Australian Journal of Business and Management Research
New South Wales Research Centre Australia (NSWRCA)

Volume. 8, Issue. 2, (52-65) ISSN (Online): 1839 - 0846

Moderating Effect of Project Environment on Financial and Contract Management Practices and Construction Cost Overruns in Real Estate Project

Joanne Akinyi Kepher[1] Charles Mallans Rambo[2] and Raphael Ondeko Nyonje[3]

Received: 20 May, 2024
Final Revision: 4 September, 2024
Accepted: 12 October, 2024
Published: 03 November, 2024
10.52283/NSWRCA.AJBMR.20240802A05

Abstract

Understanding the complex relationship between a project's environment, financial governance, and community involvement is crucial for managing construction costs in real estate. This research work, therefore, seeks to identify the extent of moderation of project environment on the association of the financial and contract management practices with cost overrun in real estate construction projects. The results of the multiple linear regression analysis as well as the Pearson correlation coefficient were significant; this indicates that the project environment had a moderating effect on the relationship between financial and contract management practices and the occurrence of cost overruns in real estate projects. Future research should explore additional variables to gain a more comprehensive view of construction cost overruns.

Keywords Project Environment, Financial Governance, Community Involvement, Construction Cost Overruns.

I. Introduction

Research Background

The project environment encompasses conditions influencing project operations, including landscape patterns, socio-economic factors, community awareness, and the involvement of opinion leaders (Mayeda & Boyd, 2020; Mwangangi et al., 2024; Wang et al., 2021; Zikargae et al., 2022). This environment significantly affects financial and contract management processes and their impact on cost overruns in real estate construction projects. Economic stability, material pricing, and labor availability directly impact financial management, while community involvement and opinion leaders influence investment decisions and funding.

Legislative frameworks and stakeholder participation shape contract management strategies to minimize risks and ensure compliance. Unforeseen obstacles such as regulatory changes and community opposition can cause cost overruns, but proactive management and extensive risk assessments can mitigate these challenges. Landscape patterns aid in visualizing the project structure and the interaction of resources, stakeholders, processes, and technologies, facilitating efficient resource allocation and planning (Nasr-Azadani et al., 2022). This understanding improves financial forecasting and prevents unexpected spending while supporting effective

[1] Faculty of Business and Management Sciences, University of Nairobi, Kenya
jokepher@gmail.com (Corresponding Author)
https://orcid.org/0000-0002-8778-4236
[2] Faculty of Business and Management Sciences, University of Nairobi, Kenya
crambo@uonbi.ac.ke
https://orcid.org/0000-0002-0970-865X
[3] Faculty of Education, University of Nairobi, Kenya
raphael.nyonje@uonbi.ac.ke
https://orcid.org/0000-0002-5300-1547

contract negotiation and enforcement by highlighting interdependencies among parties. Socio-economic elements, including local economic realities and regulatory frameworks, affect resource availability, material costs, and compliance needs. Anticipating issues like labour strikes, inflation, and policy changes through contingency plans and risk mitigation strategies is crucial to avoid cost overruns. Community awareness plays a vital role in financial and contract management, ensuring costs related to community involvement are anticipated, thereby avoiding delays and additional expenses (Di Maddaloni & Sabini, 2022). Understanding the project environment is key to successful financial and contract management strategies for reducing construction cost overruns in real estate projects.

The study makes a meaningful addition to project planning and management by assessing and availing financial and contract management guidelines in real estate projects, especially in avoiding or minimizing cost overruns. This paper is helpful for project owners, financiers, engineers, contractors, and managers who want to devise ways to reduce the project's cost risks. From the perspective of financial practices, project environment, and organizational capacity, policymakers will learn how to manage cost overruns. As Kenya moves to the next level in real estate development, specifically under the affordable housing agenda, such a study will mitigate waste derived from cost overruns. The research addresses a critical omission in the extant literature on financial and contractual management for managing construction costs. This study thus seeks to investigate the moderating influence of the project environment on the relationship between financial and contract management practices and construction cost increase in real estate projects.

Gap in Literature

The literature reveals a significant gap in understanding how the interplay between a project's environment, financial governance, and community involvement influences construction cost management in real estate (Mwangangi et al., 2024). Although prior studies, such as those by Habte, (2021), Kepher, Rambo and Nyonje (2021), and Chadee et al. (2022), highlight factors like subcontractor oversight, political risks, and fluctuating material prices, they often overlook the moderating effects of project environments on financial and contract management practices. This gap underscores the need for research that explores the integrated impact of economic conditions, social concerns, and community engagement on cost management strategies, as noted by Simushi and Wium, (2020) and Asiedu and Ameyaw, (2021), emphasizing the importance of a comprehensive systems approach to enhance project resilience and prevent cost overruns in real estate construction.

Originality of the Study

It investigates the complex interplay between a project's environment, financial governance, and community involvement to enhance construction cost management in real estate. Existing research highlights subcontractor oversight, political risks, and material price fluctuations but often overlooks how project environments moderate financial and contract management practices (Habte, 2021; Kepher et al., 2021; Chadee et al., 2022). This study addresses this gap by exploring the integrated impact of economic conditions, community engagement, and environmental concerns on cost management strategies, emphasizing the importance of a systems approach to improve project resilience and prevent cost overruns (Simushi and Wium, 2020; Asiedu and Ameyaw, 2021). By utilizing systems theory, this research uniquely links these factors into a cohesive framework, demonstrating that effective construction cost management in real estate requires comprehensive coordination between financial governance, project environment, and community dynamics. The study's originality lies in its focus on tailoring financial management and contract strategies to the broader social, economic, and environmental contexts, offering a holistic approach to reducing inefficiencies, managing risks, and enhancing the overall resilience of construction projects.

II. Literature Review

Empirical Review

Habte, (2021) study investigates the causes of building delays and cost overruns, particularly in Addis Ababa's Project 6 condominium complex. It took 48 months for the project to reach an 89.24% completion percentage due to significant delays. A mixed-method research technique was used for the study, which included stakeholder interviews and surveys. Analysis of construction waste management techniques by Tafesse et al. (2022) looking into the socio-economic and environmental impacts of building waste proposed prudent management. Findings reveal that 95.71% of active project posed a likelihood of contributing to construction waste. Waste volume of 6-10% of purchased materials was recorded. This was found in 57.14% of measured waste by compliant companies.

Cost overruns resulted from such waste. Five significant construction effects of waste were identified in the study; the recommended solutions included appointing a waste management officer and compliance with green building codes. As Pyanov et al. (2021) underscore, NPOs and NGOs must possess adequate financial and organizational systems that align with the regional initiatives and socioeconomic goals and objectives and have regard for environmental factors. To that end, the systems used by NPOs and NGOs should compile a comprehensive list of best practices and recommendations based on examples and case studies of other countries, ensuring that the information provided is credible and useful for various stakeholders and regulators. Finally, the conclusion emphasizes the significance of the financial and other strategic directions about regional and environmental specifications for further appropriate and sustainable growth. Another study was done by Kepher et al. (2021) to establish the effect of subcontractor supervision on cost overruns in real estate projects in Nairobi and Kisumu Counties. The general research question informed the need to undertake the research, which aimed at determining the relationship between subcontractor management and cost control in the identified projects. With 4,000 target population, stratified, simple random, and purposive sampling techniques was used to realize a sample of 351 respondents. Questionnaires were distributed among the 351 project practitioners and ten interviews conducted among the key informants in the real estate industry.

Simushi and Wium, (2020) focused their research on the issues related to time and cost overruns, specifically concerning large projects in South Africa. The study also isolates root causes, which include lack of experience in a specific type of project, past decisions, community resistance, and changes in scope. Asiedu and Ameyaw (2021) formulated and validated a System Dynamics Causal Loop (SDCL) model with data from the Ghanaian construction industry to assess the causes of cost overruns in construction projects within developing nations. The findings further affirmed the hypothesis that the low technical skill of consultants was the main reason for cost overruns in government projects. The study also noted various risk components that must undergo standard risk reduction procedures to gain reasonable success in construction projects. Durdyev, (2021) critically reviewed articles on project cost overruns in construction management after 1985 and determined 79 reasons. Chadee et al. (2022) Cost overruns in international projects, including SIDS, have been the main focus of this study. It was used to establish and categorize critical factors contributing to cost escalation in PSSHPs. The study also reveals that political issues cause cost overruns, such as politically related contractors, deliberate designing of unfavorable contracts, deliberate under-costing, political project management teams, and political postures.

The studies by Habte, (2021), Kepher et al. (2021), Simushi and Wium, (2020), Durdyev, (2021), and Chadee et al. (2022) collectively underscore the multifaceted nature of delays and cost overruns in construction projects. Habte, (2021) identifies fluctuating material prices, poor planning, inadequate inspection, and low productivity as critical factors, highlighting the necessity for enhanced planning and stakeholder responsibility. Kepher et al. (2021) reveal a notable connection between subcontractor oversight and cost overruns, recommending comprehensive oversight to mitigate these issues. Simushi and Wium, (2020) suggest that effective management of the project's management and organizational and external environments is essential to reduce overruns, providing valuable insights for extensive project management. Durdyev, (2021) offers a comprehensive list of causes for future research and practical insights to improve cost performance, benefiting academia and the construction industry. Chadee et al. (2022) emphasizes the importance of incorporating political risk management into project management practices, urging policymakers to focus on controlling and mitigating these risks.

Mwangangi et al. (2024) investigated the resource management's effect on the completion of Kenya Police Housing Scheme projects, employing a mixed-method design with a sample of 319 projects across Kenya. It found significant correlations between various resource management practices and project completion, highlighting the critical role of effective resource allocation in construction project outcomes. These findings align with the current study on the moderating effect of the project environment on financial and contract management practices, emphasizing the need for robust management strategies tailored to project-specific conditions to mitigate construction cost overruns in real estate projects. Omisakin, (2024) explored the relationship between entrepreneurial orientation (EO) and profit growth performance of SMEs, highlighting that EO positively influenced performance, moderated by dynamic and munificent environments. These findings align with the current study, emphasizing how project environments influence management practices and underscoring the importance of contextual factors in performance outcomes.

The existing literature demonstrates that cost overruns are influenced by various factors, from material price fluctuations and subcontractor oversight to broader organizational and political environments. However, how the project environment moderates these factors and their impacts on financial and contract management practices still needs to be explored. Understanding this moderating effect is essential because it can provide a more nuanced approach to managing and mitigating cost overruns. The study can offer targeted strategies that accommodate specific project environments by investigating how different environmental conditions influence the effectiveness

of financial and contract management practices. This can lead to more resilient and adaptable management practices, ultimately enhancing the efficiency and cost-effectiveness of real estate construction projects. Therefore, this study is pivotal in bridging the knowledge gap and offering practical solutions tailored to diverse project environments.

Theoretical and conceptual framework

The construction industry is well known for its susceptibility to cost escalations, which pose significant financial risks and can disrupt project timetables. Numerous factors, including faulty planning and political meddling, have contributed to these cost overruns. In this study, the project environment significantly impacts financial and contractual management processes, resulting in cost overruns in real estate projects.

The study was initiated by system theory, which provides a holistic approach to analyzing phenomena in the construction industry. Walonick, (1993) distinction between cross-sectional and developmental approaches allows researchers to explore static interactions between different systems and the dynamic changes that occur over time. This dual perspective is essential for understanding how various factors contribute to cost overruns at different project stages. System Theory emphasizes integrating all activities into a meaningful total system (Kerzner, 2013). This approach enables project managers to identify optimal solutions and strategies for problem-solving. Understanding how delays in one task can affect subsequent tasks and overall costs is critical for effective project management. The concept of emergent behavior in construction projects, as noted by McBride, (2005), underscores the necessity of a dynamic and adaptive management approach, which System Theory inherently supports. Chang, (2002) assertion that numerous factors influence construction project costs further reinforces the need for a systemic approach. System Theory enables a more accurate identification and analysis of these factors, which is critical for devising effective strategies to mitigate cost overruns. Figure 1 shows a conceptual framework of the proposed study, showing the independent variables of the study.

The study is also guided by the following hypotheses:

H_o: Project Environment does not significantly moderate the correlation between financial and contract management practices and the occurrence of construction cost overruns in real estate projects.

H_1: Project Environment significantly moderate the association between financial and contract management practices and construction cost overruns in real estate projects.

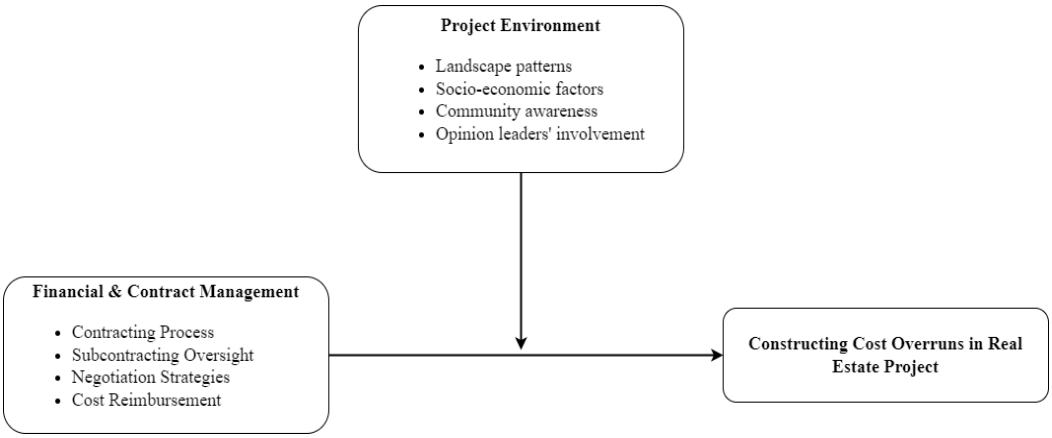

Figure 1: conceptual framework
Sources: Developed by authors

III. Methodology

The study utilized correlational analysis to scrutinize the posited hypotheses. The correlational design was pivotal in allowing the cross-tabulation of variables measured at the interval level, thereby facilitating an assessment of the interrelations among the variables (Brook, 2013).

Target population

The study target population was 4000 participants listed in Table 1.

Table 1: Target population

Nairobi Population Strata	**Frequency**	**Cumulative Percent%**
Construction managers/ Clerk of work	475	14.25
Quantity Surveyors	475	28.00
Architects	475	42.50
Structural Engineers	475	57.00
Contractors	475	71.25
Electrical Engineers	475	85.50
Mechanical Engineers	475	99.75
Key informant	8	100.00
Subtotal	3,333	
Kisumu Population Strata		
Construction managers/ Clerk of work	95	14.24
Quantity Surveyors	95	28.48
Architects	95	42.72
Structural Engineers	95	56.96
Contractors	95	71.20
Electrical Engineers	95	85.80
Mechanical Engineers	95	99.68
Key informant	2	100.00
Sub Total	667	
Grand Total	4000	

Source: Prepared by authors.

Sample size, data and instrumentations

When determining the sample size, the target population was found to be 4000 which included project professionals & key informants in Nairobi and Kisumu Counties. Through the help of Krejcie and Morgan table, a sample size of 351 was realized and the sufficiency of the statistics of this sample was established (Krejcie and Morgan,1970). As it can be seen from table 1 which identifies the required sample size given a population of 4000, the sample amounted to 351. To ensure the sampling technique was proper, the confidence interval and margin error were used to confirm whether the sample was adequate. This was further verified using the hyper-geometric calculation for the following sample size:

$$n=\frac{Z^2\ N.P.(1-P)}{e^2(N-1)+Z^2P(1-P)}=\frac{NZ^2Pq}{(E^2(N-1)+Z^2)Pq} \quad (1)$$

where n =estimated sample size, N=target population size, Z=confidential level of sample size 1. 95 for instance. Using nomogram normal distribution table = 96, p = q = Population Proportion = 0.5, and e = sample proportion accuracy = 0.05. Therefore,

$$N=\frac{1.96^2\ \times 4000\times 0.5(1-0.5)}{0.05^2(4000-1)+1.96^2\times 0.5(1-0.5)}=\frac{NZ^2\,Pq}{(E^2\ (N-1)+Z^2)\,Pq)}=\frac{630\times 1.96^2\times 0.5\times 0.5}{(0.05^2(630-1)+1.96^{2)\times 0.5\times 0.5}}=351 \quad (2)$$

Another 3,000 astronomical were randomly selected as non-respondents to the first survey, and follow-up surveys were conducted to compare the differences between the respondents to the first survey and the non-respondents. The potential of a Low response rate was assessed to decrease the nonresponse bias arising from a low response rate. An effort to test common method bias was made by reviewing the correlation matrix to ascertain that the common method is not prevalent between the dependent and independent variables. Three stages of data collection were used for the study: pre-field, field, and post-field work. The research proposal was first created, and then approvals were secured from the University of Nairobi graduate school and the School of Continuing and Distance Education. Finally, a permit was obtained from the National Council of Science and Technology (NACOSTI).

Introductory letters and consent forms accompanied the survey questionnaire, which was distributed to project professionals via email and Google Forms due to COVID-19. A five-point Likert scale measured the data. During the post-field phase, distributed questionnaires were verified for return accuracy and completeness. A follow-up was conducted to improve the return rate, involving re-administering missing or incomplete questionnaires. Notes were made on why some respondents needed to follow instructions. The questionnaires were emailed back for analysis and processing, and each item was labeled for tracking and retained until the final report was approved. In this study, the main tool used was a self-administered questionnaire with an interview guide used as a backup tool. The bulk of the questions in the questionnaire were structured questions. The responses were grouped into sections on the questionnaire. Section A aimed at the identification of the demographic profile of project professionals. In Section B, the constructs of the project implementation environment included topography, gender, and community awareness through opinion leaders. Instruments administered in this study had items rated on a 5-point Likert scale that ranged from 5=Strongly agree to 1=Strongly disagree. The interview guide sought information from ten (10) purposively sampled key informants regarding realistic financial and contract management practices that add cost to the construction of real estate projects. The interview guide was mainly geared towards the lending institutions, the key informants of commercial banks, joint ventures, and investors pooled resources nominated by the project financing. In addition, the interview guide was employed to confirm what the surveyed respondents had indicated.

Validity of the research instrument

Measurement validity in this study was determined through content analysis, criterion, and construct validity. For content validity of the instruments, the questionnaires and checklists were moderated by two research supervisors at the University of Nairobi. They also used very relevant (4), relevant (3), somewhat relevant (2), and not relevant (1) to determine the relative importance of each item in achieving the research objectives. The overall validity was then calculated using the Content Validity Index (CVI).

$$CVI = \frac{Sum\ of\ item\ rated\ 3\ or\ 4}{Number\ of\ Quetionnaire\ items}$$

CVI= Items rated 3 or 4 by both experts divided by the total number of items in the questionnaire. The results summarized in Table 2 were obtained.

Table 2: Experts Rating of Instruments

		Supervisor I				
		1	2	3	4	Total
Supervisor II	1	0	0	0	0	0
	2	0	4	0	0	4
	3	1	1	6	5	13
	4	1	1	17	24	43
	Total	2	6	23	29	60

Source: Prepared by authors

Table 2 shows that validity index: $CVI = \frac{(23+29)}{60} = 0.867$, which is acceptable since it was more than the standard level which is 0.7. Internal validity was evaluated in terms of construct validity since a positive or negative correlation was found for items related to the independent variable with a similar proportion of high scores for items related to the dependent variable. This was done through the inclusion of cross-subject score comparison. For criterion validity, the instrument's items were made to correspond with the indicators of the variables and to measure connections that are independent and dependent between the variables adequately and appropriately. The validation strategy aimed at checking correspondence between scores on the given construct and on other related constructs. To increase the credibility and reliability of the research undertaken, triangulation analysis was used to get different information regarding construction cost overrun from both the guided interviews with the key informants and the questionnaires.

Reliability of the instruments

Reliability of the instrument was tested based on Cronbach's Alpha against a threshold of $\alpha = 0.70$ and the results are presented in Table 3.

Table 3: Reliability output results

Scale	No. of Items	Alpha
Construction cost overrun	10	0.907
Financial and Contract Management Practices	40	0.874
Project environment	10	0.870
Overall	60	0.884

Source: Prepared by authors

Data analysis

Data analysis was based on inferential statistics, which dependent on hypothesis stated as follows: Project environment does not significantly moderate the connection of the relationship between Financial and Contract management practices with cost overrun in real estate's construction projects = f (project environment, financial and contract management practices, random error).

$$Y_j = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + (\beta_3 X_1 X_2) + \varepsilon \quad (3)$$

where β_0 is the population's regression constant, $X_1 \rightarrow X_2$ (Financial and contract management practices, project environment, ε is the random error term). The model hypothesis was tested based on significance test, that is, for $p - value > 0.05$, do not reject, $p - value \leq 0.05$ reject the null hypothesis.

IV. Results

Questionnaire Return Rate

Out of the sample size of 351 from the target population, 336 participants from the seven active real estate projects licensed to operate within Kisumu and Nairobi Counties by National Construction Authority dully filled and returned the questionnaires giving a return rate of 96%. The return rate on the questionnaire are as indicated in Table 4.

Table 4: Questionnaire return rate

County	Sampled	Returned	Return rate %
Nairobi	293	281	80.06
Kisumu	58	55	15.67
Total	351	336	97.96

Source: Prepared by authors

The high return rate was attained because the researcher consistently followed up all the sampled respondents during data collection. The high return rate of 96% facilitated gathering of sufficient data that could be generalized to determine the effect of Financial and Contract Management practices on Construction Cost Overruns in Real Estate Projects in Kisumu and Nairobi Counties. The Questionnaire return rate was considered adequate and subsequently satisfactory and contributes towards gathering of sufficient data that could be generalized to represent the opinions of participants.

Distribution of respondents by position category

It was imperative to investigate the respondents' position category to establish how project environment moderate on the relationship between financial and contract management practices and construction cost overruns of real estate projects were related with cadre of the project professional whose information were considered to be significance to the construction agencies for policy decision making. The respondents were therefore asked to state their position category and the results are presented in Table 5.

Table 5: Respondents demographic survey

Position category	Frequency	Cumulative frequency	Valid Percent	Cumulative percentage
Quantity Surveyor	41	41	12.20	12.20
Construction Manager/Clerk of works	66	107	19.60	31.80
Structural Engineer	49	156	14.60	46.40
Contractor	81	237	24.10	70.50
Architect	35	272	10.40	80.90
Mechanical and Electrical Engineer	40	312	11.90	92.80
Other Staff	24	336	7.20	100
Total	336		100.00	

Source: Source: Prepared by authors

Table 5 shows that 81 (24.10%) were classified as Contractors, 66 (19.60%) as Construction Managers/Clerks of Work, 49 (14.6%) as Structural Engineers, 40 (11.9%) as Mechanical and Electrical Engineers, 41 (12.2%) as Quantity Surveyors, 35 (10.4%) as Architects, and 24 (7.2%) as other project professionals.

The findings on position category indicates that majority of the respondents were contractors, an indication that the survey data presented respondent vast with knowledge on project environment and construction cost overruns in real estate projects.

Regression analysis

Some assumptions are essential in regression analysis before undertaking the study. In the following cases where these assumptions still need to be met, some analysis results may create inaccuracies and result in misleading data. The following assumptions were tested: normality, linearity, multicollinearity, and independence of error.

First, it is non-multicollinearity, followed by data errors.

The degree of the normality of data distribution was checked prior to statistical analysis for all the predictor and moderating variables by using the Kolmogorov-Smirnov test statistics (or KS-test), as well as by applying the Shapiro-Wilk test (or SW-test). The outcomes of the Kolmogorov-Smirnov and Shapiro-Wilk tests are shown in Table 6.

Table 6: Test for s Normality

Tests of Normality						
Financial and contract management, Project environment	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Project environment	0.333	336	0.126*	0.93	335	0.717

Source: Source: Prepared by authors

The study revealed that the variable is normally distributed. When the numbers of samples were less than or equal to 2000, we used Shapiro-Wilk tests, and the results were df (336) = 0. 930 and the p-value = 0.717. Since the p-values were more significant than 0.05 as such, and from the results, it was concluded that the data was normally distributed.

Before performing a linear regression test, one should always check for linearity between the dependent and independent variables. An ANOVA test for linearity was carried out to assess the degree of deviation from linearity based on the test results. A threshold of 0.05 was applied to prove the admissibility of the regression of the independent variable with linearity. The results of this test are shown in Table 7.

Table 7: Test for linearity for Construction cost overrun & Project Environment

		Sum of Squares	df.	Mean Square	F	Sig.
Between Groups	(Combined)	15.446	54	0.286	0.820	0.808
	Linearity	0.000	1	0.000	0.001	0.979
	Deviation from Linearity	15.416	53	0.291	0.836	0.782
Within Groups		97.970	281	0.349		
Total		113.417	335			

Source: Source: Prepared by authors

From the results presented in Table 7, which are based on the ANOVA output, the significance value for the deviation from linearity for the moderating variable "Project Management" is 0.782. Since this value is greater than the threshold of 0.05 (0.782 > 0.05), it indicates that there is no significant deviation from linearity. In other words, there is a moderating effect of Project Management on the relationship between financial and contract management practices and cost overruns in real estate projects within Kisumu and Nairobi Counties.

The model of multicollinearity was checked using variance inflation factors. A cut-off value of 10 was utilized in the analysis to tackle deals with multicollinearity. Hence, when any of the VIF values exceeded ten, this was taken to be indicative of multicollinearity. The diagnostic test for collinearity of the independent variables was performed, the results of which have been presented in Table 8.

Table 8: Collinearity Statistics

Variables	Tolerance	VIF
Project environment	0.551	1.816
Financial & Contract management	0.515	1.942

Source: Source: Prepared by authors

As shown in Table 8, the recorded tolerance values were all greater than 0.2, while the Variance Inflation Factors (VIF) values were below 5. In statistical terms, multicollinearity is assumed to be present when VIF values exceed 5 and tolerance values are less than 0.2. Multicollinearity refers to a situation in which independent variables in a regression model are highly correlated with one another, potentially distorting the results of the analysis. However, since the statistical analysis revealed that the tolerance values were sufficiently high and the VIF values were well below the threshold of 5, it was concluded that the variables under study did not exhibit multicollinearity.

Durbin-Watson test was used to test if the residuals were independent viz, if the errors in the model were auto correlated. In general terms, the test statistic value should lie between 1.5 and 2.5. Values outside this range could because for concern. This is the range of values that Twale et al. (2016) hoped to achieve; values below or above this range could suggest problems. Kepher et al. (2021) said that any value less than 1 or higher than 3 is an obvious cause for worry. The findings as presented in this study are presented in Table 9:

Table 9: Test statistics for Independence of Errors

Model	Durbin-Watson Statistic (D)	Conclusion
	1.525	Error terms are independent

Source: Source: Prepared by authors

Table 9 shows that the Durbin-Watson statistic value is 1.525. The Durbin-Watson test is used to detect the presence of autocorrelation in the residuals (errors) of a regression model, particularly between adjacent observations. A value of 2 indicates no autocorrelation, while values between 1.5 and 2.5 are generally considered acceptable, suggesting little to no autocorrelation. Since the Durbin-Watson value of 1.525 falls within this acceptable range, it suggests that the residuals, or errors, associated with one observation are not correlated with

those of other observations. This lack of correlation means that the assumption of independence of errors, a key requirement for the validity of regression analysis, has been met.

Table 10: Examination of contingency factors such as project environment as a moderator to the relationship between financial and contract management practices and construction cost overruns during the development of real estate projects

Variable	**n**	**Composite Mean**	**Composite standard deviation**
Financial and contract management	336	4.65	0.441
Project environment	336	4.19	0.780
Overall Composite mean & Composite standard deviation	**336**	**4.42**	**0.611**

Source: Prepared by authors

Table 10 presents the descriptive statistics of the moderating effect of Project environment on the relationship between Financial and contract management practices on construction cost overruns in real estate projects. The line composite mean for Financial and contract management practices of 4.65 when moderated with Project environment was higher than the overall composite mean of 4.42; implying that Financial and contract management practices when moderated with Project environment have an effect on construction cost overruns in real estate projects, the lower standard deviation of Financial and contract management practices of 0.441 when moderated with Project environment than the overall composite standard deviation of 0.611 indicate that there was a convergence view in opinion among the participants. The results confirm the research done by Habte, (2021) because he stated that flexibility during contacting process promotes relational improvement in project environment hence enhancing project performance.

In order to determine whether project environment plays a mediating role in the correlation co-efficient between financial and contract management practices and construction cost overrun in real estate projects, the mediating role was established through a Pearson product moment correlation test. The correlation results are given in Table 11.

Table 11: Correlation analysis

Item	**construction cost overruns in real estate projects**
Pearson Correlation	0.318*
Sig. (2-tailed)	0.000
N	336

The results presented in Table 11 indicate that project environment exerts a moderating influence on the relationship between financial and contract management practices and construction cost overruns in real estate projects ($r = 0.318$; p-value<0.05). This finding suggests that the characteristics and conditions of the project environment play a significant role in how financial and contract management practices impact cost overruns. Consequently, this analysis leads to the rejection of the null hypothesis (H0), which posited that the project environment has no substantial effect on the relationship between financial and contract management practices and construction cost overruns in real estate projects. In contrast, the acceptance of the alternative hypothesis implies that the project environment is indeed a crucial factor in this relationship. Thus, the implications of this finding suggest that project stakeholders should prioritize the assessment and optimization of the project environment to mitigate cost overruns effectively.

Regression Analysis

To analyze the moderating role of project environment on the dependent variables of this study: Financial and contract management practices on construction cost overruns in real estate projects, ordinary least square regression analysis was applied. The models should be statistically significant and the results are presented in the Table 12.

Table 12: Regression analysis model summary

R	R^2	$Adj.R^2$	Std error of estimate	R^2 change	F-change	df1
0.330	0.109	0.106	0.466	0.388	288.64	1.334

Source: Source: Prepared by authors

Table 12 indicated that the regression model shows a weak positive correlation between the independent and dependent variables (R = 0.330). The model explains about 10.9% of the variance in the dependent variable (R^2 = 0.109), and the adjusted R^2 value is very close, indicating minimal shrinkage (Adjusted R^2 = 0.106). The standard error of 0.466 suggests moderate dispersion of the observed values around the predicted values. The significant increase in explanatory power with adding a predictor (R^2 change = 0.388) and a high F-change (288.64) indicates that the new predictor substantially improves the model's fit.

To assess whether project environment statistically moderated the relationship between financial and contract management practices and construction cost overruns in real estate, a regression analysis was performed. The coefficients from the regression model are detailed in Table 13.

Table 13: Regression analysis coefficient

Item	Unstandardized Coefficients		Standardized coefficients	t	Sig.
	B	Std. error			
Constant	-3.302	1.206	0.318	-2.739	0.010
Coefficient (project Environment/financial and contract management)	1.245	0.311	1.645	4.005	0.000

Source: Prepared by authors

The p-value = 0.00<0.05 in Table 13, which clearly shows that the model is statistically significant. Therefore, project environment has a moderate impact on the relationship between Financial and Contract management practices and Construction cost overruns in Real Estate projects. A regression analysis is hence given by this equation;

$$y = -3.302 + 1.245x_1 \quad (4)$$

where x_1 denotes the project environment. Equation (4) indicates that project environment positively affects financial and contract management practices for construction cost overruns in real estate projects. In the absence of project environment, financial and contract management practices for construction cost overruns in real estate projects reduces by 3.303 units.

V. Discussion

The independent variable of the study was the financial and contract management practices. In contrast, the dependent variable used in the study was construction cost overruns in real estate projects across Kenya. The results also indicated that there was a moderating impact, which was 4.19, and the standard error of the mean was 0. 780, which produces a Likert scale. The correlation coefficient was R=0.710, with a p-value of 0.000, confirming a statistically significant relationship. This led to rejecting the null hypothesis, affirming that the project environment positively influences financial and contract management practices, aligning with the current research debate on the complexity of cost overruns.

The consistency of these results is evident when contextualized within existing literature. Studies by Habte, (2021) and Kepher et al. (2021) identify critical factors like fluctuating material prices, poor planning, subcontractor oversight, and inadequate stakeholder responsibility, which are all directly influenced by the project environment. Similarly, Simushi and Wium, (2020) emphasize that managing project-specific conditions, including external and internal factors, is essential to reducing overruns and aligns well with this study's findings. Chadee et al. (2022) further stresses the importance of political risk management, showing that organizational and environmental factors significantly impact financial governance in construction projects.

This study contributes uniquely to the current debate by identifying these well-established factors and highlighting the moderating effect of the project environment, an area often overlooked. The systems approach used in this

study bridges a critical gap by integrating financial governance, community involvement, and environmental conditions into a single framework. Unlike previous research that treats these factors independently, this study provides evidence that effective cost management requires a holistic view, linking economic conditions, community dynamics, and project-specific challenges.

The findings underscore that financial and contract management practices are not one-size-fits-all; they must be adaptable to varying project environments. This reinforces the ongoing debate that adaptive, context-sensitive strategies are crucial for enhancing resilience and reducing inefficiencies in real estate projects. By demonstrating that these practices work synergistically within their environments, this study validates the argument for a comprehensive, integrated approach, significantly contributing to the literature and offering actionable insights for practitioners. The study's originality lies in illustrating that to effectively manage costs; one must consider the broader, dynamic interplay of environmental, financial, and social factors that align with and advance the current discourse in construction management research.

VI. Conclusion

On the strength of the multiple linear regression coefficients and Pearson correlation coefficients, the moderating role of the project environment unveiled in the observed link between financial and contract management practices and cost overruns in real estate construction projects can be considered substantial. These findings are relevant to current research and policies as they support the idea of contingency theorizing in project management by noting that organizational environments for projects change, and this must be reflected in management strategies.

Implications

In current research, there is growing recognition that more than traditional financial and contract management practices are needed to address cost overruns, especially in complex and dynamic project settings. The study supports this view by demonstrating that environmental factors such as economic conditions, regulatory changes, and community involvement play a critical role in influencing project outcomes. This aligns with emerging research advocating for a systems approach that integrates these factors into the overall project management framework, emphasizing the interconnectivity between governance, environmental dynamics, and stakeholder engagement.

Recommendations

From a policy perspective, the study's findings underscore the importance of context-sensitive regulations and guidelines that promote adaptive financial and contract management practices tailored to specific project environments. Policymakers can leverage these insights to develop standards that mandate the consideration of environmental and social factors in construction planning and budgeting processes. For instance, this could inform policies that encourage proactive risk assessment, flexible contract terms that adjust to changing market conditions, and the inclusion of community engagement strategies to mitigate opposition and legal challenges.

Furthermore, the results highlight the need for policies that enhance the capacity of project managers to assess and respond to environmental moderators effectively. This could involve training programs focusing on integrating financial governance with environmental management and stakeholder coordination, equipping professionals with the skills necessary to navigate the complexities of real estate projects.

Limitations and call for future research

The study has some limitations, and they include the following: First, the study is restricted to specific project environments, which limits the generalizability of the findings to other contexts or industries beyond real estate. Additionally, while the study demonstrates the moderating effect of the project environment on financial and contract management practices, it does not deeply explore the individual impact of specific environmental factors like regulatory changes or community involvement. The reliance on regression analysis, while robust, may also overlook nuanced, qualitative insights that could further explain the complexities of environmental impacts. Future research should consider diverse contexts and mixed-method approaches to capture a broader range of influencing factors.

Acknowledgment

I am deeply grateful to the University of Nairobi lecturers, including Professor Christopher Gakuu, Professor Winnie Nyamute, Professor Dorothy Kyalo, Dr. Angeline Mulwa, Professor Harriet Kidombo, and others, for their dedicated scholarly research in project planning and their invaluable guidance on research methods.

Declaration of Conflict of Interests

No potential conflicts of interest were made known.

Author (s) Contribution Statement

The authors contributed equally while developing this research.

Funding statement

The authors were not given any financial support for the study.

Ethical Approval Statement

This research upheld ethical standards at every stage—before, during, and after data collection. The study was granted approval by NACOSTI (National Commission for Science, Technology and Innovation), an institution responsible for regulating and ensuring quality in the Science, Technology, and Innovation sector, as well as advising the government on related matters.

Informed Consent of Participants

Formal consent was obtained from each participant, ensuring that they were fully informed about their right to participate voluntarily in the study. Participants were made aware of their freedom to choose whether to engage and their right to withdraw at any time. The confidentiality of personal information and the data collected was strictly maintained throughout the process.

Informed Consent of authors

Accordingly, we allow Joanne Kepher who is the corresponding author of this manuscript to handle and respond to the comments of the reviewers pertaining to the publication of this manuscript in the journal.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author, Joanne Akinyi Kepher, upon reasonable request.

References

Asiedu, R. O., & Ameyaw, C. (2021). A system dynamics approach to conceptualize causes of cost overrun of construction projects in developing countries. *International Journal of Building Pathology and Adaptation*, 39(5), 831-851.

Brooke, J. (2013). SUS: a retrospective. Journal of Usability Studies. 8(2):29 40 https://uxpajournal.org/sus-a-retrospective/

Chadee, A. A., Martin, H. H., Mwasha, A., & Otuloge, F. (2022). Rationalizing critical cost overrun factors on public sector housing programmes. *Emerging Science Journal*, 6(3), 647-666.

Chang, A. S. T. (2002). Reasons for cost and schedule increase for engineering design projects. *Journal of Management in Engineering*, 18(1), 29-36.

Di Maddaloni, F., & Sabini, L. (2022). Very important, yet very neglected: Where do local communities stand when examining social sustainability in major construction projects? *International Journal of Project Management*, 40(7), 778-797.

Durdyev, S. (2021). Review of construction journals on causes of project cost overruns. *Engineering, Construction and Architectural Management*, 28(4), 1241-1260.

Habte, Y. (2021). Factors Affecting Time Delay and Cost Overrun in Construction of Condominium in Addis Ababa: *Project 6 Housing Development* (Doctoral Dissertation, St. Mary's University).

Kepher, J. A., Rambo, C. M., & Nyonje, R. O. (2021). Subcontractor Oversight on Construction Cost Overruns in Real Estate Projects in Nairobi and Kisumu Counties, Kenya. Journal of Sustainable Development. 14. 15. 10.5539/jsd.v14n6p15.

Kerzner, H. (2013). Project management: case studies. John Wiley & Sons.

Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*, 30, 607-610. https://doi.org/10.1177/001316447003000308

Mayeda, A. M., & Boyd, A. D. (2020). Factors influencing public perceptions of hydropower projects: A systematic literature review. *Renewable and Sustainable Energy Reviews*, 121, 109713.

McBride, G. B. (2005). A proposal for strength-of-agreement criteria for Lin's concordance correlation coefficient. *NIWA client report*: HAM2005-062, 45, 307-310.

Mwangangi, N. S., Mulwa, A., Kyalo, D. N., & Ombati, T. (2024). Effect of Resource Management on Completion of Kenya Police Housing Scheme Projects in Kenya. *Australian Journal of Business and Management Research* (AJBMR), 8(1), 1-18.

Nasr-Azadani, E., Wardrop, D., & Brooks, R. (2022). Is the rapid development of visualization techniques enhancing the quality of public participation in natural resource policy and management? *A systematic review. Landscape and Urban Planning*, 228, 104586.

Omisakin, O. M. (2024). The Impact of Entrepreneurial Orientation and Profit Growth Performance of Small and Medium-Sized Enterprises and the Influence of the Environment. *Australian Journal of Business and Management Research* (AJBMR), 8(1), 53-80.

Pyanov, A., Drannikova, E., Shevchenko, E., & Kochkarova, Z. (2021). Sustainable development of non-profit and non-governmental organizations: financial and organizational mechanisms. *In E3S Web of Conferences* (Vol. 250, p. 04008). EDP Sciences.

Simushi, S., & Wium, J. (2020). Time and cost overruns on large projects: Understanding the root cause. Journal of Construction in Developing Countries, 25(1), 129-146.

Tafesse, S., Girma, Y. E., & Dessalegn, E. (2022). Analysis of the socio-economic and environmental impacts of construction waste and management practices. *Heliyon*, 8(3).

Twale, D. J., Weidman, J. C., & Bethea, K. (2016). Conceptualizing socialization of graduate students of color: Revisiting the Weidman-Twale-Stein framework. *Western Journal of Black Studies*, *40*(2).

Walonick, D. S. (1993). General systems theory.

Wang, Y. F., Lee, S. K., & Ye, Q. (2021). Opinion leaders in eco-innovation diffusion: Analysis of information networks for waste separation in Shanghai. *Resources, Conservation and Recycling*, 174, 105822.

Zikargae, M. H., Woldearegay, A. G., & Skjerdal, T. (2022). Assessing the roles of stakeholders in community projects on environmental security and livelihood of impoverished rural society: A nongovernmental organization implementation strategy in focus. Heliyon. 8. e10987. 10.1016/j.heliyon.2022.e10987.