

INNOVATION SCIENCE AND TECHNOLOGY

ISSUE 6, PART I / JUNE 2026

 Acceptance of papers



**Acceptance of
papers**

Published monthly



Topics

economics,
technology, social
sciences





EDITOR-IN-CHIEF:

Mirzaliyev Sanjar Makhmatjon ugli

DEPUTY EDITOR-IN-CHIEF:

Makhmudov Nosir Makhmudovich
DSc., Prof., Academician

DEPUTY EDITOR-IN-CHIEF:

Ochilov Bobur Bakhtiyor ugli – Senior
lecturer at TSUI

THE SCIENTIFIC-POPULAR ELECTRONIC
JOURNAL **"INNOVATION SCIENCE AND
TECHNOLOGY"** HAS BEEN REGISTERED
UNDER THE NUMBER **C-5669633** BY THE
AGENCY FOR INFORMATION AND MASS
COMMUNICATIONS (AOKA) OF THE
REPUBLIC OF UZBEKISTAN, EFFECTIVE
FROM OCTOBER 9, 2024.

CONTACTS

Phone: **+998 50 737 87 88**

Website: <https://ist-journal.uz>

Email: innovationist2025@gmail.com

The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

Editorial board:



Sharipov Kongiratbay Avezimbetovich,
Doctor of Technical Sciences (DSc), Professor



Abdurakhmanova Gulnora Kalandarovna, Doctor of
Economic Sciences (DSc), Professor



Cham Tat Huei,
Doctor of Philosophy (PhD), Professor (Malaysia)



Muhammad Imran Sadiq
Doctor of Philosophy in Economics (PhD), Professor,
Malaysia



Ahmed Aziz Ismail
Doctor of Technical Sciences (DSc),
Professor (Egypt)



Lee Chin
Doctor of Philosophy in Economics (PhD), (Malaysia)



Asongu Simplice
Doctor of Philosophy in Economics (PhD), Cameroon



Rui Dang
Doctor of Chemistry (DSc), Professor, China



Zahoor Ahmed
Doctor of Philosophy in Economics (PhD), Turkey



Shujaat Abbas
Doctor of Philosophy in Economics (PhD), Russia



Tina A Coffelt
Doctor of Philosophy in Educational Sciences (PhD),
USA



Abdikarimova Dinara Rustamxanovna
Doctor of Economic Sciences (DSc), Professor

Kurbonbekova Mohichehra Turobjonovna
Doctor of Economic Sciences (DSc), Professor

Alimardonov Ilkhom Muzrabshokovich
Doctor of Economic Sciences (DSc), Professor



Razakova Barno Sayfieva
Doctor of Philosophy in Economics (PhD)



Khasanov Sarvar Ulugbek ugli
Doctor of Philosophy in Economics (PhD)



Kholikova Rukhsora Sanjarovna
Associate Professor (PhD)

CONTENTS

BUDGETING BASED ON THE BALANCED SCORECARD SYSTEM IN STRATEGIC MANAGEMENT ACCOUNTING.....	8
Pardaeva Shakhnoza Abdinabievna	
TURIZM SOHASIDA TARJIMA NAZARIYASINING O'RNI	13
Bahronova Charos Mirabbos qizi	
THE ROLE OF ESG PRINCIPLES AND DIGITAL TECHNOLOGIES IN THE DEVELOPMENT OF CORPORATE SOCIAL MANAGEMENT SYSTEMS	16
Shokhrukh Abdisalimovich Muratkosimov	
A COMPARATIVE SEMANTIC FIELD ANALYSIS OF "BENEFIT" ACROSS ENGLISH AND UZBEK CULTURES	23
Mohira Husanovna Divanova	
ROSSIYA TIJORAT BANKLARIDA DEPOZIT OPERATSIYALARINI RIVOJLANTIRISHNING O'ZIGA XOS JIHATLARI	30
Rahimov Akmal Matyaqubovich	
USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES AGAINST CYBER THREATS IN THE PUBLIC SECTOR.....	37
Nuratdinov Xushnid Begzadovich, Erejepov Kewlimjay Kaymatdinovich	
PUL-KREDIT SIYOSATI INSTRUMENTLARIDAN FOYDALANISH AMALIYOTINI TAKOMILLASHTIRISH ..	42
A.A. Ismailov	
"O'ZBEKISTON TEMIR YO'LLARI" AJNING AMALIY IQTISODIY HOLATI TAHLILI VA OPSIONLARNI ANIQLASH	48
Bobojonova Zarnigor Shokirovna	
COMPARATIVE ANALYSIS OF DEEP LEARNING ALGORITHMS FOR AUTOMATED SKIN DISEASE DIAGNOSIS FROM DERMOSCOPIC IMAGES.....	56
Nazirova Elmira Shodmonovna, Abdusalomova Shokhista Boboyor qizi	
STRATEGY FOR THE DEVELOPMENT OF THE FINANCIAL MARKET OF UZBEKISTAN IN THE CONTEXT OF DIGITAL AND GREEN TRANSFORMATION	61
Muftaydinov Mansur Kiyomidinovich	
TOURISM POTENTIAL OF UZBEKISTAN AND FINANCIAL FACTORS FOR ITS DEVELOPMENT	68
Bau Long	
CASH FLOWS OF "TERRITORIAL ELECTRIC NETWORKS" JSC: COMPREHENSIVE ACCOUNTING ANALYSIS AND METHODOLOGICAL APPROACHES TO IMPROVEMENT.....	75
Djuraev Davlat Djonibekovich	
MONETARY POLICY INSTRUMENTS.....	78
A.A. Ismailov	
ECONOMIC EFFICIENCY OF IMPLEMENTING INNOVATIVE TECHNOLOGIES IN THE SERVICE SECTOR OF REGIONS	83
Abdikayumov Bekzod Turdiniyozovich	
KNOWLEDGE STRATEGY AND ITS SYSTEM OF INDICATORS IN STRATEGIC MANAGEMENT ACCOUNTING.....	89
Pardaeva Shakhnoza Abdinabievna, Pardaeva Zulfizar Alimovna	
ANALYSIS OF THE REGIONAL DYNAMICS AND STRUCTURAL CHARACTERISTICS OF LABOR MIGRATION	95
Mukhtorbek Rahimboyev, Alibek Normurodov	
SUN'IY INTELLEKT ASOSIDA KREDIT RISKLARNI BAHOLOVCHI TIZIMLARNI ISHLAB CHIQISH. MIJOZ SCORE MODEL VA QARORLARNI OPTIMALLASHTIRISH	104
Olimova Mukhlisa Vohidjon qizi	
PUBLIC-PRIVATE PARTNERSHIP IN ESG IMPLEMENTATION: OPPORTUNITIES AND CHALLENGES FOR SUSTAINABLE DEVELOPMENT	111
Khusenova Mekhrangiz	

FORMATION OF MEDICAL TOURISM CLUSTERS IN THE REGION	115
Yusupova Mehribon O'ktamovna	
DIRECTIONS FOR IMPROVING THE INTEGRATION OF SCADA AND ERP SYSTEMS IN OIL AND GAS INDUSTRY ENTERPRISES	120
Abdullaev Munis Kurbonovich	
ANALYSIS OF THE EXPERIENCE OF FOREIGN COUNTRIES IN IMPLEMENTING GREEN PUBLIC PROCUREMENT AND LESSONS FOR UZBEKISTAN.....	125
Ruzimurodova Charos Ural qizi	
AGROTECHNICAL AND INNOVATIVE STRATEGIES FOR ENHANCING GRAIN PRODUCTION EFFICIENCY	129
Turayeva Gulizahro	
MINERALOGICAL OCCURRENCE OF RARE METALS IN THE INGICHKA DEPOSIT AND DEVELOPMENT OF TUNGSTEN EXTRACTION TECHNOLOGY	133
Shodiyev Abbos, Dononov Jasur, Safarov Gulomjon	
STRATEGIC DIRECTIONS OF PUBLIC-PRIVATE PARTNERSHIP COOPERATION IN THE GREEN ECONOMY OF UZBEKISTAN	140
Zukhra Bakhramovna Abdikarimova	
TIME MANAGEMENT IN THE CRAFT ECONOMY: STRATEGIES FOR OPTIMIZING THE TIME RESOURCES OF INDIVIDUAL PRODUCERS	148
Feruza Nazrillaevna Israilova	
DEVELOPMENT STAGES OF THE GREEN ECONOMY IN THE CONTEXT OF GLOBAL SUSTAINABILITY GOALS	154
Muminova Mokhchekhra	
FEATURES AND FACTORS OF WOMEN'S ENTREPRENEURSHIP DEVELOPMENT IN THE DIGITAL ECONOMY.....	160
Ibodullayeva Malohat Sirojiddin qizi	
MECHANISMS FOR POVERTY REDUCTION THROUGH THE DEVELOPMENT OF SMALL BUSINESS AND FAMILY ENTREPRENEURSHIP IN THE SERVICE SECTOR.....	165
Dauletmuratov Adilbay Mirzabovich	
IMPROVING THE METHODOLOGY OF ENVIRONMENTAL AUDITING AT ENTERPRISES BASED ON A RISK-ORIENTED APPROACH AND DIGITAL EVIDENCE	171
Abdullayev Khurshidjon Nazrullo o'g'li, Khurshidjon Abdullayev	
INTEGRATION MECHANISMS OF DIGITAL ECONOMY TECHNOLOGIES INTO REGIONAL GOVERNANCE SYSTEMS	176
Kurbanova Malika Ahmad kizi	
DEVELOPMENT OF A LOGICAL-LINGUISTIC MODEL OF THE KOREAN NOUN CATEGORY AND CREATION OF A PREFIX AND AFFIX DATABASE.....	181
Yendirboyeva Zumrad Zohidjon qizi	
THEORETICAL AND INSTITUTIONAL FOUNDATIONS OF MANAGING STATE SHARES IN BUSINESS ENTITIES	186
Akmaljon Valijonov	
ENSURING OBJECT SECURITY AND ANALYZING INFORMATION SECURITY BASED ON NEURAL NETWORKS.....	190
Babayazov Saidbek Po'latovich, Sultamuratova Dilnoza Gulmuratovna	
FUNDAMENTAL METHODS FOR IDENTIFYING AI-GENERATED DATA IN ACADEMIC AND ONLINE PUBLICATIONS USING MACHINE LEARNING AND NLP MODELS.....	196
Abdullaev Munis Kurbonovich, Kungratov Ilmurod Kuzibay ugli	
QUALITY ASSURANCE OF NON-AUTOCLAVED AERATED CONCRETE WITH THE ADDITION OF CMC (CARBOXYMETHYL CELLULOSE)	204
Pulatova D.G., Akhundjanov K.A.	
INTEGRATION MECHANISMS OF DIGITAL ECONOMY TECHNOLOGIES INTO REGIONAL GOVERNANCE SYSTEMS	210
Kurbanova Malika Ahmad kizi	

IMPROVING TAX ADMINISTRATION IN UZBEKISTAN AND ITS SOLUTIONS	215
Shamsiyev O'ktam Sayfitdinovich	
ASSESSING THE SOURCES AND QUALITY OF REGIONAL ECONOMIC GROWTH USING THE SOLOW MODEL.....	222
Turaev Bakhtiyor Ergashevich	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF BANKING SYSTEM DIGITALIZATION	228
Suyunov Feruz, Ergashov Firdavs, Norqulov Habibullo	
HARDWARE-AWARE PERFORMANCE OPTIMIZATION OF YOLOV8 FOR REAL-TIME APPLICATIONS: GPU ACCELERATION WITH TENSORRT AND AN ANALYTICAL FPGA COMPARISON.....	232
Ulugbek Tursunaliyev, Bakhromjon Tulkinov	
DEVELOPMENT OF SPATIAL INFORMATION MODELS OF TERRITORIAL DEVELOPMENT TAKING INTO ACCOUNT ENVIRONMENTAL FACTORS (ON THE EXAMPLE OF THE REPUBLIC OF KARAKALPAKSTAN AND THE ARAL REGION)	241
Reymova Gulmira Polatovna	
LEADERSHIP STYLES AND QUALITY ASSURANCE CULTURE IN UNIVERSITIES.....	248
Urinov Bobur Nasilloevich	
SOCIO-ECONOMIC MECHANISMS FOR ENHANCING THE EFFECTIVENESS OF SCIENTIFIC RESEARCH AND INCENTIVE SYSTEMS IN THE AGRICULTURAL SECTOR.....	256
Zafar Ibragimovich Xakimov	
SOCIOLINGUISTIC FEATURES OF NEGATIVE AESTHETIC EVALUATION UNITS DENOTING PHYSICAL APPEARANCE IN ENGLISH AND UZBEK.....	260
Qalandarova Shaxzoda Qurbonboy qizi	
REMITTANCE INFLOWS AND THE SUSTAINABILITY OF ECONOMIC GROWTH: A TIME-SERIES ANALYSIS FOR UZBEKISTAN.....	265
O. B. Gimranova	
FORECAST INDICATORS, PROSPECTS, AND OUTCOMES OF DEVELOPING THE MECHANICAL ENGINEERING INDUSTRY THROUGH GREEN INVESTMENTS.....	271
Xursandov Komiljon Maxmatkulovich	
FEATURES AND FACTORS OF WOMEN'S ENTREPRENEURSHIP DEVELOPMENT IN THE DIGITAL ECONOMY.....	276
Ibodullayeva Malohat Sirojiddin qizi	
FACTORS INFLUENCING TAX REVENUE EFFICIENCY IN UZBEKISTAN IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT	282
Jurayev Xusan Atamuratovich	
THE DIGITAL GASTRONOME: HOW TECHNOLOGY CONNECTS TOURISTS, RESTAURANTS, AND DIGITAL PLATFORMS	286
Freshta Qayoumi	
THE REPRESENTATION OF RESTRICTED LEXICON IN FRENCH LITERARY WORKS	290
Gulnoz Akhmedova	
RESEARCH ON THE TRANSMISSION MECHANISMS AND IMPLEMENTATION PATHS OF SHANDONG PROVINCE'S "SILVER ECONOMY" DEVELOPMENT EXPERIENCE IN THE FERGANA REGION	294
Zhang Zhe	
APPLICATION OF NET PRESENT VALUE ANALYSIS TO SHORT-TERM PERSONAL FINANCIAL DECISIONS	299
Akhunova Elena Anvarovna	
ECONOMIC OPPORTUNITIES FOR INCREASING EMPLOYMENT THROUGH THE DEVELOPMENT OF SMALL BUSINESS ENTITIES IN KHOREZM REGION	307
Azadova Gulnoza Sardorbekovna	
DEVELOPMENT TRENDS AND INSTITUTIONAL FEATURES OF THE STOCK MARKET IN THE REPUBLIC OF UZBEKISTAN	313
Nargiza E. Jiyanova, Diana D. Qurbaniyazova	
MODELING AND FORECASTING THE SCIENTIFIC PUBLISHING ACTIVITY OF HIGHER EDUCATION INSTITUTIONS (A CASE STUDY OF SCOPUS DATA)	321
Ozoda B. Sakieva	

YELLOW TOURISM: CONCEPTUAL CONTOURS, SPECTATORIAL LOGICS, AND THE POLITICS OF JOYFUL MOBILITY	326
Samiev Siroj, Ochilova Guli	
SHAKESPEARE'S CREATIVE METHOD: ADAPTATION, COLLABORATION, AND THEATRICAL REFINEMENT	334
Mirzakhidova Nozima Ulugbek kizi	
THE IMPACT OF TOURISM ON UNESCO SITES: THE CASE OF SAMARKAND	338
Samiev Siroj, Kakhramanova Maftuna	
MODERN METHODS FOR ASSESSING ECONOMIC EFFICIENCY UNDER CONDITIONS OF DIGITAL TRANSFORMATION	344
Meyliyev Farrux Ikrom o'g'li	
INTEGRATION OF ESG PRINCIPLES INTO THE CORPORATE GOVERNANCE SYSTEM OF STATE-OWNED ENTERPRISES IN UZBEKISTAN: KEY BARRIERS AND PRACTICAL SOLUTIONS.....	349
Jumadullaeva Durdona Shukhrat qizi	
COMPARATIVE ADVANTAGES OF LOCAL NATURAL AND ECONOMIC POTENTIAL AND THEIR EFFECTIVE USE UNDER CLIMATE CHANGE CONDITIONS	357
Madenova Elmira Nizamatinovna	
IDENTIFICATION OF FACTORS INFLUENCING RETAIL SALES	362
Markova Mariya Stanislavovna, Pooja	
APPLICATION OF MARKETING APPROACHES AND PRINCIPLES IN THE EDUCATION SYSTEM	377
Musayeva Shoirazimovna	
FORECAST INDICATORS OF GROSS REVENUE IN THE PRIVATE HIGHER EDUCATION SECTOR FOR 2027-2030	382
Rahimov Sardor Uralovich	
OPTIMIZATION OF WASTE ROCK PLACEMENT SCHEMES FROM A MINING PERSPECTIVE IN THE DEVELOPMENT OF TITANOMAGNETITE DEPOSITS	386
Ibrohimov Dilshodbek Norimbat oglu	
ARTIFICIAL INTELLIGENCE AS A DRIVER OF BANKING SERVICES DEVELOPMENT: MODERN APPROACHES, OPPORTUNITIES, AND CHALLENGES	394
Mamutova Aygul Kalmurzaevna	
DIGITAL TRANSFORMATION OF UZBEKISTAN'S ARCHITECTURAL INDUSTRY: THE ROLE OF BIM, ARTIFICIAL INTELLIGENCE AND DIGITAL TWIN TECHNOLOGIES	402
Abdullaeva Sitorabonu Xasanjon kizi	

DIGITAL TRANSFORMATION OF UZBEKISTAN'S ARCHITECTURAL INDUSTRY: THE ROLE OF BIM, ARTIFICIAL INTELLIGENCE AND DIGITAL TWIN TECHNOLOGIES



Abdullaeva Sitorabonu Xasanjon kizi

Lecturer, «Architecture» department

AJOU University in Tashkent

Email: sitorik1997@gmail.com

ORCID: [0009-0003-5840-0605](https://orcid.org/0009-0003-5840-0605)

Abstract: This article examines the role of Building Information Modeling (BIM), Artificial Intelligence (AI), and Digital Twin technologies in the digital transformation of Uzbekistan's architectural industry. The study analyzes the potential of these technologies to improve architectural design, construction management, and urban development processes. Based on a review of scientific literature, international experience, and national digitalization initiatives, the main challenges and opportunities of technology adoption are identified. The findings suggest that BIM, AI, and Digital Twins can enhance project efficiency, resource management, and sustainability throughout the building lifecycle. The study concludes that the integration of advanced digital technologies is essential for the modernization and competitiveness of Uzbekistan's architectural sector.

Keywords: digital transformation, Building Information Modeling (BIM), artificial intelligence, digital twins, architectural industry, construction digitalization, smart cities, Uzbekistan.

Annotatsiya: Mazkur maqolada O'zbekiston arxitektura sohasining raqamli transformatsiyasida Building Information Modeling (BIM), sun'iy intellekt (AI) va Digital Twin texnologiyalarining o'rni tahlil qilingan. Tadqiqotda ushbu texnologiyalarning arxitektura loyihalash, qurilish jarayonlarini boshqarish hamda shaharsozlikni rivojlantirishdagi imkoniyatlari o'rganilgan. Ilmiy adabiyotlar, xalqaro tajriba va mamlakatda amalga oshirilayotgan raqamlashtirish tashabbuslari asosida zamonaviy texnologiyalarni joriy etishning asosiy muammolari va istiqbollari aniqlangan. Tadqiqot natijalari BIM, sun'iy intellekt va Digital Twin texnologiyalari loyiha samaradorligini, resurslarni boshqarish sifatini hamda binolarning butun hayotiy sikli davomida barqarorlikni oshirish imkonini berishini ko'rsatdi. Tadqiqot yakunida ilg'or raqamli texnologiyalarni integratsiya qilish O'zbekiston arxitektura sohasini modernizatsiya qilish va uning raqobatbardoshligini oshirishning muhim sharti ekanligi xulosasi chiqarildi.

Kalit so'zlar: raqamli transformatsiya, Building Information Modeling (BIM), sun'iy intellekt, Digital Twin, arxitektura sohasi, qurilishni raqamlashtirish, aqlii shaharlar, O'zbekiston.

Аннотация: В данной статье рассматривается роль технологий информационного моделирования зданий (BIM), искусственного интеллекта (AI) и цифровых двойников (Digital Twin) в цифровой трансформации архитектурной отрасли Узбекистана. В исследовании анализируется потенциал этих технологий в совершенствовании процессов архитектурного проектирования, управления строительством и развития городской среды. На основе обзора научной литературы, международного опыта и национальных инициатив в области цифровизации определены основные проблемы и перспективы внедрения современных цифровых технологий. Результаты исследования показывают, что BIM, искусственный интеллект и цифровые двойники способны повысить эффективность реализации проектов, качество управления ресурсами и обеспечить устойчивость на всех этапах жизненного цикла зданий. Сделан вывод о том, что интеграция передовых цифровых технологий является необходимым условием модернизации и повышения конкурентоспособности архитектурной отрасли Узбекистана.

Ключевые слова: цифровая трансформация, информационное моделирование зданий (BIM), искусственный интеллект, цифровые двойники, архитектурная отрасль, цифровизация строительства, умные города, Узбекистан.

INTRODUCTION

The digital revolution has been a significant driver of innovation and sustainable development in the architecture, engineering, and construction (AEC) industry. The integration of digital technologies has transformed the way buildings, urban areas, and infrastructure are designed, constructed, and managed throughout their lifecycles. Compared to traditional approaches, digital solutions promote interdisciplinary collaboration, improve project transparency, optimize resource utilization, and facilitate decision-making, resulting in increased efficiency and sustainability in the built environment.

Among the technologies supporting this transformation, Building Information Modeling (BIM) has become the foundation of modern digital construction. BIM provides an integrated digital representation of a building's physical and functional characteristics, allowing architects, engineers, contractors, and facility managers to collaborate within a unified information environment [1]. As emphasized by Succar, BIM should be understood not only as a software application but also as a comprehensive methodology that transforms organizational processes and information management across the entire project lifecycle [2]. Numerous international studies have confirmed that BIM implementation improves project coordination, minimizes design conflicts, reduces construction costs, and increases overall project performance [3].

In recent years, Artificial Intelligence (AI) has emerged as another important catalyst for innovation within the AEC sector. AI-based technologies are increasingly applied to generative design, project optimization, automated documentation, cost estimation, construction monitoring, and predictive decision-making. By processing large volumes of project data, AI enables architects and engineers to evaluate multiple design alternatives, identify potential risks, and improve the quality and efficiency of project delivery [4].

Another rapidly developing technology is the Digital Twin, which extends the capabilities of BIM by integrating real-time operational data with virtual models of buildings and urban infrastructure. Digital Twins enable continuous monitoring, simulation, predictive maintenance, and performance analysis throughout the operational lifecycle of physical assets [5]. According to Batty, Digital Twins have become one of the key technological foundations for smart cities, providing opportunities for more efficient infrastructure management, environmental monitoring, and evidence-based urban planning [6].

The relevance of these technologies is particularly significant for developing countries seeking to modernize their construction industries and improve urban governance. In Uzbekistan, digital transformation has been identified as one of the national development priorities through the implementation of the Digital Uzbekistan–2030 Strategy, which promotes the adoption of digital technologies across public administration, infrastructure, and the construction sector [7]. In parallel, the United Nations Development Programme emphasizes that the expansion of the digital economy creates favorable conditions for technological modernization, innovation, and sustainable economic growth in Uzbekistan [8].

Despite the growing international experience in implementing BIM, Artificial Intelligence, and Digital Twin technologies, Uzbekistan's architectural industry is creating favorable conditions for their wider practical adoption. Ongoing developments include the expansion of qualified specialists, strengthening digital competencies, continuous improvement of the regulatory framework, increasing investment opportunities, and growing organizational support for innovation [9]. Furthermore, although numerous international studies examine individual digital technologies, increasing attention is being devoted to analyzing their combined role within the context of Uzbekistan's architectural sector and national digital transformation agenda. This evolving research direction highlights the growing opportunities for a comprehensive assessment of the potential and prospects associated with integrating these technologies into professional architectural practice. The aim of this study is to examine the role of Building Information Modeling, Artificial Intelligence, and Digital Twin technologies in the digital transformation of Uzbekistan's architectural industry and to identify the major opportunities, future directions, and practical approaches for their effective implementation.

REVIEW OF LITERATURE ON THE SUBJECT

In recent decades, the scientific community has been actively studying the digital transformation of the architecture and construction industry. In particular, the development of Building Information Modeling (BIM), Artificial Intelligence (AI) and Digital Twin technologies makes it possible to increase the efficiency of project management, construction processes and facility operation.

The theoretical and practical foundations of BIM technologies have been studied by many researchers. N.S. Buronov, Z. Baidoun, Z. Matniyazov and other researchers analyzed the importance of BIM standards and regulatory legal acts in the field of construction. They concluded that BIM platforms improve data exchange between project participants, reduce errors in the design process, and form a unified information environment throughout the entire life cycle of an object [10].

In his works, V.V. Yaskevich has studied in detail the issues related to the introduction of building information modeling (BIM) technologies at the state level. The author convincingly proves that for the effective functioning of the BIM system, it is necessary to create a standardized data environment, train qualified specialists and improve the regulatory framework [11]. According to the results of the study, the use of BIM not only increases the efficiency of managing the lifecycle of construction projects, but also creates an important infrastructure for the transition to the Digital Twin concept.

S.V. Kharitonchik, S.I. Akhmedov, I.I. Gancherenok, N.N. Gorbachev and other authors also studied the digitalization of the construction industry. In their research papers and textbooks, they show that the integration of BIM, CAD, ERP, IoT, and Industry 4.0 technologies opens up new horizons for automating construction processes, optimizing project costs, and efficiently using resources [12; 13].

In their work, T. Ergasheva, N. Ismailova and their colleagues studied the potential of artificial intelligence in architectural and engineering systems [14]. They concluded that the use of artificial intelligence algorithms makes it possible to quickly evaluate various design options, as well as increase energy efficiency and optimize the technical characteristics of construction sites. The results of the study confirm that artificial intelligence can significantly improve the quality of decision-making at the initial design stage.

In the context of the Industry 5.0 concept, R. Simionov, R. Dolchinkov and K. Seimenlitsky conducted an in-depth analysis of the integration of BIM technologies, artificial intelligence and Digital Twin. They note that intelligent monitoring systems, robotic construction, and real-time data management significantly improve the accuracy, reliability, and operational efficiency of construction projects [15].

N.U. Dadabayeva conducted a study, during which she explored the possibilities of using digital twin technology in infrastructure projects. As a result of the research, it was found that the integration of BIM, IoT and AI on a single digital platform allows monitoring of construction sites in real time. This makes it possible to identify technical problems in a timely manner and reduce operating costs. According to the results of the study, Digital Twin technology was recognized as an effective tool for reducing project risks and optimizing costs [16].

In modern research on the preservation and digitization of architectural heritage, Digital Twin technologies and 3D reconstruction are becoming increasingly important. L.L. Chen and W.W. Huang proposed new methods based on advanced computer vision algorithms for digital modeling of historical buildings. The results of their work demonstrate that these methods open up new perspectives for high-precision digitization and long-term storage of cultural heritage objects [17; 18].

N.S. Buronov's works deeply analyze the historical aspects of the development of architectural modeling. He conducts scientific research, tracing the path from CAD systems to BIM, generative design, artificial intelligence and Digital Twin technologies. The author notes that modern digital tools are fundamentally changing the architectural design process and accelerating the transition to data-driven management [19].

An analysis of the scientific literature shows that BIM technologies have become a key information management tool in the field of construction and architecture. The introduction of artificial intelligence makes it possible to optimize the design and management processes.

Digital Twin technology combines the advantages of BIM and artificial intelligence in a single environment, enabling real-time monitoring and management of facilities. However, despite the importance of these technologies, the practical and methodological aspects of their integration in the architectural industry of Uzbekistan have not been sufficiently studied. This study is aimed at filling this scientific gap.

RESEARCH METHODOLOGY

As part of this research, we aim to explore the role and impact of BIM, artificial intelligence (AI), and Digital Twin technologies in the field of architecture. Our analysis is based on a methodology based on the study of scientific literature, documents and conducting a comparative assessment. This approach is particularly useful in the study of digital transformation processes in the field of architecture, engineering and construction (AEC). In the course of the research, we will analyze the possibilities and advantages of BIM, AI and Digital Twin technologies, as well as identify possible problems that may arise when they are put into practice.

ANALYSIS AND RESULTS

The analysis of the reviewed literature demonstrates that building information modeling (BIM), artificial intelligence (AI), and digital twin technologies form the foundation of the current digital transformation in the architecture, engineering, and construction (AEC) industry. These technologies are revolutionizing architectural design, construction management, and urban development through enhanced information exchange, decision-making, and lifecycle management of built assets.

Among the various technologies available, Building Information Modeling (BIM) is the most mature and

widely adopted digital solution within the construction industry. This technology enables the development of comprehensive digital models that integrate geometric, technical, operational, and financial information throughout the entire lifecycle of a building project.

Compared to traditional, two-dimensional design approaches, BIM significantly improves interdisciplinary collaboration among project teams, reduces the likelihood of design conflicts, and facilitates more efficient coordination of projects. International experience indicates that BIM implementation can lead to increased productivity, enhanced project quality, and improved lifecycle management of buildings and infrastructure projects.

Artificial intelligence (AI) has become a critical technology in supporting the digital transformation of the architecture and construction industry. AI-driven systems assist professionals with generative design, automated documentation, construction monitoring, cost estimation, and project optimization.

By processing vast amounts of data, AI allows architects and engineers to analyze numerous design options, identify potential risks, and make informed decisions. As a result, AI has evolved from an experimental tool to a practical one that enhances efficiency throughout the project lifecycle.

Furthermore, digital twin technology enhances the capabilities of building information modeling (BIM) by integrating virtual building models with real-time operational data from physical assets. This enables continuous monitoring, simulation, predictive maintenance, and performance analysis of buildings and infrastructure systems.

As highlighted in recent research, digital twins offer significant potential for enhancing urban infrastructure management, environmental monitoring, and long-term planning in intelligent cities.

The principal applications and expected benefits of these technologies within architectural practice are summarized in Table 1 (Table 1).

Table 1
Main Digital Technologies and Their Applications in Architecture¹

Technology	Main Applications	Expected Benefits
Building Information Modeling (BIM)	Integrated design, project coordination, lifecycle management	Reduced design errors, improved collaboration, higher efficiency
Artificial Intelligence (AI)	Generative design, cost estimation, risk assessment, project optimization	Faster decision-making, increased productivity, improved accuracy
Digital Twin	Building monitoring, infrastructure management, urban simulation	Real-time control, predictive maintenance, sustainable development

The analysis also indicates that the implementation of digital technologies within Uzbekistan's architectural industry is currently at an early stage of development. National initiatives supporting digital transformation and the implementation of the Digital Uzbekistan–2030 Strategy have created favorable institutional conditions for technological modernization [7]. In addition, the continued development of the country's digital economy provides new opportunities for integrating advanced digital solutions into architectural design, construction management, and urban planning.

These findings are in line with Rogers' Theory of Innovation Diffusion, which posits that successful technology adoption relies on both the technical merits of the innovation as well as the preparedness of organizations, institutional backing, and user propensity for change.

Overall, the findings demonstrate that BIM, Artificial Intelligence, and Digital Twin technologies possess considerable potential to improve the quality, efficiency, and sustainability of architectural activities in Uzbekistan. Their successful implementation could strengthen the competitiveness of the national construction industry while supporting the country's long-term objectives for digital transformation and sustainable urban development (Figure 1).

¹ Source: Compiled by the author based on the analysis of scientific literature.

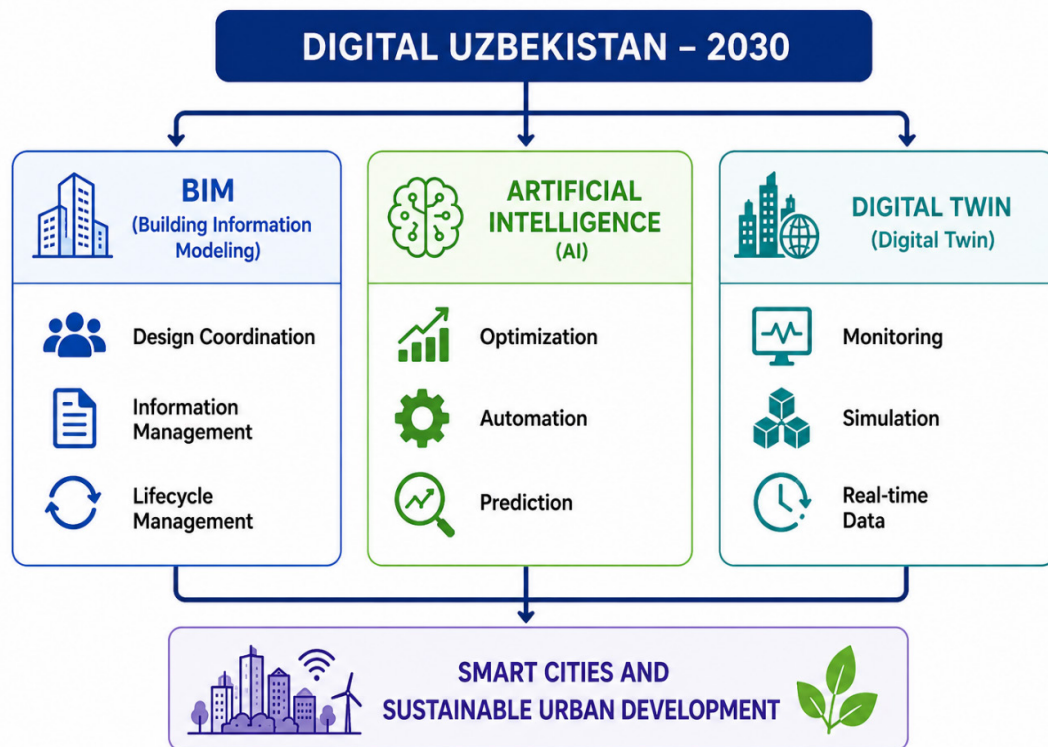


Figure 1. Framework of Digital Transformation of Uzbekistan's Architectural Industry²

Figure 1 illustrates the conceptual framework of digital transformation in Uzbekistan's architectural industry by demonstrating the interaction between BIM, Artificial Intelligence, Digital Twin technologies, and the strategic objectives of the Digital Uzbekistan–2030 Strategy.

The findings of this study demonstrate that Building Information Modeling (BIM), Artificial Intelligence (AI), and Digital Twin technologies collectively represent the foundation of digital transformation within the architecture, engineering, and construction (AEC) industry. Rather than functioning as independent digital tools, these technologies complement one another by creating an integrated digital environment that supports more efficient project delivery, data-driven decision-making, and sustainable urban development.

Among the three technologies, BIM remains the most mature and widely implemented solution. The results indicate that BIM serves as the basis for digital information management throughout the entire building lifecycle and creates favorable conditions for integrating more advanced technologies such as Artificial Intelligence and Digital Twins. Similar conclusions were reported by Azhar, who emphasized that BIM implementation improves interdisciplinary collaboration, reduces project risks, and increases overall project performance while requiring organizational adaptation and appropriate management strategies. Therefore, expanding BIM adoption should be considered a strategic priority for accelerating digital transformation within Uzbekistan's architectural sector.

Artificial Intelligence represents the next stage of digital innovation by enhancing the analytical capabilities of BIM-based workflows. International experience demonstrates that AI can support architects and engineers in design optimization, automated documentation, construction monitoring, and predictive decision-making. Although AI applications within Uzbekistan's construction industry remain limited, the country's ongoing digitalization initiatives create favorable conditions for gradually introducing intelligent design and project management systems.

Digital Twin technology further extends the functionality of BIM by connecting digital models with real-time operational data. This integration enables continuous monitoring of buildings and infrastructure, predictive maintenance, and simulation of future operational scenarios. Such capabilities are particularly important for improving urban infrastructure management and supporting evidence-based planning in rapidly developing cities.

The implementation of these technologies, however, depends not only on technical capabilities but also on institutional, organizational, and educational factors. The findings indicate that Uzbekistan has favorable

² Source: Developed by the author based on the "Digital Uzbekistan - 2030" strategy and an analysis of BIM, artificial intelligence, and digital twin technologies.

opportunities to further strengthen digital transformation by expanding digital competencies, increasing practical experience, enhancing investment capacity, and continuously improving comprehensive regulatory mechanisms. According to international experience, successful BIM implementation requires governmental support, standardized regulations, and the integration of digital requirements into public procurement procedures. Consequently, technological modernization can be effectively supported through consistent policy measures that encourage digital innovation across the construction sector.

Another important implication concerns the relationship between digital technologies and sustainable urban development. The integration of BIM, Artificial Intelligence, and Digital Twin technologies supports the broader concept of smart cities by improving infrastructure management, resource efficiency, environmental monitoring, and public service delivery. As noted by Albino et al., smart city development depends on the effective integration of digital technologies with urban governance and sustainable development strategies [20]. This perspective is particularly relevant for Uzbekistan, where rapid urbanization and national digital transformation initiatives create new opportunities for implementing intelligent urban management systems.

Overall, the findings suggest that digital transformation should be understood as a comprehensive process that combines technological innovation, institutional development, regulatory modernization, and professional capacity building. The successful integration of BIM, Artificial Intelligence, and Digital Twin technologies has the potential to increase the efficiency, sustainability, and international competitiveness of Uzbekistan's architectural industry while supporting the long-term objectives of the Digital Uzbekistan–2030 Strategy.

CONCLUSIONS AND SUGGESTIONS

This study examined the role of Building Information Modeling (BIM), Artificial Intelligence (AI), and Digital Twin technologies in the digital transformation of Uzbekistan's architectural industry. The analysis of international scientific literature, official policy documents, and national digital development initiatives demonstrates that these technologies are becoming fundamental components of modern architectural practice and sustainable urban development.

The findings indicate that BIM currently provides the technological foundation for integrated information management and interdisciplinary collaboration throughout the building lifecycle. Artificial Intelligence expands the capabilities of architectural design and construction management through automation, optimization, and data-driven decision-making, while Digital Twin technology enables continuous monitoring, predictive maintenance, and more efficient management of buildings and urban infrastructure.

The study also revealed that the successful implementation of digital technologies in Uzbekistan depends not only on technological progress but also on the development of institutional support, professional competencies, regulatory frameworks, and educational programs. Although significant progress has been achieved through the implementation of the Digital Uzbekistan–2030 Strategy, further efforts are required to accelerate the adoption of digital technologies within the architecture, engineering, and construction sector.

The practical significance of this research lies in the identification of the key opportunities and challenges associated with the implementation of BIM, Artificial Intelligence, and Digital Twin technologies in Uzbekistan's architectural industry. The proposed conceptual framework may serve as a useful reference for policymakers, researchers, educators, and industry professionals involved in the modernization of the national construction sector.

Future research may focus on developing practical implementation models for BIM and Artificial Intelligence in architectural organizations, evaluating the economic effectiveness of digital technologies, and investigating the application of Digital Twin technologies in smart city projects within Uzbekistan.

REFERENCES:

1. Eastman C., Teicholz P., Sacks R., Liston K. BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers. 3rd ed. Hoboken, NJ: John Wiley & Sons, 2018. 688 p.
2. Succar B. Building Information Modelling Framework: A Research and Delivery Foundation for Industry Stakeholders // *Automation in Construction*. 2009. Vol. 18, No. 3. P. 357–375.
3. Smith P. BIM Implementation – Global Strategies // *Procedia Engineering*. 2014. Vol. 85. P. 482–492.
4. Abioye S.O., Oyedele L.O., Akanbi L.A., Ajayi A.O., Delgado J.M.D., Bilal M., Akinade O.O., Ahmed A., Owolabi H.A., Qadir J. Artificial Intelligence in the Construction Industry: A Review of Present Status, Opportunities and Future Challenges // *Journal of Building Engineering*. 2021. Vol. 44. Article 103299.
5. Fuller A., Fan Z., Day C., Barlow C. Digital Twin: Enabling Technologies, Challenges and Open Research // *Journal of Industrial Information Integration*. 2020. Vol. 21. Article 100174.
6. Batty M. Digital Twins // *Environment and Planning B: Urban Analytics and City Science*. 2018. Vol. 45, No. 5. P. 817–820.
7. United Nations Development Programme (UNDP). Digital Economy of Uzbekistan: Assessment and Policy

- Recommendations. Tashkent: UNDP Uzbekistan, 2025.
8. Tran T., Nguyen H., Le P., et al. A Review of Challenges and Opportunities in BIM Adoption for the Construction Industry // Buildings. 2024. Vol. 14, No. 2. Article 421.
 9. Buronov, N., Baydoun, Z., Matniyazov, Z., Rasul-Zade, L., & Tajibaeva, D. (2026). ADVANCING BIM REGULATORY DOCUMENTS IN URBAN PLANNING AND CONSTRUCTION: GLOBAL INSIGHTS AND GAP. PLANNING MALAYSIA, 24.
 10. Yaskevich, V. V. (2025). Paradigma vnedreniya BIM tekhnologiy v arkhitekturno-stroitelnyuyu praktiku Respubliki Kazakhstan (PhD Dissertation). Satbayev University, Almaty, Kazakhstan.
 11. Kharitonchik, S. V., & Akhmedov, S. I. (Eds.). (2021). Tsifrovizatsiya v stroitelstve. Minsk–Samarkand.
 12. Gancheryonok, I. I., Gorbachev, N. N., Spiridonov, S. V., Rakhimov, A. R., Kirinovich, O. A., & Zhuraev, O. J. (2021). Tsifrovaya transformatsiya v stroitelstve: Informatsionnoe modelirovanie. Minsk–Samarkand.
 13. Ergasheva, T., Ismailova, N., Umarova, R., Xaydarova, G., Abdukarimova, G., Majidov, J., & Siyaeva, G. (2025). AI based optimization of architectural designs and mechanical systems. Proceedings of ICFNDS 2025, Dubai, UAE.
 14. Simionov, R., Dolchinkov, R., & Seymenliyski, K. (2026). Modern intelligent systems for digital transformation in corporate building construction within the context of Industry 5.0. Bulgarian Journal of Business Research, 37(1), 45–57.
 15. Dadabayeva, N. U. (2026). Digital twin technology for cost optimization and risk reduction in infrastructure projects. Research Square Preprint. <https://doi.org/10.21203/rs.3.rs-8294991/v1>
 16. Chen, L. L., & Huang, W. W. (2025). Feature extraction and digital modeling of ancient architectural heritage based on improved SIFT algorithm. Discover Artificial Intelligence, 5, Article 333.
 17. Huang, W. W., & Chen, L. L. (2025). Digital design of architectural heritage protection based on 3D reconstruction technology. Discover Artificial Intelligence, 5, Article 248.
 18. Buronov, N. S. (2026). From clay tablets to digital twins: A comprehensive historical analysis of architectural design and BIM technologies. Pedagogical Sciences and Teaching Methods, 57, 186–206.
 19. Albino V., Berardi U., Dangelico R.M. Smart Cities: Definitions, Dimensions, Performance, and Initiatives // Journal of Urban Technology. 2015. Vol. 22, No. 1. P. 3–21.

Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

2026. № 6

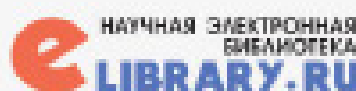
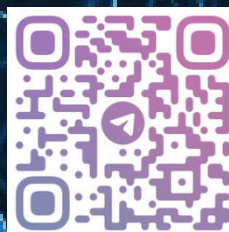
© When materials are reproduced, the INNOVATION SCIENCE AND TECHNOLOGY journal must be cited as the source. Authors are responsible for the accuracy of the information in materials and advertisements published in the journal. Editorial opinions may not always align with those of the authors. Submitted materials will not be returned to the editorial office.

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot_77. Based on this, we will send the latest issue of the journal to your address each month.

“The journal “INNOVATION SCIENCE AND TECHNOLOGY” has been registered by the Agency for Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan from 09.10.2024 under the registration number №390637. License number: C-5669633. PNFL: 30407832680027

Our address: Tashkent city, Yunusobod district, 19th block,
House 17.



Acceptance of articles

Published every
monthly



Directions

Social, economic, political,
technological, scientific



Scopus || Scientific electronic journal specializing in Scopus

CERTIFICATE NUMBER: №390637

**ORDER NUMBER ACCORDING TO
THE LICENSE REGISTER: C-5669633**

CONTACT:



Contact us
+998 50 737 87 88



Telegram channel
t.me/scopus_IST2100



Journal official website
<https://ist-journal.uz/index.php/IST>