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Assessment of innovative solutions and risks of development in the construction industry

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Abstract: The directions of development of innovative activity in the field of industrial and civil construction are considered, the main innovative approaches that are most popular at the present stage of digitalization of the economy are presented. The analysis of innovative solutions and risks associated with the implementation of digital transformation in construction organizations is presented.

Keywords: construction industry, digitalization, innovative development, risks

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Introduction

An innovative type of economic development is the most important way to increase a country's competitiveness. The implementation of this priority area requires the transformation of innovation potential into one of the most important resources for sustainable economic growth (Veko & Maslennikova, 2021).

The construction industry at the present stage is facing long-term systemic challenges that necessitate the creation of a strategy for its development, including its innovative component for the period up to 2030, in particular: increased global competition; the formation of technological changes that enhance the role of innovation; creation of a technological base based on the use of biotechnology, informatics and nanotechnology; the growing role of human capital as the main factor in economic

development; depletion of the potential of the raw material export model of economic development due to the unstable situation on the world energy market, and the need to reorient financing from budget to investment, including, first of all, attracting funds from the population (*Strategy of innovative …*; Maltsevich et al., 2021).

The construction business is starting to introduce digital technologies with some delay. This is generally explained by industry specifics, strict regulations and conservatism. However, nowadays, the need for digital transformation is becoming quite obvious, which will allow organizations to maintain competitiveness in the market. Innovative solutions in the construction industry will prevent a decrease in the pace of construction, increase labor productivity, and will contribute to the creation of highly qualified jobs (through training personnel, which are necessary for the development of highly efficient industries, taking into account modern trends in the development of the industry), also the growth of R&D, etc. (*Belarus in numbers…*, 2020). The intensification of investment activities towards the introduction of digital technologies will allow a new level of construction organization to be attained. At the same time, the industry will face problems inherent in the innovation process as a whole.

1. The purpose and objectives of the study

The purpose of this work is to assess innovative solutions and risks for the development of the construction industry. In the course of the study, the task was set to identify, through the assessment system, the degree of implementation of innovative solutions and risks of the construction industry.

2. Research system and methodology

The research was carried out using the methods of logical and comparative analysis, graphical presentation of information, methods of comparison, analogy and systematization, and a comprehensive review of industry literature.

In the economy of the Republic of Belarus, the share of the gross value added of construction products (408.9 million rubles in current prices) in the total gross domestic product (GDP) in 2019 amounted to 4.1 percent (National Statistical Committee). The average annual number of workers employed in construction is 6.2 percent of the total number of people employed in the country's economy according to data for 2019 (National Statistical Committee). The volume of contract work completed over the past decade reflects the stability of the construction industry.

However, due to a slowdown in industrial development and a drop in economic growth in trade and services in the context of a pandemic, in order to minimize their costs, many enterprises have stopped the expansion of production through new construction and at the same time have postponed current production. This situation

leads to a reduction in the industry's contribution to the gross domestic product, a decrease in the volume of contract work, an aggravation of the problems of non-payments, and a complication of the financial situation of construction organizations. The limited use of modern design technologies and insufficient responsibility of design organizations affect the timing and quality of the development of design documentation (Vasilyeva & Bachurinskaya, 2018).

In addition to weak investment activity, obstacles to the development of the construction industry include the monopoly position of individual construction companies, unnecessary administrative barriers, as well as imperfect technical regulation, and the imbalance of building codes and codes of practice with international standards. Ultimately, the gap in the interaction of the scientific, industrial and commercial environment impedes the continuous functioning of the innovation system and leads to a decrease in the competitiveness of the construction industry, which is due to insufficient investment, information opacity of the industry and the market (lack of objective data on construction companies and manufacturers of construction materials and products), inconsistency of business processes in construction companies with international standards (differences in regulatory and technical documentation and approaches to the organization and management of construction), and insufficient efficiency of the system for transferring innovative developments to construction production, etc. (Borisova & Abidov).

The reason for the reluctance of the construction industry in terms of innovations lies in the lack of commercial interest from the overwhelming majority of developers, since with a favorable market situation, a high rate of return can be obtained without the use of innovations.

The short-term business thinking that has developed among the subjects of the investment and construction process, limited by the time frame for the implementation of the construction project, does not contribute to the activation of the processes of introducing innovations. The developer plans and carries out its activities only within the approved schedule of the construction project. Everything that will happen after the completion of construction, most often, is not in their opinion, an area of responsibility or a subject of commercial interest. As a result, the requirements for resource and energy efficiency, for the cost of the subsequent operation of the facility are underestimated, which contributes to the use of obsolete, but quickly recouped materials and technologies (*On priority* …, 2019). Most of these factors affecting the decline in the competitiveness of the construction industry are interdependent and exacerbate the main systemic problems of the industry – technological backwardness, disunity, and closeness.

3. Analytical research

The solution of the indicated problems has, not only theoretical, but also practical importance, since it will improve the level of management and, on this basis, ensure the innovative attractiveness of the construction industry.

An analysis of the literature on the problem showed that, in general, it is widely represented in scientific publications, which provides a basis for the formation of a system-integral idea of the subject of research. However, the publications do not pay enough attention to the issues of assessing innovative solutions and risks of development of the construction industry. This actualizes the need to substantiate the ways of assessing innovative solutions and risks in the construction industry.

The increase in the rates of economic development and production efficiency of the Republic of Belarus is associated primarily with the activation of innovative activities.

In 2020, the share of gross fixed capital formation in GDP for the Republic of Belarus amounted to 24.8%, investments in fixed assets – 29633.3 million rubles, investments in fixed assets per capita – 3152.2 rubles, construction – installation work was 15602.3 million rubles (52.7% of the total investment in fixed assets) (*Investments and construction*, 2021).

The main indicators of investment in fixed assets are shown in Table 1.

Table 1. Main indicators of investments in fixed assets (*Investments and construction*…, 2021)

Indicators	Years				
	2016	2017	2018	2019	2020
Share of investments in fixed capital in GDP, %	19.7	19.9	20.4	21.4	20.2
Fixed capital investment indices (in % of the previous year)	82.6	105.1	106.0	106.6	94.0
Fixed capital investments per capital, thousand Rubles	2.0	2.2	2.6	3.1	3.2
Construction and installation work indices (in % to the previous year)	83.8	95.6	105.0	103.9	101.3
Construction and installation work indices, (in % to the previous year) Technological structure of investments in fixed assets (in % of the previous year) including:					
- construction and installation work	52.2	48.9	49.4	49.6	52.7
- machinery, equipment and vehicles	37.5	40.0	40.3	40.0	36.8
- other work and costs	12.1	11.1	10.3	10.4	10.5

The analysis of the given indicators in the Republic of Belarus shows their positive dynamics from 2016 to 2019 and their slight decrease in 2020 due to objective reasons (due to the pandemic). In accordance with the Directive of the President of the Republic of Belarus dated March 4, 2019 No 8 «On the priority directions of development of the construction industry», the relevance of the digital transformation of the industry (Fig. 1) in the Republic of Belarus is considered based on conceptual principles (*Directive of the President* …, 2019).

The digitalization of construction is inevitable, and in a pandemic it can be accelerated. The latest statistics for the construction industry show a fast growing and resilient sector. However, rising construction costs and labor problems, in addition to new regulations, reduce the likelihood of errors and losses.

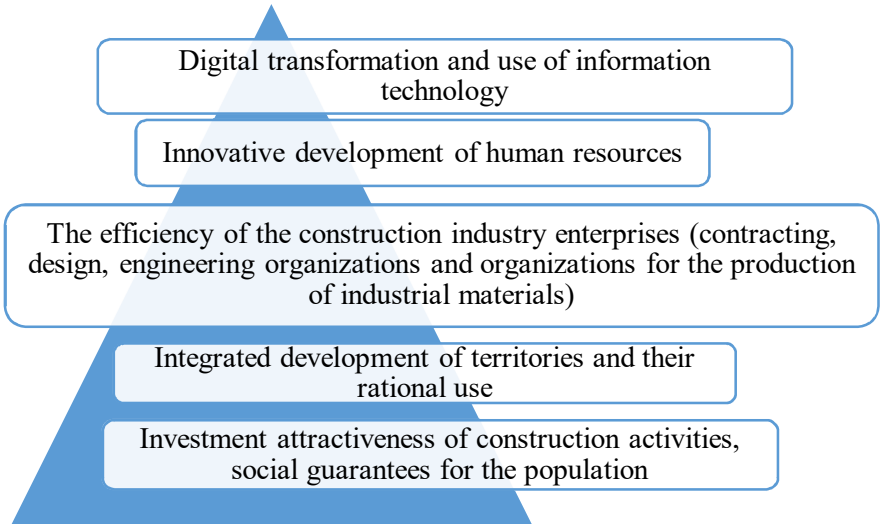

Fig. 1. Basic principles for the development of the construction industry in the Republic of Belarus

Source: developed by the author based on (Shumsky)

New technologies continue to reshape the construction site, improve the ability to win projects and increase profit margins. Trends and movements are changing the role of industry professionals and front-line workers. As the industry becomes more competitive and the market changes, the use of these trends in the construction industry will be beneficial for any construction firm (*National strategy* …).

Updating the above criteria allows you to change the construction time by reducing the cycle time, which allows you to prevent the loss of funds due to the "freeze" of construction (in case of an unfinished object, bankruptcy, refusal of loans and other situations).

Thus, the information technology of the organization serving the strategic goals of the construction business, are used to manage the activities of structures and facilities, financial, information, material flows, jobs and teams of people. The demand for information and information services ensures the active distribution of software products used in construction. The strategic goals for the development of the construction business are to ensure its manageability and quality, competitiveness and reduce the cost of performing business processes.

Within the framework of the National Strategy for Sustainable Socio-Economic Development of the Republic of Belarus for the Period up to 2030, the Digital Construction area is currently being developed, which is focused on the trends shown in Figure 2.

The idea of digitalizing the industry lies in the need to switch to electronic interaction of all participants in the investment and construction process through the formation of a single information environment. In this regard, a draft Decree "On digital transformation of building (structure) life cycle management" was

prepared. One of the main directions, which is determined by the Decree, is the formation of a unified information environment for the construction complex (creation of a state construction portal) (Borisova & Abidov).

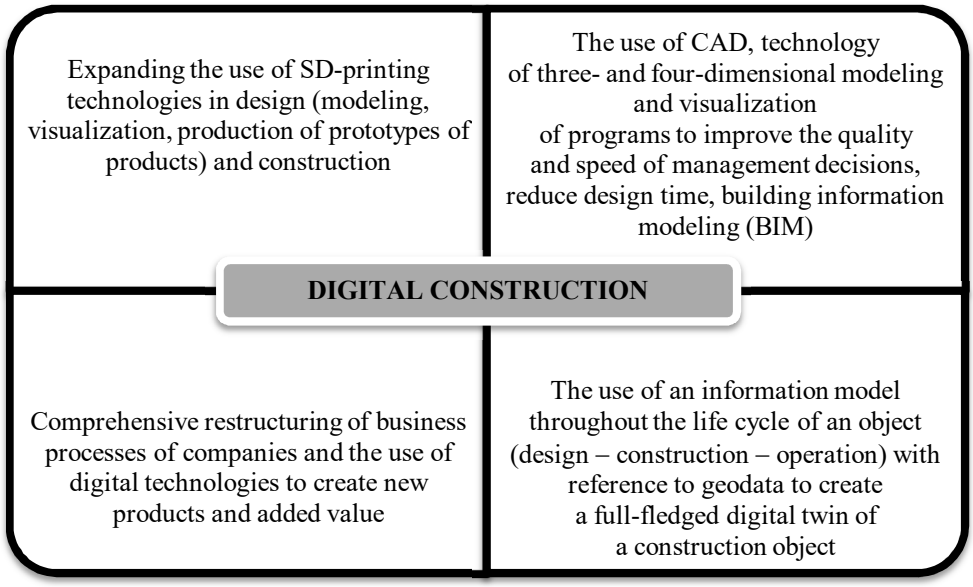

Fig. 2. Actual trends in the direction of "Digital construction"

Source: developed by the author based on (*Digitalization of construction …*, *Draft Decree …*)

For the purpose of digital transformation (informatization) of architectural, urban planning and construction activities, activities in the field of building materials, products and structures of the Republic of Belarus, improving the operation of construction facilities, as well as implementing a unified state policy in the field of information, informatization and information protection, it is planned to create:

- a state information system that provides support for the formation of a state system for the provision of electronic services and the implementation of state functions in electronic form through a single portal of electronic services based on basic and other state information resources integrated into the nationwide automated information system;
- center for informatization of the building complex in the structure of the republican unitary enterprise "Republican Scientific and Technical Center for Pricing in Construction" (Borisova & Abidov).

The expected economic effect of digitalization of construction will reduce the cost of managing a construction project (on average, it is 5-7% of the budget) due to the introduction of "digital" by 1.5% of the total. In addition, the quality of planning is also improved, which makes it possible to comply with all deadlines as closely as possible and avoid losses from downtime and late penalties.

At the same time, there are also new risks associated with issues of information security and data protection, data exchange and information availability. When digitalizing any process, it is necessary to pay special attention to data security, as it can be intercepted by competitors or intruders. It is no coincidence that during the period of a pandemic and self-isolation, the transfer of many companies to the remote work mode, the issues of protection, secure data transfer and cyber risks have become relevant.

Conclusions

The innovative solutions and development risks of the construction industry discussed in this article have revealed a number of problems that need to be solved in the near future.

Thus, any innovative solution has its pros and cons, although in most cases the positive effect clearly dominates. But, it is the minuses that are the deterrent factor for the investor, who sees, first of all, risks in the innovative project. In order for an investor to assess an innovative solution as profitable and promising, it is necessary to develop an analytical model that allows him to select those innovative projects that will satisfy him in terms of profitability and degree of risk.

The development of digitalization in the economy is associated with digitalization processes in the construction industry. To increase the competitiveness and export potential of the Republic of Belarus, innovative technologies are being developed. Digitalization in the construction industry will progress – there is a market demand, where efficiency and time and cost reduction are becoming a priority. Therefore, construction becomes smart not only in computer design, but also in the direct process of creating an object. Digital technologies will affect the profit of the construction industry, as it aims to optimize and efficiently implement the stages of the project from engineering surveys to the operation of the constructed object.

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