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Full Length Research

Board diversity and intellectual capital disclosure in listed firms in Nigeria: The moderating role of ownership concentration

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ABSTRACT: This study examines the moderating role of ownership concentration on the relationship between board diversity and intellectual capital of forty-four listed non-financial services firms in Nigeria during the period of ten years from 2011-2020. The descriptive statistics tool was used to obtain summary statistics for the variables in the study. Similarly, ordinary least square regresion was employed to examine the study's hypotheses using STATA 12 software. The finding of the study revealed that board education has a significant positive impact on intellectual capital disclosure. However, board nationality was discovered to have a significant negative impact on intellectual capital disclosure. The study also revealedthat board ownership has no effect on intellectual capital disclosure. The findings from the moderated model revealed that ownership concentration increased the negative impact of board education and board ownership on intellectual capital disclosure. The study recommends that in constituting the boards of these firms, board education background should be given top priority in order to ensure quality decision concerning intellectual capital. Likewise, in order to ensure quality decision making, non-financial services firms in Nigeria should ensure that there is increase in number of foreign members on the board and attend board meeting regularly. Also, there should be regulation as to the percentage of shares held by directors. Finally, management should consider the multiple roles of the concentrated ownership and board diversity when constituting the board. This will enable the management to carefully select, nominate, and appoint members of the board with great diversity which will ultimately lead to disclosure of intellectual capital.

Keywords: Board education, board nationality, disclosure, Intellectual capital, profitability.

INTRODUCTION

The world has transitioned from an industrial to a knowledge-based economy, in which intellectual capital, communication, and information technology have replaced physical capital and traditional manufacturing methods. In a knowledge-based economy, a company's economic value is derived from the development and manipulation of intellectual capital rather than the production of physical things (Guthrie *et al.,* 2004). Intellectual Capital (IC) research is becoming a more appealing area for academic and professional investigators from a variety of perspectives due to movement towards knowledge-based economy. Previous researchers such as Oba and Bature (2013), Alfraih (2017) and Rahman *et al.* (2020), have revealed that intellectual capital has successfully contributed to firm economic capital generation. However, financial statements, unfortunately, fail to capture and

reflect IC's contributions, resulting in information asymmetry between firms and other stakeholders.

Intellectual Capital Disclosure (ICD) is a method of describing the nature of the company's intangible assets. Voluntary intellectual capital disclosure procedure provide stakeholders with important information that is necessary in making investment decisions and, as a result, has a positive impact on firm financial performance (Oba *et al.*, 2013). The ability of a company to disclose IC aids it in increasing its value, gaining a competitive edge, improving internal controls, increasing asset management capabilities, enriching the features of information provided, and reducing risk-related decisions (Ranani and Bijani, 2014; Al-Sartawi, 2017). As a result, the disclosure of IC in annual reports is critical if stakeholders of enterprises are to be able to make crucial investment decisions in Nigeria, as it is envisaged that via this disclosure, stakeholders will be able to make more informed decisions.

Board diversity is part of corporate governance mechanisms. The board is viewed as a monitoring and controlling instrument whose function is to analyse and evaluate management's effectiveness in running the company, with the ultimate goal of maximizing shareholder wealth and minimizing agency concerns. Due to previous financial scandals and a higher risk of company failure, there has been a rise in interest in increasing board performance through sound corporate governance. It is widely considered that having a diverse board of directors, increases cognitive flexibility, increasing the knowledge, ideas, and approaches accessible to the company's board of directors and, as a result, improving the quality of decision-making. Board diversity (education, nationality, and ownership) was considered in this study to be a method for increasing such efficacy and, as a result, improving firm ICD.

The emergence of the knowledge-based economy resulted in the shifting in strategy focus from tangible to intangible resources and these knowledge-based intangible assets are not always captured in the traditional financial accounting information. The western countries (Germany, USA and Britain) have long recognised IC as a key contributor to an organisation's competitive advantage and value creation (Mouritsen *et al.,* 2001). As a result, companies began to supplement information on IC voluntarily due to a greater demand on the information concerning their soft assets (Guthrie and Petty, 2000), as these are not fully capitalised in traditional financial statements. However, little is known about IC in emerging economies, for example, Nigeria. Through disclosure, it is expected that stakeholders can properly evaluate corporate management be sure that resources can be properly distributed and that corporate value can be enhanced.

Because IC is a relatively new concept, there has been very little study on the impact of board diversity on the level of intellectual capital disclosure by Nigerian firms. The current research is based on two primary factors. To begin with, there are few studies in this field in Nigeria. Few research on ICD in Nigeria employed data from a small number of enterprises over a short period of time. For instance, Oba *et al*. (2013) examined the impact of board mechanisms on IC disclosure of ten firms in Nigeria for a period of four years. Unlike previous studies, this study has a much larger sample size and period for analyzing ICD in Nigerian non-financial services firms. Second, disclosure of information on IC leads to reduction of information asymmetry between a company and external users of information. Information asymmetry may result in the misallocation of capital, which eventually leads to social costs such as unemployment or reduced productivity. Similarly, investors may have difficulties in accurately assessing firm value for resource allocation with financial statements that do not report IC. A reduction of information asymmetry has advantages, such as lower costs of capital. Moreover, the better assessment and belief of the company's future wealth creation capabilities might raise the company share price, and thus the market capitalization (Williams, 2001). Therefore, investors may have difficulties in accurately assessing firm value for resource allocation with financial statements that do not report human capital. Disclosing information regarding IC has strategic relevance for enterprises because it represents a competitive business edge in the current economy. As a consequence, the provision of relevant information on IC by firms in Nigeria becomes important as this can be used for strategic decision making by investors and other stakeholders.

Third, most Nigerian researchers have overlooked the importance of a moderating variable in the link between board diversity and intellectual capital disclosure. The distribution of power and influence of shareholders on the company's functioning is reflected in the share ownership structure. Concentrated owners can use their expertise and resources to improve a company's resource endowment (Carney and Gedajlovic, 2001). Because large shareholders have a large stake in the company, they will actively participate in its decision-making to ensure that it engages in value-adding activities. As a result, an effort is undertaken in this study to close the gap in understanding the specific role of ownership concentration on the relationship between board diversity and ICD.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The concept of intangible resources

Previously, the role of intangible assets in value creation has been ignored because of the dominance of physical assets on firms' balance sheets (Jhunjhunwala, 2009) thus, firms always concentrate in building up physical

assets because they influence the net worth of the firm. However, in today's economy, the success of firms mostly depends upon the effective use of their intangible assets including employees' knowledge, skills and other invisible resources such as patents and copyrights. As revealed by Jhunjhunwala, (2009), the invisibles capital comprises two-thirds of the total GDP of the United States.

The International Accounting Standard Board (IASB, 2010) defined intangible assets as: identifiable non-monetary assets which do not have physical existence. As opine by Diefenbach (2006) the major characteristics of intangible assets is that it is non-physical in nature and can be considered as an idea in the mind rather than on paper. Furthermore, the author stated that the typical nature of the intangible assets is that they increase when they are used, for instance, knowledge increases when it is shared with others. The evolution of intangible resources was what gave birth to the recognition of the existence and importance of IC.

The concept of IC

IC is an increasingly attractive field for academic and professional studies from different angles. The term does not have a universally accepted definition as defined by different scholars based on their views. Stewart (1997) defined it as the sum of everything that everybody knows within the company that gives it a competitive edge in the market place. Klein *et al.* (1994) stated that IC encompasses intangibles, such as patents, intellectual property rights, copyrights and franchises. On the other hand, Edvinsson (1997) defined IC in a more explicit term as the possession of applied experience, knowledge, professional skills, organisational technology and customer relationships that enable a firm to occupy a competitive position in the market.

IC comes with a high importance for business success, growth and long-term sustainability (Squicciarini and Voigtla, 2015). In addition, it gives firms the momentum and energy to compete in the market (Bratianu and Orzea, 2013).

IC measurement models

Kaplan and Norton (1995) provided measurement of IC model known as the Balance Score Card approach. The idea was to measure the efficiency of intangible assets which were previously ignored. This model produces results in the form of scores for different elements of IC such as human, structural and innovation capital.

Using Skandia Navigator as a base, Bontis (2004) constructed a new measure called National Intellectual Capital Index (NICI) aimed at measuring and managing IC at the national level. The model includes market capital, process capital, renewal capital and human capital as different indicators of the IC of a nation. The author applied NICI model to several Arab countries to measure the national IC and concludes that national IC represents almost 20 percent of the total financial wealth of each country in the study's sample. In the same vein, applying the Skandia Navigator model partially, Pulic (1998) developed a new but more comprehensive, easy to calculate measure called Value Added Intellectual Coefficient (VAIC) which measures the efficiency with which an entity utilises its physical capital and IC.

However, since the main objective of this current study is to examine the moderating role of ownership concentration on the relationship between board diversity and ICD, the disclosure index was used to measure ICD as used by previous researchers (White *et al.*, 2007; Li *et al.,* 2008, Yi and Davey, 2010, Uzliawati and Djati, 2015; Rahman *et al.*, 2020).

Determinants of ICD

Board educational level diversity and ICD

Ruigrok *et al.* (2006) define educational level diversity as the differences in knowledge or skill among board members that would aid in the creation of the best option for resolving challenges and formulating and evaluating strategic decisions. Wallace and Cooke (1990) found that the directors who have a background in accounting and business education may make a broader level of disclosure to enhance the corporate image and credibility of management. Therefore, directors that possess these qualities are expected to take quality decision concerning IC management and disclosure by firms in Nigeria.

Uzliawati and Djati (2015) found that the educational background of financial accounting is positively associated with ICD of 31 banks listed in Indonesia. Cardi *et al.* (2018) investigated the impact of corporate governance on ICD in 70 Italian companies' initial public offerings between 2004 and 2014. The study's findings demonstrated that board education had no significant impact on a company's ICD. As a result, the following hypothesis is proposed:

H_{01}: Board education does not have a significant impact on ICD.

Board nationality diversity and ICD

Incorporating foreign directors onto the board is a technique to bring in human resources who are familiar with the worldwide business environment. This is done in order for them to make better investment and operational decisions, assist the organization in accessing international resources, and expand their business potential.

Furthermore, foreign directors may reflect differing perspectives on the board's control role, particularly if they originate from nations with more robust shareholder rights. Othman *et al.* (2018) investigated whether board characteristics influenced the disclosure of innovation capital in 68 publicly traded businesses on Bursa Malaysia's main market over a five-year period between 2011 and 2015. The finding of the study revealed that the presence of foreign directors on the board had a significant impact on the level of innovation capital disclosure. In a separate study, Rahman *et al.* (2019) looked at the factors that influence IC in Bangladesh's pharmaceutical and chemical industries from 2016 to 2017. The findings of the study revealed that board ownership had a significant negative impact on ICD. Using data from 323 Southeast Asia's largest Stock market and Indonesia's emerging economy during the period 2008 to 2017, Ulfah *et al.* (2021) found that a negative and significant relationship exist between foreign ownership and ICD. Thus, this study hypothesizes that:

H_{02}: Board nationality does not have a significant impact on the level of ICD.

Board ownership and ICD

The allocation of control and ownership is referred to as a company's ownership structure. The identification of the equity owners, as well as the allocation of equity in terms of votes and capital, determines the ownership structure. If managers own a larger percentage of equities, their interests and those of stakeholders will be more aligned. To avoid the market from lowering their wealth, firms whose directors are also shareholders would willingly divulge additional information to signal to the market that they are not making suboptimal decisions. Taliyang *et al.* (2011) found that director ownership had a significant impact on intellectual disclosure of 150 companies listed in Bursa Malaysia. Dewi *et al.* (2014) found that managerial ownership had no significant effect on IC of 146 services companies listed in Indonesia Stock Exchange during the period 2008-2012. Siala and Moalla (2017) looked at how ownership structure affected the voluntary disclosure of IC by 50 Canadian companies listed on the Toronto Stock Exchange. The finding of the study revealed that there was no significant association between the extent of ICD and managerial ownership. Using data from 323 Southeast Asia's largest Stock market and Indonesia's emerging economy during the period 2008 to 2017, Ulfah *et al.* (2021) found that a negative and significant relationship exist between managerial ownership and ICD. Given the foregoing, the following hypothesis is proposed:

H_{03}: Board ownership does not have significant impact on ICD.

Ownership concentration and ICD

Ownership concentration is a significant governance mechanism through which shareholders can exert control over and influence over the firm's management in order to safeguard their interests. A limited number of large, dominating shareholders control the majority of the stock and have a vital role in managerial oversight. The impact of corporate governance procedures on the degree of ICD across companies listed on the Kuwait Stock Exchange was investigated by Alfraih (2018) and discovered that organizations with a higher amount of block holder ownership had a higher level of IC disclosure. Using data from 323 Southeast Asia's largest Stock market and Indonesia's emerging economy during the period 2008 to 2017, Ulfah *et al.* (2021) found that ICD is positively related to ownership concentration. These findings show that substantial shareholders play a monitoring management role in reducing a company's agency concerns by influencing voluntary disclosure procedures. As a result, the following hypothesis is proposed in this study:

H_{04}: Ownership concentration does not moderate the relationship between board diversity ICD.

Theoretical review

The stakeholders theory

The postulates of this theory give general assumptions that firms operate within a complicated multi-party environment (Cots, 2011). The parties, known as stakeholders, are either affected by or affecting the business (Deegan, 2002). Therefore, companies will disclose information voluntarily to address outside stakeholders' concerns and encourage their engagement in its different activities (Michelon and Parbonetti, 2012). Each category of stakeholders has their unique expectations from the business firms; for example, shareholders want continuous growth of wealth, governmental departments want compliance and the analyst wants information that facilitates their forecast and analysis.

In accordance with information requirements of every stakeholder, which is varied, the stakeholder theory supports the view that companies are expected to satisfy all the information needs of these stakeholders. In addition, they communicate a different type of information via annual reports to address different types of stakeholders and in response to a varied and wide range of needs for information. Moreover, companies that adopt a responsive disclosure policy may find themselves in better communicative positions, which result in a better mental image and the ability to be more competitive than companies that neglect stakeholders' claims for information.

The signalling theory

Many businesses have recently sought to improve their performance by delivering high-quality information disclosure. The situation indicated that the company will be more active in increasing stakeholder confidence and support for the management contract (Malone *et al*., 1993). This is because information transparency can provide a good signal to all stakeholders, including ICD, so increasing the company's value. In the same vein, Whiting and Miller (2008) stated that ICD enables investors and other stakeholders to better assess the company's right, assess the company's ability in the future, and reduce the financial risk perception that may occur. It may be inferred that the disclosure of IC sends a larger favourable signal about the company's state, which may provide assurance and value to stakeholders, causing investors to buy shares, resulting in an increase in the company's stock price.

This study is based theoretically on the stakeholders theory and signalling theory.

METHODOLOGY

This study employed correlation and descriptive research designs, as it empirically examines the moderating role of ownership concentration on the relationship between board diversity and ICD of listed non-financial services firms in Nigeria. The population covers five sectors largely in accordance with NGX classification. Data for this study were obtained from annual reports and accounts of selected firms from the website of Nigerian Exchange Group during the period January, 2011 through December 2020. A stratified sampling technique was used in arriving at the sample size (sectoral selection) of this study. Therefore, for firms to be part of this study, some criteria were employed which are: (i) firms must have been quoted on the Nigerian Exchange Group as at 1st January, 2011 (ii) firms must have not been delisted from the floor of Nigerian Exchange Group during the period of study (iii) firms must have not been taken over or merged during the period of study. By applying the above filters, forty-four (44) firms were adjudged to have met the criteria. The techniques of data analysis employed in this study are descriptive statistics and multiple regression. Table 1 presents the sectoral distribution of firms and sample used in the study.

There are fifty-nine firms in all. Forty-four firms were selected while fifteen firms did not meet the criteria either for the fact that they were delisted during the study period or were not quoted as at 1st January 2011.

Variable measurement

The dependent variable

ICD is the quantity of information that companies reveal about their intellectual property. Content analysis was used to acquire the data for this proxy from the narratives in financial statements. The quantity of information on the IC included in the annual reports of the firms was measured using a disclosure index following the works of prior researchers such as (Ax and Maton, 2008; Salman *et al.,* 2013).

A 0 and 1 coding method was utilized. That is, if a particular index item is found, a 1 is recorded, and if the provided item is not found in Nigerian firms' annual reports, a 0 is recorded. The extent of disclosure was determined by dividing the number of recorded information items in yearly reports by the maximum number of information items in the disclosure index (Yi and Davey, 2010, Alshhadat, 2017; Al-Sartawi, 2017). The following formula is used to calculate the extent of ICD:

$$\mathrm{ICDj} = \frac{\mathrm{TADSj}}{\mathrm{MRDIj}}$$

Where ICD_j is intellectual capital disclosure, $TADS_j$ is the total actual disclosure score for a company j and $MRDI_j$ is the maximum relevant disclosure items of the company j.

Therefore in order to examine the factors influencing the level of IC disclosure, this study used the count of IC related words as the unit of the content analysis. The study then aggregated the disclosure frequencies of occurrence to determine the quantity of IC disclosure using the content analysis conducted earlier.

Independent variables

The board diversity which includes board education, board nationality and board ownership are the independent variables in this study. The ratio of board members with accounting, finance, management, and economic education backgrounds compared to all board members is used to quantify educational background variation (Rasmini *et al.,* 2014). Also, board nationality is measure as the number of foreign directors divided by the total number of board members (Abdul Rauf *et al.,* 2012; Talavera *et al.,* 2018). Board ownership is measured as the proportion of executive share ownership to the total number of shares in a company (Noradiva *et al.,* 2016; Hatane *et al.*, 2017).

Moderating variable

Ownership concentration: This is referred to as mechanism that allows owners to control and influence the firm's management in order to safeguard their interests. Ownership concentration is measured as the percentage (%) of ordinary shareholders, who own more than 5% of

Table 1. Population and sample size.

S/no	Sector distribution	Population	Delisted/quoted after 2011	Sample
1.	Consumer goods	21	4	17
2.	Health care	10	2	8
3.	Industrial goods	15	6	9
4.	Information & Communication Technology (ICT)	7	2	5
5.	Conglomerates	6	1	5
	Total	59	15	44

Source: Authors' compilation, 2022.

the total share outstanding (Ferreira *et al.,* 2012; Isa, 2014).

Control variables

In this study, four control variables are used. They are firm size, auditor type, profitability, and firm age. Kamath (2008) stated that firm size is a crucial component that has a significant impact on the amount of IC disclosure by corporations. It is measured as natural logarithm of Total Assets (Ferreira *et al.*, 2012; Alshhadat, 2017).

Auditing is a cost-cutting tool for enterprises. As a result, the type of auditor who investigated an entity's books of accounts may push them to release more information about IC, particularly if they are audited by one of the major four audit firms. As a result, the information asymmetry gap between the entity and outsiders may be reduced. For the type of auditing firm, a dummy variable was used, with a value of 1 if the auditor is a Big 4 accounting firm (that is, Deloitte & Touche, Ernst & Young, KPMG, and Price Waterhouse Coopers, or for the purposes of this study, when a local audit firm is affiliated with one of the Big Four accounting firms) and 0 if not (Barde, 2009; Gan, *et al*., 2013; Firmansa *et al.,* 2018).

Profitability is an important indicator of a company's success. It has been used as an important element in determining IC in previous studies. It is measured as the ratio of net profit after tax to total assets (Ferreira *et al.*, 2012; Alshhadat, 2017). The date of a company's incorporation may be important in determining how disclosures differ. The number of years passed since incorporation is used to measure this (Barde, 2009; Damayanti and Budiyanawati, 2009; Widiatmoko *et al.*, 2020; Chandraratne *et al.,* 2021).

Validity and reliability

Validity: the validity of the data collection instrument (disclosure index) was established by following certain steps to ensure that the current disclosure index achieves the desired goal of assisting the researcher in gathering the necessary data for the study. Following the studies of (Krippendorff, 2013; Alshhadat, 2017), the following measures were adopted for testing the validity:

1. Based on a preliminary analysis of the annual reports, adopting a disclosure index from the literature and customizing it to the study setting by deleting non-applicable information.
2. Following the development and finalization of the disclosure index, the researchers sent it for review to professional and academic specialists with vast experience in disclosure and familiarity with the Nigerian financial markets, who provided significant value to the research.

Reliability: The disclosure index's reliability, also known as its degree of trust, requires that it produce the same results when reproduced by the same researcher at a different time or simply by another researcher(s). In this study, the researcher repeated the exercise on ten firms, and the recoded results were identical. Similarly, the researchers invited some colleagues to undertake the coding for one firm in order to confirm the findings, and the results corroborate with the researchers' findings (Krippendorff, 2013; Alshhadat, 2017).

Model specification

In line with the previous ICD studies such as the work of Oba, *et al.* (2013) in Nigeria, Nurlis (2017) in Indonesia, Dan and Arianti (2017) in Indonesia, Siala and Moalla (2017) in Canada, Alshhadat, (2017) in Jordan, Rahman *et al.* (2019) in Bangladesh and some modifications, the following regression model was adapted to examine the moderating role of ownership concentration on the relationship between board diversity and ICD.

Model specification for direct relationship

$$ICD_{it} = \beta_0 + \beta_1 BED_{it} + \beta_2 BND_{it} + \beta_3 BON_{it} + \beta_4 FSZ_{it} + \beta_5 ATP_{it} + \beta_6 PRT_{it} + \beta_7 FGE_{it} + \varepsilon_{it}$$ ---------- Model 1

Model specification for direct relationship and moderating variable

$ICD_{it} = \beta_0 + \beta_1 BED_{it} + \beta_2 BND_{it} + \beta_3 BON_{it} + \beta_4 ONC_{it} + \beta_5 FSZ_{it} + \beta_6 ATP_{it} + \beta_7 PRT_{it} + \beta_8 FGE_{it} + \varepsilon_{it}$ ---------- Model 2

Model specification for the explanatory and moderating variables (Interaction)

$ICD_{it} = \beta_0 + \beta_1 BED_{it} + \beta_2 BND_{it} + \beta_3 BON_{it} + \beta_4 BED_{it}*ONC_{it} + \beta_5 BND_{it}*ONC_{it} + \beta_6 BON_{it}*ONC_{it} + \beta_7 ONC_{it} + \beta_8 FSZ_{it} + \beta_9 ATP_t + \beta_{10} PRT_{it} + \beta_{11} FGE_{it} + \varepsilon_{it}$ ---------Model 3

Where: ICD_{it} = Intellectual Capital Disclosure of firm i in period t, BED_{it} = Board Education of firm i in period t, BND_{it}= Board Nationality of firm i in period t, BON_{it}= Board Ownership of firm i in period t, ONC_{it} = Ownership Concentration of firm i in period t, FSZ_{it} = Firm size of firm i in period t, PRT_{it} = Profitability of firm i in period t, ATP_{it} = Auditor Type of firm i in period t, FGE_{it} = Firm Age of firm i in period t, ε_{it} = Error term, β_0 = Constant, β_1= Constant

RESULTS AND DISCUSSION

Descriptive statistics

The descriptive statistics of all the variables used in the study is presented in Table 2. Table 2 revealed that overall; the mean ICD score for the sampled non-financial services firms in Nigeria has an average information disclosure of about 0.84. The minimum disclosure level is 10% and maximum disclosure level of 134%. The standard deviation is 0.31. Board education recorded a minimum value of 0.20 and a maximum value of 0.88. Meanwhile, on the average, the number of board members with accounting, business and economics background was 63%. The standard deviation of 0.10 indicates that there is no significant variation in board education among the sampled non-financial services firms during the period of the study.

Also, board nationality diversity has a minimum value of 0 and a maximum value of 0.67. The mean value is 0.2716 and the standard deviation is 0.19 Board ownership had a minimum value of 0 and a maximum value of 0.92. On average, board ownership had a mean value of 0.112 and the standard deviation is 0.15. The mean value of the ownership concentration of the sampled firms is 0.6023. The minimum value is 0.18 and the maximum value is 0.94. The standard deviation is 0.18.

Firm size has a mean of 7.02, with a minimum of 4.70 and maximum of 9.26. The mean profitability was about 7.9% with a minimum loss of 84% and maximum profit of 81%. The mean auditor type was 0.60. The minimum value is 0 and the maximum value is 1. Finally, age has a mean value of 46.11 years. The minimum value is 6 years, while the maximum value is 97 years respectively.

Results of regression analysis

The cumulative R-squared (R^2) of 0.3681 for the direct relationship model, which is the multiple coefficient of determination, gave the proportion of the total variation in the dependent variable as explained by the independent variables jointly. Thus, it signified that 36.8% of the total variation in ICD of listed non-financial services firms in Nigeria is accounted for by the percentage of board members with accounting, business and economics background to total numbers of board members, its composition in terms of ratio of non-executive director to the total number of board members, percentage of shares owned by the directors and the size of board of directors used in the study. The F-statistics of 20.71, which is significant at one percent, indicates that board diversity and ICD model is fit. It implies that for any change in board diversity of the listed non-financial services firms in Nigeria, their ICD will be affected directly. The P-value of F-statistics which is statistically significant at a level of 0.0000 implies that there is 99.9 percent probability that the relationship among the variables were not due to mere chance. Therefore, the results from the regression can be relied upon. Furthermore, it means that the independent variables reliably predict the dependent variable of the study (Chandraratne *et al.,* 2021; Ulfah *et al.,* 2021).

The Hausman specification test determines how closely statistical models match the facts under investigation. In panel data analysis, the Hausman specification test aids in determining whether a random effects or fixed effects model should be used. The Hausman specification test was conducted, and the results demonstrated that the random effects model was adequate with a significance level of greater than 5% (1.000). However, when Lagrangian Multiplier test was conducted, the result favours the use of Ordinary Least Square (OLS) robust regression. The Lagrangian Multiplier test was conducted in order to choose between random effect and OLS regression, if it is significant at either 1% or 5%, the random effect should be reported, but if not, the OLS results should be reported (Baltagi, 2014). In this study, the results of Lagrangian Multiplier test is not significant at either 1% or 5%, thus, necessitates the researchers reporting the OLS robust regression.

From the regression results in Table 3, the percentage of board members with accounting, finance, business and economics background on the board for direct relationship has a coefficient value of 0.417 and a probability value of 0.002 which is significant at 5% level of significance. This means that education background of board members has a significant impact in influencing the ICD of the firms. This connotes that an increase in the numbers of members with

Table 2. Descriptive statistics of the variables.

Variables	Observation	Mean	Std. Dev.	Min.	Max.
ICD	440	0.8424	0.2964	0.1	1.34
BED	440	0.6313	0.0944	0.2	0.88
BND	440	0.2716	0.1946	0	.67
BON	440	0.1119	0.1535	0	0.92
ONC	440	0.5912	0.1825	0.18	0.94
FSZ	440	7.0168	0.8575	4.6999	9.2611
ATP	440	0.6127	0.4876	0	1
PRT	440	0.1132	0.1851	-1.2695	0.7927
FGE	440	44.5425	20.8321	4	96

Source: Authors' computation from STATA 12, 2022.

Table 3. Summary of ordinary least square regression of direct relationship (Model 1).

Variables	Coefficients	Robust Std Error	t-stat.	Prob.
Cons	0.0323	0.219	0.15	0.882
BED	0.417	0.133	3.13	0.002
BND	-0.186	0.071	-2.64	0.009
BON	-0.041	0.079	-0.52	0.601
FSZ	0.100	0.019	5.04	0.000
ATP	0.034	0.032	1.06	0.289
PRT	0.070	0.088	0.80	0.426
FGE	0.003	0.001	4.00	0.000
R-square	= 0.3681			
F-Statistic	= 20.71			
Prob. F	= 0.0000			

Source: Results output from STATA 12.

accounting, finance, business and economics background on the board will increase the level of ICD positively and significantly. This may be as a result of the fact that directors with accounting and management background know the importance of ICD and as such encourage their firms to disclose it voluntarily in the annual reports. Hypothesis one predicts that board education does not have a significant impact on ICD; however, based on the finding of the study, we therefore reject the null hypothesis. This finding is in line with the study of Uzliawati and Djati (2015). However, it is in contrast to the finding of Cardi *et al.* (2018).

Also, the regression results revealed that board nationality has a coefficient value of -0.186 which is significant at 5%. This indicates that board nationality has a negative and significant effect on ICD of the firms. This implies that for every increase in the percentage of foreign board members, the intellectual capital disclosure of the firms will significantly reduce by the coefficient value. This may be as a result of the fact that foreign directors' location, distance and cost may not permit them to attend board meetings frequently. Hypothesis two predicts that board nationality does not have a significant impact on ICD; however, based on the finding of the study, the null hypothesis is therefore rejected. The finding concurs with those of Rahman *et al.* (2019) and Ulfah *et al.* (2021). But it is contrary to that of Othman *et al*. (2018).

As regards board ownership, the regression results showed a coefficient value of -0.041 which is neither significant at 1% nor at 5%. This indicates that board ownership has a positive but insignificant effect on ICD of the firms. This implies that for every increase in the percentage of shares held by executive directors, their ICD will reduce insignificantly by the coefficient value. The finding of this study indicates that an increase in managerial share holdings by one more unit, other independent variables remaining constant reduces the ICD of positively but insignificantly. The results suggest that the variation in the extent of ICD in the annual reports of the non-financial services firms in Nigeria cannot be explained by the managerial share holdings. Hypothesis three predicts that managerial shareholding does not have

Table 4. Summary of ordinary least square regression of model 2.

Variables	Coefficients	Robust Std Error	t-stat.	Prob.
Cons	0.206	0.215	0.96	0.339
BED	0.395	0.134	2.95	0.003
BND	-0.121	0.076	-1.60	0.111
BON	-0.056	0.077	-0.73	0.463
ONC	-0.206	0.075	-2.77	0.006
FSZ	0.105	0.020	5.21	0.000
ATP	0.047	0.032	1.49	0.137
PRT	0.059	0.088	0.62	0.502
FGE	0.002	0.001	3.14	0.002
R-Squared	0.3806			
F-Statistics	20.09			
Prob. F	0.0000			

Source: Results output from STATA. 12.

a significant impact on ICD, based on the finding of the study; we therefore fail to reject the null hypothesis. The finding is in line with those of Dewi *et al.* (2014) and Siala and Moalla (2017). But it is contrary to those of Taliyang *et al.* (2011) and Ulfah *et al.* (2021).

Firm size recorded a coefficient value of 0.1223 which is significant at 1%. This indicates that large firms disclosed more IC voluntarily than smaller ones. As for the auditor type, the coefficient value is 0.0792 with a probability value of 0.001 which signifies its significance at 1% level. This implies that the type of audit firm that examined the book of accounts of the firms has a significant positive effect on their ICD. In addition, profitability had a coefficient value of 0.1034 which is neither significant at 1%, 5% nor at 10%. This indicates that profitability has a positive but insignificant impact on ICD of the firms during the period of study. Age has a positive and significant impact on intellectual capital disclosure at 1% with positive coefficient estimation.

From the regression result in Table 4, it was observed that ownership concentration has a coefficient value -0.206 with a probability value of 0.006 which means it is significant at 5% level. This implies that ownership concentration has a negative and significant effect on ICD of the firms. This therefore means that for every increase in the percentage of shareholders who held more than five percent shareholdings, the ICD of the firms will reduce by the coefficient value. Similarly, the probability value of 0.006 is an indication ownership concentration can moderate the relationship between board diversity and ICD. Hypothesis four predicts that ownership concentration does not influence the relationship between board diversity and ICD, however from the regression result; we therefore reject the null hypothesis and conclude that ownership concentration has significant influence in moderating the relationship between board diversity and ICD. This finding is in line with those of Alfraih (2018) and Ulfah *et al.* (2021).

From the cumulative results for moderated model as shown in Table 5, the adjusted R^2 is 0.4052 which implies that the ICD can be explained by ratio of women directors on the board, ratio of foreign board members to the total number of board members, percentage of board members with accounting, finance, business and economics background to total numbers of board members, its composition in terms of ratio of non-executive director to the total number of board members, percentage of shares owned by the directors, the size of board of directors, the percentage of shareholders who own more than five percent shares and all the moderated independent variables of the study to the tune of 40.5%.

The value of F-Statistics of 17.29 which is significant at one percent indicates that board diversity, ownership concentration, control variables and ICD model is fit. It connotes that any change in the diversity of the board and the ownership concentration will affect the ICD of non-financial services firms in Nigeria. The F-Statistics of 17.29 which is significant at 1% level further substantiate that there is a 99.9% probability that the relationship among the variables were not just due to mere chance. Also, it further connotes that ownership concentration predict the relationship between board diversity and ICD variables of the firms reliably.

The result in respect of moderated board education has a coefficient value of -1.771 with a probability value of 0.009 which is significant at 5% level. This indicates that moderated board education has a negative and significant effect on ICD of the firms. This implies that for every increase in the multiple effects of board education and ownership concentration, the ICD of the firms significantly decreased. In the output from the moderated board nationality, the coefficient value recorded is -1.268 which

Table 5. Summary of ordinary least square regression of model 3.

Variables	Coefficients	Robust Std Error	t-stat	Prob.
Cons	-0.204	0.829	-0.25	0.806
BED	1.442	0.432	3.34	0.001
BND	0.697	0.310	2.25	0.025
BON	0.471	0.492	0.96	0.339
ONC	0.769	1.284	0.60	0.550
BEDONC	-1.771	0.670	-2.64	0.009
BNDONC	-1.268	0.448	-2.83	0.005
BONONC	-0.878	0.781	-1.12	0.262
FSZ	0.108	0.020	5.37	0.000
ATP	0.035	0.037	0.97	0.333
PRT	0.047	0.081	0.59	0.558
FGE	0.002	0.0001	2.24	0.025
R-Squared	0.4052			
F-Statistics	17.29			
Prob. F	0.0000			

Source: Results output from STATA 12.

is significant at 5% level. This shows that moderated board nationality has a negative and significant impact on ICD of the firms. This shows that when nationality of directors is moderated with ownership concentration, there is a proportionate decrease in the level of ICD of the firms.

The result in respect of moderated board ownership has a coefficient value of -0.878 with a probability value of 0.262 which is neither significant at 1% nor at 5% level. This indicates that moderated board ownership has a negative but insignificant effect on ICD of the firms. This implies that for every increase in the multiple effects of board ownership and ownership concentration, the ICD of the firms decreased insignificantly based on the finding of the study.

Conclusion

From the results, analysis, interpretation and discussions of findings, the study concludes that having a large number of board members with background in accounting, finance, economics, or business is connected with a high degree of ICD. Furthermore, combining board education with ownership concentration has a significant negative impact on the extent and level of ICD in listed non-financial services companies in Nigeria. Furthermore, the presence of foreign board members in the boardroom has a significant impact on the disclosure of IC. On the other hand, moderating foreign director with ownership concentration has significant negative effect on ICD. Furthermore, based on the findings of the study, having a large number of shares owned by management does not ensure increased ICD. Similarly, when board ownership is moderated by ownership concentration, it has no significant impact on ICD.

Recommendations

Following the findings and conclusion of the study, the following recommendations were put forward in order to ensure that the players (such as the Securities and Exchange Commission; management) in these industries pay adequate attention to the importance of IC and the need to disclose it by listed non-financial services firms in Nigeria. The study recommends that in constituting the boards of these firms, board education background should be given top priority in order to ensure quality decision concerning IC. Likewise, in order to ensure quality decision making, non-financial services firms in Nigeria should ensure that there is increase in numbers of foreign members on the board and attend board meeting regularly. Also, there should be regulation as to the percentage of shares held by directors. Finally, management should consider the multiple roles of the concentrated ownership and board diversity when constituting the board. This will enable the management to carefully select, nominate, and appoint members of the board with great diversity which will ultimately lead to disclosure of IC.

CONFLICT OF INTEREST

Authors declare that they have no conflicts of interest.

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