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## Diversity-In-Board and Environmental Reporting of Listed Manufacturing Companies in Nigeria

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### **Abstract**

*The objective of this study is to examine the effect of diversity-in-board on environmental reporting of listed manufacturing companies in Nigeria. Furthermore, extant literature on this topic focus on the use of isolated or separate demographic attributes rather than a measure of single index which*

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*consist of wide range of demographic attributes to proxy diversity-in-board. This study adopts ex-post facto research design. The study has a population of 61 listed manufacturing firms and a sample size of 36 firms which is arrived at based on two-point filter employed to eliminate firms that are not suitable for the study. Through content analysis, secondary data was collected principally from the annual report of the sampled companies. Using descriptive statistics and linear multiple regression, this study found that diversity-in-boards is positive and improves environmental reporting; however the effect is not statistically significant ( $t = 0.84$ ,  $p = 0.413$ ). Based on the findings of this study, the study recommends that there should be diversity-in-board of listed manufacturing companies in Nigeria. Five areas of diversity-in-boards recommended are gender diversity, age diversity, board nationality and diversity in educational backgrounds.*

**Keywords:** Board diversity, Demographic diversity, Environmental Reporting, Diversity-in-board, Nigeria.

## 1. Introduction

Stakeholders in the financial reporting chain have shown a heightened interest in Environmental Reporting (ER) since the beginning of 19<sup>th</sup> century. ER is not entirely a new phenomenon in corporate reporting; it has taken to the centre stage of strategic reporting recently because it provides a vehicle for communicating environmental issues to corporate stakeholders (Masud, M. A. K., Nurunnabi, M., & Bae, S. (2018). ER is important because most activities of the firms have externalities. The operations of most companies pose serious environmental problems such as air, water, noise pollution and global warming (Okoye & Adeniyi, 2018). This concern has been repeatedly expressed in so many international forums (Bassey, et al. 2013). Thus, CER is important for all companies to report their effort towards conserving the environment for the present and future generations.

ER is a vehicle for expressing the extent of commitment by organizations to the environment and stakeholders at large. Nowadays, firms' responsibilities have grown beyond satisfying just the fund providers to satisfying other stakeholders as well. Firms have come to realize that ER can play an important role not only to prevent or restrict negative environmental impact but also to facilitate positive and proactive actions that benefit the people and stakeholders in general. It is widely believed that companies that have imbibed the culture of ER are environmentally responsible and enjoy relative peace within their society of domicile (Utile, 2017). Further, Fodio and Oba (2012) opined that companies which embark on environmental development and report on same are likely to perform well as they are seen to be globally competitive and economically viable, thus, there is need for companies to see ER as a moral and corporate duty.

Despite the importance of ER, significant discrepancies exist in practice both in terms of content and quality of reports among companies across the globe (Uyagu et al., 2017; Aljifri et al., 2014). In Nigeria, ER is a voluntary exercise, consequently, ER practice is low (Ademigbuji, 2014). The reason being the lack of political will and laxity on the part of enforcing authorities to entrench the initiative within the Nigerian business environment which invariably affect the process of environmental disclosure (Echefu & Akpofure, 2002).

Based on the voluntary nature of ER, what influences the decisions of companies to engage in environmental reporting has remained unresolved. From the corporate perspective, board diversity which is a combination of people with different factors that set them apart or bind them together is believed to be one of the factors that could be used to encourage or improve ER (Mgbame & Mgbame, 2018). Diverse board members provide a variety of skills and expertise (Jonson et al., 2020) and are able to make hypercritical decisions compared to a homogeneous board (Zhang et al., 2013). Thus, firms have required heterogeneous boards to improve competitive advantages (Galbreath, 2016) and offer a diverse perspective when making strategic decisions, such as those regarding ER (Rao & Tilt, 2016a).

In concurrence, the Nigerian Code of Corporate Governance (2018) indicated that the effective discharge of board and its committee's responsibilities is assured by an appropriate balance of skills and diversity (including experience and gender) without compromising competence, independence and integrity. In view of this, it is expected that companies with more effective board composition will be particularly diligent in providing information on environmentally-related issues.

Given the benefits associated with having a diversified board, this study adapts Diversity-in-Board (DiB), one aspect of board diversity used by scholars such as Hafsi and Turgut (2013), Hoang et al. (2018); Baalouch et al. (2019) to measure organisational outcomes. The term DiB in this text refers to differences within a given board, and is related to demographic attributes such as board gender, age, nationality, and educational background. The choice of these characteristics is due to their effect on the strength of corporate governance. It is assumed that the strength of the board of directors is closely related to the degree of diversity of its members (Prado-Lorenzo & Garcia Sanchez 2010).

Thus, this study, unlike prior literatures such as Khan et al. (2021); Beji et al. (2020); Yusof et al. (2019) that examined the individual attributes of the demographic diversity among directors (such as gender diversity, age diversity, nationality diversity), rather than the effect of their combined attributes (diversity-in-board) to form a single index known as DiB index, which give a comprehensive picture of their simultaneous influence on various firm strategies.

This study is limited to manufacturing companies listed in Nigeria, given the importance of productivity in boosting the economy and the standard of living of the people, the economic activities of these corporations is highly dependent on natural resources yet, these companies are criticised for creating environmental problems without giving the desired attention (Osemene & Fagbemi, 2019). For instance, environmental footprints such as the Zamfara State lead poisoning had contaminated soil surfaces, air, drinking water, edible plant leaves and fruits and resulted to the death of over 163 people; oil spillage in the Niger Delta area, and other indiscriminate disposal of domestic and industrial waste have not been given the attention it deserves, perhaps, because ER is not yet mandatory in Nigeria, and thus, it is optional to be considered in management decision making. This failure in corporate governance culture to address the concerns of a wider group of stakeholders needs has provided additional justification for this paper.

Studies abound on DiB and ER around the world (Beji et al., 2020; Yusof et al., 2019; Harjoto et al., 2015). However, most of these studies were conducted outside the shores of Nigeria, and findings and recommendations of such studies cannot be generalised to Nigeria because of the differences in economic systems, market structure, geographical location and reporting requirements. Although, limited studies are conducted in Nigeria (Ndukwe et al., 2015; Fodio & Oba, 2012; Utile et al., 2017), these studies were restricted to the Oil and Gas industry (Asaolu, et al. 2011; Ayoola & Olasanmi, 2013). This makes manufacturing industry vantage for investigation since by their nature, utilise a lot of environmental resources. Furthermore, extant literature on ER concentrates on the use of separate demographic attributes rather than a measure of single index which consist of wide range of demographic attributes to proxy diversity-in-board.

Consequent upon the existing gap, the question is: how does DiB affect ER of listed manufacturing companies in Nigeria? Thus, the objective of this paper is to examine the effect of DiB on ER of listed manufacturing companies in Nigeria. To this end, the study hypothesized that: DiB has no significant effect on ER of listed manufacturing companies in Nigeria. This study covers a period of eighteen (18) years from 2002 to 2019 with emphasis on listed manufacturing companies in Nigeria. The result of this study would have an important policy implication for the regulators such as the Federal Ministry of Environment, Nigerian Stock Exchange (NSE), Security and Exchange Commission (SEC) and Financial Reporting Council of Nigeria (FRCN), as it would enable policy formulation about ER. In addition, the study is significant because, it makes a methodological contribution to literature by providing a demographic review that combines the attributes of diversity- in-board in the research.

## 2. Literature Review

This section discusses relevant concepts and variables that are used in the study. The variables include ER and DiB (board gender, age diversity, and board foreign nationality, board educational background). This section conceptualises ER and factors that influence it DiB. This section further presents theories which underpin this study and concludes with a review of related empirical studies.

Various terminologies are used in past studies to refer to ER like environmental disclosure (Alarussi et al., 2009), environmental expenditures (Cho et al., 2012), ER (Buniamin, 2010), sustainability reporting (Herda et al., 2013), environmental accounting (Donwa, 2011) and environmental management accounting (Sulaiman & Mokhtar, 2012). The idea of ER emerges because of the need to communicate the firm's environmental performance to various users of reports. Therefore, adapting from Chaklader and Gulati (2015), ER is a means of communicating to the stakeholders, the impact of the firm's activities on the environment. Also Adam et al. (2016) viewed ER as the process of communicating environmental information about companies' impact, performance and its contribution to ecologically sustainable developments

In this study, DiB is an index-driven variable consisting of four demographic attributes of directors: (i) gender; (ii) age; (iii) education background; and (iv) nationality. These are the commonest demographic attributes examined in the literature, and are often mentioned in isolation but rarely together as a composite variable (Al-fadli et al., 2019; Harjoto et al., 2019; Katmon et al., 2019). The concept of DiB refers to dissimilarities or a mixture of qualities, attributes, demography, and expertise of individual(s) within a given board, which relates to demographic aspect of diversity. DiB is one of the two forms of board diversity used by Hafsi & Turgut 2013, Hoang et al. 2016; Beji et al. 2020 to define demographic attributes. Therefore, the board is expected to have a mix of demographic characteristics that will enhance their decision making ability.

Gender diversity is the ratio of the number of women to men on the board of corporations. Board gender diversity has captured the attention of policy makers, companies, media and academic scholars in many countries over its effect on boardroom dynamics and firm's outcomes (Al-Jaifi, 2020). Women and men have traditionally, culturally and socially different backgrounds. Female directors are more committed and less self-oriented, and their behavior differs from their male counterparts as they are more independent, and not part of the "old boys" network (Carter et al., 2003).

In fact, studies suggest that different genders respond to different norms, attitudes, beliefs, and perspectives (Sundarasan et al., 2016). Women and men appear to differ in values when it comes to environmental responsibility. In this context, having gender diversity in the boards will bring some balanced decision because women think differently from men. In addition, women are more sensitive with environmental issues, more generous towards communities and pay more attention to stakeholders especially such as communities, employees and the environment. To this end, the monitoring potential of female directors and rationale offered by stakeholder theory, it can be asserted that female director's commitment, independence, thoughtfulness and other attributes enable them to actively participate in corporate decision making concerning environmental reporting practices.

Board nationality is the number of foreign directors relative to board size. Foreigners bring global exposure (broader industry experience) to the board. The presence of foreign directors on the board also ensures firms commitment towards compliance with corporate governance practices. Board nationality is crucial because it increases a firms' positive image (Ararat, et al. 2010; Ntim, 2015). Dawar and Frost (1999) opined that the presence of foreign directors on the board should be considered a great variable to motivate companies to show its commitment towards environmental issues. Similarly, Al-Amarneh, (2014) in their study found that the inclusion of foreign personality on the board plays a significant role in influencing firms' commitment, values and performance in the disclosure of environmental information. Odera, et al. (2016) revealed that firms without foreign directors on the board are found to disclose more information on environmental activities than those with foreign directors. In contrary, Taufik, et al. (2017) found that having foreign directors among the board members goes a long way in influencing firms' commitment to environmental activities.

Age diversity is another attribute of a board that plays an important role in the way the directors think to cope with various challenges in today's business environment. Directors age may be indicative of their business experience and maturity (Kang et al., 2007; Hafsi & Turgut, 2013), it can also influence how they perceive events and the decisions they make (Wiersema & Bantel, 1992). If the directors of a board are of the same age group, the leadership and the decision-making styles of the board might be biased towards a particular age segment of the market. This is because the directors may have similar information and experiences. Appointing directors from different age groups will help the board to tap information from directors who understand better the need and the sensitivity of the stakeholders in their age group. The board should reflect society which is, in reality, heterogeneous in composition.

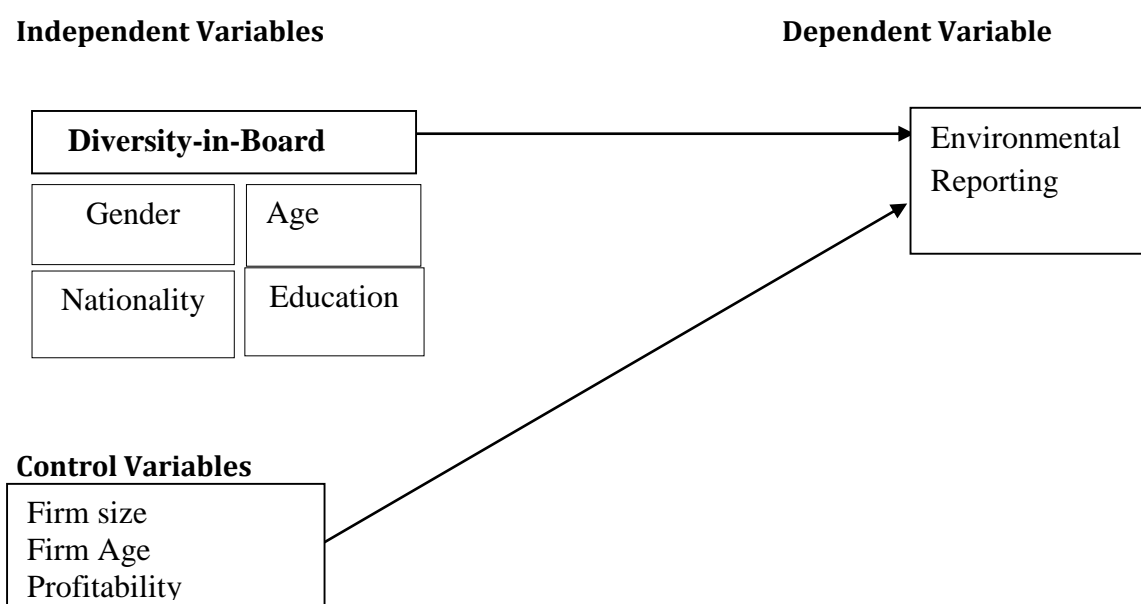
Educational diversity can be viewed in two ways. The first way is to measure the level of education (Ararat et al., 2015) and the second way is to measure the subject stream or the nature of education (Hart, 1995. Rose, 2007): such as science, engineering, arts, and commerce, among others. Similarly, Ewert and Baker (2001) also recommended that besides the level of formal education, a person's academic major is associated with their general perspectives, values, beliefs and motivations. Past studies showed that the type of academic major is related to different levels of an individual's environmental concern and behavior towards environmental activities. Graduates majoring in accounting/finance or legal educational backgrounds are more likely to show greater pro-environmental concerns than those individuals majoring in other disciplines (Ewert & Baker, 2001). The justification is that those with educational background in accounting/finance or law are likely to adopt voluntary environmental programs and ensure compliance to avoid litigation with regulatory bodies or communities.

There are other firm-level factors that can influence ER. In this study, firm size, firm age and profitability were incorporated in the model as control variables. The control variables are employed to account for variations in ER which

are not explained by the main explanatory variables (DiB). The justification for the individual-level control variables is to enhance accuracy and have more confidence about the unique contribution of DiB on ER.

There are reasons why firm size is an important consideration in relation to environmental reporting. Firstly, large firms tend to be more visible to society as they attract public scrutiny, political, and regulatory pressures. Thus, large firms disseminate future oriented environmental information that is driven to address environmental concerns, sustain the competitive edge and increase its market size (Chiu et al., 2020). This is unlike smaller firms who are more likely to hide crucial information because of their competitive disadvantage within their industry. Therefore, the drive to use corporate governance to enhance environmental reporting can be controlled by firm size.

Also, firm age is an important variable that enhance a firm towards expressing its obligations to the environment in which it has attained a lofty height (Innocent & Okafor, 2018). The older a firm becomes, the more it should be willing to voluntarily express how much effort and commitment it has made in ensuring sustainable development towards the environment in which it operates and not just consider its financial obligations toward the shareholders alone (Welbeck et al., 2017). More so, Profitability can be seen as a sign of good management and it is from profit that company's carryout corporate social responsibility and maintains their environment. Therefore, profitability of a company is very crucial in determining company's strength to disclose environmental information.



**Figure 1:** Conceptual Framework: DiB and ER

**Source:** Researcher's compilation (2021)

The conceptual framework in Figure 1 depicts that DiB directly influence ER. In addition to DiB, the conceptual framework in Figure 1 suggests that ER is influenced by firm size, age and profitability (control variables). Thus, the study variables include ER and DiB (mix of gender, age, nationality and education).

## 2.1 Theoretical underpinnings

This research sees the following theories as most useful framework in explaining ER. First, agency theories had suggested that diversity has the potential to enhance board effectiveness (enhancing independence and providing more pooled resources among board members). Kagzi and Guha (2018) explain gender diversity from three perspectives: theoretical, ethical and moral, and business-case perspective. From the theoretical lenses, resource-dependence theory (Pfeffer & Salancik, 1978), signaling theory (Connelly et al., 2011), resource-based view (Richard, 2000), stewardship theory (Gaur et al., 2015) and upper echelon theory (Post & Byron, 2015) are used to justify demographic attributes, such as gender



diversity among others. These theories argue that gender diversity improves board functioning and consequently increases firm performance.

Secondly, legitimacy theory is also useful because management must respond to environmental issues within their society of domicile to gain acceptance that will ensure the survival of their firm. Thirdly, stakeholders' theory is also relevant because it advocates that all stakeholders should be treated with fairness, honesty, and even generosity. However, this study is anchored on resource dependency theory because as key resource, the board has influence on strategic decision-making that will effectively address environmental issues and report same in the annual reports.

## *2.2 Review of Empirical Studies*

A number of empirical studies from developed and developing nations have shown support for DiB as one factor that influence ER. Relevant literatures from these countries are presented with emphasis on the problems, methodologies adopted for the studies and the various findings and conclusion using both local and international journals.

### ***Gender diversity***

Bernardi and Threadgill (2010) investigated whether companies with a higher proportion of women on their boards of directors are more environmentally responsible. This study looked at 143 companies in the Fortune 500 list in USA over a three year period. A regression analysis shows that the presence of women on company's board is strongly correlated with attention to environmental issues. However, this study has been criticized for its ad-hoc use of sample (companies on the list of Fortune 500), which limits the generalisability of the findings. On the contrary, Muttakin and Subramaniam (2015) conducted a study on the influence of board diversity on corporate environmental disclosure in Bangladesh. Data from 116 non-financial companies for the period 2005 to 2009 were analysed. Multiple regression results indicate that female directorship has a negative and significant association with corporate ER. This study focus is on Bangladesh public firms for a period of 4 years which is too short. The study could be improved upon by increasing the number of period covered which this study is doing.

Furthermore, Ozordi et al. (2018) explored how corporate diversity can influence environmental disclosure. A total of 17 industrial and consumer goods firms were selected using purposive random sampling from 2012–2016. Findings revealed that board gender and board foreign nationality have a significant positive influence on the extent of environmental disclosure of the selected firms. This study only focused on industrial and consumer goods firms listed on the Nigeria stock market. Further research is needed to examine more manufacturing firms, which is the focus of our research.

In another development, Adeniyi and Fadipe (2018) investigated the 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. The study period is two years which is considered to be short. Further research should focus on increasing the number of periods covered.

However, Chebbi et al. (2020) used a sample of 85 firms in France for the period 2010-2019. The authors found that the presence and percentage of women on the board of directors are positively associated with environmental disclosures. A limitation in the study is that it is difficult to generalize the results to other countries that might have diverse regulations concerning women on boards and environmental disclosure. Thus, this research would examine the same topic considering the voluntary nature of Nigeria environmental policy.

Yahaya and Apochi (2021) analysed the influence of Board of directors on corporate social responsibility reporting of 47 quoted companies over 7 years (2013-2019). The authors revealed that board gender diversity has significant effect on corporate social responsibility reporting of quoted companies in Nigeria. In collaboration with this finding, Cicchiello et al. (2021); Riyadh et al. (2019); Issa and Fang (2019); Garcia-Sanchez et al. (2019); Awodiran and Kareem (2019); Mahmood et al. (2018) also agreed that a greater female representation on the board of directors increases the quality of sustainability reporting in terms of balance, comparability and reliability of the information, especially in firms located in more stakeholder-oriented countries.

### ***Age diversity***

Handajani et al. (2014) examined the effect of board diversity on corporate social disclosure, testing public firms listed on the Indonesia Stock Exchange for the period of 2010-2012. Multiple regression results showed that board age has significant and positive effect on corporate social disclosure. The research findings indicate the dominance of older boards

group is able to respond to the interest of diverse stakeholders. Although the study is about effect of board diversity, the dependent variable (corporate social responsibility) differs from ER, being the focus of this research.

Ibrahim and Hanefah (2016) studied board age diversity and the level of corporate social responsibility (CSR) disclosures of Jordanian listed companies. Samples of 117 companies were drawn from financial, services and industrial sectors for the period between 2007 and 2011. It was found that, age diversity has positive and significant impact on CSR disclosure. This finding was corroborated by Ferrero- Ferrero et al. (2013) and Handajani et al. (2014). These studies found positive effect of age diversity on corporate social disclosure. According to Ferrero-Ferrero et al. 2015, age diversity could boost environmental performance. In contrast, Liu and Zeng (2017) investigated the effect of age diversity on corporate social responsibility of 305 Chinese listed firms for the period 2010 to 2014. The study found that age diversity was negatively associated with the CSR disclosure. However, the study focuses on corporate social responsibility (dependent variable) in China which is Asia. Further research should focus on ER and in Africa, specifically Nigeria which this paper sorts to.

Fernandes et al. (2018) conducted a study on board of directors' age and the level of environmental disclosure. A sample of 152 companies listed on the São Paulo stock exchange. The result suggests that board members with an average age of 55–60 manifest greater concern for environmental issues. A possible explanation for this behavior was reported by Post et al. (2011), who found that the environmental discussion over time caused a growth of environmental concern in people of this age range. However, younger individuals are bolder, they have less experience; older people are more experience and conservative. The finding is in tandem with the study by Kang et al. (2007), who found that individuals in this age range are more prudent, responsible, and aggregate more experience and wisdom, factors that favour decision making that raises the value of a company.

More so, Musa et al. (2020) found age diversity to be negative but have significant impact on sustainability reporting. The result supports the position of the constitution of the Federal Republic of Nigeria that older directors (60 years and above) will prove non-productive on the board of an organisation. However, the study failed to agree with the stakeholder-resource dependency perspective that age diversity on the board promotes sustainability reporting. This finding is in dissonance with the work of Baker et al. (2019) who discovered that age diversity in the boardroom does not have a significant relation to sustainability reporting.

In a related manner, Prudencio et al. (2021) measured the effect of diversity in the board of directors and top management team on corporate social responsibility of 194 listed on Brazilian stock exchange. The results indicated that the age heterogeneity among board members has a negative influence on CSR practices. Thus, leaning on these empirical pieces of evidence, this study also envisages likewise.

### ***Board nationality***

Lau et al. (2014) found that the presence of foreign directors on the board has a positive relationship with CSR, they put forward that foreign nationality brings a positive energy for directors to be environmentally responsible. In contrast, Anazonwu et al. (2018) found that foreign nationality has no significant influence on sustainability reporting. This study is in line with the work of Muttakin and Subramaniam (2015) who found negative and significant relationship between female director and corporate environmental reporting. Although, the study by Anazonwu et al. (2018) focused on sustainability reporting, further research is needed to examine environmental reporting, being the focus of this paper.

Onyali and Okafor (2019) explored the influence of foreign directors on sustainability reporting of 21 listed consumer goods firms in Nigeria from 2011 to 2017. The study found a significant influence of foreign directors on the economic, social, and governance disclosure. The domain of the study is restricted to listed consumer goods firms only. It also focused on economic, social and governance disclosure without studying ER which is the focus of this research. Also, Zaid et al. (2020); Kılıç and Kuzey (2019); Khan et al., (2019a); Ibrahim and Hanifah (2016); Khan et al., (2019b); and Berger (2019) echoed that nationality diversity is one of the modern drivers of corporate sustainability reporting in the present-day business world.

However, as mentioned earlier, Musa et al. (2020) used nationality, age and educational level to proxy board diversity and its effect on sustainability reporting of listed industrial goods firms on the Nigerian Exchange from the period 2014–2018. The authors found no evidence on the nexus between nationality diversity and sustainability reporting. Also, the finding is consistent with the work of (Zaid et al., 2020; Fuente et al., 2017; Sharif & Rashid, 2014): they found no evidence on the nexus between a nationally diverse board and sustainability reporting. However, it sharply deviates from the

findings of Khan et al. (2019a); Ibrahim and Hanifah (2016); Khan et al. (2019b); and Berger (2019) which found a positive and significant relationship between foreign directors on the board of an organisation and sustainability reporting.

### **Educational Background**

Agrawal and Knoeber (2001) examined that directors with backgrounds in politics and law play a political role, and are more important on the boards of firms for which politics matters more. This study provides a strong support for this view by showing that directors with legal backgrounds are more prevalent in firms where the costs of environmental regulation are higher.

In addition, Kassinis and Vafeas (2002) stated that boards have an incentive to seek such legal expert advice as an additional resource for promoting sound environmental policy. Lawyers are more likely to possess the analytical skills to assess environmental opportunities and be knowledgeable about the stakeholder impacts of environmental actions. Their professional status also ensures that they are connected to higher social networks and are exposed to intellectual circles where environmental opportunities are discussed. Thus, firms are more likely to have better environmental performance as the number of law experts on board's increases.

In another study, Setyawan and Kamilla (2015) investigated how corporate governance affects corporate environmental disclosure. Mining companies listed on Indonesia Stock Exchange from 2011-2013 were analysed. The regression result found negative effect of educational background on environmental disclosure. The study limits its focus to specific educational majors in business and economics (finance), whereas there is a possibility of other educational background such as accounting or finance or law that can influence ER practices, being the focus of this research. This finding is in agreement with Suhardjanto (2010) who also found in 2007 that, educational background has no effect on environmental disclosure. The period covered by this study has been overshadowed by series of economic, political and regulatory events. There is the need to look at current issues around the world, which this study seeks to examine.

Ma et al. (2019) assessed the influence of top managers on environmental information disclosure. The sample consists of listed manufacturing companies in Shanghai Stock and Shenzhen Stock Exchange for the period 2015 to 2017. The regression analysis revealed that a Master of Business Administration (MBA) educational background has positive effect on environmental information disclosure, while the impact of legal educational background is negative. This study focused on MBA and legal educational background which may limit the universality of the findings. Further studies need to be conducted on other educational background such as accounting or finance or law, which is the focus of this research.

Musa et al. (2020) examined the influence of board member educational level on sustainability reporting of listed industrial goods firms in Nigeria but failed to provide supporting evidence on the relation between board members' education level and sustainability reporting. Similarly, Iyafekhe et al. (2020) determined the influence of an educationally diverse board on sustainability reporting of listed deposit money banks in Nigeria and equally found that board members education level background has no significant impact on sustainability reporting.

In another study, Umukoro et al. (2019) revealed that highly educated directors have an influence on the sustainability report disclosure of 10 Nigerian Deposit Money Banks over the period of 2014 to 2016. In corroborating the finding, Gold et al. (2021) investigated the influence of an educationally diverse board on sustainability reporting of listed consumer goods in Nigeria for the period 2014-2019. The author reported that board educational background is positive and significantly affects the sustainability reporting of consumer goods firms in Nigeria. These studies focused on sustainability reporting, further research is needed to examine environmental reporting, being the motivation for this paper.

### **3. Methodology**

The study uses *ex-post facto* (after the fact) research design because the study is conducted based on the positivism paradigm and quantitative approach. The population of this study consists of all the 61 manufacturing companies listed on the Nigerian Stock Exchange (NSE) as at 31<sup>st</sup> December, 2019. These companies cover six industries according to NSE classification viz, Agricultural, Conglomerate, Consumer goods, Industrial Goods, Healthcare and consumer services. The industries are as presented in Table 1, and the choice of these industries is motivated by the nature of their production activities which are considered to have a high propensity for environmental pollution (Uyagu et al., 2017). The study also utilised secondary data (audited financial statements) from the Nigerian Exchange spanning from 2002 to 2019.



**Table 1: Nigerian Stock Exchange Main Market Sector Distribution of Population**

S/N	Industry	No. of Companies	%	Observation
1	Agriculture	5	8.2	90
2	Conglomerate	6	9.8	108
3	Consumer goods	22	36.1	396
4	Healthcare	10	16.4	180
5	Industrial goods	15	24.6	270
6	Consumer services	3	4.9	54
	TOTAL	61	100	1,098

Source: Researcher's compilations (2021)

In selecting the sample size, census sampling technique was used and a two-point filter to eliminate firms that are not suitable for the study in line with Abu et al. (2018). The criteria are as follows: Firstly, the sampled firms must be listed on the NSE before 1st January, 2002 and published it audited account throughout the study period to produce complete data required for the study. Secondly, company must not have experienced technical suspension as a result of noncompliance with laid down regulations (Uyagu et al., 2017; Bassey et al., 2013). These criteria led to the elimination of 25 firms, leaving the study with 36 firms which represent 59 percent of the firms in the manufacturing industry. The 36 sampled companies are presented in Table 2.

**Table 2: List of Sampled Manufacturing Companies for the Study**

S/N	Company Name	Date of Listing	S/N	Company Name	Date of Listing
1	A.G. Leventis Nigeria Plc	1978	21	Beta Glass Plc	1986
2	Chellarams Plc	1978	22	Premier Paints Plc	1995
3	John Holt Plc	1974	23	Cutix Plc	1987
4	SCOA Nigeria Plc	1977	24	DN Meyer Plc	1979
5	UACN Plc	1978	25	CAP Plc	1977
6	Champion Breweries Plc	1983	26	Neimeth Plc	1991
7	Guinness Nigeria Plc	1965	27	Glaxosmithkline Plc	1977
8	International Breweries Plc	1994	28	Morison Industries Plc	1978
9	Nigerian Breweries Plc	1973	29	May and Baker	1994
10	Flour Mills Nigeria Plc	1978	30	Pharmadeko	1974
11	Northern Nig. Flour Mills	1978	31	Livestock Feed Plc	1978
12	Lafarge(WAPCO)	1979	32	Okomu Oil Palm Plc	1997
13	Nigerian Enamelware Plc	1979	33	Presco Plc	2002
14	P.Z. Cussons Nigeria Plc	1972	34	Academy Press	1978
15	Vitafoam Nigeria Plc	1978	35	University Press	1979
16	Unilever Nigeria Plc	1973	36	BOC Gases	1979
17	Nestle Nigeria Plc	1979			
18	Nascon Allied Indus. Plc	1992			
19	Cadbury Nigeria Plc	1976			
20	Berger Paints Plc	1974			

Source: NSE Fact book (2019)

The dependent variable used in this study is ER measured through content analysis of secondary data from audited annual reports. The content analysis was carried out using checklist adopted from International Organization for Standardization (ISO 14031) index to calculate ER. The ISO consist of 60 reportable disclosure items, and each of the items is coded 1 if there is a disclosure and 0 if otherwise. In line with prior studies like Uyagu et al. (2017) and Uwigbe (2011) the items are unweighted. The environmental disclosure index is calculated as follows:

$$ER = \frac{\sum_{i=1}^m d_i}{\sum_{i=1}^n d_i}$$

Where:

$d_i$  = is the expected disclosure item, and

$M$  = the number of environmental items disclosed by a company

$n$  = is the number of environmental items that the company is required to disclose

The independent variable in this study is DiB. The DiB index is fast gaining acceptance in corporate governance literature (Bebchuk, et al. 2009; Hafsi & Turgut, 2013; Hoang, et al. 2016). The common method of measuring DiB in extant literature is through pluralism (Omoye & Eriki, 2013; Perchersky, 2016; Ozordi, et al. 2018; Anazonwu, et al. 2018). However, often times individual components that make up DiB produce parallel findings; thus, single index like the DiB is considered a useful method to arrive at one conclusion. Table 3 depicts variables description, measurement and sources of literature.

**Table 3: Variables Definition and Measurement**

Proxy	Variable	Measurement and Source(s)
Environmental Reporting (ER)	Dependent variable	This study adopts ISO 14031 disclosures index, and use content analysis to measure ER. The items are scored one or zero for disclosure and non-disclosure respectively (Uwuigbe, 2011; Uyagu, 2019)
<b>Included variables in diversity-in-board index</b>		
Board Gender	Independent variable	This is the proportion of female to total directors.
Board Age	Independent Variable	A dummy variable; “1” if the average age of the board of directors is less than 60 years and “0” otherwise (Abdullah & Ku Ismail, 2013).
Board Foreign Nationality	Independent Variable	This is proxied as the proportion of foreign directors to total number of directors (Shehata, 2013).
Educational Background	Independent Variable	This is measured as the ratio of BODs with accounting/finance or legal knowledge to total board size (Lewis, et al., 2014).
<b>Control Variables</b>		
Firm Size (FS)	Control Variable	This is proxied using the natural logarithm of total assets of the firm (Yahaya & Andow, 2015, Habbash, 2016).
Firm Age (FA)	Control Variable	The number of years after the firm is listed (Yahaya et al., 2017)
Profitability (PF)	Control Variable	Net profit to total assets (Akbas, 2016).

**Source:** Researcher’s compilations (2021)

This study created the DiB using terciles split method following Dittmar and Mahrt-Smith (2007), Francoeur et al. (2008), and Hafsi and Turgut (2013). The construction is a straight forward summation of discrete values for each variable. Thus, the DiB index is divided into terciles, the values of DiB are 0, 1 and 2 representing “below average”, “average” and “above average” values respectively. In addition, for validity purposes, the study cross-checked the results by splitting the DiB sample into quartiles. The measurement of these variables is as indicated in Table 3. One model is employed in this study and it tests the effect of DiB on ER. The coefficients  $\beta_1$  is an independent variable of interest while, Coefficients  $\beta_2$  to  $\beta_4$  are the control variables; they are also expected to be positive and significantly associated with ER. The multiple regression model employed in this study is presented as follows:

$$ER = f (DiB, FS, FA, PF)$$

**Model**

$$ER_{it} = \alpha_0 + \beta_1 DiB_{it} + \beta_2 FS_{it} + \beta_3 FA_{it} + \beta_4 PF_{it} + \epsilon_{it} \dots\dots\dots (1)$$

Where:

ER= Environmental reporting

DiB = Diversity-in-Board

FS = Firm size

FA = Firm age

PF=Profitability

t = time period 2002-2019

$\alpha_0$  = Constant term,

$\epsilon_{it}$  = Error term,

$\beta_1$ -  $\beta_6$  = Coefficient of the variables.

The model in this study is the panel regression whose results are not reliable, acceptable, nor validly extrapolated to the population unless diagnostics and OLS assumptions such as adjustment for outliers (influential) observations, normality of error terms, homogeneity of variance, multicollinearity and Hausman specification test to decide between fixed or random effect models were carried out.

**4. Results and Discussions**

This study tests whether DiB has a significant effect on ER by manufacturing companies in Nigeria. Two data analysis techniques were employed namely the descriptive statistics and linear multiple regression. The results of analysis using these statistics are presented in this section accordingly. Table 4 depicts descriptive statistics of variables used in this study. The descriptive statistics include the mean as a measure of central tendency in the data while standard deviation measures degree of dispersion from the mean.

**Table 4: 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
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 (2021).

Table 4 shows that the number of firm-year observations is 648; and ER of listed manufacturing firms in Nigeria has a mean value of 27% with standard deviation of 11.5%, and minimum and maximum values of 1.7% and 56.7% respectively. 11.5% standard deviation is quite low, suggesting a narrow dispersion of the data from the mean, indicating that listed manufacturing firms in Nigeria have fairly uniform pattern of making environmental reports. Table 4 also indicates a minimum disclosure of 1.7%, implying that some companies did not cover much of the disclosure guideline of ISO 14031. The maximum disclosure of 56.7% implies that ER of some listed manufacturing firms in Nigeria is slightly above average based on ISO 14031 guidelines. The mean value of DiB is 1.119 indicating that DiB of listed manufacturing companies in Nigeria is “average” (just moderate). Table 4 shows that Firm size has a mean value of 6.901, standard deviation of 0.807, with minimum and maximum value of 5.001 and 8.975 respectively. Firm age and ROA have mean value of 29 and 0.090, standard deviation of 9 and 0.158 respectively. The minimum and maximum value of FA is 3 and 54 respectively, while ROA is -0.939 and 0.881 respectively.

**Diagnostics and Robustness checks.**

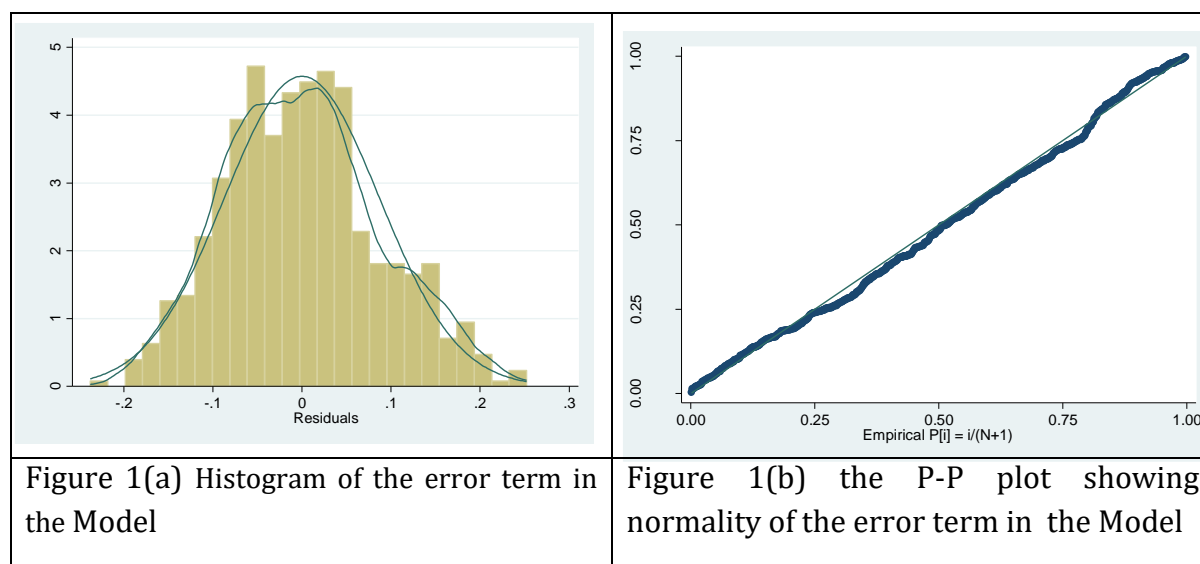
This section explains the regression assumptions and other diagnostics checks to ensure that the results are stationary and robust. The first regression assumption that was tested is the multicollinearity test using Pearson’s correlation coefficients between predictor variables. The results of Pearson’s correlation coefficients are presented in Table 5.

**Table 5: Pearson’s Correlation Coefficients**

	ER	DiB	FS	FA	ROA
ER	1				
DiB	0.3206	1			
FS	0.5094	0.5158	1		
FA	0.4964	0.2332	0.3683	1	
ROA	0.0479	0.0495	0.1336	0.071	1

Source: Stata SE/14.2 (2021)

Table 5 reports the Pearson’s Correlation Coefficients for the dependent and independent variables. An initial examination suggests that all the variables exhibit a positive relationship as expected; that is, DiB, FS, FA and ROA all had a positive relationship with ER. The bivariate correlation between the independent variables measures the degree of correlation among the independent variables. Results in Table 5 indicate that the highest correlation between the independent variables is 0.5158 which is far below the  $\pm 0.7$  threshold for multicollinearity (Gujarati & Porter, 2009), thus, this study concludes that there is no significant multicollinearity problem among the predictor variables. Furthermore, the histogram and P-P plot of standardised residuals indicate that the error terms in the Model presented in Figure 1a and 1b are fairly normally distributed.



Source: Stata SE/14.2 (2021)

When conducting regression analysis, assumption is usually made that the error term has a constant variance (i.e., homoscedasticity). If the error term does not have constant variance, the problem called heteroscedasticity is said to occur, and this may be overstating the goodness of fit. The Breusch-Pagan htest was used to check the existence of heteroscedasticity. The htest showed that there no heteroscedasticity  $\chi^2 = 0.081, p = 0.776$  for the model (see details in Appendix 3). Since the data set comprises of both the cross-sectional and time series dimensions the Hausman test was also performed to decide between fixed and random effects. The result of Hausman test for the model is significant at 95% confidence level  $\chi^2 = 122.96, p < 0.001$  for the model, (see details in Appendix 3) thus, this study concludes that the fixed effect model is the most appropriate model for this study.



Finally, Pesaran CD (cross-sectional dependence) test was performed to see whether the residuals are correlated across firms. Cross-sectional dependence can lead to bias in tests results (also called contemporaneous correlation). The null hypothesis is that residuals are not correlated. Had cross-sectional dependence been present, Hoechle (2007) suggests the use of Driscoll and Kraay standard errors with the command xtsc. Pesaran's test of cross sectional independence = 15.935,  $Pr < 0.001$  for the model, suggesting that Driscoll and Kraay standard errors method is the most favored method. Regression results depicting the effect of DiB on ER is as reported in Table 6 where ER is the dependent variable and DiB as the independent variables.

### Regression Results

To find the effect of DiB on ER of listed manufacturing firms in Nigeria, the multiple regressions were employed. The results of the multiple regression analysis are reported in Table 6.

**Table 6: Regression Results (N=648)**

ENV	Model		
	Coefficients ( $\beta$ )	T	P>t
DiB	0.003	0.84	0.413
FS	0.031	3.49	0.003
FA	0.015	9.26	0.000
ROA	0.033	1.56	0.137
Constant	-0.394	-12.31	0.000
Observations	648		
Companies	36		
F-Statistics	136.13		
Prob. >F	0.000		
R-squared	0.786		

Source: Stata 14.2 (2021)

The *F*-statistics indicate the overall model fitness. In the model, *F*-statistics is significant depicting that the Driscoll-Kraay standards regression model is well fitted  $F=136.13$ ,  $P < 0.001$  for the model. Table 6 also reports the  $R^2$  which depicts the variability in ER accounted for by DiB. Results presented in Table 6 indicate that 78.6% of variation in ER is explained by diversity- in- board and the three control variables (FS, FA, and ROA).

The unstandardized coefficients explain the effect of each variable on ER, holding other factors constant. In other words, the coefficient estimates ( $\beta$ ) of the regressors indicate the change in ER when there is one unit change in the independent variable holding all other variables constant. An increase in DiB from “below average to average” resulted to 0.003 increase in ER. Regarding economic significance, the coefficient estimate implies that ER increases by about 0.006 basis points as a firm moves from below average DiB to above average diversity in board.

In the model, as reported in Table 6, the coefficient estimate of DiB is positive but not statistically significant ( $t = 0.84$ ,  $p = 0.413$ ). In other words, DiB in the Model was statistically insignificant, indicating that DiB has no effect on ER; accordingly, this study accepts hypothesis 1 ( $H_{01}$ ) and support resource dependency theory, which states that DiB provides access to resources, knowledge and connections that can be use to influence strategic decision especially, environmental information disclosure. Since higher ER scores imply higher ER, the positive coefficients from the result suggest that DiB increases ER. The findings are in line with Zaid et al. (2020), Muttakin and Subramanian (2015), but contrary to findings by Beji et al. (2020) and Ozordi et al. (2018). Results of all the control variables are in line with the *apriori*, that is, all the control variables are both positive and significantly related to ER as expected.

This study arrives at an important conclusion which is that diversity- in-boards has significant effect on ER by listed manufacturing companies in Nigeria. Diversity in board membership introduces the individual influence of board members and their sensitivities to board issues (Hafsi & Turgut, 2013). In addition, diversity in the board is considered a key resource and has an influence on strategic decision-making. The resource dependence theory suggests that diversity in board brings new insights and perspectives to the firm and increasing creativity and innovation which the firm will be excited to report in the environmental reports. Accordingly, this study confirms that more diverse board members result to better understanding and problem solving, which consequently leads the board to effectively address the business environment and report same in the annual reports.

## 5. Conclusion and Recommendations

The main objective of this study is to examine the effect of DiB on ER of listed manufacturing companies in Nigeria. The study was carried out with the assumption that diversity in the board is a key resource and has an influence on strategic decision-making. Accordingly, more diverse board members result to better understanding and problem solving, and consequently leads the board to effectively address the business environment and report same in the annual reports.

Specifically, findings in this study suggest that DiB improves ER; however the effect is statistically not significant. Based on the findings, the study recommends that there should be diversity in the board of listed manufacturing companies in Nigeria. Five areas of diversity- in-boards recommended are gender diversity, age diversity, diversity in the nationality and diversity in educational backgrounds. A 50% mix is recommended for each of these demographic diversities. This study recommends that further studies should be done to know the appropriate mix of DiB that will be beneficial to all stakeholders. The findings of this study is a significant contribution to literature because, existing studies on DIB concentrate on the use of isolated or separate demographic attributes of the board of directors to proxy diversity in board (pluralism approach). The use of a single index consisting of several demographic attributes to forms DiB takes a more holistic view of board diversity.

In addition, this study is practicable and the research implication could be helpful to companies, managers and researchers. The company board of directors and management of manufacturing firms will use this study to make strong inform decision on the need for environmental reporting as it will curtail potential conflict between populace living within the host environment in which the firms operate aside from generating positive image for them. Also, the disclosure of environmental information would help to introduce and explain company's potentials to investors, driving the fluidity of capital market, guaranteeing more effective allocation of capital, decreasing capital costs and achieving a more positive communication with investors as regarding the information disclosed. Thus, the results of this study would serve as benchmark for future research on the effect of DiB on ER.

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