Artificial Intelligence and Blockchain in Construction Supply Chains: A Bibliometric and Thematic Analysis

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Abstract

This study examines the emerging role of Artificial Intelligence (AI) and blockchain in construction supply chain research through bibliometric and thematic analysis of the existing literature. Using VOSviewer, the study identifies key research trends, thematic clusters, and knowledge structures related to supply chain transparency, automation, optimisation, and adoption barriers. The analysis highlights interconnections between blockchain-enabled traceability, supply chain management, and AI-driven optimisation in construction projects.

The study also synthesises reported applications, including blockchain for secure transaction tracking and smart contract automation, and AI for predictive analytics in resource planning and risk management. Findings indicate growing scholarly attention to the complementary role of AI and blockchain in improving transparency, coordination, and decision-making across construction supply chains, while highlighting persistent challenges such as implementation costs, regulatory uncertainties, technological integration, and organisational resistance.

By mapping the current research landscape, this study provides a structured overview of key themes and emerging research directions, offering insights for researchers and practitioners advancing digital transformation in the construction industry.

Keywords –

Artificial intelligence; Blockchain technology; Construction supply chain; Thematic review; Bibliometric analysis

1 Introduction

The construction industry, crucial for global economic growth, consistently grapples with inefficiencies, transparency issues, and delays in supply chain processes, leading to significant cost overruns and reduced productivity. These technologies offer promising solutions to long-standing issues in the construction supply chain, including inefficiencies, delays, and a need for more transparency. This study aims to provide a comprehensive analysis of how AI and blockchain can be applied to construction supply chains, focusing on research gaps and opportunities for practical implementation.

Traditionally reliant on labour-intensive methods prone to human error, the industry has been slow to adopt new technologies. AI technologies, including machine learning and predictive analytics, enhance project planning and resource allocation by analysing historical and real-time data to anticipate delays, optimise logistics, and reduce material wastage. For instance, AI-driven predictive maintenance can forecast equipment failures, preventing costly downtime (Zheng et al., 2023; Wang et al., 2020).

Blockchain technology provides a decentralised ledger system that enhances transparency and traceability across supply chains by recording transactions and material movements, fostering stakeholder trust. Smart contracts automate agreements, streamline procurement, and support timely payments (Cheng et al., 2021). While integrating AI and blockchain can improve decision-making, reduce operational costs, and enhance project reliability, challenges such as high implementation costs, skills shortages, and regulatory barriers hinder adoption. This study reviews recent literature to identify key trends, benefits, and challenges in construction supply chains.

2 Literature Review

Integrating AI and blockchain technology in construction supply chains is a relatively new study area. However, it holds immense potential for transforming the construction industry's operations. Both technologies have significantly improved efficiency, transparency, and decision-making when applied individually. However, their combined potential still needs to be explored in current research. This study will explore the role of AI and blockchain in construction supply chains, examining critical research gaps, previous studies and recent technological advancements.

2.1 Previous Work and Study Gaps

Research into using AI and blockchain technology within construction supply chains has evolved considerably in recent years. This field of study addresses critical challenges in construction, such as inefficiencies in resource management, transparency issues and the need for better project coordination. While construction has historically been slower to adopt advanced technologies than manufacturing, the sector's increasing demand for productivity, cost reduction, and adherence to regulatory standards has led to growing interest in leveraging AI and blockchain to enhance supply chain processes. Studies have explored AI and blockchain separately, focusing on their respects and challenges, with only a few addressing their combined potential.

2.2 AI in Construction Supply Chains

The application of AI in construction primarily centres on improving project planning, resource optimisation, and risk management. Researchers have explored how machine learning algorithms can analyse vast datasets to forecast project timelines, identify resource bottlenecks, and predict delays. Elghaish et al. (2023) reviewed predictive analytics in construction supply chains, emphasising how AI-driven forecasting tools enable managers to plan proactively and allocate resources more effectively, reducing the likelihood of costly overruns.

Other studies have highlighted AI’s potential to streamline project monitoring and control. Technologies such as drones, real-time sensors, and AI algorithms allow continuous tracking of construction progress against predefined benchmarks. Hamledari and Fischer (2020) showed that AI-powered reality capture technologies provide real-time project updates by comparing site data with project plans, enabling prompt responses to deviations and improving site efficiency.

AI’s role in resource optimisation has also received significant attention in construction research. Predictive algorithms can analyse past projects to forecast material requirements, allowing firms to plan procurement schedules more precisely. Research shows AI can optimise inventory and supply chain flows, reducing wastage, streamlining procurement, and lowering costs in dynamic construction environments.

2.3 Need for Integration of AI Applications

The integration of Artificial Intelligence (AI) and blockchain technologies has increasingly been discussed in the digital transformation of construction supply chains. AI techniques such as machine learning and predictive analytics can analyse historical and real-time project data to forecast material demand, optimise inventory, and anticipate supply chain disruptions. However, the effectiveness of AI-based systems depends on reliable and trusted data exchange among stakeholders, which remains challenging due to fragmented project structures and limited transparency.

Blockchain has been proposed as a complementary solution due to its ability to provide secure, transparent, and tamper-resistant data records across decentralised networks (Turk and Klinc, 2017). Studies show that blockchain can enhance supply chain traceability, strengthen stakeholder trust, and automate contractual transactions through smart contracts (Li et al., 2019). When integrated with AI analytics, blockchain can provide a secure infrastructure for sharing predictive insights and supporting collaborative decision-making across project participants.

Another promising area of integration is quality assurance and compliance monitoring. AI-based computer vision and sensor analytics can detect material defects and monitor construction processes in real time, while blockchain can maintain immutable records of inspection results and quality certifications for audit and dispute resolution. Despite this potential, existing research largely examines AI and blockchain separately, leaving limited exploration of integrated AI–blockchain frameworks for construction supply chains.

3 Methodology

This study adopts a bibliometric and thematic review approach to analyse the development of research on Artificial Intelligence (AI) and blockchain in construction supply chains. Relevant literature was identified through systematic searches in major academic databases, including Web of Science, Scopus, and Google Scholar, focusing on peer-reviewed publications published between 2010 and 2025. Keywords related to artificial intelligence, blockchain, construction and supply chain were used to retrieve relevant studies.

The inclusion criteria were articles published in peer-reviewed journals; studies focusing on Artificial Intelligence (AI) and blockchain applications within construction supply chains; and papers discussing technological applications or implications related to supply chain efficiency, transparency, automation, or management. The exclusion criteria were articles not published in English; studies not directly related to construction supply chains; and papers without substantive discussion of AI or blockchain in the construction context. Following the initial search, duplicate and irrelevant records were removed through a screening process based on title, abstract, and relevance to the study scope A total of 412 records were initially identified through database searches in Google Scholar, PubMed, and Web of Science. After removing duplicates, 368 records remained and were screened based on their titles and abstracts.

Following this screening process, 283 records were excluded due to lack of relevance, leaving 85 full-text articles assessed for eligibility. Of these, 46 articles were excluded based on the predefined exclusion criteria, resulting in 39 studies being included in the final bibliometric analysis. The final dataset was analysed using bibliometric mapping techniques with VOS viewer to identify publication trends, keyword co-occurrence networks, and thematic clusters within the literature. These bibliometric insights were complemented by a narrative synthesis of selected studies to interpret emerging research themes, technological applications, and reported challenges associated with AI and blockchain adoption in construction supply chains. This approach enables the study to systematically map the knowledge structure, research trends, and thematic evolution of AI and blockchain applications in construction supply chain research.

3.1 Quantitative analysis

The quantitative analysis examines case studies of construction projects implementing AI and blockchain technologies, focusing on metrics such as project delivery times, cost reductions, and supply chain efficiency to identify the tangible benefits of these digital tools in construction supply chain management. Evidence from the literature suggests that AI-enabled predictive analytics and blockchain-based platforms can enhance decision-making, coordination, and resource allocation across project supply chains. For instance, the case study by Elghaish et al. (2023), which analysed projects using AI-driven predictive analytics for resource planning, reported a 20% reduction in project delivery times and a 15% decrease in material waste compared with projects that did not implement AI. These improvements were attributed to AI's ability to accurately forecast resource requirements and enable just-in-time delivery of materials and equipment, thereby reducing inventory costs and minimising idle time on-site.

Similar benefits of AI-enabled predictive analytics in construction have been highlighted in broader studies on AI adoption in construction management, which report improvements in productivity, scheduling accuracy, and resource planning efficiency (Abioye et al., 2021). In addition, blockchain-based supply chain systems have been shown to improve transparency and coordination among project stakeholders, contributing to more efficient supply chain operations (Perera et al., 2021). However, empirical studies providing detailed quantitative performance metrics for integrated AI and blockchain applications in construction supply chains remain limited. Therefore, the reported figures should be interpreted as illustrative evidence rather than universally generalisable outcomes, highlighting the need for further empirical case studies and industry validation.

3.2 Qualitative analysis

The qualitative analysis is conducted using a desktop-based approach. This approach utilises insights from existing literature, case studies and industry reports rather than primary data collection through interviews and surveys. This approach allows for a comprehensive examination of the documented experiences, perspectives, and challenges associated with adopting AI and blockchain technologies in construction supply chain.

The qualitative analysis focuses on synthesising findings from multiple sources to understand the real-world applications and perceived barriers to implementing AI and blockchain in construction. Studies indicate that traditional practices and a lack of digital expertise among construction professionals contribute to a cautious approach toward technological transformation. This study thus contextualises AI and blockchain adoption within the construction industry, synthesising existing research to conclude how these technologies can address operational inefficiencies while acknowledging barriers to their widespread adoption.

4 Analysis of Network Visualisations

The two VOSviewer network visualisations provided are bibliometric analyses based on research related to AI, blockchain and construction supply chains. Both maps, created at different resolution levels, offer insights into the dominant themes, clusters, and connections within the literature "Influences of AI and Blockchain Technology on the Construction Supply Chain". The first map, with a resolution of 1.00, presents a broad view of relationships across various keywords. In contrast, at a reduced resolution of 0.80, the second map focuses on fewer but more robust connections, highlighting the core themes and indicating critical gaps in the literature.

4.1 VOSviewer First Mapping

Figure 1. offers visualization of five primary clusters, each represented by a different colour, indicating major thematic areas and subfields within literature.

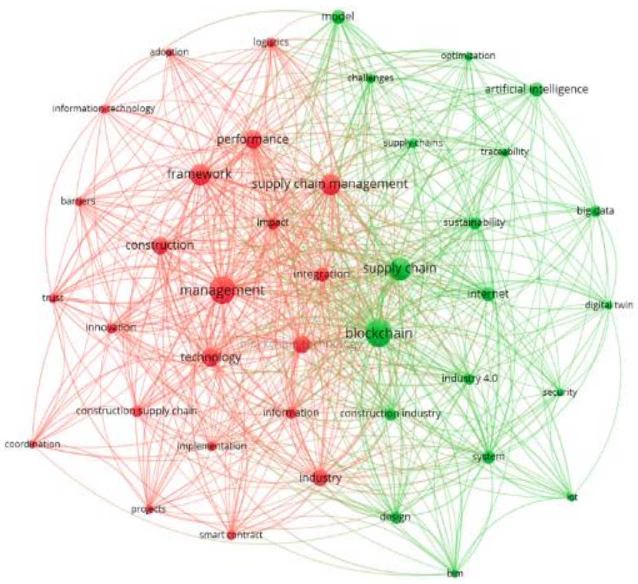

Figure 1. VOSviewer Network Visualisations at Resolution 1.00

4.1.1 Clusters and Key Themes

Red Cluster (Blockchain and Supply Chain): The red cluster centres on "blockchain" and "supply chain," suggesting that blockchain's applications within supply chain management are a focal point in the literature. This cluster includes terms like "big data," "IoT" (Internet of Things), "digital twin," and "Industry 4.0," highlighting that blockchain is often discussed in the context of digital transformation technologies that enhance supply chain transparency, traceability, and data security. The term "sustainability" in this cluster emphasises blockchain's potential to support sustainable supply chains, which is particularly relevant in construction, where resource management and waste reduction are critical concerns.

Green Cluster (Management and Technology Implementation): This cluster is anchored by terms such as "management," "innovation," "trust," and "coordination," with a focus on the operational and practical aspects of adopting AI and blockchain in construction. The frequent connection to the "construction supply chain" reflects an interest in how these technologies affect management processes, particularly in coordinating complex projects with multiple stakeholders. This cluster underscores the literature covering technical and human factors, like stakeholder trust and collaboration, necessary for successful implementation.

Blue Cluster (Construction and Integration): The blue cluster contains terms such as "integration," "construction," "information," and "supply chain management," suggesting a focus on incorporating digital technologies, like AI and blockchain, into existing construction processes. The term "integration" is particularly prominent, implying that researchers are examining the difficulties and strategies of embedding new technologies in traditional, often fragmented, construction supply chains.

Yellow Cluster (AI and Optimisation): This cluster is built around "artificial intelligence," "optimisation," "performance," and "model." It highlights the literature's interest in AI's ability to optimise performance and efficiency within construction supply chains. AI is commonly discussed in terms of predictive analytics and resource allocation, which are vital for minimising project delays and enhancing productivity in construction.

Purple Cluster (Adoption and Information Technology): The purple cluster includes terms such as "adoption," "information technology," and "barriers," reflecting an emphasis on understanding the obstacles to implementing AI and blockchain. The presence of terms like "information technology" and "barriers" indicates that technological and infrastructural limitations are primary concerns in the literature.

4.1.2 Central Nodes and Connections

Key terms such as "blockchain," "supply chain," "management," and "artificial intelligence" appear as central nodes with dense interconnections. "Blockchain" and "supply chain" are heavily connected, suggesting blockchain's potential to enhance supply chain management is a central theme. "Management" also shows high connectivity, indicating that operational and managerial aspects are widely explored within the context of technology adoption in construction. Additionally, "artificial intelligence" is well-connected, especially with "optimisation" and "performance," showing its application in improving efficiency within construction processes.

4.1.3 Overall insight

Dominant Research Themes: The VOSviewer network visualisation highlights distinct clusters representing dominant research themes in AI, blockchain, and construction supply chains. In the first mapping, the red cluster centred on blockchain and supply chain forms one of the most densely connected areas, with strong linkages to IoT, big data, digital twin, and Industry 4.0. This indicates that blockchain research in construction is largely framed within broader digital transformation efforts to improve transparency, traceability, and data security across supply chains. In contrast, the yellow cluster centred on artificial intelligence connects strongly with optimisation, performance, and model, reflecting AI's focus on predictive analytics and operational efficiency in construction projects.

The presence of these clearly defined thematic clusters suggests that the literature has developed around specific technological capabilities rather than integrated digital supply chain systems, indicating that research on AI and blockchain remains largely compartmentalised.

Fragmented Integration Between Technologies: Although both technologies appear as central nodes in the network, the visualisation shows relatively limited direct linkages between AI-related keywords and blockchain-related keywords. Instead, AI terms are primarily connected to optimisation and performance-oriented research, while blockchain terms are strongly associated with supply chain transparency and traceability. This structural separation suggests that the two technologies are frequently studied as independent technological solutions rather than as integrated systems within construction supply chains. The limited co-occurrence of keywords such as integration, framework, or combined systems further supports this interpretation. Consequently, the bibliometric structure indicates that while both technologies are recognised as important digital innovations in construction, research exploring their combined application remains relatively underdeveloped, highlighting a gap in integrated AI–blockchain supply chain studies.

Practical Implementation and Adoption Challenges: The network visualisation also reveals clusters related to management, coordination, trust, and barriers, particularly within the green and purple clusters. While these terms indicate that the literature acknowledges organisational and technological challenges associated with adopting AI and blockchain, their relatively weaker connections compared to core technological terms suggest that practical implementation issues receive less attention than conceptual technological benefits. In addition, keywords associated with empirical application such appear less central within the network. This pattern indicates that although the theoretical potential of AI and blockchain in construction supply chains is widely discussed, empirical studies demonstrating real-world implementation remain limited. The visualisation therefore supports the conclusion that future research should place greater emphasis on implementation frameworks, case-based evidence, and practical strategies for integrating AI and blockchain technologies within construction supply chains.

4.2 VOSviewer Second Mapping

Figure 2. offers the second VOSviewer map, with a reduced resolution removes weaker links and secondary themes, providing a distilled view of the literature's core focus areas. The clustering has been consolidated, highlighting fewer but stronger relationships between keywords and reinforcing the most central themes in AI and blockchain research related to construction.

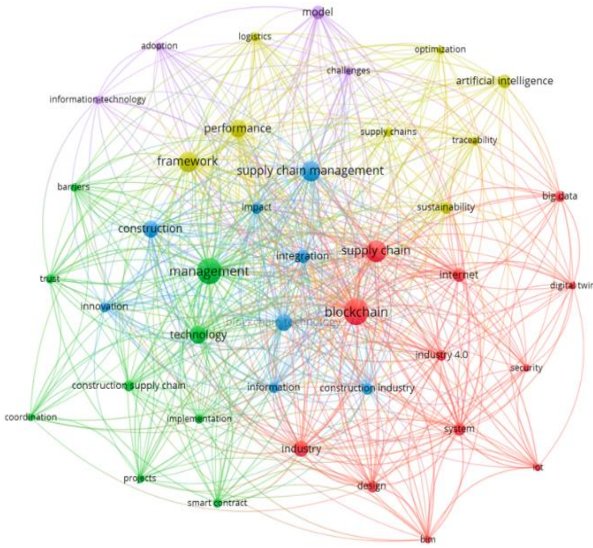

Figure 2. VOSviewer Network Visualisations at Resolution 0.8

4.2.1 Clusters and Key Themes

Red Cluster (Management, Technology, and Performance): This cluster consolidates terms around "management," "technology," "framework," and "performance." The intense focus on management and technological frameworks indicates that much research concentrates on understanding AI and blockchain's organisational impacts. This consolidation reveals that while managerial aspects are well-studied, the interaction between blockchain, AI and specific construction management practices is less pronounced.

Green Cluster (Blockchain, Supply Chain, and AI): The green cluster centres around "blockchain," "supply chain," and "artificial intelligence." AI and blockchain are closely connected in this reduced resolution map, suggesting that the literature identifies these technologies as complementary tools for optimising supply chain management. However, terms like "integration" and "implementation" are less prominent in this simplified view, pointing to a possible gap in research focused on applying these technologies in real-world construction.

Consolidation of Key Nodes The reduced resolution places even greater emphasis on "blockchain," "supply chain," and "management" as central nodes, suggesting that these are the predominant themes driving research. Blockchain’s link to the "supply chain" remains strong, reinforcing its role in enhancing transparency and trust in construction projects. The increased emphasis on these connections also suggests that, at a fundamental level, the literature is more focused on broad themes of blockchain's role in supply chain improvement and AI’s optimisation potential than on specific case applications in construction.

4.2.2 Overall insight

Research Themes and Structural Patterns: The VOSviewer keyword network reveals several prominent thematic clusters centred on blockchain, artificial intelligence, and construction supply chain management. In the higher-resolution map (1.00), strong linkages are observed between blockchain and terms such as supply chain, IoT, and digital twin, indicating that blockchain research in construction is primarily associated with improving transparency, traceability, and data sharing across project stakeholders. In contrast, AI-related terms cluster around optimisation, performance, and resource allocation, suggesting that AI research is mainly directed toward predictive analytics and operational efficiency. The separation of these clusters indicates that the literature tends to examine AI and blockchain as distinct technological approaches rather than as components of an integrated digital supply chain system. This structural pattern suggests that although both technologies are widely recognised as key enablers of digital transformation in construction, their combined application within construction supply chains remains relatively underexplored in existing research.

Barriers and Adoption Challenges: The comparison between the two visualisations also highlights differences in the prominence of adoption-related terms. In the higher-resolution map, keywords such as trust, coordination, and barriers appear more clearly connected to the broader network, indicating that the literature acknowledges organisational and technological challenges associated with adopting AI and blockchain in construction supply chains. However, in the lower-resolution map (0.80), these terms become less visible and exhibit weaker connections within the network. This pattern suggests that while barriers to adoption are recognised within the literature, they may receive less sustained analytical attention compared with themes related to technological capabilities or optimisation benefits. As a result, the bibliometric structure indicates that research has focused more heavily on conceptual technological potential than on systematically addressing the organisational, regulatory, and operational challenges associated with implementation.

Gap in Practical Integration and Implementation: Another notable observation from the network visualisations is the limited prominence of terms directly associated with integration and real-world implementation, such as implementation, framework, or deployment. These keywords appear with relatively lower occurrence frequencies and weaker link strengths compared with dominant technological terms such as blockchain, AI, and supply chain. This structural pattern indicates that much of the existing literature focuses on conceptual discussions of technological capabilities rather than empirical demonstrations of how these technologies can be integrated into operational construction supply chains. Consequently, the visualisation suggests that while the theoretical benefits of AI-driven optimisation and blockchain-enabled transparency are well established, practical frameworks for implementing these technologies together within construction supply chains remain limited. This gap highlights an important opportunity for future research to explore integrated implementation strategies and case-based evidence supporting AI–blockchain adoption in construction practice.

5 Emerging Themes

The following section analyses key trends and themes emerging from the bibliometric analysis.

5.1 Transparency and Traceability

Blockchain technology's primary advantage in construction supply chains is its unparalleled transparency and traceability. It records every transaction in an immutable, tamper-proof ledger, ensuring that all project activities, from procurement to delivery and payment, are documented precisely. This transparency can significantly reduce risks in construction, where delays, miscommunication, and disputes are common.

As mentioned previously, blockchain can be used to track the origin of materials, ensuring compliance with environmental regulations and certifications such as LEED. Wang et al. (2020) demonstrated how blockchain could track precast components, from manufacturing to installation, providing real-time visibility into their status and ensuring that all quality standards were met. This level of traceability is critical for large-scale construction projects where multiple suppliers are involved and materials are sourced from different regions.

Additionally, blockchain's transparency helps build trust among stakeholders. When all parties in a construction project have access to the same verified information, disputes over deliveries, payments, and project milestones are less likely to occur. Smart contracts further enhance this by automating payments when specific conditions, material delivery or project completion, are met Yoon et al. (2022). This drastically reduce delays caused by payment disputes, improve cash flow, and ensure projects remain on schedule.

5.2 Automation and Efficiency

AI has the potential to automate many repetitive and time-consuming tasks in construction supply chains, including scheduling, resource allocation, and material procurement. By leveraging machine learning algorithms, AI can analyse historical and real-time project data to predict future trends and optimise supply chain decisions.

One area where AI has demonstrated significant potential is project scheduling, where AI-powered project management tools can analyse project scope, timelines, and resource availability to generate optimised schedules that minimise delays and improve overall efficiency. Similarly, AI can support procurement by predicting material needs based on project progress, enabling timely ordering while reducing excess inventory and costs.

When integrated with blockchain, these AI-driven capabilities can be further enhanced through secure data sharing and automated transaction execution. For example, AI-generated predictions such as forecasts of material demand or schedule adjustments can be recorded on blockchain-based distributed ledgers, ensuring transparency, traceability, and data integrity across project stakeholders. In addition, smart contracts can interface with machine learning outputs to automatically trigger procurement orders, verify supplier deliveries, or release payments once predefined project milestones are achieved. This integration enables more reliable information exchange, reduces manual intervention in supply chain processes, and improves overall operational efficiency in project delivery.

5.3 Stakeholder Engagement

The construction industry is known for its fragmentation, with multiple stakeholders, including contractors, subcontractors, suppliers and clients, often working in silos. This lack of collaboration can lead to miscommunication, delays, and cost overruns. Blockchain and AI technologies can help address these challenges by fostering greater cooperation and ensuring all stakeholders access the same information.

Blockchain's decentralised ledger provides a single source of truth for all project stakeholders, ensuring that everyone is working from the same set of verified data. This transparency reduces the likelihood of disputes over project milestones, material deliveries, and payments, as all parties can access a consistent and trustworthy record of transactions. By enabling real-time data sharing, blockchain enhances collaboration among stakeholders, helping to minimise delays and miscommunication that can arise from discrepancies or incomplete information Wang et al. (2020), Elghaish et al. (2023).

AI can also improve collaboration by providing real-time insights into project progress and potential risks. AI can also analyse data from previous projects to identify patterns and suggest best practices for future projects, helping stakeholders make more informed decisions Hamledari et al. (2021).

5.4 Smart Contracts

Another significant theme in the literature is the use of smart contracts to automate processes in the construction supply chain. Smart contracts are self-executing contracts where the terms of the agreement are written directly into code. Once certain conditions are met, such as the completion of a project milestone, the smart contract automatically executes, triggering payments Yoon et al. (2022). In construction, smart contracts can use intelligence to streamline procurement processes, ensuring that payments are released as soon as materials are delivered and verified. This reduces the need for manual interventions and helps ensure that suppliers are paid on time, improving cash flow and reducing delays caused bypayment disputes Wang et al. (2020). Smart contracts can also automate compliance checks, ensuring all project requirements are met before payments are released Elghaish et al. (2023).

6 Discussion

While the potential benefits of AI and blockchain in construction supply chains are well-documented, several barriers exist to their widespread adoption such as high implementation costs, regulatory challenges, and resistance to change.

6.1 High Implementation Costs

One of the main barriers to adopting AI and blockchain in construction is high cost of implementation. Both technologies require significant upfront investments in hardware, software and training costs can be prohibitive if the return on investment (ROI) is not immediately apparent Yoon et al. (2022). However, long-term benefits of AI and blockchain such as improved efficiency, reduced delays and enhanced transparency can offset initial costs. For example, blockchain can help construction firms save time and money by automating procurement processes and reducing likelihood of payment disputes. Similarly, AI's ability to predict risks and optimise resource allocation can lead to significant cost savings by preventing delays and material waste Elghaish et al. (2023).

6.2 Regulatory Challenges

Another significant barrier to the adoption of blockchain in construction is the need for clear regulations surrounding the use of smart contracts. While intelligent contracts offer numerous advantages—such as automating payments and compliance checks—the legal framework for their use in construction is still underdeveloped. For example, there are questions about the enforceability of smart contracts in different jurisdictions, particularly when resolving disputes Yoon et al. (2022). Blockchain’s decentralised nature raises concerns about data privacy and security. Construction firms must comply with regulations such as the General

Data Protection Regulation (GDPR) when using blockchain to store and share data. Failure to comply can result in significant penalties, making it essential for firms to work closely with legal experts to ensure their use of blockchain is compliant Elghaish et al. (2023).

6.3 Resistance to Change

The construction industry traditionally needs to adopt new technologies faster, but management and workers often resist change. Many construction firms are risk-averse, preferring to stick with traditional methods rather than invest in new technologies that they perceive as unproven. There is also a fear that adopting AI and blockchain could lead to job losses, particularly among administrative and clerical staff whose roles could be automated Hamledari et al. (2021). To overcome this resistance, construction firms must demonstrate the tangible benefits of AI and blockchain. By providing training and education programs, firms can help workers understand how these technologies can improve rather than replace their jobs. By automating administrative tasks, AI and blockchain can free workers to focus on more value-added activities Elghaish et al. (2023).

7 Conclusion

Integrating artificial intelligence and blockchain technology into construction supply chains holds enormous potential to revolutionise the industry. These technologies offer solutions to many challenges that have plagued the construction sector. AI's predictive capabilities enable construction firms to optimise project planning, resource allocation, and risk management, while blockchain ensures transparency, traceability, and security across the supply chain. However, despite the apparent benefits, significant barriers exist to the widespread adoption of AI and blockchain in construction. These include high implementation costs, regulatory challenges, and resistance to change. Overcoming these barriers will require a concerted effort from industry stakeholders and a deeper understanding of integrating these technologies into existing supply chain management practices. Future research should focus on real-world case studies that demonstrate practical implementation of AI and blockchain in construction. These studies would help build confidence in these technologies and encourage broader adoption across the industry. Additionally, research should explore how AI and blockchain can be integrated with other emerging technologies, such as the Internet of Things (IoT) and Building Information Modelling (BIM) to create fully digitalised and interconnected construction supply chains. Finally, construction firms must work closely with regulators to ensure blockchain and smart contracts are legally enforceable and compliant with data protection laws. By addressing these challenges, construction industry can fully leverage the benefits of AI and blockchain to create more efficient, transparent and collaborative supply chains.

References

[1] Abioye, S. O., Oyedele, L. O., Akanbi, L., Ajayi, A., Delgado, J. M. D., Bilal, M., Akinade, O. O., & Ahmed, A. (2021). Artificial intelligence in the construction industry: A review of present status, opportunities and future challenges. Journal of Building Engineering, 44, 103299.

[2] Cheng, M., Liu, G., Xu, Y., & Chi, M. (2021). When blockchain meets the AEC industry: Present status, benefits, challenges, and future research opportunities. Buildings, 11(8), 340.

[3] Elghaish, F., Abrishami, S., & Hosseini, M. R. (2023). Digitalised circular construction supply.

[4] chain: An integrated BIM-blockchain solution. Automation in Construction, 132, 103988. https://doi.org/10.1016/j.autcon.2021.103988

[5] Hamledari, H., & Fischer, M. (2021). Construction payment automation using blockchain-enabled smart contracts and robotic reality capture technologies. Automation in Construction, 132, 103926.

[6] Li, J., Greenwood, D., & Kassem, M. (2019). Blockchain in the built environment: analysing current applications and future opportunities. Automation in Construction.

[7] Perera, S., Nanayakkara, S., Rodrigo, M., Senaratne, S., & Weinand, R. (2021). Blockchain technology: Is it hype or real in the construction industry? Journal of Industrial Information Integration.

[8] Turk, Ž., & Klinc, R. (2017). Potentials of blockchain technology for construction management. Automation in Construction

[9] Wang, J., Wu, P., Wang, X., & Shou, W. (2020). Blockchain technology in the construction industry: A review of applications, challenges, and future directions. Automation in Construction, 115, 103181. https://doi.org/10.1016/j.autcon.2020.103181

[10] Yoon, Jong Han & Pishdad-Bozorgi, Pardis. (2022). State-of-the-Art Review of Blockchain-Enabled Construction Supply Chain. Journal of Construction Engineering and Management. 148. 10.1061/(ASCE)CO.1943-7862.0002235.

[11] Zheng, Z., Wang, F., Gong, G., Yang, H., & Han, D. (2023). Intelligent technologies for construction machinery using data-driven methods. Automation in Construction, 147, 104711. https://doi.org/10.1016/j.autcon.2021.103926