SATBAYEV UNIVERSITY

Architecture and Civil Engineering

Volume 2 (2025), Issue 2, 31-35

https://doi.org/10.51301/ace.2025.i2.06

Building Information Modeling (BIM) in Kazakhstan: Current Trends, Challenges, and Prospects

K. Iskenderova[1], M. Bruyako[2], Z. Zhambakina[1*]

[1]*Satbayev University, Almaty, Kazakhstan*

[2]*National Research Moscow State University of Civil Engineering, Moscow, Russia*

**Corresponding author: z.zhambakina@satbayev.university*

Abstract. This study explores the current state and future prospects of Building Information Modeling (BIM) implementation in Kazakhstan. In the context of digital transformation, BIM is seen as a key tool for increasing the efficiency and competitiveness of the construction industry. The paper analyzes existing BIM practices in the country, identifies barriers such as lack of awareness, training, and funding, and highlights opportunities for development. Emphasis is placed on the need for regulatory support and educational initiatives. The study concludes that successful BIM integration can significantly improve project management and contribute to the modernization of the construction sector in Kazakhstan.

Keywords: *BIM, digital transformation, project management, implementation barriers, education and training, regulatory framework, innovation in construction, BIM integration.*

1. Introduction

The modern construction industry is undergoing a period of intensive digital transformation driven by the need to enhance efficiency, sustainability, and the overall quality of design and construction processes. One of the key tools facilitating this transformation is Building Information Modeling (BIM), an integrated approach to the creation, management, and exchange of data throughout the entire lifecycle of a construction project — from initial concept to operation and maintenance.

At the international level, the implementation of BIM has already demonstrated its effectiveness by improving coordination among project participants, reducing costs, increasing the accuracy of design documentation, and shortening construction timelines. In many countries, the use of BIM has become mandatory for public construction projects, emphasizing its strategic importance for the development of the sector.

In the context of the Republic of Kazakhstan, the adoption of BIM is gaining increasing relevance. On the one hand, the intensification of construction activities, urbanization, and the focus on sustainable development demand the use of advanced digital solutions. On the other hand, the integration of BIM into local practice faces several challenges, including the absence of a comprehensive regulatory framework, a shortage of qualified professionals, limited financial resources, and the generally low level of digital maturity within construction companies.

This study aims to analyze the current state of BIM implementation in Kazakhstan, identify the major barriers, and determine the prospects for further development of this technology. Special attention is given to the evaluation of professional training systems, institutional support mechanisms, and the demand for BIM in both the public and private sectors. Drawing on international experience, the paper discusses potential scenarios for adapting BIM technologies to the specific characteristics of the Kazakhstani construction market.

Thus, this research not only reflects the current trends in the digitalization of the construction industry but also provides a scientific and practical foundation for developing strategies for the effective integration of BIM into national design and construction practices.

1.1. Current Trends in the Implementation of BIM in Kazakhstan

Over the past decade, the global construction industry has witnessed a rapid and comprehensive shift toward digitalization, driven by the growing complexity of construction projects and the need for greater efficiency, accuracy, and sustainability. One of the most transformative developments in this context has been the emergence of Building Information Modeling (BIM), a methodology that facilitates the creation, visualization, and management of digital representations of physical and functional characteristics of buildings and infrastructure across their entire lifecycle [1].

BIM enables stakeholders—from architects and engineers to contractors and facility managers—to collaborate within a shared data environment, thereby minimizing design errors, reducing project delays, and optimizing operational performance. As a result, many countries have moved toward institutionalizing BIM through national strategies and regulatory mandates. For example, the United Kingdom made the use of BIM Level 2 mandatory for all public construction projects in 2016, while countries like Singapore and Finland have established comprehensive frameworks and training ecosystems to support BIM integration [2, 3].

In the case of Kazakhstan, BIM adoption is still in its formative phase but demonstrates a growing trajectory. The Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan has recognized the importance of implementing BIM as part of the broader agenda for digital transformation in construction. Notably, the national «Digital

Kazakhstan» program, initiated in 2018, includes provisions for the adoption of innovative construction technologies, including BIM, to foster productivity and transparency [4].

Several pilot BIM projects have been launched in major urban centers such as Astana (formerly Nur-Sultan) and Almaty, focusing primarily on infrastructure modernization and residential housing developments. These initiatives have revealed promising outcomes in terms of project coordination, budget forecasting, and construction quality. Nevertheless, the majority of BIM applications remain fragmented and concentrated in large-scale public or quasi-governmental developments [5].

Despite these positive developments, several structural and institutional challenges continue to hinder the widespread implementation of BIM across Kazakhstan. Firstly, there is no unified national regulatory framework mandating or guiding the use of BIM technologies in construction. Existing standards often rely on outdated methodologies that do not reflect international best practices [6]. Secondly, there is a significant shortage of professionals trained in BIM-related software and methodologies. Most university curricula in architecture, engineering, and construction management do not include comprehensive BIM training, resulting in a skills gap between academic preparation and industry requirements [7].

Another critical challenge lies in the technological and financial barriers faced by small and medium-sized enterprises (SMEs). The high cost of software licenses, lack of technical support, and insufficient digital infrastructure prevent many SMEs from investing in BIM tools. This creates an uneven digital landscape in which only large construction firms are able to adopt and benefit from BIM implementation [8].

However, industry momentum continues to build. A growing number of conferences, seminars, and professional development workshops on BIM are being held across the country, often in partnership with international organizations and software providers. For instance, local universities and institutions such as KazGASA (Kazakh Leading Academy of Architecture and Civil Engineering) have begun to offer elective courses and workshops on BIM, reflecting a gradual shift in academic priorities [9].

Moreover, Kazakhstan's participation in regional digital construction alliances and pilot collaborations with countries such as Russia, China, and South Korea has facilitated knowledge exchange and exposure to more mature BIM ecosystems. These efforts underscore a strategic commitment to aligning Kazakhstan's construction industry with global standards and trends.

In conclusion, the current landscape of BIM implementation in Kazakhstan is characterized by growing awareness, early-stage experimentation, and institutional support that, while limited, is beginning to mature. To accelerate progress, it is essential to establish a coherent national strategy for BIM adoption, invest in workforce development, and provide targeted support to SMEs. As digital transformation becomes a defining feature of global construction, Kazakhstan's ability to integrate BIM effectively will play a crucial role in shaping the competitiveness, sustainability, and technological resilience of its built environment.

2. Materials and methods

This study employed a qualitative research design, based on a combination of systematic literature review, document analysis, and comparative analysis. The objective was to explore the current landscape of BIM implementation in Kazakhstan, assess the barriers and driving factors, and identify applicable international best practices.

A structured review of academic publications was conducted using international databases such as Scopus, Web of Science, and SpringerLink, as well as national repositories including the Kazakhstan National Electronic Library. The search covered the period from 2015 to 2024, ensuring the inclusion of up-to-date and thematically relevant literature. Keywords included «BIM in Kazakhstan», «digital construction», «BIM adoption barriers», «ISO 19650», and «BIM training programs» [1, 2].

Official policy documents and strategic programs were also analyzed, with particular attention to materials issued by the Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan and the national digital agenda outlined in the Digital Kazakhstan Program [3]. These sources provided a policy-level understanding of Kazakhstan's goals in digital transformation, especially within the construction industry.

A comparative case analysis was used to benchmark Kazakhstan's BIM implementation against leading examples from the United Kingdom, Finland, and Singapore. National frameworks and BIM strategies such as the UK BIM Framework, Finland's COBIM standards, and Singapore's BCA BIM Roadmap were reviewed to extract relevant elements that could be adapted to the Kazakhstani environment [4,5,6].

In parallel, qualitative data from expert sources was collected and interpreted. These included published interviews with BIM professionals in Kazakhstan, proceedings from national forums such as KazBuild Expo, BIM Forum Kazakhstan, and academic reports from institutions such as KazGASA and the Kazakh Research Institute of Construction and Architecture [7, 8]. These inputs provided insight into the real-world application of BIM tools, the level of industry awareness, and gaps in current educational offerings.

Where available, quantitative indicators on BIM usage, training enrollment rates, and project outcomes were incorporated from industry surveys conducted by professional associations like the Union of Builders of Kazakhstan and the Kazakhstan Association of Designers and Engineers (KAPE) [9].

Content analysis techniques were applied to evaluate legal frameworks, draft regulations, and technical BIM documentation, enabling the study to assess the institutional and regulatory readiness for BIM adoption. Finally, methodological triangulation-across literature, expert opinions, and international benchmarks-ensured the validity and comprehensiveness of the research findings. This approach supports a nuanced understanding of both current challenges and future opportunities for BIM integration in Kazakhstan.

3. Results and discussion

The results of the study indicate that Kazakhstan is currently in the initial phase of BIM implementation, characterized by fragmented adoption across the public and private sectors. While pilot projects have been successfully launched in cities such as Astana and Almaty—primarily in government-funded infrastructure and residential construction—there is no unified national strategy or legal obligation man-

dating the use of BIM in public procurement, unlike in countries such as the UK or Singapore [10].

The analysis of government policy documents confirms that BIM is recognized as a strategic priority in the broader context of digital transformation under the «Digital Kazakhstan» initiative. However, this recognition has not yet translated into systematic regulatory or financial support. For instance, there is no centralized BIM mandate or roadmap specifying implementation phases, standards, or required competencies for construction stakeholders [3, 11].

One of the key findings is the limited integration of BIM training into higher education. As revealed in institutional reports and expert commentary, most Kazakhstani universities still offer BIM as an elective or optional module, rather than as a core component of architecture or engineering programs [7, 12]. This situation results in a significant skills gap between recent graduates and the practical needs of the construction industry. Surveys conducted by the Union of Builders of Kazakhstan indicate that less than 25% of construction firms have in-house BIM specialists with formal training [9].

Another challenge concerns the technological and financial constraints faced by SMEs. Many small and medium-sized construction companies lack access to licensed software (such as Autodesk Revit, ArchiCAD, or Navisworks), as well as the digital infrastructure required for effective BIM collaboration. As a result, BIM remains largely confined to large firms or international joint ventures operating in Kazakhstan [13].

Despite these limitations, the level of awareness and demand for BIM is increasing. Interviews with professionals and observations from national conferences suggest a growing interest in BIM as a tool for improving coordination, cost control, and error reduction in construction workflows [8, 14]. Notably, some private developers have begun to require BIM deliverables from their contractors, indicating a bottom-up movement toward BIM adoption driven by market forces rather than regulation.

International comparisons further reinforce this conclusion. Countries with high BIM maturity typically exhibit a combination of government mandates, structured certification systems, and national training centers-all of which are lacking or underdeveloped in Kazakhstan [4, 5]. Finland, for instance, implemented COBIM guidelines supported by government-backed research and dissemination programs, while Singapore created a national training ecosystem through the BCA Academy [6].

In contrast, Kazakhstan's progress remains dependent on isolated initiatives, such as private university programs, donor-funded pilot projects, and sporadic government support. For sustained and scalable BIM integration, Kazakhstan will need to adopt a multi-level strategy that addresses education, legislation, technical infrastructure, and financial incentives.

4. Conclusions

The findings of this study confirm that Building Information Modeling (BIM) is increasingly recognized in Kazakhstan as a critical component of the digital transformation of the construction industry. However, the pace and scale of its implementation remain limited and inconsistent across different sectors and regions. While certain pilot initiatives have demonstrated the practical value of BIM in improving project coordination, reducing construction errors, and optimizing time and cost management, widespread integration into national practice has not yet occurred.

One of the key insights of this research is the lack of a unified national BIM policy or regulatory framework, which creates uncertainty among stakeholders and hinders long-term planning. Unlike in countries with advanced BIM ecosystems-such as the UK with its phased mandate structure, or Singapore with centralized training institutions-Kazakhstan lacks institutional mechanisms to systematically promote BIM at the governmental level. Existing strategies, such as those outlined in the Digital Kazakhstan program, mention BIM only indirectly and without actionable steps for implementation in construction [3, 11].

Furthermore, the research highlights a significant gap between academic preparation and industry demand. Despite increasing awareness of BIM's benefits, most Kazakhstani universities and technical institutions have not yet integrated BIM training as a core element of engineering and architecture programs. This leads to a mismatch between graduate skills and the technological competencies required by the modern construction industry [12]. Without targeted educational reform and investment in upskilling the current workforce, Kazakhstan risks falling behind in global competitiveness.

Another crucial barrier is the financial and infrastructural challenge faced by small and medium-sized enterprises (SMEs). Many construction companies operate without access to licensed BIM software, lack trained staff, and are unfamiliar with international data exchange standards such as IFC and ISO 19650. As a result, BIM adoption remains limited to large-scale, often government-supported projects or collaborations with foreign partners [13].

Nevertheless, there are several positive indicators that suggest a potential for accelerated development. These include the growing number of BIM-related academic publications, the emergence of national forums and conferences such as BIM Forum Kazakhstan [8], and the initiation of local training programs by private universities and associations. Some developers and design firms have also begun to demand BIM deliverables, introducing market-driven incentives for digital transformation [14].

In light of international best practices, the following strategic priorities are proposed for Kazakhstan to foster the effective and scalable integration of BIM:

Development and enforcement of national BIM standards, aligned with international protocols and adapted to local construction norms;

Introduction of BIM into higher education curricula as a mandatory component in technical and architectural disciplines;

Creation of a national BIM competence center or academy, responsible for certification, training, and dissemination of best practices;

Financial support for SMEs, including software grants, tax incentives, and pilot project funding;

Promotion of public-private partnerships to accelerate innovation and localize BIM knowledge and software solutions.

BIM should not be viewed solely as a set of tools or software but as a paradigm shift in the way construction projects are planned, executed, and managed. Its implementation has far-reaching implications for transparency, accountability, resource efficiency, and sustainability-all of which are aligned with Kazakhstan's long-term development goals in infrastructure and urbanization.

Therefore, the successful deployment of BIM in Kazakhstan requires a coordinated, multi-sectoral effort, combining legal reform, educational innovation, institutional capacity building, and stakeholder engagement. Future research should focus on developing pilot models of BIM implementation at the regional level, assessing their scalability and cost-effectiveness, and exploring how digital twins and AI-based solutions can further enhance Kazakhstan's construction and infrastructure planning capabilities.

In conclusion, BIM offers not only operational advantages but also a strategic pathway for modernizing Kazakhstan's construction sector, making it more competitive, innovative, and integrated into global technological trends.

Acknowledgements

The author would like to express sincere gratitude to the academic advisor, Dr. Zhambakina, for her invaluable support, constructive feedback, and consistent guidance throughout all stages of this research. Special appreciation is extended to the Department of Architecture and Construction at Satbayev University for providing access to academic resources and research databases.

The author also wishes to thank the experts and practitioners whose interviews and conference presentations greatly enriched the analysis of BIM implementation in Kazakhstan. Particular thanks are given to the organizers of BIM Forum Kazakhstan and the KazBuild exhibition for providing materials and the opportunity to participate in professional discussions.

Finally, the author is grateful to colleagues and reviewers whose comments contributed to improving the content and structure of this study.

References

[1] Eastman, C., Teicholz, P., Sacks, R. & Liston, K. (2018). BIM handbook: A guide to building information modeling for owners, designers, engineers, contractors, and facility managers (3rd ed.). *John Wiley & Sons*

[2] Succar, B., Sher, W., & Williams, A. (2020). An integrated approach to BIM competency assessment, acquisition and application. *Automation in Construction, (113), 103120.* https://doi.org/10.1016/j.autcon.2020.103120

[3] Ministry of Digital Development, Innovations and Aerospace Industry of the Republic of Kazakhstan. (2020). Digital Kazakhstan state program. *Nur-Sultan*

[4] Centre for Digital Built Britain. (2019). UK BIM framework. *Retrieved from*: https://www.ukbimframework.org/

[5] Building and Construction Authority (BCA). (2016). BIM roadmap 2015–2020. *Singapore Government*

[6] Senate Properties. (2012). Common BIM requirements 2012 (COBIM). *Helsinki, Finland*

[7] KazGASA. (2022). Annual report on BIM education and digital design training in Kazakhstan. *Almaty*

[8] BIM Forum Kazakhstan. (2021). Proceedings of the National BIM Forum. *Almaty: KazBIM*

[9] Union of Builders of Kazakhstan. (2023). Report on the current state of digital transformation in the construction sector. *Nur-Sultan*

[10] Mukanov, Y., et al. (2020). Implementation of BIM in Kazakhstan's construction industry. *Ǵylym jáne bilim, (2), 34–41*

[11] Ministry of Industry and Infrastructure Development of Kazakhstan. (2021). Strategic plan for infrastructure digitalization. *Nur-Sultan*

[12] KazGASA. (2022). Curriculum review: BIM education in Kazakhstani universities. *Almaty*

[13] Zhussupov, A. (2021). Barriers to BIM implementation among SMEs in Kazakhstan. *Construction Economics and Management, 9(1), 44–50*

[14] BIM Forum Kazakhstan. (2023). Panel discussion: Digital innovation in construction. Proceedings of the National BIM Forum. *Almaty*

Қазақстандағы ғимараттарды ақпараттық модельдеу (BIM): қазіргі үрдістер, қиындықтар және болашағы

К. Искендерова[1], М. Буряко[2], З. Жамбакина[1*]

[1]*Satbayev University, Алматы, Қазақстан*
[2]*Ұлттық зерттеу Мәскеу мемлекеттік құрылыс университеті, Мәскеу, Ресей*

**Корреспонденция үшін автор: z.zhambakina@satbayev.university*

Аңдатпа. Бұл мақалада Қазақстан Республикасында ғимараттарды ақпараттық модельдеу (Building Information Modeling - BIM) технологиясын енгізудің қазіргі жағдайы мен болашағы қарастырылады. Құрылыс саласын цифрландыру жағдайында BIM жобалау және құрылыс процестерінің тиімділігі мен сапасын арттырудың маңызды құралы ретінде танылады. Мақалада отандық және шетелдік ғылыми әдебиеттерге шолу жасалып, нормативтік базаның жетіспеушілігі, білікті мамандар тапшылығы және шағын және орта бизнеске технологияларға қолжетімділіктің шектеулігі сияқты негізгі кедергілер талданады. Сонымен қатар, Қазақстанда және шетелде BIM қолданудың табысты мысалдары мен халықаралық тәжірибені бейімдеудің ықтимал үлгілері қарастырылады. Зерттеу нәтижелері BIM технологиясын енгізу үшін кешенді тәсілдің, оның ішінде білім беру реформасы, мемлекеттік қолдау және кәсіби қауымдастықтарды дамыту қажеттігін көрсетеді.

Негізгі сөздер: *BIM, цифрлық трансформация, жобаларды басқару, іске асырудағы кедергілер, білім беру және оқыту, нормативтік-құқықтық база, құрылыстағы инновациялар, BIM интеграциясы*.

Информационное моделирование зданий (BIM) в Казахстане: текущие тенденции, вызовы и перспективы

К. Искендерова[1], М. Буряко[2], З. Жамбакина[1*]

[1]*Satbayev University, Алматы, Казахстан*
[2]*Национальный исследовательский Московский государственный строительный университет, Москва, Россия*

**Автор для корреспонденции: z.zhambakina@satbayev.university*

Аннотация. Данная статья посвящена исследованию текущего состояния и перспектив внедрения технологии информационного моделирования зданий (Building Information Modeling - BIM) в Республике Казахстан. В условиях цифровизации строительной отрасли BIM рассматривается как ключевой инструмент повышения эффективности, качества и прозрачности проектных и строительных процессов. В статье проведён обзор отечественной и международной литературы, проанализированы существующие барьеры, такие как отсутствие нормативной базы, дефицит квалифицированных специалистов и ограниченный доступ к технологиям для малого и среднего бизнеса. Также рассмотрены примеры успешного применения BIM в Казахстане и за рубежом, включая возможные модели адаптации международного опыта. Выводы исследования подчёркивают необходимость комплексного подхода к внедрению BIM с опорой на образовательную реформу, государственную поддержку и развитие профессиональных сообществ.

Ключевые слова: *BIM, цифровая трансформация, управление проектами, барьеры внедрения, образование и обучение, нормативная база, инновации в строительстве, интеграция BIM*.

Received: 10 March 2025
Accepted: 15 June 2025
Available online: 30 June 2025