MODERATING EFFECT OF FIRM CHARACTERISTICS ON PROJECT FINANCING REQUIREMENTS AND PROJECT DELIVERY DELAY IN THE NIGERIAN CONSTRUCTION INDUSTRY

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Abstract

The timely completion of construction projects is a global challenge, with project delivery delays resulting in significant economic losses and reputational damage. Firm characteristics and project financing requirements are critical factors influencing project delivery outcomes. Therefore, this study investigated the moderating effect of firm characteristics on the relationship between project financing requirements and project delivery delay in the Nigerian construction industry. Employing a survey research design, primary data was collected through a cross-sectional survey of 423 construction project stakeholders in Kaduna State. The data collected was analysed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with PLS 3.0 software. Findings of the study revealed that firm characteristics - including age, experience in obtaining construction project financing, and robust financial record-keeping - play a pivotal moderating role in mitigating construction project delivery delays. Notably, the study highlights the strategic importance of forming alliances with reputable partners to bolster firm characteristics, thereby unlocking favourable financing terms and expedited project delivery. To optimize project outcomes, construction firms are advised to forge strategic consortiums with esteemed organizations, enhancing their firm characteristics and ultimately reducing construction project delivery delays.

Key words: *Construction Industry, Project Delivery, Firm Characteristics, Nigeria*

Introduction

The construction sector plays a vital role in driving economic growth, contributing substantially to global GDP and providing employment opportunities (Vaitkevicius, 2014; Macumba, Amoah & Mbelembe, 2022). In Nigeria, infrastructure development projects, such as transportation systems, healthcare facilities, educational institutions,

and residential buildings, receive annual budgetary allocations. However, many of these projects face significant challenges, including delays, suspension, or abandonment, with inadequate funding being a primary obstacle (Makun and Ganiyu, 2019). Construction project delivery delay refers to the time overrun or extension of time required to complete a project, exceeding the initially planned duration (Hamzah *et al.*, 2011). Research suggests that financial constraints are a primary cause of delays, with approximately 50% of project delays attributed to project owners' inability to settle payments with consultants, contractors, and suppliers, resulting in delayed project delivery and profit losses (Nguye & Chileshe, 2015). To maintain its contribution to the national economy, the construction sector relies heavily on financing, enabling industry stakeholders to invest in development projects with significant economic impact (Okereke, Pepple & Eze, 2018). Given the inherent nature of construction projects, where costs are incurred before returns are generated, securing capital resources is crucial for project owners to finance construction costs (Okereke, Pepple & Eze, 2018).

Effective construction project financing entails forecasting, budgeting, and acquiring necessary funds, as well as managing these resources efficiently to ensure timely and cost-effective project delivery (Adamu & Idris, 2024). Neglecting to implement suitable project financing strategies can harm business operations, lead to profit losses, and cause significant project failures or delays (Adia, 2019). Given current public budget constraints, bridging the infrastructure gap requires increased private capital fundraising (Gatti, 2015). In response, the private sector has begun to play a vital role in infrastructure spending, with banks, multilateral corporations, and institutional investors contributing to close funding gaps through various financial instruments such as debt, equity, or hybrid financial instruments (Gatti, 2015). A strong connection 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 project banks, multilateral corporations, and institutional investors in providing project financing vehicles is growing rapidly, emphasizing the importance of financial institutions in construction project financing (Shuliuk & Horyn, 2022). When providing debt and equity financing for medium- to long-term construction projects, local financial institutions typically consider collateral requirements and interest rates, after assessing project feasibility and viability (Abuye, 2020; Ofori *et al.*, 2017).

Kirubel (2023) identified firm characteristics, including organizational age, financial management expertise, and accounting proficiency, as pivotal factors influencing project delivery outcomes. However, the moderating role of these characteristics on the relationship between project financing requirements and project delivery delay remains unexplored in the context of the Nigerian construction industry. This knowledge gap necessitates an investigation into the interplay between firm characteristics, project

financing requirements, and project delivery delay, which this study aims to address. Therefore, this study investigated the moderating effect of firm characteristics on project financing requirements and project delivery delay in the Nigerian construction industry.

Literature Review

Project Delivery Delays

Construction project delivery delay is characterized by the extension of time required to complete a project, surpassing the initially planned duration (Hamzah *et al.*, 2011). This phenomenon can lead to significant economic losses, reputational damage, and decreased customer satisfaction (Aibinu & Odeyinka, 2018). When a project fails to meet its scheduled completion date, it can result in additional costs, reduced quality, and decreased client satisfaction, ultimately compromising project delivery (Oyewobi, Oke & Aghimien, 2020). The disparity between planned and actual project duration can have severe consequences, including increased costs, reduced quality, and strained relationships with stakeholders (Gharaibeh, 2019). Moreover, project delivery delay is a critical issue that can undermine the success of construction projects, leading to cost overruns, schedule extensions, and quality problems (Liu, Li & Zhang, 2020).

Project Financing

Construction project financing has to do with forecasting, budgeting, acquisition of finance needed for construction projects and management of the acquired finances in an efficient and effective manner to achieve a cost effective and timely delivery of construction projects Adamu & Idris (2024). Project financing is crucial in the construction industry as it enables the execution of large-scale projects, mitigates financial risks, and ensures timely completion with effective project financing enhancing project viability and profitability (Alzahrani, Emsley & Ahmadi, 2020). In Nigeria, infrastructure development projects, such as transportation systems, healthcare facilities, educational institutions facilities, and residential buildings, receive annual budgetary allocations. However, many of these projects face significant challenges, including delays, suspension, or abandonment, with inadequate funding being a primary obstacle (Makun and Ganiyu, 2019). Given current public budget constraints, bridging the infrastructure financing gap requires increased private capital fundraising (Gatti, 2015). In response, the private sector has begun to play a vital role in infrastructure spending, with banks, multilateral corporations, and institutional investors contributing to close funding gaps through various financial instruments such as debt, equity, or hybrid financial instruments (Gatti, 2015). A strong connection 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 project banks, bilateral cooperation, multilateral corporations, institutional investors and commercial banks in providing project financing vehicles is growing rapidly, emphasizing the importance of financial institutions and other project financing bodies in construction project financing (Shuliuk & Horyn, 2022).

Project Financing Requirements and Project Delivery Delay

When providing debt and equity financing for medium to long-term construction projects, commercial banks, institutional investors and multilateral corporations typically consider collateral requirements and interest rates as project financing requirements, after assessing project feasibility and viability (Abuye, 2020; Ofori *et al.*, 2017). Creditors typically request collateral as a precautionary measure to mitigate potential risks, rather than intending to exercise recourse on specific assets in the event of project failure (Gatti, 2015; Abuye, 2020). Instead, lenders aim to establish a comprehensive security package that grants them control over the Special Purpose Vehicle (SPV) if the project's performance raises concerns about its ability to service its debt (Klein & So, 2015, Gatti, 2015). Collaterals as security package for project finance typically includes a mortgage on fixed assets, a pledge on the project company's shares and bank accounts, and covenants that impose additional obligations on the borrower beyond debt repayment (Shuliuk & Horyn, 2022). According to recent studies, the risk of interest rate fluctuations is inherent in most project finance deals, primarily due to their long-term nature where lenders are reluctant to provide financing to a Special Purpose Vehicle (SPV) at a fixed interest rate, exposing the project to potential interest rate risks (Bhattacharya, Chakraborty & Gupta, 2020). This risk is further complicated by the complexity of project finance structures, which can involve multiple lenders and equity investors (Klein & So, 2015). The use of multilateral project financing is widespread globally, spanning both developing and industrialized countries, with a geographical breakdown of project finance loans revealing concentration in four regions where Western Europe accounts for around 28% of global project finance loans, followed by North America at 12% while Africa, the Middle East and South Asia each holding approximately 13.5% (Marques, Ferreira, & Vieira, 2020; Gatti, 2015).

The role of domestic banking and financial institutions in project finance on the perspective of hydropower sector in Nepal was investigated by Nepal *et al.* (2023), where the study employed the concept of cross-sectional survey utilizing questionnaire method of data collection responded by independent power producers and banking and financial institution (BFIs). The data collected was analysed statistically using regression analysis to examine validity or otherwise of the research hypotheses.

Findings of the study revealed predictor variables like economic environment, low default rate, central bank guidelines, availability of more bankable projects in other sectors and investible fund constraints as having significant impact on project finance. The authors identified project sponsors credibility and possible misuse of funds as considerations in financing by BFIs, which made the creditors to impose guarantee conditions to project sponsors to mitigate unforeseen default relating to project success and loan repayment.

Fachrurazi *et al.* (2023) studied factors that determine access to finance for Indonesian industrial entrepreneurs of West Java domain. The study collected primary data using structured questionnaire administered to 200 entrepreneurs with the data obtained analyzed using structured equation modelling utilizing smart PLS. Findings revealed a positive and significant impact of collateral requirement on relative government policy and financial inclusion for entrepreneurs where access to finance was found to be easier to entrepreneurs with required collaterals.

Ndala (2019) studied the determining factors in accessing finance by Small and Medium Scale Enterprises (SME's) in Blantyre city of Malawi using questionnaires administered to 100 SME's within the study domain. Findings revealed that willing and capable financial institutions exist ready to finance SME's that meet collateral and interest rate requirements but the requirements takeoff SME's from accessing the finance.

Micro and Medium Scale Enterprises (MSME's) financing in terms of the relationship between MSME's and Financial Institutions in West Aceh of Indonesia was investigated by Yasrizal *et al.* (2023) utilizing quantitative and qualitative methods that collected data from 100 MSME's within the research domain. The data collected was analyzed using binary logistics and probability models with the findings indicating that collateral requirements, loan repayment difficulties, interest rates and own capital have negative impact on MSME's access to financing by financial institutions.

Osuizugbo (2020) conducted qualitative research with the aim of identifying financing instruments used in construction project financing in Nigeria. The purpose of the study was to reduce insolvency, increase profitability and reduce delay associated with project delivery. Interviews were conducted with project financing stakeholders in commercial banks with the information obtained subjected to content analysis. Findings of the study revealed that performance bond, advance payment guarantee, bid bond, retention bond, bank guarantee and syndicate loans were the financial instruments used for construction project financing in Nigeria.

Havolli (2023) investigated the impact of government borrowing costs on microeconomic variables and private borrowing costs in eight European transition

economies from 2003 to 2016. Utilizing panel VAR analysis, the study revealed that a 1% increase in borrowing costs led to higher borrowing costs for households and non-financial institutions, resulting in decreased household consumption, investment growth, and GDP growth. The findings suggest that reducing sovereign borrowing costs could have a positive impact on the economy by lowering borrowing costs for households and businesses, thereby stimulating investment, consumption, and economic growth.

Financial management analysis on construction of Pasir Kopo Dam in Banten Province of Indonesia whose construction cost was beyond sole financing of Indonesian Government was done by Napitupulu and Rarasati (2022). Financing management of the dam was selected as dependent variable with completion risk (made of economic, financial, raw materials supply, delay, environmental and political risks) chosen as the independent variable. Primary and secondary data were obtained through interview and publications respectively. The data collected were analyzed for reliability and validity, in descriptive way as well as through statistical analysis (reliability, validity, risk and correlation). Economic risk, risk of identifying Public Private Partnership (PPP) and quantitative risk analyses were also done. Findings revealed the project to be economically viable for investment and reported raw materials dependability, construction cost increase, high operation and maintenance cost and construction delivery delays as factors that could affect the quantum of profit to be shared.

The impact of financing on construction project delivery was studied by Okereke *et al.* (2018) where bank loans and bank overdraft were mentioned among other sources of construction project financing. The study was conducted in Portharcourt, Rivers State in the Federal Republic of Nigeria. The instrument of data collection was a structured questionnaire administered to 121 respondents with insights on the construction industry. Simple percentages, Kruscal-Wallis test and multi-linear regression analyses were employed in analyzing the data obtained. The study reported 87.78% of respondents acknowledging the impact of financing in construction project delivery. Bank loans and bank overdraft were ranked as the second and third most used construction project financing option.

Borrowing constraints in emerging markets was studied by Camara & Sangiacomo (2022) using credit registry data in Argentina for the period 1998-2020 which reported that less than 15% of firms debt requirements was based on value of collaterized assets while firms cash flow represent 85% of the requirements for business financing. The study identified exploiting central bank regulations over banks, credit policies and capital requirements as the most prevalent borrowing constraints.

Abuye (2020) studied determinants of project finance for SME's in Addis Ababa of

Ethiopia where primary data was collected from 174 respondents in the study domain utilizing structured questionnaire. The study identified cost of borrowing and collateral requirements among other project financing factors. Descriptive statistics were computed while regression analyses was done to enable data interpretation and arriving at inferences. Findings of the study revealed 50:50 ratio of impact and non-impact of cost of borrowing on access to project financing. Collateral requirements were reported to have 50:50 ratio for impact and non-impact on project financing.

The causes and effects of delay in building constructions in Abuja in the Federal Republic of Nigeria was investigated by Makun and Ganiyyu (2019) utilizing quantitative and qualitative methods of data collection. Simple percentages and raking were used to analyze the collected data. Time and cost overrun resulting from access to finance were reported to have significant positive impact on construction project delivery.

On a final note, it has been shown from these review that conflicting outcomes exist regarding the relationship between project financing requirements (collateral requirements and cost of borrowing) and project delivery delay with geographic, methodological and domain gaps existing in relation to this study. Therefore, the following hypothesis was formulated in alternative form to assess the relationship between project financing requirements and project delivery delay in the Nigerian construction industry:

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

Firm Characteristics as Moderator

Firm characteristics (e.g., age, experience of firms in obtaining finance as well as the firm ability to compute and provide convincing financial records) have emerged as veritable firm characteristics to moderate the link between project financing requirements (collateral requirements and cost of borrowing) and construction project delivery delay due to inconsistency in model formation of previous studies. A model design with moderator as proposed herein suggested by researchers (Bennett, 2000) that incorporating a moderator in theoretical frameworks is feasible where a compounding or weak relationship exist between the explanatory and explained variables.

Al-Sobiei, Al-Humaidi and Ahmadi (2022) conducted a quantitative study in the United Arab Emirates (UAE) to investigate the factors influencing project delivery delay in the construction industry. The study found that firm characteristics, such as management

capabilities and expertise, have a positive and significant influence on project delivery delays. Specifically, the study revealed that a one-unit increase in firm characteristics reduces the likelihood of project delivery delay by 15.6%. Firm characteristics of age, experience in obtaining finance, and ability to provide convincing financial records, can significantly moderate the relationship between project financing requirements (cost of borrowing and collateral requirements) and construction project delivery delay (López-Menéndez, Pérez-Sánchez & Moreno-García, 2018). For instance, older firms with extensive experience in securing financing may have established relationships with lenders, enabling them to negotiate more favourable borrowing terms and reduced collateral requirements (Hottenrott & Peters, 2012). Similarly, firms with strong financial management capabilities can provide more accurate and reliable financial records, which can increase lender confidence and reduce the need for stringent collateral requirements (Dai, Li & Cao, 2019). Therefore, it is reasonable to suggest that firm characteristics can moderate the relationship between project financing requirements and project delivery delay in the Nigerian construction industry as in the following alternative hypothesis.

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

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

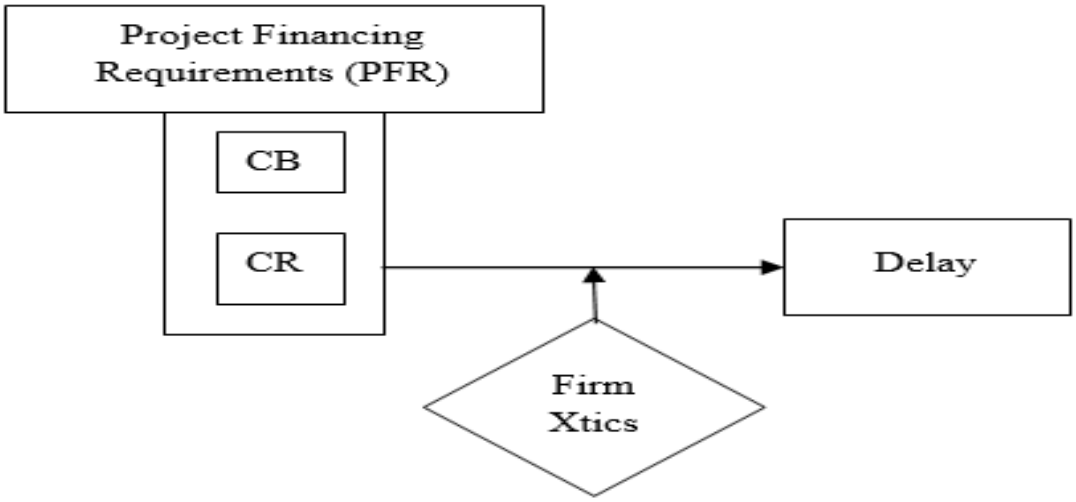
Theoretical Framework

Various theoretical frameworks have been employed to investigate the intersection of project management and project finance. This study leverages expectancy theory to explore the financing requirements that influence construction project delivery delays and to examine how firm characteristics moderate this relationship.

Expectancy Theory

This study employs the Expectancy Theory, first introduced by Vroom (1964), which posits that motivation stems from two key factors: expectancy and valence. Expectancy refers to the likelihood that effort will lead to goal attainment, while valence relates to the perceived value of the outcome (Snead & Harrel, 1994). Initially applied to understand individual intentions and behaviour in organizational settings (Fudge & Schlachte, 1999; Chen & Fang, 2008), the theory has since been refined and extended to inform decision-making on organizational objectives and strategy (Wood, Logar & Riley, 2005) and supplier development (Chen, Ellis & Suresh, 2016). More recently,

Edjimibi Nga (2019) utilized expectancy theory to investigate employee motivation in Cameroonian banks while Adamu & Idris (2024) utilized the theory to determine the effect of financing on project delivery delay of construction projects in Nigeria. Building on this theoretical foundation, this study examines the moderating effect of firm characteristics on the relationship between construction project financing requirements and project delivery delay. In line with the theory, when the independent and moderator variables are properly utilized, they might affect construction project delivery delay.



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

Figure 1: Theoretical Framework

Methodology

This study employed a survey research design, collecting primary data through a cross-sectional survey conducted in 2024. The instruments used to measure project financing requirements (collateral requirements, cost of borrowing) and project delivery delay as well as the moderator (firm characteristics) were adapted from literature (Kirubel, 2023). The collateral requirements, cost of borrowing, firm characteristic and project delivery delay instruments were unidimensional. The study's population consisted of 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 obtained, which was subsequently adjusted to 423 to account for non-respondents. The questionnaire was distributed among the sample, with 200 contractors, 100 clients, 53 developers, 70 sub-contractors participating. Data

analysis was performed using Partial Least Square Structural Equation Modelling (PLS-SEM) adopting PLS 3.0 software to examine the relationship between the independent variables (financing requirements), moderator (firm characteristics) and the dependent variable (project delivery delay) in line with the study theoretical framework presented in figure 1.

Results and Discussion

Assessment of SMART PLS-SEM Path Model Outcomes

The findings of the SMART PLS-SEM approach are presented in the following two-stage process, aligning with Henseler, Ringle & Sarstedt (2016) guidelines. This involved a sequential evaluation of the measurement model and the structural model (Hair *et al.,* 2018). The measurement model assessment encompassed several key aspects, including individual item reliability, internal consistency reliability, convergent validity, content validity, and discriminant validity (Hair *et al.,* 2018). Detailed results of these assessments are provided in Tables 1 to 5 and Figures 2 and 3.

Assessing the Measurement Model

The reliability of each indicator was evaluated by examining the outer loadings of each unique construct's measure (Hair *et al.,* 2018). The results indicated that most outer loadings exceeded the recommended threshold of 0.5, except for eight items: PM1, PM2, PM5, PM6, PM7, PM8, PM10 and PM16 (Hair *et al.,* 2014). However, as suggested by Hair *et al.* (2014), indicators with loadings between 0.4 and 0.7 can be retained if their removal does not improve the average variance extracted (AVE) and composite reliability. After careful evaluation, 21 out of 29 items measuring the study's constructs as presented in Figure 2 and Table 1 were retained, with loadings ranging from 0.539 to 0.934, thus fulfilling the acceptable threshold condition. The eight items with loadings below the threshold of 0.5 (PM1, PM2, PM5, PM6, PM7, PM8, PM10 and PM16) were removed in line with Hair *et al.* (2018). The exact outer loadings values are presented in Figure 2 and Table 1.

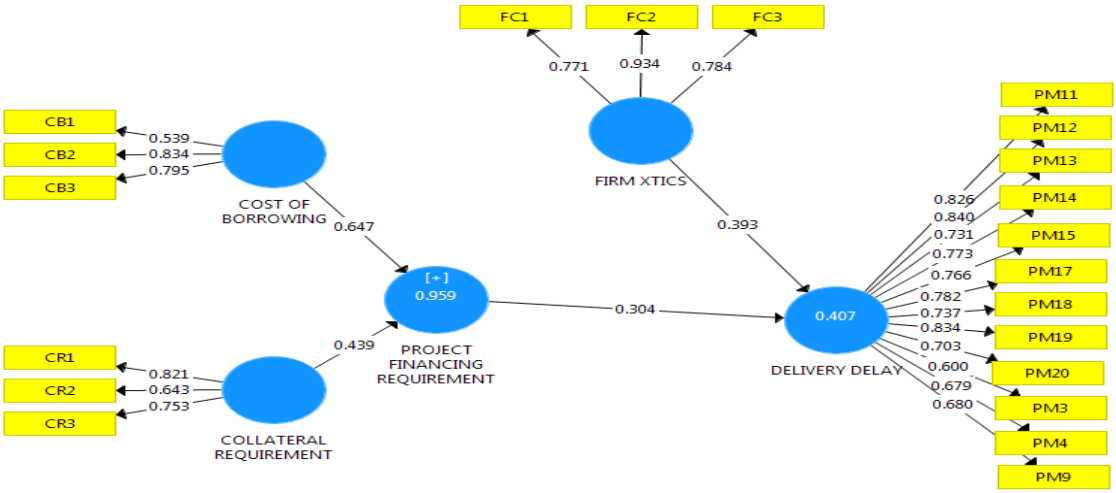


Figure 2: Measurement Model

Results of the internal consistency reliability assessed using composite reliability (Hair *et al.*, 2017) are presented in Table 1. Composite reliability offers a complementary approach to assessing internal consistency reliability, emphasizing the unique outer loadings of each indicator (Hair *et al.*, 2018). In composite reliability analysis, the threshold for retaining indicators is typically set at 0.70, where indicators with outer loadings above this value are retained, and those below are removed (Hair *et al.*, 2018). Looking at the composite reliability loadings obtained for the constructs as presented in Table 1 having the least value of 0.773 for cost of borrowing under project financing requirements, it is reasonable to infer that the constructs met the internal consistency reliability threshold required in line with Hair *et al.* (2018).

Convergent validity was evaluated by examining the average variance extracted (AVE) values, as recommended by Hair *et al.* (2014). According to Hair *et al.* (2014), an AVE of 0.50 or higher indicates satisfactory convergent validity. As presented in Table 1, the AVE values ranged from 0.540 to 0.694, exceeding the minimum threshold of 0.5. This finding confirms the adequacy of convergent validity for the constructs under investigation.

Table 1: Measurement Model Result

Constructs	**Items**	**Loadings**	**CR**	**AVE**
Project Financing Requirements (Cost	CB1	0.539	0.773	0.540

of borrowing: CB & Collateral Requirements: CR)	CB2	0.834		
	CB3	0.795		
	CR1	0.821		
	CR2	0.643	0.785	0.551
	CR3	0.753		
Project Delivery Delay	PM3	0.600		
	PM4	0.679		
	PM9	0.680		
	PM11	0.826		
	PM12	0.840		
	PM13	0.731	0.938	0.561
	PM14	0.773		
	PM15	0.766		
	PM17	0.782		
	PM18	0.737		
	PM19	0.834		
	PM20	0.703		
Firm Characteristics	FC1	0.771		
	FC2	0.934	0.871	0.694
	FC3	0.784		

Source: Smart PLS extract (2025)

Discriminant validity was subsequently assessed to evaluate the distinctiveness of each construct (Hair *et al.,* 2014). Following Henseler, Ringle & Sarstedt (2015) recommendation, the Heterotrait-Monotrait Ratio (HTMT) of correlation was employed to examine discriminant validity. Henseler, Ringle & Sarstedt (2015) argued that traditional methods, such as cross-loadings and the Fornell-Larcker criterion, may not always effectively identify discriminant validity issues. This study's findings as presented in Table 2 demonstrated satisfactory discriminant validity, as the HTMT ratio values obtained within the range of 0.742 and 0.833 which were below the recommended threshold of 0.85 (Kline, 2011). Therefore, the HTMT ratio obtained indicates that the constructs of the study are distinct and none should be removed from the model.

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

Constructs	CR	CB	Delay	Firm Characteristics
Collateral Requirements (CR)	**0.742**			
Cost of Borrowing (CB)	0.614	**0.735**		
Delay	0.324	0.578	**0.749**	
Firm Characteristics	0.522	0.658	0.597	**0.833**
Financing Requirements	0.558	0.660	0.656	0.842

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

Structural Model Results and Discussion

The structural model, also referred to as the inner model, illustrates the relationships among the theoretical latent variables (Sarstedt *et al.,* 2016). This study examined the hypothesized relationships within the conceptual framework (Figure 1). The results of these hypotheses are presented in Figure 3 and Table 4, which highlight the significant path loadings and coefficients respectively.

Table 3: Hypothesis Test (Direct and Moderating Relationship)

Hypotheses	**Relationship**	**Beta**	**(STDEV)**	**t-**	**p-**	**Findings**

		value		**value**	**value**	
H1	PFR -> DELAY	0.214	0.049	4.370	0.000	Supported
H2	FC -> DELAY	0.321	0.058	5.537	0.000	Supported
H3	FC*PFR -> DELAY	-0.180	0.030	6.129	0.000	Supported

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

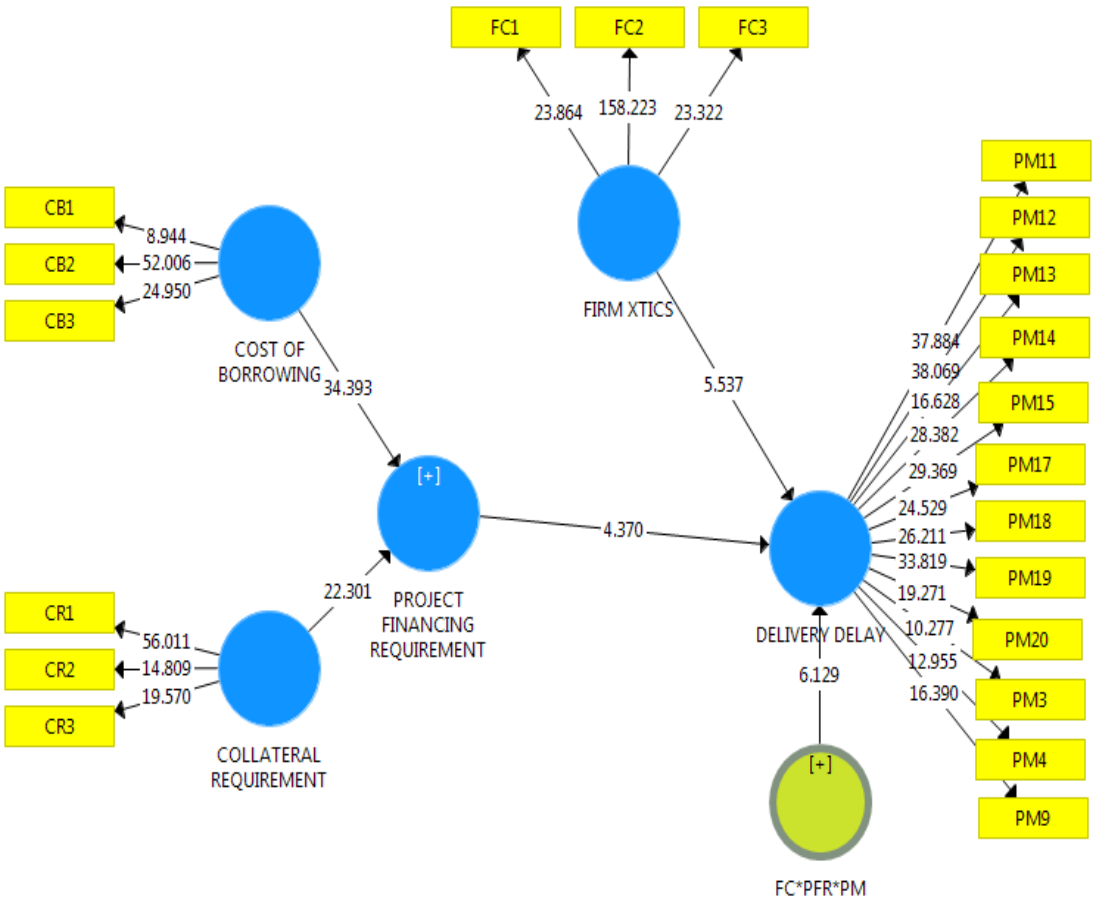


Figure 3: Structural Model

This study delved into the moderating role of firm characteristics in the relationship between project financing requirements and project delivery delay in the construction

industry. The results, as presented in Table 3 yielded a significant positive correlation between project financing requirements, comprising cost of borrowing and collateral requirements, and project delivery delay ($\beta = 0.214$, $t = 4.370$, $p < 0.000$). This finding substantiates Alternative Hypothesis 1, which posits a significant relationship between project financing requirements and project delivery delay in the construction industry. Consistent with previous studies by Ndala (2019), Havolli (2023), and Fachrurazi *et al.* (2023), the results underscore the strong correlation between project financing requirements and project delivery. This alignment is further reinforced by the expectancy theory, which suggests that individuals' actions are motivated by the expectation of achieving desired outcomes and the perceived value of those outcomes (Vroom, 1964). In the context of project financing, stakeholders strive to deliver projects with affordable financing that minimizes constraints and borrowing costs, ultimately yielding satisfactory outcomes. Conversely, financing providers, including bilateral cooperation partners, institutional investors, and commercial banks, aim to achieve their objectives with minimal risk. They seek to maximize returns on investment through interest payments on debt or dividends on equity while minimizing potential losses. Consequently, project stakeholders establish and accept conditions that ensure the attainment of their goals, highlighting the importance of effective project financing strategies in the construction industry. These findings suggest that project delivery delay is likely to escalate in the construction industry, with increase in cost of borrowing and collateral requirements predicted to result in a significant 21.4% increase in project delivery delay (as shown in Table 3). This implies that even a marginal increase in project financing requirements can substantially prolong project delivery timelines, underscoring the need for prudent project financing strategies to mitigate potential delays.

A significant positive relationship was found between firm characteristics (age, experience in obtaining finance, and ability to provide convincing financial records) and project delivery delay ($\beta = 0.321$, $t = 5.537$, $p < 0.000$), supporting Hypothesis 2, which states that *there is a significant relationship between firm characteristics and project delivery delay in the Nigerian construction industry*. This outcome aligns with Al-Sobiei, Al-Humaidi, and Ahmadi (2022), suggesting that firms with stronger and favourable characteristics are better equipped to mitigate project delivery delays. Specifically, older, more experienced firms with robust financial record-keeping abilities can negotiate favourable borrowing terms, reduce collateral requirements, and facilitate timely project delivery. The positive relationship indicates that firms with stronger characteristics can effectively manage project delivery and minimize delays. Notably, firm characteristics have a medium effect on predicting project delivery delay, with a 1% increase in effort towards acquiring required firm features boosting the chances of reducing project delivery delay by the same amount and firm characteristics explain 32.1% of the variation in the dependent variable (as shown in Table 3). This

highlights the importance of firm characteristics in reducing project delivery delays and improving overall project performance.

A strong, favourable relationship was established between firm characteristics (age, experience in obtaining finance, and ability to provide convincing financial records) and project delivery delay ($\beta = 0.321$, $t = 5.537$, $p < 0.000$) to support hypothesis 2 which states that *there is a significant relationship between firm characteristics and project delivery delay in the Nigerian construction industry* consistent with Al-Sobiei, Al-Humaidi & Ahmadi (2022). This outcome indicates that older, more experienced firms with the ability to compile convincing financial records are better equipped to reduce construction project delivery delays. Specifically, firms with established relationships with lenders or equity financiers can negotiate more favourable borrowing terms and reduced collateral requirements, thereby facilitating timely project delivery. The positive relationship indicates that firms with stronger firm characteristics (e.g., more experience, older age, better financial record-keeping) are better equipped to manage project delivery and reduce delays. Notably, firm characteristics (age, experience in obtaining finance, and ability to provide convincing financial records) have a medium effect in predicting project delivery delay in the construction industry with 1% increase in effort towards acquiring required firm features boosting the chances of reducing project delivery delay by the same amount.

The results presented in Table 3 revealed that firm characteristics (age, experience in obtaining finance, and ability to provide convincing financial records) play a moderating role in the relationship between project financing requirements (cost of borrowing and collateral requirements) and project delivery delay, supporting Hypothesis 3, which states that *Firm characteristics moderate the relationship between project financing requirements and project delivery delay in the Nigerian construction industry* ($\beta = -0.180$, $t = 6.129$, $p < 0.000$). The negative correlation coefficient ($\beta = -0.180$) indicates that favourable firm characteristics mitigate the impact of project financing requirements on project delivery delay. Specifically, a 1% increase in favourable firm characteristics, such as appropriate age, adequate experience in obtaining construction project financing, and robust financial record-keeping, can reduce project delivery delay by the same amount, provided that project financing requirements are met or negotiated to achieve a common position (as shown in Table 3). In essence, boasting favourable firm characteristics enables project stakeholders to secure better loan terms, reduce financing costs, and expedite financing approval. This, in turn, mitigates information asymmetry, enhances project delivery, and bolsters competitiveness. The established relationships between older firms and debt or equity financiers likely facilitate more favourable borrowing terms, contributing to improved project outcomes. The study's findings align with Al-Sobiei, Al-Humaidi, and Ahmadi (2022), highlighting the direct connection between firm characteristics and construction

project delivery delay. Conversely, negative interaction between project financing requirements and firm characteristics can exacerbate project delivery delay.

In Kaduna State, North-western Nigeria, the favourable interaction between firm characteristics and project financing requirements is expected to yield a significant reduction in construction project delivery delay. As demonstrated in Table 3, this interaction is anticipated to decrease project delivery delay by 18%. This finding aligns with the study's a priori expectations, which posited that meeting project financing requirements through favourable firm characteristics would mitigate construction project delivery delay. Indeed, construction project delivery delay is likely to decrease when firms possess or strive to acquire favourable characteristics, such as adequate age, more experience in acquiring project financing, and robust financial record-keeping. Forming consortiums with reputable organizations can also enhance creditworthiness and negotiating power, enabling firms to secure better loan terms and reduce financing costs. This, in turn, expedites financing approval, mitigates information asymmetry, and ultimately reduces construction project delivery delay, thereby enhancing competitiveness.

The coefficient of determination (R-squared) value indicates the degree of variation in the endogenous variable(s) explained by one or more predictor variables. While acceptable R-squared value thresholds vary depending on the study's context, Hair *et al.* (2014) suggest that a minimum threshold of 0.10 is acceptable. As shown in Table 4, the R-squared value for this study stands at 0.407, indicating that the two exogenous latent variables (cost of borrowing and collateral requirements) collectively explain 40.7% of the variance in construction project delivery delay. This R-squared value exceeds the minimum acceptable threshold, confirming that the endogenous latent variable (construction project delivery delay) exhibits a satisfactory level of explained variance. Furthermore, the results indicate that the exogenous factors account for 40.7% of the variance in construction project delivery delay, as per the research model. In addition to the R-squared value, this model assesses the effect size (F^2) of the exogenous latent variables on the endogenous variable. The F^2 value indicates 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 displayed in Table 5, the F^2 values reveal that firm characteristics have a moderate effect size on construction project delivery delay, accounting for 17.3% of the variance. In contrast, project financing requirements exhibit a small effect size, accounting for 8.5% of the variance. These findings suggest that the moderator (firm characteristics) absorbs a sizable portion of the exogenous variables' influence, indicating a significant moderating effect between the exogenous and endogenous variables.

Table 4: Coefficient of Determination

	R Square	Adjusted R Square
Project Delivery Delay	0.407 (40.7%)	0.404 (40.4%)

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

Table 5: Effective Size Assessment using F-Square

Construct	F-Square Delay	Effect Size
Firm Characteristics	0.173	Medium
Project Financing Requirements	0.085	Small

Source: Smart PLS extract 2025

Conclusion and Contribution to Knowledge

This study provides insights into the intricate relationships between project financing requirements, firm characteristics, and construction project delivery delay. The findings reveal that firm characteristics play a pivotal role in mitigating project delivery delays, with older, more experienced firms possessing a distinct advantage in negotiating favourable financing terms. Moreover, the study highlights the importance of forming strategic consortiums with reputable organizations to bolster acceptable firm characteristics, thereby enhancing access to project financing and securing favourable financing terms. By elucidating the moderating effect of firm characteristics, this study contributes to the development of a comprehensive framework for understanding the complex interplay between firm characteristics, project financing requirements and construction project delivery delay.

Recommendations and Suggestions for Future Study

To improve project delivery outcomes, construction firms should prioritize acquiring favourable firm characteristics, such as forming strategic consortiums with reputable organizations. Policymakers and stakeholders should create an enabling environment that fosters favourable project financing requirements. Future research areas include exploring consortium structures, technology adoption, regulatory frameworks, and

developing a comprehensive framework for assessing project financing requirements and construction project delivery delay.

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