THE MODERATING ROLE OF INTELLECTUAL CAPITAL ON THE RELATIONSHIP BETWEEN BOARD CHARACTERISTICS AND SUSTAINABILITY DISCLOSURE OF LISTED COMPANIES IN NIGERIA.

Shehu Abubakar P.hD.
Department of Accounting
Faculty of Management Sciences
Kaduna State University
shehu.abubakar@kasu.edu.ng

Idris Bello Sambo
Department of Accounting
Faculty of Management Sciences
Kaduna State University
idris.bello@kasu.edu.ng

Corresponding Author: shehu.abubakar@kasu.edu.ng
DOI: https://doi.org/10.57233/ijamer.v2i3.050

Article History: Received: 11 September 2026 | **Revised:** 16 September 2026 | **Accepted:** 22 September 2026 | **Published:** 25 September 2026

How to Cite This Article:
Abubakar, S., & Sambo, I. B. (2026). The moderating role of intellectual capital on the relationship between board characteristics and sustainability disclosure of listed companies in Nigeria. International Journal of Accounting, Management and Economic Review, 2(3). https://doi.org/10.57233/ijamer.v2i3.050

Abstract
This study examines the relationship between board characteristics and sustainability disclosure among listed companies in Nigeria, focusing on the moderating role of intellectual capital. It considers board independence, board size, board meetings, and directors' qualifications, controlling for firm size and profitability. The study adopts a quantitative correlational design using secondary data from company reports. Sustainability disclosure is measured using a Global Reporting Initiative-based index, while intellectual capital is measured by human capital efficiency. The population comprises 157 companies listed on the Nigerian Exchange as at 31 December 2024. Panel regression results reveal that board independence, board size, board meetings, and directors' qualifications have no significant direct relationships with sustainability disclosure. Intellectual capital has a significant negative association with disclosure, but positively moderates the relationships involving board independence and board meetings. Its interaction with directors' qualifications is negative and significant, while its interaction with board size is insignificant. Firm size is positively significant, whereas profitability is insignificant. The model is jointly statistically significant. The findings suggest that board characteristics alone may not guarantee comprehensive sustainability disclosure, as their effectiveness partly depends on how intellectual capital is deployed. The study recommends integrating sustainability into board deliberations, aligning directors' expertise with organizational knowledge, and strengthening reporting capacity. Regulators and the Nigerian Exchange should also promote improved disclosure practices and capacity-building to enhance transparency and accountability.

1.0 Introduction

Sustainable development is widely regarded as one of the most significant issues confronting contemporary society, owing to its implications for economic growth, environmental protection, and social well-being (World Commission on Environment and Development [WCED], 1987). Sustainability has therefore become a global concern, prompting both companies and government agencies across the world to continually seek solutions aimed at mitigating environmental degradation, preventing further deterioration, and addressing emerging sustainability challenges (United Nations, 2015). In light of current climatic conditions and increasing environmental risks, organizations are increasingly expected to be conscious of the environmental and social consequences of their activities within the societies and environments in which they operate (Elkington, 1997; Global Reporting Initiative [GRI], 2021).

Corporate sustainability (CS) has emerged as a critical component of contemporary business strategy, driven by increasing awareness of the need for organizations to operate in an environmentally sound, socially responsible, and economically viable manner (Dyllick & Hockerts, 2002). Sustainability disclosure, which entails the reporting of environmental, social, and governance (ESG) information, serves as a key mechanism through which firms communicate their sustainability initiatives and performance to a wide range of stakeholders (Global Reporting Initiative [GRI], 2021). The growing importance of sustainability disclosure stems from its capacity to enhance corporate transparency, strengthen stakeholder trust, and support long-term organizational value creation and business success (Eccles et al., 2014).

Companies increasingly report their sustainability activities through various channels, including stand-alone sustainability reports, dedicated sustainability sections within annual reports, corporate websites, and integrated reports (KPMG, 2017). Evidence suggests that countries with higher levels of sustainability reporting are those with regulatory frameworks mandating sustainability disclosures within annual or integrated reports. Concurrently, the expansion of environmental and social regulations has led to greater disclosure of sustainability-related information as a means of restoring public trust and enhancing accountability to stakeholders. Notable international standards and frameworks, such as the Accountability Assurance Standards (AA1000 and AA1000S), Social Accountability Standard (SA) 8000, ISO 14001, the International Standard on Assurance Engagements (ISAE) 3000, and the Global Reporting Initiative (GRI) Sustainability Reporting Guidelines, require or encourage organizations to publish sustainability reports. In both developed and developing economies, various legislative and policy initiatives have been introduced to compel firms to adopt environmentally and socially responsible strategies and disclose related information. While sustainability reporting research is extensive in developed countries (Ackers, 2009; Bewley & Li, 2000; Deegan, 2002; Khan et al., 2013), empirical evidence from Africa particularly Nigeria remains limited, even though a significant proportion of firms in the country contribute negatively to the environment through gas, liquid, and solid waste emissions (Bello & Alabi, 2022). The low level of sustainability reporting in Nigeria has been attributed to several factors, including the absence of mandatory disclosure requirements (Ajayi et al., 2012), weak or inadequate legislation (Akinbode et al., 2017), limited accounting and financial expertise among managers (Afolabi & Ogunleye, 2022; Ezeani et al., 2018), low awareness of environmental issues (Ajao & Moses, 2021; Akinbode et al., 2017), weak corporate governance structures (Anyigbah et al., 2023; Indy et al., 2022), ineffective reporting frameworks (Adeyemi & Owolabi, 2008), and minimal public and stakeholder pressure (Liu & Zhang, 2020; Wei et al., 2024).

Although previous studies have examined board attributes and sustainability disclosure, their findings remain inconsistent across countries and industries, creating a domain gap. While evidence from China, Malaysia, and Europe generally reports positive effects of board independence, size, diversity, and meeting frequency, studies in emerging economies, including Nigeria, report mixed or insignificant effects (Anyigbah et al., 2023; Kamaludin et al., 2022; Nicolo' & Andrades Peña, 2024; Agu et al., 2023). These inconsistencies suggest that the effect of board attributes on sustainability disclosure may depend on organisational conditions. Drawing on Baron and Kenny's (1986) moderation perspective, this study introduces intellectual capital as a moderator because human knowledge, organisational processes, information systems, and relational resources may strengthen the ability of boards to translate effective governance into improved sustainability disclosure. Firms with stronger intellectual capital may therefore be better positioned to utilise board expertise and oversight for enhanced sustainability reporting, while weaker intellectual capital may constrain this effect. Thus, examining intellectual capital as a moderator

provides a more nuanced explanation of the inconsistent relationship between board attributes and sustainability disclosure and helps address the identified domain gap among listed firms in Nigeria.

2.0 Literature Review

Sustainability disclosure reporting of information relating to a company's environmental, social, and governance (ESG) performance, policies, practices, and impacts, with the aim of enhancing transparency, accountability, and stakeholder engagement regarding corporate sustainability activities(Global Reporting Initiative [GRI], 2021; Hahn & Kühnen, 2013; KPMG, 2022).This practice aims to provide stakeholders with comprehensive insights into how a company manages its impacts on the environment, society, and governance practices.

The concept has gained significant importance as stakeholders increasingly demand transparency and accountability from companies regarding their sustainability initiatives (GRI, 2016). Sustainability disclosure encompasses a wide range of information that reflects a company's commitment to sustainable development. This includes data on environmental impact (carbon emissions, waste management), social performance (labor practices, community engagement), and governance practices (board diversity, executive compensation) (GRI, 2016).

Board characteristics represent the structural and compositional features of a company's board of directors that influence its ability to provide effective oversight, ensure accountability, and promote transparency in corporate reporting, including sustainability disclosure practices (Albawwat, 2022; Fama & Jensen, 1983).

Board independence refers to the presence and influence of non-executive directors on a company's board who do not participate in the daily management of the firm. These independent directors are expected to provide impartial oversight and ensure that the board's decisions are made in the best interests of shareholders and other stakeholders. The concept of board independence is crucial for effective corporate governance and is widely discussed in the context of mitigating agency problems and enhancing transparency.

Board size refers to the total number of directors that constitute a company's board of directors. The size of the board is a key structural characteristic that influences the board's effectiveness in governance, decision-making, and oversight. The optimal board size can vary depending on several factors, including the company's industry, complexity, and governance needs. Board size is defined as the number of individuals serving on a company's board of directors at any given time. This number can impact various aspects of board functioning, including decision-making efficiency, diversity of perspectives, and the ability to oversee management (Dalton et al. 1999).

Board meetings are critical components of corporate governance, serving as formal gatherings where a company's board of directors convenes to discuss and make decisions on key issues concerning the organization's strategy, performance, and oversight. The frequency, structure, and effectiveness of board meetings significantly impact a board's ability to fulfil its responsibilities and contribute to sound corporate governance. Board meetings are scheduled sessions where directors of a company come together to deliberate on various corporate matters, including financial performance, strategic decisions, risk management, and compliance issues. These meetings are governed by the company's bylaws and corporate governance policies (Vafeas, 1999).

Board director qualifications refer to the attributes, skills, experience, and expertise that directors bring to the boardroom. These qualifications are crucial in ensuring that a board of directors effectively performs its oversight, strategic, and governance roles. The qualifications of board directors can significantly impact a company's performance, risk management, and overall governance quality. Board director qualifications encompass a range of attributes including educational background, professional experience, industry knowledge, and personal traits. These qualifications are intended to ensure that directors possess the requisite skills and knowledge to contribute effectively to board discussions and decisions (Harris & Shimizu, 2004).

Intellectual capital considered as a business asset as any organization contributes for employee training, enhancing customers' relationship, product development, goodwill building, and so on. Intellectual capital can be described as intellectual material that has been formalized, captured and leveraged to produce a higher-valued asset (Gupta et al., 2022). Zhang and Wang (2022) defined intellectual capital as knowledge-based equity of a company. Intellectual is sum of knowledge-based factors that is, resources, capabilities, and competences that critical to the creation of organizational value and a long term, sustained competitive advantage. It includes human capital, relational capital, structural capital, intellectual property, know-how, copyrights, patents or any other information or resources that give a competitive advantage (Xu et al., 2021).

Empirical Review

Several studies on board characteristics and sustainability disclosure were reviewed.

Board Independence and Sustainability Disclosure

Shawai and Jalaludin (2025) found that board independence positively influences ESG disclosure among listed Nigerian firms, although weak institutional enforcement limits its effectiveness, recommending stronger regulation and director capacity building. Similarly, Adahosa and Udeh (2024) reported that board independence strengthens the positive relationship between sustainability disclosure and firm value in Nigeria, recommending greater use of independent directors to improve disclosure credibility and market valuation. Alqahtani (2024) found that board independence significantly enhances sustainability disclosure among listed Saudi Arabian firms, although board expertise and meeting frequency are necessary to maximise its effectiveness. In Nigeria, Uwuigbe et al. (2023) also found a significant positive relationship between board independence and sustainability reporting, recommending stronger regulatory monitoring, while Abubakar and Nasiru (2022) reported a positive but moderate effect of board independence on environmental and social disclosure and recommended complementing independence with sustainability expertise. Overall, the studies consistently suggest that board independence enhances sustainability disclosure, although its effectiveness depends on regulatory enforcement, board expertise, and active director engagement.

In line with the above studies the following hypotheses is formulated in a null form:
H_{01}: Board independence has no significant effect on sustainability disclosure among listed Nigerian firms.

Board Size and Sustainability Disclosure

Shawai and Jalaludin (2025) found that board size positively influences ESG disclosure among Nigerian listed firms, although weak institutional enforcement and limited director capacity constrain its effectiveness, recommending stronger regulation, director training, and improved intellectual capital. Similarly, Alqahtani (2024) reported that moderate board size enhances integrated sustainability disclosure among Saudi Arabian listed firms, while excessively large boards reduce effectiveness through coordination and monitoring challenges. The study recommended that firms maintain an optimal board

size based on organisational complexity, strengthen directors' expertise, and establish ESG-focused committees. Overall, the studies suggest that board size can enhance sustainability disclosure when supported by appropriate board composition, director competence, effective monitoring, and complementary governance mechanisms.

In line with the above studies the following hypotheses is formulated in a null form:
H_{02}: Board size has no significant effect on sustainability disclosure among listed Nigerian firms.

Board Meetings and Sustainability Disclosure
Buertey et al. (2025) found that frequent and well-structured board meetings significantly improve integrated sustainability reporting quality among multinational firms, recommending that board meetings be aligned with sustainability reviews and ESG metrics incorporated into board evaluations. Similarly, Sadiq et al. (2025) reported a positive and significant relationship between board meeting frequency and sustainability disclosure among Nigerian non-financial firms, recommending more frequent meetings and improved sustainability-related deliberations. Adegbite and Nakajima (2024) found that board meeting frequency positively affects sustainability disclosure in Nigeria's oil and gas sector only when sustainability issues are substantively discussed, recommending board charters that mandate ESG deliberations and greater director engagement. Uwuigbe et al. (2023) also found a positive and significant relationship between board meeting frequency and sustainability reporting quality among Nigerian deposit money banks, recommending quarterly sustainability-focused meetings and improved ESG performance evaluation. Overall, the studies indicate that frequent board meetings can enhance sustainability disclosure, but their effectiveness depends on the quality, structure, and substantive focus of board deliberations.

In line with the above studies the following hypotheses is formulated in a null form:
H_{03}: Board meetings have no significant effect on sustainability disclosure among listed Nigerian firms.

Directors' Qualifications and Sustainability Disclosure
Baalouch et al. (2025) examined the influence of board directors' qualifications on sustainability disclosure quality among European listed firms using panel regression analysis and GRI-based disclosure indices, anchored on stakeholder theory. The findings revealed that directors' qualifications significantly improved sustainability disclosure quality by strengthening strategic oversight of environmental, social, and governance (ESG) issues. Similarly, Sadiq et al. (2025) investigated the relationship between directors' qualifications and sustainability disclosure among non-financial firms in Nigeria using panel regression analysis, guided by agency theory. The findings indicated a positive and significant relationship between directors' qualifications and sustainability disclosure, suggesting that directors' educational backgrounds and professional experience enhance monitoring and transparency. Both studies recommended appointing qualified directors with sustainability expertise and providing continuous ESG training to strengthen board competence and improve sustainability disclosure.

In line with the above studies the following hypotheses is formulated in a null form:
H_{04}: Directors' qualifications have no significant effect on sustainability disclosure among listed Nigerian firms.

Intellectual Capital and Sustainability Disclosure
Baur et al. (2025) examined the influence of intellectual capital on sustainability reporting among European listed firms using panel data regression, guided by resource-based theory. The findings revealed that human, structural, and relational capital improved the comprehensiveness and reliability of sustainability disclosure, with human capital having the strongest effect. Similarly, Raimo et al. (2024) investigated the mediating role of intellectual capital in the relationship between corporate governance and

sustainability disclosure among Italian firms using panel regression and content analysis, guided by resource dependence theory. The findings showed that effective knowledge management and intellectual capital strengthened governance mechanisms and improved sustainability disclosure quality. Chen et al. (2022) also assessed the role of intellectual capital in sustainability reporting among listed technology firms using panel data analysis and GRI-based disclosure metrics, underpinned by the knowledge-based view theory. The study found that human and structural capital positively and significantly influenced sustainability disclosure, while relational capital enhanced external communication. Collectively, the studies recommended investing in employee training, research and development, effective reporting systems, knowledge management, and stakeholder engagement to improve sustainability disclosure.

In line with the above studies the following hypotheses is formulated in a null form:
H_{05}: Intellectual capital has no significant effect on sustainability disclosure among listed Nigerian firms.

The reviewed studies on board independence, board size, board meetings, and directors' qualifications reveal methodological, contextual, temporal, measurement, and empirical gaps. Although Shawai and Jalaludin (2025), Uwuigbe et al. (2023), and Abubakar and Nasiru (2022) reported positive relationships between board independence and sustainability disclosure, findings from Alqahtani (2024) in Saudi Arabia may not be directly generalisable to Nigeria. Similarly, studies on board size suggest potential benefits but leave questions regarding optimal board size and nonlinear effects. Research on board meetings highlights the importance of substantive sustainability deliberations, while studies on directors' qualifications do not clearly establish whether general academic qualifications or sustainability-specific expertise contributes more to disclosure. Methodologically, the available summaries provide insufficient evidence regarding the treatment of endogeneity, omitted variables, and differences in measurement. Furthermore, Baur et al. (2025), Raimo et al. (2024), and Chen et al. (2022) examined intellectual capital in different contexts, but their findings do not establish whether it moderates the relationships between board attributes and sustainability disclosure among Nigerian listed firms. Consequently, an empirical gap exists in determining the joint effects of these board attributes and the moderating role of intellectual capital using consistent measures and appropriate panel-data techniques over a clearly defined, recent study period.

3.0 Methodology

This study adopts a quantitative correlational research design, anchored on the positivist paradigm, to examine the effect of board independence, board size, board meetings, and directors' qualifications on sustainability disclosure, including the moderating role of intellectual capital among listed Nigerian firms. The population comprises 157 firms listed on the Nigerian Exchange (NGX) Group as of 31 December 2024. The study covers the period 2016–2025 and employs a stratified random sampling technique to select 20 firms, comprising 10 financial and 10 non-financial firms, to ensure representation of both sectors. The sample is expected to yield 200 firm-year observations, subject to data availability for all ten years. Secondary data was extracted electronically from published annual reports and financial statements, while appropriate panel-data estimation techniques will be used to test the hypotheses and examine the direct and moderating relationships among the study variables.

Table 1:
Variable's Measurements and Definitions

Variable	Measurement	Definition	Source
Sustainability Disclosure (SD)	GRI-based disclosure index; each item scored 1 if disclosed and 0 otherwise; total score divided by total applicable GRI items	The extent to which a firm discloses environmental, social, and governance (ESG) information in its annual or sustainability reports	Clarkson et al. (2008); Uwuigbe et al. (2023); Raimo et al. (2024)
Board Independence	Proportion of independent directors to total board members	The degree to which the board is composed of non-executive independent directors capable of objective monitoring	Klein (2002); Galbreath (2021); Abubakar & Nasiru (2022)
Board Size	Total number of directors on the board	The number of individuals serving on the board of directors, reflecting diversity of expertise and coordination capacity	Lipton & Lorsch (1992); Coles et al. (2008); Baatwah et al. (2022)
Board Meetings	Total number of board meetings held in a financial year	The frequency of formal board meetings, indicates the level of board activity and monitoring intensity	Vafeas (1999); Liu & Zhang (2020); Raimo et al. (2024)
Directors' Qualifications	Proportion of directors with business, accounting, or finance backgrounds to total board members	The level of professional and educational competence of board members relevant to financial and strategic oversight	Peters & Romi (2014); Michelon & Parbonetti (2012); Galbreath (2021)
Intellectual Capital	Human Capital Efficiency measured as Value Added divided by Human Capital (VA/HC)	Knowledge-based resources of the firm that enhance value creation through employee skills, expertise, and innovation	Amin et al. (2018); Xu et al. (2021); Zhang & Wang (2022)
Firm Size	Total assets	The scale of a firm's operations and resource base, often associated with higher visibility and disclosure capacity	Brammer & Pavelin (2008); Uwuigbe et al. (2023)

Source: Authors' Compilation, 2026.

Model Specification

The regression model for the study is specified as follows:

$$SD_{it} = \beta_0 + \beta_1 BIND_{it} + \beta_2 BSIZE_{it} + \beta_3 BMEET_{it} + \beta_4 DQ_{it} + \beta_5 IC_{it} + \beta_6 BIND*IC_{it} + \beta_7 BSIZE*IC_{it} + \beta_8 BMEET*IC_{it} + \beta_9 DQ*IC_{it} + \beta_{10} FSIZE_{it} + \beta_{11} FPROT_{it} + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots i$$

4.0 Result and Discussion

To analyze the impact of board characteristics on sustainability disclosure, while controlling for firm size and firm profitability, a multiple regression model is employed. This approach helps to determine how board independence, board size, board meetings, and directors' qualifications affect sustainability disclosure while accounting for the influence of firm size and profitability. The results of direct relationship analysis are presented in Table 2.

Table 2:
Fixed Effect (Panel Correctional Standard Error) Model Moderated

Variables	Coefficient (β)	Standard Error	t-Statistic	p-Value
Constant	-4.412	3.762	-1.17	0.053
Board Independence (BIND)	-0.516	0.348	-1.48	0.138
Board Size (BSIZE)	0.038	0.038	1.00	0.31
Directors' Qualification (DQ)	0.012	0.045	0.29	0.772
Intellectual Capital (IC)	-0.047	0.017	-2.72	0.007***
BIND × IC	0.123	0.055	2.25	0.025**
Board Meetings (BMEET)	-0.089	0.055	-1.68	0.104

Variables	Coefficient (β)	Standard Error	t-Statistic	p-Value
BSIZE × IC	0.0097	0.011	0.85	0.396
BMEET × IC	0.0096	0.003	3.14	0.002***
DQ × IC	-0.126	0.046	-2.73	0.007***
Firm Size (FSIZE)	0.911	0.299	3.04	0.002***
Firm Profitability (FPROF)	-0.217	0.335	-0.65	0.517
R-Squared	0.314			
Wald Chi^2	25.64			
Prob > Chi^2	0.0073			

Source: STATA Output, 2025.

The model reports an R-squared value of 0.314, indicating that the explanatory variables jointly account for approximately 31.4% of the observed variation in sustainability disclosure, while the remaining 68.6% is attributable to factors outside the model and unexplained variation. The Wald chi-square statistic of 25.64, with a probability value of 0.0073, indicates that the explanatory variables are jointly statistically significant at the 1% level. This suggests that the variables collectively provide meaningful explanatory power, even though some individual coefficients are statistically insignificant. The overall result supports examining board characteristics and intellectual capital together rather than interpreting each governance attribute in isolation.

Board independence has a negative coefficient of -0.516, with a standard error of 0.348, a t-statistic of -1.48, and a p-value of 0.138. This indicates a negative but statistically insignificant relationship with sustainability disclosure at the 5% significance level. Therefore, the null hypothesis that board independence has no significant effect cannot be rejected. The finding suggests that a higher proportion of independent directors does not necessarily translate into greater sustainability disclosure in the model, particularly when intellectual capital and its interaction with board independence are considered. This result contradicts Shawai and Jalaludin (2025), Uwuigbe et al. (2023), and Abubakar and Nasiru (2022), who reported positive relationships between board independence and sustainability disclosure. However, the significant positive interaction between board independence and intellectual capital indicates that the relationship may depend on the organisation's knowledge resources and reporting capacity. Thus, the insignificant direct effect does not necessarily imply that independent directors are ineffective; rather, their contribution may be conditional on other organisational characteristics.

Board size has a positive coefficient of 0.038, with a standard error of 0.038, a t-statistic of 1.00, and a p-value of 0.310. This indicates that board size has a positive but statistically insignificant relationship with sustainability disclosure. Consequently, the null hypothesis cannot be rejected. Although larger boards may provide broader expertise, resources, and monitoring capacity, the result suggests that an increase in the number of directors does not independently guarantee improved sustainability disclosure. This finding differs from Shawai and Jalaludin (2025), who reported a positive relationship between board size and ESG disclosure among Nigerian listed firms. However, it is partly consistent with Alqahtani (2024), whose findings suggest that the benefits of board size depend on maintaining an appropriate balance between board capacity and coordination effectiveness. Furthermore, the insignificant interaction between board size and intellectual capital indicates that the study does not provide sufficient statistical evidence that intellectual capital moderates this relationship.

Directors' qualifications have a positive coefficient of 0.012, with a standard error of 0.045, a t-statistic of 0.29, and a p-value of 0.772. This indicates a positive but statistically insignificant relationship with sustainability disclosure. Therefore, the null hypothesis cannot be rejected. The result suggests that directors' qualifications, as measured in this study, do not independently explain significant variations in

sustainability disclosure. This finding contradicts Baalouch et al. (2025) and Sadiq et al. (2025), who reported positive and significant relationships between directors' qualifications and sustainability disclosure. One possible explanation is that general educational qualifications may not adequately capture directors' practical experience or sustainability-specific expertise. Importantly, the interaction between directors' qualifications and intellectual capital is negative and statistically significant, suggesting that the relationship between qualifications and sustainability disclosure becomes less positive as intellectual capital increases, under the model's specification. This unexpected finding warrants further investigation rather than an immediate conclusion that intellectual capital undermines directors' competence.

Intellectual capital has a negative coefficient of -0.047, with a standard error of 0.017, a t-statistic of −2.72, and a p-value of 0.007. This indicates a negative and statistically significant conditional relationship with sustainability disclosure at the 1% level. Accordingly, the null hypothesis of no significant direct effect is rejected. However, because intellectual capital interacts with several board characteristics, this coefficient represents its estimated effect when the interacting board variables equal zero; it should not be interpreted as a universally negative effect of intellectual capital. The finding contrasts with Baur et al. (2025), who reported that human, structural, and relational capital improve sustainability disclosure, and Chen et al. (2022), who found positive effects of human and structural capital. Raimo et al. (2024) also reported that intellectual capital strengthens the relationship between corporate governance and sustainability disclosure through a mediating mechanism. Differences in measurement, sample composition, model specification, and the role assigned to intellectual capital may help explain the divergent findings. The negative coefficient therefore calls for examining how intellectual capital is operationalised and how it interacts with the board characteristics included in the model.

The interaction between board independence and intellectual capital has a positive coefficient of 0.123, with a standard error of 0.055, a t-statistic of 2.25, and a p-value of 0.025. This indicates a positive and statistically significant moderating effect at the 5% level. Therefore, the null hypothesis that intellectual capital does not moderate the relationship between board independence and sustainability disclosure is rejected. The finding suggests that higher intellectual capital strengthens the conditional relationship between board independence and sustainability disclosure. In practical terms, independent directors may be more effective when firms possess the knowledge, organisational systems, and information resources needed to support sustainability oversight. This finding is consistent with the broader argument advanced by Baur et al. (2025) and Raimo et al. (2024) that intellectual capital contributes to sustainability reporting and can complement corporate governance mechanisms. It also helps explain why the direct coefficient for board independence is insignificant while its interaction with intellectual capital is significant. However, the precise conditional effect should be established through marginal-effects calculations or a simple-slopes analysis.

Board meetings have a negative coefficient of -0.089, with a standard error of 0.055, a t-statistic of −1.68, and a p-value of 0.104. This indicates a negative but statistically insignificant relationship with sustainability disclosure at the 5% level. Consequently, the null hypothesis cannot be rejected. The finding suggests that meeting frequency alone may not be sufficient to improve sustainability disclosure, as the effectiveness of board meetings may depend on the quality of deliberations and the attention devoted to sustainability issues. This result contrasts with Buertey et al. (2025), Sadiq et al. (2025), and Uwuigbe et al. (2023), who reported positive relationships between board meeting frequency and sustainability reporting. However, it is consistent with the qualification offered by Adegbite and Nakajima (2024), who found that the relationship depends on whether sustainability issues are substantively discussed. Notably, the positive and significant interaction between board meetings and intellectual capital indicates that the

relationship may become more favourable when the organisation possesses stronger knowledge and reporting resources.

The interaction between board size and intellectual capital has a positive coefficient of 0.0097, with a standard error of 0.011, a t-statistic of 0.85, and a p-value of 0.396. Although the coefficient is positive, the relationship is statistically insignificant. Therefore, the null hypothesis that intellectual capital does not moderate the relationship between board size and sustainability disclosure cannot be rejected. This suggests that the study does not provide sufficient evidence that intellectual capital changes the effect of board size on sustainability disclosure. Although Baur et al. (2025) and Raimo et al. (2024) emphasised the importance of intellectual capital in sustainability reporting and corporate governance, their findings do not establish that intellectual capital necessarily moderates the effect of board size specifically. The result may indicate that the number of directors, rather than the interaction between board size and intellectual capital, is insufficient to explain differences in disclosure. Board expertise, committee structures, and coordination effectiveness may also be relevant, although these explanations would require additional empirical testing.

The interaction between board meetings and intellectual capital has a positive coefficient of 0.0096, with a standard error of 0.003, a t-statistic of 3.14, and a p-value of 0.002. This indicates a positive and statistically significant moderating effect at the 1% level. Accordingly, the null hypothesis that intellectual capital does not moderate the relationship between board meetings and sustainability disclosure is rejected. The finding suggests that intellectual capital strengthens the conditional relationship between board meeting frequency and sustainability disclosure. Firms with stronger knowledge resources, reporting systems, and employee expertise may be better positioned to translate board deliberations into comprehensive sustainability information. This finding supports the reasoning of Baur et al. (2025) concerning the contribution of intellectual capital to reporting quality and is consistent with Adegbite and Nakajima (2024), who emphasised the importance of substantive sustainability discussions during board meetings. Nevertheless, the interaction result demonstrates statistical moderation, not necessarily that board meetings themselves cause improved disclosure. Further analysis of marginal effects would clarify how the relationship changes at different levels of intellectual capital.

The interaction between directors' qualifications and intellectual capital has a negative coefficient of −0.126, with a standard error of 0.046, a t-statistic of −2.73, and a p-value of 0.007. This indicates a negative and statistically significant moderating effect at the 1% level. Therefore, the null hypothesis that intellectual capital does not moderate the relationship between directors' qualifications and sustainability disclosure is rejected. The result suggests that the conditional relationship between directors' qualifications and sustainability disclosure weakens as intellectual capital increases, holding the other variables constant. This finding contrasts with the positive direct relationships reported by Baalouch et al. (2025) and Sadiq et al. (2025), as well as the broader argument that organisational knowledge enhances reporting capacity. However, the negative interaction does not automatically mean that qualified directors reduce sustainability disclosure. It may reflect overlapping capabilities, differences in the measurement of intellectual capital and directors' qualifications, or other characteristics of the sample. The result should therefore be examined through marginal-effects analysis and robustness checks before drawing a substantive conclusion.

Firm size has a positive coefficient of 0.911, with a standard error of 0.299, a t-statistic of 3.04, and a p-value of 0.002. This indicates a positive and statistically significant relationship with sustainability disclosure at the 1% level. The null hypothesis of no significant relationship is therefore rejected. The finding suggests that larger firms tend to disclose more sustainability information, potentially because they

possess greater financial and administrative resources, face stronger public scrutiny, and respond to broader stakeholder expectations. This result provides an important control for interpreting the effects of board characteristics because firm size may be associated with both governance structures and reporting capacity. However, the previously supplied summaries do not provide a directly comparable firm-size coefficient for every reviewed study, so a specific empirical comparison cannot be established from the available information. The result should also be interpreted according to the measurement of firm size, such as the natural logarithm of total assets, and the scale used for the sustainability-disclosure index.

Firm profitability has a negative coefficient of -0.217, with a standard error of 0.335, a t-statistic of -0.65, and a p-value of 0.517. This indicates a negative but statistically insignificant relationship with sustainability disclosure. Therefore, the null hypothesis of no significant relationship cannot be rejected. The finding suggests that more profitable firms do not necessarily provide greater sustainability disclosure after controlling for the other variables in the model. Although profitability may provide firms with additional resources for sustainability reporting, disclosure decisions may also depend on governance arrangements, regulatory expectations, stakeholder pressure, and reporting systems. The negative coefficient should not be interpreted as evidence that profitability reduces disclosure because the result is statistically insignificant. Since the summaries of the reviewed studies do not provide directly comparable profitability estimates, the finding should be treated as an additional result of the present model rather than as a confirmed contradiction of a particular study.

The constant coefficient is -4.412, with a standard error of 3.762 and a reported p-value of 0.053. Based on the reported p-value, the constant is not statistically significant at the 5% level, although it is close to the conventional threshold. The constant represents the predicted value of sustainability disclosure when the explanatory and control variables equal zero. However, this scenario may have little practical meaning if zero values are outside the observed range of the variables. Moreover, the reported constant's t-statistic of -1.17 appears inconsistent with its standard error and p-value. These figures should be checked against the original statistical output before the results are finalised.

5.0 Conclusion and Recommendation

In conclusion, the study establishes that board characteristics and intellectual capital jointly explain variations in sustainability disclosure, as indicated by the statistically significant Wald chi-square result. However, board independence, board size, board meetings, and directors' qualifications do not have statistically significant direct relationships with sustainability disclosure at the 5% level, suggesting that these governance attributes may not independently guarantee improved disclosure. Intellectual capital has a negative and significant conditional relationship with sustainability disclosure, while its moderating effects vary across board characteristics. Specifically, intellectual capital positively moderates the relationships between board independence and sustainability disclosure and between board meetings and sustainability disclosure, but its interaction with board size is insignificant and its interaction with directors' qualifications is negative and significant. Furthermore, firm size positively and significantly influences sustainability disclosure, whereas firm profitability has a negative but insignificant relationship. Overall, the findings suggest that effective sustainability disclosure may depend not only on-board composition and activities but also on the organisational resources and knowledge available to support governance processes. Therefore, listed Nigerian firms should strengthen sustainability-reporting systems, improve the substantive engagement of directors in sustainability matters, and ensure that board expertise and intellectual capital are effectively aligned with disclosure objectives.

Recommendation

This study examines Board Attribute and Sustainability Disclosure of listed firms in Nigeria: A Moderating Role of Intellectual Capital. Base on the findings, the study Makes the following Recommendations.

Based on the findings, it is recommended that listed Nigerian firms strengthen the effectiveness of their board governance mechanisms by ensuring that independent directors actively participate in sustainability oversight rather than relying solely on their numerical representation. Although board independence, board size, board meetings, and directors' qualifications have insignificant direct relationships with sustainability disclosure, firms should improve board effectiveness through appropriate director selection, continuous professional development, and substantive deliberations on environmental, social, and governance issues. Furthermore, firms should invest in intellectual capital, including employee expertise, knowledge-management systems, sustainability-reporting infrastructure, and stakeholder engagement, to improve the effectiveness of independent directors and board meetings. Given the negative and significant interaction between directors' qualifications and intellectual capital, organisations should carefully align directors' expertise with existing knowledge resources and assess whether these capabilities complement one another in sustainability reporting. Firms should also establish appropriate monitoring mechanisms to evaluate the contribution of board size and avoid unnecessary expansion of board membership without clear governance benefits. In addition, larger firms should sustain their positive contribution to sustainability disclosure by adopting transparent reporting practices and strengthening accountability, while firms should not rely on profitability alone as a determinant of sustainability reporting. Finally, regulators and the Nigerian Exchange should encourage consistent sustainability-disclosure standards, provide practical reporting guidance, and strengthen compliance monitoring to improve the quality, credibility, and comparability of sustainability information among listed companies.

References

Abogun, S., Ibiwoye, J. M., & Orilonise, M. A. (2024). Board attributes and sustainability reporting of listed firms in Nigeria: Moderated by board commitment. *International Journal of Research and Innovation in Social Science.* https://doi.org/10.47772/IJRISS.2024.802094

Adahosa, A., & Udeh, F. N. (2023). Board characteristics: An empirical study on environmental disclosure in Nigerian oil and gas firms. *International Journal of Research,* 10(6). https://ijrjournal.com/index.php/ijr/article/view/924

Agwaramgbo, J. C., & Udeh, F. N. (2023). Effect of intellectual capital on sustainability disclosure: Evidence from listed oil and gas firms in Nigeria. *International Journal of Research*, 10(4). https://ijrjournal.com/index.php/ijr/article/view/855

Amin, S., Usman, M., Sohail, N., & Aslam, S. (2018). Relationship between intellectual capital and financial performance: The moderating role of knowledge assets. *Pakistan Journal of Commerce and Social Sciences,* 12(2), 521–547. https://jes.ac.pk/index.php/jes/article/view/265

Anaba, S., Uwuigbe, U., & Issahaku, H. (2026). Unveiling the path of sustainability reporting quality through board governance mechanisms: Evidence from Sub-Saharan Africa. *Corporate Social Responsibility and Environmental Management.* https://doi.org/10.1002/csr.71077

Anyigbah, E., Kong, Y., Edziah, B. K., Ahoto, A. T., & Ahiaku, W. S. (2023). Board characteristics and corporate sustainability reporting: Evidence from Chinese listed companies. *Sustainability*, 15(4), Article 3553. https://doi.org/10.3390/su15043553

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology,* 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Brammer, S., & Pavelin, S. (2008). Factors influencing the quality of corporate environmental disclosure. *Business Strategy and the Environment,* 17(2), 120–136. https://doi.org/10.1002/bse.506

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society,* 33(4–5), 303–327. https://doi.org/10.1016/j.aos.2007.05.003

Coles, J. L., Daniel, N. D., & Naveen, L. (2008). Boards: Does one size fit all? *Journal of Financial Economics,* 87(2), 329–356. https://doi.org/10.1016/j.jfineco.2006.08.008

Dalton, D. R., Daily, C. M., Johnson, J. L., & Ellstrand, A. E. (1999). Number of directors and financial performance: A meta-analysis. *Academy of Management Journal,* 42(6), 674–686. https://doi.org/10.2307/256988

Deegan, C. (2002). Introduction: The legitimising effect of social and environmental disclosures—A theoretical foundation. *Accounting, Auditing & Accountability Journal,* 15(3), 282–311. https://doi.org/10.1108/09513570210435852

Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment,* 11(2), 130–141. https://doi.org/10.1002/bse.323

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, 60(11), 2835–2857. https://doi.org/10.1287/mnsc.2014.1984

Elkington, J. (1997). Cannibals with forks: The triple bottom line of 21st century business. *Capstone*.

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *The Journal of Law and Economics,* 26(2), 301–325. https://doi.org/10.1086/467037

Global Reporting Initiative. (2016). GRI sustainability reporting standards 2016. https://www.globalreporting.org/

Global Reporting Initiative. (2021). *GRI standards.* https://www.globalreporting.org/standards/

Hahn, R., & Kühnen, M. (2013). Determinants of sustainability reporting: A review of results, trends, theory, and opportunities in an expanding field of research. *Journal of Cleaner Production,* 59, 5–21. https://doi.org/10.1016/j.jclepro.2013.07.005

Harris, I. C., & Shimizu, K. (2004). Too busy to serve? An examination of the influence of overboarded directors. *Journal of Management Studies,* 41(5), 775–798. https://doi.org/10.1111/j.1467-6486.2004.00453.x

Klein, A. (2002). Audit committee, board of director characteristics, and earnings management. *Journal of Accounting and Economics,* 33(3), 375–400. https://doi.org/10.1016/S0165-4101(02)00059-9

KPMG. (2017). The KPMG survey of corporate responsibility reporting 2017. *KPMG International.* https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/10/kpmg-survey-of-corporate-responsibility-reporting-2017.pdf

Lipton, M., & Lorsch, J. W. (1992). A modest proposal for improved corporate governance. *The Business Lawyer,* 48(1), 59–77.

Liu, L., Zhang, J., Xu, J., & Wang, Y. (2022). Intellectual capital and financial performance of Chinese manufacturing SMEs: An analysis from the perspective of different industry types. *Sustainability*, 14(17), Article 10657. https://doi.org/10.3390/su141710657

Michelon, G., & Parbonetti, A. (2012). The effect of corporate governance on sustainability disclosure. *Journal of Management & Governance,* 16(3), 477–509. https://doi.org/10.1007/s10997-010-9160-3

Musa, A. M. H., Alqubaysi, R., & Alqahtani, H. A. (2025). The effect of board characteristics on ESG commitment in Saudi Arabia: How diversity, independence, size, and expertise shape corporate sustainability practices. *Sustainability*, 17(12), Article 5552. https://doi.org/10.3390/su17125552

Peters, G. F., & Romi, A. M. (2014). Does the voluntary adoption of corporate governance mechanisms improve environmental risk disclosures? Evidence from greenhouse gas emission accounting. *Journal of Business Ethics,* 125(4), 637–666. https://doi.org/10.1007/s10551-013-1886-9

Shawai, A. S., Lok, C. L., & Jalaludin, D. (2025). Corporate environmental disclosure and market value: Do board independence matter? *FUDMA Journal of Accounting and Finance Research*, 3(4), 311–325. https://doi.org/10.33003/fujafr-2025.v3i4.249.311-325

United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. https://sdgs.un.org/2030agenda

Vafeas, N. (1999). Board meeting frequency and firm performance. *Journal of Financial Economics,* 53(1), 113–142. https://doi.org/10.1016/S0304-405X(99)00018-5

World Commission on Environment and Development. (1987). Our common future. *Oxford University Press.*

Xu, X. L., Li, J. P., Wu, D. S., & Zhang, X. (2021). The intellectual capital efficiency and corporate sustainable growth nexus: Comparison from agriculture, tourism and renewable energy sector. Environment, Development and Sustainability, 23, 16392–16419. https://doi.org/10.1007/s10668-021-01319-x

Zhang, J., & Wang, Y. (2022). How to improve the corporate sustainable development? The importance of the intellectual capital and the role of the investor confidence. *Sustainability*, 14(7), Article 3749. https://doi.org/10.3390/su14073749