

Board Characteristics, Digital Innovation, and Corporate Financial Performance in Listed Conglomerate Industries in Nigeria

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ABSTRACT

The study investigates the impact of board characteristics and digital innovation on financial performance of listed conglomerate companies in Nigeria, focusing on Return on Assets (ROA) as the independent variable. Based on Ex-post facto research; Secondary data from annual reports and audited financial statements of nine (9) firms for eleven (11) years from (2015–2025) were taken. Descriptive statistics, correlation analysis, panel regression were used to analyze the data obtained. The report revealed that Board Diversity showed significant positive effect on ROA ($\beta = 0.0324$, $p < 0.001$), and Board Size reported significant positive effect on ROA ($\beta = 0.0105$, $p = 0.001$); while Board Independence, Digital Innovation Disclosure, Firm Size. Reported positive but insignificant effects it was concluded that Board diversity and size are crucial for enhancing financial performance in Nigerian conglomerates. It is therefore, recommended that promoting board diversity, optimizing board size, and improving governance practices for better profitability and organizational performance are the best way to go.

Keywords: Board characteristics, board diversity, board size, digital innovation, corporate governance, financial performance, conglomerate firms.

INTRODUCTION

The increasing pace of globalization, technological advancement, and digital transformation has significantly reshaped corporate governance practices and business operations across the world. In today's digital economy, firms are expected not only to maintain effective governance structures but also to adopt innovative digital strategies that enhance operational efficiency, competitiveness, and financial performance. Among the mechanisms of corporate governance, board characteristics such as board size, board independence, board diversity, and board expertise play a vital role in influencing strategic decisions and monitoring managerial activities. (Akinwumi & Onmonya, 2025) These characteristics are particularly important in ensuring that firms effectively integrate digital innovation into their operational and financial strategies. In Nigeria, listed conglomerate companies operate in a highly competitive and dynamic environment characterized by rapid technological changes, evolving stakeholder expectations, and increasing regulatory demands (Racheal & Nse 2024). Consequently, the adoption of digital innovation has become essential for improving productivity, decision-making, customer engagement, and long-term sustainability (Agada & Lazarus 2024). However, the extent to which board characteristics influence the successful implementation of digital innovation and corporate financial performance remains a subject of growing academic and managerial concern (Cao et al., 2021).. Weak governance structures, inadequate oversight, and poor strategic decisions have contributed to declining financial performance and reduced investor confidence in some Nigerian firms (Asuquo & Ibe, 2021). Previous studies in Nigeria have mainly examined the relationship between board characteristics and financial performance separately from digital innovation, with limited focus on how both factors interact to influence corporate performance. In addition, little empirical attention has been given to listed conglomerate companies despite their importance to the Nigerian economy. Therefore, this study fills the gap by investigating the combined effect of board characteristics and digital innovation on the financial performance of listed conglomerates in Nigeria.

Specifically, the study seeks to determine how board composition and governance practices influence the adoption of digital innovation and how these factors collectively affect financial performance indicators such as Return on Assets (ROA). The study contributes to the growing literature on corporate governance and digital transformation by providing empirical evidence from the Nigerian conglomerate sector.

The objective of the study is to determine the effect of board characteristics and digital transformation on corporate financial performance on listed conglomerate companies in Nigeria, while specifically focusing on

- a. Examining the effects of board size on corporate financial performance of listed conglomerate companies in Nigeria.
- b. Determining the effects of board diversity on corporate financial performance of listed conglomerate companies in Nigeria.
- c. Establishing the effects of board independence on corporate financial performance of listed conglomerate companies in Nigeria.
- d. Investigating how digital innovations influences corporate financial performance of listed conglomerate companies in Nigeria.
- e. Showing the influence of firm size on corporate financial performance of listed conglomerate companies in Nigeria.

LITERATURE REVIEW

Conceptual Review

Financial Performance

Financial performance refers to a company's ability to generate profit, utilize resources efficiently, and maintain overall financial health through its operations (Eton & Poro 2021). It reflects how effectively management uses company assets and financial resources to maximize profitability and shareholders' wealth (Bande 2025). Financial performance is commonly evaluated using indicators such as Return on Assets (ROA), Return on Equity (ROE), Earnings per Share (EPS), and Return on Investment (ROI) (Eton & Poro, 2021). ROA measures how efficiently a firm uses its total assets to generate profit, with higher values indicating better performance and effective asset management ((Nwaorgu & Lormbagah, 2021; Onumoh & Binta, 2021) ROE, on the other hand, measures profitability generated from shareholders' equity and indicates how effectively management creates value for investors ((Akinwumi, & Onmonya, 2025). Among the various measures, ROE is considered a key indicator of corporate profitability and financial health because of its direct relevance to shareholders' wealth (Racheal & Nse, 2024). But for this present study the return on asset (ROA) is adopted as proxy for financial performance because of its overall total assets' representativeness.

Digital Innovation

Digital innovation is the adoption and application of automated technologies to generate new products, services, processes, or business prototypes aimed at improving organizational performance, efficiency, and competitiveness. Tiep (2025) inferred that it involves the integration of technologies like artificial intelligence, cloud computing, big data analytics, automation, digital platforms, and information systems into business operations to leverage value creation and decision-making. Digital innovation is not limited to technological advancement alone; it also includes changes in organizational processes, strategies, and customer engagement methods aimed at improving productivity and achieving sustainable competitive advantage (Fargher et al., 2025). In modern organizations, digital innovation enables firms to respond quickly to market changes, improve operational efficiency, reduce costs, and enhance customer satisfaction. From a corporate governance perspective, digital innovation can also support better monitoring, transparency, communication, and strategic decision-making within organizations (Tiep 2025; Bande 2025). Consequently, firms that effectively adopt

digital innovation are more likely to improve their financial performance, operational flexibility, and long-term sustainability.

Board Characteristics

Board characteristics refer to the structure and composition of a company's board of directors, which is responsible for supervising management, safeguarding shareholders' interests, and guiding corporate decisions (Bande 2025; Onumoh & Binta, 2021). The board performs key functions such as monitoring, implementing, and approving strategic decisions, including financial policies and executive appointments (Asuquo & Ibe 2021). Important board characteristics include board size, CEO duality, board diversity, board independence, and board meetings, all of which influence corporate governance effectiveness and firm performance. The Nigerian Code of Corporate Governance (NCCG, 2018) encourages a balanced board structure with a mix of executive, non-executive, and independent directors. It also supports diversity in gender, education, culture, and nationality to improve governance quality and organizational effectiveness (Nwaorgu & Lormbagah, 2021). This flexibility enables firms to improve governance quality, board diversity, and operational effectiveness.

Board Size

Board size refers to the total number of executive and non-executive directors with voting rights on a company's board (Godday et al., 2023). There are two major perspectives regarding board size: some organizations prefer smaller boards because they encourage efficient monitoring, better coordination, and faster decision-making, while others favor larger boards because they provide broader expertise and improve the quality of decisions (Olayiwola, 2021; Asuquo & Ibe, 2021). Smaller boards are often associated with improved company performance due to easier communication and quicker decision-making processes, whereas larger boards may experience delays, communication challenges, and conflicts. On average, smaller boards consist of about 9.5 directors, while larger boards have 14 or more members. However, larger boards may also enhance performance by providing diverse skills, effective committee structures, and better workload distribution (Oziegbe & Okenwa, 2021). The relationship between board size and firm performance remains widely debated. Agency theory and resource dependency theory suggest that larger boards improve monitoring and positively influence firm performance (Omoniyi & Abayomi, 2020). In contrast, stewardship theory supports smaller boards, arguing that large boards may reduce efficiency and negatively affect performance.

Board Independence

Board independence refers to the proportion of independent and non-executive directors relative to the total number of directors on a company's board (Richy & Gunasti 2022). A balanced board structure should include both executive and non-executive directors, with governance guidelines recommending that at least 50% of board members should be non-executive directors. Non-executive directors are board members who are not involved in the daily management of the company, whereas independent directors have no family, shareholder, or business relationship with the organization (Di Biase & Onorato, 2021; Onumoh & Binta, 2021). Although executive directors possess deeper operational knowledge of the company, non-executive and independent directors are often valued for their broader experience, objectivity, and ability to provide unbiased oversight functions (Osazevbaru & Tarurhor, 2020). Board independence is commonly measured by dividing the number of non-executive directors by the total number of board members. Evidence suggests that a higher proportion of independent directors improves corporate governance and positively influence financial performance by strengthening oversight and reducing agency problems (Godday et al., 2023).

Board Diversity

Board diversity refers to the variation in directors' attributes and characteristics that influence perspectives, attitudes, and decision-making within the boardroom (Manyaga & Ammar, 2021). It can be categorized into observable diversity, such as gender, age, race, nationality, and ethnicity, and less visible diversity, including educational background, industry experience, occupation, and organizational membership. Corporate governance theories support board diversity because it promotes fairness, resource allocation, and effective decision-making. Gender diversity has received significant attention. Board gender diversity refers to the

inclusion of women on corporate boards, with the proportion of female directors often used as a measure of diversity. Female directors are generally viewed as more independent and capable of bringing unique perspectives beyond traditional male-dominated board structures (Owolabi et al., 2021). Board diversity helps address issues relating to executive and non-executive directors and promotes balanced decision-making within organizations. However, board diversity may also create challenges such as reduced cooperation and increased emotional conflict among board members (Manyaga & Ammar, 2021). Despite these concerns, most studies highlight the positive contributions of board diversity, particularly gender diversity, to firm performance and corporate governance.

Firm Size

Firm size is an important factor in evaluating corporate financial performance and profitability, often measured through total assets, sales, market capitalization, and number of employees (Meiryani & Daud, 2020). Larger firms generally possess stronger competitive advantages, greater market opportunities, and higher profit-generating capacity compared to smaller firms (Akinwumi, & Onmonya, 2025).. Firm size is commonly measured using the natural logarithm of total assets to normalize differences between large and small firms. Larger firms also tend to have greater influence on stakeholders, stronger resilience during industry fluctuations, and better productivity than smaller firms (Racheal & Nse 2024). Furthermore, firm size has a positive relationship with financial performance, as larger organizations are more likely to benefit from economies of scale and effective corporate governance practices. Richy and Gunasti (2022) noted that both firm size and good corporate governance significantly influence company profitability and overall financial performance.

Empirical Review

Balarabe and Musa (2025) investigated the relationship between board characteristics and the financial performance of non-financial firms listed on the Nigerian Exchange Group from 2013 to 2023 using panel data from 76 firms. The study examined board independence, board size, gender diversity, and board meeting frequency in relation to ROA, EPS, and market capitalization. Using fixed and random effects regression models, the findings revealed that board size had a significant negative effect on ROA, while gender diversity showed a positive but insignificant relationship with financial performance. Board independence and meeting frequency had no significant effect on performance. The study concluded that board structure remains an important determinant of firm performance and recommended stronger governance frameworks to improve corporate accountability and value creation.

Bande (2025) investigated the impact of board qualities on the financial performance of 30 listed conglomerate firms in Nigeria using multiple regression analysis on data from 2018 to 2022. The findings revealed that board meetings and board diversity had a positive and significant effect on financial performance, whereas board meeting attendance showed no significant effect. The study recommended that conglomerate firms should hold regular board meetings to enhance financial performance.

Farghar et al., (2025) explored the application of digital transformation and digital twin technology to improve the performance of the Compact Bulk Feeder (CBF) used by Atlas Copco in self-pierce riveting machines. The study developed a digital twin framework that enables real-time monitoring, simulation, and analysis of CBF operations through integrated hardware and software technologies. The findings highlighted that digitalization enhances operational functionality, supports performance improvement, and strengthens the company's competitive advantage in a highly competitive global market.

Obalemo (2025) examined the effect of board diversity on the financial performance of deposit money banks in Nigeria using secondary data from five selected banks and applying Ordinary Least Squares (OLS) regression analysis. The study found that board size had a significant positive effect on financial performance, while non-executive directors showed no significant positive influence. In contrast, board diversity had a significant positive association with financial performance. The study recommended increasing board size through the inclusion of more female and foreign directors to enhance expertise, diversity, and corporate performance.

Tiep (2025) examined the impact of digital transformation on the competitive advantage of SMEs in Vietnam using a qualitative multiple case study approach based on interviews with senior managers. The findings revealed that digital transformation enhances operational efficiency, customer experience, flexibility, and data-driven decision-making, thereby shifting competition from price-based strategies to innovation and speed. The study further emphasized that successful digital transformation depends more on leadership mindset and organizational culture than technology alone, while also highlighting the need for strategic investment and policy support for SMEs.

Liu et al., (2024) examined the effect of IT interlocks on innovation outcomes among non-IT firms using a resource dependence perspective and panel data from Chinese public firms between 2000 and 2020. The findings showed that board interlocks with IT firms positively enhanced IT innovation through the transfer of technological knowledge, especially when connected firms were knowledge-intensive. The study concluded that IT interlocks serve as valuable board relational capital that supports innovation and helps firms overcome technological challenges.

Lukman et al., (2024) investigated the effect of board characteristics on firm financial performance among companies listed on the LQ45 index between 2017 and 2020 using a fixed-effect regression model on 27 sampled firms. The findings revealed that board size had a positive and significant effect on financial performance, while female directors had a significant negative effect. In contrast, the frequency of board meetings and independent commissioners showed no significant effect on firm performance. The study recommended that investors consider board characteristics in investment decisions and suggested further research using alternative financial performance measures and additional board variables.

Asaolu et al., (2023) investigated the effect of board characteristics on the sustainable growth of non-financial firms in Nigeria during periods of global financial crisis and the COVID-19 pandemic. Using data from 60 listed non-financial firms on the Nigerian Exchange Group between 2011 and 2020, the study applied a random effects regression model after conducting the Breusch–Pagan LM and Hausman tests. The findings showed that board size, board independence, and board meetings had significant positive effects on sustainable growth, while board gender diversity exhibited a positive but insignificant relationship. The study concluded that effective board structures enhance long-term corporate sustainability and supported the principal–agent theory by emphasizing the role of board attributes in reducing agency-related challenges.

Okolie and Uwaejeyan (2022) examined the effect of board attributes on the financial performance of listed conglomerates in Nigeria between 2011 and 2020. Using panel data regression on secondary data from five quoted conglomerates, the study found that board size, board independence, board committees, and board shareholdings significantly influenced Return on Assets (ROA), while board meetings had no significant effect on financial performance. The study recommended maintaining an optimal board size, promoting accountability and transparency, and reducing excessive board meetings to improve firm performance.

Adebayo et al., (2021) examined the effect of corporate governance mechanisms on the sustainable growth of listed manufacturing firms in Nigeria during periods of financial crisis. Using secondary data from 30 purposively selected firms over the 2011–2020 period, the study employed regression analysis to evaluate the relationship between governance variables and corporate sustainable growth. The findings revealed that board size, board composition, ownership concentration, board independence, and firm size positively influenced sustainable growth, while leverage exerted a negative effect. The study concluded that effective corporate governance enhances sustainable growth and recommended maintaining a diverse and independent board structure to strengthen oversight and support organizational resilience during challenging periods.

Gap in literature

Existing studies on board characteristics and financial performance in Nigeria have produced mixed findings and mainly focused on sectors such as banking, manufacturing, and non-financial firms, with limited attention to listed conglomerate companies as can be seen. Similarly, studies on digital innovation largely concentrated on foreign economies and examined digital transformation separately from board characteristics. Thus, there is limited empirical evidence on the combined effect of board characteristics and digital innovation on the financial performance of listed conglomerate firms in Nigeria, which this study aims to address.

Theoretical Framework

Agency Theory

Agency Theory, developed by Michael C. Jensen and William H. Meckling, explains the relationship between shareholders (principals) and managers (agents). The theory emphasizes the role of corporate governance mechanisms, particularly board characteristics such as board independence, board size, and board diversity, in monitoring management and reducing agency conflicts. It is relevant to this study because effective board structures can improve oversight, encourage accountability, support digital innovation decisions, and ultimately enhance corporate financial performance (Al-Faryan 2024; Lukman et al., 2024).

Legitimacy Theory

This theory was introduced by John Dowling and Jeffrey Pfeffer in 1975; with the core idea that organizations must be perceived as legitimate to survive, aligning with societal norms and expectations. The key concept is for firms to seek societal approval through responsible behavior and compliance with expectations. Sustainability and environmental disclosures help maintain legitimacy and protect reputation.

Resource Dependency Theory

Resource Dependency Theory, associated with Jeffrey Pfeffer and Gerald R. Salancik, suggests that organizations depend on external resources for survival and growth. The board of directors provides firms with valuable resources such as expertise, experience, networks, and access to information (Liu et al., 2024). This theory is relevant because diverse and knowledgeable boards can facilitate digital innovation adoption, strategic decision-making, and access to technological opportunities that improve financial performance in conglomerate firms (Lin, & Jie, 2024).

Stakeholder Theory

This theory was developed by R. Edward Freeman in 1984. The core idea behind the theory is that organizations should consider the interests of all stakeholders (shareholders, employees, customers, etc.) in decision-making, without marginalizing any group irrespective of status and affiliations. The key concept is that success and sustainability depend on managing relationships with stakeholders. Firms engage in transparency, accountability, and sustainability reporting to maintain support and enhance performance.

METHODOLOGY

This study adopts an ex-post facto research design relying on historical data obtained from existing records of listed conglomerate companies in Nigeria. The population of the study comprise of all listed conglomerate companies on the Nigerian Exchange Group, while a purposive sampling technique was used to select 9 companies with complete financial and governance data within the study period. Secondary data were collected from annual reports, corporate governance reports, and audited financial statements of the selected companies for a period of eleven (11) years from 2015 to 2025. The dependent variable, corporate financial performance, was measured using Return on Assets (ROA), while independent variables include board size, board independence, board diversity, and digital innovation indicators. Firm size served as control variable. Data was analyzed using descriptive statistics, correlation analysis, and panel regression techniques such as fixed effect and random effect models. The Hausman test may also be applied to determine the most appropriate regression model for the study.

Table 1: Variable Measurement

Variables	Type	Measurement/Proxy	Source
Return on Assets (ROA)	Dependent Variable	Net Profit After Tax ÷ Total Assets	Annual Reports
Board Size (BSZ)	Independent Variable	Total number of directors on the board	Corporate Governance Report
Board Independence (BID)	Independent Variable	Number of Independent Directors ÷ Total Board Size	Corporate Governance Report
Board Diversity (BDV)	Independent Variable	Number of Female Directors ÷ Total Board Size	Corporate Governance Report
Digital Innovation (DIDI)	Independent Variable	Digital Innovation Disclosure Index	Annual Reports/Sustainability Reports
Firm Size (FSZ)	Control Variable	Natural Logarithm of Total Assets	Annual Reports

Compiled by the Author, 2026

Table 2: Variable Measurement Ratios

Digital Innovation Indicators	Score
Disclosure of e-commerce platforms	1
Adoption of ERP/automation systems	1
Use of cloud computing technology	1
Digital payment systems disclosed	1
Data analytics/AI technologies disclosed	1
Cyber-security investment disclosed	1

Compiled by the Author, 2026

Formula

$$DIDI = \frac{\text{Total Score Obtained}}{\text{Maximum Score Obtainable}}$$

Where:

- Maximum obtainable score = 6
- Non-disclosure of any of the item's score = 0
- Firms with higher scores are considered more digitally innovative.

Model Specification

$$ROA_{it} = \beta_0 + \beta_1 BSZ_{it} + \beta_2 BID_{it} + \beta_3 BDV_{it} + \beta_4 DIDi_{it} + \beta_5 FSZ_{it} + \mu_{it}$$

Description of Variables

Where:

- ROA = Return on Assets
- BSZ = Board Size
- BID = Board Independence
- BDV = Board Diversity
- DIDi = Digital Innovation Disclosure Index
- FSZ = Firm Size
- β_0 = Constant term
- β_1 – β_6 = Regression coefficients
- μ = Error term
- i = Firm
- t = Time period

Model Justification

The model is suitable because it enables the examination of the relationship between board characteristics, digital innovation, and financial performance across firms over time using the ROA as proxy for financial performance.

DATA ANALYSIS AND DISCUSSIONS

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	99	0.313636	0.188833	0.11	1
BID	99	0.718485	3.186037	0	0.32
BDV	99	1.338788	3.463202	0	0.15
BSZ	99	11.59596	5.154588	4	29
FSZ	99	20.80131	8.390591	-0.22	29
DIDi	99	0.708081	0.286063	0.33	1

Compiled by the Author with STATA Package 17.0; 2026

Table 3 presents the descriptive statistics of the study variables based on 99 observations. The mean ROA of 0.3136 indicates that the sampled firms generated an average return of 31.36% on their assets, with moderate

variability (SD = 0.1888). Board Independence (BID) recorded a mean of 0.7185, suggesting a relatively high presence of independent directors, although the large standard deviation indicates considerable differences across firms. Similarly, Board Diversity (BDV) had a mean of 1.3388, reflecting variations in board composition among the sampled firms. The average Board Size (BSZ) was approximately 12 members (Mean = 11.60), while Firm Size (FSZ) had a mean of 20.80, indicating differences in organizational scale across firms. Furthermore, the Disclosure Index (DIDi) reported a mean value of 0.7081, implying that firms disclosed about 70.8% of the expected disclosure items on average. Overall, the statistics reveal noticeable variations in profitability, governance characteristics, firm size, and disclosure practices among the firms included in the study.

Table 4: Correlation Matrix

V	ROA	BID	BDV	BSZ	FSZ	DIDi
ROA	1					
BID	-0.0396	1				
BDV	0.6145	-0.0508	1			
BSZ	0.7354	-0.054	0.749	1		
FSZ	-0.6711	0.0035	0.7996	-0.6878	1	
DIDi	0.3181	-0.1412	0.3378	0.2605	-0.2351	1

Compiled by the Author with STATA Package 17.0; 2026

Table 4 present the correlation results which shows varying degrees of association among *ROA*, *BID*, *BDV*, *BSZ*, *FSZ*, and *DIDi*. ROA has a very weak negative relationship with BID ($r = -0.0396$), indicating virtually no linear association between the two variables. In contrast, ROA has a strong positive relationship with BDV ($r = 0.6145$) and BSZ ($r = 0.7354$), suggesting that higher board diversity and board size are associated with higher financial performance. ROA also has a strong negative relationship with FSZ ($r = -0.6711$), while its relationship with DIDi is weakly positive ($r = 0.3181$). Among the explanatory variables, the strongest correlations are between FSZ and BDV ($r = 0.7996$), BDV and BSZ ($r = 0.7490$), and BSZ and FSZ ($r = -0.6878$). These relatively high correlations suggest some association among the explanatory variables and indicate that multicollinearity should subsequently be tested using VIF/Tolerance diagnostics; since correlation matrix provides preliminary evidence of associations between variables, but correlation alone does not establish causality or statistical significance. The subsequent regression and multicollinearity tests are therefore used to determine the actual effects of the explanatory variables on ROA.

Diagnostic Tests

Table 5: Multicollinearity Test

Variable	VIF	1/VIF
BDV	3.68	0.271673
FSZ	2.94	0.339846
BSZ	2.4	0.416263
DIDi	1.15	0.867503

BID	1.02	0.975904
Mean VIF	2.24	

Compiled by the Author with STATA Package 17.0; 2026

Table 5 presents the Variance Inflation Factor (VIF) results used to assess the presence of multicollinearity among the explanatory variables. The VIF values range from 1.02 to 3.68, with Board Diversity (BDV) recording the highest VIF of 3.68 and Disclosure Index (DIDi) the lowest VIF of 1.02. The mean VIF of 2.24 is substantially below the commonly accepted threshold of 10.0 (or the more conservative threshold of 5.0). These results indicate that multicollinearity is not a concern in the model, as the independent variables are not highly correlated with one another. Therefore, the regression estimates can be considered reliable and free from multicollinearity bias.

Test for Heteroskedasticity (Breusch–Pagan/Cook–Weisberg Test)

H_0 : Constant Variance

$\text{Chi2}(1) = 0.45$

$\text{Prob} > \text{chi2} = 0.2874$

The Breusch–Pagan/Cook–Weisberg test was conducted to inspect the presence of heteroskedasticity in the regression model. The test reported a Chi-square statistic of 0.45 with a matching probability value of 0.2874, which is greater than the 5% significance level ($p > 0.05$). Therefore, the null hypothesis of constant variance cannot be rejected, indicating that the model is exempt from heteroskedasticity. This is an indication that the error terms display constant variance (homoscedasticity), and the estimated regression coefficients are reliable and efficient.

Hausman Specification Test

Test of H_0 : Difference in Coefficient not Systematic

$\text{Chi2}(6) = (b-B)'[(V_b - V_B)^{-1}](b-B)$
 $= 13.54$

$\text{Prob} > 0.000$

The Hausman specification test was employed to determine the appropriate panel estimation technique between the Fixed Effects and Random Effects models. The test yielded a Chi-square statistic of 13.54 with a probability value of 0.000, which is less than the 5% significance level ($p < 0.05$). As a result, the null hypothesis that the differences in coefficients are not systematic is rejected. This indicates that the Fixed Effects model is more appropriate for the analysis, as it provides consistent and efficient estimates by accounting for unobserved firm-specific heterogeneity.

Table 6: Regression Analysis Fixed Effects Model

ROA	Coefficient	Std err.	t	P>t	[95% conf. interval]
BID	0.0007548	0.0034006	0.22	0.825	-0.006 0.007508
BDV	0.0323726	0.0059294	5.46	0	0.020598 0.044147
BSZ	0.0105402	0.0032184	3.28	0.001	0.004149 0.016931

FSZ	0.0002836	0.0021882	0.13	0.897	-0.00406	0.004629
DIDi	0.0312336	0.0401714	0.78	0.439	-0.04854	0.111006
_cons	0.1195149	0.0716842	1.67	0.099	-0.02284	0.261866
F (5, 93)	=	43.65				
Prob > F	=	0.0000				
R-squared	=	0.7012				
Adj R ²	=	0.6852				
Root MSE	=	0.10596				

Compiled by the Author with STATA Package 17.0; 2026

Table 6 presents the regression results on the effect of board characteristics and disclosure practices on Return on Assets (ROA). The findings reveal that Board Diversity (BDV) has a positive and statistically significant effect on ROA ($\beta = 0.0324$, $p < 0.001$), indicating that greater board diversity enhances firm profitability. Similarly, Board Size (BSZ) exerts a positive and significant influence on ROA ($\beta = 0.0105$, $p = 0.001$), suggesting that larger boards contribute positively to firm performance. Conversely, Board Independence (BID) ($\beta = 0.0008$, $p = 0.825$), Firm Size (FSZ) ($\beta = 0.0003$, $p = 0.897$), and Disclosure Index (DIDi) ($\beta = 0.0312$, $p = 0.439$) exhibit positive but statistically insignificant effects on ROA, implying that these variables do not significantly influence profitability during the study period. The model explains approximately 70.12% of the variation in ROA ($R^2 = 0.7012$), while the Adjusted R^2 of 0.6852 indicates strong explanatory power after adjusting for the number of predictors, while the unexplained part represented by 29.88% are explained by other independent variables not included in the list but are shielded by the error terms. Furthermore, the F-statistic of 43.65 with a probability value of 0.0000 confirms that the overall regression model is statistically significant and suitable for prediction. Overall, the results suggest that board diversity and board size are key drivers of firm profitability, while board independence, firm size, and disclosure practices do not have a significant effect on ROA within the sampled firms. The average prediction error value of the Root MSE of 0.10596 units, shows that the predicted value does not deviate from the actual values, the regression model is therefore, fits for the data.

Discussion of Findings and Theoretical Alignment

Board Diversity (BDV) and Return on Assets (ROA)

Board diversity reported a positive significant effect on Return on Assets (ROA) ($\beta = 0.0324$, $p < 0.001$). this implies that BDV enhances profitability through better decision-making and stakeholder representation. This outcome aligns with Stakeholder Theory.

Board Size (BSZ) and Return on Assets (ROA)

Board size shows a positive significant influence on ROA ($\beta = 0.0105$, $p = 0.001$); implying that larger boards provide expertise and oversight functionalities that improves profitability. This outcome supports the Resource Dependence Theory.

Board Independence (BID) and Return on Assets (ROA)

Board independence revealed a positive but insignificant effect on ROA ($\beta = 0.0008$, $p = 0.825$). This signifies that independence in isolation is not sufficient to enhance performance. The outcome provides limited support for Agency Theory, but favours the stakeholder theory more.

Digital Innovation Disclosure Index (DIDI) and Return on Assets (ROA)

Digital innovation disclosure index showed a positive but insignificant relationship with ROA ($\beta = 0.0312$, $p = 0.439$). This suggests that disclosure practices do not directly lead to profitability. This outcome partially aligns with Legitimacy Theory.

Firm Size (FSZ) and Return on Assets (ROA)

Firm size reported a positive but insignificant effect on ROA ($\beta = 0.0003$, $p = 0.897$). This indicates that larger firms are not necessarily more profitable. This outcome from the firm size as a moderating variable explained in plain terms, that the size of a firm does not define its success or failure and that other additional factors can serve as determinants.; Resource Dependence Theory partially supports this finding.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Significant effects of board diversity and size highlight their importance in profitability. The findings primarily support Stakeholder Theory and Resource Dependence Theory. The model demonstrates high explanatory power (Adjusted $R^2 = 68.52\%$) and significant predictive relevance at ($p < 0.001$).

The study concludes that board characteristics play a central role in enhancing firm profitability. Specifically, board diversity and board size significantly improve Return on Assets, indicating that diverse and adequately sized boards strengthen corporate governance and decision-making effectiveness. However, board independence, disclosure practices, and firm size did not significantly influence profitability during the study period. Overall, the findings support the relevance of Stakeholder Theory and Resource Dependence Theory in explaining firm performance.

Recommendations

- 1) Promote board diversity to enhance decision-making quality and financial performance.
- 2) Maintain optimal board size to ensure boards perform effective oversight and expertise functions.
- 3) Strengthen independent directors by focusing on training and active participation rather than just presence.
- 4) Improve corporate disclosures to enhance transparency and stakeholder confidence to stimulate better performance.
- 5) Prioritize governance quality and efficiency over firm size for profitability.
- 6) A step toward digital transformation: development of a compact bulk feeder digital twin to improve its functionality

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