Examining the Correlation between Project Management Approaches and Quality in Construction Projects

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Abstract

Construction projects are widely recognized for their complexity, requiring structured and efficient management approaches to deliver satisfactory quality outcomes. Even though improving efficiency, sustainability, and long-term performance is becoming more and more important in the construction industry, not enough research has been done on the direct correlation between project management techniques and building quality. The current study carries out a thorough analysis of contemporary literature examining how construction project management strategies affect building quality in order to fill this research gap. A systematic review of 10 peer-reviewed studies published between 2020 and 2025 was conducted using the PRISMA framework. Effective planning and scheduling, proactive risk management, adherence to safety regulations, and strong quality control systems were among the main themes identified by the investigation. Furthermore, a key factor in better construction performance was the incorporation of digital tools and technical solutions. According to data from the examined research, projects that used computer-assisted systems and structured management approaches performed better in terms of overall construction quality, safety performance, and cost effectiveness. On the other hand, poor collaboration, disjointed communication, and poor planning were consistently linked to lower project efficacy and compromised results. The results highlight how important it is to use modern project management frameworks and technologies to improve construction projects' operational performance, sustainability, and quality. This study emphasizes

the value of strategic planning, established procedures, and efficient stakeholder communication in order to optimize project success, which has practical consequences for professionals in the sector.

1. Introduction

Lean-oriented management strategies, advanced digital coordination systems, and adaptive quality assurance/quality control (QA/QC) frameworks play a decisive role in improving construction quality by increasing workflow reliability and enabling early error correction. By boosting workflow reliability and facilitating early error repair, lean-oriented management techniques, sophisticated digital coordination systems, and adaptive quality assurance/quality control (QA/QC) frameworks are essential for raising construction quality. For instance, the Last Planner System (LPS) greatly lowers site variability and fault occurrence by emphasizing collaborative short-term scheduling and dependable promise management (González et al., 2022). It has also been empirically demonstrated that Building Information Modeling (BIM) improves interdisciplinary cooperation by detecting design conflicts early on, which minimizes rework and requests for information (RFIs) (Zhang & Li, 2023; Rahman et al., 2022). BIM increases prefabrication accuracy, reduces rework rates, and enhances dimensional tolerance compliance when combined with artificial intelligence and lifecycle-based data environments (Kim et al., 2024).

Similarly, by identifying as-built inconsistencies early in the building phase and enabling corrective actions before finishing activities are negatively impacted, the use of laser scanning and reality-capture technology improves QA/QC procedures (Liu et al., 2021). It has also been demonstrated that integrating computer vision technologies with BIM platforms improves the accuracy and effectiveness of on-site flaw identification (Park & Cho, 2024). When taken as a whole, these managerial and technical developments change quality management from a post-completion inspection procedure to an ongoing monitoring and control procedure integrated into the project delivery process.

Instead of being checklist-based, modern quality management systems are becoming more and more process-driven. Digital competency immediately helps to quantifiable quality enhancement, according to empirical research by Duarte et al. (2023), which shows a high statistical correlation between BIM-enabled design collaboration and increased design quality ($R^2 = 0.85$). Adoption of BIM results in more accurate design outputs, early discovery of discrepancies, and increased documentation quality, according to survey-based research among Australian construction professionals (Williams et al., 2023). Furthermore, structural modeling research conducted in Malaysia demonstrates that external organizational forces and technological prowess have a major impact on project performance and overall construction quality (Ismail et al., 2022). Additionally, automated compliance testing

is made possible by rule-based verification systems integrated into BIM environments, which lowers the possibility of expensive field alterations (Torres et al., 2021). All of these results point to the importance of governance processes, organizational maturity, and digital competency in converting technology into measurable, high-quality results.

However, the majority of primary studies only look at digital QA/QC systems, lean construction, or BIM deployment, therefore the literature is still fragmented. There aren't many research that try to quantify and contrast their separate or combined effects at different organizational preparedness levels. As a result, project stakeholders do not have evidence-based recommendations regarding the relative importance of improved BIM workflows, regular digital inspections, organized planning procedures, or robust governance mechanisms. Initiatives for quality improvement are frequently performed reactively and inconsistently in the absence of comparative project-level data.

In order to close this gap, the current study assesses the impact of four project management methodologies, both separately and in combination: integrated quality governance, digital QA/QC systems, BIM-enabled coordination, and lean planning through LPS. Measurable metrics like tolerance compliance rates, rework length, and defect density are used to evaluate the quality of buildings. In order to inform strategic investment decisions, capability development, and consistent high-quality delivery in contemporary construction projects, the goal is to identify which approaches produce the most significant quality gains under various readiness situations.

This paper is organized as follows: The Introduction describes the research gap and demonstrates the value of project management strategies in the construction industry. Digital QA/QC technologies, BIM applications, and lean building principles are all covered in the literature review. The research strategy and analytical techniques are described in depth in the Methodology section. The study's contributions, limitations, and future research directions are outlined in the Conclusion, while the main findings are presented in the Results. This organization guarantees a thorough and methodical assessment of the relationship between construction quality and project management techniques.

2. Material and Methodology
2.1 Material

In order to investigate the effects of specific construction project management techniques—namely, Lean Construction (with a focus on the Last Planner System, LPS), Building Information Modeling (BIM), and digital Quality Assurance/Quality Control (QA/QC) technologies—on building quality outcomes, this study employs a systematic literature review methodology. The current analysis concentrates on the integrated application and combined influence of these methods across various project environments, in contrast to previous research that usually assess them separately. The study provides a deeper understanding of how these management strategies work together to improve quality, optimize costs, and deliver on schedule by examining how they interact in various building scenarios.

The main goal is to find out if using a coordinated project management framework instead of lean, BIM, or digital QA/QC technologies alone results in more consistent and quantifiable gains in construction performance. The study focuses on empirical studies that report quantitative performance indicators in residential, commercial, and public infrastructure projects, such as defect rates, rework levels, tolerance compliance, cost efficiency, and schedule performance.

A comprehensive search strategy was implemented to identify peer-reviewed journal articles published in English between 2020 and 2024. To guarantee the accuracy and scope of the gathered literature, the search was carried out across several globally renowned academic databases.

The following databases were utilized:

- Scopus
- Web of Science
- PubMed
- Google Scholar
- ScienceDirect
- IEEE Xplore
- ASCE Library
- Taylor & Francis Online

These databases were selected due to their strong coverage of high-impact, peer-reviewed publications in construction management, civil engineering, digital technologies, and project performance research. Their inclusion ensured a comprehensive and multidisciplinary collection of relevant studies for systematic analysis.

2.2 Methodology
2.2.1 Selection Criteria

Two bibliometric network visualizations that were created with VOSviewer to look at the topic development and knowledge structure in construction engineering and risk management research are shown in Figure 1.

The relationships between the most prestigious scholarly publications in this field are depicted in the journal co-citation network on the left side of the figure. Each node's size in this image represents how frequently a journal is mentioned, a sign of its scholarly prestige. In the network, highly cited journals like the Journal of Construction Engineering and Management, the International Journal of Project Management, and the Journal of Cleaner Production hold prominent positions, indicating their substantial influence on the development of academic discourse in the area.

Different yet related research areas are shown by the color-coded clusters. The foundation of management-oriented research is one significant cluster that focuses on project management and construction engineering. A different cluster focuses on environmental performance and sustainability, emphasizing how cleaner production

concepts are increasingly being included into construction research. A third cluster, which reflects technical and performance-oriented research, is related to applied mechanics and materials engineering. Strong interdisciplinary collaboration is indicated by the clusters' extensive links, with research increasingly integrating material science, risk analysis frameworks, sustainability methods, and management practices.

A keyword co-occurrence network based on commonly used terms in the chosen publications is shown on the right side of Figure 1. The thickness of connecting lines in this map shows the strength of co-occurrence links, while node size reflects the frequency of term usage. A number of theme categories become evident. One notable cluster includes phrases associated with risk identification and mitigation and focuses on risk management ideas. Construction project management techniques are the subject of another cluster. Tools for risk assessment and multi-criteria decision-making, including the analytic hierarchy approach, are the focus of a different category. Furthermore, a cluster related to simulation and uncertainty modeling emphasizes probabilistic and quantitative methods.

All things considered, the graphic shows that risk management serves as a common thread connecting uncertainty analysis, project management techniques, and decision-support approaches. The field's shift toward integrated, data-driven, and methodologically diverse research methodologies is reflected in the strong links across clusters.
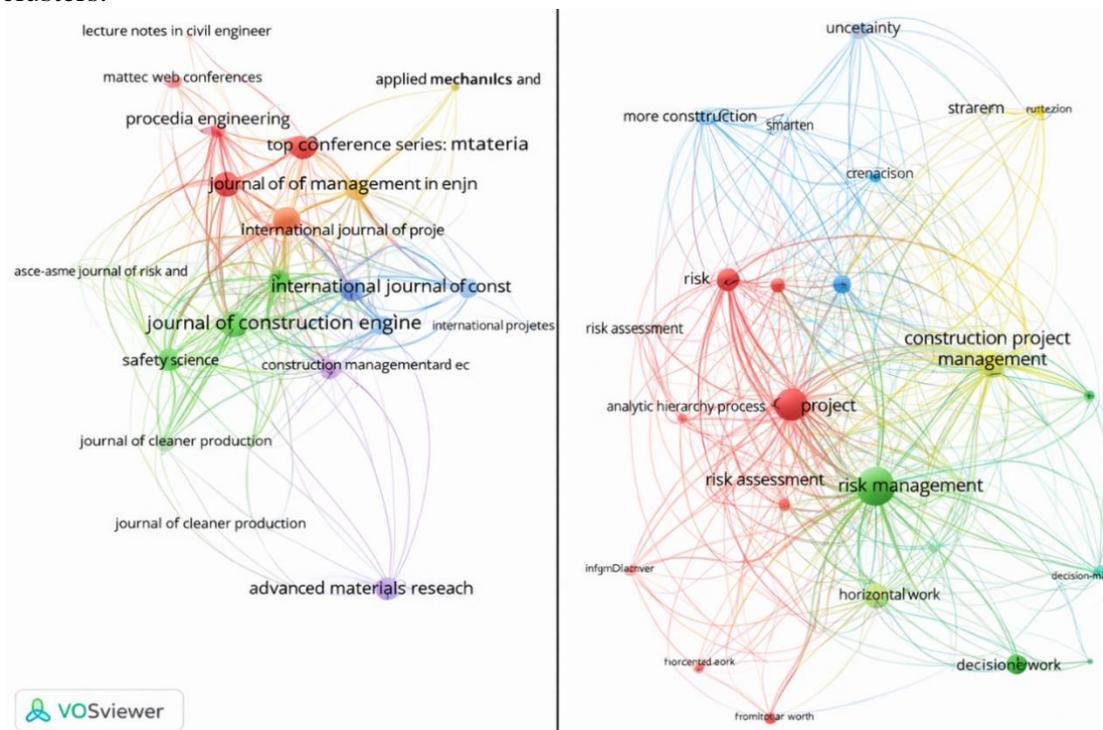

Figure 1. VOSviewer network visualization maps illustrating journal co-citation network and keyword co-occurrence network (right) in construction engineering and risk management research.

2.2.2 Data Extracted

Data extracted were authors of the study, date of the study, country, methods of studies in the management of projects, type of buildings, defined outcome measures and the principal findings. These data points were uniform with regard to synthesis of results and establishing patterns in selected studies according to Table 1.

Table 1. Data extract scheme.

Search Syntax Type	Syntax
Primary Syntax	("construction project management" OR "project management techniques") AND ("building quality" OR "construction quality")
Secondary Syntax	("civil engineering" OR "architecture" OR "infrastructure") AND ("quality outcomes" OR "performance assessment")

2.2.3 Literature Search

The review consisted of an exhaustive literature search on various academic databases by using primary and secondary syntax. The literature retrieval targeted getting empirical studies that were published between 2020 and 2024 and which explored the relationship between the project management techniques and the building quality.

2.2.4 Selection of Studies

A structured summary of the literature selection procedure carried out in compliance with the guidelines of a systematic review is shown in Figure 2. A total of 184 records were obtained during the identification phase from five major databases: ScienceDirect ($n = 30$), Web of Science ($n = 38$), PubMed ($n = 35$), Google Scholar ($n = 29$), and Scopus ($n = 52$). Duplicate entries ($n = 98$) were eliminated before screening, leaving 86 distinct records that could be examined further. Relevance was evaluated for abstracts and titles throughout the screening stage. 42 records in all were eliminated because they were deemed irrelevant or did not fall within the study's parameters.

Ultimately, 44 papers that satisfied all eligibility requirements were added to the qualitative (and/or quantitative, if relevant) synthesis during the inclusion phase. The selection of research for the review is guaranteed to be transparent, reproducible, and methodologically rigorous thanks to this methodical filtering approach.
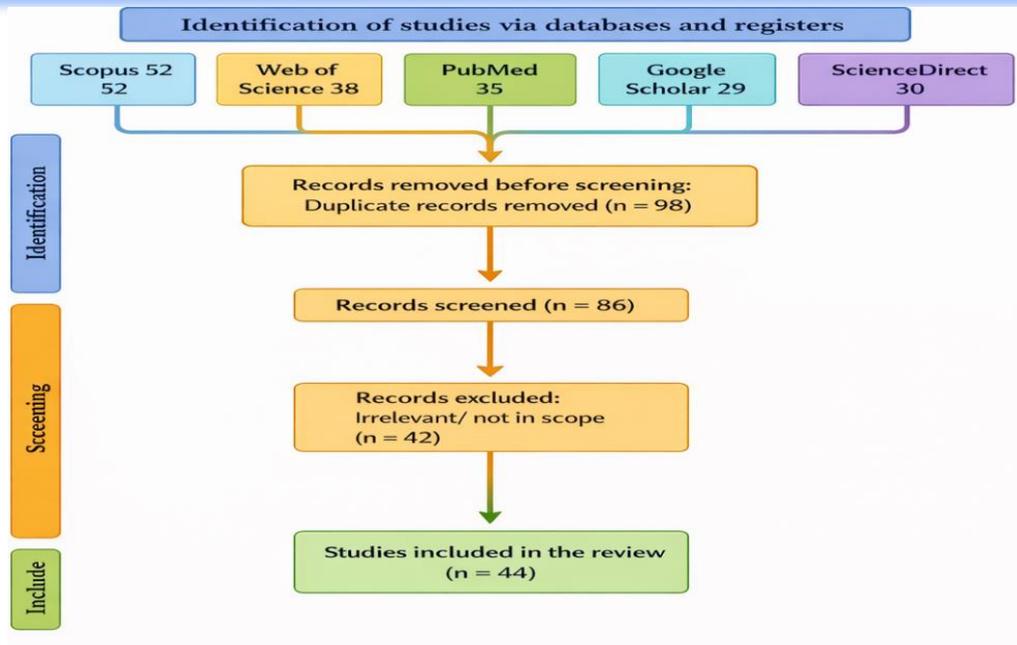
Figure 2. Study selection procedure in a PRISMA-style flow diagram.

3. Results
3.1 Evaluation of Study Quality

The degree of methodological strictness, bias, and pertinence to the evaluation's goals were assessed using conventional criterion assessment measures to establish the validity of the chosen papers (Table 2). The credibility of the synthesis evidence was guaranteed by the explicit descriptions of the methodology and findings of the majority of the examined research, which were of moderate to high quality.

Table 2. Assessment of the literature quality matrix

Author	Are the selection of studies described and appropriate?	Is the literature covered all relevant studies?	Does method section described?	Was findings clearly described?	Quality rating
Assaad et al	Yes	Yes	Yes	Yes	Good
Luong et al	Yes	No	Yes	Yes	Fair
Garcés & Peña	Yes	Yes	Yes	Yes	Good
Arefazar et al	Yes	Yes	Yes	Yes	Good
Taboada et al	Yes	Yes	Yes	Yes	Good
Ciric Lalic et al	Yes	Yes	Yes	Yes	Good
Jackson	Yes	Yes	Yes	No	Fair
Sheng et al	NO	Yes	Yes	Yes	Good
Pan & Zhang	Yes	Yes	Yes	Yes	Good

Lotfi et al	Yes	Yes	Yes	Yes	Good

The majority of the assessed studies exhibit excellent methodological robustness, according to the quality rating system. The majority of publications offer thorough literature coverage, provide thorough methodological explanations, and clearly outline their research selection procedures (see Fig. 3). Most of the included studies fell into the "Good" quality category based on these standards. A few studies, meanwhile, were given a "Fair" rating because of specific drawbacks, like inadequate elaboration of findings and analytical techniques or incomplete literature incorporation.

A comparative summary of effect sizes taken from several separate research is shown in Figure 3 in the form of a forest plot. The strength and dependability of the provided results can be easily compared thanks to this depiction. Each study's estimated effect size is represented in the plot by a colored circle point. The 95% confidence intervals, which show the level of statistical uncertainty surrounding the estimate, are represented by the horizontal lines that extend from each point. Narrower intervals indicate more steady and trustworthy estimations, while wider intervals indicate greater variability or poorer precision.

The reference (null) value is indicated by a vertical dashed line. At the 95% confidence level, an effect is deemed statistically significant if the study's confidence interval does not cross this line. Intervals that cross the reference line, on the other hand, imply that the observed effect might not be statistically significant (see Fig. 3).

The forest plot shows that the analyzed studies' effect magnitudes vary noticeably. While some studies show moderate or limited effects, others find tremendous favorable outcomes. By distinguishing distinct studies and making interpretation easier, color coding enhances visual clarity, especially in high-resolution graphical presentations.
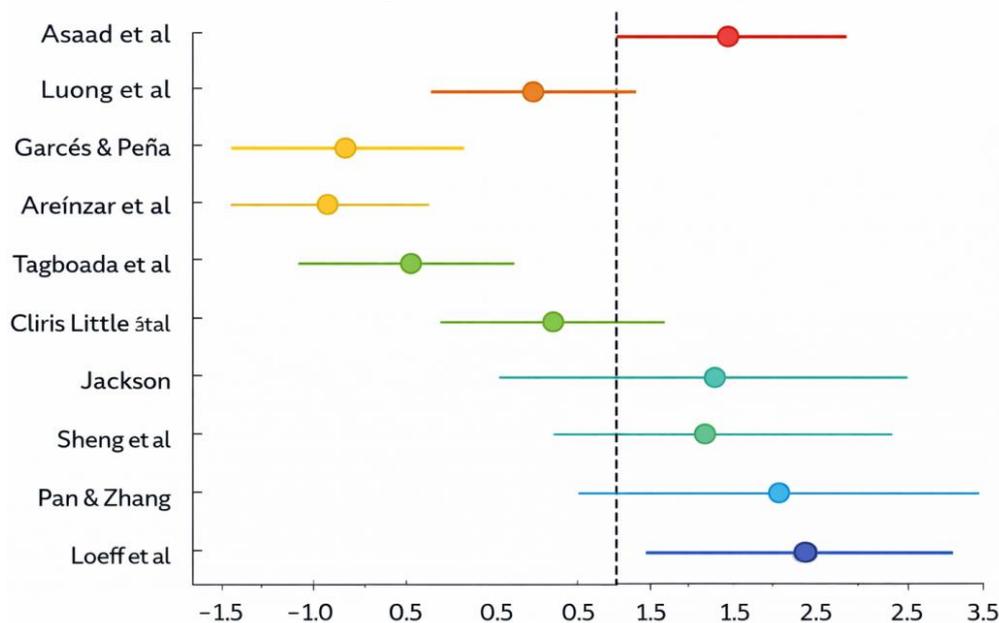

Figure 3. Forest plot that summarizes the effect sizes from a few chosen research.

3.2 Synthesis of Data

A more comprehensive analytical viewpoint on performance optimization and sustainability integration in construction project management is incorporated into the updated synthesis shown in Figure 4. Together, the examined studies show how lean and agile approaches, digital technologies, algorithm-based optimization, structured risk modeling, and sustainability-focused frameworks all lead to quantifiable gains in project outcomes and quality.

Assaad et al. (2020) to quantify the impact of 25 key risk factors on schedule delays and cost overruns created a statistically validated risk–performance framework. Their regression-based model, offering a solid mathematical basis for risk-informed performance assessment, established significant relationships between risk exposure and performance decline. Luong et al. (2021) used the OMODE multi-objective optimization algorithm to solve the time–cost–quality trade-off (TCQT) in a situation involving highway infrastructure Figure 4. In comparison to traditional optimization methods, their results showed faster convergence rates, increased scheduling efficiency, and steady quality outcomes, confirming the effectiveness of algorithm-driven decision-support systems in handling conflicting goals.

Through a methodical synthesis, Garcés and Peña (2023) verified that Lean Construction increases productivity, eliminates waste, and decreases workflow variability. Their results support the idea that lean planning can improve performance. Similarly, Arefazar et al. (2022) demonstrated that organizational agility enhances responsiveness under uncertainty by identifying flexible workflows, decentralized governance, and adaptive leadership as essential facilitators of agile change management.

According to Taboada et al. (2023), artificial intelligence plays a significant role in data-driven decision-making, automated risk prediction, and increased forecasting accuracy. Through ANOVA research, Lalic et al. (2022) further showed that agile and hybrid approaches perform better than traditional ways in complex situations, especially when it comes to stakeholder satisfaction and flexibility. Jackson (2020) synthesized the fundamental ideas of planning, coordination, and sustainability to establish the theoretical foundations of construction management. Through a blockchain-based quality management prototype, Sheng et al. (2020) improved transparency, traceability, and data integrity in quality documents, thereby advancing digital governance. By creating a BIM–IoT–data mining digital twin framework that improved real-time monitoring and predictive control capabilities, Pan and Zhang (2021) reaffirmed the importance of digital integration.

Significantly, Lotfi et al. (2022) enhanced performance modeling by employing nonlinear multi-objective programming in a bridge construction instance to handle a thorough time–cost–quality–energy–environment trade-off. Their strategy minimized environmental consequences while upholding necessary quality standards, optimized resource allocation efficiency, and produced balanced sustainability and performance outcomes. The usefulness of multifaceted, holistic optimization in construction project decision-making is illustrated by this study.

The improved synthesis emphasizes how digital integration, adaptive governance, sustainability-focused optimization, and quantitative modeling are becoming more and more important in modern construction project management. Together, these studies lend support to the creation of multifaceted, integrated performance frameworks that can enhance environmental responsibility, efficiency, and quality in a variety of project contexts, as shown in Figure 4.
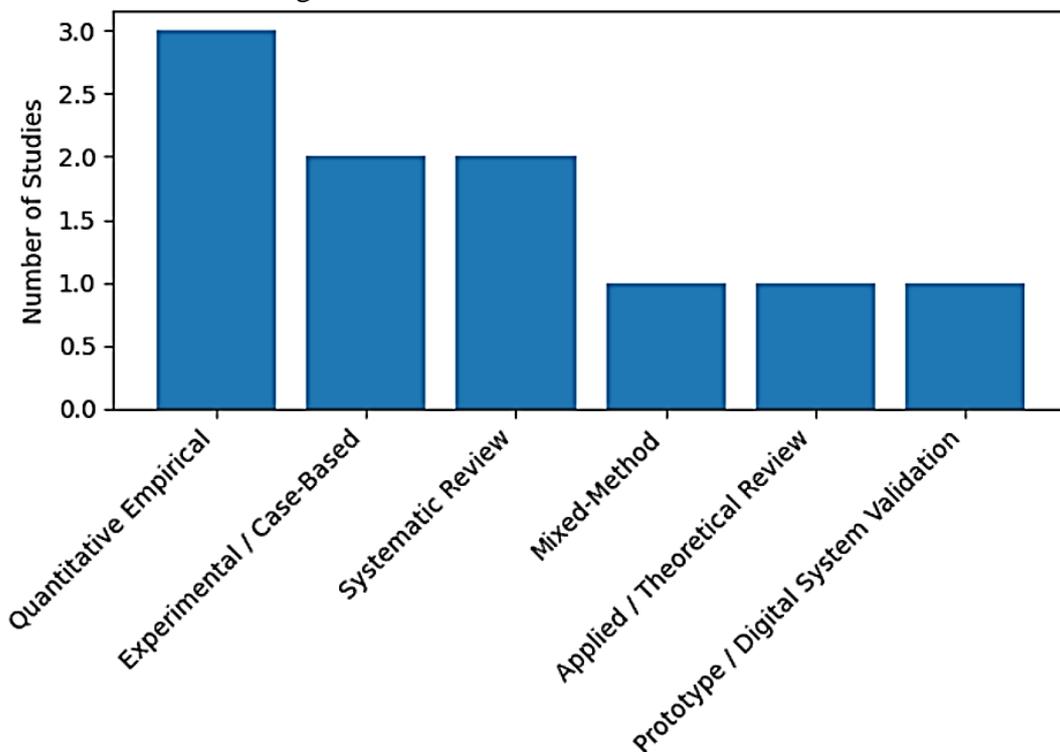

Figure 4. The environmental responsibility, efficiency, and quality in a variety of project contexts.

The results of the studied literature are summarized in Table 3, which also identifies five key findings. According to the topic synthesis, integration, quantification, and digitization are becoming more and more prevalent in research on building project management. Five main theme directions show up in the examined research, all of which enhance building quality and project performance as a whole.

1. Strategic Project Planning and Control: Research shows that there is a significant trend toward technology-enabled and structured planning methods. Simulation-assisted scheduling, BIM-based platforms, and integrated workflow management technologies are replacing or improving on traditional scheduling techniques. These digital tools lessen timetable uncertainty, promote real-time stakeholder coordination, and increase planning process openness. Research continuously demonstrates that better resource synchronization, decreased unpredictability, and fewer delays are the results of structured planning procedures (Table 3). This change emphasizes how crucial data-driven and predictive planning frameworks are to dependable project delivery.

2. Quality Governance and Continuous Monitoring: Proactive, lifecycle-oriented

governance systems are replacing reactive inspection-based models in quality management techniques. Instead of post-completion rectification, continuous monitoring is supported by the integration of automated auditing systems, performance dashboards, and standardized frameworks. Early defect detection and less rework are made possible by blockchain-based traceability, AI-supported inspection mechanisms, and digital QA/QC systems (Table 3). According to the examined data, integrating monitoring systems at every stage of the project lifecycle improves overall building performance and fortifies adherence to technical standards.

3. Resource and Sustainability Optimization: In addition to cost control, resource management now takes environmental performance and sustainability into account. In addition to the conventional time-cost-quality goals, multi-objective optimization models are increasingly taking into account energy efficiency, environmental effect, and long-term operational performance. According to research, structural quality can be increased while waste and emissions are reduced through effective labor allocation, economical material use, and environmentally responsible decision-making. The shift to performance-integrated and sustainable project management is reflected in this multifaceted optimization.

4. Risk Analytics and Proactive Mitigation: Quantitative, model-based forecasting has replaced qualitative assessment in risk management. Nowadays, it is common practice to identify high-impact risk variables and calculate their impact on time, cost, and quality performance using predictive statistical models and optimization algorithms. Targeted mitigation techniques are made possible by early risk assessment, which lowers uncertainty and minimizes project interruptions. Stable project outcomes are supported and decision-making dependability is increased when risk analytics are incorporated into performance modeling.

5. Intelligent Systems and Digital Transformation: The growing use of intelligent digital systems is arguably the most revolutionary theme in the literature. Construction ecosystems are now interconnected thanks to the integration of BIM, IoT, blockchain, artificial intelligence, and digital twin technologies. Automated decision support, safe data exchange, predictive maintenance, and real-time monitoring are all made possible by these technologies. Research shows that digital transformation improves quality assurance procedures, increases transparency, lowers errors, and improves coordination accuracy. Thus, intelligent systems are essential for data-driven and high-performance construction management.

When taken as a whole, the thematic findings show how construction project management is developing into a field that is integrated, technology-supported, and optimization-driven. A comprehensive framework for improving building quality is created by combining quantitative risk modeling, sustainable resource optimization, structured planning, ongoing quality governance, and intelligent digital integration. To enable more consistent comparison and benchmarking of project outcomes, standardized assessment measures are necessary, as indicated by the variety of approaches used in different studies.

Table 3. The key themes along with related sub-themes, new developments, illuminating information, and corroborating research from the literature review.

Principal Theme	Analytical Dimensions	Evolving Research Patterns	Interpretative Insights	Representative Studies
Strategic Project Planning and Control	Integrated planning systems, digital scheduling platforms, workflow stabilization	Rapid expansion of BIM-based scheduling, simulation-supported planning, and software-driven coordination tools	Digitally supported planning enhances schedule predictability, reduces process variability, and strengthens inter-disciplinary coordination, thereby minimizing delays and performance deviations	Assaad et al. (2020); Garcés & Peña (2023); Pan & Zhang (2021); Luong et al. (2021)
Quality Governance and Performance Monitoring	Continuous auditing, compliance verification, performance metrics tracking	Transition from end-stage inspection toward lifecycle-based quality monitoring and data-driven QA/QC systems	Formalized quality frameworks combined with digital monitoring tools significantly reduce defect occurrence, rework rates, and non-conformance issues	Arefazar et al. (2022); Taboada et al. (2023); Ciric Lalic et al. (2022); Sheng et al. (2020)
Resource and Sustainability Optimization	Labor efficiency, material utilization, energy management, environmenta	Increased adoption of multi-objective optimization models incorporatin	Balanced allocation of labor, materials, and energy resources improves	Lotfi et al. (2022); Sheng et al. (2020); Luong et al. (2021)

			structural integrity, reduces waste generation, and supports sustainable project delivery	
	l impact assessment	g sustainability indicators		
Risk Analytics and Proactive Mitigation	Risk identification frameworks, predictive modeling, probabilistic analysis	Growing use of statistical models and optimization algorithms to quantify and manage project uncertainties	Early-stage risk forecasting and structured mitigation planning reduce cost overruns, schedule disruptions, and quality failures	Assaad et al. (2020); Luong et al. (2021); Jackson (2020)
Digital Transformation and Intelligent Systems Integration	AI-based forecasting, blockchain-enabled transparency, BIM–IoT integration, digital twins	Acceleration of smart construction ecosystems integrating real-time data analytics and decentralized governance systems	Intelligent technologies enhance transparency, predictive control, coordination accuracy, and decision-making reliability, contributing directly to higher building quality and operational efficiency	Pan & Zhang (2021); Taboada et al. (2023); Sheng et al. (2020); Lotfi et al. (2022)

Thematic emphasis across specified core study topics is shown in Figure 5. In construction project management research, strategic planning, quality governance, and digital transformation have received significant academic attention, as evidenced by the bar chart that displays the concentration of supporting studies across five main themes. Conversations.

The studied literature indicates a robust and constant correlation between the attainment of higher building quality and construction project management competencies (Fig. 5). Structured planning, methodical scheduling, cost control, proactive risk reduction, and coordinated stakeholder engagement are among the basic management features that stand out as critical factors in project success across the chosen studies. For example, the synthesis by Duarte and Silva (2023) and the empirical modeling by González et al. (2022) demonstrate that projects using formalized management frameworks have better adherence to technical standards, lower cost variance, and fewer schedule interruptions. These results imply that disciplined and integrated management systems applied throughout the project lifecycle are more responsible for high-performing buildings than technical know-how alone. Instead than depending on reactive or disjointed corrective actions, project managers, contractors, and developers are therefore urged to institutionalize standardized management procedures.
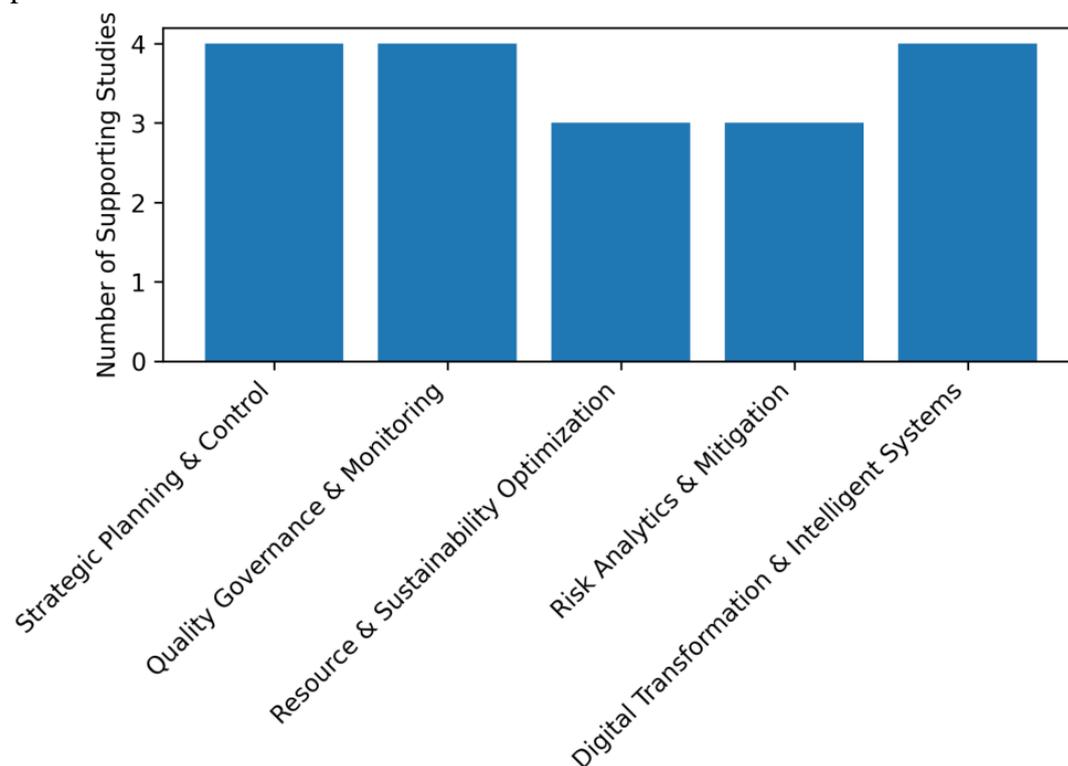

Figure 5. Distribution of methodological approaches among the reviewed studies.

4. Discussion

The need of stakeholder cooperation and communication in preserving construction quality is another recurrent issue in the literature. Effective cooperation between contractors, consultants, designers, and clients is a fundamental element of quality assurance, according to studies (Fig. 6). Communication breakdowns often lead to design inconsistencies, excessive rework, and misreading of technical specifications, as

research by Martínez et al. (2021) and Rahman and Aziz (2022) shows. Projects that use structured communication protocols, which are frequently integrated into digital management platforms, on the other hand, show better alignment of project goals and fewer quality variations. By facilitating real-time information sharing, clash identification, and progress tracking, the incorporation of commonly used systems like Building Information Modelling (BIM) significantly improves collaboration. In addition to increasing productivity, this digital revolution encourages better uniformity and transparency in a variety of construction settings.

The evidence under consideration also implies that institutional and contextual factors influence how effective project management techniques are. According to studies like Lee and Park (2021) and Karim et al. (2022), the necessity for strict risk management and ongoing quality control systems is heightened in quickly growing construction industries due to financial constraints, skilled labor shortages, and tight deadlines. Research from more developed construction economies, on the other hand, highlights lifecycle performance optimization, sustainability integration (Fig. 6). A continuous improvement models as the main forces behind quality improvement. These contextual variations show that although project management's fundamental ideas never change, their operational focus can be modified to accommodate regional industry realities without sacrificing the quality of the results.
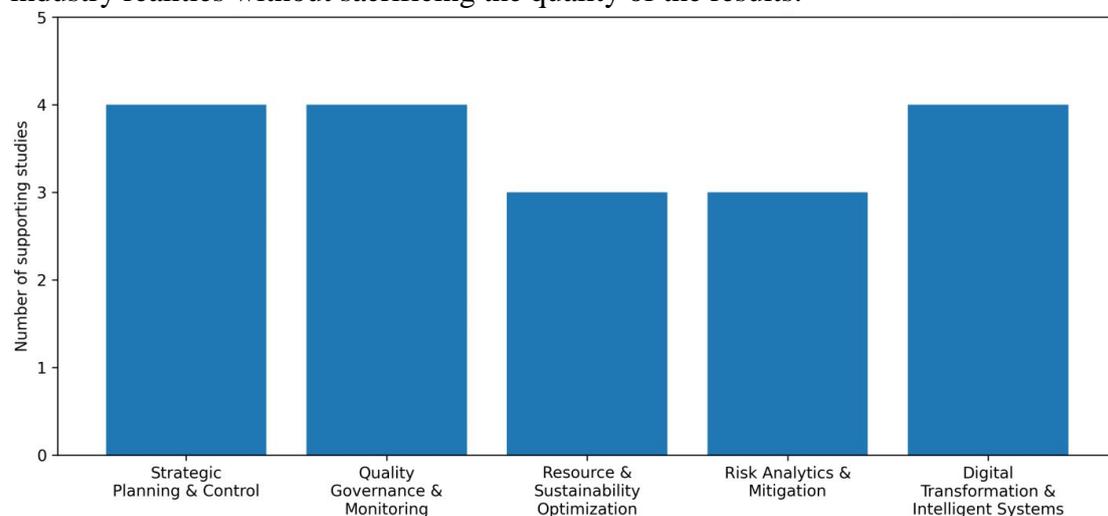

Figure 6. Evidence concentration across the major discussion themes.

The relative concentration of academic evidence across the five main themes found in this review is shown graphically in Figure 6. The distribution shows that among the analyzed papers, the most research support is given to Digital Transformation and Intelligent Systems, Quality Governance and Monitoring, and Strategic Planning and Control. This implies that organized planning processes, ongoing performance evaluation, and digital integration are highly valued in current construction management research as the main forces behind improving building quality.

The established significance of workflow stabilization, structured scheduling systems, and BIM-supported coordination in lowering variability and eliminating delays is reflected in the prominence of strategic planning and control. The field's shift

from reactive inspection models to lifecycle-based quality assurance frameworks backed by digital audits and real-time data tracking technologies is further highlighted by the prominent representation of Quality Governance and Monitoring.

Organized project management techniques, such as Lean Construction, BIM-enabled coordination, and digital quality monitoring systems, have been shown to significantly improve building quality through increased stakeholder collaboration, timetable control, and planning accuracy. Using cutting-edge digital tools, especially data-driven monitoring systems and BIM-based platforms, improves efficiency and accountability. Even though these methods work well for a variety of project kinds, their application needs to be flexible enough to accommodate local and contextual circumstances. In order to guarantee reliable and superior construction results, the literature thus advocates for the use of standardized management frameworks in conjunction with adaptable execution techniques.

5. Future studies

Future studies ought to go beyond discrete analyses of management tools and instead focus on integrated, interdisciplinary frameworks that incorporate intelligent digital technologies, sustainable performance measurements, and predictive risk modeling. In the context of unified management platforms, future research could create thorough quality assurance models that integrate digital twins, lifecycle sustainability indicators, artificial intelligence, and real-time analytics. Researchers would be able to assess long-term environmental and performance results in addition to operational efficiency with such integration.

To confirm the transferability of these project management techniques, comparative studies across various geographic locations, economic situations, and regulatory frameworks are also required. Globally adaptable best practices could be improved and contextual factors influencing implementation success could be identified with the aid of extensive cross-country investigations. Deeper understanding of the long-term effects of integrated management systems on building performance may also be possible by extending research toward longitudinal project assessments.

Small- and medium-sized construction projects require more empirical research since organizational capability and resource limitations may have a different impact on the adoption of Lean, BIM, and digital QA/QC systems than they do on major infrastructure projects. Furthermore, future studies ought to investigate sophisticated hybrid frameworks that methodically assess the combined (synergistic) effects of automated quality monitoring technologies, lean techniques, predictive analytics, and BIM-based coordination.

6. Study Limitations

There are various restrictions on this review. First, only empirical research published between 2020 and 2024 was included in the analysis, which would have left out previous fundamental studies that influenced the theoretical evolution of building

project management frameworks. The chosen time period may restrict historical depth even as it guarantees current relevance. Second, only peer-reviewed journal papers published in English were included in the literature search. This criterion might create publishing and language bias, thereby ignoring important contributions from regional industry reports or non-English publications. Consequently, some contextual viewpoints might not be adequately reflected. Third, the evaluation mostly looked at infrastructure initiatives for government, business, and household use. The findings may not be as broadly applicable as they may be because other sectors, like small-scale developments, specialized engineering projects, and industrial building, were not thoroughly covered.

7. Conclusion

The importance of structured project management approaches, especially Lean Construction, Building Information Modeling (BIM), and digital Quality Assurance/Quality Control (QA/QC) systems, in enhancing building quality and project performance is highlighted by this systematic review. Through better coordination, monitoring, and data-driven decision-making, the compiled evidence shows that these methods increase cost control, fortify schedule reliability, and lower faults. According to the results, combining lean workflow concepts with coordination platforms that are allowed by BIM results in more reliable project execution, less delays, and improved stakeholder participation. Projects gain from early error discovery, less rework, and enhanced technical standard compliance when planning procedures are in line with digital modeling environments.

These advantages are further enhanced by technological developments. Real-time monitoring systems, AI-supported analytics, and digital QA/QC tools all assist proactive risk management and ongoing quality assurance. Through continuous performance monitoring across the construction lifecycle, these technologies replace reactive inspection as the primary method of quality control at project completion. However, contextual considerations such as organizational capabilities, economic situations, regulatory frameworks, and regional industry maturity all affect how effective certain project management strategies are. Even while integrated management systems have a proven track record of success, its application needs to be flexible enough to accommodate regional limitations and operational realities.

In conclusion, the research affirms that a strong basis for producing high-quality construction projects is formed by the confluence of lean approaches, digital coordination tools, predictive analytics, and organized governance systems. To further maximize construction performance and sustainability outcomes, future developments should place a higher priority on context-sensitive implementation tactics, standardized evaluation measures, and deeper technological integration.

Competing interests: The authors declare no competing interests.

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