

Assessment of Digital Project Management Tools and Construction Project Performance in Lagos State, Nigeria

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Abstract: *This study assessed the perceived contribution of Digital Project Management (DPM) tools to construction project performance in Lagos State, Nigeria. A quantitative cross-sectional survey was conducted among construction and built-environment professionals with experience in digital project management. Of 220 questionnaires distributed, 81 valid responses were analyzed using the Relative Importance Index (RII). DPM tools were rated favorably across all six performance dimensions examined (RII = 0.80–0.88). Stakeholder communication and collaboration ranked highest, followed by project scheduling and planning, quality control and assurance, and cost control and budget management, while resource allocation and risk management and mitigation were jointly ranked fifth. The results suggest that the immediate value of DPM tools lies in strengthening information flow and coordination, consistent with Organizational Information Processing Theory. The study recommends integrated use of digital tools across communication, scheduling, quality, cost, resource and risk management processes to improve construction project delivery.*

Keywords: Digital project management tools; construction project performance; digital transformation; construction management; Relative Importance Index; Lagos State

INTRODUCTION

The construction industry is an important component of socio-economic development because it provides the buildings, transportation facilities, industrial structures and other physical infrastructure required to support productive activities and improve societal welfare. Despite its importance, achieving satisfactory construction project performance remains a persistent challenge, particularly in developing economies where projects frequently experience cost escalation, schedule delays, quality deficiencies, poor coordination and productivity problems. Nigeria is not exempt from these challenges, as cost overruns, time overruns and deficiencies in project quality continue to affect the successful delivery of construction projects (Ikediashi and Ogwueleka, 2016; Windapo et al., 2021).

These persistent performance problems have increased the need for more effective approaches to project planning, coordination, monitoring and control.

Construction project performance generally reflects the extent to which predetermined project objectives are achieved. Although project success can be assessed from several perspectives, cost, time and quality remain fundamental measures of construction project performance. Cost performance concerns the ability to execute a project within its approved financial provision; time performance reflects completion within the established project schedule; while quality performance relates to compliance with specified standards, designs and client requirements (Ingle and Mahesh, 2024; Olatunde et al., 2026). The interdependence of these dimensions means that weaknesses in planning, communication, information management or project control can adversely affect the overall performance of a construction project.

The increasing complexity of construction projects has consequently strengthened interest in digital technologies as mechanisms for improving project-management processes. Construction projects involve numerous participants, including clients, consultants, contractors, architects, engineers, quantity surveyors, suppliers and regulatory institutions, whose activities require effective coordination throughout the project lifecycle. Conventional approaches that depend substantially on paper-based documentation, fragmented information systems and manual communication can constrain the timely exchange of information required for effective decision-making. In response, the construction industry is increasingly adopting digital technologies to improve how project information is generated, communicated, stored, analyzed and utilized (Oke et al., 2023; Arowoia et al., 2024).

Digital project management tools encompass digital applications, platforms and technologies that support project planning, scheduling, budgeting, communication, documentation, collaboration, monitoring and control. They include project-management software, Building Information Modelling (BIM), cloud-based collaboration platforms, mobile applications, digital cost-management systems, Internet of Things (IoT)-enabled monitoring technologies and electronic communication systems. The growing application of these technologies is changing construction project management from largely fragmented and manually coordinated processes towards more integrated, information-driven systems. Evidence from the Nigerian construction industry similarly indicates increasing interest in ICT applications, BIM, automation and other emerging digital technologies for supporting construction activities (Ikediashi and Ogwueleka, 2016; Oke et al., 2023; Arowoia et al., 2024).

The relevance of digital project management tools to construction performance lies principally in their capacity to improve the availability, accuracy and timeliness of project information. Effective cost, time and quality management depends considerably on the ability of project teams to identify deviations, communicate changes and make appropriate decisions before problems become more difficult or expensive to correct. Digital systems can facilitate resource planning, cost monitoring, scheduling, documentation, design coordination and real-time information exchange. BIM, for example, facilitates the integration and visualization of project information, supports early identification of design conflicts and enhances coordination of project changes (Ogunbayo and Aigbavboa, 2024). Similarly, digital scheduling and collaboration platforms can improve the monitoring of project activities and facilitate faster communication among project participants, thereby strengthening project control (Alnaser et al., 2023).

These capabilities have important implications for the traditional dimensions of construction project performance. Improved access to project information can strengthen cost control by facilitating more

accurate estimation, expenditure monitoring and management of design changes. Digital scheduling and monitoring can assist project managers in tracking activities, milestones and resource utilization, thereby supporting timely corrective action where deviations occur. Likewise, shared digital information environments can enhance quality management by improving access to current drawings, specifications, inspection information and project documentation. Existing studies therefore suggest that digital technologies can contribute to better cost, time and quality outcomes when they are effectively incorporated into construction project-management processes (Ikediashi and Ogwueleka, 2016; Ogunbayo and Aigbavboa, 2024; Das et al., 2025).

Despite these potential benefits, the transition towards comprehensive digital construction management remains uneven, particularly in developing construction markets. Within Nigeria, the level of awareness, adoption and utilization varies considerably across different technologies and construction organizations. While conventional ICT applications and electronic communication technologies have become increasingly common, more advanced technologies such as BIM, automation and digital twins have experienced comparatively slower implementation (Arowoia et al., 2024; Oke et al., 2023; Babatunde et al., 2021). Consequently, the existence of digital technologies and recognition of their potential benefits do not necessarily imply that they are being sufficiently utilized to generate measurable improvements in construction project performance.

This issue is particularly relevant in Lagos State, which represents an important construction environment in Nigeria and accommodates substantial building and infrastructure development activities involving numerous project participants. The complexity and scale of construction activities within the state create significant requirements for effective information management, communication, coordination and project control. Recent evidence from Lagos indicates growing utilization of digital applications among construction professionals, although the level of adoption differs substantially across technologies. Dekolo and Dekolo (2026), for example, found relatively greater utilization of mobile-based technologies and AutoCAD, while more advanced applications, including BIM and project-scheduling software, remained less extensively utilized. Earlier evidence also identified implementation challenges affecting BIM uptake among construction organizations in Lagos (Babatunde et al., 2021). Thus, although digital transformation is progressing, its integration into construction project-management practice remains incomplete.

More importantly, much of the existing Nigerian literature has concentrated on the awareness, adoption, utilization, barriers and perceived benefits of particular digital technologies. Studies have examined ICT utilization, BIM adoption, automation techniques and emerging technologies such as digital twins, thereby providing useful evidence regarding the digital transformation of the Nigerian construction industry (Babatunde et al., 2021; Oke et al., 2023; Arowoia et al., 2024). However, establishing that construction professionals are aware of, adopt or perceive benefits from digital technologies is different from empirically establishing the extent to which their utilization translates into improved project outcomes. This distinction is important because technological adoption can only contribute meaningfully to project delivery when its application improves relevant performance indicators.

Furthermore, the rapid evolution of construction technologies creates a need to reconsider the relationship between digitalization and project performance from a broader and more contemporary perspective. Earlier Nigerian research demonstrated relationships between ICT utilization and construction project performance (Ikediashi and Ogwueleka, 2016), but contemporary digital project management extends beyond conventional ICT systems to include BIM, cloud-based collaboration,

mobile project-management applications, IoT-enabled monitoring, automation and increasingly data-driven technologies (Oke et al., 2023; Arowoia et al., 2024). Emerging applications of artificial intelligence, digital twins and immersive technologies further demonstrate the continuing transformation of construction project-management practices in Nigeria (Enebe et al., 2026).

Consequently, an empirical gap remains regarding the extent to which the utilization of digital project management tools translates into measurable improvements in the core performance dimensions of construction projects within Lagos State. Although existing Lagos-based evidence has provided important insights into technology adoption and its perceived benefits, there remains a need for research that moves beyond awareness and adoption to directly examine the performance consequences associated with the utilization of digital project management tools. Such evidence is necessary to determine whether increasing digitalization is actually contributing to improved cost management, timely project delivery and quality performance within the construction environment.

Against this background, this study assesses the perceived contribution of digital project management tools to construction project performance in Lagos State, Nigeria. Specifically, construction project performance is considered in terms of six indicators: stakeholder communication and collaboration, project scheduling and planning, quality control and assurance, cost control and budget management, resource allocation, and risk management and mitigation. By ranking the perceived contribution of digital project management tools to these performance dimensions, the study provides contemporary empirical evidence on the performance implications of digitalization within the Lagos construction industry. The study therefore extends existing research by shifting attention from predominantly technology awareness, adoption and perceived benefits towards the performance implications of integrating digital tools into construction project-management processes.

LITERATURE REVIEW AND THEORETICAL UNDERPINNING

Radman et al. (2026) provide more direct empirical evidence on the performance effects of integrated digital project-management technologies. They developed and evaluated RealCONs, a real-time digital monitoring framework integrating QR codes, BIM, mobile data capture, cloud-based SQL storage and Power BI analytics. A 90-day comparative case analysis involving two concurrent electrical and instrumentation projects showed that the digitally monitored project achieved stronger cost and schedule performance indices than the conventionally monitored project. The digital system also improved data continuity, early delay detection and forecasting reliability. These findings are important because they demonstrate the benefits of integrating multiple digital tools rather than examining technologies individually.

Alabi et al. (2026) conducted a systematic review of BIM adoption in Nigeria using 40 peer-reviewed studies published between 2013 and 2024. Their findings indicated that BIM adoption remains relatively nascent and is constrained by policy weaknesses, skill shortages and high implementation costs. The authors also found that approximately 80% of the reviewed studies relied mainly on survey methods, thereby revealing methodological concentration within Nigerian BIM research. Importantly, they observed that existing studies are disproportionately concentrated in Lagos and Abuja and argued for broader methodological and technological approaches. Their findings demonstrate that Nigerian digital-construction research remains heavily adoption-oriented rather than performance-oriented.

Dekolo and Dekolo (2026) provide particularly relevant evidence because their study was conducted specifically among building professionals in Lagos State. Using data from 53 purposively selected

respondents, they applied descriptive statistics, Exploratory Factor Analysis, reliability analysis and multivariate regression to examine ICT adoption through the People, Process, Product and Policy framework. Their results showed that mobile technologies and AutoCAD were relatively commonly utilized, whereas more advanced technologies, including BIM and project scheduling software, remained underutilized. Respondents identified improved communication, productivity and time savings among the major benefits of ICT utilization. Workplace ICT access and ICT expertise were also found to be significant predictors of adoption.

Ogunbode et al. (2025) examined strategic information-technology integration and project delivery within Nigeria's construction industry. The study surveyed 287 construction professionals and applied factor analysis and regression techniques. It identified three levels of digital integration—operational, tactical and transformative. Firms exhibiting transformative integration recorded significantly better technical performance, collaboration and quality outcomes. Strategic alignment between IT utilization and project objectives emerged as the strongest predictor of success, followed by cross-functional integration of digital tools. Interestingly, however, the study did not find significant differences in cost and time performance across the identified integration categories. This finding is particularly important because it indicates that the effect of digitalization may vary across individual performance dimensions rather than producing uniform improvements in all project outcomes.

Rinchen et al. (2024) examined BIM adoption and digital transformation in developing countries. Through a comprehensive review of BIM literature from 2013 to 2023, the study identified project efficiency, improved collaboration and cost reduction as important benefits of BIM implementation. It also showed that limited infrastructure, resource constraints, inadequate technological readiness and institutional weaknesses continue to impede effective BIM implementation in developing economies. The findings are especially relevant to the Nigerian context because they suggest that the impact of digital technologies on construction performance is conditional on organizational and environmental readiness. Consequently, performance improvements found in technologically mature settings cannot necessarily be transferred directly to developing environments without accounting for contextual limitations.

Ogunbayo and Aigbavboa (2024) assessed the impacts associated with the use of BIM among construction professionals. Their findings revealed that BIM contributes to improved coordination, project information management, design visualization and overall construction management processes. Such capabilities have implications for cost, time and quality because improved information integration can reduce errors, enhance decision-making and minimize the likelihood of rework. Their study supports the wider argument that digital project-management applications can enhance construction performance. Nonetheless, BIM represents only one component of the broader digital project-management ecosystem.

Uduokhai et al. (2023) examined the role of Building Information Modelling in improving project performance in Nigeria. Using a mixed-method approach incorporating project performance information, questionnaires and professional perspectives, the study considered BIM in relation to cost efficiency, time management, quality assurance and stakeholder collaboration. The findings indicated that BIM has considerable potential to improve project planning, coordination and resource management and consequently enhance project outcomes. The study provides useful evidence that advanced digital technologies can affect several dimensions of project performance rather than merely improving communication. Nevertheless, its concentration on BIM alone does not account for the broader collection of digital tools currently employed in project management.

Akomolafe et al. (2022) investigated the impact of ICT on the performance of building construction companies in Southwestern Nigeria. The study used questionnaire data from 85 construction companies and examined the application of ICT tools, including BIM, enterprise resource planning systems and related management technologies. The findings indicated that ICT utilization had a significant positive impact on organizational and project performance. The study reinforces the argument that digital applications can improve construction performance, particularly where they are integrated into planning, resource management and control processes. Nevertheless, its emphasis was primarily on company performance and cost-related indicators rather than simultaneously assessing cost, time and quality as distinct construction project performance dimensions.

Concept of Digital Project Management Tools

Digital transformation has increasingly influenced the management and delivery of construction projects. Digital project management tools refer to technology-enabled applications, systems and platforms used to support project planning, scheduling, budgeting, communication, collaboration, documentation, monitoring and control. Their application represents a shift from predominantly manual and fragmented project-management practices towards integrated and information-driven processes. Within construction, digitalization is particularly important because projects involve multiple organizations, professional disciplines and geographically dispersed participants who must continuously exchange information and coordinate interdependent activities.

Digital project management tools encompass a broad range of technologies, including project-management software, Building Information Modelling (BIM), cloud-based collaboration platforms, mobile applications, electronic document-management systems, digital cost-management applications, Internet of Things (IoT) technologies, automated monitoring systems and emerging data-driven technologies. Oke et al. (2023) observed that automation technologies are increasingly influencing construction processes as the industry moves towards digital transformation. Similarly, Arowoia et al. (2024) highlighted the growing relevance of digital twin technology to construction project performance, demonstrating the continued expansion of digital applications beyond conventional information and communication technologies.

The value of these technologies lies not merely in their availability but in their integration into project-management processes. Construction activities generate substantial volumes of information relating to designs, specifications, schedules, costs, procurement, resources, quality inspections and progress reports. Where such information is fragmented or communicated inefficiently, project teams may experience delays in decision-making, duplication of activities, design conflicts and poor coordination. Digital tools provide mechanisms through which information can be captured, updated, stored and shared among project participants, thereby improving the information environment within which project decisions are made.

Building Information Modelling is among the prominent technologies associated with digital construction management. BIM provides a digital representation of physical and functional characteristics of construction facilities and supports the integration of information across different stages of project development. Its application facilitates visualization, clash detection, quantity estimation, coordination and management of project information. Ogunbayo and Aigbavboa (2024) found that BIM applications have important implications for the performance of construction professionals and projects, particularly through improvements in information management and

coordination. Das et al. (2025) similarly demonstrated the relevance of BIM to project cost and time outcomes.

Cloud-based systems and mobile applications have further expanded digital project-management capabilities. These technologies enable project participants to access, exchange and update information irrespective of physical location. Such accessibility is important in construction because contractors, consultants, clients, suppliers and site personnel often operate from different locations. Digital collaboration can therefore shorten communication cycles and improve the responsiveness of project teams to emerging issues. In the Nigerian construction environment, ICT systems have been associated with improved project-management processes and performance outcomes (Ikediashi and Ogwueleka, 2016).

The effectiveness of digital project management tools, however, depends on the extent to which they are actually adopted and integrated into organizational practices. The presence of sophisticated technologies does not automatically produce improved project performance. Appropriate technological infrastructure, employee competence, organizational support, financial capacity and willingness to change established work practices are required for effective utilization. Oke et al. (2023) demonstrated that awareness and utilization of automation technologies vary within the Nigerian construction industry, suggesting that digital transformation remains an evolving process.

Construction Project Performance

Construction project performance concerns the extent to which a construction project achieves its predetermined objectives and satisfies the expectations established for its delivery. Project performance is multidimensional because construction projects are expected to achieve several interrelated objectives rather than a single outcome. Traditional construction project assessment has emphasized the cost-time-quality relationship, commonly referred to as the project management “iron triangle.” Contemporary project-performance assessment has expanded beyond these indicators to include safety, sustainability, stakeholder satisfaction, environmental performance and other measures of project success.

Despite this broader perspective, cost, time and quality remain fundamental indicators because they directly reflect important contractual and managerial expectations associated with project delivery. Ingle et al. (2024) emphasized the multidimensional nature of construction project performance and the importance of systematic performance assessment. Within the Nigerian construction industry, cost, time and quality have similarly remained important considerations in assessing project outcomes (Ikediashi and Ogwueleka, 2016).

For this study, construction project performance is anchored on cost performance, time performance and quality performance, which are extended in the empirical analysis to include stakeholder communication and collaboration, resource allocation, and risk management and mitigation. These dimensions provide the basis for examining whether the utilization of digital project management tools contributes to measurable improvements in construction project delivery in Lagos State.

Cost Performance

Cost performance refers to the extent to which a construction project is delivered within its approved budget or financial provision. It involves the relationship between planned and actual expenditure and

reflects the effectiveness with which financial and physical resources are managed throughout project implementation. Poor cost performance may manifest through budget overruns, excessive variations, rework, inaccurate estimates, resource wastage and uncontrolled changes.

Digital project management tools can influence cost performance by improving cost estimation, resource planning, quantity measurement, expenditure monitoring and change management. BIM, for example, enables project information to be integrated with quantities and cost-related information, potentially improving the accuracy and timeliness of financial decisions. Digital systems can also facilitate early detection of discrepancies between planned and actual expenditure, enabling managers to implement corrective measures before deviations become substantial.

Ogunbayo and Aigbavboa (2024) identified performance-related benefits associated with BIM utilization among construction professionals, while Das et al. (2025) reported evidence concerning BIM's implications for project time and cost. Earlier Nigerian evidence also established that ICT utilization was associated with construction project performance, including cost-related outcomes (Ikediashi and Ogwueleka, 2016). These findings provide a basis for expecting effective utilization of digital project management tools to contribute positively to construction cost performance.

Time Performance

Time performance concerns the ability to complete construction activities and the overall project within established schedules. Construction delays can generate additional costs, disrupt resource allocation, create contractual disputes and reduce stakeholder satisfaction. Effective schedule management therefore requires appropriate planning, sequencing, monitoring and coordination of interdependent construction activities.

Digital project management tools provide several mechanisms for strengthening time management. Scheduling software allows project teams to develop activity sequences, identify dependencies, establish milestones and continuously monitor actual progress against planned schedules. Cloud-based communication and mobile applications can accelerate information exchange, while BIM can support construction sequencing and visualization of planned activities.

Alnaser et al. (2023) demonstrated the relevance of BIM to construction project time performance, indicating that digitalized project processes can influence project duration. Das et al. (2025) similarly linked BIM implementation with project time and cost outcomes. Digital technologies can therefore contribute to time performance by increasing the visibility of project progress and enabling deviations from schedules to be identified and addressed more promptly.

Quality Performance

Quality performance reflects the degree to which completed construction work conforms to predetermined designs, specifications, standards and client requirements. Quality problems may arise from inaccurate project information, design inconsistencies, inadequate supervision, poor communication, defective workmanship or failure to comply with specifications. Such deficiencies can result in defects, rework, additional expenditure and delays.

Digital project management tools can support quality performance by improving documentation, information accuracy, design visualization and communication of technical requirements. BIM-based clash detection can identify inconsistencies before construction commences, while digital document-management systems can ensure that project participants have access to current versions of drawings

and specifications. Digital inspection and monitoring systems can also facilitate recording, communicating and resolving quality-related issues.

Ikediashi and Ogwueleka (2016) identified quality-related improvements among the performance implications associated with ICT utilization in Nigerian construction. Similarly, the capabilities associated with BIM and other digital technologies suggest that effective digitalization can reduce information-related errors and strengthen project quality management (Ogunbayo and Aigbavboa, 2024).

Digital Project Management Tools and Construction Project Performance

The relationship between digital project management tools and construction project performance can be explained through the information, coordination and control functions performed by digital technologies. Construction performance depends partly on the capacity of project teams to obtain accurate information, communicate effectively, coordinate interdependent tasks, allocate resources appropriately and detect deviations from project plans. Digital technologies potentially strengthen each of these capabilities.

For cost performance, digital tools can improve estimating, budgeting, quantity management and expenditure tracking. For time performance, they can enhance scheduling, progress monitoring and communication of changes. For quality performance, digital applications can strengthen design coordination, documentation, inspection and information consistency. The overall relationship therefore suggests that increased and effective utilization of digital project management tools should be associated with better construction project performance.

Nevertheless, the strength of this relationship may vary considerably across construction environments. Digital technologies can only generate performance benefits where they are appropriately implemented and used. Inadequate infrastructure, insufficient technological competence, resistance to organizational change and limited investment can reduce their effectiveness. This consideration is particularly relevant in developing construction markets where adoption of advanced digital technologies remains uneven (Oke et al., 2023; Arowoia et al., 2024).

Theoretical Foundation

The Technology–Organization–Environment (TOE) framework provides an appropriate theoretical basis for understanding the adoption and utilization of digital technologies within construction organizations. The framework, developed by Tornatzky and Fleischer (1990), proposes that organizational adoption of technological innovations is influenced by three broad contexts: technological, organizational and environmental.

The technological context concerns available technologies and their characteristics, including compatibility, complexity and potential advantages. Within construction project management, this relates to the availability and suitability of BIM, project-management software, cloud technologies, IoT applications and related digital systems. Technologies perceived as useful, compatible with existing operations and capable of improving project activities are more likely to receive organizational attention.

The organizational context includes characteristics such as firm size, financial resources, managerial support, technological competence and organizational readiness. Construction organizations may recognize the potential benefits of digital project management tools but remain unable to implement them effectively because of financial, technical or human-resource limitations. The environmental context incorporates external pressures such as competition, client expectations, regulatory requirements, industry practices and technological developments.

The TOE framework is relevant to the present study because the performance effects of digital project management tools depend partly on their effective organizational utilization. However, because the principal focus of the study is the impact of digital tools on project performance rather than solely their adoption, the framework is more useful in explaining the conditions under which digital utilization may occur than the entire performance relationship.

Another theory that forms the basis for this study is the Organizational Information Processing. Organizational Information Processing Theory (OIPT) was principally developed by Galbraith (1973, 1974). The theory conceptualizes organizations as information-processing systems and proposes that organizational effectiveness depends on the ability to match information-processing capacity with the information-processing requirements created by task uncertainty and complexity. As uncertainty increases, organizations require greater amounts of timely and relevant information to facilitate coordination and effective decision-making. Theory provides a stronger explanation of how digital project management tools can influence construction project performance. The theory views organizations as information-processing systems whose effectiveness depends on their capacity to acquire, process and communicate the information required to manage uncertainty and coordinate activities.

Construction projects exhibit considerable information-processing requirements because multiple stakeholders must continuously exchange technical, financial and operational information. Changes in design, project schedules, quantities, resource requirements and site conditions create uncertainty that requires timely information for effective decision-making. Where information-processing capacity is inadequate, coordination problems and decision delays can arise.

Digital project management tools increase information-processing capacity by enabling faster collection, integration, storage, retrieval and communication of project information. BIM integrates different forms of construction information; cloud platforms facilitate real-time collaboration; project-management software supports scheduling and monitoring; and digital reporting systems provide project managers with more timely information concerning performance. From this perspective, improved information-processing capacity should strengthen cost control, schedule management and quality assurance.

Organization Information Processing Theory is therefore particularly appropriate for the present study because it establishes a logical mechanism connecting the independent and dependent variables. Digital project management tools enhance information-processing and coordination capabilities, which in turn can improve construction project performance.

METHODOLOGY

The study adopted a quantitative cross-sectional survey design to examine digital project management practices and their relationship with construction project performance in Lagos State. The target population comprised professionals actively involved in construction project delivery, including civil

and structural engineers, project managers, contractors, consultants, quantity surveyors, architects, ICT specialists and other built-environment professionals. Respondents were selected based on their direct involvement in project execution, supervision, planning, monitoring or coordination and their practical knowledge of digital project management tools.

Due to the absence of a comprehensive sampling frame for construction professionals within Lagos State, the Cochran (1977) formula for large or unknown populations was employed to determine the sample size. At a 95% confidence level, 5% margin of error and population proportion of 0.50, a minimum sample size of 385 respondents was obtained. However, because of practical field constraints and limited access to qualified professionals and some project sites, 220 questionnaires were distributed, of which 81 valid responses were retrieved and analyzed, representing a response rate of 36.8%. A combination of purposive and stratified sampling techniques was adopted. Purposive sampling ensured the selection of professionals with relevant experience in construction project delivery and digital project management, while stratification facilitated representation of the major professional groups involved in project delivery.

Primary data were collected using a structured questionnaire administered to the selected professionals. The instrument captured information on respondents' characteristics, adoption and utilization of digital project management tools, project performance, implementation challenges and strategies for improving digital project management practices. Secondary information obtained from peer-reviewed journal articles, textbooks, policy documents, conference proceedings and relevant professional and industry publications provided theoretical and contextual support for the study. Questionnaire items were predominantly measured on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Both electronic and physical modes of administration were employed, while completed questionnaires were screened for completeness before coding and analysis.

The validity of the research instrument was established through expert assessment by professionals with relevant expertise in construction project management, digital technologies and academic research. The questionnaire was assessed for clarity, relevance, adequacy and consistency with the objectives of the study, and the resulting observations were incorporated into the final instrument. Construct validity was further addressed by aligning the measurement items with the theoretical constructs underpinning the study. Ethical principles were observed throughout the data-collection process; participation was voluntary, respondents were informed of the purpose of the research, and anonymity and confidentiality were assured.

Data were analyzed using SPSS Version 25. Descriptive statistics comprising frequencies, percentages and mean scores were used to summarize respondents' characteristics, patterns of digital project management adoption and responses relating to project performance. The Relative Importance Index (RII) was employed to assess and rank respondents' perceptions of the contribution of Digital Project Management (DPM) tools to construction project performance. The assessment covered six performance indicators: stakeholder communication and collaboration, project scheduling and planning, quality control and assurance, cost control and budget management, resource allocation, and risk management and mitigation. RII values ranged from 0 to 1, with values closer to 1 indicating a higher perceived contribution of DPM tools to the respective performance indicator.

RESULTS/FINDINGS

This section presents the results of the assessment of the influence of Digital Project Management (DPM) tools on construction project performance in Lagos State, Nigeria. Respondents evaluated the perceived contribution of DPM tools to six dimensions of project performance: stakeholder communication and collaboration, project scheduling and planning, quality control and assurance, cost control and budget management, resource allocation, and risk management and mitigation. Responses were measured on a five-point Likert scale and analyzed using the Relative Importance Index (RII) to establish the relative importance and ranking of the performance indicators. Table 1 presents the RII results.

Table 1. Assessment of Digital Project Management Tools and Construction Project Performance

Item	1	2	3	4	5	ΣF	ΣFx	Mean	RII	Rank
Stakeholder communication and collaboration	1	2	7	26	45	81	355	4.38	0.88	1st
Improved project scheduling and planning	1	2	8	28	42	81	351	4.33	0.87	2nd
Quality control and assurance	2	3	9	25	42	81	345	4.26	0.85	3rd
Cost control and budget management	2	4	10	29	36	81	336	4.15	0.83	4th
Resource allocation	3	5	11	30	32	81	326	4.02	0.80	5th
Risk management and mitigation	2	6	13	27	33	81	326	4.02	0.80	5th

Source: Author's Estimation from Field Survey

As shown in Table 1, all six performance indicators recorded relatively high mean scores, ranging from 4.02 to 4.38, while the RII values ranged from 0.80 to 0.88. This concentration of RII values in the upper range indicates a generally favourable assessment of the contribution of DPM tools to construction project performance. More importantly, the results show that the perceived benefits are multidimensional rather than restricted to the traditional cost-time-quality measures of project performance.

To provide a clearer visual representation of respondents' assessment, Figure 1 illustrates the Relative Importance Index (RII) values of the six construction project performance indicators examined in the study. The figure highlights the relative ranking of the perceived contributions of Digital Project Management tools to stakeholder communication and collaboration, project scheduling and planning, quality control and assurance, cost control and budget management, resource allocation, and risk management and mitigation.

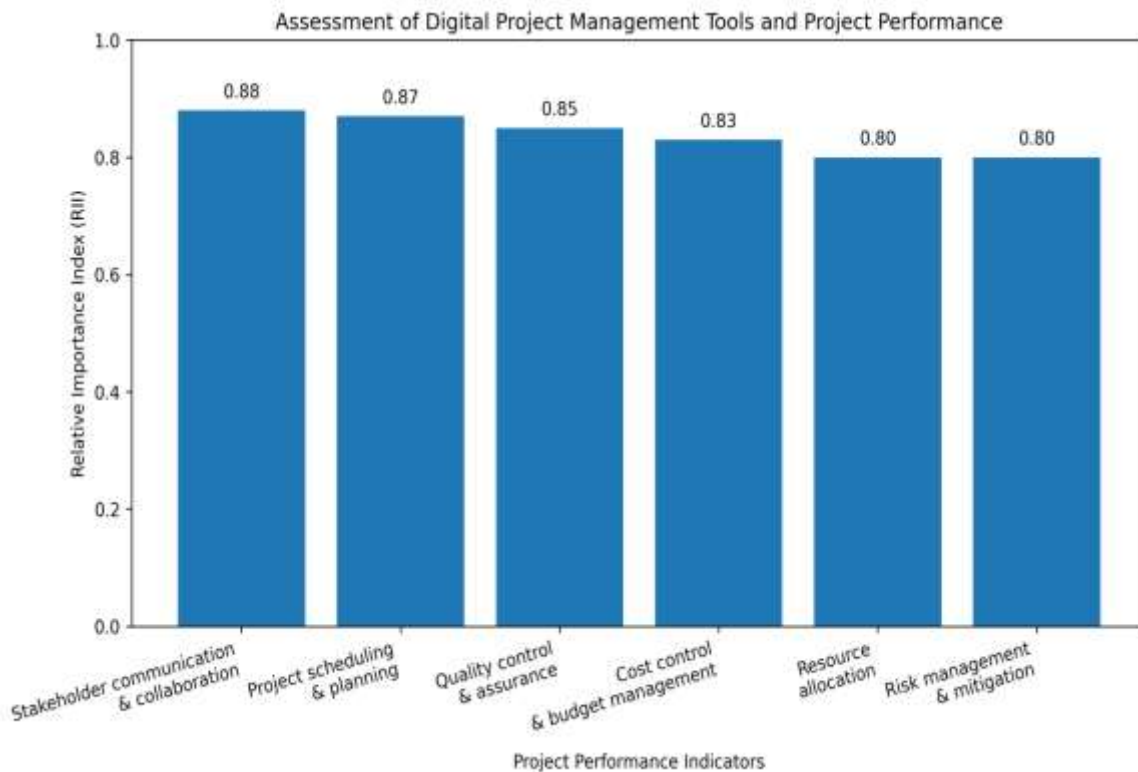


Figure 1. RII values of construction project performance indicators

Source: Author's Computation from Field Survey

DISCUSSION

Stakeholder communication and collaboration emerged as the highest-ranked performance indicator, with a mean score of 4.38 and an RII of 0.88. This suggests that the most visible contribution of DPM tools, from the respondents' perspective, is their ability to facilitate communication, information sharing and coordination among parties involved in project delivery. Construction projects typically require continuous information exchange among clients, consultants, contractors, project managers and other specialists. Digital platforms can provide shared access to project information and improve the speed with which changes, progress information and project-related decisions are communicated. This finding supports Ikediashi and Ogwueleka (2016), who found that the application of ICT systems in the Nigerian construction industry was associated with improved information management and project delivery. It is also consistent with Ogunbayo and Aigbavboa (2024), who identified improved collaboration and information exchange among the important benefits associated with BIM application in construction.

Project scheduling and planning ranked second, with a mean score of 4.33 and an RII of 0.87. The result indicates that construction professionals attach considerable importance to DPM tools for planning activities, establishing project schedules, monitoring progress and coordinating interdependent tasks. Digital scheduling and monitoring systems enable project teams to compare actual progress with planned activities and identify emerging deviations earlier than would ordinarily be possible with fragmented manual reporting systems. The finding agrees with Alnaser et al. (2023),

whose study demonstrated the relevance of BIM-based approaches to construction project time management. It is also supported by Radman et al. (2026), who showed that integrated digital monitoring can improve project visibility and enable earlier detection of schedule deviations. Thus, the high ranking obtained for scheduling and planning is particularly important because delays remain a persistent project-delivery concern in construction.

Quality control and assurance ranked third, recording a mean score of 4.26 and an RII of 0.85. This finding suggests that respondents perceived digital tools as valuable for monitoring compliance with project specifications, coordinating design information, documenting project activities and identifying potential errors during project execution. Digital documentation and model-based systems can create greater information consistency between design and construction activities, thereby strengthening quality-control processes. The result is consistent with Ogunbayo and Aigbavboa (2024), who reported quality-related benefits from BIM application, and with Ogunbode et al. (2025), whose Nigerian construction-industry evidence showed that more advanced forms of IT integration were associated with better technical and quality performance. The implication is that the usefulness of DPM tools extends beyond administrative project management to the technical control of project outputs.

Cost control and budget management ranked fourth with a mean score of 4.15 and an RII of 0.83. Although this dimension ranked below communication, scheduling and quality, its RII still indicates a strong positive assessment. Digital project management systems can facilitate the integration of cost information with project activities, improve expenditure monitoring and provide project managers with more timely information for budgetary decisions. Evidence from BIM-based project studies similarly suggests that digital technologies can contribute to improved cost management, although the magnitude of the benefit may vary according to the technology employed and the level of integration achieved. For example Das et al. (2025) found improvements in project cost and time outcomes in their BIM case studies. However, the relatively lower ranking of cost control in the present study is also noteworthy. It suggests that respondents may experience the communication and scheduling benefits of digital tools more directly than their financial benefits, which may depend on integration with organizational accounting, procurement and cost-management systems.

Resource allocation and risk management and mitigation were jointly ranked fifth, each recording a mean score of 4.02 and an RII of 0.80. Their lower rankings should not be interpreted as evidence of weak contribution because both attained comparatively high RII values. Rather, they indicate that these benefits were perceived as less prominent relative to communication, scheduling, quality and cost control. Digital project management systems can support resource allocation by providing information about activity requirements, workforce deployment, equipment utilization and competing demands on project resources. Similarly, improved access to real-time project information can support the earlier identification and monitoring of emerging project risks. Nevertheless, realizing these benefits may require more sophisticated integration of project databases, analytics and organizational decision-support systems than is required for basic communication and scheduling functions.

The ranking reveals an important pattern. The two highest-rated indicators—stakeholder communication and collaboration (RII = 0.88) and scheduling and planning (RII = 0.87)—are fundamentally information-intensive and coordination-intensive activities. This provides empirical relevance to the Organizational Information Processing Theory underpinning the study. Galbraith's (1974) information-processing perspective proposes that organizations facing uncertainty and task interdependence require greater capacity to acquire, process and communicate information. In the construction environment, DPM tools potentially increase this information-processing capacity by

providing more timely project information, facilitating coordination and supporting decision-making. The findings therefore suggest that the contribution of digitalization may originate first from improved information flows and coordination, which can subsequently support improvements in time, quality and cost performance.

The RII analysis establishes the relative importance attached to the different performance dimensions but does not demonstrate that DPM adoption independently caused the observed improvements. Within this methodological limitation, the results provide strong perceptual evidence that construction professionals in Lagos State associate DPM tools with improved project delivery, particularly through enhanced communication and collaboration, scheduling and planning, quality assurance and cost management.

The findings demonstrate that DPM tools are perceived to contribute positively across all six dimensions of construction project performance examined. The prominence of communication and scheduling suggests that the immediate value of digitalization lies particularly in strengthening information exchange, project visibility and coordination among project participants. At the same time, the favourable assessments of quality, cost, resource allocation and risk management indicate that the perceived benefits extend to broader aspects of construction project delivery. The results therefore reinforce the relevance of digital project management as a mechanism for improving the management and coordination of construction projects in Lagos State, Nigeria.

IMPLICATION TO RESEARCH AND PRACTICE

For research, the findings provide empirical support for Organizational Information Processing Theory in the construction context, since the highest-rated contributions of DPM tools, stakeholder communication and collaboration, and scheduling and planning, are primarily information- and coordination-intensive. The results also show that the perceived contribution of digital tools varies across performance dimensions, suggesting that studies of construction digitalization should examine individual performance outcomes rather than treat project performance as a single construct. For practice, the following implications arise.

Based on the findings of the study, construction firms, contractors, consultants and project managers in Lagos State should strengthen the integration of Digital Project Management (DPM) tools throughout the construction project lifecycle. Particular attention should be given to digital platforms that facilitate real-time communication, information sharing and collaboration among project stakeholders, since stakeholder communication and collaboration emerged as the highest-rated performance dimension.

Construction organizations should further integrate DPM tools into quality and cost management processes. Digital documentation, quality-monitoring systems and model-based coordination should be used to improve compliance with project specifications and minimize errors and rework, while project-management platforms should be linked more effectively with budgeting and cost-control processes to strengthen expenditure monitoring and financial decision-making.

Greater attention should also be directed towards the use of DPM tools for resource allocation and risk management, as these dimensions recorded the lowest rankings despite their relatively high RII values. Construction organizations should expand digital applications beyond communication and scheduling to support resource planning, risk identification, risk monitoring and timely implementation of mitigation measures.

Construction organizations should promote more integrated use of digital project management technologies across project functions. Rather than operating individual digital tools in isolation, project stakeholders should establish interconnected digital workflows that support communication, scheduling, quality management, cost control, resource management and risk management. Such integration would enable construction firms to derive broader performance benefits from digitalization and strengthen overall construction project delivery in Lagos State.

CONCLUSION

This study assessed the contribution of Digital Project Management (DPM) tools to construction project performance in Lagos State, Nigeria, with particular attention to stakeholder communication and collaboration, project scheduling and planning, quality control and assurance, cost control and budget management, resource allocation, and risk management and mitigation. The findings demonstrate a generally favourable perception of DPM tools across all the performance dimensions examined.

The study therefore concludes that DPM tools constitute an important mechanism for enhancing the management of construction projects in Lagos State. Their perceived benefits extend beyond communication and coordination to key dimensions of project performance, including time, quality and cost management. However, since the findings are based on respondents' perceptions and RII rankings, they should be interpreted as evidence of the perceived contribution and relative importance of DPM tools rather than proof of a causal relationship. Greater and more integrated utilization of digital project management technologies could further strengthen the efficiency and effectiveness of construction project delivery in Lagos State.

FUTURE RESEARCH

This study relied on respondents' perceptions and RII rankings, which establish relative importance but not causality. Future studies could use objective project data, such as cost and schedule performance indices and defect or rework records, to measure the actual effect of DPM tools on project outcomes. Larger, probability-based samples and inferential techniques such as regression or structural equation modelling would allow the relationship between the extent of DPM utilization and each performance dimension to be tested directly. Comparative studies across Nigerian states, project types and firm sizes, as well as longitudinal or case-study designs that track projects before and after DPM implementation, would further clarify the conditions under which digital tools improve construction project performance.

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