

Russian practice of providing a construction industry with information and communication infrastructure in conditions of a digital economy establishment

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Abstract – The article considers the concept of information and communication infrastructure as a necessary condition for the entrepreneurship functioning in conditions of the digital economy establishment. The author’s interpretation of the term of information and communication infrastructure as a tool for business activity support is given. Elements of information and communication infrastructure in construction are presented, including organizational, economic, and technological aspects. The main elements of the information and communication infrastructure of entrepreneurship in Russia are analyzed in the framework of the construction industry digital transformation. The article reveals the problems and proposals for the development of information and communication infrastructure of entrepreneurship based on the elements of the digital economy.

Keywords — *information and communication infrastructure, digital economy, entrepreneurship, digital transformation of construction.*

I. INTRODUCTION

The relevance of business processes informatization in the conditions of the digital economy establishment is justified by the fact that the competitiveness of construction organizations is increased under the condition of effective use of information resources [1, 2]. Digital transformation, globalization, and informatization as factors of entrepreneurship development, provides organizations with the ability to react to the challenges of the modern market and adjust to its dynamic transformations. On the contrary, with the incomplete use of the information and communication infrastructure potential by enterprises, they risk losing their competitive positions and occupied market niches, “dropping out” from the market as well as from the international division of labour and the community of developed countries.

Under these conditions, the most important task of increasing the competitiveness of entrepreneurship from the position of the state is to form a modern, unified information and communication infrastructure (later referred to as ICI) that meets the requirements of the digital economy [3].

Insufficient research of the possibilities of the information and communication infrastructure of entrepreneurial activity in the construction industry leads to the adoption of ineffective management decisions, and, consequently, to a violation of the

terms for implementation of investment and construction projects, financial operations, and negatively affects the efficiency of entrepreneurial activities in construction.

II. LITERATURE REVIEW

Despite the reasonably extensive coverage of the infrastructure support for entrepreneurship issues in the scientific literature in general, the specifics of providing information and communication infrastructure for business activities in the construction industry are not sufficiently disclosed. Consequently, it is important to conduct a study of the entrepreneurship information and communication infrastructure in the construction sphere under the influence of digitalization processes, as well as appropriate instruments and mechanisms of the entrepreneurship efficiency improvement.

According to the author Koyda S.P. - ICI is a complex of auxiliary industries and enterprises that are engaged in servicing and supporting the functioning of socio-economic systems by providing access for business entities of these systems to the information resources they need, as well as instruments for generating new knowledge, processing information, and building communication interaction [4].

The most generalized and universal is the definition given by the British Council in Russia and the Institute of the Information Society. Information and communication infrastructure - a set of geographically dispersed state and corporate information systems, communication networks, switching facilities and information stream management, as well as organizational structures, legal and regulatory mechanisms to ensure their effective functioning [5].

Information and communication infrastructure in different scientific sources is described as a system of organizational structures that allows maintaining the efficiency and improvement of the information space at the state level as well as mechanisms of information exchange ensurance and interaction between business participants [6].

The information space is understood as a set of databases, technologies for its maintenance and use, information telecommunication systems that function on the basis of general principles and provide informational interaction between

business entities and citizens to meet their needs [7]. The information space consists of information resources, interaction tools, and infrastructure [6].

Entrepreneurs who can effectively use information and communication resources occupy leading market positions and stimulate the construction industry development. At the same time, such organizations allow developing of modern digital technologies due to their continuous use and improvement. This correlation was studied by the American scientist, the author of the “information society” concept, M. Castells and was named the information-global economy development cumulative loop [8].

Thus, based on the existing analysis of scientific views, as well as the specifics of the business entities functioning in the conditions of the digital economy establishment [9], the author can formulate the concept of information and communication infrastructure of entrepreneurship.

Under the information and communication infrastructure of entrepreneurial activity, the author understands the totality of information systems, organizational, legal and economic mechanisms for its operation, ensuring the collection, transmission, processing and data access on all aspects of the socio-economic life of society.

III. METHODS

Tools and methods of information support for business activities in the digital economy are implemented using technological capabilities within a single information space. Imagine the information and communication infrastructure as a set of general and specialized ICI elements in construction [2].

General ICI consists of information objects and tools that contain data on business activities, regardless of the one's scope. This group of ICI includes legal support of entrepreneurship, investment and credit resources.

Specialized ICI covers the necessary elements and tools which characterize the specifics of business activities in the construction industry. Specialized ICI consists of organizational-economic and technological units.

The organizational and economic unit of the ICI includes elements that provide business entities with information from official authorities on federal, regional, and local levels, as well as other information related to business, such as market researches, monitoring, control, statistics, etc. (Minstroy, zakupki.gov.ru and others).

The technological block includes software products and solutions for the construction industry digitalization and various aspects of business activities, for example, management of investment and construction projects, interactions between participants of before-mentioned activities. According to the Federal Law “On Information, Information Technologies and Information Protection” of 07.27.2006 N 149-Φ3 information systems (hereafter - IS) include [10]:

- State information systems;
- Municipal IS developed and operated on the basis of the decision of the local government;
- Other IS.

There is a State Information Systems Register in Russia, which is presented on the federal service for supervision in the sphere of communications, information technologies and mass communications website (Roskomnadzor) [11]. The registry in

electronic form is maintained according to constant organizational, methodological, and software-technical principles that ensure the compatibility and interaction of this registry with different federal information systems and information and telecommunication networks [12].

IV. RESULTS

The progress of information and communication technologies affects all aspects of entrepreneurial activity and stimulates its development. Information support for entrepreneurship includes its legislative support, the information provision about potential partners and investors, the consulting provision services, access to information about the market situation and forecast of its development as well as other business aspects. The competitiveness of an organization depends on relevant legal information that provides regulation of both business activities and the construction sphere.

The development of the information environment is important for the digital transformation of the construction industry and will increase its efficiency. According to the forecast of the Ministry of Construction and Housing and Communal Services, the transition to digital construction in 5 years will reduce the time and additional costs of construction projects implemented at the expense of the Russian Federation budget at all levels up to 20%. In this case, the time from the building decision to the commissioning of the object will be reduced to 30% [13].

The large-scale introduction of digital tools in construction business activities will require serious preparatory work. In particular, it is necessary to transfer the fund of regulatory and technical documentation in the construction sector to digital format, develop a basis for an information model of a building being under construction automating, introduce a unified system for classifying building information in order to harmonize regulatory and technical documentation with international and Russian legislation [14].

The “roadmap” of construction development includes measures in the informatization field [15]. The strategy of innovative construction development, developed in 2018, covers its digitalization. Amendments were made to the legislative acts regarding the responsibilities for the development and exploitation of information supporting systems for urban planning activities on the responsible executive authorities of the constituent entities of the Russian Federation.

At the end of 2018, the process of collecting and analyzing information on the cost of material and technical resources in construction was automated using the functionality of the federal state information system for pricing in construction. Aforementioned allows organizations to obtain timely, reliable and accurate data on the cost of material and technical resources.

ICI in construction will be significantly improved due to the development, commissioning and informational filling of the state information system “The Unified State Register of Capital Construction Objects Project Documentation Examination”. Due to the information contained in this resource, organizations will be able to reduce the time and cost of designing and further passing the examination and construction and installation works.

The development of an open information resource for publishing data on registries describing procedures in the construction industry is continuing. This digital tool will increase the availability and transparency of relevant information for business entities.

Monitoring of the typical software solutions for providing local government with urban planning activities using information systems in order to standardize software was conducted out by the end of 2018.

In addition, proposals were developed to substantiate the development of a federal state IS for the provision of urban planning. The main task of the proposed IS will be the implementation in the territory of the country of a single collection, documentation, updating, processing, systematization, accounting, storage, and provision of information to interested parties for carrying out urban planning activities [14].

In order to further develop the legal support of ICI, the legislation of the Russian Federation proposes amendments aimed at developing a unified standard for the provision of regional or municipal services with receiving permission for building using e-government infrastructure. This will eliminate the existing imperfect practice of providing services for the supplying of building permits in different regions of the Russian Federation and define a single standard for the provision of relevant services.

An important step in the development of legal support for ICI at the end of 2018 was the implementation of changes in legislation related to the introduction of information modelling technologies at all stages of a capital construction object life cycle. The result of the adoption of these changes will become the federal state pricing IS during the construction, operation and demolition of capital construction objects. The purpose of this event is to improve the accuracy of the predicted calculations due to the transition to the resource method of forming the estimated documentation, as well as improving the transparency of the estimated cost of the building exploitation and its liquidation.

During September 2018, the deadlines for the completion of a single digital platform for building IS were approved. The platform will be developed within the framework of the federal project "Digital construction". This large-scale project will ensure the digital transformation of the industry by 2024 [16].

Digital transformation of the construction sector is the automation of all stages and procedures throughout the life cycle of the object. It is planned to launch a unified state digital platform in construction by December 2019, which will ensure the interaction of authorities, local government, and business structures in digital format at all stages of the urban planning processes.

It is supposed within the defined time limits to introduce corrections to the legislation, related to the creation of a regulatory documents federal register in the field of real estate security. The registry will include data covering building codes and rules, as well as documents of federal executive authority, the use of which affects the safety, reliability and durability of capital construction projects (in digital format).

During September 2018, the establishment of a regulatory technical documents system was completed, ensuring the introduction of information modelling technologies in

construction [17]. In February 2019, the Ministry of Construction and Housing and Communal Services developed and published amendments to the Town Planning Code on Information Modeling Technologies [18]. Now the legislative act contains the concept of "information model of a capital construction object". The draft law provides the legal basis for the implementation of a unified information management system for capital construction objects through the use of information modelling technologies during the building life cycle, taking into account all business processes, government functions and public services in the construction industry.

The amendments introduce the concept of "Classifier of building information" into the Town Planning Code [16]. According to the document, this classifier will be designed "to provide information support for tasks in the field of classification and coding of construction information for automating engineering survey processes, calculating investment needs, designing, building, renovating, overhauling, operating, and demolishing real estate. It is assumed that the rules of formation and the procedure for maintaining this classifier will be established by the Ministry. The system operator is proposed to appoint the Ministry or its subordinate institution.

Further development of ICI entrepreneurship is impossible without the introduction of BIM-technologies. The government has developed an official document to implement the tasks - a Plan of Measures for the implementation of an assessment of the economic efficiency of justifying investments and information modelling technologies at all stages of the "life cycle" of a capital construction project [17].

Its first direction is the approval of domestic standards for the use of BIM-technologies in Q1 2019. The roadmap for the transition to BIM-technology contains the main aspects of its implementation [19].

Information on digital models of capital construction projects created using BIM technologies will be categorized as technological data in the second quarter of 2020. It is assumed to provide a regulatory requirement for the storage of this information within the territory of the Russian Federation in this case.

In the second quarter of 2021, according to the law, state authorities and state corporations will be required to independently design construction sites, as well as to purchase the necessary resources and services for the facilities construction only using BIM technologies. Documentation of the procurement should include the need to use appropriate digital models.

All state structures will implement the construction of real estate objects with the help of digital information modelling technologies until the end of 2022.

Due to the developed system of measures for the ICI business support until the end of 2024, the part of projected buildings, which are subject to verification for compliance with the requirements and standards without human participation, will be 9% of the projected buildings total number. The part of real estate objects built using information modelling technologies will be 80% of the total number of implemented projects.

The plan also provides a system of measures to improve the efficiency of buildings and structures construction [17]. In the

first half of 2019, it is planned and carried out an analysis of the possibilities for introducing remote pre-shift inspection systems and remote monitoring of the personal health status in the construction industry, as well as during the operation of the in-house infrastructure elements. It is expected to establish a requirement for the mandatory implementation of systems for remote pre-shift inspection systems and remote monitoring of the personal health status in the construction industry, as well as during the operation of the hazardous in-house infrastructure elements.

There is a mandatory integration of built objects with “System-112” and KSEON comprehensive emergency alert system which is an important tool for the ICI entrepreneurship development [16].

In particular, by the beginning of 2020, all construction companies will be obliged to ensure the integration of existing regional and municipal solutions as “System 112” and the comprehensive emergency alert system KSEON (hereafter - KSEON) when designing buildings.

It is planned to introduce systems for economic monitoring, analysis and forecasting of the house infrastructure breakdowns (elevators, pipelines, etc.) for buildings constructed using BIM technologies in 10 cities by the end of 2020 [20]. At the same time, the integration of these systems with digital platforms for resources management of cities and municipalities should be ensured.

All the constructed real estate objects which are approved by the state commission and transferred to the state balance will be integrated with regional or municipal solutions as “System 112” and KSEON until the end of 2021.

Due to the developed measures, it is expected by the end of 2024 that injuries on construction yards will decrease by 15% compared to 2018. All housing projects built using BIM technology will be equipped with monitoring systems, analysis and forecasting of house infrastructure breakdowns. The share of operated real estate and housing and public utilities, having a digital twin model, will be 60% of the total number of real estate facilities in use.

The plan also provides real estate transactions in electronic form as part of the ICI development [17]. With that goal will be developed Russian own digital platform, based on an analysis of effective world experience in obtaining construction permits and making real estate transactions using digital technologies. It is intended to implement the regulatory ability to verify the integrity of participants in a real estate transaction in electronic form using information from state information systems.

Continuing the analysis of legal aspects of entrepreneur ICI activity, the author notes that new sets of rules on information modelling in construction came into force in 2017 [21, 22, 23].

The system of regulatory and technical documents related to BIM totally will include 15 national standards (GOST R) and 10 sets of rules, according to the Ministry of Construction. 13 GOST R and 4 sets of rules of all will concern the fundamental (basic) areas, the rest - the individual stages of the life cycle. As for today, 7 GOST and 6 sets of rules are already operating in the field of information modelling.

V. DISCUSSION

In modern conditions of transformation to a digital economy, entrepreneurship is a key structural element for the economy and

civil society development. In a digital economy and high requirements for goods and services, tough competition, and increasing market instability, the most common problems are: access to financing, labour qualifications, unfair competition in the informal economy, corruption, high infrastructure facilities physical deterioration, lack of legal guarantees from state, insufficient level of development, accessibility and balance of the existing infrastructure system for entrepreneurs etc.

The author offers the following to solve these problems:

- Optimization of the state and non-state influence on the formation of the entrepreneurship infrastructure system;
- Development of integrity and systematic improvement of infrastructure conditions;
- A balanced distribution of infrastructure facilities;
- Ensuring close interaction of all participants in this process;
- Formation of ICI in accordance with the needs of business entities;
- Creation and development of ICI facilities, their coordination and monitoring;
- Introduction of promising practices and technologies that are successfully implemented in foreign countries and various regions of Russia;
- Wider use of self-regulatory mechanisms and public-private partnerships;
- Use of information and communication technologies which are currently an effective tool for business development in the global digital economy.

Thus, for the formation of modern ICI entrepreneurship in accordance with the strategic goals and priorities of the national economic development in general, and the construction sector in particular, effectiveness of managerial influences, a rational combination of economic, legal, and administrative levers, methods, and forms of influence from regional authorities and management. Coordination of the state, region and business interests on the basis of mutual complementarity, the introduction of mechanisms to attract investment will largely depend on the effectiveness of the creation and development of ICI business facilities.

VI. CONCLUSION

Thus, in the modern condition of the digital economy establishment, the information and communication infrastructure is becoming increasingly important in the development of entrepreneurship. Under the information and communication infrastructure of entrepreneurial activity, it is proposed to understand the combination of information systems and organizational, legal, economic mechanisms, and their functioning, which ensures the collection, processing, transmission and access to data on all aspects of the society socio-economic life. Information and communication infrastructure becomes a separate business sector, a necessary condition for the transparency of its implementation and the field for effective capital investment.

Analysis of the elements and mechanisms of the information and communication infrastructure of entrepreneurial activity requires deep economic and managerial elaboration in further studies. The main reason is that the composition, functions, and technologies of the information infrastructure functioning are dynamically changing today, which is due to the digital transformation of the world and Russian economies.

The main measures for the development of entrepreneurship ICI should include: optimal interaction of the state and business in solving the problems of infrastructure support for entrepreneurship; establishment of the necessary conditions for the systematic and balanced extension of the ICI; ensuring transparent interactions at each level; ICI formation in accordance with the needs of business entities; construction of ICI facilities, their coordination and monitoring; the use of self-regulatory mechanisms and public-private partnerships; the use of information and communication technologies, which are currently an effective tool for business development in the global digital economy; introduction of international best practices.

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