

BOARD ATTRIBUTES AND INTELLECTUAL CAPITAL EFFICIENCY OF LISTED MANUFACTURING FIRMS IN NIGERIA

Ahmed Yahaya Onumoh¹, Mohammed Nma Ahmed², Suleiman Tauhid³,
Joshua Samuel Gambo⁴

^{1,2,3,4}Department of Accounting, Nigerian Defence Academy, P.M.B. 2109, Kaduna- Nigeria

ABSTRACT

This study investigates the effect of board attributes on intellectual capital efficiency of Nigerian-listed manufacturing firms for ten years from 2013 to 2022. This study utilized a sample of 31 firms from a population of 66 firms. An ex post facto research design was used, and the Value-added Intellectual Coefficient was used as a proxy for intellectual capital efficiency. This study employed multiple regression techniques and analyzed the panel data through STATA 13. This study reveals that there was positive and statistically significant effect of board size and gender diversity on ICE, suggesting that better ICE is associated with larger boards and greater gender diversity on corporate boards. On the other hand, Board meeting frequency has a significant negative association, indicating that too many board meetings could be detrimental to ICE. Board independence, however, shows an insignificant effect on ICE. This study conclude that board size, gender diversity, and meeting frequency have a significant effect on ICE of listed NLMFs in Nigeria. This study recommends that Nigerian-listed manufacturing firms without females should try to have at least one female director on their board; those that have less than 10 board members should try to increase the number, as this will improve intellectual capital efficiency.

Keyword: Board Independence, Board Meetings, Board Size, Gender Diversity, Intellectual Capital Efficiency.

1. INTRODUCTION

Scholars, practitioners, and regulators emphasize the importance of corporate governance in contemporary business. Corporate governance, defined as the rules, guidelines, and practices that direct and oversee a firm, significantly impacts organizational performance, sustainability, and accountability (Egbunike & Okoye, 2023). The board of directors' makeup and performance influence corporate governance quality. Intellectual capital efficiency has become vital for evaluating organizational competitiveness and performance. Intellectual capital includes intangible assets such as relational, structural, and human capital (Shahzad et al., 2023). Effective intellectual capital management boosts innovation, productivity, and long-term sustainability (Sanyaolu et al., 2022).

Board attributes significantly impact organizational efficacy, decision-making, and strategic direction. Key predictors of board success include size, independence, gender diversity, and meeting frequency (Oktaviana & Setiawan, (2022. Larger boards may face coordination issues, while board independence, indicated by non-executive directors, enhances oversight and accountability (Aslam & Haron, 2020). Gender diversity fosters creativity (Adams & Ferreira, 2009), and frequent, high-quality meetings indicate board commitment (Gillan & Starks, 2000).

However, optimizing board attributes to enhance intellectual capital efficiency poses a significant challenge for these firms. Determining the optimal board size is crucial for effective governance and strategic oversight. A large board can lead to inefficiencies and slower decision-making, while a smaller board may face expertise diversity, and perspectives. Companies such as Dangote Cement and Nigerian Breweries have faced issues with low board size that may affect their decision-making processes and overall efficiency.

In addition, board independence is another critical attribute, as independent directors are expected to provide unbiased oversight and enhance governance quality. However, striking the right balance between independent and executive directors to ensure effective oversight without stifling strategic agility remains a challenge. Firms like Nestlé Nigeria still faced with low board independence to balance effective oversight with strategic responsiveness (Okeke et al., 2023). Furthermore, increasing gender diversity on boards is associated with diverse perspectives and better decision-making. Yet, many firms struggle to have female gender representation, which can limit their intellectual capital development. Companies such as Nigerian Breweries, Honeywell, and Flour Mill have encountered challenges in have female gender on their boards to enhance intellectual capital and overall performance (Nwachukwu & Chladkova, 2023). Additionally, the frequency of board meetings can significantly influence the effectiveness of governance and strategic oversight. While too frequent meetings can lead to decision fatigue, infrequent meetings may result in inadequate oversight. Firms like Dangote Cement, champion Breweries, and Nigerian Breweries, have historically faced challenges in determining the optimal frequency of board meetings to ensure effective governance and strategic oversight (Egbunike & Okoye, 2023).

However, previous works have investigated the link between board attributes and ICE and are found to have limitations. For example, Lawal et al. (2022) and Shahzad et al. (2023) examine non-financial and service firms, leaving a gap in understanding these effects among Nigerian listed manufacturing firms (NLMFs). Furthermore, the previous studies are on banking institutions in a context that is outside Nigeria, which reduces their relevancy to the manufacturing setting in a developing country. Previous studies have focused on the concept of gender diversity in certain sectors, including Islamic banking (Oktaviana & Setiawan, 2022) and the banking sector in Africa (Asare et al., 2023); therefore, the results differ and depend on the given industry. Meanwhile, other research studies, such as Humairo and Abidin (2024), show low coefficients between gender diversity and ICE; however, these should be investigated deeper within the manufacturing industry. Meeting frequency has been associated with ICE in such areas as the Gulf banks (Aljuaidi, 2020) and firms (Attarita et al., 2017). However, these conclusions are not homogeneous across regions and sectors and, therefore, require a detailed examination in NLMFs.

Despite ICE being examined in some studies both qualitatively and quantitatively, there are no clear guidelines on how the various views, including the human, structural, and capital-employed, should be included in the evaluation of ICE. Many literature reviews have considered the Nigerian manufacturing industry in general but have not looked into specific functions and associated challenges coupled with sector-specific factors. Research, therefore, sector-specific peculiarities have been considered in their entirety to determine their exact effect on the manufacturing industry in Nigeria.

To fill these gaps, this study analyzes board attributes and ICE in NLMFs between the years 2013 and 2022 while embracing a broad ICE model and being limited to geographic and sectoral generalizability of past research.

This study specific objectives is to:

- Examine the effect of board size on intellectual capital efficiency of manufacturing firms listed in Nigeria.
- Investigate the effect of board independence on intellectual capital efficiency of in Nigerian-listed manufacturing companies.
- Assess the effect of board gender diversity on intellectual capital efficiency of Nigerian-listed manufacturing companies.
- Evaluate the effect of board meetings on intellectual capital efficiency of Nigerian listed manufacturing firms.

This study hypothesized that:

H0₁: Board size has no any significant effect on intellectual capital efficiency of listed manufacturing firms in Nigeria.

H0₂: Board independence has no any significant effect on intellectual capital efficiency of listed manufacturing firms in Nigeria.

H0₃: Board gender diversity has no any significant effect on intellectual capital efficiency of listed manufacturing firms in Nigeria.

H0₄: Board meetings has no any significant effect on intellectual capital efficiency of listed manufacturing firms in Nigeria.

This study will be relevant for scholars, practitioners, and policymakers. The scholars will gain deeper knowledge regarding the effects of board attributes on ICE in the context of the Nigerian manufacturing industry, which is under researched. The study also provides methodological contributions by including a wide range of ICE metrics that can be useful for future practice. The implication is that practitioners such as boards of directors, executive directors, and managers can use the findings to properly select capable boards of directors, improve governance structures, and manage human capital with a view to creating innovation and increased competitiveness. Both management insiders and policymakers receive research-based advice for enhancing governance codes, enhancing female board representation, and implementing suitable benchmarks for board composition and functioning, which will lead to improved monitoring and corporate responsibility. In this background, it plays a crucial role toward achieving sustainable organizations, as well as enhanced governance standards and better policies, which will enhance the economic development in Nigeria as well as other nations.

This study investigates the effect of board attributes on intellectual capital efficiency of listed manufacturing firms in Nigeria from 2013 – 2022. While the ICE is proxy by VAIC, board attributes are proxy by board size, independence, gender diversity, and board meetings.

This study covers an introduction, literature review, methodology, results and discussions, conclusion and recommendations.

2. LITERATURE REVIEW

Pulic (2004) defined intellectual capital efficiency (ICE) using the Value-Added Intellectual Coefficient (VAIC), which measures the efficiency of value creation from human, structural, and capital employed. Although VAIC provides a standardized metric for comparing ICE across firms and industries, it may oversimplify complex intangible assets and not account for industry-specific differences. Shahzad et al. (2023) assessed ICE based on employee productivity, highlighting the critical role of human capital in driving innovation. However, this approach neglects structural and relational capital. Mahmudi (2014) measured ICE by the effectiveness of organizational processes, databases, and intellectual property, emphasizing internal systems. Yet, this method may overlook the importance of human and capital employed. Kweh et al. (2022) evaluated ICE based on the quality of a firm's capital employed but fail to capture human capital. Farooq and Ahmad (2023) use an integrated approach, combining human, structural, and capital employed to measure overall efficiency, providing a comprehensive view but requiring complex data collection. This study defines ICE as the synergistic effect of these capitals in enhancing the competitiveness of Nigerian manufacturing firms.

Board attributes have a significant influence on corporate governance procedures and, ultimately, business outcomes like ICE. These consist of meeting frequency, gender diversity, board size, and independence. Mahmudi (2014) described board size as the number of directors governing a firm, noting that smaller boards may function more efficiently due to easier coordination and fewer conflicts. The limitation is that smaller boards might expertise challenges that larger boards offer. Nonetheless, their efficiency can lead to quicker decision-making and more cohesive strategic direction. Lawal et al. (2022) considered board size in terms of the number of board members, emphasizing that an optimal board size can enhance intellectual capital performance by balancing diverse insights and streamlined operations. The drawback is that determining the optimal size can be complex and context-specific. This study defines board size as the number of directors on the boards of listed manufacturing firms in Nigeria.

Aslam and Haron (2020) defined board independence as the presence of non-executive directors who are not part of the company's management, providing unbiased oversight and reducing conflicts of interest. However, non-executive directors may lack detailed operational knowledge, limiting their effectiveness. Nevertheless, their unbiased perspective strengthens governance. Farooq and Ahmad (2023) described board independence as the proportion of independent directors, emphasizing enhanced monitoring and control over management. The limitation is that a high proportion of independent directors might slow decision-making due to potential disconnects with the executive team. However, increased independence protects shareholder interests and improves governance. This study defines board independence as the proportion of non-executive and independent directors on Nigerian manufacturing firm boards.

Adams and Ferreira (2009) defined gender diversity as the representation of women on corporate boards, which can enhance decision-making by bringing diverse perspectives. However, the limitation is that increased gender diversity might lead to tokenism, where women are appointed for appearance rather than merit. Nevertheless, gender diversity promotes equality and can improve board performance. Oktaviana and Setiawan (2022) view gender diversity as the ratio of female to male directors, emphasizing that it can lead to more balanced and inclusive governance. The limitation is that focusing solely on numbers may overlook the quality of participation. This study defines gender diversity as the proportion of female directors on Nigerian manufacturing firm boards.

Gillan and Starks (2010) define board meetings as regular gatherings of directors to discuss and decide on company matters, which can enhance oversight and strategic direction. However, frequent meetings may become routine and less productive. Despite this, they signify a commitment to governance and engagement. Aljuaidi (2020) views board meetings as a mechanism for directors to monitor management, emphasizing their role in improving intellectual capital efficiency. The limitation is that excessive meetings might lead to managerial micromanagement. This study defines board meetings as the frequency of board gatherings in Nigerian manufacturing firms to explore their impact on intellectual capital efficiency.

An essential idea in corporate governance, agency theory looks at how principals like shareholders and agents like management interact and focus on minimizing conflicts of interest and guaranteeing alignment of interests (Jensen & Meckling, 1976). The application of agency theory to Nigerian listed manufacturing enterprises helps clarify the difficulties in distinguishing ownership from control, especially about founders who may have a great deal of authority and influence within the company (Eisenhardt, 1989). Studies examining board characteristics and their effect on business performance and efficiency, especially intellectual capital efficiency, have regularly been supported by research using agency theory as a theoretical framework (Demir, 2009). Using agency theory, scholars can examine how attributes of the board, such as size, independence, and gender diversity, impact the agency dynamic between management and shareholders. This, in turn, shapes organizational outcomes, such as ICE.

Ebrahim et al. (2021) examined the effect of board composition on the intellectual capital performance of the BSE commercial banks between 2014 and 2018. In the study, both regression testing analysis and correlation testing analysis are applied in assessing the relationship between board size and ICP. The study found a positive significant correlation between ICP and board size. While the study provides valuable knowledge on the relationship of board composition with ICP in Bahraini commercial banks, the generalization of the findings may not be very feasible, as the study is confined to Bahraini commercial banks only. To address this gap, this study is conducted in the Nigerian NFSFs context. Lawal et al. (2022) examined the effects of board diversity, including board size, on intellectual capital performance in Nigerian non-financial service organizations for ten years (2011-2020). They employed descriptive statistics, correlation, and Fixed Effects regressions, the finding revealed that intellectual capital performance is significantly enhanced by board size. However, focusing on non-financial firms may limit the findings' generalizability to other sectors, such as NLMFs. This study addresses this gap by analyzing the dynamics of board size and its effect on NLMFs' ICE from 2013-2022.

Shahzad et al. (2023) investigated the relationship between intellectual capital efficiency and corporate governance characteristics, such as board size, in Pakistani service companies between 2016 and 2020. Using a fixed-effect model and two-stage least squares regression, they found a strong negative association between board size and ICE, indicating that larger boards were linked to lower ICE levels. The study's focus on Pakistani service companies limits its applicability to other sectors and regions. This study fills this gap by examining board size and ICE in NLMFs from 2013-2022.

Mahmudi (2014) explored the impact of board governance features on intellectual capital performance in Indonesian banks listed on the Indonesia Stock Exchange between 2008 and 2012. Using the VAIC technique and SPSS software, the study found a significant positive relationship between board independence and intellectual capital performance. The study focused on the banking industry and the Indonesian context and the period covered limiting its generalizability to other sectors and regions, such as NLMFs. This study addresses these gaps by examining the effect of board attributes on NLMFs' ICE from 2013-2022.

Kweh et al. (2022) investigated the connection between board independence and intellectual capital efficiency (ICE) in Taiwanese semiconductor companies from 2011 to 2018. They used a stochastic nonparametric envelopment of data (StoNED) paradigm to convert structural, relational, and human capital into performance metrics. The study revealed an ideal degree of board independence that optimizes ICE, showing a substantial cubic S-curve link between ICE and board independence. While the study provides valuable insights into the semiconductor industry, its findings may not be generalized to other sectors and geographical areas, including NLMFs. This study addresses this gap by examining board attributes and ICE in NLMFs from 2013 to 2022.

Kotte and Reddy (2023) also discussed the sample analysis to explain the impact of independent directors on ICE in Indian commercial banks from 2010 to 2020 using multiple regression and the VAIC method. Even though the study demonstrated a tremendous positive relationship of board independence and ICE, it suffers from a limited industry generalization as its focus was on the banking sector and applied VAIC with no consideration of qualitative aspects of governance across different industries. In addition, it failed to consider an interaction effect of executive compensation on the ICE enhancement. These studies are then pursued in the present research to fill the foregoing gaps in two ways: by examining the effect of board independence and other characteristics of Nigerian non-financial service firm boards on ICE and by considering executive compensation as a moderator to these assessments to add richness to the results. It also provides a glimpse into how different characteristics of the board affect ICE in an emerging economy with a different governance environment.

From 2010 to 2019, Farooq and Ahmad (2023) investigated the association between non-financial companies listed on the Pakistan Stock Exchange and the success of their boards, particularly their independence. Using regression analysis with the modified value-added intellectual capital (MVAIC) model and various board features, they found a significant inverse association between board independence and ICE. Although the study offers valuable insights, its focus on Pakistani enterprises and covering ten years from 2010-2019 limits the applicability of its conclusions to other developing economies and sectors, such as NLMFs. This study fills this gap by investigating the dynamics of board independence and its effect on ICE in NLMFs from 2013 to 2022.

Oktaviana and Setiawan (2022) examined the impact of board attributes, such as gender diversity, on intellectual capital in Islamic banks in Bangladesh, Malaysia, and Indonesia from 2014 to 2019. Using multiple linear regression analysis, they found that gender diversity positively affects intellectual capital. However, the study's focus on Islamic banks in specific countries and covering six years from 2014 to 2019 limits its applicability to other regions and sectors, including NLMFs. This study addresses these gaps by analyzing board attributes and ICE in NLMFs from 2013 to 2022.

Asare et al. (2023) investigated the connection between intellectual capital and gender diversity on boards in African banks using data from 366 banks in 26 African nations between 2007 and 2015. They utilized the value-added intellectual coefficient (VAIC) and employed panel-corrected standard error estimation and panel regressions. The study found no significant impact of gender diversity on intellectual capital in African banks. However, the study's focus on African banks limits its applicability to other industries and regions, such as NLMFs. Additionally, advancements in board gender diversity practices may not have been captured in the 2007–2015 timeframe. This study fills these gaps by examining board gender diversity and its effects on ICE in NLMFs from 2013 to 2022.

In support of this, Humairo and Abidin (2024) conducted a quantitative study on the impact of gender diversity on intellectual capital performance in the Indonesian banking industry, using the Common Effect Model (CEM) and multiple regression analysis on panel data from 23 banking companies for 2021–2022. They found a positive but statistically insignificant impact of gender diversity on intellectual capital performance. While the study clarifies the connection between gender diversity and intellectual capital, its focus on Indonesia's banking industry limits its generalization to other sectors. This study fills this by examining NLMFs and using comprehensive ICE metrics over an expanded period from 2013 to 2022.

Attarita et al. (2017) analyzed the impact of board qualifications on intellectual capital efficiency (ICE) using data from 403 Thai companies listed on the Stock Exchange of Thailand (SET). Using structural equation modeling (SEM), they found that the frequency of board meetings negatively affected ICE. While insightful for the Thai context, the study's findings may not apply to other industries and regions, such as NLMFs. Moreover, the study's timeframe (2013–2022) may have missed recent advancements in NLMF board meeting procedures. This study fills these gaps by investigating board attributes and ICE in NLMFs.

Aljuaidi (2020) examined the relationship between board meetings and intellectual capital performance in Gulf banks, analyzing yearly reports from 86 banks over five years (2014–2018). Results showed a positive relationship between board meeting frequency and intellectual capital performance. Despite highlighting the value of board meetings for the banking industry, the focus on Gulf banks limits applicability to other sectors, such as NLMFs. This study addresses these gaps by examining board attributes and ICE in NLMFs from 2013 to 2022.

Adebayo et al. (2020) studied corporate governance attributes and intellectual capital in Nigerian firms and reveal a negative relationship between board meeting frequency and ICE. However, purposive sampling and multiple regression analysis enhance the focus of the study and reduce the population variance, although they limit the number of participating firms (64) and the generalizability of the study results. Furthermore, the study lacks mediating factors or variation in the nature of industries. These limitations are addressed in this study by including a larger and more diverse sample of Nigerian NFSFs and the addition of executive compensation as a moderating variable to gain a deeper understanding of how the corporate governance attributes affect ICE in a broader and more complex sample.

3. METHODOLOGY

This study uses an ex-post facto research approach to investigate how board attributes and ICE in NLMFs relate. 66 NLMFs make up the population of this study as shown in appendix A. Out of the 66 NLMFs, a representative sample of 31 firms is chosen using purposeful sampling based on the availability of data for the period 2013–2022 as shown in appendix B. Data is gathered from the chosen firms' annual reports for 2013 to 2022. STATA 13 software was utilized to carry out multiple regression analysis. The dependent variable in the model specification is intellectual capital efficiency, while the independent variables are board size, meetings, gender diversity, and independence; also, the control variables are firm age and sector. This model specification is predicated on theoretical underpinnings and earlier empirical research that suggests these board attributes may influence intellectual capital efficiency. This study adapts the model of Sanyaolu, et al. (2022). The model is stated below:

$$VAIC_{it} = \beta_0 + \beta_1 GD + \beta_2 IN_{it} + \beta_3 (GD * IN)_{it} + \beta_4 ROA_{it} + \beta_5 AGE_{it} + e_{it}$$

And modified as:

$$vaic_{it} = \beta_0 + \beta_1 bs_{it} + \beta_2 bi_{it} + \beta_3 gd_{it} + \beta_4 bm_{it} + \beta_5 age_{it} + \beta_6 sec + \epsilon_{it}$$

where: vaic = Value-added intellectual coefficient; bs = Board size; bi = board independence; gd = Bord gender diversity; bm = board meetings; age = Firm's age; sec = firm's sector; β_1 – β_5 = Coefficients of determination; β_0 = Intercept of the regression line; it = firm i time t; ϵ_i = Residual or error term.

Variable definition and measurement is shown in appendix C.

4. RESULT AND DISCUSSIONS

This section presents the result of data analysis and the discussions as it relates to descriptive statistics, Correlation Matrix, Robustness Tests, Regression results, and test of hypothesis.

Table 1

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Vaic	310	4.624	6.85	-32.53	40.07
Bs	310	9.139	2.559	4	17
Bi	310	.741	.105	.5	.92
Gd	310	.188	.139	0	.6
Bm	310	5.058	1.381	1	11

Source: STATA 13, 2024

Table 1 shows that ICE values range from -32.53 to 40.07, with a mean of 4.624 and a standard deviation of 6.85; this revealed a wider variation in how successfully firms employ their intellectual capital. Board size (bs) ranges from 4 to 17 and has a mean of 9.139 with a standard deviation of 2.559, indicating a larger variation in board size among firms. Board independence (bi) values ranging from 0.5 to 0.92 have a mean of 0.741 and a standard deviation of 0.105, revealing a moderate deviation of board independence among firms. In addition, gender diversity, which ranges from 0 to 0.6, has a mean of 0.188 and a standard deviation of 0.139, indicating low variation in gender diversity. Board meetings (BM) vary from 1 to 11, with a mean of 5.058 and standard deviation of 1.381, implying deviation in board meetings among firms.

Table 2

Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)		
(1) vaic	1.000						
(2) bs	0.115*	1.000					
	(0.044)						
(3) bi	0.173*	0.123*	1.000				
	(0.002)	(0.031)					
(4) gd	-0.055	-0.118*	0.011	1.000			
	(0.337)	(0.038)	(0.844)				
(5) bm	-0.096	0.113*	0.038	0.218*	1.000		
	(0.090)	(0.047)	(0.506)	(0.000)			

*** p<0.01, ** p<0.05, * p<0.1

Source: STATA 13, 2024

Table 2 shows a modest positive correlation between board size and intellectual capital efficiency (ICE) ($r = 0.115$, $p < 0.1$). Board independence has a weak positive association with ICE ($r = 0.173$, $p < 0.01$). Gender diversity on boards shows a weak negative correlation with ICE ($r = -0.055$, $p > 0.1$), and board meetings also have a weak negative correlation with ICE ($r = -0.096$, $p > 0.1$). There is no strong linear relationship among the independent variables.

Table 3

Robustness Test

	VIF	1/VIF
Age	1.207	.828
Gd	1.178	.849
Bs	1.145	.873
Bm	1.115	.897
sect	1.106	.904
Bi	1.065	.939

Mean VIF	1.136	.
Hettest	0.0434	
Hausman Specification Test	0.5103	
Breusch and Pagan Lagrangian Multiplier Test for Random Effects	0.0000	

Source: STATA 13, 2024

Table 3 shows that the regression model's Variance Inflation Factor (VIF) values and tolerance levels indicate no multicollinearity, ensuring model robustness. The Hettest p-value of 0.0434 suggests the presence of heteroscedasticity, which was addressed through regression robustness tests.

The random effects model is suitable for the dataset, as per the Hausman Specification Test result of 0.5103. Additionally, the Breusch and Pagan Lagrangian Multiplier Test result of 0.0000 supports the use of random effects for panel data.

Table 4

Regression results

	Coef.		p-value		Sig
Independent Variables					
Bs	.689		.000		***
Bi	6.923		.093		*
Gd	8.289		.006		***
Bm	-.566		.035		**
Age	-.156		.000		***
Constant	2.106		.582		
Overall r-squared	0.230		Number of obs	310	
Wald Chi2(6)	42.467		Prob > chi2	0.000	
*** p<.01, ** p<.05, * p<.1					
Source: STATA 13, 2024					

Table 4 presents the regression results, revealing significant insights into the relationships among the dependent variable, control factors, and independent variables. The total R-squared value of 0.230 indicates that the model explains 23% of the variation in ICE for the sample of NLMFs. The statistically significant Wald Chi-square result ($p < 0.001$) confirms the model's fitness and predictive potential.

Board size has a coefficient of 0.689 with a p-value of 0.000, indicating a positive and statistically significant effect, implying that an increase in board size has a significant effect on ICE.

This study therefore rejects the null hypothesis 1. However, this finding is in support of agency theory (Jensen & Meckling, 1976) and the studies of Ebrahim et al. (2021) and Lawal et al. (2022), but contrary to the study of Shahzad et al. (2023).

On the contrary, board independence has a coefficient of 6.923 with a $p = 0.093$, documenting that board independence is statistically insignificant at the 0.05 level. This study accepts the null hypothesis 2. This study finding is in support of the study of Mahmudi (2014) and Farooq and Ahmad (2023), contrary to agency theory (Jensen & Meckling, 1976) and the study of Kotte and Reddy (2023).

In addition, gender diversity has a coefficient of 8.289, and a p-value of 0.006 exhibits a positive and statistically significant coefficient at the 0.01 level. Indicating that gender diversity has a positive, significant effect on ICE. In the light of this, this study rejects the null hypothesis 3.

This finding supports agency theory (Jensen & Meckling, 1976) and the study of Oktaviana and Setiawan (2022) but is contrary to the study of Humairo and Abidin (2024) and Asare et al. (2023).

Board meetings have a coefficient of -0.566 and a p-value of 0.035, which has a negative and statistically significant effect on ICE. This study rejects null hypothesis 4.

This finding does not support the study of Attarita et al. (2017) and Adebayo et al. (2020), but is contrary to agency theory (Jensen & Meckling, 1976) and the study of Aljuaidi (2020).

5. CONCLUSION AND RECOMMENDATIONS

In conclusion of this study, board size, gender diversity, and meetings significantly affect ICE in NLMFs. In particular, there is a negative and statistically significant effect of the frequency of board meetings on ICE; but, there is a positive and statistically significant effect of board size and gender diversity on ICE. Unfortunately, there is an insignificant effect of board independence on ICE.

This study recommends that as follows:

Nigerian-listed manufacturing firms without females should try to have at least one female director on their board; those that have less than 10 board members should try to increase the number, as this will improve intellectual capital efficiency. While board meetings are essential for governance, those firms with more than five board meetings should try to reduce it, as too-frequent meetings lead to fatigue that may reduce ICE. Additionally, the role and effectiveness of independent directors should be reexamined to enhance their contribution to ICE, ensuring they provide meaningful oversight and strategic input.

6. REFERENCES

- [1] Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2), 291-309.
- [2] Adebayo, A. O., Oyewole, O. M., & Lamidi, W. A. (2020). Corporate governance characteristics and intellectual capital of listed non-financial service firms in Nigeria. *Horn of Africa Journal of Business and Economics (HAJBE)*, 4(1), 44-55.
- [3] Aljuaidi, O. (2020). Impact of Characteristics of Board of Directors on Intellectual Capital Performance for Banks Listed in Gulf Markets. *International Journal of Innovation, Creativity and Change*, 14(2).
- [4] Asare, N., Aboagye-Otchere, F., & Onumah, J. M. (2023). Corporate board structures and intellectual capital: evidence from banks in Africa. *Asian Journal of Economics and Banking*, 7(1), 146-163.
- [5] Aslam, E. & Haron, R. (2020). The influence of corporate governance on intellectual capital efficiency: evidence from Islamic banks of OIC countries. *Asian Journal of Accounting Research*, 5(2), 195-208
- [6] Attarita, T., Dampitakseb, K., & Panmanee, P. (2017). Using SEM to Verify the Impacts of Board of Director Characteristics and Intellectual Capital Efficiency. A Case of Thailand-Listed Companies. *International Journal of Applied Business and Economic Research*, 15(10), 321-332.
- [7] Demir, R. (2009). Corporate governance and firm performance in Turkey: Evidence from Turkish manufacturing industry. *International Journal of Economic Perspectives*, 3(1), 42-54.
- [8] Ebrahim, S. A., Ali, B. J., & Oudat, M. S. (2021). The effect of board characteristics on intellectual capital in the commercial banks sector listed on the Bahrain Bourse: An empirical study. *Information Sciences Letters An International Journal*, 10(S1), 91-109.
- [9] Egbunike, F. C., & Okoye, E. I. (2023). Comparative analysis of firms' financial performance in manufacturing and non-manufacturing sectors in Nigeria. *Research Journal of Finance and Accounting*, 14(1), 24-32. Retrieved from <https://www.iiste.org/Journals/index.php/RJFA/article/view/40150>
- [10] Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57-74.
- [11] Farooq, M., & Ahmad, N. (2023). Nexus between board characteristics, firm performance and intellectual capital: an emerging market evidence. *Corporate Governance: The International Journal of Business in Society*.
- [12] Gillan, S. L., & Starks, L. T. (2000). Corporate governance proposals and shareholder activism: The role of institutional investors. *Journal of Financial Economics*, 57(2), 275-305.
- [13] Humairo, S., & Abidin, Z. (2024). Influence of Gender Diversity, Age, Education, and Work Experience Top Management Team on Intellectual Capital Performance: Empirical Study on Sector Companies Banking in 2021-2022. *Journal of Business Management and Economic Development*, 2(01), 142-158.
- [14] Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360.
- [15] Kamath, G. (2019). Board Characteristics and Intellectual Capital Performance: A Comparison of Service vs. Manufacturing Firms in India. *Scholedge International Journal of Business Policy & Governance*, 6(1), 1-11. <https://doi.org/10.19085/sjbp060>
- [16] Kotte, S., & Reddy, I. L. (2023). The influence of corporate governance factors on intellectual capital performance: Panel data evidence from the Indian banking sector. *Banks and Bank Systems*, 18(2), 101-112. doi:10.21511/bbs.18(2).2023.09

- [17] Kweh, Q. L., Lu, W. M., Ting, I. W. K., & Thi My Le, H. (2022). The cubic S-curve relationship between board independence and intellectual capital efficiency: Does firm size matter?. *Journal of Intellectual Capital*, 23(5), 1025-1051.
- [18] Lawal, T., Abdulazeez, D.A., & Saidu, M. (2022). Board diversity and intellectual capital performance of listed non-financial service firms in Nigeria. *Accounting Analysis Journal*, 11(2), 85-93.
- [19] Mahmudi, B. (2014). The Influence of Board Governance Characteristics on Intellectual Capital Performance (Empirical Study on Listed Banks in BEI 2008 – 2012). *Rev. Integr. Bus. Econ. Res.*, 4(1), 417-430.
- [20] Nwachukwu, C. C., & Chladkova, H. (2023). Corporate governance and firm performance: Evidence from the Nigerian non-financial services sector. *African Journal of Economic and Management Studies*, 14(1), 56-74. <https://doi.org/10.1108/AJEMS-08-2022-0332>
- [21] Okeke, T. C., Nneji, I. D., & Anichebe, N. A. (2023). Board attributes and intellectual capital efficiency of listed non-financial firms in Nigeria. *Journal of Business Diversity*, 24(3), 59-74. Retrieved from <https://www.articlegateway.com/index.php/JBD/article/view/3971>
- [22] Oktaviana, A. R., & Setiawan, D. (2022). Board Characteristics and Intellectual Capital in Islamic Banks: Evidence from Indonesia, Malaysia and Bangladesh. *Falah: Journal Ekonomi Syariah*, 7(1), 1-12. <https://doi.org/10.22219/jes.v7i1.19900>
- [23] Pulic, A. (2004). Intellectual capital – does it create or destroy value? *Measuring Business Excellence*, 8(1), 62-68.
- [24] Sanyaolu, W. A., Eniola, A. A., Zhaxat, K., Nursapina, K., Kuangaliyeva, T. K. & Odunayo, J. (2022) Board of directors' gender diversity and intellectual capital efficiency: The role of international authorisation, *Cogent Business & Management*, 9(1), 2122802, <https://doi.org/10.1080/23311975.2022.2122802>
- [25] Shahzad, K., Shah, S. Q. A., Lai, F. W., Jan, A. A., Shah, S. A. A., & Shad, M. K. (2023). Exploring the nexus of corporate governance and intellectual capital efficiency: from the lens of profitability. *Quality & Quantity*, 57(3), 2447-2468.