AUDIT COMMITTEE AS A MODERATOR ON THE RELATIONSHIP BETWEEN DIVERSITYINBOARD AND ENVIRONMENTAL REPORTING OF LISTED MANUFACTURING COMPANIES IN NIGERIA

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Abstract
Corporate environmental practices are facing more and more scrutiny from stakeholders as a result of growing ecological concerns that affect not just local communities but the planet as a whole. To this end, this paper examines the moderating role of audit committees on the relationship between diversity-in-board and environmental reporting of Listed Manufacturing Companies in Nigeria (LMCN). The paper employed an ex-post facto research design and data collected from annual reports of thirty-six LMCN were analyzed using descriptive statistics and linear multiple regression techniques. Findings suggest that while diversity-in-board positively influenced environmental reporting, this effect became statistically significant when moderated by the audit committee. This underscores the importance of audit committee crucial role as a moderator in influences that impact of diversity-in-board and ensures adequate disclosure of environmental information in the annual reports of listed manufacturing companies in Nigeria. The study recommends among others that Financial Reporting Council (FRC) of Nigeria should no longer allow environmental disclosure in Nigeria to be voluntary, but make it compulsory using ISO 14031 reporting guideline as a common standard among listed manufacturing firms in Nigeria for the purpose of attaining detailed environmental disclosures and easy comparison of such disclosures among firms. Also, encourage regulators to regularly review corporate governance codes to strengthen diversity provisions for more credible stakeholder reporting. Additionally, manufacturing firms should focus on boosting the effectiveness of their audit committees to enhance environmental stewardship, which will in turn improve corporate brand image and reputation.

Keywords: Diversity-in-board, environmental reporting, audit committee, Nigeria.

1.0 Introduction

Over the years, many businesses have focused more on growth, survival, and the maximisation of shareholder wealthoften at the expense of environmental sustainability (Felix & Aruna, 2021). Since the establishment of formal business structures, companies have heavily depended on the environment for their operations, as no business can exist in isolation (Uwuigbe et al.,2018). From sourcing raw materials to managing waste, the connection between business activities and the environment is undeniable. However, this interaction often comes with significant environmental and social threats affecting people, ecosystems, and society at large. These threats include occupational hazards, negative impacts on host communities, global warming, and harmful effects associated with products and services (Nwaigwe et al., 2020; Saka, 2024).

These externalities have led to environmental imbalances such as land degradation and desertificationespecially in developing countries where environmental regulations are weak or poorly enforced (Ogoun & Ekpulu, 2020). As the effects of this degradation on human health and well-being become more apparent, public awareness continues to rise. Yet, many large corporations contributing to these problems have not fully embraced their environmental responsibilities (Worimegbe & Oyewole, 2021). This has prompted investors and other concerned stakeholders to demand greater transparency and accountability in corporate environmental practices. Today, stakeholders expect companies to report not only their environmental efforts but also the strategies they adopt to promote sustainability.

In response to these concerns, Environmental Reporting (ER) has emerged as a key mechanism for safeguarding natural resources and addressing the limitations of traditional financial reporting systems (Yaakoo et al., 2021). ER has gained growing attention in academic literature (Osemene & Fagbemi, 2019; Aliyu, 2019; Gardazi et al., 2020; Haruna, 2024). In Nigeria, particularly among publicly listed manufacturing firms, environmental disclosure is gradually gaining recognition alongside financial reporting. This development is significant, as transparency and accountability are fundamental pillars of good governance across both developed and developing economies.

Forward-thinking companies increasingly recognise that ER fosters trust, attracts stakeholder support, mitigates operational risks, and ultimately enhances financial performance (Akinkunmi & Simeon, 2022). However, despite its potential benefits, ER remains largely unregulated in Nigeria and is still not widely practised (Okpala, 2019). Many firms fail to comply with existing frameworks such as the Securities and Exchange Commission (SEC) Sustainability Reporting Guidelines (2018) and the Nigerian Code of Corporate Governance (2018). Additionally, although Nigeria has enacted environmental laws and established regulatory bodies, enforcement is weak. The non-mandatory nature of ER makes it easy for environmental concerns to be overlooked in managerial decision-making (Ogoun & Ekpulu, 2020).

Given this backdrop, the drivers of ER adoptionparticularly in developing economiesremain unclear. From a corporate governance perspective, board diversity is considered one of the key factors that can promote environmental stewardship. A diverse board combines varied skills, experiences, and perspectives that enhance decision-making and strategic direction (Mgbame & Mgbame, 2018; Jonson et al., 2020; Rao & Tilt, 2016a). Accordingly, more companies are adopting heterogeneous boards to improve competitiveness and governance outcomes (Galbreath, 2016; Zhang et al., 2013).

Thus, unlike extantliterature that assessed individual diversity traits (Khan et al., 2021; Beji et al., 2020; Yusof et al., 2019), this study builds on the concept of Diversity-in-Board (DiB), a composite index of board diversity that captures board members' demographic attributes such as gender, age, nationality, and education (Hafsi & Turgut, 2013; Baalouch et al., 2019).It is expected that the composite index like DIB would give a comprehensive picture of their simultaneous influence on various organisational outcomes such as ER practices.Based on the foregoing, this study seeks to examine the influence of DiBon the environmental disclosure practices of listed manufacturing companies in Nigeria.

In addition, audit committee (AC)is introduced as a moderating variable. The role of AC in this study is justify because it can affect how strong or in what direction the relationship between DiB and ER goes. As outlined in Section 11.4(1) of the Nigerian Corporate Governance Code (2018), every company is required to set up an audit committee that takes charge of audit-related tasks. These tasks include reviewing accounting policies, evaluating internal control systems, and making sure that external reporting requirements are met (Putri et al., 2017). Given its oversight responsibilities for both financial and non-financial disclosures, including environmental reports, the audit committee can have a significant influence on the quality and scope of ER (Ghassan et al., 2020). Therefore, understanding its moderating role is crucial for grasping how governance structures impact corporate environmental accountability.

Consequent upon, the motivation for this study stems from rising stakeholder concerns over the environmental impacts of industrial activities such as oil exploration, gas flaring, mining, and especially manufacturing. Furthermore, most existing studies on DiB and ER have been conducted outside Nigeria (Hafsi & Turgut, 2013; Hoang, 2016, 2018). It is dangerous to generalised their findings to other economies in the world due to differences in economic systems, market structure, geographical location and reporting requirements.

Also, past empirical studies(Otung et al., 2025; Blay et al., 2025; Saka, 2024, Haruna, 2024) were unable to considered the crucial role of audit committee as a moderating factor to influence relationships between corporate governance variables. To the best of the research knowledge, only Isa and Farouk 2018 made an earliest attempt to empirically test how audit committee moderates organizational outcomes. Although, their studies examined the influence of audit committee on the relationship between board diversity and earnings management of deposit money banks in Nigeria. The author's domain is different from this study which is manufacturing firms.

This has significantly thrown up a gap to be filled by this paper because, manufacturing sector is particularly important due to its substantial environmental footprint involving pollution and hazardous waste. Again, the inadequacy of corporate governance culture to effectively address the concerns of stakeholders especially the inability of corporate organization to meeting the needs of the current generation without compromising the ability of future generations has provided additional justification for this study. Thus, the main objective of the study is to examine how the audit committee moderates the relationship between DiB and ER of listed manufacturing firms in Nigeria. Other specific objectives include to:

i. determines effect of DiB on ER practice of listed manufacturing companies in Nigeria

ii. explores the influence of audit committee on ER practice of listed manufacturing companies in Nigeria.

iii. investigate whether audit committee moderates the relationship between DiB and ER of listed manufacturing companies in Nigeria.

Thus, the study hypothesized that:

$H0_1$: DiB has no significant effect on ER practice of listed manufacturing companies in Nigeria.
$H0_2$: AC has no significant effect on ER of listed manufacturing companies in Nigeria.
$H0_3$: AC does not significantly moderate the relationship between DiB and ER of listed manufacturing companies in Nigeria.

This study, spanning 2006 -2023, focused on pollution potential in Nigerian manufacturing companies using ISO 14031 checklists for standardized reporting across companies of varying sizes. The findings offer policy insights for regulators, promote corporate transparency, and guide companies in effective environmental management and reporting. It also enriches academic literature on environmental reporting in Nigeria. The paper is organized into five sections: literature review, methodology, analysis, conclusion, and recommendations.

2.0 Literature Review

This section focused on key study elements such as: ER, DiB encompassing board gender, age, nationality, and educational background), and the audit committee. The study also explored theoretical foundations and reviewed empirical studies. Conceptual framework (Figure1) shows audit committee's influence on DiB and ER, considering firm size, age, and profitability as control factors.

Figure 1: Conceptual Framework of the Study
Source: Researcher's compilation (2023).

"ER" is a broad term covering how organizations communicate their environmental activities, encompassing disclosure, expenditures, governance, sustainability reporting, and more. It's an umbrella term in this study for conveying environmental activities to end users (Gerged, 2021; Ofoegbu et al., 2018).

In the context of this study, "DiB" entails demographic differences in a board (gender, age, nationality, education). Researchers such as Hoang et al. (2018); Baalouch et al. (2019) acknowledge the influence of these DiB attributes on decision-making, including ER. To gauge the effect of these attributes on ER, they are aggregated into a DiB index for a holistic view, diverging from previous studies like Beji et al. (2020); Khan et al. (2021) examining attributes individually. The DiB index are categorized into tercile with values 0, 1, 2 representing "below average," "average," and "above average" values. This methodology allows for comprehensive assessment of their influence on ER. Subsequent discussion explores these DiB attributes in detail.

The study evaluates gender diversity on corporate boards, recognizing its value in introducing diversity and broadening perspectives, particularly in environmental responsibility. Women are seen as more environmentally conscious and community-oriented, offering a balance of financial and non-financial objectives while meeting stakeholder needs (Bala et al., 2023). This study measured gender diversity as the proportion of female directors to total number of directors (Baalouch et al., (2019).

Age diversity is crucial for boards, categorizing as older (60+) and younger (<60) and is measured as dummy variable; “1” if the average age of the board of directors is less than 60 years and “0” otherwise (Abdullah & Ku Ismail, 2013). Older directors bring expertise and maturity, enhancing decision-making and environmental reporting. Younger directors focus more on environmental issues and innovation. Diverse age groups avoid decision bias and enrich resources to address social and environmental concerns effectively (Al-Qahtani & Elgharbawy, 2020; Amorelli & García-Sánchez, 2020; Fernandes et al., 2019; Jansson et al., 2010).

Board nationality is the ratio of foreign board members to total board size (Shehata, 2013). Foreign members bring a global perspective, emphasizing long-term environmental and social goals. They offer valuable resources, networks, and experiences. Having foreign board members can really boost how companies report on environmental issues and stick to corporate governance standards (Yarram & Adapa, 2021).

Educational background diversity among board members significantly influences their behavior and decision-making processes. Diverse backgrounds in various fields promote environmental disclosure and overall performance. Specific backgrounds like accounting, finance, or law tend to enhance environmental information disclosure due to their affinity for voluntary environmental programs and compliance (Aifuwa et al., 2020; Iyakekhe et al., 2020; Khan et al., 2019a). Therefore, Board educational background (BEB) is measured as the ratio of BODs with accounting/finance or legal knowledge to total board size (Lewis et al., 2014).

Audit committee comprises board members and shareholder representatives (maximum six members), plays a crucial role in supervising financial and nonfinancial reporting amidst rising environmental crises. Regulatory requirements mandate its formation to enhance internal control and financial statement reliability. Its effectiveness depends on size, expertise, diversity, and oversight capabilities (Elhawary, 2021). The variable is proxied and measured asAudit Committee size (ACS) = This is measured as total numbers of audit committee members divided by 6.(Abdulkadir & Alifiah, 2020), Audit Committee Composition (ACC) = This is measured as ratio of outside members to directors on the audit committee, Audit Committee Educational Background (ACEB) = This is measured as proportion of audit committee members that have accounting or legal to does without accounting or legal

knowledge, Audit Committee Meetings (ACM) = Number of meetings held by audit committee members in a year. Divided by 6 (Isa & Farouk ,2017).

Researchers are increasingly highlighting the importance of looking into moderating variableslike innovation intensity, ownership structure, and gender/minority diversityto gain a clearer picture of how both internal and external factors influence the relationship between corporate governance and sustainability outcomes. In this regard, the audit committee stands out as a crucial governance structure that plays a significant role in shaping firms' decision-making processes and accountability frameworks.Specifically, the audit committee serves as a bridge between the board and stakeholders by ensuring the transparency, accuracy, relevancy and completeness of disclosed information, particularly in areas like environmental reportingThankGod et al. (2021). This makes it a suitable and strategic moderator when examining the effectiveness of board diversity on environmental reporting.

In Nigeria's manufacturing sector, where environmental and regulatory demands are on the rise, a strong audit committee can strengthen or weakenthe impact of diversity-in-board on the quality and frequency of environmental disclosures. For instance, a well-functioning audit committee may reinforce the voice of diverse board members who advocate for sustainability, thereby amplifying the positive influence of board diversity on environmental transparency. Therefore, choosing the audit committee as a moderating variable is in line with existing literature and is especially significant for fostering sustainable practices in Nigerian companies.

The study also incorporates firm size, age, and profitability as control variables to account for variations in environmental reporting beyond key factors (DiB). Larger firms disclose more future-oriented environmental information and is measured as thetotal number of directors on the board of the organization (Osemene & Fagbemi, 2019). Firm age signifies commitment to sustainability, while profitability influences disclosure (Chiu et al., 2020; Innocent & Okafor, 2018).

Theoretical review

This study is grounded in Resource Dependency Theory (RDT) and Stakeholder Theory.These theories provide a strong conceptual foundation for understanding the influence of audit committee on diversity-in-board and environmental reporting (ER) practices.

RDT suggests that companies rely on external resources, and having a diverse board brings in a variety of viewpoints and networks that can improve ER, thus supporting $H0_1$. On the other hand, Stakeholder Theory highlights the importance of being transparent and responsive to all stakeholders, positioning the audit committee as a crucial player in ensuring clear, relevant comprehensive and high-quality environmental information that aligns with stakeholders' expectation. The theory emphasizes the importance of managing key stakeholders such as the board of directors as environmental advocates, while balancing the often-conflicting interests of society and the operating environment (Shaheen et al., 2022), which supports $H0_2$. Lastly, $H0_3$ explores the moderating role of the AC. Here, RDT posits that the AC enhances the effectiveness of a diverse board in influencing ER strategies, while stakeholder theory justifies the moderating effect by positioning the audit committee as a steward of stakeholder interests, ensuring that diversity translates into accountable and transparent reporting practices.

Review of Empirical Studies

In many developing economies, many people beginning to realize that having a diverse mix of genders on boards is essential to improving board effectiveness, encouraging good governance, and drawing attention from academics and business executives alike. Recently, studies have showed a link between gender diversity and environmental reporting, as aspect of sustainability reporting (Magambo & Nyamwesa, 2022; Tilt et al. (2021); Hoang et al., 2018; Nekhili et al., 2018; Katmon et al., 2017; Mohammed et al., 2024).

Kanadlı et al. (2022) examined the role of gender diversity in shaping sustainability practices. The authors argued that women directors are more likely to advocate for sustainability since women frequently bring distinct viewpoints to the table relative to their male colleagues (Baker et al., 2019). While this argument aligns with prior research, it generalizes the behavioral tendencies of female directors, ignoring variations in individual leadership styles and industry-specific governance dynamics.This aligns with findings by Yahaya and Apochi (2021) Cicchiello et al. (2021), Riyadh et al. (2019), Issa and Fang (2019), Garcia-Sanchez et al. (2019), Awodiran and Kareem (2019), and Mahmood et al. (2018), who collectively affirm that increased female representation on boards enhances the quality of sustainability reporting particularly in terms of balance, comparability, and reliability especially in stakeholder-oriented environments.

Again, Naveed et al. (2021) examined the link between board gender diversity (BGD) and corporate social performance (CSP) across Chinese industries from 2009 to 2015 using OLS regression. The study found that even the inclusion of one female director to the board has positive influences on CSP, particularly for firms exposed to environmental and social risk. However, the study focused solely on gender diversity and did not consider board nationality's impact on environmental disclosure. Exploring this relationship in the Nigerian context would enrich the literature. Supporting this, Odum (2023) also found a significant positive impact of board nationality diversity on environmental reporting.

Further, Chebbi et al. (2020), used a sample of 85 French firms from 2010 to 2019, and found that the presence and proportion of women on corporate boards positively influence environmental disclosure. However, the study's findings may not be easily generalisable to countries with different regulatory frameworks on gender diversity and environmental reporting. This limitation underscores the need to investigate this relationship within the context of Nigeria, where environmental disclosure remains largely voluntary.

In another development, Adeniyi and Fadipe (2018) looked into how effect of board diversity on sustainability reporting in Nigeria for the period 2015 and 2016. The authors established that board gender diversity does not significantly affect sustainability reporting. However, since the study only covered a two-year period, which is quite brief, it would be beneficial for future research to explore a longer timeframe.

On board age diversity, Beji et al. (2020) found that greater age diversity on boards is linked to improved environmental performance, aligning with Fernandes et al. (2019), especially in boards with an average age of 55-60. However, Prudencio et al. (2021), Musa et al. (2020), and Baker et al. (2019) did not find a significant correlation between age diversity on boards and ER.

In another study, Ma et al. (2019) found board educational background especially those with Master's in Business Administration (MBA) to have positive affect on environmental disclosure, while board member with legal educational backgrounds have a negative effect. More so, Gold et al. (2021) discovered a positive influence of diverse board education on sustainability reporting in Nigerian consumer goods firms.

Furthermore, Olanrewaju et al. (2020) found that board nationality diversity positively influences corporate social responsibility (CSR) in Nigeria's oil and gas sector, using data from eight listed firms (2012–2018) and Panel Corrected Standard Error regression. However, expanding the focus to environmental disclosure especially among listed manufacturing firms in Nigeria and using ISO standards may yield broader insights and provide more favorable outcome. Similarly, Mirza et al. (2020) showed that board nationality moderates the relationship between corporate governance and investment decisions but did not treat it as an independent factor. Exploring board nationality's impact as a composite index of DIB on environmental disclosure in Nigeria could provide valuable contributions which will add to the existing body of knowledge. In concurrence, Onyali and Okafor (2019) discovered a significant influence of foreign directors on ER of Nigeria consumer goods firms. The outcome was supported by studies like Zaid et al. (2020), Khan et al. (2019a, 2019b), and Berger (2019). In contrast, Anazonwu et al. (2018), Musa et al. (2020), Zaid et al. (2020) found no evidence of a connection.

In another study by Kolsi (2022). The author discovered a significant positive link between audit committee independence and CSR disclosure among 410 UAE-listed firms, though the study lacked a specified period and broader context. Similarly, Moalla et al. (2020) in France, and Ika et al. (2021), Namakavarani et al. (2021), and Arif et al. (2020) across various contexts, all reported a positive effect of audit committee independence on environmental and sustainability disclosures (ENDC), including compliance with GRI guidelines. Broader studies in Nigeria may yield more context-relevant insights.

In the same vein, Amin et al. (2021) investigated the relationship between audit committee characteristics and biodiversity disclosure in Japanese insurance firms (2012–2018), using qualitative data. The study found that frequent audit committee meetings significantly enhance biodiversity disclosure. However, the findings are limited to Japan's insurance sector and may not apply broadly across manufacturing sector. A similar study covering Nigeria's entire manufacturing sector could yield more comprehensive insights. In agreement with this finding, Arif et al. (2020), Odoemelam and Okafor (2018), Appuhami and Tashako (2017), and Samaha et al. (2015) also reported a strong positive association between audit committee meeting frequency and environmental and sustainability disclosures. These studies collectively underscore the importance of board's role in environmental disclosure, but context-specific variations exist, urging further research, especially in Nigeria's distinct context.

In contrast, Blay et al. (2025) found a negative link between audit committee meeting frequency and environmental reporting in SSA firms but overlooked differences in environmental laws across countries. Their focus on only publicly traded non-financial firms limits generalizability. This study fills the gap by examining whether the audit committee strengthens or weakens environmental reporting, considering broader regulatory contexts.

While existing studies on board diversity and sustainability reporting have been insightful, many overlook key disclosure principles outlined in the ISO 14031 guidelines. This creates a knowledge gap in assessing the quality of environmental reporting. To address this, the present study adopts ISO 14031, which provides flexible, voluntary standards applicable to manufacturing firms of all sizes.

3.0 Methodology

This study adopts an ex-post facto research designas it enables existing data to analyses and examine relationships between variables without manipulating them. The population comprises all 61 manufacturing companies listed on the Nigerian Exchange (NGX) as of December 31, 2023, across six industries: Agriculture, Conglomerates, Industrial Goods, Consumer Goods, Healthcare, and Wood, Paper & Printing. These sectors were selected due to their perceived direct or indirect environmental impacts (Kolawale et al., 2021).

A census sampling method with a three-point eligibility filter (Haruna, 2024) was used, resulting in a final sample of 36 firms (representing 59% of the population) after meeting the following criteria:i.) must have complete data for the study; ii.) timely submission of financial and governance reports; iii). musthave not been delisted at any point during the study period

The dependent variable in this study is Environmental Reporting (ER), assessed through content analysis of audited annual reports. A checklist based on the ISO 14031 index, which contains 60 reportable disclosure items, was used for the analysis. Each item was scored as 1 if disclosed and 0 if not, in line Chiu, et al. (2020). This study used the unweighted dichotomous and calculated environmental disclosure index as follows:

$$\frac{\text{Total number of items appearing in the annual report}}{\text{Maximum number of items that should appear in annual reports}}$$

The independent variable in this study is Board Diversity (DiB), commonly measured in literature by evaluating its components separately (Omoye & Eriki, 2013; Anazonwu et al., 2018). However, due to inconsistent findings from individual components, this study adopts a unified DiB index. Specifically, the Unweighted DiB (UWDiB) index is calculated using the tercile split method, categorizing each diversity attribute into three levels: below average (0), average (1), and above average (2) (Ben-Amar et al., 2013). For validation, the study also cross-checked results using a quartile split.

Audit Committee (AC) is used as a moderating variable, measured through a composite index combining four attributes: committee size, composition, educational background, and meeting frequency. Although the main focus of this study is on the effect of DIB on Environmental Reporting (ER), the study also controls for firm-specific variablesfirm size, age, and profitabilityto minimize model bias (Jizi et al., 2014). Table 2 provides detailed descriptions, measurements, and sources for all variables.

Table 1:
Variables Definition and Measurement

Proxy	Variable	Description	Sources
Dependent Variable			

Environmental Reporting	ER	This study adopts ISO 14031 disclosures index, and use content analysis to analyse the disclosure items in the annual reports. The items are scored one or zero based on the presence or absence of a disclosure item.	Uwigbe (2011), Uyagu et al. (2017).
Independent Variables			
Diversity-in-board	DiB	A composite index is calculated by dividing the sum of board gender, board age, board nationality, and board educational background into terciles.	Hafsi and Turgut (2013), Hoang et al. (2016), (2018)
Moderating Variable			
Audit Committe	AC	An index measured as the sum of audit committee attributes: size, composition, educational background, and meetings.	(Isa & Farouk 2018).
Control Variables			
Firm Size	FS	This is proxied using the natural logarithm of total assets of the firm.	Yahaya and Andow, (2015), Habbash (2016).
Firm Age	FA	The number of years after the firm is listed	Yahaya et al. (2017)
Profitability	ROA	The ratio of net profit before tax to total assets.	Akbas (2016).

Source: Researcher's compilations (2024)

The study used three models. Model 1 tested the direct effect of DiB on ER. Model II examined the moderating effect of AC on ER. Model III analyzed the moderating effect of AC on the relationship between DiB and ER. The multiple regression models were presented as follows.

Model

$ER_{it} = \alpha 0+\beta_1 DiB_{it}+ \beta_2 FS_{it} +\beta_3 FA_{it}+\beta_4 ROA_{it} +\varepsilon_{it}$ ----------(1)

$ER_{it} = \alpha 0+\beta_1 DiB_{it}+\beta_2 AC+\beta_3 FS_{it} +\beta_4 FA_{it}+\beta_5 ROA_{it} +\varepsilon_{it}$ ----------(2)

$ER_{it} = \alpha 0+\beta_1 DiB_{it}+\beta_2 AC_{it}+\beta_3 (AC_{it}*DiB_{it}) + \beta_4 FS_{it} +\beta_5 FA_{it}+\beta_6 ROA_{it} +\varepsilon_{it}$ ---------- (3)

Where:

ER= Environmental reporting
DiB = Diversity-in-Board
AC= Audit Committee: -
FS = Firm size

FA = Firm age
PF=Profitability
t = time period 2006-2023
α_0 = Constant term,
ε_{it} = Error term,
β_1- β_5 = Coefficient of the variables.

Before running regression analysis, key diagnostic tests were conducted and they met all statistical assumptions. Normality was checked using histograms, P-P plots, skewness, kurtosis, and Shapiro-Wilk test. Heteroscedasticity was tested with the Breusch-Pagan/Cook-Weisberg test. Multicollinearity was assessed using correlation, Tolerance, and VIF. Finally, the Hausman test determined the appropriate model between fixed and random effects.

4.0 Results and Discussions

Regression analysis was used to assess if AC moderates DiB's impact on ER in Nigeria. Before this analysis, data was described using Table 3 is descriptive statistics.

Table 2:
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ER	648	0.270	0.115	0.017	0.567
DiB	648	1.119	0.641	0	2
AC	648	3.415	0.367	2.040	4
FS	648	6.901	0.807	5.001	8.975
FA	648	29	9	3	54
ROA	648	0.090	0.158	-0.939	0.881

Source: Stata SE/14.2 Output

Table 2 summarizes environmental reporting in Nigerian listed manufacturing firms. On average, firms report 27% environmentally, with a relatively uniform pattern (SD = 11.5%). Minimum disclosure is 1.7%, suggesting incomplete ISO 14031 adherence. Maximum disclosure is 56.7%, slightly above average. DiB is moderate (mean = 1.119). AC mean is 3.415 (SD = 0.367), ranging from 2.040 to 4. FS averages 6.901 (SD = 0.807), ranging from 5.001 to 8.975. FA and ROA average 29 and 0.090 respectively. Minimum and maximum values for FA are 3 and 54, while for ROA, they are -0.939 and 0.881.

Diagnostics and Robustness Checks

This section covers regression assumptions and diagnostic tests to ensure result stability and reliability. The first test checks multicollinearity using Pearson's correlation coefficients for predictor variables, with results shown in Table 4.

Table 3:
Pearson's Correlation Coefficients

	ER	DiB	AC	FS	FA	ROA

ER	1					
DiB	0.3206	1				
AC	0.5215	0.3631	1			
FS	0.5094	0.5158	0.4825	1		
FA	0.4964	0.2332	0.4314	0.3683	1	
ROA	0.0479	0.0495	0.051	0.1336	0.071	1

Source: Stata SE/14.2 Output

Table 3 presents Pearson's Correlation Coefficients for dependent and independent variables. Results in Table 3 show no significant multicollinearity (highest correlation: 0.5158 which is below ±0.7 threshold recommended by Gujarati & Porter, 2009). Also, the histogram and P-P plot of standardised residuals indicate that the error terms in the Model presented in Figure 2a and 2b are fairly normally distributed.

Figure 2(a) Histogram of the error term in model 1

Figure 2(b) the P-P plot showing normality of the error term in Model 1

FIGURE 2 (a) and FIGURE 2(b)
Source: Stata SE/14.2 Output

The Breusch-Pagan test showed no heteroscedasticity ($\chi^2 = 8.961$, $p = 0.003$). The Hausman test favored the fixed effect model ($\chi^2 = 113.57$, $p < 0.001$). Additionally, the Pesaran CD was used to test for cross-sectional dependence ($\chi^2 = 15.461$, $Pr < 0.001$), the result indicates the presence of cross-sectional dependence, suggesting the use of Driscoll and Kraay standard errors as the appropriate method (Hoechle, 2007).

Regression Results
The study utilized multiple regressions and presented the findings in Table 4 to investigate how DiB influences ER of manufacturing firms listed in Nigeria.

Table 4*:*
Regression Results

ER	Coefficients (β)	T	P>t
DiB	0.0077	1.64	0.102

FS	0.0401		10.10	0.000
FA	0.0003		0.91	0.366
ROA	0.0322		2.17	0.030
Constant	-0.0281		-1.12	0.261
F-Statistics		46.89		
Prob. >F		0.000		
R-squared		0.6778		
Adjusted R-squared		0.6670		

Source:STATA 14.2 Output (2023).

The regression model was well-fitted (F=46.89, p<0.001), explaining 67.78% of ER variation with DiB and control variables. DiB showed a positive but statistically insignificant effect on ER (β=0.0078, t=1.64, p=0.102), opposing prior research such as Hoang et al. (2018). The study accepts hypothesis 1 ($H0_1$) and aligns with some literature (Zaid et al., 2020) but differs from others such as Beji et al. (2020) and Ozordi et al. (2018). Control variables were positively related to ER, and DiB contributes to strategic decision-making and innovation, consistent with resource dependence theory.

Furthermore, the findings for the analysis of the second specific objective (AC on ER) and the tests of hypothesis 2 are presented in Table 5.

Table 5
Regression Results

ER	Coefficients (β)	T	P>t
AC	0.0318	3.60	0.000
FS	0.0431	10.76	0.000
FA	0.0004	1.34	0.180
ROA	0.0329	2.24	0.026
Constant	0.0511	1.60	0.110
F-Statistics	34.66		
Prob >F	0.000		
R-squared	0.6859		
Adjusted R-squared	0.6743		

Source: STATA 14.2 Output (2023).

Table 5 examines the effect of AC on ER. The model significantly fits (F=34.66, p<0.01) and explains 67.43% of ER variation. AC has a statistically significant effect on ER (t=3.60, p=0.000), contradicting hypothesis $H0_3$. This aligns with previous studies by IKA et al. (2020) and Abdi et al. (2020), and supports stakeholder and resource dependency theories, emphasizing the role of AC in environmental disclosure and accountability. Diverse perspectives from AC influence strategic decisions, addressing environmental challenges. Table 6 indicates the moderating role of AC on the relationship between DiB and ER.

Table 6
Regression Results

	Model 1			Model 3		
ER	**Coefficients (β)**	**T**	**P>t**	**Coefficients (β)**	**T**	**P>t**
DiB	0.0777	1.64	0.102	0.0886	0.23	0.818
AC	-	-	-	0.0340	2.05	0.041
DiB x AC	-	-	-	0.027	2.17	0.002
FS	0.0401	10.10	0.000	0.0431	10.75	0.000
FA	0.0003	0.91	0.366	0.0004	1.41	0.159
ROA	0.0322	2.17	0.030	0.0323	2.19	0.029
Constant	-0.0281	-1.12	0.261	0.0506	0.94	0.350
F-Statisics	46.89			34.37		
Prob >F	0.000			0.000		
R-squared	0.6778			0.6852		
Adjusted R-squared	0.6670			0.6736		

Source: STATA 14.2 Output (2023).

F-statistics confirm well-fitted models (F=46.89, p<0.001 in Model 1; F=34.37, p<0.001 in Model 3). Adjusted R-squared indicates DiB and controls explain 66.7% (Model 1) to 67.36% (Model 3) of ER variation.

Initially, DiB's effect on ER is positive but not significant; with AC, it becomes significant. Thus, AC significantly moderates the DiB-ER relationship (β2=0.027, t=2.17, p=0.002). The study rejects $H0_3$, affirming AC's significant role in moderating DiB's effect on ER. Control variables align as expected.

5.0 Conclusion and Recommendations of the Study

The study investigated the moderating role of AC on the DiB and ER relationship. It was found that DiB alone did not significantly influence ER due to the focus of corporate governance primarily on investors, not social or environmental performance thus, the result conflicting with stakeholder theory. However, with AC introduced, it was found to significantly moderate the DiB-ER relationship, emphasizing AC role in environmental reporting oversight.

i. Based on the findings, the study recommendations include promoting DiB in manufacturing firms in Nigeria as regulators are encourage to regularly review codes of corporate governance to boost diversity requirements in governance for credible stakeholder reporting.
ii. Also, manufacturing firms should really focus on boosting the functionality or effectiveness of their audit committees to improve environmental reporting (ER) and enhance their brand reputation. This is because by having well-organized committees that are the right size, with the right mix of skills and expertise, and holding regular meetings, they can establish solid audit processes. This not only promotes accountability and integrity within management but also ensures that the board's

actions with accuracy and diligence, which impact ER and the company's image, are properly overseen.

iii. The policy makers like the Financial Reporting Council of Nigeria, Security and Exchange Commission should review the Nigerian Code of Corporate Governance to change orientation from agency cost reduction to balance the interest of all stakeholders on listed manufacturing companies in Nigeria.

iv. Furthermore, from a regulatory perspective, Financial Reporting Council (FRC) of Nigeria should no longer allow environmental disclosure to be voluntary but make it compulsory using ISO 14031 reporting guideline as a common standard among listed manufacturing firms in Nigeria for the purpose of attaining detailed environmental disclosures and easy comparison of such disclosures among firms.

In spite of the importance of our findings, this research has some limitation which includes a limited sample of listed manufacturing firms and reliance on annual reports for data, suggesting potential for broader sectoral studies and diverse data collection methods for future research.

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