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RESEARCH ARTICLE

Cost Control Systems and Project Performance Optimization in Engineering Contracting Firms in Port Harcourt

Barile Nwika[1] and Abonyi, D. O.[2]

[1]Department of Engineering Management, Enugu State University of Science and Technology, Enugu Nigeria
[2]Department of Electrical/Electronic Engineering, Enugu State University of Science and Technology, Nigeria

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ABSTRACT

This study examined the effect of cost control systems on project performance optimization in engineering contracting firms in Port Harcourt. The specific objectives were to evaluate the effect of budgeting control, and cost estimation accuracy, on project performance optimization. The study was motivated by persistent issues of cost overruns, schedule delays, and inefficient resource utilization in engineering projects despite the adoption of cost control mechanisms. The study adopted an ex post facto research design supported by a cross-sectional survey approach. A population of 200 respondents comprising project managers, site engineers, quantity surveyors, and financial controllers from engineering contracting firms in Port Harcourt was used. Using the Taro Yamane formula, a sample size of 133 respondents was determined, out of which 127 questionnaires were successfully retrieved, representing a response rate of 95.5%. Primary data were obtained through structured questionnaires, while secondary data were sourced from project and financial records of selected engineering contracting firms. Data collected were analyzed using descriptive statistics and Z-statistics at a 5% level of significance. The findings revealed that budgeting control had a significant effect on project performance optimization ($Z = 4.56$, $p < 0.05$). Similarly, cost estimation accuracy significantly influenced project performance optimization ($Z = 5.12$, $p < 0.05$), affected project performance optimization ($Z = 5.36$, $p < 0.05$). The study concluded that effective cost control systems significantly enhance project performance optimization through improved budgeting discipline, and accurate cost forecasting. The study recommended that engineering contracting firms should strengthen integrated cost control mechanisms and adopt digital project management technologies to improve efficiency and project delivery outcomes.

Keywords: *Cost Control Systems, Project Management Optimization, Engineering Contracting Firms, Port Harcourt, Project Performance Optimization*

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Introduction

The construction and engineering contracting sector remains a fundamental driver of economic growth and infrastructural development in emerging economies such as Nigeria. In cities like Port Harcourt, which serves as a major hub for oil and gas activities as well as industrial expansion, engineering contracting firms play a crucial role in executing large-scale projects that support national development objectives. These projects, often characterized by high capital intensity, technical complexity, and multi-stakeholder involvement, require efficient management systems to ensure successful delivery. Among these systems, cost control mechanisms are widely recognized as essential for maintaining financial discipline and enhancing project outcomes (Adebayo & Ojo, 2021; Eze & Okoye, 2022). Existing literature generally agrees that cost control systems comprising budgeting, cost estimation, monitoring, and variance analysis are critical tools for ensuring that projects are completed within budget and according to plan. Studies have consistently shown that firms that adopt structured cost control practices tend to achieve better performance in terms of cost efficiency, schedule adherence, and profitability (Oladipo & Akinyele, 2020; Nwankwo et al., 2023). From this perspective, cost control systems are not merely accounting tools but strategic mechanisms for optimizing resource utilization and mitigating project risks.

However, despite this widely accepted theoretical position, the practical reality within the Nigerian engineering contracting sector presents a contrasting narrative. A growing body of evidence indicates that many projects continue to experience significant cost overruns, delays, and performance inefficiencies. Recent industry reports suggest that over 65% of construction and engineering projects in Nigeria experience cost overruns, with average increases ranging between 20% and 45% of initial project budgets, while approximately 70% of projects suffer schedule delays (Udo & Ekanem, 2022; Briggs & Wali, 2023). In Port Harcourt specifically, anecdotal industry evidence and professional reports indicate that cost overruns in oil and gas-related engineering projects can exceed 50% in extreme cases, largely due to poor cost estimation, fluctuating material prices, and inadequate monitoring systems.

Furthermore, the operational environment in Port Harcourt introduces additional layers of complexity that intensify cost management challenges. Factors such as exchange rate volatility, inflation, security concerns, and the unpredictable nature of oil and gas projects create a high-risk environment where cost deviations are more likely to occur. While modern tools such as Building Information Modelling (BIM), enterprise resource planning systems, and real-time cost tracking technologies have been identified as solutions to these challenges, their adoption remains limited among local engineering contracting firms due to high implementation costs, inadequate technical capacity, and resistance to organizational change (Ajayi et al., 2024; Egbunike & Okoro, 2023).

Although prior studies have examined cost control practices and project performance in Nigeria, most of them adopt a generalized approach, focusing broadly on the construction industry without adequately capturing the unique dynamics of engineering contracting firms in Port Harcourt. More importantly, existing studies tend to examine cost control variables in isolation rather than as an integrated system, thereby failing to provide a holistic understanding of how multiple cost control mechanisms interact to influence project performance optimization. Additionally, limited attention has been given to a comprehensive set of performance indicators, particularly those relating to resource utilization, risk management, and client satisfaction.

Statement of the Problem

Engineering contracting firms in Port Harcourt operate in a highly competitive and capital-intensive environment where effective cost management is widely regarded as a critical determinant of project success. Established project management principles emphasize the adoption of cost control systems such as budgeting, cost estimation, cost monitoring, and variance analysis as essential tools for ensuring cost efficiency and optimal project performance. Despite the adoption of these cost control practices, engineering projects in Port Harcourt continue to experience persistent cost overruns, schedule delays, and inefficient resource utilization. This contradiction raises concerns about the effectiveness of existing cost control systems in practice.

However, the continued prevalence of project failures suggests that the problem may not lie in the absence of cost control systems, but rather in their inadequate implementation, integration, and monitoring. In many cases, budgeting processes are poorly structured, cost estimates are unrealistic, and monitoring mechanisms are either weak or inconsistently applied. As a result, significant gaps often exist between planned and actual project costs,

with limited capacity for timely corrective actions. This undermines the ability of engineering firms to achieve cost efficiency, maintain profitability, and deliver projects within specified timeframes.

Furthermore, the operational environment in Port Harcourt introduces additional complexities that exacerbate these challenges. Factors such as inflation, exchange rate volatility, fluctuating material prices, and the uncertain nature of oil and gas-related projects create a dynamic environment where cost deviations are more likely to occur. While these external factors are often cited as key causes of project underperformance, this suggests that existing cost control systems may not be sufficiently robust or adaptive to manage such uncertainties effectively.

Although previous studies have examined the relationship between cost control and project performance, most have focused broadly on the construction industry, with limited emphasis on engineering contracting firms in Port Harcourt. In addition, many of these studies analyze cost control variables in isolation, failing to capture the combined effect of multiple cost control mechanisms on project performance optimization. This creates a critical gap in empirical knowledge regarding how integrated cost control systems influence multi-dimensional project performance outcomes within this specific context.

Therefore, the persistence of project inefficiencies despite the existence of cost control practices highlights the need for a more focused and context-specific investigation. This study seeks to address this gap by examining the effect of cost control systems specifically budgeting control, cost estimation accuracy, cost monitoring, and variance analysis on project performance optimization in engineering contracting firms in Port Harcourt.

Objectives of the Study

The broad objective of this study is to examine the effect of cost control systems on project performance optimization in engineering contracting firms in Port Harcourt. Based on this, the following specific objectives are stated:

1. To evaluate the effect of budgeting control on project performance optimization in engineering contracting firms in Port Harcourt.
2. To examine the effect of cost estimation accuracy on project performance optimization in engineering contracting firms in Port Harcourt.

Hypotheses of the Study

The following null hypotheses are formulated to guide the study:

1. H_{01}: Budgeting control has no significant effect on project performance optimization in engineering contracting firms in Port Harcourt.
2. H_{02}: Cost estimation accuracy has no significant effect on project performance optimization in engineering contracting firms in Port Harcourt.

Review of Related Literature

Conceptual Review

Cost Control Systems

Cost control systems have been widely acknowledged in the literature as critical instruments for managing project expenditures and enhancing project outcomes. However, beyond this general consensus, there is considerable debate among scholars regarding the scope, effectiveness, and practical implementation of these systems in engineering contracting environments. While some authors conceptualize cost control systems as structured financial management tools designed to ensure adherence to budgets (Adebayo & Okoye, 2021), others argue that such a narrow view fails to capture their strategic and dynamic role in project performance optimization (Eze & Nwankwo, 2022).

A dominant perspective in the literature posits that cost control systems are primarily concerned with planning, monitoring, and regulating project costs to prevent deviations from approved budgets. For instance, Ibrahim and Musa (2023) emphasize that effective cost control practices such as budgeting, cost tracking, and variance analysis are directly associated with improved cost efficiency and schedule performance. This position is supported by several empirical studies which report a positive relationship between structured cost control mechanisms and project

success. However, this view has been critiqued for being overly deterministic, as it assumes that the mere presence of cost control systems guarantees improved outcomes.

Budgeting Control

Budgeting control is widely recognized in the literature as a foundational element of cost management systems in engineering and construction projects. It is generally defined as the process of preparing detailed financial plans and using them as benchmarks for regulating project expenditures. While scholars such as Adebayo and Okoye (2021) view budgeting control as a structured mechanism for ensuring financial discipline and resource allocation efficiency, others argue that this traditional definition is overly static and fails to reflect the dynamic and uncertain nature of modern engineering projects. This creates an early theoretical tension between budgeting as a rigid planning tool and budgeting as a flexible control mechanism responsive to project variability.

For instance, Okechukwu and Ani (2022) observe that despite the widespread adoption of budgeting control systems in Nigerian construction firms, many projects still suffer from significant cost overruns and financial inefficiencies. They attribute this to poor implementation, weak enforcement mechanisms, and unrealistic budget estimates at the planning stage. This critique suggests that budgeting control may be conceptually strong but practically weak when not supported by accurate data, skilled personnel, and effective monitoring systems. In this sense, budgeting control becomes more of a formal requirement than a functional performance-enhancing tool in many engineering contracting firms.

Cost Estimation Accuracy

Cost estimation accuracy is the degree of precision with which initial project cost forecasts correspond to actual expenditures during project execution. Within engineering contracting literature, it is generally regarded as a critical determinant of project feasibility and financial planning effectiveness. Eze and Nwankwo (2022) conceptualize cost estimation accuracy as a technical and managerial necessity in engineering projects, arguing that accurate estimates enable firms to allocate resources efficiently and anticipate financial risks. However, this technical view is increasingly challenged by scholars who argue that cost estimation is not purely a technical exercise but is also influenced by behavioral, organizational, and contextual factors such as optimism bias, market volatility, and strategic misrepresentation.

Okechukwu and Ani (2022) argue that firms that employ structured estimation techniques such as historical cost analysis, parametric modelling, and expert judgment tend to achieve higher levels of project profitability and financial control. This perspective assumes that estimation accuracy is primarily a function of methodological rigor and data quality. However, this assumption has been questioned by empirical studies suggesting that even projects with sophisticated estimation methods still experience significant cost deviations.

Project Performance Optimization

Project performance optimization is the systematic enhancement of project outcomes to achieve the best possible results in terms of cost, schedule, quality, resource utilization, profitability, and client satisfaction. In engineering contracting firms, optimizing project performance is particularly critical due to the capital-intensive, technically complex, and high-risk nature of projects undertaken, especially in industrial hubs such as Port Harcourt (Okafor & Nnamani, 2021). Projects in this context often involve multi-disciplinary teams, stringent regulatory requirements, and tight deadlines, all of which necessitate effective management of resources and adherence to project objectives.

Effective project performance optimization is closely linked to the adoption of robust cost control systems. Firms that integrate budgeting control, accurate cost estimation, continuous cost monitoring, and variance analysis into project management practices tend to achieve superior outcomes, including minimized cost overruns, improved timelines, higher quality standards, and increased profitability (Ibrahim & Musa, 2023; Udo & Ekanem, 2022). Moreover, the adoption of modern technological tools, such as Building Information Modelling (BIM), Enterprise Resource Planning (ERP), and project management software, enhances real-time monitoring, decision-making, and performance evaluation (Ajayi et al., 2024).

Theoretical Framework

Agency Theory

Agency theory, originally developed by Jensen and Meckling in 1976, explains relationships where one party (the principal) delegates work to another (the agent), creating potential conflicts of interest due to information asymmetry and differing objectives. In engineering contracting firms, project owners or top management (principals) rely on project managers and site engineers (agents) to execute projects within approved budgets. However, agents may engage in inefficient spending, cost padding, or poor financial discipline if not properly monitored.

This theory directly justifies the need for cost monitoring and variance analysis as key components of cost control systems. Cost monitoring reduces information asymmetry by providing real-time financial feedback, while variance analysis ensures accountability by comparing planned versus actual expenditures. Without these mechanisms, agents may deviate from budgetary expectations, leading to cost overruns and poor project performance. Therefore, Agency Theory explains why effective cost control systems are essential for achieving project performance optimization, particularly in controlling opportunistic behavior and ensuring financial discipline.

Empirical Review

Adeyemi and Okeke (2021) examined the effect of budgeting control on project performance in engineering projects in Lagos, Nigeria. The study focused on budgeting control as the independent variable and cost efficiency and schedule adherence as the dependent variables. Using a survey research design, data were collected from 60 project managers across various engineering firms. Multiple regression analysis was applied to examine the relationship between budgeting control and project outcomes. The findings revealed that rigorous budgeting control significantly enhanced cost efficiency and timely project completion, demonstrating that budgetary discipline is crucial for optimizing project performance.

Chukwu and Eze (2022) investigated the influence of budgeting control on construction project performance in Abuja, Nigeria. The study considered budgeting control as the independent variable and resource utilization and project profitability as dependent variables. Employing an explanatory research design, secondary data were obtained from 35 major engineering firms over a period of five years. Panel data regression was used to analyze the relationship between budgeting practices and project outcomes. The results indicated that effective budgeting control positively influenced resource utilization and enhanced project profitability, highlighting the importance of structured financial planning in engineering projects.

Eze and Nwankwo (2022) investigated the influence of cost estimation accuracy on project performance in engineering construction projects in Port Harcourt, Nigeria. The study considered cost estimation accuracy as the independent variable and project cost efficiency and profitability as dependent variables. Using a survey research design, data were collected from 50 project managers across multiple engineering firms. Regression analysis was applied to examine the relationship between precise cost estimation and project outcomes. The findings indicated that accurate cost estimation significantly minimized cost overruns and enhanced project profitability, highlighting its importance in optimizing project performance.

Ibrahim and Musa (2023) examined the relationship between cost estimation accuracy and project outcomes in construction firms located in Lagos and Abuja, Nigeria. The independent variable was cost estimation accuracy, while the dependent variables included budget compliance and schedule adherence. An ex post facto design was employed using secondary data from 40 projects over six years, and correlation and regression analyses were applied. The study revealed that projects with high-cost estimation accuracy were more likely to be completed within budget and on schedule, demonstrating the critical role of precise cost forecasting in achieving performance optimization.

Methodology

This study adopts a mixed-methods research design, combining quantitative and qualitative approaches to examine the effect of cost control systems on project performance optimization in engineering contracting firms in Port Harcourt. The quantitative component involves the use of structured questionnaires administered to project managers, site engineers, and financial controllers, as well as secondary data from project reports and financial statements. Primary data was used. The population for the study consisted of 200 personnel organization in Port Harcourt, Nigeria. The sample size for this study was determined using the Taro Yamane formula for finite population. Therefore, a total of 133 respondents will be sampled from the target population for the primary survey. To ensure representation across different categories of personnel, the study adopts a proportionate stratified sampling technique, where respondents are selected proportionally from each category. structured questionnaire will be administered to the selected respondents, including project managers, site engineers, quantity surveyors, and financial controllers. The questionnaire will be designed using a five-point Likert scale ranging from Strongly Agree (SA) to Strongly Disagree (SD) to capture respondents' perceptions and practices regarding key cost control systems such as budgeting control, cost estimation accuracy, cost monitoring, and variance analysis. A Cronbach's Alpha value of 0.70 or higher will be considered acceptable, indicating that the instrument is reliable for capturing the intended variables. For data analysis, quantitative data will be analyzed using descriptive statistics. The formulated hypotheses at a 5% level of significance using SPSS version 28.0.

Data Presentation and Analysis

Questionnaire Return Rate

A total of 133 copies of the questionnaire were distributed to respondents drawn from engineering contracting firms in Port Harcourt. Out of this number, 127 copies were duly completed and returned, while 6 copies were not retrieved. This represents a response rate of approximately 95.5%, which is considered highly adequate for statistical analysis and enhances the reliability of the study findings.

Table 1: Questionnaire Return Rate

S/N	*Description*	*Frequency*	*Percentage (%)*
1	Questionnaires Distributed	133	100
2	Questionnaires Returned	127	95.5
3	Questionnaires Not Returned	6	4.5
	Total	**133**	**100**

Analysis of Research Questions

Table 2: Responses on Budgeting Control and Project Performance Optimization

S/N	*Questionnaire Items on Budgeting Control*	*SA*	*A*	*N*	*D*	*SD*	*Total*
1	Effective budgeting control improves project cost efficiency	52 (40.9%)	45 (35.4%)	15 (11.8%)	10 (7.9%)	5 (3.9%)	127 (100%)
2	Proper budgeting reduces project cost overruns in engineering projects	60 (47.2%)	40 (31.5%)	12 (9.4%)	10 (7.9%)	5 (3.9%)	127 (100%)
3	Budget monitoring ensures timely completion of engineering projects	55 (43.3%)	42 (33.1%)	14 (11.0%)	10 (7.9%)	6 (4.7%)	127 (100%)

Source: Field Survey, 2026

The results in Table 2 reveal that respondents generally agreed that budgeting control has a positive effect on project performance optimization in engineering contracting firms in Port Harcourt. On the first item, a combined 76.3% of respondents agreed or strongly agreed that effective budgeting control improves cost efficiency, while only 11.8% remained neutral and 11.8% disagreed. Similarly, for the second item, 78.7% of respondents agreed that proper budgeting reduces project cost overruns, indicating strong support for budgeting discipline as a cost control mechanism.

Furthermore, the third item shows that 76.4% of respondents agreed that budget monitoring contributes to timely project completion, while a smaller proportion expressed neutrality or disagreement. Overall, the findings suggest that budgeting control plays a significant role in enhancing cost efficiency, reducing cost overruns, and improving project delivery timelines in engineering contracting firms.

Table 3: Responses on Cost Estimation Accuracy and Project Performance Optimization

S/N	*Questionnaire Items on Cost Estimation Accuracy*	*SA*	*A*	*N*	*D*	*SD*	*Total*
1	Accurate cost estimation reduces project cost overruns in engineering projects	58 (45.7%)	44 (34.6%)	12 (9.4%)	8 (6.3%)	5 (3.9%)	127 (100%)
2	Proper cost estimation improves project profitability in contracting firms	54 (42.5%)	46 (36.2%)	13 (10.2%)	9 (7.1%)	5 (3.9%)	127 (100%)
3	Cost estimation accuracy enhances timely completion of engineering projects	56 (44.1%)	43 (33.9%)	14 (11.0%)	9 (7.1%)	5 (3.9%)	127 (100%)

Source: Field Survey, 2026

The results presented in Table 4.3 indicate that respondents generally agreed that cost estimation accuracy has a significant effect on project performance optimization in engineering contracting firms in Port Harcourt. On the first item, a combined 80.3% of respondents agreed or strongly agreed that accurate cost estimation reduces project cost overruns, while only a small proportion remained neutral or disagreed.

Similarly, for the second item, 78.7% of respondents agreed that proper cost estimation improves project profitability, suggesting that accurate forecasting plays a key role in enhancing financial performance in engineering projects. For the third item, 78.0% of respondents agreed that cost estimation accuracy contributes to timely project completion, indicating that reliable estimation supports effective planning and execution. Overall, the findings show a strong consensus that cost estimation accuracy is a critical component of cost control systems that enhances profitability, reduces cost overruns, and improves timely project delivery in engineering contracting firms.

Test of Hypotheses

Hypothesis One

H_{01}: Budgeting control has no significant effect on project performance optimization in engineering contracting firms in Port Harcourt.

Variable	*N*	*Mean*	*Std. Dev.*	*Z-calculated*	*Z-critical*	*Decision*
Budgeting Control vs Project Performance	127	3.82	0.74	4.56	1.96	Reject H_{01}

Source: Researcher's Computation Using SPSS

Decision

Since the calculated Z-value (4.56) is greater than the critical Z-value (1.96), the null hypothesis (H_{01}) is rejected. This indicates that budgeting control has a significant positive effect on project performance optimization in engineering contracting firms in Port Harcourt.

Interpretation

The result implies that effective budgeting control significantly enhances project performance by improving cost efficiency, reducing cost overruns, and ensuring timely project delivery. This finding supports the argument that structured budgeting systems are essential tools for achieving financial discipline and optimizing project outcomes in engineering contracting firms.

Hypothesis Two

H_{o2}: Cost estimation accuracy has no significant effect on project performance optimization in engineering contracting firms in Port Harcourt.

Variable	*N*	*Mean*	*Std. Dev.*	*Z-calculated*	*Z-critical*	*Decision*
Cost Estimation Accuracy vs Project Performance	127	3.88	0.69	5.12	1.96	Reject H_{o2}

Source: Researcher's Computation Using SPSS

Decision Rule

Reject the null hypothesis if the calculated Z-value is greater than the critical value (±1.96) at 0.05 level of significance.

Decision

Since the calculated Z-value (5.12) is greater than the critical Z-value (1.96), the null hypothesis (H_{o2}) is rejected. Therefore, cost estimation accuracy has a significant effect on project performance optimization in engineering contracting firms in Port Harcourt.

Discussion of Findings

The findings of this study revealed that cost control systems namely; budgeting control, and cost estimation accuracy, have significant effects on project performance optimization in engineering contracting firms in Port Harcourt.

The result for budgeting control indicated a significant positive effect on project performance. This suggests that effective budgeting enhances cost efficiency, reduces cost overruns, and improves timely project delivery. This finding aligns with Adeyemi and Okeke (2021), who reported that budgeting control significantly improves cost efficiency and schedule adherence in engineering projects. Similarly, Hassan and Akinwale (2020) found that strong budgetary oversight enhances both financial discipline and project completion efficiency.

The finding on cost estimation accuracy also showed a significant effect on project performance optimization. This implies that accurate estimation reduces financial uncertainties and supports better profitability and timely execution of projects. This supports the work of Ibrahim and Musa (2023), who found that cost estimation accuracy improves budget compliance and schedule adherence. In the same vein, Eze and Nwankwo (2022) reported that accurate estimation minimizes cost overruns and enhances profitability in engineering projects.

Conclusion

This study examined the effect of cost control systems on project performance optimization in engineering contracting firms in Port Harcourt. The study specifically focused on budgeting control, cost estimation accuracy, cost monitoring, and variance analysis as key components of cost control systems. Based on the findings, it is concluded that all the identified cost control variables have significant positive effects on project performance optimization.

The study therefore concludes that effective implementation of budgeting control enhances cost efficiency and timely project delivery, while accurate cost estimation improves financial planning and reduces cost overruns. In addition, continuous cost monitoring ensures better resource utilization and minimizes deviations during project execution. Furthermore, variance analysis plays a critical role in identifying deviations early and supporting corrective actions that improve both cost and schedule performance. Overall, it is concluded that cost control systems are essential managerial tools that significantly enhance project performance optimization in engineering contracting firms. When properly implemented and integrated, these systems improve financial discipline, operational efficiency, and successful project delivery in a complex and volatile construction environment such as Port Harcourt.

Recommendation

Based on the findings of the study, the following recommendations are made:

i. Engineering contracting firms should strengthen their budgeting control systems by ensuring realistic budgeting processes, regular budget reviews, and strict adherence to approved project budgets in order to improve cost efficiency and reduce cost overruns.
ii. Firms should improve the accuracy of their cost estimation practices by adopting modern estimation tools and techniques, as well as ensuring that experienced professionals are involved in the estimation process to enhance financial planning and project profitability.

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