



IMPACT OF DIGITALIZATION, ENVIRONMENTAL INNOVATION, AND REGULATORY CHANGES ON MANAGEMENT PRACTICES IN THE CONSTRUCTION INDUSTRY

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ABSTRACT

In the modern world, the construction industry faces several challenges and obstacles that significantly affect its competitiveness and financial stability. Existing regulatory barriers and restrictions can hinder the innovative development of the industry and increase compliance costs. Using mixed methods, the research combines quantitative data analysis of industry performance indicators with a comprehensive review of relevant literature and case studies. The conclusions reveal that the adoption of digital tools and environmental innovations enhances project efficiency, reduces environmental impact, and improves stakeholder satisfaction. The following innovative approaches are considered the main tools for transforming the business climate: the use of information technology and digital transformation; the introduction of electronic platforms to simplify the processes of obtaining construction permits and monitoring construction quality; the spread of environmental innovations in construction to reduce the industry's impact on the environment and improve the quality of life of the population; the implementation of BI platforms aimed not only at analyzing and processing large arrays of data, which will bring planning in the industry to a new level, but also at increasing the transparency of information to optimize the interaction with government bodies, the business community, public organizations, and the population. The possibility of transforming the business climate via various tools will increase the efficiency and competitiveness of construction organizations and create favorable conditions for the innovative development of the industry.

Keywords: Transformation of the business climate; Regulatory barriers; Construction industry; Sustainable development; Information technology; Digitalization; Green building.



1. INTRODUCTION

In the modern business sphere, despite unfavorable political and economic conditions and a significant increase in the sanctions activity of Western countries towards Russia, the investment climate is still improving (Degtev et al. 2022). One of the directions for increasing investment attractiveness was the introduction of the “Transformation of the Business Climate” plan (Order of the Government of the Russian Federation No. 20-r, 2019). This mechanism aims at quickly responding to changing business needs and eliminating outdated regulatory restrictions. To introduce the mechanism into daily activities, it is necessary to amend existing construction rules. The mechanism for transforming the business climate is implemented using tools that play an important role in the sustainable development of the construction industry (Bobkov et al. 2020; Matvienko et al. 2022).

The construction industry is one of the key sectors of the Russian economy that has a major impact on its development (Decree of the President of the Russian Federation No. 474, 2020). In 2023, the construction industry continued to grow, despite several challenges and difficulties. The total volume of construction work is growing due to an increase in residential construction, infrastructure projects, and commercial construction. Investments in the construction and modernization of facilities also contribute to an increase in the total volume of construction products.

Figure 1 demonstrates the total volume of work completed in construction for the period from 2000 to the present day (Official website of the Federal State Statistics Service, n.d.).

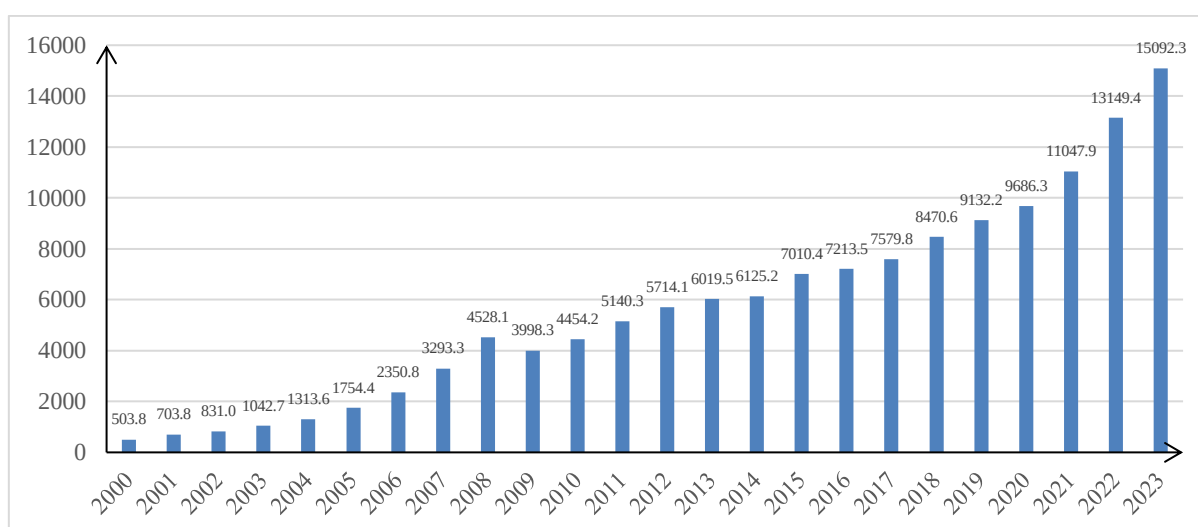


Figure 1. The amount of work performed by such a type of economic activity as “Construction”

Housing construction remains one of the main sectors of the construction industry in Russia. In 2023, there was also an increase in the construction of residential buildings, which is associated with government support programs and mortgage lending opportunities in contrast to high interest rates and stable demand for housing. The growing housing construction market creates new opportunities for the development of the construction industry and contributes to the socio-economic development of the country.

Figure 2 shows the volume of housing construction from 2000 to the present day in millions of square meters (Official website of the Federal State Statistics Service, n.d.).

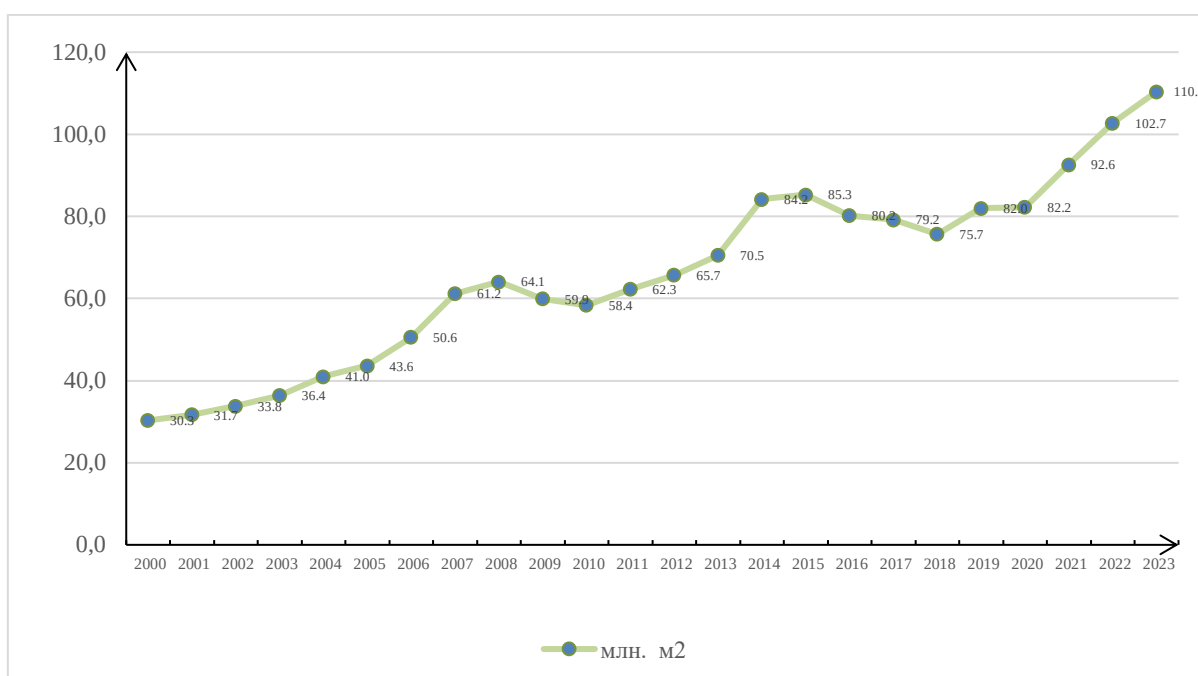


Figure 2. The volume of residential construction in Russia

In 2023, Russia continued commercial construction in the form of office buildings, shopping centers, hotels, and other facilities, which is associated with growth in business activity, development of the service sector, and increased demand for modern commercial premises. In addition, infrastructure projects are being developed in Russia, including the construction and modernization of roads, bridges, airports, and railways. The implementation of such projects is facilitated by the growth of both public and private investment.

Construction volumes continue to grow, which creates favorable conditions for business development, attracting investment and improving the quality of life of the



population. However, some regulatory barriers can hinder the functioning of the construction industry and have a negative impact on its competitiveness and sustainability. This is also demonstrated by the saw-tooth business confidence index (BCI) in construction that assesses the business mood in this industry as satisfactory and at the same time uncertain, which is a certain signal.

In this regard, the study aims to develop modified tools for transforming the business climate that can overcome regulatory barriers and create better conditions for the development of the construction industry.

2. MATERIALS AND METHODS

The transformation of the business climate in Russia (including the construction industry) is an important research topic for scholars. Thus, new tools for transforming the business climate in Russia are considered by D.S. Vechernin (2020), N.V. Medvedeva (2022), L.A. Melnikova (2023), I.V. Mishurova, D.V. Nikolaev, N.V. Nikolaeva, T.V. Rassokhina (2019), S.V. Muzalev, S.N. Kukushkin, O.A. Grazhdankina, A.V. Nikolaenko (2022), G.P. Pochivalova (2020), T.E. Stepanova, O.V. Schneider (2022), etc. The most significant publications in the field of analysis and assessment of the construction industry are written by T.I. Kubasova, N.G. Novikova, A.P. Sukhodolov (2017), A.V. Babkin, G.I. Kurcheeva, L.A. Aprelova (2022), K. Berg (2024), E. Allen, R. Thallon, A.C. Schreyer (2017), N.B. Ganaway (2006), etc.

Based on the research materials, it was shown that there are several regulatory barriers, changes to which will significantly transform the business climate in the construction industry (Figure 3).



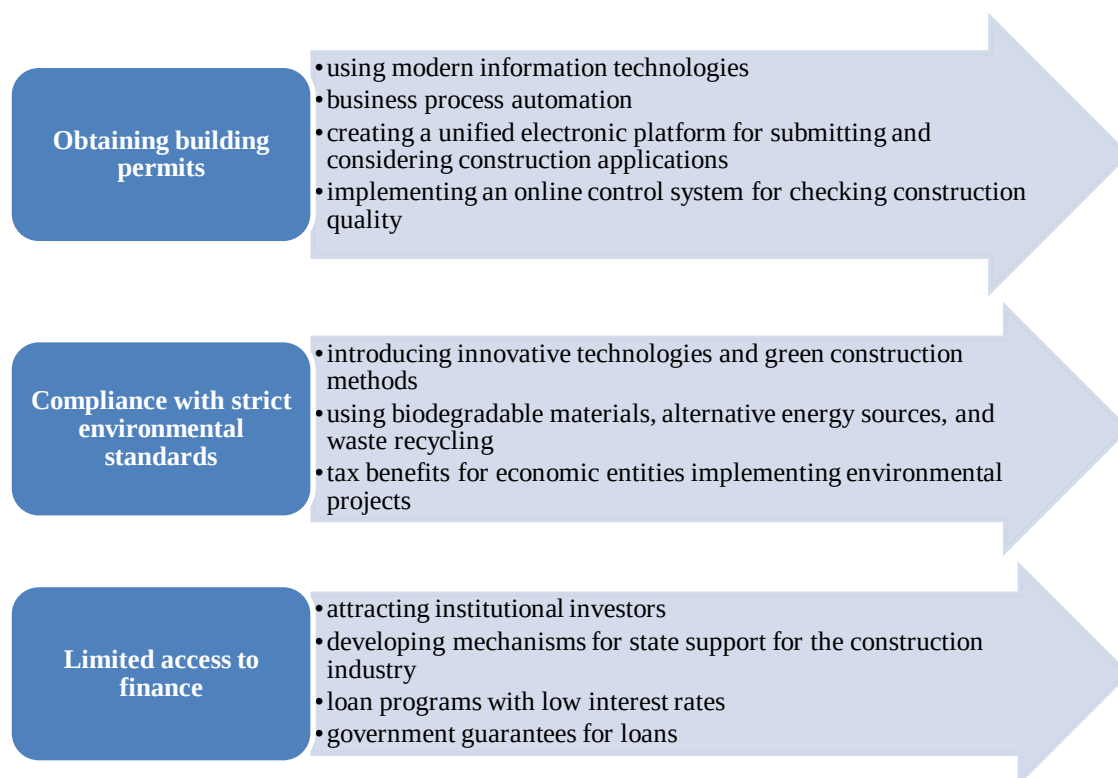


Figure 3. Regulatory barriers in construction and measures to overcome them

Thus, modifying the tools for transforming the business climate in the construction industry will eliminate existing regulatory barriers. The introduction of modern technologies, environmental innovations, and government support mechanisms will create favorable conditions for the development of the construction industry, contributing to the sustainable development of the industry and significant economic growth.

Further research was based on comparison, economic, and statistical methods. Special attention was paid to modifying the tools for transforming the business climate in the construction industry.

3. RESULTS AND DISCUSSION

Digitalization and the use of modern information technologies are important aspects in construction that can significantly improve business efficiency. Modern project management systems and BIM (building information modeling) technologies allow to speed up design and construction, reduce errors, and improve coordination between project participants. Such BI platforms as Power BI, Tableau Public, or QlikSense can process large volumes of information in a short time interval, leading to an increase in the quality of strategic and tactical planning in construction and the



ability to receive timely information about business problems and making management decisions aimed at preventing such problems. In addition, BI platforms visualize information about the activities of a construction organization, which makes it more open and helps to bring it to a new level of business climate transformation as cooperation between the public sector, business, and population (Muzalev, 2019). The timely exchange of information between participants in the construction industry also creates a favorable environment for the growth of their innovative activity.

The introduction of innovative technologies and green construction methods will significantly reduce the negative impact on the environment. Such technologies include the use of energy-efficient materials and renewable energy sources and improved waste disposal and water supply systems. In addition, the development and application of new construction methods, such as modular construction or 3D printing, will reduce waste, decrease material consumption, and speed up the construction process (Perova, 2020).

Modern environmental innovations in the construction industry are a key factor for achieving sustainable development and reducing negative impacts on the environment. These include the application of new technologies, materials, and approaches that promote energy efficiency, reduce emissions, eliminate waste, and increase the use of renewable energy sources (Vinogradova et al., 2020).

The number of advanced production technologies used in construction has been growing in recent years (Figure 4). The most significant growth in the implementation of modern production technologies is shown by such activities as the development of computer software and the production of vehicles and equipment. However, the construction industry also has high implementation rates exceeding the average growth in all industries (112%).



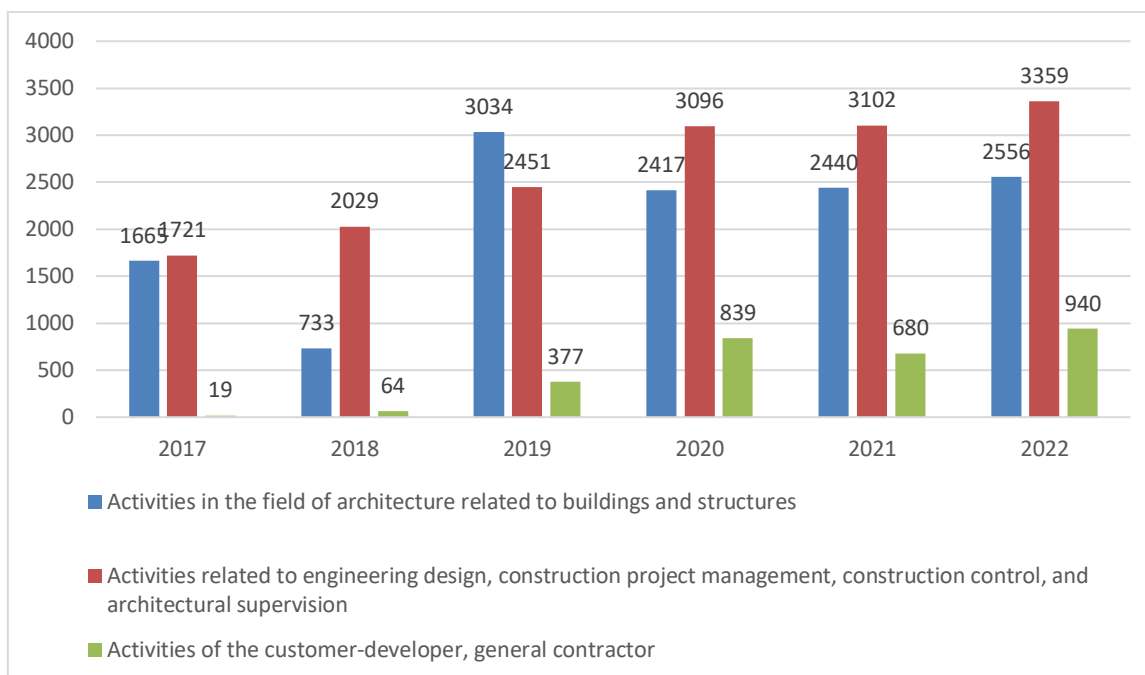


Figure 4. The use of advanced manufacturing technologies in construction

The introduction of environmental innovations in the construction industry is one of the main challenges aimed at ensuring environmental sustainability within the framework of the Russian Environmental Safety Strategy for the period until 2025 which was approved by the Decree of the President of the Russian Federation of April 19, 2017. No. 176 (Decree of the President of the Russian Federation No. 176, 2017). Effective environmental activities of construction organizations will have a significant impact not only on the Russian economy but also on the life and health of the population. The share of innovative goods, works, and services used in construction differs. In 2020, there was a significant decline (more than 3 trillion rubles) due to the COVID-2019 pandemic. In 2021, there was an increase but the construction industry did not return to the pre-COVID level. In 2022, there was a slight decline in the volume of innovative products due to tightening sanctions against Russia (Figure 5).

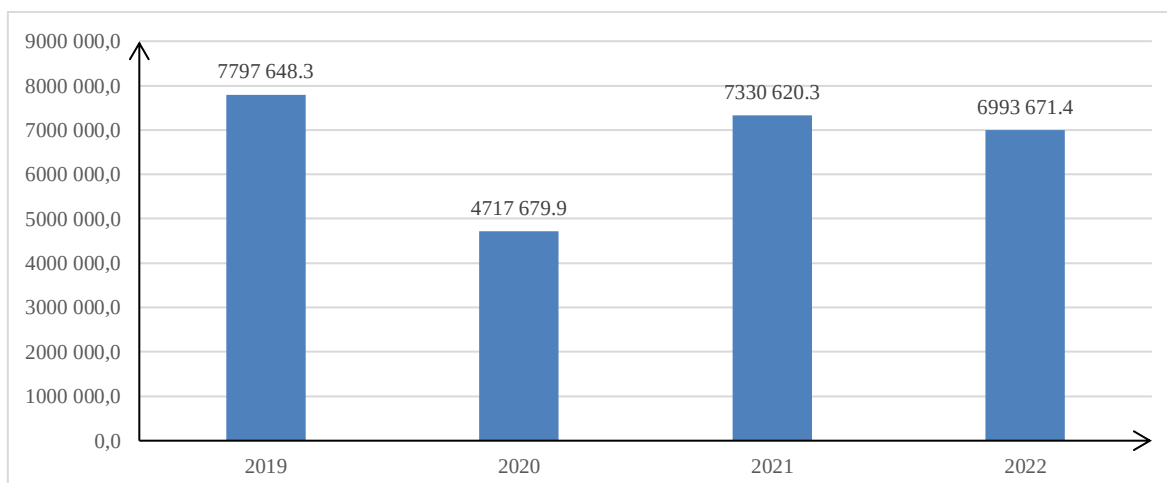


Figure 5. The dynamics of innovative goods, works, and services used in construction

The cost of innovative goods, works, and services introduced in the construction industry has been steadily growing in recent years. In 2022, these expenses exceeded 33 billion rubles (Figure 6).

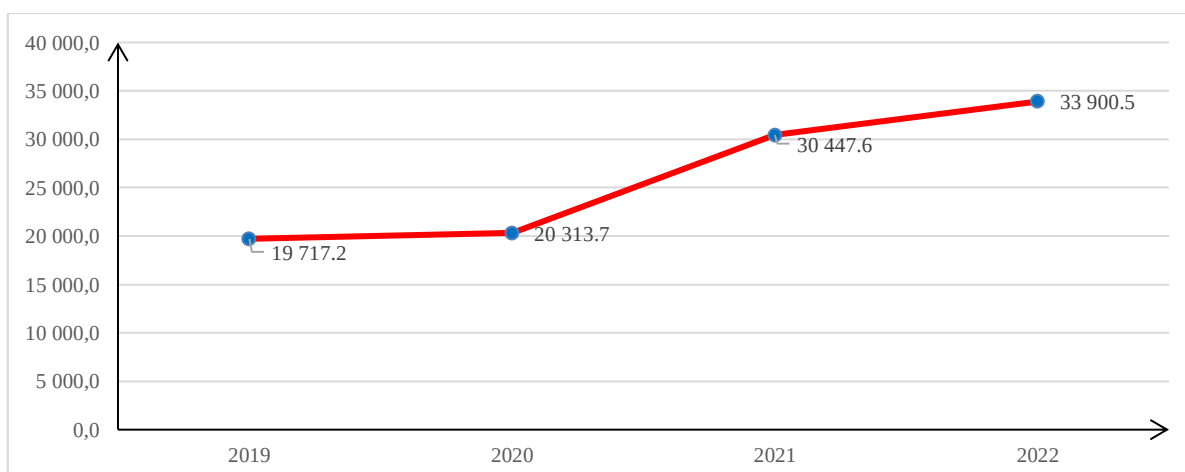


Figure 6. The dynamics of innovative goods, works, and services newly introduced in the construction industry

The introduction of environmental innovations into the construction industry is not just a modern trend but rather a necessity associated with reducing its impact on the environment and improving the life of the population. The design and construction of modern buildings and structures using environmental standards opens up new opportunities for a more efficient use of resources, increasing comfort and safety and improving the quality of the urban and rural environment (Sukhinina, 2021).

The main directions of environmental innovations are presented in Figure 7.



Figure 7. Environmental innovations in the construction industry

A major area of environmental innovation is energy efficiency, including energy-efficient heating, ventilation, and air conditioning systems, high-performance insulation materials, LED lighting systems, and intelligent energy management systems. The use of alternative energy sources (solar and wind power plants, geothermal systems, hydrokinetic generators, etc.) is also an important aspect. Waste management in construction involves developing effective methods for sorting and recycling construction waste, improving the strength and durability of building materials to increase their service life and reduce the need for recycling and replacement, and zero-waste manufacturing.

One type of environmental innovation in construction is green building which includes the use of alternative materials and natural lighting and ventilation, the creation of green areas on roofs and walls, the monitoring of energy efficiency, and the use of renewable energy sources (Dergunova et al., 2023; Tuskaeva et al., 2021). Today the largest volumes of green building under GOST R 70346-2022 (Rosstandart, 2022) are typical of the following constituent entities: Moscow (8.4 million m²), the Moscow Region (4 million m²), the Sverdlovsk Region (1.5 million m²), the Tyumen Region (1.3 million m²), and Saint Petersburg (1.2 million m²) (INFRAGREEN. 2023).

Green building can reduce overall energy consumption by 25% and water consumption by 30% (Makhortova et al., 2020). For example, Iceland used green construction in the Country Residence (Skagafjord) equipped with energy- and heating-generating systems, i.e., the roof of the building is covered with grass, which helps retain heat (Ekoby.ru, n.d.). The administration of Shenzhen (China) plans to build a natural history museum, whose roof will be covered with trees and will become a pedestrian zone (Golden Trezzini Awards, n.d.; Mezhdunarodnoe energeticheskoe agentstvo, 2023).

4. CONCLUSIONS

Modern environmental innovations in construction aim at creating energy-efficient and eco-friendly facilities, which is a necessary condition for reducing the environmental impact of this industry. According to the International Energy Agency,



the construction industry in Russia generates about 23% of greenhouse gas emissions.

In addition, environmental innovations include aspects of social responsibility, which means creating conditions for improving the quality of life, ensuring safety, generating new jobs, building inclusive and affordable housing for people with disabilities, as well as supporting local and regional projects and initiatives aimed at the sustainable development of the constituent entities of the Russian Federation, including those included after 2022. The development and implementation of environmental innovations in construction is a complex and comprehensive process that requires the cooperation and participation of all stakeholders: the state, business, public, and academic community, whose joint efforts will help achieve the desired result.

Therefore, modifying the tools for transforming the business climate in the construction industry will help reduce regulatory barriers and thereby increase the efficiency of various innovations. The effective use of digital technologies, green building, and collaboration between various industry players are key to achieving the goals set. Information transparency and data availability are also important aspects of transforming the business climate in the construction industry. The clear and open transmission of information about regulatory requirements, environmental impact assessments, and quality and safety standards allows enterprises to make smart management decisions and better predict possible risks. The use of BI platforms ensures better processing and analysis of large arrays of information, which contributes to the timely identification of modern trends and optimization of development strategies. This creates a favorable environment for entrepreneurship, innovation, and achieving a competitive advantage in the construction industry.

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