



DEVELOPMENT OF ENTREPRENEURSHIP IN THE SPHERE OF CONSTRUCTION AND RELATED SERVICES: CHALLENGES AND PROSPECTS

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Abstract

The article analyzes current trends in the development of entrepreneurship in the construction industry and related services. The study was conducted in the context of key modern processes: urbanization, digitalization, and the transition to a sustainable economy. The paper analyzes the main challenges faced by the industry, such as rising resource costs, personnel shortages, and the need to implement green technologies and digital project management tools.

Keywords: Entrepreneurship, construction, urbanization, digitalization, BIM, modular construction, sustainable development, Lean Construction, innovation.

Introduction

The scientific novelty of the article consists in systematization of strategies for development of entrepreneurship in the construction industry taking into account digitalization, environmental requirements and new organizational models. For the first time modern approaches (BIM, modular construction, Lean) are compared Construction (sustainable construction) and their measurable effects, which allows developing recommendations for practical application in urban conditions.

The construction sector has traditionally been one of the key drivers of economic growth, making a significant contribution to the formation of the gross domestic product and ensuring employment. In modern conditions, the development of entrepreneurship in this area is of particular importance, since the industry is a



key instrument for the spatial transformation of cities and the creation of infrastructure for sustainable development.

According to the UN, by 2050, more than 68% of the world's population will live in cities, which will lead to increased demand for housing, transport and social infrastructure [1]. This urbanization process is associated with a number of challenges for entrepreneurs, including rising costs of building materials and energy, a shortage of skilled workers, the need to implement digital technologies and «green» standards, as well as innovative approaches and diversification.

Modern research records systemic changes in the construction industry associated with the transition from traditional project management methods to innovative approaches such as modular construction, integrated project management (IPD) models, building information modeling (BIM) technologies and sustainable practices aimed at reducing the carbon footprint. Diversification of services, including engineering, logistics, service and digital solutions, plays a special role in the development of construction entrepreneurship. This expands business models and strengthens the competitive position of companies. Therefore, the study of the challenges and prospects for the development of entrepreneurship in the construction industry is a topical task.

The development of entrepreneurship in the construction sector faces a range of challenges caused by both global socio-economic changes and the specifics of the industry itself:

1. Accelerated urbanization creates a growing demand for residential and infrastructure development, which puts pressure on land and resource resources [1]. This requires entrepreneurs to search for innovative solutions for the efficient use of limited territories.
2. The rising cost of building materials and logistics services, especially against the backdrop of global supply chain disruptions and fluctuating energy prices, remains a significant challenge [2]. This is pushing for the implementation of resource-saving technologies and the search for alternative materials.
3. The shortage of skilled labor and the need to increase labor productivity are serious problems [3]. The shortage of specialists remains one of the main structural problems of the industry, which requires investment in automation and personnel training.



4. The demands for environmental sustainability in construction are increasing. The sector is responsible for a significant share of global carbon dioxide emissions, which necessitates the introduction of energy-efficient technologies and «green» standards [4].

5. Transition to BIM (Building Information Modeling , digital twins and automated control systems is a key challenge that requires entrepreneurs to make significant investments in technology and personnel training.

Thus, modern challenges in the field of construction entrepreneurship can be grouped into key areas, which allows us to systematize approaches to overcoming them.

Table 1 - Main challenges to the development of entrepreneurship in construction

Call group	Content
Urbanization	Growing demand for housing and infrastructure, pressure on resources
Economic	Rising cost of materials, logistics costs
Personnel	Shortage of skilled labor, low labor productivity
Ecological	High CO ₂ emissions, transition to green building
Technological	The need for digitalization , implementation of BIM, automation

Developing entrepreneurship in construction requires a combination of technological innovation, organizational and management practices, and new business models. Below are key approaches and strategies applicable to both general contractors and small and medium-sized enterprises in the related services sector.

1. Digitalization and BIM. Digitalization of the construction industry is based on the implementation of building information modeling (BIM), which provides centralized storage and management of design, estimate and operational information [5]. This improves coordination between project participants and minimizes the number of reworks. For entrepreneurs, this provides an opportunity



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to offer new digital services, increasing their competitiveness, especially in large projects.

2. Industrialization and modular construction. Industrialization of construction processes through modular and off-site manufacturing allows the assembly of components to be transferred to a controlled factory environment [6]. This approach, based on standardization, reduces construction time and reduces risks associated with weather conditions. This business model is particularly effective in mass housing, hotel and infrastructure segments.

3. Lean practices and integrated models. Lean construction, including approaches such as Last Planner System and Tact Planning is aimed at reducing losses and increasing the predictability of deadlines [3]. Integrated delivery models (IPD) are aimed at moving from traditional contractual relationships to partnerships, where risks and benefits are distributed among all project participants, which increases transparency and efficiency.

4. Diversification and service model. Entrepreneurs are actively expanding the range of their services, moving to a service model (servitization), which includes not only the construction itself, but also subsequent maintenance, facility management, energy audit and consulting [7]. This approach increases the lifetime value of the client and ensures income stability through long-term operating contracts.

5. Sustainable and circular construction. The implementation of sustainable and circular construction principles includes the use of energy-efficient solutions, low-carbon and recycled materials, and life cycle assessment (LCA) [8]. This opens up new market niches (e.g. building certification) and reduces regulatory risks, increasing the investment attractiveness of projects.

6. Technology platforms. Entrepreneurs are increasingly using advanced technology platforms such as the Internet of Things (IoT), digital twins, artificial intelligence (AI), and blockchain [9]. These technologies enable automated asset monitoring, optimized planning, and transaction transparency, creating new business opportunities in analytics and predictive maintenance.

7. Financial mechanisms and partnerships. To scale up innovative solutions and implement large projects, entrepreneurs actively use flexible financial mechanisms, including public-private partnerships (PPP) and venture financing



[10]. This allows for risk distribution and attracting the necessary capital to technological startups in the construction industry.

8. Human Capital Management: Investments in human capital management through training, retraining and the introduction of technologies (e.g. exoskeletons) are key to overcoming talent shortages and increasing productivity.

Table 2 - Basic strategies of entrepreneurship in construction

Strategy	Tools / practices	Benefits for the entrepreneur	Main risks
Digitalization (BIM, VDC)	ISO 19650, IFC, software (Revit , Navisworks), digital twins	Less rework, new digital services, competitive advantage	Investments in Software /training, format compatibility
Modular / off-site	Factory production, standardization of modules	Reduced lead times, consistent quality, scalability	Capital expenditures for the factory, logistics of modules
Lean / IPD	LPS, takt planning , joint contracts	Increased chart reliability, reduced conflicts	Complexity of organizational changes, culture change
Diversification of services	FM, consulting, energy audit	Long-term contracts, income equalization	The transition to a service model requires new competencies
Sustainable construction	LCA, energy efficiency , recycled materials	Access to green finance, reducing regulatory risks	Higher initial costs, certification
IoT / AI / Blockchain	Sensors, ML analytics, smart contracts	New products and sources of income, operational control	Cybersecurity , Regulatory Affairs
Funding and partnerships	PPP, venture capital, project finance	Access to capital, risk sharing	Complexity of transaction structuring, transparency requirements
HR and training	Professional retraining , training centers, exoskeletons	Increased productivity and security	Time spent on training, resistance to change



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The approaches and strategies considered are not purely theoretical concepts, but are already being actively implemented in global construction practice. They demonstrate tangible results, expressed in the reduction of construction time, cost reduction, and increased environmental friendliness and quality of facilities. It is especially important for entrepreneurs in the construction sector to study successful examples, since they clearly demonstrate how innovations can be transformed into specific competitive advantages and sustainable business models. Below are practical cases of implementing key strategies in construction companies in different countries.

Skanska in Sweden successfully used BIM in the construction of the «New Karolinska Solna», which reduced the number of design errors by 25% and reduced the commissioning time of the facility by 6 months. This example demonstrates the effectiveness of digital models in increasing the accuracy and speed of implementation of complex projects. In the UK, the Premier Inn Hotel » was implemented using modular construction, which reduced the construction period from 24 to 12 months and reduced the budget by 15%. This case confirms the potential of industrialization to speed up projects and reduce costs.

Company «Sutter Health» in the USA has implemented a number of projects using the Integrated model Project Delivery (IPD). The use of lean tools (Lean) allowed to reduce budget overruns by 17% and increase labor productivity by 10-15%, which indicates the effectiveness of partnership project management models. The French company «VINCI Facilities» has successfully switched to a service business model, providing a full cycle of services: from construction to operation. As a result, the company receives 30% of its income from long-term contracts for facilities management, which ensures the stability and diversification of its business model.

Royal BAM Group in the Netherlands has completed a circular office project called Circl, where 90% of the materials are recycled. This has not only strengthened the company 's image as a green contractor, but also attracted new corporate clients, demonstrating the commercial benefits of sustainable construction. «China State Construction Engineering Corporation» implemented IoT systems and digital twins to monitor skyscrapers in Shanghai. This allowed



predicting system failures and reducing operating costs by 20%, confirming the effectiveness of technology platforms for building management.

Crossrail project in London, implemented as a public-private partnership (PPP), attracted £19 billion in investment and shared risks between private and public parties. This case shows how flexible financial mechanisms can facilitate the implementation of large-scale infrastructure projects. Hochtief in Germany created a corporate training center using VR/AR simulators, which improved the skills of employees and reduced the number of accidents by 12%. This example highlights the importance of investing in human capital to improve safety and productivity.

In the context of accelerating urbanization and growing demand for housing and infrastructure, entrepreneurs in the construction sector need to develop strategies that allow them not only to respond to challenges, but also to get ahead of them. Based on an analysis of modern approaches and global experience, the following recommendations can be identified.

1. Integration of digital technologies. The key area is the implementation of building information modeling (BIM) and digital twins to manage the entire life cycle of an object. It is necessary to use the Internet of Things (IoT) to monitor the condition of objects and optimize operating costs, as well as to develop platform solutions that ensure effective interaction of all participants in the construction process.
2. Use of modular and industrial construction. It is recommended to move to the production of building elements in factories with their subsequent installation on site. This approach, based on industrialization, allows for the optimization of logistics and the reduction of construction time.
3. Use sustainable and green technologies. Entrepreneurs should implement international energy efficiency standards (LEED, BREEAM, DGNB), use recycled materials and zero-carbon technologies. It is important to develop projects taking into account the principles of the circular economy, aimed at the reuse of resources.
4. Formation of partnership models and flexible financing. It is necessary to actively use public-private partnerships (PPP) in the implementation of large infrastructure projects. It is recommended to attract venture capital to finance



technology startups, and to use blockchain to increase the transparency of contracts and payments.

5. Development of human capital. An important element is the creation of corporate training and certification centers for workers. It is necessary to implement motivation systems and digital personnel management tools, as well as improve labor safety through automation and the use of robotic systems and exoskeletons .

6. Diversification of business models. Entrepreneurs should expand the range of services by developing service areas such as facility management, energy audit and consulting. It is recommended to form complex turnkey offers, including long-term maintenance, as well as to implement additional services for end users, such as smart home systems.

Thus, the development of entrepreneurship in the field of construction and related services is directly related to the challenges of urbanization, digitalization and environmental transformation of the economy. Modern approaches and strategies allow entrepreneurs to increase efficiency, reduce costs and strengthen competitive positions. In the future, the key direction will be the integration of innovative technologies and sustainable business models that can ensure long-term development of the construction industry.

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