



FIRM INNOVATIVENESS AND ENVIRONMENTAL DISCLOSURE: EVIDENCE FROM NIGERIAN MANUFACTURING FIRMS

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Abstract

The persistent increase in economic activities of companies, specifically manufacturing companies in Nigeria, has resulted in high levels of outputs, energy consumption, air pollution, and materials used. Environmental disclosures of these issues has become a major concern to communities, employees, shareholders, and other stakeholders and these difficulties drive this study. This study therefore, investigates the effect of the innovativeness and environmental disclosure of all listed manufacturing companies in Nigeria. Specifically, the paper investigates the extent at which firms' complexity influences environmental disclosure, and how technological infrastructures affect environmental disclosure. With Ex-post factor research design and population of seventy-six (76) listed manufacturing companies, this paper employed Krejcie and Morgan (1970), while 63 companies formed the sample size. However, due to in availability of data and inconsistent listing of the companies, only forty-nine (49) out of the companies were chosen as the sample size determination table spanning across seven (7) sectors. Findings revealed that firms' complexity and technological infrastructure have negative significant effect on environmental disclosure. Thus, this study recommends that Nigeria Exchange Group (NGX) should establish policy and penalties for companies that have not been adequate disclose information about their firms operating segment and new asset acquisition.

Keywords: *Firm Complexity, Technological Infrastructures and Environmental Disclosure*

INTRODUCTION

Recently, concern has grown over the increase in air pollution, flooding, emissions, energy pollution, and other natural calamities among companies in the world most especially in Nigeria's listed and traded manufacturing enterprises. The ability of these companies to disclose their environmental impact and effects in its annual report is known as environmental disclosure. This creates major concern among stakeholders such as shareholders, investors, the community, and other stakeholders. Environmental disclosure should not be reactive but proactive to create and maintain synergies among the triad of the people, planet, and profit (Ren & Jackson 2020).



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Additionally, environmental disclosure is steadily developing because of expanding innovation activities by businesses, such as increased complexity and technological expenditure. Earlier studies conducted by Ren & Jackson 2020, show that environmental disclosures between companies are not required, especially in Nigeria and other underdeveloped nations. However, the Global Reporting Initiative (GRI)'s compulsory disclosure in 2000 forces businesses to share good information and overleap negative information because failing to do so would be detrimental to communities, clients, and other stakeholders. However, to execute environmental responsibility, firms require the support and acknowledgment of stakeholders. According to Sari, Sudana, Ratnadi, and Rasmini (2022), organizations communicate with stakeholders about their positions, efforts, and accomplishments of their environmental impact.

Recently, businesses have viewed innovation as the best method for growth, market performance, and achieving long-term goals. Alvarado-Vargas & Kelley (2020) opined that the degree of changes and uncertainty has grown due to changing market dynamics. The innovation may be the consequence of an increase in the business operating activities and technological advancements in noncurrent assets with innovativeness. It has been cited in literature that new invention has exposed businesses to the perception of environmental hazards that have implications for communities, employees, and other stakeholders.

Stakeholders have expressed concern to the Nigeria Exchange Group (NGX) on the requirement for all listed companies to publish both positive and negative effects on the innovative items. The communities, customers, employees, and potential investors are just a few of the various stakeholders who demand that businesses disclose their environmental responsibility policies. It's interesting to note that starting in 2011, NGX also required all listed companies to disclose the environmental effects of their operations, including air pollution, noise pollution, and other dangerous environmental conditions. It is noted in the literature that these manufacturing enterprises were delisted from the Nigeria Exchange Group (NGX) for of not being able to submit this information in their annual reports, despite these regulations.

According to literature such as (Nandia and Ghosh 2014; Karim, Qamruzzaman and Jahan 2022; Ruhana and Hidayah 2019; Ndemez and Kayitana 2020 searches conducted in developing nations, including Nigeria, it is known that several research using a variety of methodologies and analytical techniques have looked at various environmental disclosure strategies that have contributed to the body of knowledge over time. The outcome of the environmental disclosure resulted from several sectors, and this was because of intersections or concessions. Different research designs utilized to examine the effect of factors including business size, gender, and other cooperative governances, among others, are the primary reasons for variation in the findings. Additionally, despite the existence of literature, evidence suggests that no specific study has been conducted to assess environmental disclosure and corporate innovation in developing nations utilizing the firm's complexity and technological infrastructure as independent factors. Consequently, this study assesses Nigerian manufacturing firms' environmental transparency and innovativeness. The following research hypotheses were raised to achieve research objectives:



- i. Ho₁: Firm complexities have no significant impact on environmental disclosure.
- ii. Ho₂: Technological infrastructure has no significant effect on environmental disclosure.

LITERATURE REVIEW

Conceptual Review

Firm's innovation has become best strategy to achieved companies' long-term objective. Meanwhile Adeniran & Johnston (2012). arguing that firms achieving success must acquire and develop valuable and not substitutable Resources. However, Ferraresi Quandt dos Santos & Frega (2012). described innovativeness as comprising the complete innovation initiatives of firms and is strategic in nature because it offers direction in dealing with markets. Also, in the work of Kapoor and Adner (2012) explained innovation as a multicomponent construct consisting of new product introduction, technological changes, R&D expenditures, complexity of the companies and order of market entry, whereby single variable categorizations of innovativeness do not fully capture the complexities of innovativeness. In keeping with the definition, vehemence has been expressed in the literature that enterprises with high degree of innovation are subjected to high impact of environmental omission, carbon emission and other environmental hazardous. Therefore, this study conceptualizes firm innovativeness as a process of increase in firm operating activities and technological asset which at long run have negative impact on communities and other stakeholders.

The best way to consistently track a company's operations regarding air, water, and carbon emissions is through environmental disclosure. According to Grösser (2017) analysed complexity of the firm as analyst with technology and market research company Forrester Research, business complexity is the situation of having numerous interdependent and interrelated stakeholders. Additionally, Godwin (2017) defines complexity as the quantity of demands that businesses must meet to live up to the expectations of their clients and staff as well as technological advancements, cultural shifts, and evolving legal obligations. This definition makes it clear that businesses operate in a variety of ways to achieve their long-term goals.

On the other hand, Chong, Jin, Chow and Saint (2010) characterized technological innovation as new technologies that have been proved to be theoretically feasible under particular site conditions but have not been widely deployed under the conditions that occur at the hazardous waste site. Undergoing pilot-scale treatability tests, that normally is undertaken in the field or the laboratory and needs installation of the technology, and that give financial performance, cost, and design objectives for the system prior to full-scale deployment (Jiang, Yang, Li & Wang 2011). These phenomena suggest that firms engage in a range of creative activities that benefit shareholders and prospective investors while negatively affecting the communities, staff, and clients. Businesses have to disclose this.



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Environmental disclosure is the international best practices to disclose firm's innovative activities such as innovative asset and complexity of the firm that courses air pollution, energy pollution and carbon emission. By implication of all these, Herawati (2021). viewed environmental disclosure as the disclosure of specific pollution measures and occurrences (toxic waste emissions, oil spills, Superfund sites, etc.) that an investor might find useful in estimating future cash flows. Meanwhile Olagunju and Ajiboye (2022) examined, in a more detailed way that, environmental disclosure is an active means for putting environmental matters strongly on strategic management's plan, making worthwhile statistics available to enlighten environmental and financial executives for proper policy making, and to strongly show environmental obligation to interested parties. These different approaches assist communities, shareholders and investors to know in depth knowledge about environmental metrics and costs information to make their long-term decisions. In addition, it enhances more accuracy to credibility and accountability to firms' environmental performance.

Theoretical Framework

As a result of unforeseen circumstance, technological changes, societal needs and customer satisfactions, firms have subjected most of their activities to innovation. Organizations consequently pursue innovation due to changes in their internal or external environment or as a preventive measure to shape their environment impact (Alegre et al., 2006; Amara et al., 2008; 2015). Indeed, it enhances and adds value to the existing shareholders and potential investors. However, the theories adopted for this study are subjective on the bases of each research hypotheses:

H₀₁ Firm's complexity does not significantly influence the environmental disclosure among listed manufacturing companies in Nigeria.

Administrative Management Theory was propounded by Fredrick Taylor (1856-1915). The focus of management theory is the process of ensuring goals and objectives such as those through employee in an efficient and effective manner. However, Godwin (2017) perceived Management theory is the art of what you want to execute and then safeguarding that it is done in the most efficient and cost-effective way possible. The management theory also postulated that workplace place efficiency, management creation of new idea, training, corporation, the primary goal of labour and thought is efficiency and technical calculation in all respects is superior to human judgment are the foundation of some of the most successful business. Administrative management theory is concerned that management are expected to innovative by establishing new operating segment and disclose information that is relevant to the respective stakeholders. In the efforts of management creating new operating activities as result of innovation, firms create more wealth to shareholders and create negative impact to communities, customers and employees inform of environmental hazardous. Therefore, efforts must be made by the management to ensure adequate positive and negative information are provided in their annual report for proper accountability.



H₀₂ Technological infrastructures do not significantly influence the environmental disclosure among listed manufacturing companies in Nigeria.

The stakeholder theory is of opinion that shareholders and other users of financial statement have the right of information, both financial and non-financial Fiandrino & Tonelli (2021). However, because of unforeseeable future occurrence firms innovate in other to gain competitive advantages ahead of their competitors, companies innovation come in form of innovative asset, technological changes. These skills of innovation determine the managerial ability to implement innovative ideas by identifying new markets, customers, and resources or combining these factors through innovative business models Liao, Fu & Liu (2020). Consequently, majority of these innovative assets have negative impact such as environmental hazardous, water and air pollution. Therefore, shareholders will be expecting the company to make disclosures on these environmental impact and effect of environmental hazardous asset to improve the company's reputation in the market. Therefore, this study found this theory to explain if there is relationship between Technological infrastructures and environmental disclosure among listed manufacturing companies in Nigeria.

Empirical Studies

This section covers previous studies' evidence related to the study. These include empirical studies on developed, developing countries, and Nigeria.

With respect to innovation, few studies such as (Nandia and Ghosh 2014; Karim, Qamruzzaman and Jahan 2022; Ruhana and Hidayah 2019; Ndemez and Kayitana 2020; reveal its impact on environmental disclosure. For instance, Karim, Qamruzzaman and Jahan (2022) evaluated open innovation Nexus between Information Technology, Voluntary Disclosure, and Sustainable Performance. The study examined a sample of 30 bank-based financial institutions and used cross-sectional panel regression, specifically, random effects and fixed effects regression estimation. The study found that open innovation has a mixed effect on a firm's environmental disclosure. But other studies such as Ruhana and Hidayah 2019; Ikechukwu 2022 and (Grace) found negative relationship between technological innovations on environmental disclosure.

Also, in Nigeria, Olagunju and Ajiboye (2022) elucidated Environmental Accounting Disclosure and Market Value of Listed Non-Financial Firms in Nigeria. Data were obtained between 2012 and 2020. The study employed panel feasible generalized least square regression technique for data analyses. Meanwhile, the study revealed that environmental disclosure influence earning per share as well as share price positively and significantly. Different from the findings of the above, Okolo, Uchenna and Augustina (2022) found technologies and strong environmental policies have statistically significant effect on sustainable economic development.

However, Yahaya, Bamigbade and Ajiboye (2022) evaluated the effect of Corporate Governance on Environmental Disclosure by Listed Nigerian Consumer Goods Firms. The ex-post facto research design was used, and regression analysis was used to analyse data derived from seventeen



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consumer goods firms. The result found that the presence of environmental sustainability committee, number of meetings held by the board of directors, and firm size have significant positive impact on the quantity of environmental information disclosure (EDI). As against this study, the study of Kamaldeen (2019) found that environmental certification is an important predictor of corporate environmental disclosure by listed manufacturing companies.

METHODOLOGY

This study adopts an ex-post facto research design to collect data from listed manufacturing companies in Nigeria. Empirical information was gathered from all listed manufacturing companies on the floor of the Nigeria stock exchange as of 31st December 2020. The choice of chosen all listed manufacturing companies in Nigeria was justified on the bases that, it is the highest sector, that has highest contributions to the Gross Domestic Product (GDP) of Nigeria economy. The sample size representation of the study is sixty-three (63), it was determined based on Krejcie and Morgan's (1970) sample size determination table. However, Due to the unavailability of data and the inconsistent listing of some manufacturing companies in Nigeria, the study intends to exclude fourteen (14) manufacturing firms from the sample size which eventually made the total of forty-nine (49) companies that was used as the sample size.

Data for this study were collected from the annual report and accounts of listed manufacturing companies in Nigeria from 2011 up to 2020. This is based on the fact annual reports are readily available and accessible by various users. Both descriptive and inferential statistical techniques were employed as a form of quantitative analysis of the data collected. The descriptive statistics, which include mean, standard deviation maximum, and the minimum value are used to summarize the 2011-2020 annual report and account of sample companies. The inferential statistics use for the study is Panel Corrected Regression Error (PCRE). The following is the model use to achieve hypotheses above:

$$EVD = \beta_1 FC + \beta_2 TI + \beta_3 FS + \epsilon \dots\dots\dots(i)$$

Where:

EVD= Environmental Disclosures

FC= firms Complexity

TI = Technological Infrastructures

FS= Firm Size

Table 1: Measurement of Variables

Variables	Construct	Measurement	Evidence from previous studies	A-prior expectation
Dependent variable:	EnD	GRI Index (G4) = Total score disclosed	Nandia et.al (2014)	+/-

Environmental Disclosure		Total GRI score index	Agnes Pravita et. al (2018);Aifuwa (2020)	
Independent variable: Firm's Complexity	FC	Number of business unit / segment in a company	Subrameriam et.al (2009) & Nurul et.al (2018)	+/-
Independent variable: Technological Infrastructures	TI	Is Dummy variable to 1 if firms introduce new asset to improve innovation. Zero (0) otherwise.	Meriam et. al (2021)	+

RESULTS AND DISCUSSIONS

Prior to evaluating hypotheses, preliminary tests were performed to confirm that the data collected was normal. Kurtosis and Skewness were used in the Normality Test, which was one of the first tests run. However, the early test result reveals that most variables are normally distributed based on skewness, even though most of them are not typically dependent on kurtosis. This is because most of the kurtosis values exceed the range of ± 1.96 indicating that such data are not normally distributed. Consequently, because of these, this study used Panel Corrected Regression Error (PCRE) as inferential statistics. Also, before data are subjected to inferential statistics, data were subjected to diagnostics using linearity test, auto, and serial correlation test, heteroscedasticity test, normality test, and Hausman test and the result of normality test using Shapiro-Wilk test indicate that the p-value is significant at 1%. Therefore, the null hypothesis that the residuals are normally distributed across the model is rejected. However, according to the Gauss-Markov theorem, normality of data and residual distribution is not necessary for obtaining Best Linear Un-bias Estimate (BLUE) for as long as the sample size is greater than 15 observations. Sequel to the preliminary and diagnostic test, here is the result of inferential statistics:

The table below show the Summary of Result of Panel Corrected Standard Error

Variable	Coefficient	Std-error	Z-Value	Significant
Firm Complexity	(-0.062)	0.024	-9.26	(0.000)
Technological Infrastructure	(-0.075)	0.024	-3.09	(0.000)

Models Interpretation



$$\text{EVDISit} = -0.317 - 0.062 \text{ FCit} - 0.075 \text{ TIit}$$

The result of PCSE displays that dependent variable known as environmental disclosure, and independent variables. The R² describes the cumulative effect of independent variables on environmental disclosure. The proportion of the overall variation in the dependent variable described by the independent variables together was calculated using the cumulative R² of 17.46%, this gives multiple coefficients of determination. As a result, the independent variables in the analysis account for 17.46% of the overall variance in environmental disclosure of listed manufacturing companies in Nigeria. In addition, this model as shown in table above has a wald chi² of 232.25, since it is greater than 2, the model seems perfect (Gujarati, 2004). In view of that, the model is suitable for estimating the interaction between the variables. Furthermore, according to the p-value of the wald chi², which is significant at 1%, all of the independent variables collectively in the model are significant. This means that the study's independent variables reliably predict the study's dependent variable.

Restatement and Test of Hypothesis One

Ho1: The firm's complexity does not significantly influence the environmental disclosures among listed manufacturing companies in Nigeria.

A firm's complexity has a significant influence on environmental disclosures among listed manufacturing companies in Nigeria because p value < 0.005. Therefore, the study rejects the null hypothesis. The study also found negative result of firm's complexity on environment disclosure as evidenced by Panel Corrected Standard Error (PCSE) shown in table 4.4a above: $\beta_{1b} = -0.062$; SE=0.024, p<0.01. This result implies that technological infrastructure has no relationship with the environmental disclosure of listed manufacturing companies in Nigeria.

Restatement and Test of Hypothesis Two

Ho2: Technological infrastructure does not significantly influence the environmental disclosures among listed manufacturing companies in Nigeria.

Panel Corrected Standard Error (PCSE) regression result for EVDIS indicate that technological infrastructure has a significant value of 0.002 which is less than p< 0.05. Thus, it is an indication to reject the null hypothesis and accepts the alternative hypothesis. However, technological infrastructure has a significant influence on environmental disclosures among listed manufacturing companies in Nigeria. Furthermore, the result of Panel Corrected Standard Error (PCSE) given as $\beta_{2b} = -0.075$; SE=0.024 p<0.05 shows that there is a negative relationship between technological infrastructure and environment disclosure among listed manufacturing companies in Nigeria.

Discussions and Implications



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This study evaluated Firms' Innovativeness and Environmental Disclosure. Firms' Innovativeness was examined based on firms' complexity and technological infrastructure and Environmental Disclosure was also based on GRI index 2011. The empirical result shows that a firm's complexity is significant and negatively influences environmental disclosure (via EVDISC) as indicated by $\beta_{1b} = -0.062$; $SE=0.024$, $p<0.000$. The p-value is significant at 1% hence, this study found a piece of sufficient evidence to provide a basis for rejecting the null hypothesis which states that, there is a significant relationship between firm complexity and environment disclosure of listed manufacturing firms in Nigeria. These are in line with the findings of Abdullahi et. al., (2021); Ndalu et. al., (2019); Ikpor, et.al. (2019) who also found that significant negative between a firm's complexity and environmental disclosure.

In addition, the p-value is significant at 5% hence, this study found a piece of sufficient evidence to provide a basis for rejecting the null hypothesis which states that, there is no significant relationship between technological infrastructure and environmental disclosure of listed manufacturing companies in Nigeria. However, the result of Panel Corrected Standard Error (PCSE) Regression show that $\beta_{2b} = -0.075$; $SE=0.024$ $p<0.05$. This implies that there is a negative relationship between technological infrastructure and environmental disclosure. The results of this study were consistent with the results of the study of Ndemez et.al., (2020); Benjamin et.al., (2018). They all found negative relationship between technological infrastructure and environmental disclosures.

CONCLUSION AND RECOMMENDATIONS

Considering these findings, the study concludes that listed manufacturing companies in Nigeria have not been disclosing environmental information on each operating segment of their operation. This study evaluated firms' innovativeness and environmental disclosure among listed manufacturing companies in Nigeria. The results of the study show that firm complexity has a significant influence but a negative relationship on environmental disclosure. According to the study, listed manufacturing companies have not disclosed enough information about their technological infrastructure when it comes to the acquisition of new or existing assets, or when it comes to environmental concerns, as required by NGX and GRI.

The study suggests that Nigeria Exchange Group (NGX) strengthen its current policy to guarantee that all listed manufacturing commissions in Nigeria disclose the environmental effect of their separate operational sectors. This recommendation is based on the study's findings and conclusions. Furthermore, (NGX) ought to impose sanctions on the businesses that disregard these policies. Additionally, the report suggests that all publicly traded manufacturing companies set up procedures inside their respective organizations to guarantee that businesses publish environmental facts related to the purchase of a new asset that will benefit businesses to draw in global investors and guarantee compliance with international regulations.

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