Artificial Intelligence and FinTech Applications for Reducing Payment Disputes in the Construction Industry: A Review of Secondary Evidence

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Abstract: Payment delays and disputes are persistent challenges in the construction industry, leading to financial strain, project interruptions, and weakened stakeholder relationships. This paper reviews secondary evidence published between 2021 and 2025 to examine how financial technologies (FinTech) and artificial intelligence (AI) can reduce payment-related disputes. The review synthesizes findings on blockchain-based smart contracts, BIM-integrated payment systems, digital payment platforms, and supply-chain financing tools, highlighting their potential to enhance transparency, automate workflows, and accelerate payment cycles. AI applications, including invoice analysis, claim verification, contract compliance monitoring, and risk prediction, further strengthen the accuracy and efficiency of financial processes. Despite these benefits, adoption remains limited due to technical complexity, dependence on high-quality data, implementation costs, and stakeholder scepticism. The study identifies strategies to address these barriers and highlights the complementary role of AI and FinTech in transforming construction payment management. The findings offer practical insights for researchers, practitioners, and policymakers seeking to leverage digital and AI-enabled solutions to reduce disputes, improve project outcomes, and promote a more transparent and accountable construction industry.

Keywords: Payment disputes, Construction industry, FinTech, Artificial intelligence, AI, Smart contracts, BIM, Digital payment systems.

INTRODUCTION

The construction industry has long struggled with payment delays, cash-flow disruptions, and disputes arising from different causes. Some of these causes include slow verification, fragmented documentation, and limited financial transparency which are issues that have persisted for decades and continue to affect project performance, contractor relationships, and overall productivity (Silva *et al*., 2024). According to Francis *et al*. (2022), disputes adversely affect project budgets, schedules, and quality, reducing overall project performance. Payment disputes are among the leading causes of cost overruns and project delays for many countries. On the other hand, financial risks increase when projects grow more complex and supply chains more fragmented. Contractors, subcontractors, and suppliers often face uncertainty about when payments will be processed and whether claims will be honored.

There are evidences from different countries that highlight how payment disputes escalate in construction projects when financial decisions lack transparency. A recent project in Nepal demonstrates this clearly. According to a study done by Kisi *et al*. (2023), the contractor submitted four claims, and both the adjudicator and the arbitrator ruled in favor of the contractor on three of them. Yet, the project owner rejected these outcomes and pursued full litigation. The court ultimately supported the contractor and required the owner to cover all legal fees and accumulated interest (Kisi *et al*., 2023). The study revealed that the owner pursued litigation mainly due to fear of external audits and potential accusations of misconduct. This case illustrates how unclear payment governance and hesitant financial decisions can prolong disputes, increase costs, and expose projects to greater financial risk.

A similar situation is seen in China too. According to this case, payment disputes often arise from a mix of cultural norms, client financial management, and interaction processes (Wang *et al*., 2023). Cultural practices may create informal expectations that complicate payment procedures. Limited financial management capability on the client side weakens the system's ability to process payments efficiently. Further, interaction and procedural factors can act as triggers, escalating disputes when miscommunication or delays occur (Wang *et al*., 2023).

It is also found that, late payment issues are also common in the United Kingdom. Research shows that delays affect the majority of subcontractor projects and nearly half of all payments (Bolton *et al*., 2022). Extended delays, especially in releasing the second half of retention, can hold back a significant portion of income for weeks. While regulatory and contractual measures exist, available evidence suggests they are insufficient. In this recent study, it is also found that Subcontractors often have to factor late payments into

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cash flow planning. That study highlights emerging solutions, such as project bank accounts, central retention schemes, and smart contracts, which may improve payment reliability and reduce disputes (Bolton *et al*., 2022).

Similar challenges are observed in Sri Lanka and that was particularly in government-funded projects. According to Perera & Dewagoda (2021), delayed payments have been a persistent problem, affecting project progress and creating financial strain for contractors and subcontractors. The causes of these delays and the parties responsible for managing them are often unclear, hampering efforts to implement effective mitigation strategies.

Findings from the author's prior study on Singapore construction disputes further reinforce this trend. That research showed that payment matters accounted for 34.3% of all litigated cases, demonstrating that payment disputes remain a dominant driver of conflict even in well-regulated markets (Gamage & Kumar, 2025).

Payment delays continue to disrupt timelines, inflate costs, and increase the likelihood of disputes. Therefore, understanding the root causes and consequences are important to mitigate or prevent these disputes over payment matters (Perera & Dewagoda, 2021).

These persistent issues have prompted interest in digital innovations to modernize financial workflows. For example, Sonmez *et al*. (2022) has been proposed a BIM-integrated smart contract system to manage progress payments in construction projects. By linking as-constructed BIM data with blockchain, the system creates a digital record of completed work. That will reduce ambiguity in payment verification. Surveys done using construction professionals indicate that such systems can accelerate payments, enhance transparency, and improve trust among stakeholders.

FinTech solutions have also gained attention. Digital payments, blockchain-based smart contracts, AI-driven credit assessments, automated claim verification, and supply-chain financing platforms are being explored in construction sector (Mahmudnia, 2022). These tools promise faster transactions, secure data management, and transparent records. Many other industries have adopted FinTech to prevent fraud, reduce approval time, and enhance trust (Beknazarova, 2025). Construction, however, has been slower due to traditional practices, complex procurement, and multiple stakeholders with conflicting interests. Nevertheless, interest in FinTech has grown as companies seek technologies to reduce disputes and improve productivity.

Studies indicate that artificial intelligence (AI) is emerging as a key enabler. AI can analyze invoices, detect inconsistencies, verify documents, monitor contract compliance, and predict payment risks. It can also identify patterns that lead to disputes, such as variations in measurements, unclear contract clauses, or delays in submitting claims. Therefore, AI can reduce the administrative burden of payment processes and provide an evidence-based foundation for resolving disagreements when combined with FinTech tools (Ivanova *et al*., 2023).

Despite growing interest, research on AI and FinTech in construction payment processes is limited. Rather than financial workflows, most studies focus on digital technologies in general or on project management. There is also a lack of consolidated evidence explaining how these tools reduce disputes. Many construction companies want to adopt digital payment solutions but lack clarity on available tools, benefits, risks, or implementation challenges. Therefore, a structured review of secondary data can help fill this gap.

This paper aims to examine how AI-enabled FinTech tools can reduce payment disputes in construction projects by reviewing existing secondary evidence. It synthesizes findings from existing academic research and case studies to identify trends and practical applications.

The study addresses the following research questions:

- How do FinTech technologies currently support payment processes in construction?
- What roles can artificial intelligence play in reducing payment-related disputes?
- What evidence exists from secondary sources on the effectiveness of AI-enabled FinTech solutions in construction?
- What challenges limit the adoption of these technologies in the industry?
- What future opportunities and research directions can support wider implementation?

By answering these questions, the study aims to provide an overview of how digital financial technologies and AI can transform traditional payment systems of construction sector. It also offers insights for researchers, practitioners, and policymakers who are seeking to modernize construction finance and reduce long-standing disputes.

Beyond dispute reduction, the integration of AI and FinTech also contributes to sustainable financial practices within the construction industry. Technologies such as blockchain, AI-enabled risk forecasting, and digital payment platforms enhance transparency, strengthen trust among project stakeholders, and improve cash-flow stability which are key elements of financial sustainability (Rijanto, 2021).When payment cycles become more predictable and transaction records more secure, contractors and subcontractors experience reduced financial stress. This will also improve liquidity. These outcomes support long-term project viability, minimize wasteful financial leakage arising from disputes (Almadadha, 2024). This new technologies can even align construction financial management with broader principles of sustainable finance.

METHODOLOGY

This study uses a systematic secondary-research approach to review recent evidence on how AI-enabled FinTech tools can reduce payment disputes in construction. The review focused on English-language publications from 2021–2025 to capture the most recent technological and financial developments.

Google Scholar was used as the main source. Combined keywords and Boolean operators helped identify studies linking AI, FinTech, and construction payments. The main search string was:

("artificial intelligence" OR "AI") AND (construction OR "construction industry") AND (FinTech OR "financial technology" OR "digital payment" OR "smart contract" OR blockchain) AND (payment OR invoice OR "payment dispute" OR cashflow).

Studies were included if they (1) examined AI or FinTech tools in construction payment systems, (2) were published between 2021–2025, (3) provided empirical or conceptual insights on payment efficiency or dispute reduction, and (4) were peer-reviewed articles, conference papers, or credible technical reports. Non-English publications, opinion pieces, news articles, unrelated studies, and papers older than five years were excluded.

The initial search returned more than five million results, which reduced to around 58,500 when filtered by year. Titles and abstracts were screened for relevance, followed by full-text review using the inclusion criteria. This process resulted in 22 studies selected for detailed analysis.

Each study was assessed using a simple quality checklist covering clarity of purpose, methodological rigour, data transparency, relevance to payment issues, and strength of financial implications. Quality ratings (high/moderate/low) helped determine how much weight each study contributed to the synthesis.

Key data extracted included study aims, context, technology type (*e.g.*, blockchain, smart contracts, AI forecasting), methods, main findings, and noted limitations. Although multiple sources were reviewed, limitations remain due to the English-only scope, the short date window, and reliance on secondary data. Publication bias and indexing variations may also have influenced the final selection.

LITERATURE REVIEW

Payment delays and disputes remain a persistent challenge in construction projects around the world. These issues disrupt cash flows, strain contractor and subcontractor relationships, increase project costs, and often lead to delays and quality compromises. Despite decades of research and regulatory interventions, payment disputes still remain a persistent challenge in construction projects worldwide. These issues are reported in diverse contexts, ranging from government-funded projects in Sri Lanka (Perera & Dewagoda, 2021) to complex private developments in Europe (Bolton *et al.*, 2022) and Asia (Wang *et al.*, 2023).

Such evidence highlights that delays, unclear financial processes, and governance gaps are widespread. It also highlights the need for innovative solutions. These innovative solutions include digital technologies and AI-enabled FinTech tools to improve payment workflows and reduce disputes. On the other hand, it is important to understand the underlying causes of these disputes and identify effective strategies to mitigate them. This is critical for improving project performance and to reduce financial risk.

In recent years, the rapid development of digital technologies, financial innovations, and artificial intelligence can be seen. This has created new opportunities to address the longstanding challenges. Tools such as blockchain-based smart contracts, AI-driven invoice verification, digital payment platforms, and supply-chain financing solutions offer the potential to enhance transparency, accelerate payments, and reduce conflicts among project stakeholders (Mahmudnia, 2022). However, evidence on their effectiveness, adoption, and practical implementation remains scattered, especially within the construction sector.

CAUSES AND CONSEQUENCES OF PAYMENT DISPUTES

The way payments are structured and managed often causes payment disputes in construction projects.

Many of these problems stem from the financial arrangements built into construction contracts. Agreements between stakeholders typically cover advance payments, progress payments, retention, delay recovery, repayment periods, and various forms of bonds and insurance. These payments usually flow through a top-to-bottom cascade mechanism. Typically, funds move from the owner to contractors, subcontractors, suppliers, and other linked parties (Saygili *et al*., 2022). This chain is long and interdependent. Therefore, any delay at the top can quickly spread through the entire network.

Studies consistently highlight that late payment, and even non-payment is a chronic and global problem in the construction industry. It has persisted for decades and continues to disrupt project performance and stakeholder relationships (Wu & Xu, 2022). This shows that payment issues are not limited to specific regions but are experienced worldwide.

The industry also operates within a chained payment settlement culture. Payments are usually made progressively based on the value of work completed within a period or upon achieving milestones. Although this system is defined in contract conditions, it typically involves several steps including preparation of claims, checking, certification, and final payment (Nanayakkara *et al*., 2021). This process can take months due to lengthy default settlement cycles. Research also indicates that delays in this chain result in significant financial losses. As cited in Nanayakkara *et al*. (2021), according to Danuri *et al*, about 1.6% of income is lost due to payment delays in the construction sector.

These systemic delays have severe consequences. Subcontractors, sub-subcontractors, and suppliers, who sit at the bottom of the payment chain are particularly affected. They are the most vulnerable to cash-flow disruptions and frequently experience partial or non-payment (Nanayakkara *et al*., 2021). Such instability increases financial risks and can lead to work slowdowns, disputes, or even insolvency among smaller firms.

The consequences of payment disputes extend beyond financial strain. When contractors cannot access timely funds, Projects often face delays, cost overruns, and resource shortages. Relationships deteriorate as trust erodes between parties, leading to adversarial behaviour and further disputes. Over time, these issues can affect organizational performance, reputation, and the overall stability of the construction supply chain.

Overall, recent literature shows that payment disputes arise from a combination of governance gaps, complex payment procedures, and structural weaknesses in the industry's payment culture. The global prevalence of these problems highlights the need for more transparent, efficient, and technology-supported payment mechanisms.

DIGITAL AND FINTECH SOLUTIONS FOR PAYMENT MANAGEMENT

Recent studies show growing interest in digital tools that can reduce payment delays by improving transparency, accuracy, and verification speed. Many of these studies focus on blockchain, smart contracts, and BIM-based automation. Those are technologies designed to address long-standing weaknesses in manual, paper-driven payment processes.

Smart contracts are central to many proposed solutions. Nanayakkara *et al*. (2021) describe smart contracts as self-executing agreements encoded on a blockchain network. These contracts automatically enforce payment terms and compliance requirements without relying on intermediaries. Blockchain offers transparency, auditability, and enhanced security. Therefore, smart contracts reduce the risk of manipulation and accidental errors. This creates a more reliable environment for payment administration, especially in projects where trust between parties is limited.

Building on this foundation, several studies demonstrate how smart contracts can be combined with automated progress measurement. Hamledari and Fischer (2021) introduce an autonomous payment system that integrates blockchain-enabled smart contracts with robotic reality-capture technologies. In their work, construction progress is captured using Unmanned Aerial Vehicle (UAVs) and Unmanned Ground Vehicles (UGVs). Then, those data were converted into as-built BIM models. Then data were fed directly into a smart contract. Payments and lien rights are executed automatically using crypto currencies and Non-Fungible Token (NFTs). The system was tested on real projects in Canada and the United States and demonstrated accurate, efficient, and timely payment administration by removing manual intermediaries. This work highlights the potential for linking physical site progress with digital financial transactions.

Other researchers argue that blockchain alone is not enough. Khalid *et al*. (2024) present a BIM-blockchain system (BBS) designed to address both payment efficiency and financial misconduct. Their system incorporates BIM-based schedules, decentralized storage, and smart contracts that verify bills, check compliance, and process payment flows according to encoded rules. Case study validations

showed strong improvements too. The improvements include 92.3% in payment efficiency, 92.4% in transparency and auditability, and 84.6% in controlling financial misconduct. However, respondents also expressed concerns about the system's reliance on cryptocurrencies and the absence of legal frameworks supporting their use. They highlight practical barriers to large-scale adoption.

Newer work continues to refine these ideas. Elsharkawi *et al*. (2025) propose a payment automation approach that integrates smart contracts with scan-to-BIM data. In this study, Real-time 3D scans captured through photogrammetry. Then, depth-sensing technologies are used to convert these data into BIM models. After that, these were securely transmitted to a blockchain system through a chain-link interface. Once the system verifies completed work, payments are automatically executed. Their case study demonstrates that tying payments directly to verifiable progress enhances trust, speeds up release of funds, and reduces disputes related to measurement or documentation.

Scholars have also highlighted the broader implications of combining BIM and blockchain. Pham *et al*. (2025) argue that this integration addresses long-standing payment challenges by improving transparency, tracking progress in real time, and automating payment milestones. According to their findings, these technologies help reduce disputes, strengthen security, and streamline payment operations. Prior studies echo this outlook, noting that BIM–blockchain platforms create more precise and dependable financial transactions and support a more sustainable payment ecosystem within the industry (Tao *et al*., 2022; Mahmudnia *et al*., 2022).

Collectively, these studies show a clear direction. The suggestions are based on digital and FinTech solutions. These solutions particularly include blockchain, smart contracts, and BIM-integrated verification. On the other hand, these new solutions have strong potential to make payment processes faster, more transparent, and less prone to disputes. While challenges remain in legal acceptance, currency volatility, and industry readiness, the evidence suggests that automation anchored in verifiable progress data is a promising path for resolving payment conflicts and strengthening trust across the construction supply chain.

ROLE OF ARTIFICIAL INTELLIGENCE IN REDUCING PAYMENT DISPUTES

Construction engineering and management is experiencing rapid digital transformation driven by the growing adoption of artificial intelligence (AI) (Pan & Zhang, 2021). This shift is increasingly extending to payment management functions aimed at minimizing disputes. On the other hand, many payment conflicts arise from delayed verification, inconsistent documentation, fraud risks, or unclear interpretation of contract requirements. AI helps address these issues by improving accuracy, transparency, and consistency across the payment cycle. Recent studies highlight how AI strengthens verification processes, enhances auditability, and supports evidence-based decision-making.

A key advantage of AI is its ability to analyse large volumes of documents quickly. Low-level AI tools can review invoices, progress records, contract clauses, and certification documents with high precision (Ermakova & Frolova, 2021). These systems can check whether submitted invoices match contract requirements and highlight irregularities. They also help identify missing evidence or valuation discrepancies. This reduces manual workload and lowers the chance of human error. As payment disputes often stem from mismatched quantities or delayed verification, automated checking offers more consistent settlement cycles.

AI also supports claim verification. Natural language processing and machine learning models can interpret narrative descriptions, photographs, and supporting files. They can compare this evidence against project schedules or BIM data and identify whether the claimed work aligns with actual progress. Abioye *et al*. (2021) note that AI technologies are increasingly used to automate contract review, identify dispute-prone clauses, and strengthen financial oversight. These functions collectively contribute to more transparent and defensible payment process when integrated with digital systems or smart contracts.

Compliance monitoring is another area where AI adds value. Low-level AI can scan contracts and track obligations, deadlines, and milestones (Ermakova & Frolova, 2021). This reduces ambiguity and ensures that payments are not released without meeting agreed conditions. AI tools can act as digital assistants by organising documents, flagging gaps, and responding to queries raised by decision-makers. This improves administrative consistency while allowing human professionals to retain full decision-making authority.

Beyond construction, research in the financial sector shows that AI can enhance the security of digital payments. Fraud and data misuse are major risks in electronic payment systems. Studies show that AI-enabled fraud detection models help identify unusual patterns, suspicious transactions, and potential cyber-attacks more effectively than traditional

methods (Rutskiy *et al*., 2022; Siddiqui & Goyal, 2023). Machine-learning models can analyse millions of transactions rapidly and detect anomalies in real time. Although these studies focus on banking and mobile payments, the insights are relevant to construction payment platforms as well, where fraudulent claims, false invoices, and identity misuse remain persistent concerns.

Advanced fraud-detection research in mobile transactions also provides useful parallels for construction payment systems. Hajek *et al*. (2023) demonstrate that ensemble machine-learning models, such as those combining outlier detection and XGBoost algorithms, can significantly improve fraud detection accuracy. These findings show the potential of AI to strengthen digital payment tools used in supply-chain financing, e-certification portals, or e-procurement systems within construction.

AI can also enhance transparency and legitimacy in dispute-resolution environments. Explainable AI (XAI) and data-driven systems support more transparent decisions by making algorithmic outputs easier to understand (Karthikeyan, 2025). These systems help stakeholders trust automated verification and reduce concerns about hidden processes. They also support better documentation, which is critical when disputes escalate into arbitration or adjudication.

However, existing literature also highlights limitations. Strong-level AI, such as fully autonomous “robot judges,” remains unsuitable due to fairness and accountability concerns (Ermakova & Frolova, 2021). Researchers emphasize that human oversight is essential, especially when interpretation of contractual intention or fairness principles are required. Therefore, the most effective approach is a combined model where AI performs administrative and analytical tasks, while humans retain control over final decisions.

AI-ENABLED PAYMENT VERIFICATION AND RISK MANAGEMENT

AI and FinTech tools work best when used together. Blockchain smart contracts offer transparent execution rules. AI validates whether conditions have been met. Digital payment systems provide secure and traceable records. AI strengthens these systems by detecting fraud, analysing documentation, and predicting risks. According to Rane (2023), AI, particularly through machine learning and natural language processing, enhances construction processes. AI can be used to analyze large datasets, identifying patterns, forecasting risks, and enabling data-driven decision-making for more efficient project outcomes.

This integrated ecosystem supports faster, more accurate, and more transparent payment cycles. It reduces opportunities for manipulation and provides an auditable trail for dispute resolution. Contractors gain more predictable cash flow. Clients benefit from objective and verifiable evidence before releasing payments. Supply-chain members face fewer cascading delays.

Overall, current literature shows that AI can transform payment administration from reactive dispute handling to proactive dispute prevention. Therefore, AI offers a practical pathway towards fairer, faster, and more transparent payment processes when combined with human oversight and strong digital infrastructure.

IMPLEMENTATION CHALLENGES AND ADOPTION BARRIERS

Although there are clear advantages of AI and FinTech solutions in construction payment management, adoption remains limited. There are several practical and technical challenges that slowdown implementation across projects and organizations.

Technical complexity is one of the major challenges. Many systems require integration of multiple technologies. For example, autonomous payment administration may involve UAVs, UGVs, blockchain-enabled smart contracts, and BIM-based progress tracking (Hamledari & Fischer, 2021). Such integration demands skilled personnel and sophisticated infrastructure. Due to this, small or less technologically advanced firms may struggle to deploy these solutions effectively.

According to previous studies, financial concerns and scepticism also hinder adoption. Blockchain systems often rely on cryptocurrencies, which face issues such as price volatility and uncertain legal recognition. Khalid *et al*. (2024) found that many respondents were hesitant to adopt such systems due to these risks. Even when blockchain offers transparency and efficiency, such concerns over financial stability can prevent implementation.

Data accuracy and availability is another barrier. Blockchain and AI rely on real-time, verifiable data to function properly. Elsharkawi *et al*. (2025) highlight that scan-to-BIM technologies need precise data capture, or automated payments could be compromised. Similarly, AI algorithms require large, high-quality datasets for accurate risk prediction and dispute prevention. Data issues such as incompleteness, heterogeneity, imbalance, and bias can reduce AI effectiveness and increase implementation difficulty (Saghiri *et al*., 2022; Groumpos, 2023).

Cybersecurity and privacy concerns also play a role. Digital payments and FinTech systems must protect sensitive financial information. Siddiqui & Goyal (2023) emphasize that encryption, digital signatures, firewalls, and IP geolocation are essential to secure online transactions. Organizations in high-risk regions may face additional scrutiny, which can increase operational complexity and slow adoption.

Cost and resource requirements further limit uptake. For instance, investment is needed not only in technology but also in training, system maintenance, and stakeholder coordination (Nanayakkara *et al*., 2021). High computational demands for AI, such as deep learning models, add energy and infrastructure costs. This makes implementation expensive for many organizations (Saghiri *et al*., 2022).

Finally, trust and ethical concerns too influence adoption. AI failures or misuse can have serious consequences, as seen in high-profile incidents in other industries (Groumpos, 2023). Issues such as algorithmic bias, accountability, transparency, and the potential for misuse must be addressed before organizations are willing to adopt AI-enabled payment solutions widely.

To overcome these challenges, studies suggest practical strategies. Pilot implementations help organizations test technologies on a smaller scale. Training programs build technical skills and increase confidence among staff. Clear policies and regulatory guidance regarding cryptocurrency and AI use, improve trust and legitimacy. Effective stakeholder communication and demonstration of tangible benefits can further accelerate adoption. The Figure **1** summarises the main barriers limiting the adoption of AI- and FinTech-enabled payment systems in construction projects.

The existing studies highlight the potential of AI, blockchain, and digital payment platforms to improve payment efficiency in construction industry. However, the evidence remains fragmented and inconsistent. Some researchers report strong benefits such as faster payment cycles and reduced disputes, whereas others highlight substantial barriers. These challenges include high implementation cost, resistance to digitalisation, and lack of regulatory clarity. Few studies directly compare these technologies or assess their relative effectiveness under different project conditions. Moreover, most publications rely on conceptual discussions rather than empirical validation. This results in limited quantitative proof of financial impact. These contradictions and gaps indicate the need for a more rigorous synthesis of the literature, which this review aims to address by critically evaluating the strengths, limitations, and practical implications of previous findings.

DISCUSSION

As this study is based solely on secondary literature, the focus is on synthesising conceptual, qualitative, and emerging evidence rather than generating new empirical or quantitative results. The reviewed studies varied widely in context, methodology, and technological maturity. Therefore, it makes cross-study numerical comparison difficult and potentially misleading. As such, the findings are discussed qualitatively, highlighting mechanisms, themes, and reported outcomes rather than attempting to consolidate inconsistent quantitative metrics.

Figure 1: The main barriers limiting the adoption of AI- and FinTech-enabled payment systems in construction projects.

The findings from the existing literature demonstrate that FinTech and AI technologies are increasingly being recognized as potential solutions to persistent payment disputes in construction projects. Blockchain-based smart contracts and BIM-integrated payment systems are repeatedly highlighted for their ability to automate verification, enhance transparency, and reduce reliance on intermediaries across the reviewed studies (Nanayakkara *et al*., 2021; Hamledari & Fischer, 2021; Khalid *et al*., 2024; Elsharkawi *et al*., 2025; Pham *et al*., 2025). These tools can streamline complex payment workflows by linking verified construction progress data to payment execution. In that way, these tools can reduce delays, minimize human errors, and improve trust among project stakeholders.

The existing studies further highlight the role of artificial intelligence in reducing payment-related disputes. AI applications range from invoice analysis, automated claim verification, and contract compliance monitoring to risk prediction and fraud detection (Ermakova & Frolova, 2021; Karthikeyan, 2025; Siddiqui & Goyal, 2023; Hajek *et al*., 2023; Rutskiy *et al*., 2022). AI can rapidly process large volumes of payment data, detect inconsistencies, and flag potential risks before they escalate into disputes. In combination with FinTech solutions, AI can create evidence-based, automated payment workflows that enhance decision-making and accountability. For example, AI-enabled fraud detection systems in mobile and electronic payments have been shown to save costs and reduce financial risks while maintaining transparency and security (Hajek *et al*., 2023; Siddiqui & Goyal, 2023).

However, adoption of digital and AI-based payment solutions remains limited. There are several barriers identified from the existing literature. First, traditional procurement practices and complex stakeholder networks in construction projects slow the integration of new technologies (Nanayakkara *et al*., 2021; Hamledari & Fischer, 2021).

Second, there is skepticism regarding cryptocurrency use, including concerns over price volatility and lack of legal frameworks, which affects the acceptance of blockchain-enabled payments (Khalid *et al*., 2024). Third, the implementation of such systems often requires specialized technical expertise and access to accurate, real-time data, which may not be available in all projects (Elsharkawi *et al*., 2025).

Fourth, AI-based solutions face challenges related to data quality, bias, incompleteness, and high computational costs, which can limit algorithm reliability and increase operational complexity (Saghiri *et al*., 2022; Groumpos, 2023). Finally, users' trust and familiarity with digital payment systems vary across contexts, requiring secure encryption, authentication protocols, and awareness of fraud risks (Siddiqui & Goyal, 2023).

The combined evidence suggests that while AI and FinTech technologies are effective in mitigating payment disputes, their full potential depends on careful integration with existing workflows, regulatory compliance, and stakeholder training. According to these studies, hybrid approaches where automated tools support but do not fully replace human oversight, are likely to be the most successful (Ermakova & Frolova, 2021; Karthikeyan, 2025). For example, smart contracts can automatically release payments based on verified progress, while AI monitors data quality, compliance, and risk. However, it is important to allow project managers to intervene where necessary.

From a research perspective, there are several gaps remain. There is a lack of large-scale empirical studies that quantify the effectiveness of AI-enabled FinTech solutions across different project types and geographic contexts. Similarly, issues such as legal recognition of blockchain-based contracts, cryptocurrency regulations, and AI accountability are yet to be fully addressed. The literature also highlights the need for user-centered design to ensure that digital systems align with the operational realities and capabilities of construction organizations.

Overall, this study confirms that FinTech and AI offer transformative potential for the construction industry. This combination of tools and technologies addresses the root causes of payment disputes, including inefficient workflows, lack of transparency, and slow verification processes. While adoption barriers exist, they can be mitigated through technology integration, stakeholder education, and supportive regulatory frameworks. By bridging technical, procedural, and human factors, AI-enabled FinTech solutions could significantly improve payment reliability, reduce conflicts, and enhance overall project performance.

In addition to resolving operational challenges in construction payments, the findings also align with broader FinTech principles. These FinTech principles include financial transparency, digital trust, and risk mitigation. AI-enabled verification tools, blockchain-based smart contracts, and digital payment platforms collectively enhance transparency by creating traceable financial records. These technologies also support digital trust models by reducing information asymmetry and ensuring that all project stakeholders have access to consistent and

verifiable data. Furthermore, these systems minimise financial risks, including delayed approvals, fraudulent claims, and unverified variations by automating verification and reducing dependency on manual judgment. Although construction is not traditionally discussed within the context of financial inclusion, the adoption of reliable digital payment technologies can strengthen the financial stability of SMEs and subcontractors. These are the groups that often face cash-flow vulnerabilities. Therefore, the digital transformation of construction payments reinforces fundamental FinTech objectives while addressing industry-specific dispute drivers.

Although numerical evidence in the existing literature remains limited, the reviewed studies consistently report qualitative improvements such as faster approval processes, earlier detection of discrepancies and reduced manual verification steps. It also includes greater transparency in financial workflows. These recurring findings collectively demonstrate that AI and FinTech applications have strong potential to reduce payment-related disputes, even in the absence of extensive quantitative datasets, and provide a meaningful foundation for future empirical research.

PROPOSED AI-ENABLED FINTECH FRAMEWORK FOR REDUCING PAYMENT DISPUTES IN CONSTRUCTION

Based on the findings of this study, a structured framework is proposed to guide construction organisations in integrating Artificial Intelligence (AI) and Financial Technology (FinTech) tools to reduce payment delays and disputes. This framework outlines the key layers needed for effective implementation and it aligns AI capabilities with financial workflows in construction projects. Figure **2** shows Proposed AI-Enabled FinTech Framework for Reducing Payment Disputes in Construction

LIMITATIONS & FUTURE RESEARCH

This study relies exclusively on secondary data, which imposes certain limitations. First, the literature reviewed varies widely in context, methodology, and reporting standards. This may introduce bias and affect the generalisability of findings. Publication bias is also possible, as studies reporting positive impacts of AI and FinTech are more likely to be published than those showing neutral or negative results. Second, while qualitative synthesis provides valuable insights, the lack of primary empirical data prevents precise quantification of financial impacts such as payment-cycle reductions or cost savings. Third, gaps exist in the literature regarding comparative evaluations of different technologies, long-term adoption outcomes, and impacts on smaller contractors or subcontractors. Future research should conduct empirical studies, including case studies, surveys, or controlled pilots, to validate the conceptual and qualitative findings reported in this review. Such studies would strengthen evidence on the financial benefits, adoption challenges, and broader implications of AI and FinTech in construction payments.

CONCLUSION

Payment delays and disputes remain persistent challenges in the construction industry. These challenges cause financial strain, project delays, and strained stakeholder relationships. This study highlights that traditional payment processes, fragmented documentation, and limited transparency continue to exacerbate these issues despite regulatory measures and long-standing awareness. Emerging digital solutions such as blockchain-based smart contracts, BIM-integrated payment systems, and supply-chain financing platforms offer promising avenues to streamline payment workflows, enhance transparency, and reduce conflicts.

Artificial intelligence further strengthens these innovations by enabling automated invoice analysis, claim verification, contract compliance monitoring, and risk prediction. When combined with FinTech tools, AI supports evidence-based, real-time financial processes that improve trust, accountability, and efficiency across construction projects.

Based on the findings of this review, several practical recommendations emerge. Industry practitioners are encouraged to adopt AI-enabled verification tools, blockchain smart contracts, and digital payment platforms. This is to streamline payment processes, reduce administrative errors, and mitigate disputes, while ensuring adequate training for smooth implementation. Policymakers should consider establishing supportive regulatory frameworks to guide the adoption of digital financial tools in construction. Such frameworks can standardise e-invoicing, enhance transparency, and protect SMEs and subcontractors. FinTech developers can focus on designing construction-specific digital payment solutions that integrate AI monitoring, risk alerts, and interoperability with existing project management systems, while prioritising security and user-friendly interfaces to build digital trust. Collectively, these recommendations translate the qualitative insights of this study into actionable steps that enhance the practical significance of AI and FinTech applications in improving financial sustainability and reducing payment disputes.

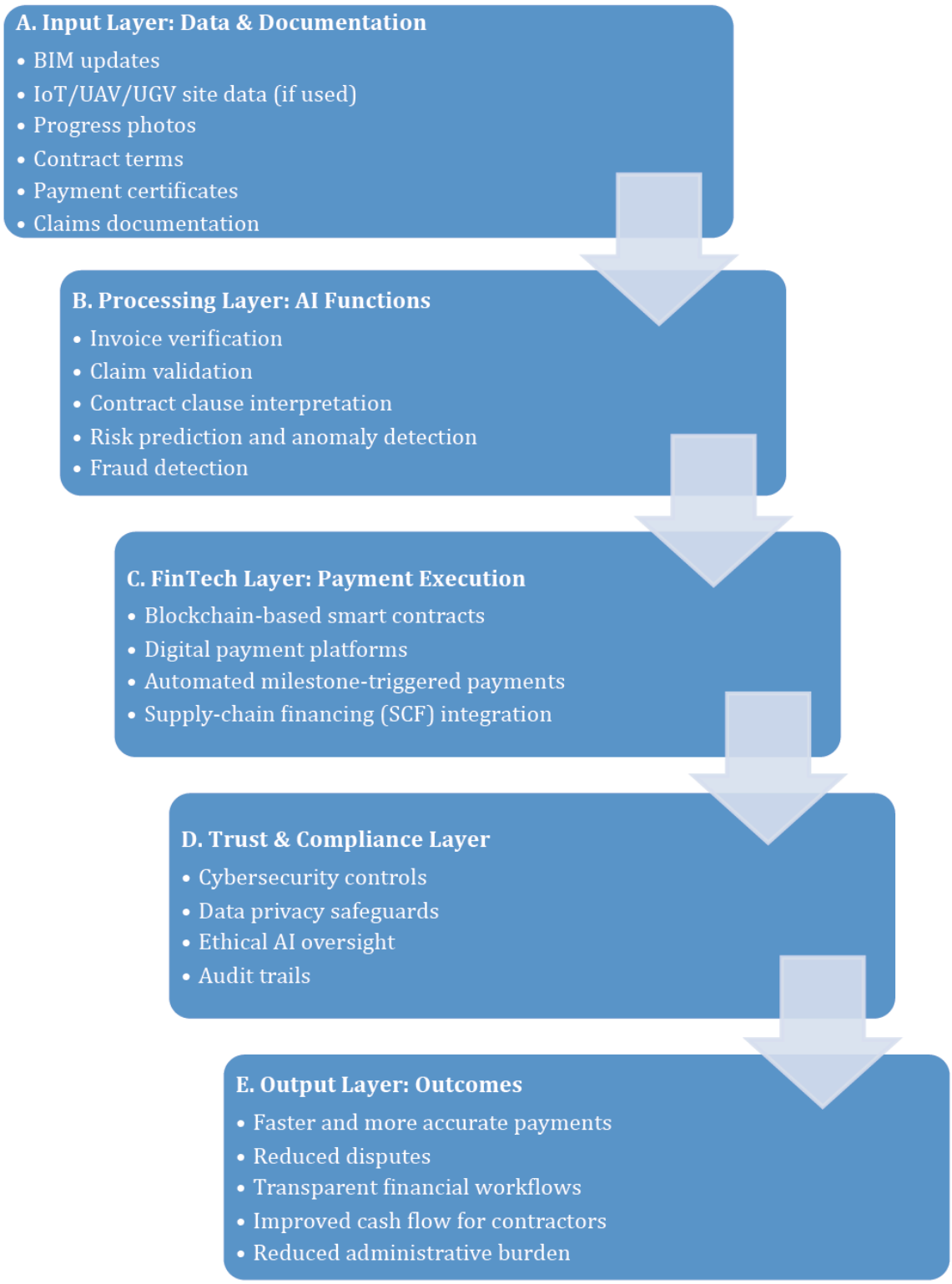

Figure 2: Proposed AI-Enabled FinTech Framework for Reducing Payment Disputes in Construction.

Nevertheless, technology adoption also presents challenges. Complex system integration, dependence on accurate data, cost considerations, limited technical expertise, and skepticism toward digital systems remain significant barriers. Addressing these issues requires careful planning, investment in digital capabilities, stakeholder engagement, and strong regulatory support to facilitate secure and reliable implementation.

Overall, integrating AI and FinTech into construction payment management presents a transformative opportunity. These technologies can reduce disputes, improve project outcomes, and contribute to the long-term sustainability of the industry by modernising financial workflows. Future research and real-world implementation should continue to explore optimal strategies, address adoption constraints, and provide

empirical evidence of measurable benefits across diverse project contexts.

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