

An Empirical Analysis of Construction Project Planning Techniques, Financial Management and Contextual Environmental Factors as Predictors of Construction Project Performance in polytechnics in Adamawa state

By

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Abstract

The successful delivery of construction projects in tertiary institutions depends on effective planning, sound financial management, and the ability to manage external environmental challenges. The study examined the influence of construction project planning techniques, financial management practices, and contextual environmental factors on construction project performance in polytechnics in Adamawa State, Nigeria. The study adopted a correlational survey research design. The population of the study comprised of 67 construction and project management personnel responsible for the planning, supervision, and execution of construction projects in the selected polytechnics. The Data were collected through the use of structured questionnaire which was validated by experts and presented an acceptable reliability Cronbach's Alpha coefficient of 0.75. The data were analyzed using mean, standard deviation, and multiple regression analysis with the aid of SPSS Version 26 at the 0.05 level of significance. The findings revealed that the implementation of construction project planning techniques and financial management practices was moderate, while the overall performance of construction projects was also rated as moderate. In contrast, contextual environmental factors were found to have a significant influence on project implementation. The regression analysis showed a strong positive correlation between the predictor variables and construction project performance, with three variables significantly contributing to the project performance. The study suggest that improvement in project planning practices, strengthening of financial management systems, and effective strategies to tackle environmental challenges are essential for enhancing construction project performance in polytechnics in Adamawa State. Among the recommendations proffered include, adoption of modern project planning techniques and proactive strategies for managing financial and environmental risks.

Keywords: construction project planning techniques, financial management, contextual environmental factors, construction project performance, polytechnics, Adamawa State.

INTRODUCTION



Background of the Study

The construction industry is widely recognized as one of the key drivers of socio-economic development because of its contribution to infrastructure provision, employment generation, and overall economic growth (Akinradewo et al., 2019). In Nigeria, the sector plays a pivotal role in supporting national development goals, particularly within the education sector, where the availability of quality infrastructure is essential for effective teaching and learning. This is especially true for polytechnics, whose mandate of providing technical and vocational education depends largely on the availability of functional classrooms, laboratories, workshops, hostels, and other supporting facilities (Oyewobi et al., 2021). Despite the importance of these facilities, the performance of construction projects in Nigerian polytechnics, particularly those located in Adamawa State, has remained a major concern due to recurring problems such as project delays, cost overruns, and poor-quality workmanship (Aibinu & Jagboro, 2002; Oyewobi et al., 2021).

The success of a construction project is commonly assessed using indicators such as timely completion, cost efficiency, quality of work, and the satisfaction of clients and other stakeholders (Egwunatum, 2017). Unfortunately, many construction projects in Nigeria continue to perform below expectations. Previous studies have attributed this trend to weaknesses in project planning, ineffective financial management, and the influence of challenging environmental conditions (Oluwajana et al., 2022; Ikwueze & Nnadi, 2024). For example, Aibinu and Jagboro (2002) identified poor planning and inadequate scheduling as major contributors to project delays and cost overruns within the Nigerian construction industry. Similarly, Okoye (2016) observed that weak financial management practices often result in budgetary constraints, delayed

project execution, and inefficient utilization of available resources. These challenges become even more pronounced in states such as Adamawa, where insecurity and socio-political instability continue to disrupt construction activities. As a result, there is a growing need to understand how these factors interact and collectively influence project performance.

.Effective planning is essential for the successful execution of construction projects. Tools like the Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and Gantt charts are widely used to help schedule and coordinate tasks efficiently. However, in Nigeria, the use of these planning techniques has been inconsistent. A study by Arijeloye et al. (2021) found that while some contractors in Ondo State use planning tools like bar charts and method statements, there is often a lack of proper training for personnel. This leads to these techniques being used ineffectively, resulting in project delays and cost overruns, which ultimately affect the overall success of construction projects.

Financial management plays a crucial role in ensuring the successful completion of construction projects. It involves budgeting, cost control, financial reporting, and managing risks. Poor financial management can lead to issues like cash flow problems, delayed payments to contractors, and, ultimately, project delays or even abandonment. In Adamawa State, small-scale building contractors often struggle with limited capital and restricted access to financial resources, which negatively impacts their ability to perform technically (Abdulmalik *et al* 2020). Furthermore, the lack of strong financial controls and accountability mechanisms in public sector projects only worsens the situation, resulting in inefficient use of funds and lower quality outcomes.

The construction industry doesn't exist in isolation; it's shaped by various external factors. These include political instability, economic shifts, social changes, technological progress, legal regulations, and environmental concerns. In Adamawa state, for example, the ongoing insurgency and insecurity have had a serious impact on construction activities, causing

delays and driving up costs. Adebisi et al. (2015) pointed out that environmental factors such as government policies, instability, and challenges with imports are significant contributors to time and cost overruns in construction projects. These external factors create an unpredictable environment, making it necessary for project teams to adopt flexible strategies to minimize their negative effects on project performance.

Polytechnics in Nigeria play a vital role in developing technical and vocational skills, which are crucial for the country's growth. Building proper educational facilities in these institutions is key to providing students with the space they need to learn and thrive. Unfortunately, construction projects at Nigerian polytechnics have been plagued by various challenges, including poor planning, ineffective financial management, and disruptions caused by environmental factors. These problems are especially severe in the Adamawa state, where security concerns and a lack of resources make infrastructure development even more difficult. When construction projects are delayed or go over budget, it not only wastes public funds but also negatively impacts the quality of education students receive.

Statement of the Problem

Construction projects in educational institutions, particularly polytechnics, play a vital role in providing the infrastructure required for quality technical and vocational education in Nigeria. In Adamawa State, substantial investments have been made by government and donor agencies to expand and improve educational facilities such as lecture halls, laboratories, workshops, hostels, and administrative buildings. Despite these investments, the performance of many construction projects remains unsatisfactory. Common challenges include project delays, cost overruns, poor workmanship, abandoned projects, and low stakeholder satisfaction, all of which reduce the effectiveness of public investment and limit the

ability of polytechnics to fulfill their educational mandates (Aibinu & Jagboro, 2002; Okoye, 2016).

The construction environment in Adamawa State presents unique challenges that further affect project delivery. The region has experienced insecurity arising from insurgency, political instability, weak institutional capacity, and inadequate technical expertise among some contractors. These conditions often disrupt project schedules, increase construction costs, restrict access to project sites and building materials, and ultimately reduce the quality and durability of completed facilities (Ameh et al., 2010; Ibrahim, 2011). Such challenges make it increasingly difficult for construction projects in polytechnics to achieve their intended objectives within the planned time, cost, and quality standards.

One of the major causes of poor project performance is inadequate construction project planning. Effective planning enables project managers to organize resources efficiently, establish realistic schedules, identify potential risks, and monitor project progress. However, many construction projects in the study area continue to rely on traditional planning approaches, with limited application of modern planning tools such as the Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), and computer-based scheduling software. The limited adoption of these techniques reduces the ability of project teams to manage uncertainties, allocate resources efficiently, and achieve project objectives (Kerzner, 2017; Arijeloye et al., 2021).

Financial management also remains a significant challenge affecting construction project performance. Poor budgeting, delayed release of project funds, inadequate financial monitoring, inflation in material prices, and weak accountability systems frequently result in cash flow problems that slow down or completely halt construction activities. Many polytechnics depend heavily on irregular government allocations, making it difficult to sustain project implementation. Consequently, contractors often experience delayed payments, leading to project abandonment,

reduced productivity, and compromised quality of work (Odeyinka et al., 2006; Emerald Insight, 2019). In addition to planning and financial challenges, contextual environmental factors significantly influence construction project outcomes. Political interference, insecurity, changing government policies, economic instability, adverse weather conditions, labour shortages, and community related issues contribute to project delays and increased construction costs. In Adamawa State, insecurity in some local government areas, seasonal rainfall, and logistical difficulties frequently disrupt construction activities. These external factors create uncertainties that project managers must address to ensure successful project delivery (Adebiyi et al., 2015).

Although numerous studies have examined factors affecting construction project performance in Nigeria, most have investigated planning, financial management, or environmental factors independently. For instance, Aibinu and Jagboro (2002) concentrated mainly on causes of project delays, while Arijeloye et al. (2021) emphasized construction planning techniques without integrating financial management and contextual environmental conditions. Consequently, there is limited understanding of how these factors interact collectively to influence project performance, particularly within the unique socio-economic and security conditions of North-East Nigeria. This gap is important because the successful delivery of construction projects in polytechnics directly affects teaching and learning, student welfare, institutional accreditation, and the overall development of technical education. Besides the financial losses associated with abandoned or poorly executed projects, inadequate educational infrastructure weakens the quality of technical and vocational education and undermines national efforts to promote industrial development, innovation, and youth employment. As demand for technical education continues to increase, there is an urgent need to improve the planning, financing, and management of construction projects within educational institutions.

Since successful delivery of construction projects is essential for providing the infrastructure required to support effective teaching and learning in polytechnics. Consequently, construction project planning, sound financial management, and effective management of contextual environmental risks have become critical factors influencing project performance. Understanding how these factors affect the successful delivery of educational infrastructure is therefore of considerable importance. This forms the basis for the present study, which empirically examines the extent to which construction project planning techniques, financial management practices, and contextual environmental factors predict the performance of construction projects in polytechnics in Adamawa State.

Objectives of the Study

The general objective of this study is to assess how construction planning techniques, financial management practices, and contextual environmental factors predict the performance of construction projects in polytechnics in Adamawa State. Specifically the study intend to:

1. Examine the influence of construction planning techniques on the performance of construction projects in polytechnics in Adamawa State.
2. Evaluate the effect of financial management practices on construction project performance in polytechnics in Adamawa State.
3. Analyze the influence of contextual environmental factors on the performance of construction projects in polytechnics in Adamawa State.
4. Determine the combined predictive power of construction planning techniques, financial management practices, and contextual environmental factors on the performance of construction projects in Adamawa State.

Research Questions

1. What is the relationship between construction planning techniques and the performance of construction projects in polytechnics in Adamawa State?
2. How do financial management practices affect construction project performance in polytechnics in Adamawa State?
3. In what ways do contextual environmental factors influence the performance of construction projects in Adamawa State?
4. To what extent do construction planning techniques, financial management practices, and contextual environmental factors jointly predict construction project performance in polytechnics in Adamawa State?

Research Hypotheses

H₀₁: There is no significant relationship between construction planning techniques and construction project performance in polytechnics in Adamawa State.

H₀₂: Financial management practices have no significant effect on construction project performance in polytechnics in Adamawa State.

H₀₃: Contextual environmental factors do not significantly influence construction project performance in polytechnics in Adamawa State.

H₀₄: Construction planning techniques, financial management practices, and contextual environmental factors do not jointly predict construction project performance in polytechnics in Adamawa State.

METHODOLOGY

This study adopted a correlational survey research design to investigate the relationships between construction project planning techniques, financial management practices, contextual environmental factors, and construction project performance in polytechnics located in Adamawa State, Nigeria. The design was considered appropriate because it enabled the researcher to examine the extent to which the independent variables predict variations in construction project performance without manipulating any of the study variables. The study was conducted in Adamawa State, and the target population comprised 67 construction and project management personnel involved in the planning, supervision, and execution of construction projects across the polytechnics in the state. Since the population was relatively small and manageable, all 67 respondents were included in the study.

Data were collected using a structured questionnaire developed by the researcher based on the objectives of the study and relevant literature. The questionnaire consisted of five sections. Section A collected respondents' demographic information, while Section B focused on construction project planning techniques. Section C assessed financial management practices, Section D examined contextual environmental factors, and Section E measured construction project performance. All questionnaire items were rated on a five-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. To ensure the quality of the research instrument, both face and content validity were established through expert review. The questionnaire was evaluated by three specialists: one from Modibbo Adama University, Yola, one from Federal Polytechnic, Mubi, and one from Federal Polytechnic, Bauchi. Their comments and recommendations were incorporated to improve the clarity, relevance, and adequacy of the instrument before it was administered.

The reliability of the instrument was determined using the Cronbach's Alpha method. The analysis produced a reliability coefficient of 0.75, indicating an acceptable level of internal consistency and confirming that the instrument was reliable for data collection. The collected data were

analyzed using the Statistical Package for the Social Sciences (SPSS) Version 26. Descriptive statistics, specifically mean and standard deviation, were used to answer the research questions by summarizing respondents' perceptions of the study variables. In addition, multiple regression analysis was employed to determine the extent to which construction project planning techniques, financial management practices, and contextual environmental factors predict construction project performance in polytechnics in Adamawa State. Statistical significance was determined at the 0.05 level of significance.

RESULTS AND DISCUSSION

Table 1: Respondents' Views on the extent to which Construction Project Planning Techniques are implemented in Construction Projects within Polytechnics in Adamawa State.

Item	Mean	Decision
Work Breakdown Structure (WBS) is used in planning construction projects.	3.45	Agree
Critical Path Method (CPM) is effectively applied in project scheduling.	2.55	Disagree
Gantt charts are utilized to track project progress.	2.24	Disagree
Milestone planning is used in project implementation.	3.39	Agree
Effective resource allocation exists during project planning.	2.48	Disagree
Risk analysis is incorporated into planning processes.	2.99	Moderate
Planning considers procurement timelines.	3.18	Agree
Grand Mean	2.90	Moderate

Table 1 indicates that the implementation of construction project planning techniques in polytechnics in Adamawa State is moderate, with a grand mean of 2.90.

Table 2: Respondents' Perceptions of the Financial Management Practices Adopted in Construction Projects Carried out in Polytechnics in Adamawa State.

Item	Mean	Decision
Project budgets are clearly defined before commencement.	2.61	Disagree
Fund disbursement is timely and consistent.	3.21	Agree
Financial management is transparent.	3.02	Moderate
Regular financial reporting is conducted.	3.18	Agree
Cost control measures are effectively implemented.	2.99	Moderate
Project auditing is conducted during and after completion.	2.99	Moderate
Inflation and market conditions are considered in planning.	2.19	Disagree
Grand Mean	2.88	Moderate

Table 2 reveals that the implementation of financial management practices in construction projects across polytechnics in Adamawa State is moderate, as evidenced by a grand mean of 2.88.

Table 3: Respondents' Perceptions of the Contextual Environmental Factors Affecting Construction Projects in Polytechnics in Adamawa State.

Item	Mean	Decision
Political instability affects project performance.	2.09	Disagree
Security issues hinder project execution	3.54	Agree
Community interference affects project timelines.	3.49	Agree
Weather and climate affect project progress.	3.18	Agree
Cultural and social dynamics influence implementation.	3.25	Agree
Availability of skilled labour affects project outcomes.	3.21	Agree
Bureaucratic processes delay project execution.	4.04	Strongly Agree
Grand Mean	3.26	Agree

Table 3, shows that contextual environmental factors exert a considerable influence on construction projects in the study area, as reflected by a grand mean of 3.26, suggesting that respondents generally agreed that these factors affect project implementation and outcomes.

Table 4: Respondents' Perceptions of Construction Projects Performance in Polytechnics in Adamawa State.

Item	Mean	Decision
Projects are delivered within the stipulated time frame.	2.09	Disagree
Projects are completed within the allocated budget.	2.24	Disagree
The quality of completed projects meets expected standards.	2.45	Disagree
Client satisfaction with project outcomes is generally high.	2.18	Disagree
Project goals are fully achieved upon completion.	3.25	Agree
There is minimal rework or defect liability after project delivery.	3.21	Agree
Completed project complies with the required design specifications and contract requirements.	2.55	Agree
Grand Mean	2.59	Agree

Table 4 detailed the overall performance of construction projects in polytechnics in Adamawa State is moderate, with a grand mean of 2.59. This suggests that while some project objectives are being achieved, there is still significant room for improvement in critical performance areas such as timely completion, cost efficiency, quality, and client satisfaction.

Multiple Regression Analysis.

Table 5. Model Summary

Model	R	R ²	Adjusted R ²	Std. Error
1	0.821	0.675	0.659	.392

Table 5 above, presents the model summary for the multiple regression analysis, showing the relationship between the predictor variables and construction project performance. The table indicates that construction project planning techniques, financial management practices, and contextual environmental factors jointly explain 67.4% of the variation in construction project performance ($R^2 = 0.674$)

Table 6: Analysis of Variance

Source	Sum of	df	Mean	F	Sig.
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	Squares		Square		
Regression	19.437	3	6.479	43.281	0.000
Residual	9.432	63	0.150		
Total	28.86	66			

Table 6 above, presents the ANOVA results for the regression model used to predict construction project performance. The results show that the overall regression model is statistically significant ($F = 43.281$, $p < 0.001$), indicating that the predictor variables jointly have a significant effect on construction project performance.

Table 7: Regression Coefficients

Predictor	B	Std. Error	Beta (β)	T	Sig.
Constant	0.624	0.331		1.886	0.64
Planning Techniques	0.341	0.089	0.364	3.842	0.000
Financial Management	0.287	0.082	0.318	3.501	0.001
Contextual Environmental Factors	0.392	0.076	0.437	5.167	0.000

Table 7, presents the regression coefficients showing the individual contribution of each predictor variable to construction project performance. The results indicate that construction project planning techniques ($\beta = 0.318$), financial management practices ($\beta = 0.364$), and contextual environmental factors all significantly predict construction project performance, with contextual environmental factors having the strongest influence ($\beta = 0.437$)

Findings

1. The implementation of construction project planning techniques in polytechnics in Adamawa State was moderate (Grand Mean = 2.90)
2. Financial management practices in construction projects were implemented to a moderate level (Grand Mean = 2.88)

3. Contextual environmental factors significantly affect construction projects in polytechnics in Adamawa State, with an overall grand mean of 3.26
4. The performance of construction projects in polytechnics in Adamawa State was moderate (Grand Mean = 2.59).
5. There is a strong positive relationship between the predictor variables and construction project performance ($R = 0.821$).
6. The combined influence of construction project planning techniques, financial management practices, and contextual environmental factors significantly predicts construction project performance
7. All three independent variables significantly influenced construction project performance.

Discussion of the Findings

The study discovered, that the implementation of construction project planning techniques in polytechnics in Adamawa State was moderate (Grand Mean = 2.90). This suggests that although some planning practices are being adopted, the use of modern project planning and scheduling techniques remains inadequate. The finding supports the assertion that effective planning is a critical determinant of project success because it improves coordination, resource utilization, and decision-making throughout the project life cycle (Project Management Institute [PMI], 2021; Kerzner, 2022).

The findings revealed that financial management practices were implemented to a moderate extent (Grand Mean = 2.88). This implies that while some financial management mechanisms are in place, there is still room for improvement in budgeting, cost control, auditing, and financial planning. This finding is consistent with Love et al. (2021), who reported that sound financial management enhances project efficiency and reduces

the likelihood of cost overruns, and Akintoye and Main (2022), who emphasized that effective financial control contributes significantly to project success

The study established that contextual environmental factors have a significant influence on construction projects, with an overall grand mean of 3.26. This indicates that external factors such as bureaucratic procedures, security challenges, weather conditions, and community-related issues play an important role in project implementation and performance. The finding agrees with Olanrewaju et al. (2022) and Windapo and Cattell (2023), who found that environmental and institutional conditions are major factors affecting the successful delivery of construction projects.

The findings showed that the overall performance of construction projects in polytechnics in Adamawa State was moderate (Grand Mean = 2.59). This suggests that although projects are able to achieve some of their intended objectives, improvements are still required in key performance indicators such as timely completion, cost efficiency, quality, and client satisfaction. This finding supports Doloi (2022), who observed that shortcomings in project planning and management often lead to delays, increased costs, and quality-related challenges

The study revealed a strong positive relationship between construction project planning techniques, financial management practices, contextual environmental factors, and construction project performance ($R = 0.821$). This finding indicates that improvements in these variables are associated with better project outcomes. Similar findings were reported by Hwang and Ng (2021), who concluded that effective project management practices are strongly associated with improved construction project performance.

The findings revealed that construction project planning techniques, financial management practices, and contextual environmental factors

collectively have a significant influence on construction project performance. This suggests that successful project delivery depends on the combined effectiveness of sound planning, prudent financial management, and the ability to address external environmental challenges, rather than on any single factor alone. Furthermore, each of the three variables made a statistically significant contribution to project performance, with contextual environmental factors emerging as the strongest predictor, a finding that is consistent with the recommendations of the Project Management Institute (2021) and the observations of Turner (2022) on the importance of integrating internal management practices with effective responses to external project risks.

Conclusion

This study concludes that the performance of construction projects in polytechnics in Adamawa State is shaped by both internal project management practices and the external environment in which projects are executed. Although construction project planning techniques and financial management practices are implemented to a moderate level, the findings indicate that greater attention is needed to improve the use of modern planning tools, optimize resource allocation, strengthen budgeting and cost control, and enhance financial monitoring throughout the project life cycle. The study also highlights the significant influence of contextual environmental factors on project performance. Challenges such as bureaucratic delays, security concerns, community interference, adverse weather conditions, and shortages of skilled labour were found to have a considerable impact on the timely completion, cost efficiency, and quality of construction projects.

Overall, the findings demonstrate that achieving better construction project performance requires a balanced approach that combines effective planning, sound financial management, and proactive management of environmental challenges. By strengthening these key areas, polytechnics in Adamawa State can improve project delivery, enhance value for money,

and increase the likelihood of completing construction projects on time, within budget, and to the expected quality standards.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. polytechnic management should encourage the consistent application of modern construction project planning tools
2. The management of polytechnics, in collaboration with relevant government agencies, should strengthen financial management practices
3. Project managers should adopt proactive risk management strategies that effectively address security concerns, bureaucratic delays, and environmental uncertainties,
4. Greater attention should be given to improving project delivery by ensuring that construction projects are completed on schedule, within budget, and in accordance with the required quality standards
5. Project managers should adopt an integrated project management approach that combines effective planning, sound financial management, and proactive management of environmental risks throughout the project life cycle.
6. Policymakers and institutional administrators should develop and implement policies that simultaneously strengthen the adoption of effective construction planning techniques, sound financial management practices, and comprehensive risk management strategies, rather than addressing these areas independently.
7. continuous capacity-building programmes should be organized for construction project personnel
8. Future research should examine additional factors that may influence construction project performance, including procurement

methods, contractor competence, building information modelling among others.

Suggestions for further studies

Based on the findings of this study, the following areas are recommended for further study:

1. Investigate how emerging technologies, including Building Information Modelling (BIM), Artificial Intelligence (AI), Geographic Information Systems (GIS) and project management software, can improve construction planning efficiency, financial control, and construction project performance in tertiary institutions
2. Evaluate how procurement regulations, government funding policies, institutional governance structures, and regulatory frameworks influence the planning, financing, and successful delivery of construction projects in public tertiary institutions.
3. Determine the effectiveness of training programmes and professional development initiatives designed to improve the competencies of project managers, engineers, quantity surveyors, architects, and other construction professionals involved in institutional construction projects.

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