trends for Sustainability of Modern Society****INNOVATION MANAGEMENT BASED ON COMMUNICATION  
IN THE DIGITAL ENVIRONMENT**

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**Abstract**

The purpose of the article is to determine the features of innovation management in the digital economy based on a digital platform and communications between innovation participants. The necessity of a digital platform that ensures the process of reproduction of knowledge is theoretically substantiated. The problems of knowledge formation in the digital environment are highlighted, aggravated by the unevenness of the effectiveness of innovation. The model of communication of the participants of the innovation process is presented. New features of the communication model of interaction between innovation participants in the digital environment, the possibility of creating a single digital environment for the interaction of innovation participants, connecting to a single source of information and coordination mechanisms, as well as the digital transformation associated with this process, direct communication between the authorities and citizens have been identified. The growth in the quantity, quality and variety of relationships between organizations, citizens and socio-economic systems is taken into account, the changing dynamics of the number of transactions and the volume of data circulating leads to difficulties in synchronizing the participants in the management process. The changes in the communication model in the management of innovative activities of the territory on the basis of a digital platform are highlighted. The methodological basis of the research includes research by Russian and foreign scientists.

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## 1. Introduction

The modern social formation from the end of the twentieth century, characterized by new features caused by the development of digital technologies and new communication models in various spheres of life, the formation of a digital platform that underlies the formation of the digital economy. The modern economic formation is characterized by many researchers as a digital economy based on the use of digital technologies and digital innovations. The digital space is considered today as an integral part of any management system. Its features are the complex impact and the problem of information inequality both in terms of the level of implementation of digital technologies and, if possible, access to information, which is of particular importance for the diversified economy of Russia. The main goal of regional development in these conditions should be the determination of the appropriate priorities for technological development, the restructuring of the industry based on the introduction of a digital technological platform and the use of long-term economic growth factors that ensure sustainable competitive advantages of the region. The competitive advantages of the region in modern conditions should be considered through the system of factors of innovative development of the region. The source of these transformations is convergent technologies, which include information and communication technologies, biotechnologies, nanotechnologies and cognitive technologies, which represent the technological basis of the digital society. Their influence on social progress was reflected in the transformation of the hierarchical social structure of society into network forms of communication at all levels of social interaction: interpersonal, group, national, global Castells (2000) presented his concept of the "information" economy with the decisive importance of information, "knowledge" resources and communications in all social processes. The term "information" was first introduced in 1928 by the American Hartley (1928) to denote a measure of quantitative measurement of information disseminated through technical communication channels. It does not have a generally accepted interpretation. Each branch of science and technology determines its value. Competitiveness and productivity in a new formation, according to Castells (2000), depend on the ability of various participants to generate, process and effectively use information based on knowledge. The term "digital economy" refers exclusively to the ongoing and still unfinished transformation of all sectors of the economy due to the digitalization of information using computer technology.

Researchers Brynjolfsson and Kahin (2000), Tapscott (1996) sought to demonstrate that something is happening that goes beyond the previous concepts. Another researcher who introduced the expression "information society" - Bell (1999), considered the development of post-industrial society, emphasizing not its position in the sequence of stages of social development - after the industrial society - but the basis for determining its social structure - information. Information in Bell's works is primarily associated with scientific, theoretical knowledge, and information and telecommunications in post-industrial society play a decisive role and perform the function of a platform. The new economic formation leads to a serious change in the sectoral structure of the economy. This trend is significantly reflected in the development strategy of the region. The development of regional innovation systems is a process of economic transformations through the introduction and dissemination of new knowledge, ensured by the synergistic interaction of the participants in the innovation process and the components of the innovation infrastructure.

### **1.1. Digital platform and communications as a basis for knowledge transfer**

The digital economy puts forward new requirements for the level of innovative activity. Productivity growth rates in developed countries began to decline significantly as early as the 1970s. The growth of productivity in the manufacturing industry, which acts as a system customer and consumer of products of technological industries, has decreased. Traditional manufacturing technologies in most sectors are close to the productivity ceiling. The main direction of the study should be the conditions for ensuring the effectiveness of innovation and management of the development of the region, the identification, preservation and technological development of priority sectors of the regional economy, taking into account the new threats and consequences of the reduction in production on the one hand and the possibilities of using the digital industry.

Currently, the term "digital economy" has entered the scientific terminological turnover. The formation of a global digital economic space, the creation of information and communication platforms and digital platforms have been considered in a number of works by foreign and domestic authors. The work of Negropte (1996), Teece et al. (1997) is devoted to the study of digital platformization processes. Kling and Lamb (1999), Bukht and Hicks (2018), each country that demonstrates success in creating a digital economy has its own strategy and specific priorities for industrialization based on the use of digital technologies, experience, and there is no absolute leader in the development of all its aspects. Only on the basis of the processes of accelerated introduction of digital technologies in the economy and the social sphere, implemented on the basis of the national program "Digital Economy of the Russian Federation" (dated 04.06.2019, No. 7K), thus, the necessary conditions for the strategic development of Russia are formed.

Communication plays an important role in the generation, dissemination and implementation of new knowledge. Communication - from lat. "Communication" is a message, it is a stable connection between the participants in the management and innovation process. Communication is the basis for knowledge transfer in order to achieve regional development goals. In management processes of any level of communication, depending on their type (horizontal, vertical, interpersonal, organizational, verbal and non-verbal) I perform my functions. With the complication of organizational conditions and the emergence of new forms of communication in the digital environment, the functions of communication are changing. The organization of information exchange between the subject and the controlled object moves to a completely different level and degree of interaction. If earlier this was only possible to a limited extent in the system of organizational support, the use of feedback from the head and communication from the head of the vertical of power in the organization. The organizational bureaucratic model of Weber (1990) is distinguished by the use of a formal written form of communication within the organization, simple predictable, rational methods of transferring information, taking into account the modern possibilities of electronic document management, corporate information systems (CIS).

At present, the entropy of the external environment is high, the internal environment in a person's response to new challenges and opportunities. Ensuring an emotional and intellectual exchange of management information becomes a difficult communication task in the context of remote work and the need to manage a working group, to form a team. Establishing the relationship between people in an organization at a new stage in the development of digital technologies becomes, depending on the context,

easier and more difficult. One of the main challenges is the exponential growth of the quantity, quality and diversity of relationships between organizations, citizens and socio-economic systems, the changing dynamics of the number of transactions and the volume of data circulating and leads to difficulties in synchronizing the participants in the management process. On the other hand, the advantages include the huge potential for information processing, the speed of transmission and processing of information through communication channels. In order to form a flexible and effective model of a learning organization (the concept of Senge (2004)) in modern conditions of high dynamics and speed of organizational changes, these advantages are necessary, but obvious problems appear in the process of spreading so-called "tacit" knowledge and a shortage of live interpersonal communication. The Japanese researchers Nonaka and Takeuchi (2003) proposed to highlight implicit knowledge that is not separable from their carrier - a person, which differs from formalized, documented knowledge. For the first time, the concept of "tacit knowledge" was used in the concept of "personal knowledge" by Polani (1985) to denote a layer of human experience that is not articulated in the language, which nevertheless makes a significant contribution to such forms of scientific activity as the ability to develop and conduct experiments, the ability to work with technical means, knowledge of theoretical tools, etc.

The following types of "implicit knowledge" are distinguished: implicit knowledge is associated with the following phenomena: subjective understanding; ideals, shared values and experienced emotions; premonitions, insights and guesses; personal beliefs, points of view and opinions; intelligent models: formulated and expressed beliefs, opinions and points of view, schemes, paradigms, approaches to solving common problems and tasks; know-how, skills, technological skills, competencies.

There are two approaches to knowledge management (sometimes called scripting) - "codification" (people-content-people) and "personalization" (people-to-people), their differences are largely determined by the degree of use of information technology.

The codification approach presupposes the obligatory formalization of those knowledge and information that are especially important for the company. In accordance with certain procedures, employees are required to formalize some of their knowledge (write reports, for example) and put them in databases. In the future, they themselves and their colleagues can use these documents.

The personalization approach implies direct communication between employees at meetings, at events such as team building, etc. The key to the perception of non-formalized knowledge is experience. Without the perception of experience in any form, it would be extremely difficult for a person to penetrate into the thought process of another person.

"Digitization", in contrast to "digitalization", which is defined in the context of the processes of introducing and using digital technologies in order to obtain a synergistic effect of knowledge reproduction, involves the transfer of information to digital media as one of the options for introducing new technologies. In the context of "physical media" such as paper documents or analogue printed images, we mainly digitize through scanning, photographing, printing.

## **1.2. Communication model of innovation participants in the digital environment**

The use of information technology, the Internet and all types of network organization, computer programs not only allows you to quickly receive information and make decisions, but also causes many

fundamental organizational changes. The bureaucratic apparatus is being reduced, traditional views on the role and mechanism of effective communication of corporations are being revised, unlimited opportunities for the growth of financial markets and investment are opening up, and the cohesion of personnel is strengthening. The real diffusion of knowledge, its availability in any corner of the earth, and the general familiarization of people with cultural values are connected with the Internet. The growth rates of labour productivity are significantly increasing. The economic and managerial potential of an organization increasingly depends on the ability of managers to control information, manipulate it, and direct personnel to the most efficient use of resources.

It becomes important to encourage new cross-functional interactions that could serve the consumer. The reason for creating alliances is the fact that customer satisfaction requires the integration of different knowledge, skills and abilities. The development of wireless communications and other technological areas of development are the basis for the implementation of the basic technologies of Industry 4.0. Figure 1 presents the international statistics of 4G mobile network penetration based on the UN Economic Commission for Europe statistical database (Statistical database of the United Nations Economic Commission for Europe, 2020).

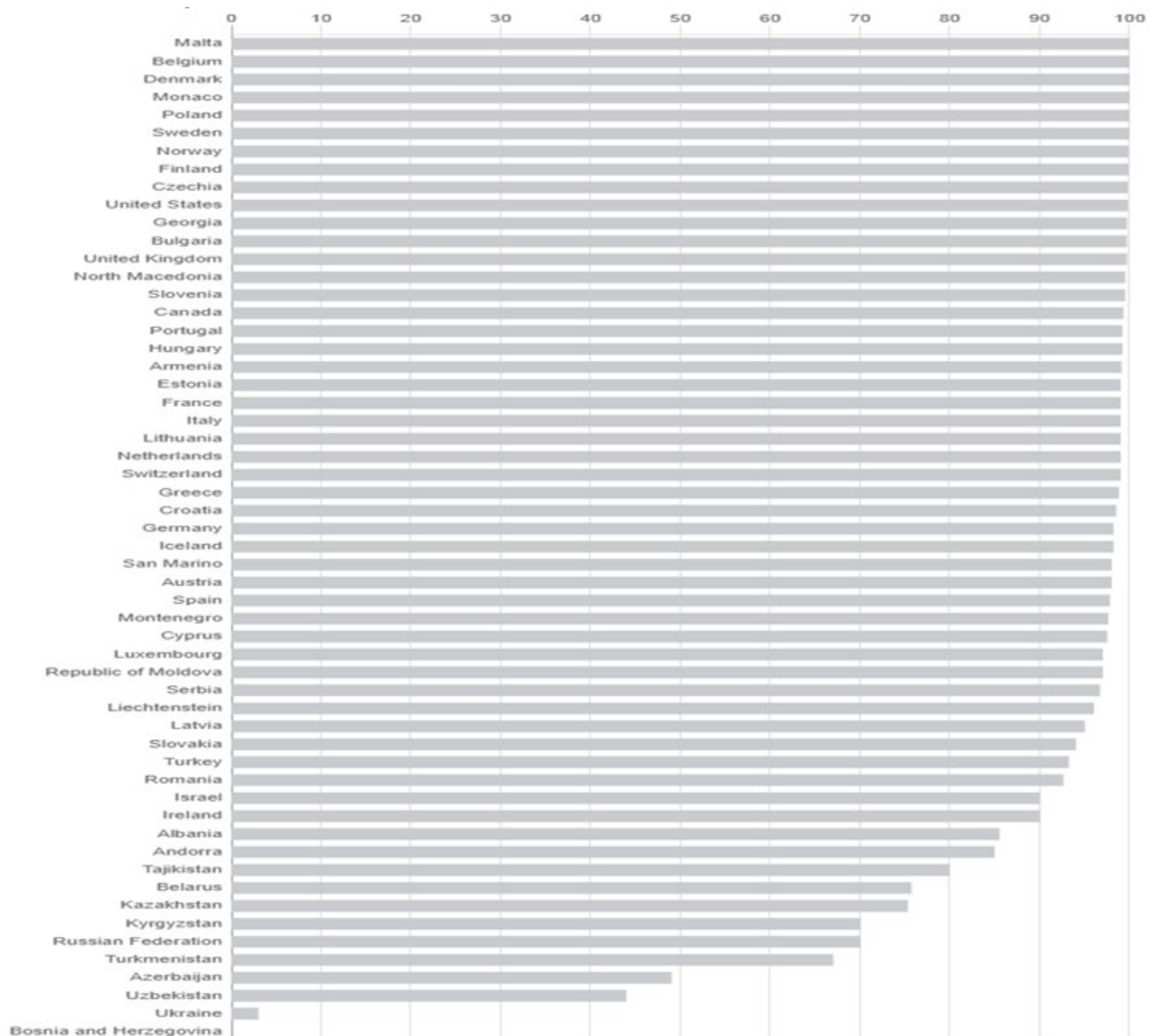


Figure 1. Share of population covered by 4G mobile network, %

The development of regional innovation systems is also interpreted as a process of economic transformation through the introduction and dissemination of new knowledge, ensured by the synergistic interaction of the components of the innovation infrastructure and participants in the innovation process. Regional socio-economic systems in modern conditions should have innovative flexibility, that is, the property, the "ability" of systems to ensure the introduction of innovations, new knowledge, to implement product and technological innovations. It is necessary to determine the key components of the innovation process and the elements governing it that ensure the innovative development of the region. The disclosure of these components is possible through the analysis of modern economic trends and conditions that determine the most priority direction of the innovative development of the Russian economy and the experience of foreign countries, most illustrating the innovative performance - the industrialization of the economy based on advanced technological solutions, new industrialization, ensuring the advanced development of regional systems. To achieve the effectiveness of innovative activities of the territories, one cannot rely only on cost reduction. Innovation and flexibility, adaptation to changes are becoming the key ingredients for success based on the use of new communication resources. The innovation process, as an investment object, is not financially attractive for private business, which is mainly focused on obtaining high profits in the shortest possible time. Innovations are the basis for the development of the economy in a transitional stage, in connection with scientific and technological progress, there is a transition from lower structures to higher and more progressive ones. These processes determine key communication technologies and new requirements for personnel training and the spread of a special culture of entrepreneurship, openness, and flexible behaviour.

Considering the experience of stimulating innovation in other countries, one should focus on the experience of countries that are leading in the existing ratings of innovative development.

South Korea, being the permanent leader of the Bloomberg rating, lost only in 2020 its primacy in the Innovation Index of Germany. According to the data of the National Statistics Office published on the website of the Ministry of SMEs and Startups of Korea (Ministry of SMEs and Startups - MSS) - about 90.2% of the population is employed in small business, with over 3.6 million business entities, which is 99.9 % of the total number of registered commercial enterprises (Jamrisko & Wei, 2020).

Change must be permanent to ensure that the economy's ability to quickly introduce new ideas, methods or products will take precedence. This is why seizing opportunities and harnessing innovation can accelerate economic growth. However, the innovation capacity component has the lowest scores on average across 12 indicators in the Global Competitiveness Index (GCI 4.0.) With an average score of only 36, and three-quarters of countries score 50 or below, indicating that they are less than halfway to the border.

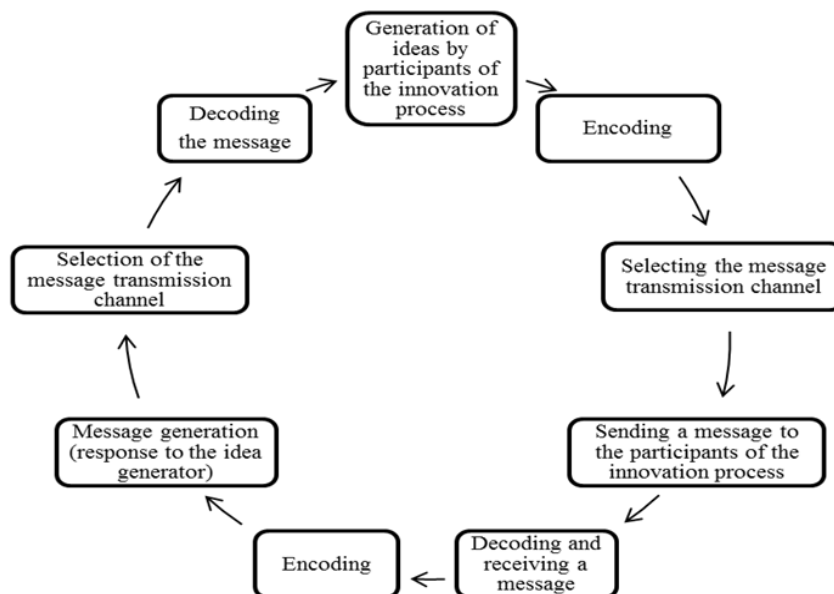
The distribution of points is so skewed that the three most efficient economies in the international rankings - Germany (87.5), the United States (86.5) and Switzerland (82.1) - are considered statistical exceptions. Innovation potential consists of indicators that reflect more or less tangible aspects of idea generation, reflected in interaction and diversity, as well as research and development (for the development of inventions) and the basis of commercialization (the ability to successfully bring innovations to the market). The business dynamism component encompasses broader factors reflected in two subsystems: administrative requirements (the extent to which the regulatory framework supports creative destruction by

making it easier to find and close a company) and entrepreneurial culture (the country's willingness to take risks and accept destructive ideas).

Other GCI components also play a critical role in determining a country's ability to innovate. These include the adoption of information and communication technologies ICT, the quality of education (as reflected in the skills component), the intensity of competition in innovation and the availability of funding.

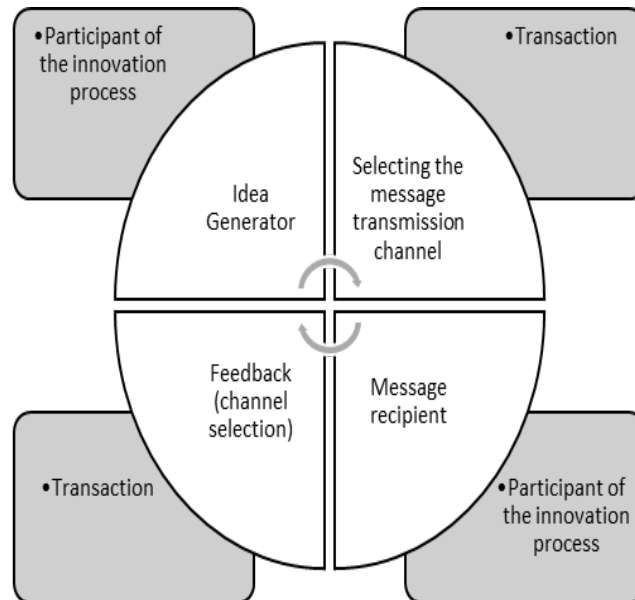
Drucker (2007) notes that a new type of labour activity is emerging: it is manifested by an employee in the field of knowledge, or an intellectual worker. At the same time, he differs from the worker of the industrial era, for whom the principles of Taylorism were suitable. Japanese researchers of knowledge management (Nonaka & Takeuchi, 2003) proposed the concept of a company that creates knowledge, which involves the use of both explicit and tacit knowledge in the process of constantly building up the intellectual capital of the company. It is also necessary to note the experience of industrial development, modernization of the economies of Korea, Singapore, the Chinese model from the 1980s and 1990s. The main task of the Chinese economic reform during this period was to ensure long-term sustainable economic growth based on the creation of new private enterprises and to involve in this process the largest possible contingent of the economically active population by rejecting the total domination of state property and attracting foreign investors to the Chinese market.

Determining the key factors of reindustrialization, economic differentiation and growth in the existing models of the last two decades of different countries, one should point to the technological core of the fifth technological order, the development of communication links and technologies, the information revolution, and the emergence of the knowledge reproduction sector. The social economic formation began to be defined as an innovative economy. The scientific and technological development of industry and the further dissemination and implementation of the technological order of a higher level are associated in modern conditions with this context. The growing role of knowledge was once noted by Bell (1999), Touraine (2004) and Toffler (2004) and other theorists of post-industrial society. Figure 2 shows the innovation process in innovation management.



**Figure 2.** Communication in the innovation process

Under the influence of the proliferation of modular digital platforms and the use of platform technologies, it is possible to create a single digital environment for interaction between innovation participants, connect to a single source of information and coordination mechanisms, as well as the digital transformation associated with this process, direct communication between authorities and citizens has already been built in some regions.



**Figure 3.** Communication in the innovation process in the digital environment

The communication model in the innovation process (Figure 3), which is formed by the new logic of interaction in the network, can be described as a blockchain. For the first time, the technology and principles of blockchain were presented by some research groups in 1991, considering its main task as storing information in digital format, excluding the possibility of data falsification. Blockchain is a distributed database containing data on all transactions that were carried out by system participants (Government Office for Science, 2016). Information is stored in the form of a "chain of blocks", each of which contains a certain number of communications. Any transaction in the blockchain is information that is subsequently verified by independent participants and embedded in the global transaction history. This technology has a set of mechanisms that help the system remain independent and transparent. By blocks of transactions, it is possible to track the fidelity of each transaction. It is a decentralized database that allows you to make a transaction anonymously, instantly and without the involvement of specialized intermediaries.

The advantages of this model, which is actively used in many areas of the digital economy, is to increase the reliability of financial transactions and reduce costs, stimulates the further development of digital tools, the introduction of platforms, and systematization of innovative processes. The innovation process as three intersecting processes: the creation of new knowledge; transformation of knowledge into a product, system, process or service; further bringing the latter in line with market demand (Patel, 1994). Most researchers consider the following stages of the innovation process: initiation, planning, implementation, monitoring and control, analysis, completion. An innovation process is a set of works



aimed at creating and commercializing new knowledge in the form of scientific and technical products, improving production technology, translating new knowledge into a product.

To meet the modern challenges of Industry 4.0, it is necessary to increase the share of innovative products and reorganize to digital technological platforms using a new communication model. Fundamental unevenness and disproportions of innovative and socio-economic development of territories is characteristic not only of Russia. The digital environment can both enhance this unevenness without using digital platformization processes in the regions, and provide new technological opportunities: convergence, flexibility, universality and globality of technologies, cross-industry efficiency, the development of additive, cloud technologies based on new network resources.

## 2. Problem Statement

Communications in the innovation management system are one of the main success factors, since they provide the main resource of the information environment - information, transfer and reproduction of knowledge, and therefore - the formation of competencies of participants in innovative activities. Communication is the interaction between the participants with innovative detail with the aim of transferring and practical implementation of knowledge, the formation of competencies. Thus, in the innovation management system, communications perform two functions:

- Infrastructure, providing information circulation and data transmission.
- Forming the competence of participants in innovative activities on the basis of formalization of knowledge and documentation, as well as direct communication with carriers of tacit knowledge.

It is through direct contacts that implicit knowledge is most effectively disseminated, which is the results of the latest research, personal experience of trial and error, the opinions of "people in business", a vision of prospects for further development, etc. knowledge that is rarely entrusted to paper in a timely manner and is published for the general public. Implicit knowledge is very important precisely at the stage of developing the concept of an innovative product, the formation of an idea, competition at the pre-market phase, which modern researchers call the most relevant and the formalization of knowledge at this phase is not possible or not safe. In the process of reaching maturity within the product life cycle, production processes are standardized and the importance of tacit knowledge decreases. The role of tacit knowledge also varies by industry. The higher the role of tacit knowledge in the industry, the more significant the factor of geographic proximity is for economic agents.

Regular face-to-face interaction also gradually leads to the formation of informal standards of conduct (business ethics) and the growth of trust in local communities. Trust, in turn, increases the density of economic transactions and promotes the proliferation of complex risk-sharing schemes required to commercialize new ideas. The conclusion should be highlighted that the communication model in the digital environment, performing the presented functions based on the generation of explicit and implicit knowledge, forms and provides the following components of the territorial innovation management system: mental, competence, institutional, infrastructural. At the same time, subsystems are distinguished according

to functional system-forming characteristics and are divided into mental, cultural, competence, technological, institutional, infrastructural, traditional subsystem of the region.

The first subsystem is "mental". In the presented conceptual structure, it covers mental models that include deeply rooted in human consciousness ways of perception and thinking of participants, principles and stereotypes of behaviour of participants in innovative processes (Sumina, 2019). In the early 90s, the American scientist Senge (2004) presented this component as a management system for an organization that effectively implements innovative transformations. At different levels of innovation in the region: a working group (team) of an innovation project, organization, work of the executive authorities of a given constituent entity of the Russian Federation, mental models determine the level of initiative, a subjective attitude towards various innovative initiatives. It reflects the peculiarities of perception, characteristics of individuals' thinking and interpretation of information, stereotyped approaches, the ability to predict the situation. Mental models perform their function at the stage of conceptualization, following generation in the innovation process, their task is to determine several solutions and an objective assessment of the situation. Mental models are inseparable from carriers and are associated with an implicit component of knowledge.

The second subsystem - "cultural" covers the previously presented factor of innovative entrepreneurial culture in the system of factors of innovative development of the region. According to T. Parsons, the main function of culture is "preservation and reproduction of the sample." Culture serves as a necessary environment for infrastructure, an institutional component of the innovative development of a territory, i.e. a set of relatively stable norms, rules, traditions, patterns of behaviour in the framework of innovation that determine the attitude to innovation, risk, inventive rationalization, understanding and acceptance of the development goals of socio-economic systems, collective values and team spirit, skills of joint activity in the implementation of innovations. Also, the result of the impact of this factor is the opportunity for the participants of the innovation process (management personnel, performers at the level of executive authorities of a given region, organizations, individual participants) to rank and assess the importance and make a decision regarding the incoming information on the results of scientific and technological progress (STP), its interpretation, skills to determine the need for the necessary knowledge.

The third subsystem of factors - "infrastructural" covers institutional and instrumental support for innovation in the region, including federal and regional projects and programs to stimulate innovation and entrepreneurial activity, tax and administrative instruments, preferential conditions, the activities of the organization of the innovation infrastructure and the executive authorities of this constituent entity of the Russian Federation.

The fourth subsystem "competence" provides the formation of the necessary innovative competencies among participants in the innovation process, includes cognitive mechanisms of cognition, the necessary skills and knowledge of the implementation of research, rationalization activities, knowledge of the basics of innovative management, organization, labor activity, motivation of participants in research, including including learning and sharing knowledge in innovation; knowledge of the most promising technological solutions and the possibilities of their search and implementation, corresponding to the range of tasks and objective conditions for the implementation of innovative transformations (Sumina, 2019). The listed subsystems form the mental and infrastructural basis for the implementation of innovative processes

in the regional economy. Its change can only take place in a relatively long term. The reproduction, preservation and evolution of this fundamental structure is ensured by the processes of education and the formation of an entrepreneurial culture, taking into account the natural motivational mechanisms for satisfying stakeholders in the process of introducing an innovation.

### **3. Research Questions**

The object of the research in the article is a model of the communication process in the management of innovative activities in the context of digital transformation, the features of the management of innovative activities of territories as a process of generating new knowledge of participants in innovative activities.

### **4. Purpose of the Study**

The purpose of the article is to determine the features of innovation management in the digital economy based on a digital platform and communications between innovation participants; theoretical substantiation of the need to form a digital platform that ensures the process of reproduction of knowledge.

### **5. Research Methods**

The methodological basis of this work includes fundamental research by Russian and foreign scientists in the field of scientific and technological development, strategic management, and regional economics. In the process of preparing the article, the following methods of scientific research were used: methods of systemic and formal-logical, scientific analysis and synthesis, comparative analysis, economic and statistical methods.

### **6. Findings**

The characteristics of the communication model of interaction between participants in innovative activities in the digital environment are determined. The functions of communications in the management of innovation activities based on a digital platform have been identified: infrastructural (ensuring the circulation of information flows) and forming the competencies of participants in innovative activities (the level and range of competencies affect the effectiveness of the innovation process). The components of the system for managing the innovative activity of the territory are determined, including the mental model (providing the formation of implicit knowledge), cultural (innovative entrepreneurial culture), infrastructural (ensuring interaction) and competence subsystems.

### **7. Conclusion**

Territorial innovation management and network logic of interaction between innovation process participants in the context of Industry 4.0. determines the need to search for ways to improve the efficiency of the communication process, its components and communication model in the digital environment.

Innovative efficiency in the context of digital transformation is increasingly determined by changes in the parameters of communications, the interaction of participants in the innovation process. A digital platform, in order to ensure the interaction of participants in innovative activities, acts as a specific communication channel, providing an infrastructure basis, but also actualizes decisions and transactions. Thus, the communication model of interaction between the participants in the innovation process is distinguished by a providing (infrastructural) and knowledge-generating (aimed at increasing the level of competence) function. In the communication process, there is a need to formalize knowledge, but the innovative result is determined and achieved in the presence of implicit knowledge. The main functions of communications in the management of innovative activities by territories are associated with the provision of information transfer channels and the formation of competencies. There is a need for motivational tools for transferring knowledge in the digital environment and solving the problems of the lack of some direct communication interaction between the participants in the innovation process.

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