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DIGITAL TRANSFORMATION OF URBAN CONSTRUCTION: THE IMPACT OF INNOVATIVE TECHNOLOGIES ON INVESTMENT ATTRACTION AND COMPETITIVENESS OF UKRAINE

ЦИФРОВА ТРАНСФОРМАЦІЯ МІСЬКОГО БУДІВНИЦТВА: ВПЛИВ ІННОВАЦІЙНИХ ТЕХНОЛОГІЙ НА ЗАЛУЧЕННЯ ІНВЕСТИЦІЙ ТА КОНКУРЕНТОСПРОМОЖНІСТЬ УКРАЇНИ

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The article examines how digital transformation affects operational efficiency and market competitiveness within the construction sector. Given the persistent technological gap between Ukrainian and European enterprises, assessing digital maturity has become critically important. The study introduces the Construction Digital Intensity Index (CDII), a specialized instrument incorporating industry-specific parameters such as business intelligence adoption, process automation, and cloud integration. A quantitative methodology combining enterprise performance metrics with digitalization level evaluation was applied. Results confirm that higher digital maturity correlates with improved profitability and stronger market positioning, while Ukrainian firms remain considerably behind European counterparts in technology adoption. The practical value lies in providing construction companies with a targeted tool for digital maturity assessment and strategic technology planning.

Keywords: digital transformation, construction industry, digital maturity, operational efficiency, competitiveness, Construction Digital Intensity Index, cloud integration.

Дослідження присвячене впливу цифрової трансформації на операційну ефективність та конкурентоспроможність підприємств будівельної галузі. Актуальність теми зумовлена зростаючими вимогами ринку до технологічної модернізації будівельних компаній, а також необхідністю подолання суттєвого розриву між рівнем цифровізації українських та європейських підприємств галузі. В умовах активного відновлення інфраструктури та інтеграції України до міжнародних ринків здатність компаній ефективно впроваджувати цифрові технології стає ключовим чинником їхньої конкурентоздатності та інвестиційної привабливості. Метою дослідження є розроблення спеціалізованого інструменту для комплексної оцінки цифрової зрілості будівельних підприємств та визначення взаємозв'язку між рівнем цифрового розвитку і показниками господарської

діяльності компаній. У процесі дослідження застосовано кількісний аналіз фінансово-економічних показників підприємств у поєднанні з оцінюванням рівня їх цифрового впровадження. Розроблено Індекс цифрової інтенсивності будівництва (CDII) – галузево-специфічний композитний показник, що охоплює такі виміри, як впровадження систем бізнес-аналітики, автоматизація виробничих і управлінських процесів, а також інтеграція хмарних технологій. На відміну від універсальних індексів цифровізації, CDII враховує особливості технологічних потреб і операційних процесів будівельної галузі. Отримані результати засвідчують, що підприємства з вищим рівнем цифрової зрілості демонструють покращені показники операційної ефективності, вищу рентабельність та стійкіші ринкові позиції. Порівняльний аналіз українських і європейських компаній виявив значну асиметрію в рівні технологічної інтеграції: тоді як провідні європейські гравці активно використовують інструменти бізнес-аналітики, IT та автоматизацію, більшість українських підприємств перебуває на початковому етапі цифрового розвитку. Встановлено, що підвищення рівня цифровізації безпосередньо корелює із зростанням прибутковості та показників повернення інвестицій у технологічний розвиток. Практична цінність дослідження полягає в тому, що розроблений інструмент CDII надає будівельним підприємствам дієвий механізм самодіагностики цифрової зрілості та стратегічного планування технологічного розвитку. Це дозволяє компаніям цілеспрямовано визначати пріоритетні напрями цифрових інвестицій, формувати обґрунтовані стратегії трансформації та підвищувати власну привабливість для міжнародних інвесторів, що є особливо важливим у контексті повоєнного відновлення та євроінтеграційних прагнень України.

Ключові слова: цифрова трансформація, будівельна галузь, цифрова зрілість, операційна ефективність, конкурентоспроможність, індекс цифрової інтенсивності будівництва, хмарні технології.

Statement of the problem. The construction sector is one of the pillars of Ukraine's economy, directly shaping the pace of post-war infrastructure recovery, the country's ability to attract foreign capital, and its broader integration into European markets. Yet despite this strategic importance, domestic construction enterprises remain considerably behind their European counterparts when it comes to adopting digital technologies. Data from the State Statistics Service of Ukraine indicate that no more than one in five construction companies has meaningfully incorporated digital tools into day-to-day operations – a stark contrast to the significantly higher rates recorded across the European Union [1].

The scope of digital transformation in construction is broad. It spans Building Information Modelling, cloud-based project platforms, Internet of Things solutions, automated business processes, digital management systems, business intelligence tools, mobile site applications and cybersecurity infrastructure. When properly integrated, these technologies help align the efforts of all project participants, bring down costs, catch design mistakes early, and make operations more transparent – all of which ultimately make a company more appealing to investors.

The practical benefits are well documented. Research shows that BIM adoption alone can trim project expenditure by as much as 20% while lifting management effectiveness by around 25% [5]. Introducing automation and robotics on construction sites has been linked to a reduction in design-related errors of up to 30% [6]. That said, none of this comes without a price: meaningful digitalization demands serious financial commitment, a workforce with the right digital competencies, a supportive regulatory environment, and genuine organisational willingness to change.

For Ukraine, these challenges carry additional weight. The construction industry is currently expected to do several demanding things at once – rebuild war-damaged infrastructure, meet the requirements of international investors, align with European standards, and sharpen the competitive edge of domestic firms. This means that evaluating digital tools solely from a technological standpoint is no longer sufficient. What matters equally is understanding how digitalization translates into tangible financial outcomes, better operational performance, and stronger positioning in the eyes of global investors.

Analysis of recent research and publications. A growing body of international research confirms that digital transformation is reshaping the construction industry in fundamental ways. Studies examining BIM, IoT, construction robotics and digital project platforms consistently show that technology adoption leads to lower costs, smoother project coordination and measurable improvements in construction quality [5–9].

Xinran Hu, and their co-authors demonstrate that BIM implementation can reduce overall project costs by up to 20% and improve management effectiveness by approximately 25% [5]. Research by ConWize points to the role of automation and robotics in cutting design errors by as much as 30% [6]. Moradi, Sormunen and colleagues examine the intersection of BIM,

lean construction principles and sustainability objectives, noting that while the benefits are clear, the upfront cost of digital services can place real pressure on smaller enterprises and act as a genuine barrier to entry [7]. Reis and Melão make the broader case that, despite requiring substantial initial investment, the long-term returns from digital transformation tend to outweigh the costs when assessed over the full project lifecycle [8].

Beyond efficiency gains, researchers have also begun exploring the human dimension of digitalization. Zihan Mi highlights that technology adoption is not always welcomed on the ground – workers may resist change when they perceive it as a threat to their jobs or feel unprepared for the new digital competencies that modern construction demands [9].

Ukrainian scholars have contributed meaningfully to this debate as well. Emelianova, Tytok and co-authors make the case for a service-oriented approach in the digital transformation of urban construction, arguing that digital tools, when properly implemented, improve both transparency and overall project management efficiency [10]. Dziamulych, Shulha and their colleagues provide evidence that digital technology adoption raises the productivity of Ukrainian construction firms and supports their gradual alignment with international operational standards [11]. Other researchers draw attention to the structural obstacles facing the sector in Ukraine – particularly the high cost of innovation and a relatively underdeveloped digital culture within the industry [12]. Taiwo Afinowi focuses on the investment dimension, showing that BIM and related digital tools can substantially strengthen investment management practices in urban construction projects [13]. Levchenko, Antonenko and Kosarevska point to a different set of constraints: in the Ukrainian context, BIM adoption remains limited not so much by technological availability as by the absence of a coherent regulatory framework and insufficient public and private investment [14].

The statistical picture reinforces what the literature suggests. Eurostat data show that 59% of enterprises across the EU – including 58% of small and medium-sized businesses – have achieved at least a basic level of digital intensity, with the figure rising sharply among large enterprises [20]. Ukraine's construction sector, where only around 20% of companies have integrated digital tools in any meaningful way [1], sits well below this threshold.

Taken together, the existing research leaves little doubt that digitalization produces positive outcomes for construction enterprises. However, a closer look at the literature reveals that the specific economic effects of digital technologies – particularly for Ukrainian companies operating under conditions of war, reconstruction pressure and limited resources – remain underexplored.

Highlighting previously unresolved parts of the overall problem. The academic literature on digital transformation in construction has expanded considerably in recent years, yet several important questions remain without satisfactory answers.

One persistent gap concerns the financial dimension of digitalization. While researchers have thoroughly documented the technological capabilities of BIM, IoT, automation, and cloud-based solutions, far fewer studies have attempted to quantify how these tools translate into concrete financial outcomes at the enterprise level.

Another area that warrants closer attention is the performance of digital technologies within specific market segments. Small and medium-sized enterprises face a fundamentally different set of circumstances compared with large corporations – most notably, the financial burden of transitioning to digital operations can be prohibitive [7]. This challenge, though widely acknowledged, has not been studied in sufficient depth.

Ukraine's construction industry operates under conditions that differ substantially from those found in Western Europe. A combination of constrained financing, limited institutional support from the state, wide variation in workforce digital skills, an underdeveloped digital culture, an unsettled regulatory environment, and the extraordinary demands of rebuilding war-damaged infrastructure creates a context that standard international research frameworks are not equipped to address.

There is also a methodological shortcoming worth noting. The digital intensity indicators currently in use were designed as universal tools and inevitably miss much of what matters in construction. The EU's Digital Intensity Index captures how widely companies adopt standard digital technologies, but it says little about sector-specific instruments – BIM systems, construction-oriented IoT devices, automated quality assurance tools, or digital management solutions for construction sites.

Taken together, these gaps make a compelling case for a dedicated measurement instrument – one designed specifically around the realities

of the construction industry. The present study addresses this need by introducing the Construction Digital Intensity Index (CDII).).

Formation of the objectives of the article. This article sets out to examine how digital transformation – understood through the lens of service-oriented approaches – shapes the operational efficiency, financial performance, competitiveness, and investment appeal of construction enterprises operating in Ukraine.

Six concrete objectives guide the research: assessing the current state of digital adoption across both the Ukrainian and European construction sectors; investigating how digitalization levels relate to the financial results of construction firms; evaluating the economic returns generated by specific digital tools; constructing and applying the CDII as a sector-tailored measure of digital maturity; drawing comparisons between Ukrainian companies and international counterparts; and mapping the barriers and opportunities that define the digitalization landscape for Ukrainian construction businesses.

Summary of the main research material. The research draws on a multi-component methodological framework developed and applied over the period 2023–2024. Primary sources included open statistical databases, industry analytical reports, and corporate information from construction companies in Ukraine and internationally.

The framework encompassed the following elements: a systematic review of scholarly work on BIM, IoT, construction robotics, and digital platforms [5–9; 13–15]; examination of statistical data from Eurostat and the State Statistics Service of Ukraine [1; 20]; collection of financial and operational data from annual reports and public disclosures of Kyivmiskbud, Ukrbud, Zhytlobud-1, Skanska, Turner Construction, and CSCEC [21–26]; application of the existing Digital Intensity Index as a reference point for digital maturity benchmarking [20]; construction of the CDII as a construction-specific alternative; and correlation analysis to explore the link between digitalization and profitability. The Pearson correlation coefficient served as the primary statistical measure for assessing the strength of this relationship.

Enterprise digitalization across the European Union has reached a level that stands in sharp contrast to the situation in Ukraine. By 2023, three in five EU enterprises – 59% in total – had attained at least a foundational level of digital intensity. The figure held at 58% for small and medium-sized businesses, while nine out of ten large enterprises cleared the same threshold. More strikingly, over a quarter of large EU companies had achieved very high digital integration [20].

Ukraine presents a strikingly different picture. National data indicate that roughly one in five Ukrainian construction enterprises – approximately 20% – has meaningfully incorporated digital tools into day-to-day operations [1]. The resulting technological divide erodes the capacity of Ukrainian firms to compete abroad and narrows their access to foreign capital. A structured comparison of digital intensity levels between EU and Ukrainian enterprises is provided in Table 1.

As Table 1 makes clear, Ukrainian construction enterprises fall substantially short of EU benchmarks across all categories of digital intensity. The scale of this gap takes on particular urgency in the context of post-war reconstruction, where technologies such as BIM, cloud platforms, and digital project management systems could accelerate recovery, enhance accountability, and help unlock international funding.

Digital transformation in construction spans a wide technological spectrum, covering every phase from initial design through to facility management – including planning, procurement, on-site construction, quality assurance, and ongoing monitoring.

Each of these technologies influences how efficiently and transparently a construction

Table 1

Digital intensity level of enterprises in the EU and Ukraine

Indicator	European Union	Ukraine
Enterprises with at least basic digital intensity	59%	about 20%
SMEs with at least basic digital intensity	58%	limited data
Large enterprises with basic digital intensity	91%	limited data
Large enterprises with very high digital integration	26%	limited data

Source: compiled by the authors based on [1; 20]

Table 2

Key digital technologies in construction and their expected effects

Digital technology	Main area of application	Expected effect
BIM	Design, planning, coordination	Cost reduction, better coordination, fewer design errors
Cloud platforms	Project management, data exchange	Faster communication, transparency, remote access
IoT solutions	Monitoring of equipment, materials and works	Real-time control, better safety and productivity
Automation systems	Business processes and quality control	Reduced manual work, improved accuracy
Digital documentation management	Contracts, permits, technical documentation	Faster document flow, better control
Mobile applications	Site management and communication	Faster decision-making, operational flexibility
AI/ML tools	Forecasting, optimization, risk analysis	Predictive analytics, process optimization
VR/AR technologies	Visualization, training, project presentation	Improved design understanding and stakeholder interaction
Digital supply chain management	Procurement and logistics	Reduced delays and better resource planning
Cybersecurity measures	Protection of digital systems and data	Reduced digital risks and increased reliability

Source: compiled by the authors based on [5–9; 13–15]

enterprise operates, and how competitive it can be in the market. BIM occupies a central place in this picture: it fundamentally changes how projects are conceived, how different teams work together, and how material and time waste are controlled throughout the build.

The general Digital Intensity Index provides a useful starting point for cross-sector comparisons, but it was not built with construction in mind. The industry has characteristics that set it apart: intricate webs of project stakeholders, extended and often unpredictable delivery timelines, demanding regulatory and safety requirements, and a need for tight synchronisation between design decisions and physical construction.

These particularities motivated the development of the CDII. Where the general index measures broad technology adoption, the CDII focuses specifically on the ten digital technologies that most directly affect the efficiency and competitiveness of construction firms. The CDII is calculated using the following formula:

$$CDII = \sum_{i=1}^{n} W_i \times D_i$$

where:

i – the weight coefficient of the i-th digitalization indicator;

D_i – the value of the i-th digitalization indicator;

n – the number of evaluated digitalization indicators;

$$\sum_{i=1}^{n} W_i = 1 .$$

The selection of these technologies and the assignment of their respective weights drew on three sources: structured consultations with construction industry experts, a review of leading international practice in construction digitalization, and careful consideration of both the specific characteristics of the Ukrainian market and the direction set by European construction standards. The resulting indicators and weight coefficients are set out in Table 3.

BIM carries the greatest weight in the index, given its outsized influence on design quality, team collaboration, and cost outcomes. Cloud services and IoT solutions follow closely, reflecting their critical role in enabling real-time monitoring and remote accessibility. Automated quality control and digital documentation management contribute by reducing process friction and human error. AI/ML and VR/AR technologies receive lower weights at this stage, as their practical uptake in Ukraine remains limited –

Table 3

Key indicators and their weight coefficients for CDII

Digitalization indicator	Weight coefficient W_1
BIM implementation	0.20
Cloud services for project management	0.15
IoT integration in construction processes	0.12
Automated quality control systems	0.12
Digital documentation management	0.10
Mobile applications for site management	0.10
AI/ML-based process optimization	0.08
Virtual/Augmented reality for projects	0.06
Digital supply chain management	0.04
Cybersecurity measures	0.03

Source: compiled by the authors based on expert assessment and analysis of [5–9; 13–15; 20]

though their strategic importance is expected to grow. Cybersecurity, while currently assigned the lowest weight, becomes progressively more significant as a company moves up the digital maturity ladder.

To measure the economic impact of digital transformation in practice, the study examined digitalization levels, pre- and post-digitalization profit figures, implementation costs, and return on investment for a representative selection of Ukrainian and international construction companies. How average profitability evolved before and after digitalization across the global sample is shown in Figure 1. Figure 1 demonstrates that profit trajectories became noticeably more stable following digitalization. The contrast with the pre-digitalization period is evident: the adoption of BIM, IoT, artificial intelligence, and cloud technologies appears to have reduced volatility while pushing average profitability upward.

Fewer planning and design errors, combined with greater investor confidence in digitally managed projects, help explain this pattern.

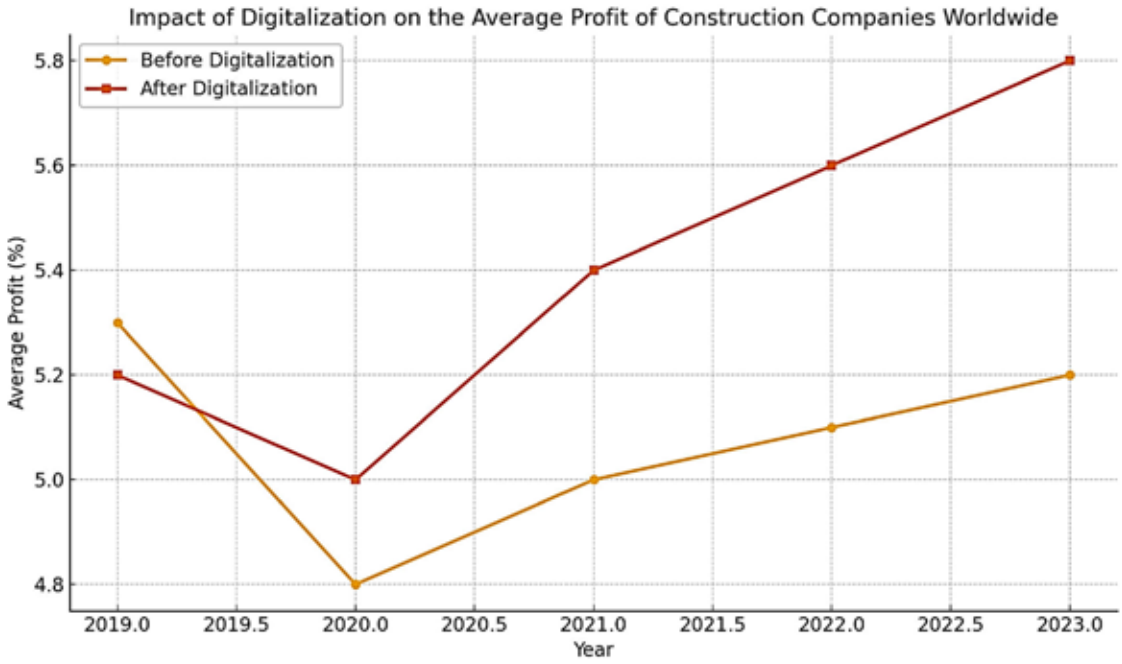

Figure 1. Dynamics of the average profit of construction companies worldwide before and after digitalization in 2019-2023.

Source: developed by the authors based on [5–9; 21–26]

The evolution of revenues among Ukrainian construction companies alongside their digitalization rates over 2019–2023 is presented in Figure 2.

Figure 2 captures how Ukrainian construction revenues gradually recovered from their 2020 low while digitalization penetration rose from 15% to 30% over the same five-year span. The concurrent movement of these two variables points to a connection between broader digital adoption and the sector's ability to stabilise and rebuild – a process that unfolded first in response to the COVID-19 disruption and then amid the economic pressures of subsequent years.

Across all the cases reviewed, digitalization proved to be a financially positive decision. Skanska's investment in BIM and drone technology generated revenue growth that comfortably exceeded the cost of implementation. CSCEC's rollout of artificial intelligence and robotic systems delivered on financial expectations, even though the initial outlay was substantial. Turner Construction's shift toward virtual reality tools and mobile management platforms translated into measurable gains in project delivery efficiency.

Among Ukrainian companies, Zhytlobud-1 stands out for achieving a high return on

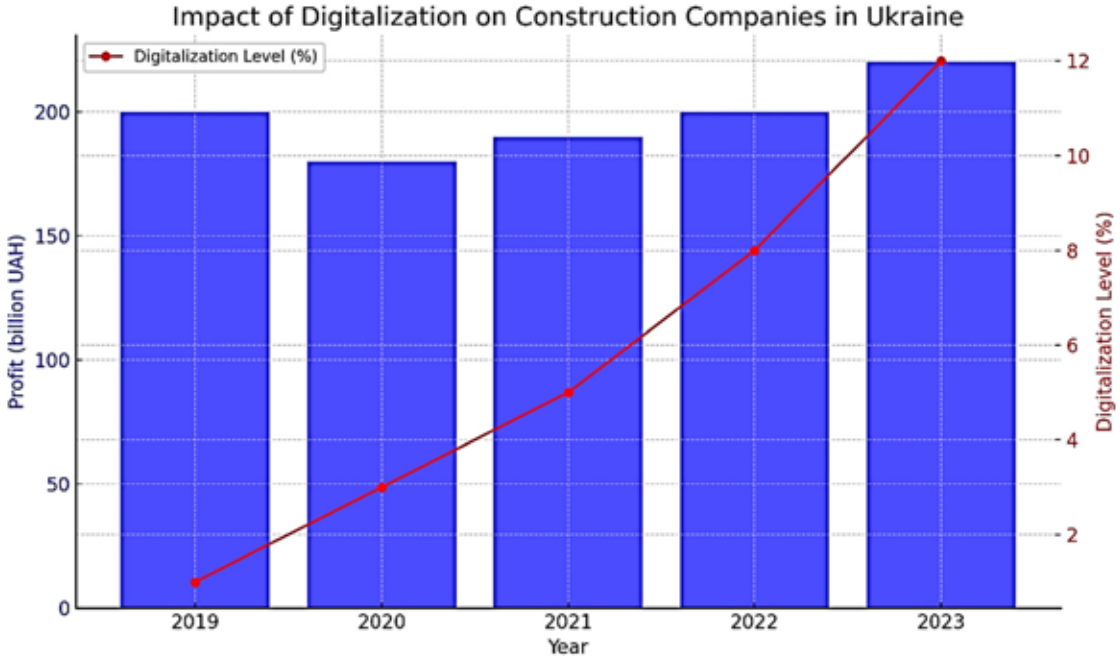

Figure 2. Income dynamics of construction companies of Ukraine and the level of digitalization, 2019-2023.

Source: calculated by the authors based on [1; 18; 19]

Table 4

Financial and digitalization indicators of construction companies

Company	Digitalization level, %	Profit before digitalization, million USD	Profit after digitalization, million USD	Profit growth, %	Cost of digitalization, million USD	ROI, %
Kyivmiskbud	40	60	67.2	12.0	8	90.0
Ukrbud	45	70	87.5	25.0	10	175.0
Zhytlobud-1	50	50	58.5	17.0	6	141.67
Skanska	60	500	640.0	28.0	60	233.33
Turner Construction	70	800	1040.0	30.0	80	300.0
CSCEC	80	1500	1995.0	33.0	200	247.0

Source: calculated by the authors based on open company reports and analytical data [21–26]

investment through BIM and CRM integration at comparatively modest cost. Kyivmiskbud's deployment of geoinformation systems and mobile applications reduced defect rates and raised project quality standards. A recurring advantage for Ukrainian firms is that lower baseline implementation costs allow them to generate strong proportional returns – often exceeding those of larger global players who carry the overhead of enterprise-wide digital programmes. How the CDII framework classifies digital maturity across the studied companies is shown in Table 5.

The CDII results expose a wide gap between Ukrainian and international construction firms. CSCEC, Turner Construction, and Skanska occupy the upper tiers of the index, their scores reflecting sustained, strategic investment in digital capabilities. Kyivmiskbud and Ukrbud have reached the established digital integration level, while Zhytlobud-1 remains closer to the developing digital capability tier.

What these numbers confirm is that Ukrainian companies are genuinely on the path toward digitalization – but the distance still to be covered before they reach the level of global leaders is significant. Closing that distance is not merely a question of efficiency: it is a prerequisite for alignment with European standards and for meaningful participation in international construction markets.

Correlation analysis revealed a robust positive association between digitalization level and financial performance, with a Pearson coefficient of $r = 0.86$ – indicating that digital maturity and profit growth move strongly together across the sample. The scatter of individual company results around this relationship is visualised in Figure 3.

Figure 3 shows that companies sitting at the upper end of the digitalization scale – CSCEC, Turner Construction, Skanska – consistently record stronger profit growth. Ukrainian companies cluster in the moderate range on both dimensions, but the upward trend they are part of makes their growth potential clear. The combined picture of digitalization level, profit growth, and CDII scores across all analysed companies is presented in Table 6.

The overall pattern across Table 6 confirms that digital maturity and financial strength tend to reinforce each other. CSCEC's 80% digitalization rate and CDII score of 8.2 place it firmly in the digital leadership category and correspond to the strongest financial indicators in the sample. Turner Construction and Skanska occupy similarly high positions.

Ukrainian companies tell a different but encouraging story: moderate CDII scores paired with solid ROI figures suggest that selective, well-planned digital investment can generate meaningful returns without requiring the scale of spending that characterises global leaders. The clearest opportunities lie in BIM adoption, cloud-based project management, mobile site applications, process automation, and digital documentation.

The broader implication is difficult to ignore: competing in international construction markets without digital infrastructure is becoming

Table 5

CDII maturity levels and practical assessment of construction companies

CDII range	Digital maturity level	Digital maturity characteristics	Example companies
0–2	Basic Digital Adoption	Minimal use of digital tools, no strategy for digital transformation, limited digital skills, manual processes dominate	—
2–4	Developing Digital Capability	Partial adoption of BIM or cloud services, emerging IoT experiments, basic digital workflow implementation	Zhytlobud-1
4–6	Established Digital Integration	Comprehensive uptake of BIM, integrated systems for quality control, regular use of digital project management tools, defined digital strategy	Kyivmiskbud, Ukrbud
6–8	Advanced Digital Transformation	Fully implemented BIM and IoT, AI/ML-driven process optimization, advanced cybersecurity, predictive analytics	Skanska, Turner Construction
8–10	Digital Leadership	Industry-wide innovation, automation ecosystem integration, extensive data analytics and leadership in digital solutions	CSCEC

Source: compiled and calculated by the authors based on [21–26]

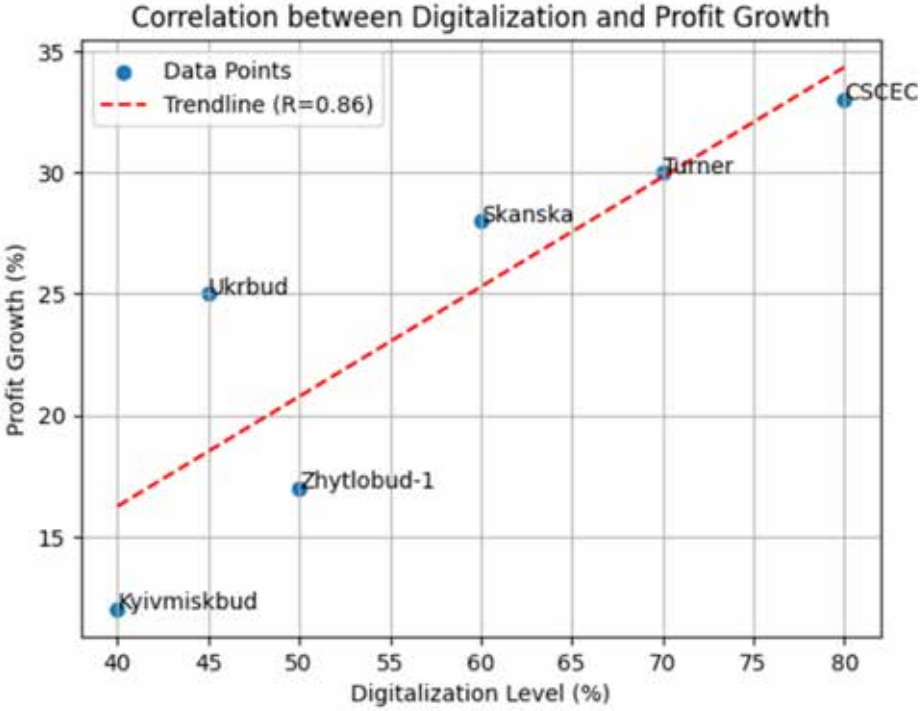

Figure 3. Correlation between the level of digitization (%) and profit growth (%)

Source: calculated by the authors based on [21–26]

Table 6

Relationship between digitalization level and profit growth

Company	Digitalization level, %	Profit growth, %	CDII score
Kyivmiskbud	40	12.0	4.2
Ukrbud	45	25.0	4.5
Zhytlobud-1	50	17.0	3.8
Skanska	60	28.0	6.8
Turner Construction	70	30.0	7.4
CSCEC	80	33.0	8.2

Source: calculated by the authors based on [21–26]

untenable. The study data show that 59% of EU enterprises have cleared the basic digital intensity threshold, against roughly 20% of Ukrainian construction companies [1; 20]. For SMEs, the financial barrier to rapid digital transition is particularly acute [7], and the limited availability of state-backed support programmes amplifies this constraint [12].

The r = 0.86 correlation coefficient reinforces what the case studies suggest individually: higher digitalization is consistently associated with better financial outcomes at the enterprise level.

The CDII adds a layer of precision to this finding. Where aggregate statistics smooth over industry-specific differences, the index highlights exactly where Ukrainian companies stand – and what it would take to move up. Kyivmiskbud and Ukrbud currently score in the moderate range; CSCEC and Turner Construction have already crossed the 7-point threshold that signals advanced integration.

The quantified benefits of specific technologies further underscore the business case. BIM brings average project cost savings of 20% and a 25% improvement in coordination [5]; process

automation reduces design errors by up to 30% [6]. These are not marginal gains – they represent the kind of efficiency improvements that attract foreign capital and meet the expectations of international project partners.

A service-oriented approach to construction management amplifies these effects. When digital platforms become the backbone of project communication, stakeholders gain real-time visibility into progress, risks are flagged earlier, and the overall management process becomes more accountable [12]. For Ukrainian enterprises seeking to enter or expand in international markets, this kind of digital infrastructure is increasingly a baseline expectation rather than a differentiator.

The most strategically valuable digital investments for Ukrainian construction companies are likely to be: BIM platforms, cloud project management systems, mobile applications for on-site management, digital documentation tools, and automated quality control systems. Larger corporations absorb higher costs for comprehensive digital programmes, but those programmes deliver long-term competitive positioning that justifies the spend. Ukraine's lower implementation cost environment means that domestic companies can achieve comparable strategic gains at a fraction of the outlay – a structural advantage that, if properly leveraged, could drive broader economic development.

Realising this potential will require more than individual company decisions. Industry-wide progress depends on building genuine digital expertise in the construction workforce, bringing Ukrainian technical standards into closer alignment with European frameworks, cultivating a collaborative digital culture across project stakeholders, and putting in place financial incentives and regulatory structures that make digital investment accessible for SMEs.

Conclusions. This study provides evidence that digital transformation materially improves operational efficiency, profitability, competitiveness, and investment attractiveness in the construction sector. Technologies including BIM, IoT, cloud platforms, automation systems, digital documentation management, and mobile applications deliver measurable benefits across cost control, project coordination, transparency, and market positioning.

Ukrainian construction enterprises lag significantly behind their European and international counterparts in the adoption of digital tools. The contrast is stark: 59% of EU enterprises have achieved at least a foundational level of digital intensity, while only around 20% of Ukrainian construction companies have meaningfully integrated digital technologies into their operations. This divide reduces Ukrainian firms' ability to compete internationally and to participate in infrastructure projects governed by European standards.

The Construction Digital Intensity Index introduced in this study offers a targeted instrument for measuring digital maturity in construction. By incorporating sector-specific technologies – BIM, IoT, cloud services, automated quality control, digital documentation, and mobile site management – the CDII provides a more accurate and relevant assessment than general digital intensity indicators.

Applying the CDII to the selected sample showed that CSCEC, Turner Construction, and Skanska have reached advanced digital transformation or digital leadership status. Among Ukrainian firms, Kyivmiskbud and Ukrbud have established a functional digital integration base, while Zhytlobud-1 remains at the developing capability stage.

The Pearson correlation coefficient of $r = 0.86$, obtained through correlation analysis, confirms a strong positive relationship between digital maturity and financial performance. Enterprises that have invested more heavily in digitalization consistently achieve higher profit growth and stronger returns on their digital spending.

Digital transformation should be treated as a strategic imperative for Ukrainian construction enterprises. Priority investment areas include BIM, cloud integration, project management automation, business intelligence tools, mobile applications, digital documentation, and cybersecurity. Achieving meaningful progress, however, will also require supportive government policy, targeted financial incentives, harmonisation with European regulatory standards, and sustained development of digital skills across the sector.

Future research should broaden the empirical base, extend the analysis to small and medium-sized construction enterprises, and explore practical models for financing digital transformation within the Ukrainian construction industry.

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