MODERATING ROLE OF EXTERNAL FACTORS ON PROJECT FINANCING REQUIREMENTS AND PROJECT DELIVERY DELAY IN THE NIGERIAN CONSTRUCTION INDUSTRY

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ABSTRACT
The devastating impact of construction project delivery delays is felt worldwide, with estimated losses running into trillions of dollars annually. As the global demand for infrastructure and construction projects continues to rise, understanding the factors that influence project outcomes is crucial. As such, this study investigated the moderating role of external factors on the relationship between project financing requirements and project delivery delay in the Nigerian construction industry. A survey research design was employed, which collected primary data from 423 construction project stakeholders in Kaduna State and analyzed it using Partial Least Squares Structural Equation Modeling (PLS-SEM). Findings of the study revealed that the external factors and project financing requirements exacerbate construction project delivery delays. Furthermore, the study's external factors were found to moderate the relationship between project financing requirements and project delivery delay by increasing investor or financier's confidence through reduced volatilities and risk resulting from adequate project planning, illegal development control, proactive risk management and stable regulatory environment. The research recommends that project stakeholders need to reduce or eliminate volatilities and risk caused by the study's external factors to get favourable financing requirements and expedited project delivery. Policy implications suggested that to foster resilient project delivery with minimal delays, the Nigerian government through the relevant ministries, departments and agencies, should establish a policy framework that takes care of external factors and balances project financing requirements, including affordable collateral and borrowing costs, while encouraging project owners and financial institutions to properly plan projects and adopt proactive risk management strategies that mitigate the impact of the external factors. The study concludes with recommendations for further research on innovative financing models like green bonds or pension funds, and exploring the effectiveness of digital technologies such as building information modelling and blockchain technology in enhancing project planning, financing and delivery.

Keywords: economic development, financial institutions, financing requirements, vulnerabilities, risk management
GEL Classification Codes: O15, G2, G32, G02, G32

1. INTRODUCTION

The construction industry is a cornerstone of economic growth, social progress, and environmental sustainability, providing the physical infrastructure that enables modern societies to function effectively (Olawumi & Chan, 2020). As a key sector driving economic development, the industry's impact resonates across various domains, including transportation networks, energy systems, housing, educational facilities and public buildings (Ling, Low & Ang 2020). The successful delivery of infrastructure projects hinges on meticulous planning, coordination, and execution, underscoring the importance of effective project governance (Gatti, 2020). In this context, project financing plays a vital role in bridging the funding gap between project conception and completion, thereby facilitating the delivery of critical infrastructure projects that might otherwise be unfeasible due to financial constraints (Zhang, Li & Wang, 2022). Leveraging innovative financial instruments and risk mitigation strategies in project financing can promote sustainable development, foster economic growth, and enhance the overall quality of life for global communities (Ye, Li & Tiong, 2020).

Infrastructure development in Nigeria relies heavily on annual budgetary allocations, which are dispersed across various sectors; including transportation, healthcare, education and housing, but despite these allocations, numerous projects are plagued by delays, suspensions, or abandonment, primarily due to inadequate funding, which has become a persistent obstacle to project completion (Makun and Ganiyu, 2019). Construction project delivery delay, defined as the time overrun or extension of time required to complete a project, exceeding the initially planned duration (Alzahrani, Emsley & Ahmadi, 2020), is a pervasive issue in the construction industry. Financial constraints are the primary causes of delay, with project owners' inability to settle payments with consultants, contractors, and suppliers resulting in delayed project delivery and profit losses (Adamu & Idris, 2024). The construction sector's significant contribution to the national economy relies heavily on financing with robust financing plans and sufficient funding essential in reducing the likelihood of delay and ensuring successful project delivery (Okereke, Pepple & Eze, 2018).

Effective construction project financing involves a multifaceted approach, encompassing forecasting, budgeting, and securing necessary funds, as well as efficient resource management to ensure timely and cost-effective project delivery (Adamu & Idris, 2024). Effective financing strategies, such as those employed in public-private partnerships, in relation to debt or equity financing of construction projects by business partners, financial institutions, bilateral corporations, institutional investors and multi-lateral corporations might help mitigate construction project delivery delays (Chen, Zhang & Li, 2020). Furthermore, the consequences of neglecting suitable project financing strategies can be severe, leading to business disruptions, profit losses, and significant project failures or delays (Adia, 2019). As such, bridging the infrastructure gap, particularly in the face of public budget constraints, necessitates innovative financing solutions, including increased private capital fundraising (Gatti, 2015). In response to these, the private sector has emerged as a vital player in infrastructure spending, with financial institutions, multilateral corporations, and institutional investors contributing to close funding gaps through various financial instruments (Kwak, Chih & Ibbs, 2020; Gatti, 2015). A symbiotic relationship exists between financial institutions, governments, and the construction industry, as project financing is crucial to government operations and construction projects (Ofori *et al*., 2017). The role of financial institutions in providing project financing vehicles is expanding rapidly, emphasizing their importance in construction project financing (Gatti, 2015). When providing debt and equity financing for medium or long-term construction projects, commercial banks, multilateral corporations, and institutional investors typically consider collateral requirements and interest rates after evaluating the project feasibility and viability (Alzahrani, Emsley, & Ahmadi, 2020; Ofori *et al.*, 2017). Despite the widespread

attention for private financing of infrastructure projects, actual empirical work on financing Public Private Partnerships (PPP's) remains limited (Demirel, Leendertse & Volker, 2022) with Shen (2024) reporting that PPP financiability is influenced by both internal and external factors of the project.

Research has consistently shown that financing difficulties can have severe consequences on project delivery, with Makun and Ganiyyu (2019) reporting that 56,000 projects in six geopolitical zones of Nigeria were suspended or abandoned due to financing difficulties, requiring approximately 12 trillion naira to complete. Similarly, Ofori *et al.* (2017) found that collateral requirements and high borrowing costs from commercial banks in Ghana hindered access to affordable project financing, leading to delays in construction project delivery. Furthermore, studies have highlighted the impact of collateral requirements on access to financing, with Fachrurazi *et al.* (2023) finding that collateral requirements had a positive and significant impact on government policy and financial inclusion in Indonesia, making it easier for entrepreneurs with required collateral to access finance. Moreover, Ndala (2019) reported that financial institutions in Malawi require collateral and interest at a given rate as financing requirements, posing a significant barrier to SMEs accessing necessary financing. Additionally, research has shown that government borrowing costs can have a ripple effect on the economy, reducing borrowing costs for households and businesses can stimulate investment, consumption, and economic growth (Havolli, 2023). External factors, such as inflation, climate change, and extreme weather conditions, can also impact project delivery outcomes, with Osmond, Akamike, and Ihugba (2024) noting that inflation negatively impact the public and private sectors, leading to increased expenditures and budget deficits. Moreover, Amarachi *et al.* (2025) reported that climate change resulting from extreme weather conditions threatens urban planning and infrastructural development, while Kirubel (2023) identified external factors, including extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws, as potentially affecting project delivery outcomes. However, there remains a significant gap in how external factors including extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws affect construction project financing requirements (collateral requirements and cost of borrowing) and project delivery delay in the Nigerian construction industry.

This study seeks to bridge the knowledge gap by investigating the moderating effect of external factors, including extreme weather events, material price volatility, equipment shortages, right-of-way issues and unstable laws and regulations, on the relationship between project financing requirements (collateral requirements and cost of borrowing) and project delivery delay in Nigeria's construction industry. Guided by specific hypotheses (outlined below), this research employs a structured thematic analysis of data collected from construction project stakeholders in Kaduna State, Nigeria. The paper is organized into five sections: a literature review of relevant empirical perspectives and value addition in the research (Section 2), a description of the research methodology, including the theoretical framework, instrument validation and data analysis techniques (Section 3), a presentation of the results and discussion (Section 4), and finally, conclusion, policy implication for implementation and recommendations conclude the paper (Section 5).

Hypothesis 1: There is a significant relationship between project financing requirements and project delivery delay in the Nigerian construction industry.

Hypothesis 2: There is a significant relationship between external factors and project delivery delay in the Nigerian construction industry.

Hypothesis 3: External factors moderate the relationship between project financing requirements and project delivery delay in the Nigerian construction industry.

2. LITERATURE REVIEW

2.1 Empirical Literature

2.1.1 Project financing requirements and project delivery delay

Empirical studies have looked at the dynamics between project financing requirements and delivery delay highlighting the pivotal role of collateral requirements, interest rates, and government borrowing costs. For instance, Fachrurazi *et al.* (2023) found that collateral requirements had a positive and significant impact on government policy and financial inclusion, facilitating access to financing for industrial entrepreneurs in West Java, Indonesia. Similarly, Ndala (2019) revealed that financial institutions in Blantyre, Malawi, require specific collateral and interest rates, posing a significant barrier to Small and Medium Scale Enterprises (SMEs) in accessing necessary financing. Havolli (2023) demonstrated that a 1% increase in government borrowing costs led to higher borrowing costs for households and non-financial institutions, subsequently reducing household consumption, investment growth, and GDP growth in eight European transition economies between 2003 and 2016. Osuizugbo (2020) identified a range of financing instruments, including performance bonds, advance payment guarantees, and syndicate loans, used in construction project financing in Nigeria. Furthermore, Yasrizal *et al.* (2023) found that stringent collateral requirements, high interest rates, and inadequate own capital significantly hindered Micro and Medium Scale Enterprises (MSMEs) access to financing from financial institutions in West Aceh of Indonesia, thereby increasing delays. Okereke *et al.* (2018) revealed that financing significantly impacted construction project delivery in Portharcourt of Rivers State, Nigeria, with bank loans and overdrafts being prominent financing options, and 87.78% of respondents acknowledging the significant impact of financing on construction project delivery. Abuye (2020) investigated the determinants of project financing for Small and Medium-sized Enterprises (SMEs) in Addis Ababa, Ethiopia, identifying cost of borrowing and collateral requirements as key factors influencing project financing and project delivery.

2.1.2 External factors and project financing requirements

Nepal *et al.* (2023) conducted a cross-sectional survey of independent power producers, banking and financial institutions (BFIs) in Nepal's hydropower sector, revealing that economic environment, low default rates, central bank guidelines, availability of bankable projects in other sectors, and investible fund constraints significantly impacted project financing. Notably, the study highlighted that BFIs consider project sponsors' credibility and potential misuse of funds when providing financing, leading to the imposition of guarantee conditions to mitigate default risks, ensure project success and loan repayment. Furthermore, Ozioko & Enya (2021) emphasized the significance of credit risk management associated with external factors in improving the performance of commercial banks in Nigeria. Additionally, Okoroigwe, Jessica & Osmond (2025) highlighted the need for sustainable financing, developing local currency bond markets, and enhancing risk management practices to improve access to local financing for economic development.

2.1.3 External factors and project delivery delay

Demirel, Leendertse & Volker (2022) examined the mechanisms used by private financiers to protect their returns on investment in infrastructure projects, identifying nine control mechanisms, including asset and risk diversification portfolio strategies. Amarachi *et al.* (2025)

assessed the socio-economic consequences of climate change, highlighting its disproportionate impact on vulnerable communities and suggesting the adoption of green finance and effective project management to mitigate its effects. Light & Nwaobia (2025) investigated the impact of financial institutions on economic development in Nigeria, identifying low public trust and regulatory gaps as major challenges. Napitupulu and Rarasati (2022) conducted a financial management analysis of the Pasir Kopo Dam construction project in Indonesia, highlighting factors that could impact profit sharing and completion, including raw materials dependability and construction delivery delays. Okeowo and Awotade (2024) studied the relationship between money supply, exchange rate, and output growth volatility in Nigeria, advocating for central bank intervention to reduce exchange rate volatility and associated consequences.

2.2 Value Addition in the Research

This study addresses a significant knowledge gap by investigating the moderating effect of external factors on the relationship between project financing requirements and project delivery delay in Nigeria's construction industry, where empirical research of this type is scarce. By bridging this gap, this research provides novel insights into the complex interplay between external factors, project financing requirements, and project delivery delay in the Nigerian construction industry, ultimately informing policymakers, construction stakeholders, and financial institutions on strategies to mitigate the impacts of the identified external factors, improve project financing and reduce construction project delivery delays.

3. METHODOLOGY

3.1 Theoretical Framework

This study explores moderating role of external factors (extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws) on the relationship between project financing requirements (cost of borrowing and collateral requirements) and project delivery delay in Nigeria's construction industry by leveraging three underpinning theories (Expectancy, inspired confidence and output growth volatility). These theories with their reviews are as follows with the study's theoretical framework presented in Figure 1.

3.1.1 Expectancy theory

Expectancy theory suggests that individuals' behaviour is influenced by their expectations of actualizing outcomes and the reward of actions (Vroom, 1964). In the context of the Nigerian construction industry, external volatilities such as extreme weather conditions, materials price volatility, lack of equipment, unstable laws and regulations, and right-of-way issues can affect project stakeholders' expectations of project outcomes, thereby influencing project financing requirements and project delivery delay. When external volatilities increase, project stakeholders' expectations of successful project outcomes may decrease, leading to decreased motivation and increased risk aversion (Kwak *et al.,* 2020). For instance, extreme weather conditions can disrupt construction activities, leading to delays and increased costs, which can decrease expectations of successful project outcomes and increase financing requirements (Amarachi *et al.,* 2025). Similarly, materials price volatility can impact construction costs, leading to decreased expectations of successful project outcomes and increased financing requirements (Napitupulu & Rarasati, 2022). Lack of equipment and unstable laws and regulations can also decrease expectations of successful project outcomes, affecting financing requirements and project delivery timelines (Demirel, Leendertse & Volker, 2022). Right-of-way issues, such as disputes over land acquisition, can also decrease expectations of successful project outcomes, leading to increased financing costs and requirements (Okeowo & Awotade, 2024). Therefore, based on expectancy theory, it could be hypothesized that external volatilities

will decrease project stakeholders' expectations of successful project outcomes, thereby increasing project financing requirements (cost of borrowing and collateral requirements) and project delivery delay in the Nigerian construction industry.

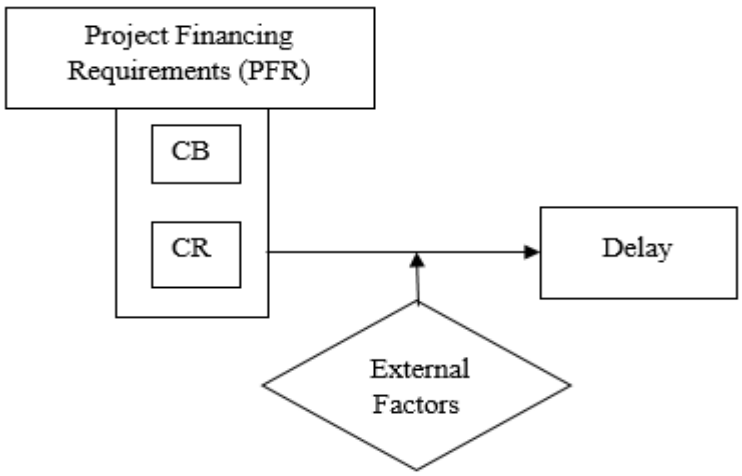
3.1.2 Inspired confidence theory

Inspired confidence theory suggested that confidence in project outcomes affects behaviour which is influenced by various factors, including external volatilities (Kwak *et al.,* 2020). In the context of the Nigerian construction industry, external volatilities such as extreme weather conditions, materials price volatility, lack of equipment, unstable laws and regulations, and right-of-way issues can erode confidence in project outcomes, thereby affecting project financing requirements and project delivery delay. When external volatilities increase, project stakeholders' confidence in project outcomes may decrease, leading to increased risk perception and higher financing costs (Yasrizal *et al.,* 2023). For instance, extreme weather conditions can disrupt construction activities, leading to delays and increased costs, which can erode confidence in project outcomes and increase financing requirements (Amarachi *et al.*, 2025). Similarly, materials price volatility can impact construction costs, leading to decreased confidence in project outcomes and increased financing requirements (Napitupulu & Rarasati, 2022). Lack of equipment and unstable laws and regulations can also decrease confidence in project outcomes, affecting financing requirements and project delivery timelines (Demirel, Leendertse & Volker, 2022). Right-of-way issues, such as disputes over land acquisition, can also decrease confidence in project outcomes, leading to increased financing costs and requirements (Okeowo & Awotade, 2024). Therefore, based on inspired confidence theory, it could be hypothesized that external volatilities will decrease confidence in project outcomes, thereby increasing project financing requirements (cost of borrowing and collateral requirements) and project delivery delay in the Nigerian construction industry.

3.1.3 Output growth volatility theory

Output growth volatility theory suggested that external shocks can lead to fluctuations in economic output, affecting the overall performance of industries, including construction (Havolli, 2023). In the context of the Nigerian construction industry, external volatilities such as extreme weather conditions, materials price volatility, lack of equipment, unstable laws and regulations, and right-of-way issues can increase output growth volatility, thereby affecting project financing requirements and project delivery delay. Extreme weather conditions, for instance, can disrupt construction activities, leading to delays and increased costs (Amarachi *et al.*, 2025). This, in turn, can affect project financing requirements, such as cost of borrowing and collateral requirements, as lenders may perceive projects as riskier and demand higher interest rates or collateral (Fachrurazi *et al.*, 2023). Similarly, materials price volatility can impact construction costs, leading to delays and increased financing requirements (Napitupulu & Rarasati, 2022). Lack of equipment and unstable laws and regulations can also increase project uncertainty, affecting financing requirements and project delivery timelines (Demirel, Leendertse & Volker, 2022). Right-of-way issues, such as disputes over land acquisition, can also delay project completion, increasing financing costs and requirements (Okeowo & Awotade, 2024). Therefore, based on output growth volatility theory, it could be hypothesized that external volatilities will increase project financing requirements (cost of borrowing and collateral requirements) and project delivery delay in the Nigerian construction industry.

Figure 1: Conceptual Framework



Project Financing Requirements: Cost of borrowing (CB), Collateral requirements (CR)

3.2 Research Design, Sample Size and Sampling Techniques

This study adopted a survey research design, gathering primary data through a cross-sectional survey conducted in 2024. The survey instrument, adapted from existing literature (Kirubel, 2023; Abuye, 2020), measured project financing requirements (collateral requirements and cost of borrowing), project delivery delay, and external factors (extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws) as a moderator. The instruments for each construct are unidimensional. The study's population comprised construction project stakeholders in Kaduna state, including clients, contractors, subcontractors, and developers. Using Krejcie and Morgan's sample size determination table, a sample size of 384 was initially determined, which was later adjusted to 423 to account for potential non-responses. A total of 423 questionnaires were distributed to the construction stakeholders in Kaduna state using random sampling technique which yielded responses from 200 contractors, 100 clients, 53 developers, and 70 subcontractors.

3.3 Instrument Validation and Method of Data Analysis

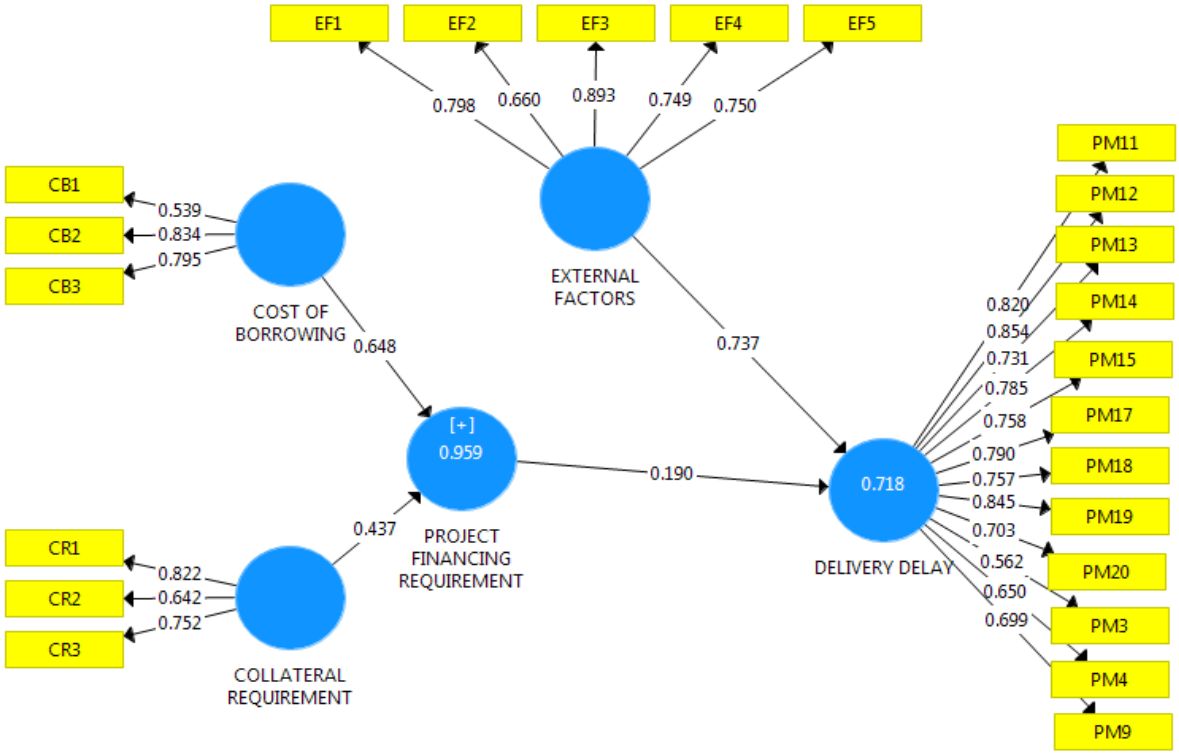
The study instrument was adapted from Abuye (2020) and Kirubel (2023) whose outcome was subjected to expert assessment and corrections before despatch. Furthermore, validity of the research instrument was investigated through the measurement model of Partial Least Squares Structural Equation Modelling (PLS-SEM) with PLS 3.0 software by computing item loadings, average variance extracted (AVE), composite reliability (CR), discriminant validity using the Heterotrait-Monotrait Ratio (HTMT) and removing items measuring the study constructs with loadings less than the minimum threshold in line with (Hair *et al.*, 2018; Hair *et al.*, 2014; Henseler, Ringle & Sarstedt, 2016). The structural model analysis which requires hypotheses testing and model validation was done utilizing PLS-SEM 3.0 software. This approach enabled a comprehensive research instrument validation and examination of the relationships between project financing requirements (cost of borrowing and collateral requirements), external factors (extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws), and project delivery delay, aligning with the study's theoretical framework presented in Figure 1. The outcomes of these analysis are summarized in Tables 1-5 and Figures 2-3, providing a comprehensive overview of the results.

4. RESULTS AND DISCUSSION

4.1 Measurement Model Assessment

In assessing the reliability of each indicator, the outer loadings of each construct's measure were scrutinized, following established guidelines (Hair *et al.*, 2018). While most loadings surpassed the recommended 0.5 threshold, eight items fell short. However, Hair *et al.* (2014) suggest that indicators with loadings between 0.4 and 0.7 can be retained if removing them doesn't enhance the model's average variance extracted (AVE) and composite reliability (CR). Upon careful evaluation, 23 of the 31 items measuring the study's constructs were deemed reliable, with loadings ranging from 0.539 to 0.893. The eight items with subpar loadings (PM1, PM2, PM5, PM6, PM7, PM8, PM10) were removed, consistent with Hair *et al.* (2018) recommendations. The detailed outer loading values are presented in Figure 2 and Table 1. This rigorous evaluation process ensured that only reliable indicators were retained, thereby maintaining the integrity of the study's findings.

Figure 2: Measurement Model



An assessment of internal consistency reliability was conducted using composite reliability, as recommended by Hair *et al.* (2017). This approach provides a nuanced evaluation of indicator reliability by focusing on individual outer loadings. The results, presented in Table 1, demonstrate that all constructs exceeded the recommended threshold of 0.70, with the lowest composite reliability (CR) value being 0.773 for cost of borrowing under project financing requirements. This suggests that the constructs exhibit satisfactory internal consistency reliability, aligning with established guidelines (Hair *et al.*, 2018). The composite reliability analysis confirmed that the study's constructs possess adequate internal consistency reliability.

Convergent validity was assessed by analysing the average variance extracted (AVE) values, in line with Hair *et al.* (2014) recommendations. AVE values of 0.50 or higher are considered

indicative of satisfactory convergent validity. As shown in Table 1, the AVE values for the constructs ranged from 0.540 to 0.599, surpassing the minimum threshold. This outcome provides evidence of adequate convergent validity, supporting the notion that the constructs effectively capture their intended theoretical domains. The AVE values confirmed that the constructs exhibit satisfactory convergent validity.

Table 1: Measurement Model Result

Constructs	Items	Loadings	CR	AVE
Project Financing Requirements (Cost of borrowing: CB & Collateral Requirements: CR)	CB1	0.539	0.773	0.540
	CB2	0.834		
	CB3	0.795		
	CR1	0.822	0.785	0.551
	CR2	0.642		
	CR3	0.752		
Project Delivery Delay	PM3	0.562	0.939	0.563
	PM4	0.650		
	PM9	0.699		
	PM11	0.820		
	PM12	0.854		
	PM13	0.731		
	PM14	0.785		
	PM15	0.758		
	PM17	0.790		
	PM18	0.757		
	PM19	0.845		
	PM20	0.703		
External Factors (EF)	EF1	0.798	0.881	0.599
	EF2	0.668		
	EF3	0.893		
	EF4	0.749		
	EF5	0.750		

Source: Smart PLS extract (2025)

To evaluate the distinctiveness of each construct, discriminant validity was assessed using the Heterotrait-Monotrait Ratio (HTMT) correlation, as suggested by Henseler, Ringle & Sarstedt (2015). This approach was chosen over traditional methods, such as cross-loadings and the Fornell-Larcker criterion, due to concerns that these methods may not always effectively identify discriminant validity issues (Henseler, Ringle & Sarstedt, 2015). The results, presented in Table 2, show that the HTMT ratio values ranged from 0.410 to 0.819, falling below the recommended maximum threshold of 0.85 (Kline, 2011). This indicates that the constructs demonstrate satisfactory discriminant validity, confirming that each construct is distinct and should be retained in the model. The HTMT ratio analysis provides evidence of discriminant validity, supporting the notion that the study's constructs are unique and well-defined.

Table 2: Discriminant Validity using Heterotait-Monotrait Ratio (HTMT)

Constructs	CR	CB	Delay	External Factors
Collateral Requirements (CR)				
Cost of Borrowing (CB)	**0.765**			
Delay	0.429	**0.737**		
External Factors (EF)	0.410	0.597	**0.819**	
Financing Requirements	0.722	0.735	0.656	**0.596**

Source: Smart PLS extract (2025**)**

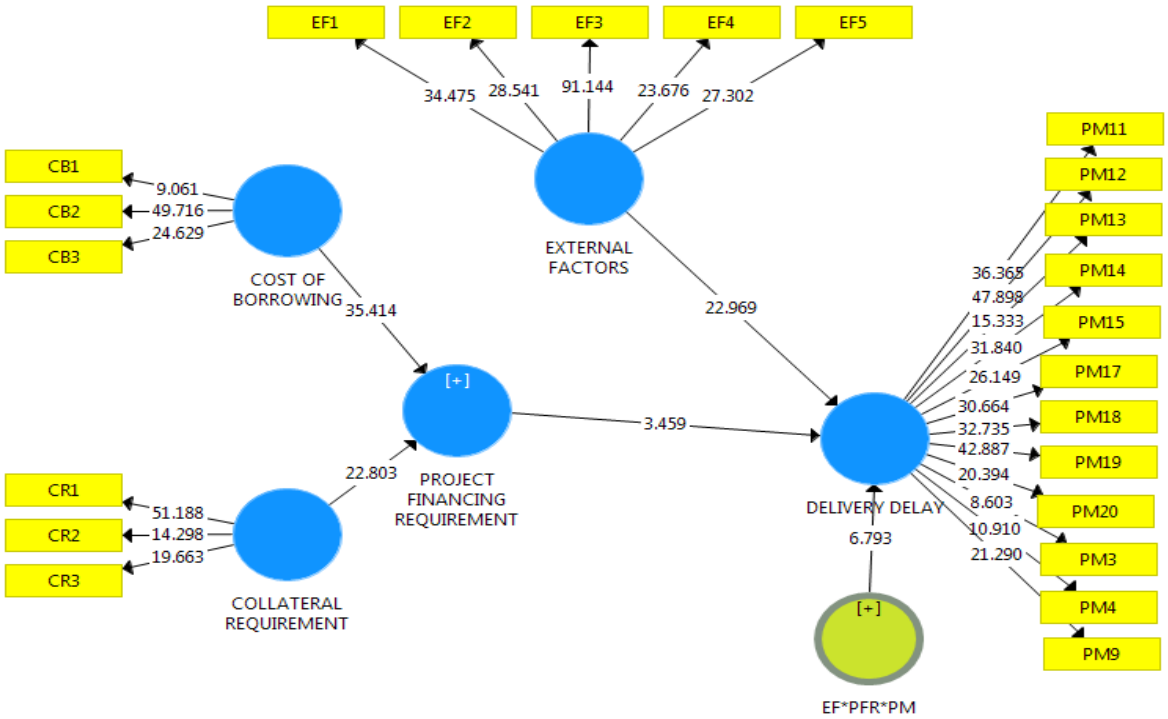
4.2 Structural Model Assessment

The structural model, or inner model, provides a visual representation of the relationship between the theoretical latent variables, offering insights into the complex interplay between these constructs (Sarstedt *et al.*, 2016). This study investigated the hypothesized relationship outlined in the conceptual framework (Figure 1), with the results of these hypotheses presented in Figure 3 and Table 3. These findings highlight the significant path coefficients and loadings, shedding light on the interplay between the study constructs.

Table 3: Hypothesis Test (Direct and Moderating Relationship)

Hypotheses	**Relationship**	**Beta value**	**(STDEV)**	**t-value**	**p-value**	**Findings**
H1	PFR -> DELAY	0.115	0.033	3.459	0.000	Supported
H2	EF -> DELAY	0.705	0.020	22.969	0.000	Supported
H3	EF*PFR -> DELAY	-0.136	0.031	6.793	0.000	Supported

Figure 3: Structural Model



This study probed the moderating influence of external factors (extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties

and unstable laws) on the relationship between project financing requirements (cost of borrowing and collateral requirements) and project delivery delay in Nigeria's construction industry.

The results, as presented in Table 3, revealed a significant positive correlation between project financing requirements (cost of borrowing and collateral requirements) and project delivery delay ($\beta = 0.115$, $t = 3.459$, $p < 0.000$), meaning that increase in project financing requirements (borrowing cost and collateral) will exacerbate construction project delivery delays in line with the study's alternative hypothesis 1 which posits a significant link between project financing requirements and construction project delivery delay in the Nigerian construction industry. This outcome is consistent with prior research by Ofori *et al.* (2017), Ndala (2019), Havolli (2023), and Fachrurazi *et al.* (2023). The results highlight the robust correlation between project financing requirements and project delivery delay. This correlation is further underscored by the expectancy theory, which suggests that individuals' actions are driven by the expectation of achieving desired outcomes and the perceived value of those outcomes (Vroom, 1964). In project financing, project owners aim to deliver projects with affordable financing that minimizes constraints and borrowing costs, while project financiers strive to reduce risk and ensure favourable returns on investment. To achieve these, financiers demand returns in the form of borrowing costs and hedge against risk by requiring collaterals to support financing, after assessing the project's feasibility and viability. Demirel, Leendertse & Volker (2022) emphasized that guaranteeing returns on investment is a significant factor in investors' project evaluation and investment decisions, highlighting the need for project owners to provide assurances of favourable returns. Furthermore, Light & Nwaobia (2025) cautioned that inefficient risk management by financial institutions can prevent them from achieving their objectives and even lead to bankruptcy, underscoring the importance of effective risk management strategies. As a result, project owners and financiers seek to obtain value through favourable returns on investment while minimizing risk by imposing and accepting conditions that favour their objectives. The inability of construction project stakeholders to strike a balance on project financing requirements, particularly collateral and borrowing costs, is likely to increase construction project delivery delays. Therefore, effective project financing strategies are essential to minimize delays and ensure successful project outcomes.

The results presented in Table 3 revealed a significant positive relationship between external factors, including extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws, and construction project delivery delay in the Nigerian construction industry ($\beta = 0.705$, $t = 22.969$, $p < 0.000$), meaning that the study's external factors will exacerbate construction project delivery delays, supporting alternative hypothesis 2, which posits a significant link between external factors and project delivery delay. This outcome is consistent with previous research by Amarachi *et al.* (2025), Osmond, Akamike, and Ihugba (2024), Okeowo & Awotade (2024) and Demirel, Leendertse & Volker (2022) highlighting the substantial impact of the study's external factors on project delivery delay. The findings suggest that these external factors introduce vulnerabilities, uncertainties, and conflicts which reduce financier's confidence and prolong project delivery timelines. Notably, the results indicate that external factors have a profound effect on predicting project delivery delay, with a 1% reduction in the impact of these factors potentially leading to a corresponding 1% decrease in project delivery delay. Furthermore, the analysis revealed that external factors account for 70.5% of the variation in project delivery delay (as shown in Table 3). These findings align with output growth volatility theory which suggested that vulnerabilities and uncertainties affecting outcomes and decision-making, can drive away investors and project financiers, as noted by Demirel, Leendertse & Volker (2022), who

emphasized that investors and financiers generally approach uncertainties from a risk perspective and characterized them as exposure to loss, which could affect return on investment and deter favourable investment and financing decisions. This underscores the critical importance of mitigating the effects of external factors to improve project outcomes and reduce project delivery delays in the Nigerian construction industry. Specifically, climate change, which leads to extreme weather events, poses a significant threat to rural, urban planning and development in line with Amarachi *et al.* (2025), who recommend climate change mitigation strategies, including resilient planning and design, improved infrastructure, and sustainable management practices. Inflation which could lead to increased material prices negatively impacts the public and private sectors, leading to increased expenditure and budget deficits (Osmond, Akamike & Ihugba, 2024), as proposed by Osmond, Akamike & Ihugba (2024) intervening in inflation through interest rate pegs, fiscal, and monetary policies to reduce material price volatility resulting from naira devaluation and the dependence of the Nigerian economy on imports is a significant pathway for economic development. Furthermore, equipment shortages, as outcome of improper procurement and project planning, can be prevented through improved cost estimation, strengthened appraisal and approval, effective procurement and project planning strategies, improved programme management, and implementing lessons learned, as reported by Chapman (2024). Finally, unstable laws and regulations can drive away investors and increase construction project delivery delays, highlighting the need for institutional strengthening and improved governance to maintain fiscal stability and borrowing, as noted by Okoroigwe, Jessica & Osmond (2025), who cited Germany and Japan's effective debt financing and management policies, transparency, prudent fiscal policies, and credibility as successful examples.

Also, the results presented in Table 3 reveal that external factors (extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws) play a moderating role in the relationship between project financing requirements (cost of borrowing and collateral requirements) and project delivery delay. This finding supports Hypothesis 3, which posits that *external factors moderate the relationship between project financing requirements and project delivery delay in the Nigerian construction industry* ($\beta = -0.136$, $t = 6.793$, $p < 0.000$). The negative correlation coefficient ($\beta = -0.136$) highlights the significance of mitigating external factors' impact on project delivery and financing, fostering confidence among project financiers in line with the inspired confidence theory. By implementing robust procurement and project planning, illegal development control, risk assessments and management, collaborative design and decision-making among stakeholders, project financiers' confidence can be instilled, as emphasized by the findings and recommendations of Amarachi *et al.* (2025), Osmond, Akamike & Ihugba (2024), Okeowo & Awotade (2024), Chapman (2024), and Demirel, Leandertse & Volker (2022), which stress the importance of proactive risk management, collaborative planning, and effective governance mechanisms to ensure successful project outcomes, ultimately minimizing the negative effects of external factors and ensuring project success. These can lead to more favourable financing terms, reduced cost of borrowing, and lower collateral requirements. Specifically, a 1% increase in efforts to mitigate the negative effect of external factors can improve project financing requirements, leading to reduced construction project delivery delays. The study's outcome corroborates the findings of Okoroigwe, Jessica & Osmond (2025), who noted that integrating financial and debt policies, maintaining microeconomic stability, and strengthening local and international debt market engagements are crucial for improving access to financing and debt management in Nigeria. This is particularly important, as Okeowo & Awotade (2024) observed that micro and macroeconomic variables in Nigeria fluctuate, leading to expansionary and contractionary impacts that require effective policies and governance to contain. In this

context, Demirel, Leendertse & Volker (2022) posited that investors and financiers typically peg project ratings on calculated ranges of qualitative and quantitative risk characteristics likely to affect project outcomes, and that it is an inherent practice for investors and financiers to transfer or allocate risk to third parties through risk hedging to guarantee returns on investment. Furthermore, Okoroigwe, Jessica & Osmond (2025) opined that emerging trends in debt management are focusing on sustainability, risk management, digitalization, and innovation, with sustainable financing options like green bonds, local currency bond markets, social bonds, SDG-linked bonds, and Public Private Partnerships (PPPs) being vigorously pursued to ensure resilience and crisis preparedness. Amarachi *et al.* (2025) also emphasized the need for a comprehensive approach to mitigating climate change in Nigeria, including robust policies, PPPs, stakeholder collaboration, community engagement, and innovation. Additionally, Demirel, Leendertse & Volker (2022) suggested that governments can attract investors and financiers by providing fiscal incentives such as guarantees, insurance, and credit enhancements, while strong political support, standard contracts, and sound contract management can improve investment and financing decisions. Therefore, effective government policies, procurement, project planning, risk management, and collaborative planning can enable project stakeholders to secure better loan terms, reduce financing costs, and expedite financing approval, ultimately enhancing project delivery and competitiveness.

To shed light on how project financing requirements contribute to project delivery delay, the coefficient of determination (R-squared) for project delivery delay was computed and presented in Table 4. While acceptable R-squared thresholds vary across studies, Hair *et al.* (2014) recommend a minimum threshold of 0.10. The R-squared value obtained in this study is 0.718 (Table 4), indicating that the two exogenous latent variables (cost of borrowing and collateral requirements) collectively account for 71.8% of the variance in construction project delivery delay, aligning with the research model. This exceeds the minimum acceptable threshold, confirming that the endogenous latent variable exhibits a satisfactory level of explained variance. To assess the effect size of the exogenous latent variables on the endogenous variable, the F^2 value was calculated. The F^2 value represents the relative influence of a particular exogenous latent variable on the latent endogenous variable, based on changes in the R-squared value caused by the exclusion of the former (Chin, 1988; Hair et al., 2014). As shown in Table 5, the F^2 values reveal that external factors have a substantial impact on construction project delivery delay, accounting for 69.5% of the variance. In contrast, project financing requirements exhibit a relatively small effect size, accounting for 9.6% of the variance. These findings suggest that the moderator (external factor) significantly influences the relationship between the exogenous and endogenous variables, absorbing a substantial portion of the exogenous variables' influence. As such, this study highlights the importance of considering external factors in construction project delivery delay, as they have a significant impact on the outcome.

Table 4: Coefficient of Determination

	R Square	Adjusted R Square
Project Delivery Delay	0.718 (71.8%)	0.716 (71.6%)

Source: Smart PLS extract (2025)

Table 5: Effective Size Assessment using F-Square

Construct	F-Square Delay	Effect Size
External Factors	0.695	large
Project Financing Requirements	0.096	Small

Source: Smart PLS extract 2025

5. CONCLUSION, POLICY AND RECOMMENDATIONS

5.1 Conclusion

This study offers a nuanced understanding of the intricate relationships between project financing requirements (collateral requirements and cost of borrowing), external factors (extreme weather events, material price volatility, equipment shortages, right-of-way disputes, regulatory uncertainties and unstable laws) and construction project delivery delay in the Nigerian construction industry. Findings of the study highlight the pivotal role of these external factors in exacerbating project delivery delays, emphasizing the need for proactive project planning, illegal development control, adequate risk management, strategic material demand planning and inventory management and stable regulatory environment. By shedding light on the moderating effect of these external factors on project financing requirements and project delivery delay in the construction industry, this study provides valuable insights into the complex interplay between these constructs. The findings revealed that employing effective risk management strategies, effective procurement and project planning, curtailing illegal development and providing stable regulatory environment can mitigate the impact of these external factors and restore confidence to investors and project financiers, thereby reducing borrowing cost and collateral requirements, increase financial certainty and stability and lead to expedited project delivery.

5.2 Policy Implications for Implementation

The study's findings necessitate a multi-faceted policy response from various Ministries, Departments, and Agencies (MDAs) of the Nigerian government, as well as financial institutions and other private sector stakeholders. The Central Bank of Nigeria (CBN) should develop and implement policies to mitigate the impact of external factors on project financing requirements, including collateral and cost of borrowing, and delivery delay, while the Federal Ministry of Finance (FMF) should support project financing through fiscal policies and taxation incentives. The Debt Management Office (DMO) should implement risk management strategies and provide financing options that account for external factors, while the Nigeria Deposit Insurance Corporation (NDIC) should ensure deposit insurance policies protect depositors or investors and maintain stability in the financial system. The Federal Ministries of Works (FMW), Transportation (FMT) and other ministries in charge of infrastructure should develop infrastructure development policies and implement project planning and effective management strategies that consider external factors, while the Federal Ministry of Justice (FMJ) should ensure that regulatory frameworks are in place to mitigate the impact of external factors, reduce volatilities and uncertainties in the Nigerian landscape which is expected to culminate to effective and timely construction project delivery. The National Information Technology Development Agency (NITDA) should promote the adoption of ICT in the construction industry to improve project planning, management, and delivery. The Bank of Industry (BOI) should provide financing options for Small and Medium Enterprises (SMEs) in the construction industry, while the Nigeria Sovereign Investment Authority (NSIA) should invest or encourage investment in feasible and viable infrastructure development projects of national importance whose delivery are impacted or projected to be affected by external factors. The Nigeria Investment Promotion Commission (NIPC) should promote investment in the construction industry and provide support for project financing, while the National Planning Commission (NPC) should ensure that national development plans account for the impact of external factors on project delivery delay. The Nigeria Pension Commission (PENCOM) should explore the deployment of pension funds into infrastructure financing by developing necessary guiding policies and regulating Pension Fund Administrators (PFA) in this regard. State Governments, through their physical planning and development ministries, boards, and authorities, should implement physical planning policies that support infrastructure

development and mitigate the impact of external factors on project delivery. The Bureau for Public Procurement (BPP) should ensure that procurement policies and regulations account for external factors, while the National Assembly should enact laws that support project financing and mitigate the negative impact of external factors on project delivery. Private sector stakeholders, including project owners, should adopt risk management strategies and implement project planning and management practices that account for external factors, while financial institutions should provide financing options that consider the impact of external factors on project delivery, including flexible collateral requirements and competitive borrowing costs. Financial institutions should also develop and implement risk assessment frameworks that account for external factors, and provide training and capacity-building programs for project owners and developers on risk management, project planning and project financing. Ultimately, the Nigerian government, in collaboration with private sector stakeholders, should establish a comprehensive policy framework that addresses the challenges posed by external factors and project financing requirements and promote sustainable project financing and delivery in the construction industry.

5.3 Recommendations

The study's findings offer valuable insights into the moderating role of external factors on project financing requirements and project delivery delay in the Nigerian construction industry. Although the sample was drawn from Kaduna State, Nigeria, the findings are likely generalizable to other regions of the country due to the nature of the Nigerian construction industry and its present regulatory frameworks. Notwithstanding these, future studies could validate these findings by exploring the effect of these external factors in other regions of the country, African countries or regions with similar economic and regulatory environments. Additionally, research could investigate innovative financing models like green bonds or pension funds, and the effectiveness of digital technologies such as Building Information Modelling (BIM) or Blockchain Technology (BCT) in enhancing project planning and delivery. The study recommends that policymakers, project owners, and financial institutions proactively manage external factors like extreme weather events, materials price volatility, equipment shortages, right-of-way disputes and regulatory uncertainties through effective planning and risk management. Policymakers should develop policies supporting project financing, including affordable collateral requirements and competitive borrowing costs, ensuring that project financing requirements are balanced with the need for sustainable project delivery.

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