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Building Information Modeling as a Tool for Improving Project Cost Performance in the Construction Industry

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Abstract - Building Information Modeling (BIM) has emerged as a transformative digital technology that enhances project planning, coordination, and cost management within the construction industry. This study examined the impact of Building Information Modeling on project cost performance in Ondo State, Nigeria, with a view to demonstrating its role in improving cost efficiency, minimizing cost overruns, and enhancing the overall financial performance of construction projects. The study provides valuable insights for construction professionals, policymakers, and researchers seeking to promote the adoption of BIM in the Nigerian construction industry. A structured questionnaire was administered to 100 construction professionals comprising quantity surveyors, architects, engineers, and builders actively involved in construction projects within the study area. A total of 71 valid responses were retrieved and used for the analysis, representing a response rate of 71.0%. Descriptive statistics were employed, with frequency and percentage used to analyse the demographic characteristics of the respondents, while the impact of BIM on project cost performance was evaluated using mean score and ranking techniques. The findings revealed that Building Information Modeling has a significant positive impact on project cost performance by reducing the likelihood of cost overruns, improving cost estimation accuracy, strengthening cost control mechanisms, and enhancing overall financial management throughout the project lifecycle. The study concluded that Building Information Modeling (BIM) has a significant positive impact on project cost performance by enhancing cost estimation, budgeting, forecasting, risk management, project coordination, and profitability while reducing cost overruns, rework, errors, and project disputes. The findings confirmed that BIM is an indispensable tool for improving cost management and achieving successful project delivery in the construction industry. The study therefore recommended increased adoption of BIM across all stages of project delivery, continuous training of construction professionals, investment in BIM technologies and digital infrastructure, integration of BIM into construction-related curricula, supportive government policies to promote BIM implementation, and greater collaboration among project stakeholders to maximize its benefits in improving project cost performance.

Keywords: Building Information Modeling (BIM), Project Cost Performance, Cost Management, Construction Industry, Nigeria.

INTRODUCTION

The construction industry plays a significant role in national economic development through the provision of infrastructure, housing, industrial facilities, and employment opportunities. However, the industry continues to experience persistent challenges such as cost overruns, project delays, design conflicts, poor communication among project participants, and inefficient information management. These challenges have negatively affected project performance and have increased the demand for innovative digital technologies capable of improving project planning, coordination, and cost management. Building Information Modeling (BIM) has emerged as one of the most effective digital innovations for addressing these challenges by integrating project information into a collaborative digital environment throughout the project life cycle (International Organization for Standardization [ISO], 2018; Olanrewaju, Chileshe, Babarinde, & Sandanayake, 2020).

Building Information Modeling is a process for creating and managing digital information about built assets throughout their lifecycle. The ISO 19650 series describe BIM as an information management process based on the use of a common data environment to facilitate collaboration among project participants during the planning, design, construction, and operational phases of a project. By providing a shared platform for information exchange, BIM enables architects, engineers, quantity surveyors,

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builders, contractors, and clients to access accurate and coordinated project information, thereby improving decision-making and reducing errors associated with traditional design and documentation methods (ISO, 2018).

Project cost performance remains one of the most important indicators of success in construction projects because it reflects the ability to deliver projects within approved budgets while meeting the required quality and functional standards. Poor cost performance often results from inaccurate quantity estimation, design inconsistencies, inadequate coordination, frequent variations, and rework during project execution. The integration of BIM into construction project delivery has significantly improved cost management through automated quantity take-off, enhanced cost estimation accuracy, early clash detection, better design coordination, and improved communication among project stakeholders. Consequently, BIM has become an essential tool for improving cost efficiency and minimizing unnecessary project expenditures (ISO, 2018).

The adoption of BIM has gained considerable attention within the Nigerian construction industry over the last decade. Nevertheless, its implementation remains relatively slow compared with many developed countries. Olanrewaju *et.al* (2020) investigated the barriers to BIM implementation within the Nigerian construction industry and found that inadequate BIM knowledge, high implementation costs, the absence of government policies, insufficient contractual frameworks, and limited technical expertise are among the most significant factors hindering its adoption. Despite these challenges, the study established that Nigerian construction professionals recognize the potential of BIM to improve project delivery and organizational performance.

Subsequently, Olanrewaju, Babarinde, Chileshe, and Sandanayake (2021) identified several important drivers that could accelerate BIM implementation in Nigeria, including increased government support, improved awareness, professional training, client demand, and organizational commitment to digital transformation. Their findings suggest that wider BIM adoption would enhance project coordination, improve information management, and contribute to better project cost performance across the Nigerian construction industry.

Similarly, Olanrewaju, Babarinde, and Salihu (2020) examined the current state of BIM within the Nigerian construction industry and reported that BIM awareness has increased among construction professionals, although its practical application remains limited. The study recommended increased investment in BIM education, supportive government policies, and industry-wide capacity development to maximize the benefits of digital construction technologies.

Although previous Nigerian studies have focused primarily on BIM awareness, implementation barriers, adoption drivers, and the current state of BIM practice, empirical evidence specifically examining BIM as a tool for improving project cost performance remains limited, particularly within Ondo State. Given the increasing complexity of construction projects and the need for improved cost control, there is a growing need to investigate how BIM contributes to accurate cost estimation, reduction of rework, effective cost control, improved coordination, and enhanced financial performance. Therefore, this study examines Building Information Modeling as a tool for improving project cost performance in the construction industry with a view to providing empirical evidence that will support wider BIM adoption and improve cost management practices within the Nigerian construction industry.

LITERATURE REVIEW

2.1 Building Information Modeling as a Tool for Improving Project Cost Performance in the Construction Industry

Building Information Modeling (BIM) has become one of the most significant technological innovations transforming the global construction industry. Unlike conventional computer-aided design (CAD), which primarily produces two-dimensional drawings, BIM provides an intelligent digital representation of the physical and functional characteristics of a facility throughout its lifecycle. The International Organization for Standardization (ISO, 2018) defines BIM as a collaborative process for creating, managing, and exchanging information throughout the planning, design, construction, operation, and maintenance phases of built assets. This integrated digital environment enables project stakeholders to access accurate and up-to-date project information, thereby facilitating informed decision-making and improving project delivery.

The adoption of BIM has increased considerably over the past decade because of its ability to improve collaboration, productivity, project quality, and cost performance. According to Eastman, Teicholz, Sacks, and Liston (2018), BIM enables architects, engineers, quantity surveyors, contractors, and clients to work from a common digital model rather than relying on fragmented drawings and isolated databases. The centralized nature of BIM significantly minimizes inconsistencies in project documentation, improves information sharing, and reduces errors that frequently occur during project execution.

Project cost performance remains one of the principal indicators of construction project success. Cost performance refers to the ability of a project to achieve its objectives within the approved budget while maintaining the required quality and project schedule. However, the construction industry continues to experience frequent cost overruns arising from inaccurate estimates, design changes, poor communication, material waste, contractual disputes, and rework. Bryde, Broquetas, and Volm (2013) observed that

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BIM provides substantial opportunities for improving project performance through enhanced visualization, better communication, improved coordination, and more reliable cost management processes. Although their study predates the ten-year threshold, its findings remain foundational and have been reinforced by more recent investigations.

One of the most important contributions of BIM to project cost performance is its ability to automate quantity take-off and cost estimation. Traditional quantity surveying practices require manual measurement from two-dimensional drawings, a process that is often laborious, time-consuming, and susceptible to human errors. BIM-generated models automatically produce quantities directly from the digital model, thereby improving estimating accuracy while reducing the time required for preparing Bills of Quantities. Babatunde, Perera, Ekundayo, and Adeleye (2020) investigated BIM-based detailed cost estimating among quantity surveying firms in Nigeria and found that BIM significantly improves the accuracy of cost estimates, enhances productivity, reduces estimating errors, and supports better decision-making during project planning. Their findings further revealed that BIM facilitates efficient quantity extraction and enables quantity surveyors to produce more reliable cost information for clients and project teams.

Similarly, Smith (2016) emphasized that BIM has fundamentally transformed quantity surveying practice by integrating three-dimensional models with project cost information to create what is commonly referred to as five-dimensional (5D) BIM. Through 5D BIM, every modification made to the project design automatically updates quantities and associated costs, allowing project teams to evaluate the financial implications of design changes instantly. This capability greatly enhances cost planning, cost forecasting, budgeting, and value engineering throughout the project lifecycle.

Another important mechanism through which BIM improves project cost performance is clash detection. Construction projects frequently experience cost overruns because structural, architectural, and mechanical services are designed independently using different software platforms. These inconsistencies often remain undetected until construction commences, resulting in expensive modifications, delays, and disputes. BIM integrates all project disciplines into a single coordinated model, enabling automatic identification of clashes before construction begins. According to Hardin and McCool (2015), early clash detection substantially reduces design conflicts, minimizes rework, improves project coordination, and contributes to considerable cost savings throughout project execution.

Construction rework has consistently been identified as one of the major contributors to project cost escalation. Love, Edwards, Han, and Goh (2018) argued that design errors, omissions, inadequate communication, and poor coordination account for a substantial proportion of construction waste and unnecessary expenditure. The authors emphasized that digital technologies such as BIM significantly reduce these problems by enabling virtual construction, design validation, and multidisciplinary coordination before physical construction commences. Consequently, construction organizations adopting BIM experience lower levels of rework, improved labour productivity, reduced material wastage, and enhanced overall project performance.

Beyond improving estimating accuracy and reducing rework, BIM also enhances communication among project stakeholders. Construction projects involve numerous professionals, including architects, engineers, builders, quantity surveyors, contractors, subcontractors, suppliers, and clients. Traditional project delivery methods often rely on fragmented communication channels that contribute to misunderstandings, duplicated efforts, and inconsistent project information. BIM provides a Common Data Environment (CDE) where project participants can simultaneously access current project information and coordinate their activities. ISO 19650-1 (2018) recognizes the Common Data Environment as a critical component of BIM implementation because it promotes transparency, accountability, and effective collaboration throughout project delivery.

Improved communication has significant implications for project cost performance. According to Kassem *et.al* (2017), BIM maturity enables organizations to integrate information across multiple disciplines, thereby reducing communication barriers and facilitating collaborative decision-making. Effective collaboration improves project coordination, accelerates problem resolution, reduces project uncertainties, and minimizes costly design modifications. As a result, BIM contributes not only to technical improvements but also to better financial performance and stakeholder satisfaction.

Visualization is another important characteristic of BIM that contributes to improved cost performance. Three-dimensional visualization enables project stakeholders to understand design concepts more effectively than conventional two-dimensional drawings. This enhanced visualization allows clients to identify design deficiencies, request modifications early, and participate actively in project decision-making before construction begins. According to Volk, Stengel, and Schultmann (2014), BIM visualization supports improved planning, enhances design quality, reduces design errors, and facilitates lifecycle information management. Although the study primarily focused on existing buildings, its conclusions regarding visualization and information integration remain highly relevant to project cost management.

Within the Nigerian construction industry, BIM adoption has grown steadily but remains relatively low compared with developed economies. Olanrewaju et.al (2020) examined barriers to BIM implementation in Nigeria and identified inadequate technical expertise, high software acquisition costs, insufficient organizational support, lack of government policies, and limited awareness

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as the principal challenges hindering BIM adoption. Nevertheless, the study concluded that construction professionals increasingly recognize BIM as a valuable innovation capable of improving project efficiency, reducing construction waste, and enhancing project cost performance. Their findings further suggest that increasing professional education, institutional support, and government involvement will significantly accelerate BIM implementation within the Nigerian construction industry.

The benefits of BIM extend beyond design visualization and project coordination to encompass comprehensive cost management throughout the project lifecycle. One of the distinctive features of BIM is its integration with cost information, commonly referred to as five-dimensional (5D) BIM. Five-dimensional BIM links three-dimensional project models with cost databases, enabling automatic updating of project costs whenever modifications are made to the design. This functionality provides project managers and quantity surveyors with real-time information regarding the financial implications of design decisions, thereby facilitating proactive cost control and reducing the likelihood of budget overruns. According to Smith (2016), the integration of cost information into BIM significantly enhances estimating accuracy, improves cost planning, and supports informed investment decisions throughout project delivery.

Effective cost forecasting and budgeting are essential for achieving successful project outcomes. Traditional budgeting approaches often rely on periodic manual updates, making it difficult to monitor cost fluctuations resulting from design modifications or construction progress. BIM enables dynamic cost forecasting by continuously synchronizing project quantities with cost information. Consequently, project managers can evaluate different design alternatives, assess their financial implications, and select the most cost-effective solutions before construction commences. This proactive approach enhances financial control and minimizes unexpected project expenditure (Eastman *et.al*, 2018).

Another significant contribution of BIM is the enhancement of risk management in construction projects. Cost risks frequently arise from incomplete designs, inaccurate information, unforeseen site conditions, material price fluctuations, and poor coordination among project participants. BIM enables project teams to identify potential risks during the planning and design stages through simulation, visualization, and integrated project information. By detecting design conflicts and constructability issues before physical construction begins, BIM reduces uncertainty and supports effective mitigation strategies. Kassem *et.al* (2017) argued that BIM maturity improves organizational capability in managing project risks by facilitating informed decision-making, integrated information management, and collaborative project delivery.

The ability of BIM to simulate construction processes also contributes significantly to improved project cost performance. Four-dimensional (4D) BIM integrates project schedules with three-dimensional models, enabling construction teams to visualize project sequencing and monitor progress virtually. This simulation improves construction planning, identifies potential scheduling conflicts, optimizes resource allocation, and minimizes idle time on construction sites. Improved planning reduces delays that frequently result in additional labour costs, equipment expenses, and contractual claims. According to Hardin *et.al* (2015), integrating construction scheduling with BIM improves project efficiency, minimizes waste, and contributes to substantial reductions in project costs.

Material management represents another important area in which BIM enhances cost performance. Construction materials constitute a significant proportion of total project costs, and ineffective material management often results in waste, theft, over-ordering, and increased storage costs. BIM-generated quantity schedules provide accurate material requirements, enabling contractors to procure materials based on actual project needs. This reduces unnecessary purchases and minimizes material wastage. Furthermore, digital material tracking improves inventory management and supports just-in-time delivery, thereby lowering storage costs and improving cash flow management (Smith, 2016).

Numerous empirical studies have confirmed the positive relationship between BIM adoption and project performance. Bryde *et.al* (2013), through a comprehensive review of BIM implementation across several countries, reported that BIM adoption consistently improves project coordination, reduces project costs, enhances communication, and increases client satisfaction. Similarly, Volk *et.al* (2014) observed that BIM supports efficient lifecycle information management by integrating planning, construction, operation, and maintenance data into a unified digital environment. Such integration promotes better decision-making throughout the lifecycle of construction projects and contributes to long-term cost savings.

Within the Nigerian construction industry, BIM adoption has continued to attract increasing scholarly attention. Babatunde *et.al* Adeleye (2020) found that quantity surveyors who adopted BIM-based cost estimating experienced improvements in estimating accuracy, project coordination, and productivity compared with traditional estimating methods. Their study further established that BIM enables efficient quantity extraction, improves cost reliability, and facilitates rapid evaluation of alternative design solutions. These findings reinforce the growing importance of BIM in modern quantity surveying practice.

Similarly, Olanrewaju *et.al* (2021) investigated the factors influencing BIM implementation in Nigeria and identified improved project performance, enhanced collaboration, increased productivity, and better cost management as major drivers encouraging organizations to adopt BIM. Their study demonstrated that professionals increasingly recognize BIM as a strategic tool capable of

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improving organizational competitiveness and project delivery despite the challenges associated with implementation costs and technical capacity.

Although BIM offers numerous advantages, several challenges continue to hinder its widespread adoption, particularly in developing countries. High software acquisition costs, inadequate training opportunities, resistance to organizational change, limited government support, insufficient technical expertise, lack of standardized contractual frameworks, and poor interoperability among software applications remain major obstacles. Olanrewaju *et.al* (2020) emphasized that these barriers significantly limit BIM implementation in Nigeria despite growing awareness among construction professionals. Similarly, Babatunde *et.al* (2020) identified inadequate BIM education and insufficient organizational commitment as important constraints affecting BIM utilization among quantity surveying firms.

Notwithstanding these implementation challenges, recent technological advancements continue to strengthen the relevance of BIM in construction cost management. The integration of BIM with emerging technologies such as artificial intelligence, cloud computing, digital twins, laser scanning, drones, the Internet of Things (IoT), and blockchain has expanded its capabilities beyond traditional design coordination. These technologies facilitate real-time project monitoring, automated progress measurement, predictive cost analysis, lifecycle asset management, and transparent financial reporting. Consequently, BIM has evolved into a comprehensive digital platform supporting sustainable project delivery and improved financial performance across the construction industry.

From the foregoing literature, it is evident that BIM has become an indispensable tool for improving project cost performance. The technology enhances quantity take-off accuracy, facilitates reliable cost estimation, supports effective budgeting and forecasting, minimizes design errors, reduces construction rework, improves communication among stakeholders, strengthens cost transparency, enhances risk management, and promotes informed decision-making throughout the project lifecycle. Empirical evidence from both developed countries and Nigeria consistently demonstrates that BIM contributes significantly to reducing project costs while improving productivity and profitability. Nevertheless, achieving these benefits requires sustained investment in professional training, organizational commitment, supportive government policies, standardized implementation frameworks, and continuous technological advancement. The reviewed literature therefore provides strong theoretical and empirical support for investigating the impact of Building Information Modeling on project cost performance within the Nigerian construction industry.

RESEARCH METHODOLOGY

3.1 Research Design

This study adopted a descriptive survey research design to examine the impact of Building Information Modeling (BIM) on project cost performance in the construction industry. The choice of this research design was informed by its suitability for collecting quantitative data from construction professionals regarding their perceptions and experiences with the application of BIM in project cost management. The descriptive survey approach enabled the researcher to obtain firsthand information from respondents without manipulating the study variables, thereby providing an objective assessment of the phenomenon under investigation.

3.2 Study Area

The study was conducted in Ondo State, Nigeria, where construction activities have continued to expand due to increasing investments in residential, commercial, institutional, and infrastructural developments. The State is home to several consulting firms, contracting organizations, and government establishments employing professionals such as Quantity Surveyors, Architects, Engineers, and Builders who are actively involved in the planning, design, procurement, execution, and management of construction projects. These professionals constituted suitable respondents because of their familiarity with Building Information Modeling and construction cost management practices.

3.3 Population of the Study

The population for the study comprised construction professionals practicing within Ondo State. Specifically, the study focused on Quantity Surveyors, Architects, Engineers, and Builders who were directly involved in building construction projects and possessed practical knowledge of Building Information Modeling and project cost management. These professionals formed the target population because they play significant roles in project planning, cost estimation, design coordination, project execution, and financial management throughout the construction process.

3.4 Sampling Technique and Sample Size

The study employed a purposive sampling technique to select respondents from the target population. This sampling approach was considered suitable because it allowed the researcher to deliberately identify and select construction professionals who possess the

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relevant knowledge, skills, and practical experience in the application of Building Information Modeling (BIM) in construction project delivery. Consequently, only Quantity Surveyors, Architects, Engineers, and Builders who were actively participating in building construction projects within Ondo State were included in the study.

The sample size consisted of 100 construction professionals. The selection of the sample was based on the respondents' accessibility, professional competence, and practical experience in BIM implementation and project cost management. Purposive sampling is particularly appropriate for studies where participants are intentionally selected because they possess specialized knowledge that is relevant to the research objectives (Creswell & Creswell, 2018). Similarly, Patton (2015) asserted that purposive sampling focuses on selecting information-rich participants who can provide in-depth and credible information about the phenomenon under investigation rather than achieving statistical representativeness.

Accordingly, 100 structured questionnaires were administered to the purposively selected construction professionals. Of the questionnaires distributed, 71 valid copies were retrieved and found suitable for analysis, representing a 71.0% response rate. This response rate was considered adequate to support the analysis and interpretation of the study findings.

3.5 Instrument for Data Collection

Primary data for the study were collected through a **structured questionnaire** developed after an extensive review of relevant literature on Building Information Modeling and project cost performance. The questionnaire was designed to obtain information relating to the respondents' background characteristics and their perceptions regarding the influence of BIM on construction project cost performance.

The questionnaire consisted of two sections.

Section A elicited information on the demographic characteristics of the respondents, including profession, academic qualification, years of professional experience, and organizational affiliation.

Section B contained statements measuring the impact of Building Information Modeling on project cost performance. The items were structured using a five-point Likert rating scale as follows:

- Strongly Agree (SA) = 5
- Agree (A) = 4
- Undecided (U) = 3
- Disagree (D) = 2
- Strongly Disagree (SD) = 1

The questionnaire items focused on various dimensions of BIM implementation, including cost estimation, cost forecasting, budgeting, design coordination, quantity take-off, management of design changes, reduction of construction rework, cost transparency, project profitability, and overall project cost performance.

3.6 Method of Data Collection

Data were collected through the direct administration of the questionnaire to the selected respondents. The researcher personally visited consulting firms, construction companies, professional offices, and active construction sites within the study area to distribute the questionnaires. This approach enabled the researcher to explain the purpose of the study where necessary and ensured that only eligible respondents participated in the survey.

Completed questionnaires were retrieved immediately after completion or collected during subsequent visits to maximize the response rate. The retrieved questionnaires were screened for completeness and consistency before being coded for statistical analysis.

3.7 Method of Data Analysis

The data obtained from the completed questionnaires were coded and analyzed using the Statistical Package for the Social Sciences (SPSS).

Descriptive statistical techniques were employed to analyze the data. Specifically, frequency distributions and percentages were used to summarize and present the demographic characteristics of the respondents.

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To evaluate the impact of Building Information Modeling on project cost performance, Mean Score (MS) and ranking analysis were employed. The mean score was computed for each questionnaire item to determine the level of respondents' agreement regarding the influence of BIM on project cost performance. Thereafter, the items were ranked in descending order based on their respective mean values, with the highest mean score indicating the most significant perceived impact of Building Information Modeling on project cost performance.

DISCUSSION AND FINDINGS

This section discussed the findings of the study in relation to the research objectives and compares them with relevant literature. The discussion highlights the implications of the findings and demonstrated how the study objectives were achieved.

Table 1 Years of experience in the construction industry

Classification	Frequency	Percentage
1-5 Years	46	64.8
6-10 Years	12	16.9
11-15 Years	4	5.6
16- 20 years	9	12.7
Total	**71**	**100**

Source: Field Survey, 2026.

The results presented in Table 1 show the distribution of respondents according to their years of experience in the construction industry. Out of the total 71 respondents, 46 respondents (64.8%) had 1–5 years of construction industry experience, making this the largest category. This was followed by 12 respondents (16.9%) with 6–10 years of experience. Respondents with 16–20 years of experience accounted for 9 respondents (12.7%), while only 4 respondents (5.6%) had 11–15 years of experience, representing the smallest proportion.

The findings indicate that the majority of the respondents are relatively early in their professional careers, with nearly two-thirds having between one and five years of industry experience. Nevertheless, the inclusion of respondents with over five years of experience provides a reasonable mix of perspectives from both less experienced and more experienced construction professionals. This diversity in years of experience enhances the credibility of the study by ensuring that the responses reflect insights from individuals with varying levels of exposure to construction industry practices.

Table 2: Academic qualification of respondents

Classification	Frequency	Percentage (%)
Higher national diploma/bachelor of science holders	58	81.69
Master of science	7	9.86
Doctor of Philosophy	6	8.45
Total	**71**	**100.0**

Source: Field Survey, 2026.

Table 2 presents the academic qualifications of the respondents. The results indicate that the majority of the respondents, 58 (81.69%), possessed either a Higher National Diploma (HND) or a Bachelor of Science (B.Sc.) degree. Respondents with a Master of Science (M.Sc.) degree accounted for 7 (9.86%), while 6 respondents (8.45%) had attained a Doctor of Philosophy (Ph.D.) degree. The findings demonstrate that most of the respondents possess the minimum academic qualifications required for professional practice in the construction industry. Furthermore, the inclusion of respondents with postgraduate qualifications (M.Sc. and Ph.D.) suggests that the study benefited from contributions from individuals with advanced academic knowledge and professional expertise, thereby enhancing the credibility and reliability of the data collected.

Table 3: Respondent's profession

Variable	Frequency	Percent
Architect	18	25.35

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Quantity Surveyor	20	28.17
Builder	20	28.17
Civil Engineer	10	14.08
Others	3	4.23
Total	**71**	**100.0**

Source: Field Survey, 2026.

Table 3 presents the professional distribution of the respondents. The findings reveal that Quantity Surveyors and Builders constituted the largest proportion of the respondents, with 20 respondents (28.17%) each. This was followed by Architects, who accounted for 18 respondents (25.35%), while Civil Engineers comprised 10 respondents (14.08%) of the sample. Respondents classified under other professions represented the smallest category, with 3 respondents (4.23%). The distribution indicates that the study captured the perspectives of professionals from the major disciplines involved in building construction projects. The relatively balanced representation of Quantity Surveyors, Builders, and Architects, together with the inclusion of Civil Engineers and other related professionals, provided a multidisciplinary perspective, thereby improving the comprehensiveness and reliability of the findings.

Table 4: The impact of Building Information Modeling as a Tool for Improving Project Cost Performance in the Construction Industry

Variables	Mean	R.I.I
Reduced the risk of cost overruns in building projects	4.569	1st
Improved our ability to manage and track expenses	4.472	2nd
Reduced project cost in the construction industry	4.443	3rd
Increase the overall quality of building designs	4.403	4th
Helped to achieve better cost outcomes and improved project profitability.	4.394	5th
Improve ability to create and manage building designs	4.333	6th
Helped us better identify and manage potential cost risk	4.306	7th
Helped to better understand and manage the cost implication of design changes.	4.292	8th
Reduced the risk of cost disputes and claims	4.292	8th
Improved our ability to analyze and optimize project cost	4.271	10th
Improved our ability to accurately estimate project cost	4.268	11th
Resulted in improved cost forecasting and budgeting	4.250	12th
Reduced the time and cost associated with change orders and variations	4.236	13th
Resulted in cost savings from reduced errors to omission	4.222	14th
Reduced the need for costly rework and revisions	4.197	15th
Improved our ability to identify and capture cost savings opportunities.	4.181	16th
Resulted in improved cost transparency and accountability	4.167	17th

Source: Field Survey, 2026.

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Table 4 presents the respondents' assessment of the impact of Building Information Modeling (BIM) on project cost performance in the construction industry. The results indicate that all the identified impacts recorded high mean scores (above 4.00), suggesting a strong level of agreement among respondents that BIM contributes significantly to improving project cost performance.

The highest-ranked impact was reducing the risk of cost overruns in building projects (Mean = 4.569), indicating that respondents perceived BIM as an effective tool for controlling project costs and preventing budget overruns. This finding corroborates the assertions of Bryde et al. (2013), who reported that BIM enhances project performance through improved coordination and cost management, as well as Eastman et al. (2018), who noted that BIM provides accurate and integrated project information that supports better financial control.

The second-ranked impact was improving the ability to manage and track project expenses (Mean = 4.472), while reducing project costs in the construction industry (Mean = 4.443) ranked third. These findings suggest that BIM facilitates effective cost monitoring and enhances overall financial management throughout the project lifecycle. This is consistent with Babatunde et al. (2020), who found that BIM improves estimating accuracy, productivity, and the reliability of cost information, thereby supporting informed decision-making.

Respondents also agreed that BIM increases the overall quality of building designs (Mean = 4.403) and helps achieve better cost outcomes and improved project profitability (Mean = 4.394), ranking fourth and fifth, respectively. These findings reflect the ability of BIM to integrate design information, improve collaboration among project stakeholders, and reduce design-related errors, ultimately enhancing project value and profitability. This supports the views of Hardin et al. (2015) and Love et al. (2018), who emphasized that BIM minimizes design conflicts and construction rework through effective coordination and virtual project modeling.

Furthermore, respondents acknowledged that BIM improves the ability to create and manage building designs (Mean = 4.333), identify and manage potential cost risks (Mean = 4.306), and understand the cost implications of design changes (Mean = 4.292). Similarly, reducing the risk of cost disputes and claims (Mean = 4.292) received a high level of agreement. These findings align with Smith (2016), who explained that the integration of cost information within 5D BIM enables automatic updating of project costs whenever design modifications occur, thereby strengthening cost planning, forecasting, and risk management.

Other highly rated impacts include improving the ability to analyse and optimise project costs (Mean = 4.271), accurately estimate project costs (Mean = 4.268), improving cost forecasting and budgeting (Mean = 4.250), and reducing the time and cost associated with change orders and variations (Mean = 4.236). Respondents also agreed that BIM reduces errors and omissions (Mean = 4.222), minimises costly rework and revisions (Mean = 4.197), identifies cost-saving opportunities (Mean = 4.181), and enhances cost transparency and accountability (Mean = 4.167). These findings are consistent with the literature, which highlights BIM as an integrated digital platform that improves estimating accuracy, facilitates effective budgeting and forecasting, reduces rework, strengthens transparency, and supports proactive cost control throughout the project lifecycle.

The findings demonstrate that construction professionals strongly perceive Building Information Modeling as a valuable tool for improving project cost performance. The consistently high mean scores across all the assessed variables indicate that BIM enhances cost planning, estimation, budgeting, coordination, risk management, and project profitability. These results provide empirical support for the reviewed literature, which identifies BIM as an indispensable technology for achieving effective cost management and successful project delivery in the construction industry. Therefore, the findings confirm that the study achieved its objective of examining the impact of Building Information Modeling on project cost performance in the construction industry, as the respondents overwhelmingly agreed that BIM contributes significantly to improved cost management and overall project success.

CONCLUSION

The findings of this study demonstrate that Building Information Modeling (BIM) has a significant positive impact on project cost performance in the construction industry. The consistently high mean scores recorded across all the assessed variables indicate a strong consensus among construction professionals that BIM enhances various aspects of project cost management. Specifically, BIM was found to be highly effective in reducing the risk of cost overruns, improving the management and monitoring of project expenses, lowering overall project costs, enhancing design quality, and improving project profitability. The findings further reveal that BIM strengthens cost estimation, budgeting, forecasting, risk management, cost optimization, transparency, and accountability while minimizing errors, omissions, rework, disputes, and the costs associated with design changes and project variations.

These findings corroborate existing empirical evidence that BIM serves as an integrated digital platform for improving collaboration, facilitating informed decision-making, and enhancing financial control throughout the project lifecycle. The ability of BIM to provide accurate and real-time project information enables construction professionals to make proactive decisions that improve project efficiency and optimize cost performance.

The study concludes that Building Information Modeling is an indispensable technological innovation for achieving improved project cost performance in the construction industry. The findings confirm that the study successfully achieved its objective of examining the impact of Building Information Modeling on project cost performance, as respondents overwhelmingly agreed that BIM significantly enhances cost management and contributes to successful project delivery.

RECOMMENDATION

Based on the findings of this study, it is recommended that construction organizations increase the adoption and integration of Building Information Modeling (BIM) across all stages of project delivery, including planning, design, cost estimation, construction, and facility management. This will enhance cost performance, improve project coordination, and reduce the likelihood of cost overruns.

Construction professionals, particularly Quantity Surveyors, Architects, Builders, and Civil Engineers, should be provided with continuous professional training and capacity-building programmes on BIM applications, especially in the use of 5D BIM for cost estimation, budgeting, forecasting, and cost control. This will strengthen their technical competence and improve the quality of project cost management.

Construction firms should invest in modern BIM software, digital infrastructure, and skilled personnel to maximize the benefits of BIM implementation. Such investments will improve project coordination, reduce design errors, minimize rework, enhance productivity, and ultimately improve project profitability.

Professional bodies, tertiary institutions, and training centres should incorporate comprehensive BIM education into their academic curricula and professional development programmes. This will ensure that both future and practicing construction professionals acquire the digital skills and competencies required for effective BIM implementation and project cost management.

Government at all levels, through relevant regulatory agencies, should develop and implement policies that encourage or mandate the use of BIM in public construction projects. The provision of implementation guidelines, incentives, and institutional support will accelerate BIM adoption and improve the efficiency and cost performance of construction projects nationwide.

Construction project stakeholders should embrace collaborative project delivery approaches supported by BIM to improve communication, facilitate information sharing, enhance cost transparency and accountability, strengthen risk management, and promote informed decision-making throughout the project lifecycle. The adoption of these measures will contribute to improved project cost performance and the successful delivery of construction projects within budget while maintaining the required quality standards.

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