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Research paper

Investigating project issue factors as causes of construction contract terminations: the case of Ghana

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Abstract

This study aims to investigate and analyse the project issue factors (PIF) contributing to construction contract terminations within Ghana's construction industry. By identifying and understanding these key factors, the study seeks to provide valuable insights for stakeholders to improve project success rates, minimise disruptions, and foster sustainable growth in the sector. The research adopted a quantitative research approach, utilising techniques such as exploratory factor analysis (EFA) and structural equation modelling (SEM) to analyse data collected from 315 construction industry professionals in Ghana. A combination of purposive and random sampling techniques was employed to ensure a diverse and representative sample, considering participants' qualifications, experience, specialisations, and employment sectors. The study's findings revealed significant project issue factors (PIF) that contribute to construction contract terminations in Ghana. Top-ranking factors include contractor refusal to work with engineer instructions, construction time delays, failure to remedy defective works, and unsuitable materials on structures. The study underscores the importance of addressing these factors through enhanced communication, robust project management practices, quality control measures, and continuous professional development. The study's methodology and comprehensive analysis add value to the literature as it contributes to the existing body of knowledge by focusing specifically on the Ghana's construction industry and providing empirical insights into the factors driving construction contract terminations. The recommendations have practical implications for industry stakeholders, policymakers, and professionals, guiding them in implementing strategies to mitigate project issue factors (PIF) and improve overall project outcomes, thereby fostering a conducive environment for sustainable growth in Ghana's construction industry.

Keywords: *Construction Contract Terminations; Ghana's Construction Industry; Project Issues; SEM; AMOS.*

1. Introduction

Globally, the construction industry is recognised as a significant contributor to economic growth, infrastructural development, and job creation. Construction projects play a critical role in advancing national development, contributing to various sectors, including housing, transport, health, and energy. However, contract terminations are a persistent challenge in the global construction industry, often resulting from project delays, budget overruns, poor workmanship, and disputes among contractors and clients. In countries like the United States, the United Kingdom, and Australia, contract terminations are typically triggered by issues such as project scope changes, contractor insolvency, or non-performance [1], [2]. These terminations result in severe financial losses, strained stakeholder relationships, and disruptions to project timelines. Recent studies have called for more robust risk management strategies and dispute resolution mechanisms to reduce the incidence of contract terminations and ensure project continuity [3], [4].

In developing regions, such as Africa, the construction industry has experienced rapid growth driven by urbanisation, infrastructure needs, and government-led projects. Across the continent, the demand for new infrastructure, including roads, bridges, airports, and power plants, is unprecedented. However, like their global counterparts, African countries face challenges with project sustainability, including contract terminations. In countries such as Nigeria, Kenya, and South Africa, frequent contract terminations have been reported due to corruption, inadequate funding, poor project management, and the failure of contractors to meet contractual obligations [5], [6]. The African construction industry suffers from additional challenges related to unstable regulatory frameworks, political instability, and varying cultural practices across regions, which further exacerbate the risk of project failures [7]. Consequently, construction projects are often delayed, leading to cost escalations and the erosion of investor confidence. Within the broader African context, Ghana's construction industry stands out as a key player in the nation's economic development. The sector has been instrumental in improving infrastructure, creating jobs, and attracting foreign direct investment. Despite this positive outlook, Ghana's construction industry is not immune to the problems facing the wider African construction landscape. Contract terminations remain a significant concern, with widespread reports of projects being halted due to contractor non-performance, delays, financial mismanagement, and disputes [8, 9]. As in other African countries, the reasons for contract terminations in Ghana are multifaceted. They include contractors' failure to comply with engineers' instructions, delays in

addressing defects, the use of substandard materials, and force majeure events such as war [10]. Project management issues, rising costs of local materials, and cultural differences within project teams further complicate matters [11], [12].
The impact of these terminations is severe. They not only lead to financial losses and project delays but also damage relationships among key stakeholders, including contractors, clients, and government agencies. This, in turn, impedes the growth of the sector and discourages investment in future projects. Furthermore, the terminations have an impact on the country's overall economic objectives, particularly in light of Ghana's ambitious developmental projects acquisition. The recent termination of 27 E-Block projects in Ghana was an absolute setback on the country's education reform agenda [13]. Thus, understanding the root causes of contract terminations in Ghana is crucial for developing targeted interventions to mitigate these issues and promote sustainable growth in the construction industry. While the global and African construction industries have extensively explored the causes and consequences of contract terminations, there is limited research focussing specifically on Ghana's unique socioeconomic, legal, and regulatory environment. Factors such as local procurement processes, regulatory frameworks, and cultural dynamics are often overlooked in the literature, leaving a significant research gap. Although international research identifies common causes of terminations such as delays, contractor insolvency, and poor workmanship [14], [15], it is essential to contextualise these issues within Ghana's construction industry.
Furthermore, the application of factor analysis to systematically assess and quantify the underlying causes of contract terminations in Ghana remains underexplored. Factor analysis offers a robust statistical tool to identify and measure the complex interactions of administrative, financial, and technical challenges that contribute to contract terminations [16]. This study aims to address this gap by investigating the root causes of construction contract terminations in Ghana. By employing factor analysis, the study seeks to provide insights that can inform targeted interventions and policy reforms, ultimately fostering a more conducive environment for successful project delivery in the Ghana's construction industry.

2. Related work

A prominent area of discussion revolves around the impact of contractual disputes and breaches on project outcomes. Researchers such as [17] have extensively explored the escalation of disagreements between contractors, subcontractors, and project owners, emphasising how these conflicts often culminate in contract terminations. Issues such as differing interpretations of contractual clauses, changes in project scope without appropriate approvals, payment disputes, and subpar performance by involved parties frequently lead to contractual breakdowns, significantly impacting project timelines, costs, and overall success. Complementing this discussion is a focus on the crucial role of effective project management in mitigating contract termination risks. Studies by [18] underscore the importance of robust project planning, proactive risk management strategies, clear communication channels, and stakeholder engagement frameworks in preventing and resolving issues that may otherwise result in contract terminations.
Inadequate resource allocation, scheduling discrepancies, lack of transparency in decision-making processes, and ineffective conflict resolution mechanisms within project teams have been identified as key contributors to heightened termination rates in construction projects. Beyond internal project dynamics, the literature also exploring the influence of external factors on contract terminations. Scholars such as [19] and [20] have examined how changes in regulatory frameworks, economic fluctuations, material shortages, geopolitical uncertainties, and market dynamics impact project feasibility and execution. Understanding and navigating these external influences are critical for project stakeholders to adapt their strategies, manage risks effectively, and safeguard against contract terminations stemming from forces beyond their immediate control. Cultural and social dimensions also emerge as significant factors influencing project outcomes, particularly in diverse and multicultural settings such as Ghana. Research by [21] and [22] highlights the complexities of navigating cultural differences, language barriers, labor issues, community relations, and local customs within construction projects. Failure to address these nuances can lead to misunderstandings, conflicts, productivity challenges, and ultimately, contract terminations. Adopting culturally sensitive approaches, fostering effective cross-cultural communication, and cultivating strong relationships with local communities are identified as pivotal strategies to mitigate these risks.

3. Methodology

3.1. Survey development

This paper adopted quantitative research. It consists of three important steps. The first step was a literature review of textbooks, articles, and related works to collect project issue dominant factors that cause construction contract termination. The second step was to design a questionnaire survey on factor analysis to align with the literature review. The questions were based on project issues as determinants of contract termination and were structured to suit industry specialists and academicians. A five-point Likert scale was used to gauge the participants' responses. The five ratings were: 1. no extent, 2. small extent, 3. moderate extent, 4. large extent, and 5. very large extent.

3.2. Data collection

A sample size of 400 was taken from 1,364 estimated populations, according to the guidelines of [23]. The 7 targeted population groups were public and private sector employees specified in the questionnaire. These groups consist of project managers, contract managers, quantity surveyors, architects, procurement officers, engineers, and lecturers of Technical University in Ghana. Respondents' firms seemed to be typical of the Ghanaian general practice of construction project management. The researchers retrieved 315 complete and usable responses, yielding an effective rate of 78.75 percent. This sample size was considered sufficient for quantitative data analysis and ensured a scientifically valid outcome, enabling a thorough investigation into the project issue factor on contract termination. Two types of sampling techniques were chosen for this study. These consisted of simple random sampling and purposive sampling techniques. The third stage was about measuring the project-issue factor model. Three industry specialists from the construction sector and five academicians (3 in construction technology and 2 statisticians) were consulted to improve the questionnaire.

3.3. Data analysis

The data was analysed using descriptive analysis in order to meet the requirements of the research goal. To investigate the research objective, factor analysis (FA) was specifically used. Multivariate correlational data analysis techniques were also used in the analysis, including exploratory factor analysis (EFA) with SPSS version 26, confirmatory factor analysis (CFA), and structural equation modelling

(SEM) with AMOS version 22. Researchers can investigate the underlying structure of complicated datasets, especially when working with multivariate correlational data, by employing factor analysis. By using methods like exploratory factor analysis (EFA) with SPSS version 26, latent variables and their associations within the dataset can be found. EFA makes it easier to identify important elements or dimensions from a big collection of observed data, revealing patterns and relationships that might not be immediately obvious via univariate analysis alone.

Confirmatory Factor Analysis (CFA) is also required for validating the identified components and assessing model fit. By defining presumptions about the connections between latent and observable variables, CFA enables researchers to evaluate how well the proposed factor structure conforms to reality. This process provides more certainty to the underlying conceptual framework and increases the validity and rigour of the findings. In addition, AMOS version 22 Structural Equation Modelling (SEM) provides a strong analytical method for investigating intricate interactions between several latent variables at once. By combining measurement models (CFA) with structural models, SEM gives insights into the causal chains and interdependencies across constructs, enabling the testing of theoretical models and hypotheses. Researchers can determine the underlying processes underpin these relationships by using SEM to evaluate the direct and indirect impacts of different variables on construction breaches of contract termination.

4. Results and discussion

4.1. Respondent characteristic

The background characteristics of the respondents were presented in this section, with emphasis made on qualification, years practiced, area of specialisation, and employers. This was to help provide an understanding of the respondents' level of expertise and experience, which was suitable for giving confidence to their responses and the overall research findings. It is an important way to increase the reliability and credibility of the responses and results in a survey [24]. Table 1 shows the breakdown of the survey demographics of the respondents.

Table 1: Respondent Characteristic

Qualification	N	Percent
HND	8	2.5
BSc/BTech	165	52.4
Masters	138	43.8
PhD/DPhil/DTech	4	1.3
Years Practiced		
6-10 years	117	37.1
11-15 years	89	28.3
16-20 years	69	21.9
21 years and above	40	12.7
Current specialization		
Building works only	121	38.4
Civil works only	69	21.9
Building and civil works	125	39.7
Employer		
Public sector	248	78.7
Private sector	67	21.3
Total	315	100

The result of descriptive statistics showed that the construction professionals possessed the minimum qualification of a Higher National Diploma (HND). Table 1 shows that 1.3%, 43.8%, 52.4%, and 2.5% of the industry specialists and academicians possessed PhD, MSc., BSc., and HND, respectively. The work experience of the participants ranged between the intervals of 6-10, 11-15, 16-20, and above 21 years. Furthermore, 50% of the respondents had work experience above 10 years. The educational qualifications and work experience of the respondents were adequate for participating in the research survey. Structural equation modelling (SEM) was used to establish an empirical relationship between project issues and contract termination in projects.

4.2. Mean ranking analysis

Table 2 is a summary of the results of the mean ranking analysis. A total of ten (10) factors were ranked by the construction industry professionals as project issue factors. Factor analysis results are contained in Table 3.

Table 2: Results for Mean Ranking Analysis

Project issues variables	Mean	SD	Rank
Contractor refuses to work with engineer instructions	4.11	0.975	1
Construction time delay	4.07	0.900	2
Failure to remedy defective works	3.98	0.981	3
Unsuitable materials on structure	3.82	0.909	4
Existence of force majeure (war)	3.75	1.075	5
Engineer issues stop work over 30 days	3.69	1.091	6
Increasing cost of local materials	3.65	0.990	7
Project management problem	3.41	0.978	8
Increase size of projects	3.10	0.992	9
Cultural differences among team members	2.56	1.082	10

From the table, it was found that the refusal of contractors to follow engineers' instructions was ranked as the primary cause of construction contract termination, with a mean score of 4.11 (SD = 0.975). Construction time delay was rated 2^{nd} as a large extent cause of construction contract termination with a mean score of 4.07 (SD = 0.900). Another factor of project issue influencing the cause to a large extent was failure to remedy defective works with a mean score of 3.98 (SD = 0.981). Unsuitable materials on structure were ranked 4^{th} as a large extent cause of construction contract termination in Ghana with a mean of 3.82 (SD = 0.909). These indicators of project issues were rated to a large extent with a low standard deviation, less than 1.00, indicating the respondents were consistent in rating.

Table 3: Results for Factor Analysis

	PIF	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Engineer issues stop work over 30 days	0.786	0.429	0.225	0.807	
Failure to remedy defective works	0.754	0.284	0.188	0.824	
Contractor refuses to work with engineer instructions	0.754	0.505	0.316	0.800	
Unsuitable materials on structure	0.751	0.599	0.521	0.789	
Existence of force majeure (war)	0.666	0.600	0.517	0.789	0.817
Project management problem	0.653	0.621	0.456	0.788	
Construction time delay	0.648	0.516	0.408	0.798	
Increase size of projects	0.623	0.650	0.565	0.782	
Cultural differences among team members	0.616	0.420	0.375	0.808	
Increasing cost of local materials					

4.3. Factor analysis

The EFA was used to determine the PIF construct's one-dimensionality and dependability. The extraction and rotation method employed was Principal Component Analysis with Varimax Rotation (PCA Varimax). The construct was measured with ten different components. The Kaiser-Meyer-Olkin (KMO) coefficient of 0.836 has a p-value less than 0.000. [25] also suggested a KMO cut-off value of 0.70 and a p-value<0.05 for Bartlett's test of sphericity, which demonstrates homogeneity. These findings showed that the data may be subjected to factor analysis. All the ten items (PIF1, PIF2, PIF3, …, PIF10) that are expected to measure PIF loaded one component. A factor loading threshold of 0.5 was advocated by [26] and [27], which exceeds the recommended threshold of 0.40. All items exhibited factor loadings surpassing 0.5 for their respective components except "Increasing cost of local materials," which loaded below the threshold. In the component, nine (9) items surpassed the threshold of 0.5. They are "Engineer issues stop work over 30 days," "Failure to remedy defective works," "Contractor refuses to work with engineer instructions," "Unsuitable materials on structure," "Existence of force majeure (war)", "Project management problem," "Construction time delay", "Increase size of projects," and "cultural differences among team members." These items measure PIF. Thus, they will be called PIF. The item-total correlation adjusted for the items within the component was extracted using the proposed cut-off value of 0.30 after utilising the EFA to extract the component. The items were considered reliable measures of the component, as evidenced by the Cronbach's alpha coefficient for the component (PIF) being 0.817, showing satisfactory internal reliability [28], [29].

4.4. Structural equation modelling

After the constructs demonstrated sufficient evidence of one-dimensionality and reliability using EFA, a CFA was then administered. As advised by [30], the analysis strategy of goodness of fit for detecting project problems built for contract termination used three statistical techniques of fit indexes. The S-Bχ2 of 4.068 with 9 degrees of freedom (df) and a probability of p = 0.0000 were obtained from the sample data using the PIF model. This chi-square result demonstrated a considerable deviation of the sample data from the proposed model, suggesting a decent match. As a descriptive indicator of fit rather than a statistical test, the chi-square test is very sensitive to sample size [31], [32]. Since the CFI value of 0.962 was higher than the cut-off value of 0.90, the model is deemed acceptable. The NFI value of 0.951 falls within the specified range; nevertheless, Table 4 indicates that the NFI cut-off value must be greater than or equal to 0.90. As a result, the model works. The computed PNFI value of 0.571 is likewise less than the 0.80 cut-off value. Moreover, the GFI value of 0.959 is higher than 0.090, and the RMR of 0.040 is less than 0.05. The hypothesised model seems to properly reflect the sample data based on these fit indices for the PIF model.

Table 4: Results for Robust Fit Index

Fit Index	Cut-Off Value	Estimate	Comment
$S - B\chi^2$		4.068	
Df	0≥	9	Acceptable
CFI	0.90≥ acceptable 0.95≥ good fit	0.962	Good fit
PCFI	Less than 0.80	0.577	Good fit
RMSEA	Less than 0.08	0.079	Acceptable
RMSEA 95% CI	0.00-0.08 "good fit"	0.000-0.067	Acceptable
NFI	Greater than 0.90 "good fit"	0.951	Good fit
IFI	Greater than 0.90 "good fit"	0.963	Good fit
PNFI	Less than 0.80	0.571	Good fit
RMR	Less than 0.05 "good fit"	0.040	Good fit
GFI	Greater than 0.90 "good fit"	0.959	Good fit

Note: $s\text{-}bx^2$ = Chi-Square, DF = Degree of Freedom, CFI = Comparative Fit Index, PCFI =Parsimony Comparative Fit Index, RMSEA = Root Mean Square Error of Approximation, RMSEA 95% CI = Root Mean Square Error of Approximation 95% Confidence Interval, NFI = Normed Fit Index, IFI = Incremental Fit Index, PNFI = Parsimony Normed Fit Index, RMR = Root Mean Residual and GFI = Goodness of Fit Index.

A unidimensional model for PIF is illustrated in Figure 1 and Table 6. Out of the ten indicator variables examined, six were selected for the final confirmatory factor analysis (CFA) [33, 34]. These six variables, drawn from 315 analysed cases, formed a single component labelled as PIF, encompassing PIF1, PIF2, PIF3, PIF4, PIF5, and PIF7.

Table 5: Indicator Variables for the Conceptual Model

Latent Component	Indicator Variable	Measurement Variable
Project Issues Factors	PIF1	Engineer issues stop work over 30 days
	PIF2	Budget deficit or overrun of contracts
	PIF3	Contractor refuses to work with engineer instructions
	PIF4	Unsuitable materials on structure
	PIF5	Existence of force majeure (war)
	PIF7	Construction time delay

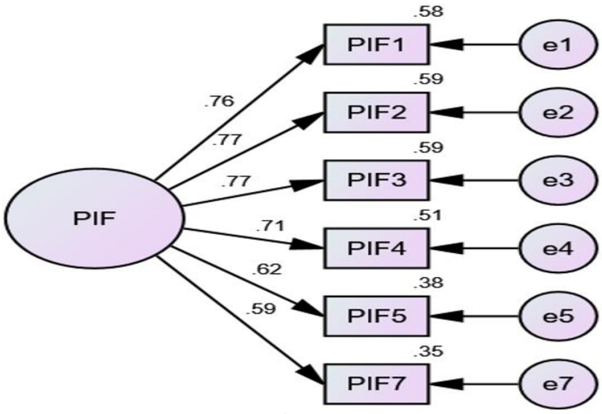

Fig. 1: CFA Model for Project Issues Factors.

The correlation values, standard errors, and statistical test results for the final six-indicator model are displayed in Table 6. Every correlation value was below 1.00, and every p-value was below the significance level of 0.05, exhibiting the proper indications. As a result, the estimates were accepted as both statistically significant and acceptable. The indicator with variable PIF2, whose parameter coefficient was 0.768, had the highest standardised coefficient of any parameter. This suggests that PIF2 has a strong positive relationship with the outcome variable, indicating its crucial role in the model. Furthermore, the robust nature of these findings reinforces the model's overall validity and its potential applicability in further research.

Table 6: Factor Loadings and P-Values for the Model

Hypothesised relationships (Path)	Unstandardised Coefficient (λ)	Standardised Coefficient (λ)	P-Value	R- Square	Sig. at 5% Level
PIF1 ← PIF	1.000	0.762	0.00	0.581	Yes
PIF2 ← PIF	0.906	0.768	0.00	0.590	Yes
PIF3 ← PIF	0.898	0.766	0.00	0.587	Yes
PIF4 ← PIF	0.779	0.713	0.00	0.508	Yes
PIF5 ← PIF	0.800	0.619	0.00	0.383	Yes
PIF7 ← PIF	0.638	0.589	0.00	0.347	Yes

Most of the parameter estimations showed strong correlation values close to 1.00. The high correlation values imply a substantial degree of linear link between the indicator variables and the unobserved variables (PIF). Additionally, the R squared values were close to the desired 1.00 value, indicating that a larger percentage of the variation observed in the indicator variables was explained by the factors. The findings suggest that the indicator variables significantly predict the unobserved components because all of the measured variables show a strong association with the components (PIF) under the project issues factors.

4.5. Project issue factor

Understanding and addressing PIF is crucial in mitigating construction contract terminations in Ghana’s vibrant construction industry. The study’s findings, focussing on PIF such as contractor refusal to work with engineer instructions, construction time delays, failure to remedy defective works, and unsuitable materials on structures, underscore the pervasive challenges impacting project success and sustainability. Aligning with established literature, these PIF have been consistently identified as major contributors to project disruptions and contract terminations globally. Scholars like [17, 18] have emphasised similar issues, highlighting their universal impact across diverse construction contexts.

The significance of these findings lies in their direct implications for industry stakeholders, including government agencies, private enterprises, contractors, and consultants. Strategies aimed at improving communication channels between contractors and engineers, implementing robust project management practices, ensuring quality control measures for materials, and proactively addressing potential delays can effectively mitigate the identified PIF. However, it is essential to acknowledge the study’s limitations, particularly its focused scope on specific PIF. Future research endeavours could delve into additional variables such as regulatory constraints, economic factors, and stakeholder collaborations to provide a more comprehensive understanding of contract termination dynamics in the Ghanaian construction sector.

5. Conclusion and recommendation

5.1. Conclusion

The influence of project issues on construction contract termination cannot be underestimated in public projects in Ghana. This study, through the analysis of 315 valid samples using SEM on 10 project issues, provides valuable insights into the Project Influence Factors (PIF) that significantly contribute to contract terminations within Ghana's construction industry. The findings underscore the critical importance of addressing these factors to enhance project success rates, minimize disruptions, and foster sustainable growth in the sector. Key factors identified include contractor refusal to work with engineer instructions, construction time delays, failure to remedy defective works, and the use of unsuitable materials on structures. These pervasive issues have a detrimental impact on project outcomes and are consistent with challenges observed in construction projects globally, as highlighted in existing literature. Addressing these critical factors is essential for improving project performance and reducing the likelihood of contract terminations.

5.2. Recommendations

Institutions such as Road agencies, Metropolitan, Municipal, and District Assemblies (MMDAs), the Public Works Department (PWD), and Architectural and Engineering Services Limited (AESL) should foster open and effective communication channels between contractors, engineers, and project stakeholders. Encouraging collaborative problem-solving approaches to address issues promptly and prevent misunderstandings that could lead to contract terminations is crucial. Additionally, these institutions should invest in comprehensive project management strategies that prioritize proactive risk management, realistic scheduling, resource allocation, and regular project monitoring. Enforcement of stringent quality control standards for materials used in construction projects is also essential. This ensures that materials meet the required specifications and contribute to the overall integrity and success of the projects. Furthermore, construction industry professionals must stay updated with evolving regulatory frameworks, market trends, and economic conditions that may impact construction projects. Future research endeavours should explore additional variables such as regulatory frameworks, economic influences, and stakeholder collaborations to gain a more comprehensive understanding of contract termination dynamics in Ghana's construction industry.

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