

IMPACT OF ARTIFICIAL INTELLIGENCE AND BOARD CHARACTERISTICS ON EARNINGS PER SHARE OF LISTED NIGERIAN BREWERIES

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ABSTRACT

The rapid evolution of technology and corporate governance practices has sparked growing interest in their combined effects on firm performance, particularly in emerging markets. This study explores the impact of Artificial Intelligence (AI) adoption and board characteristics—namely board size, gender diversity, and managerial ownership—on the Earnings per Share (EPS) of listed Nigerian breweries over the period 2014–2023. The research draws on panel data obtained from annual reports and financial statements of the five breweries listed on the Nigerian Exchange Group (NGX), employing a fixed effects regression model to evaluate the relationships among the variables. The results reveal that, while AI adoption, board size, and managerial ownership exhibited statistically insignificant effects on EPS, gender diversity showed a marginally significant negative effect, suggesting transitional governance challenges in leveraging diverse perspectives for financial gains. Collectively, however, the predictors were statistically significant, explaining approximately 24% of the variations in EPS, indicating that board composition and AI MSMER adoption jointly contribute to shareholder value. These findings imply that although AI investments may involve substantial short-term costs and governance restructuring, their long-term potential in enhancing profitability remains strong if strategically aligned with board oversight. The study underscores the need for Nigerian breweries to strengthen board competencies, embrace inclusive governance practices, and integrate AI strategically into operational models. By bridging gaps in existing literature, the research contributes to a nuanced understanding of how governance structures and technological innovations interact to shape financial performance in emerging economies, offering practical insights for managers, policymakers, and investors.

Keywords: Artificial Intelligence, Board Characteristics, Earnings per Share, Nigerian Breweries

INTRODUCTION

The financial performance of firms in emerging economies such as Nigeria remains a central driver of growth, stability, and competitiveness. Listed Breweries, in particular, are vital to Nigeria's manufacturing and consumer goods sector, contributing to employment, tax revenue, and foreign exchange earnings (Abolarinwa, Asogwa, Ezenwakwelu, Court, & Adedoyin, 2020). Despite their economic relevance, these firms have recorded fluctuating performance over the past decade, raising concerns about the internal and external factors influencing shareholder returns.

Among the internal determinants, board characteristics play a crucial role in shaping organizational outcomes. Attributes such as board size, gender diversity, and managerial ownership directly influence strategic oversight, the quality of decisions, and the alignment of managerial interests with those of shareholders (Adebayo et al., 2020). Larger boards often enhance monitoring capacity, gender diversity contributes to more inclusive and innovative strategies, while managerial ownership strengthens accountability by linking executive welfare to firm profitability (Almashhadani & Almashhadani, 2023). These features are particularly

important in industries like brewing, where competition, regulation, and changing consumer preferences require agile yet effective decision-making structures.

At the same time, technological advancement—particularly Artificial Intelligence (AI)—is transforming business operations globally. AI, a branch of computer science concerned with building intelligent systems, is increasingly applied in areas such as automation, predictive analytics, defect detection, and supply chain optimization (Renner, 2020). For firms, AI enables efficiency gains, cost reduction, and improved financial forecasting, thereby contributing to stronger profitability and shareholder value (Makridakis, 2017). Although adoption in Nigeria remains at an early stage due to infrastructural gaps, high investment costs, and limited expertise (Velu, 2020), its potential to improve competitiveness and performance is widely acknowledged.

While board characteristics and AI adoption have individually been linked to performance outcomes, their combined effect on Earnings per Share (EPS) has received limited scholarly attention. EPS is a vital performance indicator that reflects profitability and the value created for shareholders, making it a suitable measure for assessing how governance and technology interact to influence firm outcomes. Previous studies have often analyzed governance or technology in isolation, leaving a gap in understanding the extent to which effective board structures can complement AI adoption in driving financial results in Nigerian Breweries (Olayemi & Adebisi, 2021).

This study, therefore, investigates the relationship between board characteristics and EPS in listed Nigerian Breweries, while examining how AI strategies may moderate this relationship. By focusing on EPS, the study provides empirical insights into how governance features and technological adoption jointly shape shareholder value, thereby offering practical implications for both policy and managerial decision-making.

The financial performance of listed Nigerian Breweries has been unstable in recent years, reflecting challenges in strategic management and competitiveness (Eze & Onyekwere, 2024). This raises questions about the extent to which board structures contribute to firm outcomes such as Earnings per Share. Board characteristics—including board size, gender diversity, and managerial ownership—remain critical determinants of financial performance, yet their direct influence on shareholder value creation has not been fully established in the Nigerian context. Simultaneously, the adoption of Artificial Intelligence has emerged as a potential game changer for manufacturing firms. AI supports efficiency, reduces operational costs, and enhances data-driven decision-making, all of which can improve profitability. However, the extent to which Nigerian breweries leverage AI remains limited due to inadequate infrastructure, financial constraints, and limited technological expertise (Velu, 2020).

Although prior studies have separately highlighted the importance of board features and AI strategies, little research has examined their combined impact on EPS, which serves as a critical measure of firm performance and shareholder wealth. This study seeks to address this gap by analyzing the effect of board characteristics on EPS in listed Nigerian Breweries and exploring the moderating role of AI adoption in this relationship.

Building on this background, the study seeks to examine how Artificial Intelligence and board characteristics affect the Earnings per Share of listed Nigerian breweries. It considers whether these variables, either independently or in combination, exert any significant influence on shareholder value and financial outcomes. The study proceeds on the premise that Artificial

Intelligence and board characteristics may not have a substantial impact on the Earnings per Share of breweries in Nigeria.

CONCEPTUAL REVIEW

Board characteristics are central to determining how effectively firms create value for shareholders. Independent directors, for instance, enhance objectivity and strengthen oversight, ensuring that managerial decisions are aligned with shareholders' wealth maximization (Garad et al., 2021). By providing unbiased scrutiny, independent boards are better positioned to evaluate strategic investments, such as Artificial Intelligence (AI), thereby minimizing agency problems and supporting initiatives that enhance profitability and Earnings per Share (Boachie, 2021). Similarly, board expertise in finance and technology contributes to better decisions on resource allocation. Directors with knowledge of data analytics, AI, and financial management are more capable of assessing technological proposals, asking critical questions, and ensuring that technology adoption translates into improved financial performance (Ghasemaghahi et al., 2018). Such expertise enables firms to leverage innovation to strengthen competitiveness and boost EPS.

Leadership structure also plays a significant role. CEO duality, where one individual holds both the CEO and board chair positions, concentrates power and weakens accountability (Malenko, 2024). This undermines independent oversight of strategic initiatives, including AI adoption, often resulting in poor allocation of resources that negatively affect shareholder returns. Conversely, separating the two roles enhances monitoring and supports sound decision-making, which in turn contributes to higher Earnings per Share. Beyond leadership, organizational culture influences the extent to which firms embrace AI. A culture of innovation and openness facilitates smooth adoption and integration of AI, while rigid or hierarchical cultures may resist technological change, thereby limiting financial gains (Velu, 2020).

In addition to internal factors, external dynamics such as AI governance and the regulatory environment are equally important. Responsible AI practices—including data privacy, transparency, and ethical use—help firms avoid reputational and legal risks while ensuring sustainable profitability (Brynjolfsson & McAfee, 2017). Moreover, industry technological intensity shapes the speed and scale of AI adoption. Although breweries operate in a relatively low-tech sector, AI applications in supply chain management, quality assurance, and operational efficiency can still generate cost savings and ultimately improve EPS (Makridakis, 2017). However, weak regulatory support, infrastructural deficits, and inconsistent policies in Nigeria continue to hinder both effective board performance and AI integration, thereby limiting their potential impact on shareholder value (Olayemi & Adebisi, 2021).

Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) Framework provides a comprehensive model for analyzing the adoption of Artificial Intelligence (AI) in corporate governance and financial performance. Developed by Tornatzky and Fleischer (1990), the framework highlights three critical dimensions—technological factors, organizational factors, and environmental factors—that influence AI adoption within Nigerian Breweries. This framework is relevant to the study as it explains how firms integrate AI strategies into their governance structures, which in turn affects their financial performance.

The technological factors in this study refer to the characteristics of AI technologies, including automation, predictive analytics, and decision-support systems. AI has the potential to enhance board decision-making, improve financial forecasting, and optimize operational efficiency.

However, AI adoption in Nigerian Breweries depends on factors such as ease of implementation, compatibility with existing systems, and cost-effectiveness. Companies with AI technologies that are user-friendly, scalable, and integrate seamlessly with financial management systems are more likely to experience improved financial outcomes. The ability of AI to provide real-time data analysis, fraud detection, and performance monitoring makes it an essential tool for enhancing corporate governance and financial performance.

The organizational factors focus on the internal characteristics of Nigerian Breweries that influence AI adoption, particularly board characteristics such as board size, gender diversity, and managerial ownership structure. Larger and more independent boards are likely to facilitate AI adoption by ensuring strategic alignment and regulatory compliance. Additionally, managerial ownership structure plays a role in driving AI initiatives, as managers with equity stakes have a vested interest in adopting innovative technologies that improve profitability. The availability of financial resources, technical expertise, and management support also determines the extent to which AI is integrated into financial decision-making and governance processes.

The environmental factors encompass external pressures such as regulatory policies, competitive dynamics, and industry trends that influence AI adoption in Nigerian Breweries. The Nigerian corporate landscape is evolving, with increasing regulatory requirements on financial reporting, risk management, and corporate transparency. AI technologies, particularly in automated compliance monitoring and financial fraud detection, are becoming critical in meeting these regulatory standards. Competitive pressures also drive AI adoption, as companies seek to leverage AI-driven analytics to enhance market positioning and profitability. Additionally, advancements in AI infrastructure and industry-wide digital transformation initiatives influence how firms integrate AI into their governance and financial management strategies.

By applying the TOE Framework, this study examines how Nigerian Breweries adopt AI strategies within their governance structures and how these elements collectively impact financial performance. The framework helps in understanding the interplay between technological advancements, corporate governance mechanisms, and external market forces, providing insights into the role of AI in enhancing financial outcomes.

Stewardship Theory

Stewardship Theory, developed by Donaldson and Davis (1991), presents an alternative perspective to the traditional Agency Theory by suggesting that managers are inherently trustworthy and motivated to act in the best interests of shareholders. Unlike agency theorists who assume self-serving behavior, stewardship theorists view executives and board members as stewards whose motives are aligned with the objectives of the firm. The theory posits that stewards place higher value on organizational and collective success than on individual gains, particularly when the organizational culture supports empowerment, trust, and intrinsic motivation.

From a corporate governance perspective, Stewardship Theory implies that board members, especially when actively engaged and empowered, will make decisions that support long-term firm performance. This has direct implications for board characteristics: smaller, more cohesive boards with aligned goals can function efficiently without excessive monitoring (Smith, 2025). In the context of Nigerian breweries, where relationship-based management and communal

values may influence governance behaviors, stewardship may be a better explanatory lens than purely control-based mechanisms.

Moreover, gender diversity and managerial ownership—both critical aspects of board structure—can enhance stewardship when board members feel personally invested in the company's future. For instance, a director with equity in the firm may see themselves as a steward of both shareholder and firm value, thereby promoting financial health and strategic innovation (Trivedi, Bhagat, & Sharma, 2024).

Board Characteristics and EPS

Board size has been extensively studied in relation to firm performance, with mixed results. Kyere and Ausloos (2021) found that larger boards in Sub-Saharan Africa brought diverse expertise, strategic networks, and stronger oversight, which contributed to higher Earnings per Share (EPS). However, they cautioned that excessively large boards could slow decision-making and create coordination problems, ultimately reducing financial performance. In Nigeria, Eze and Uchenna (2023) examined listed manufacturing firms and concluded that boards with 7–10 members recorded significantly higher EPS compared to firms with fewer or more directors, supporting the idea that an optimal board size enhances efficiency and shareholder returns. Similarly, Ibrahim and Mohammed (2022) observed that Nigerian breweries with moderately sized boards achieved superior EPS due to more effective decision-making and access to strategic resources. These findings suggest that the relationship between board size and EPS may be non-linear, with both very small and very large boards potentially undermining shareholder value.

Gender diversity on boards has also been linked to improved financial outcomes. Dang, Houanti, and Vo (2021) reported that gender-diverse boards in European firms enhanced EPS through better decision-making, reduced groupthink, and stronger stakeholder representation. In emerging economies, Post and Byron (2015) found that female directors improved board monitoring, leading to higher profitability metrics, including EPS. For Nigeria, Olabisi and Bolarinwa (2022) analyzed manufacturing firms and found that the presence of women on boards positively correlated with EPS, particularly when women held leadership roles such as board chairs or audit committee chairs. Abiola and Oyeyemi (2023) similarly noted that breweries with gender-diverse boards experienced stronger EPS performance due to inclusivity in strategy formulation and innovation adoption. These studies indicate that gender diversity strengthens board effectiveness, which is reflected in shareholder returns.

Managerial ownership has been associated with better financial performance by aligning managers' interests with those of shareholders. Asadi et al. (2021) found an inverted U-shaped relationship between managerial ownership and EPS—low ownership had limited impact, moderate ownership significantly improved EPS, while excessively high ownership risked managerial entrenchment. Yahaya and Lawal (2022), studying Nigerian firms, confirmed a positive and significant relationship between managerial ownership and EPS, arguing that managers with equity stakes were more accountable, risk-aware, and committed to sustainable profitability. Ofori and Kwarteng (2023) also observed that managerial ownership in African breweries enhanced EPS by aligning executive incentives and encouraging long-term investment decisions. Overall, managerial ownership acts as both a motivational and governance mechanism for improving shareholder value.

Artificial Intelligence (AI) adoption is increasingly recognized as a key driver of financial performance. Brynjolfsson and McAfee (2017) demonstrated that firms using AI-driven

automation and analytics achieved higher EPS by reducing operational costs and increasing productivity. In manufacturing, Makridakis (2017) argued that AI integration strengthened efficiency and competitive positioning, translating into improved shareholder returns. In the Nigerian context, Adebayo et al. (2023) found that AI-enabled predictive analytics in listed breweries increased EPS by minimizing downtime, reducing production waste, and enhancing product quality. Similarly, Okoro and Chinedu (2022) reported that Nigerian firms adopting AI for supply chain management and marketing optimization recorded higher EPS than non-adopters. These findings underscore that AI adoption enhances operational efficiency and directly contributes to increased shareholder value.

Board Characteristics, AI, and EPS

Recent studies have begun examining the combined effect of board characteristics and AI adoption on firm performance. Gibson, Wainwright, and Amankwah (2020) found that firms with gender-diverse boards and technologically knowledgeable directors were more successful in implementing AI, leading to higher Earnings per Share (EPS) through innovation-driven growth. Okonkwo et al. (2022), focusing on Nigerian breweries, reported that board attributes such as moderate size, gender diversity, and managerial ownership significantly moderated the effect of AI adoption on EPS. They argued that well-structured boards facilitated effective resource allocation and provided oversight in AI-driven projects, ensuring that technological investments translated into enhanced shareholder returns. Similarly, Eneh and Chukwu (2023) highlighted that boards with directors experienced in digital innovation were better equipped to drive AI integration, which directly improved EPS through operational efficiency and value creation.

RESEARCH DESIGN

This study adopts a quantitative research design that integrates correlation and descriptive approaches to investigate the relationship between board characteristics (board size, gender diversity, managerial ownership structure), artificial intelligence (AI) strategy adoption, and Earnings per Share (EPS). This design is appropriate as it enables the researcher to measure the strength and direction of relationships among the variables without altering or manipulating them.

Population and Sample Size

The population of the study consists of the five breweries listed on the Nigerian Exchange Group (NGX) as of 2025. A census approach will be used to ensure that all companies in the sector are captured. By covering all five listed breweries over a ten-year period (2014–2023), the study provides a comprehensive representation of governance and technological dynamics in the brewery industry while minimizing sampling bias. This approach strengthens the reliability of the findings and ensures they reflect the sector as a whole.

Sources of Data

The study makes use of secondary data obtained from publicly available sources, including annual reports and financial statements of the selected breweries. The data will focus on board characteristics, AI adoption, and Earnings per Share across the study period.

Model Specification

The model specification for the study is expressed as:

$$EPS_{it} = \beta_0 + \beta_1 ASB_{it} + \beta_2 BS_{it} + \beta_3 GD_{it} + \beta_4 MOS_{it} + \epsilon_{it}$$

Where EPS represents Earnings per Share, ASB denotes AI Strategy Binary (1 = AI adopted, 0 = AI not adopted), BS is Board Size, GD is Gender Diversity, and MOS is Managerial

Ownership Structure. Here, β_0 represents the intercept, β_1 – β_4 denote the slope coefficients of the independent variables, and ϵ is the error term.

The hypotheses of the study will be tested at a 5% significance level ($p < 0.05$) to determine whether board characteristics and AI adoption have a statistically significant influence on firm performance. The coefficient of determination (R^2) from the regression output will indicate the proportion of variation in ROA explained by the independent variables. Data analysis will be carried out using the Econometric View (E-Views) statistical package to ensure accuracy, robustness, and reliability of results.

RESULT AND DISCUSSION

To determine the impact of Artificial Intelligence and Board Characteristics on Earnings per share in Listed Nigerian Breweries, this section presents and evaluates the results in relation to the objective, covering the study's aim of understanding how artificial intelligence and board characteristics impacts earnings per share.

FIXED effect pooled (OLS) panel data econometrics approaches were utilized to estimate the regression in the firm's model

Dependent Variable: EPS

Method: Panel Least Squares

Date: 06/27/25 Time: 08:07

Sample: 2014 2023

Periods included: 10

Cross-sections included: 5

Total panel (unbalanced) observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AI	-2.834132	1.900970	-1.490887	0.1447
BOARD_SIZE__BS_	-0.104762	0.326668	-0.320698	0.7503
GENDER_DIVERSITY				
__GD_	-15.98166	8.036598	-1.988610	0.0544
MOS	-27.14985	46.10181	-0.588911	0.5596
C	6.054969	4.737080	1.278207	0.2094

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.377197	Mean dependent var	0.390444
Adjusted R-squared	0.238796	S.D. dependent var	3.436050
S.E. of regression	2.997850	Akaike info criterion	5.210524
Sum squared resid	323.5358	Schwarz criterion	5.571857
Log likelihood	-108.2368	Hannan-Quinn criter.	5.345226
F-statistic	2.725398	Durbin-Watson stat	2.050962
Prob(F-statistic)	0.018543		

Source: Author's Compilation (2025) EViews 10.0

The fixed effects regression model evaluated the influence of Artificial Intelligence (AI) and board characteristics on the Earnings Per Share (EPS) of listed Nigerian breweries from 2014 to 2023. The coefficient for AI was negative (-2.83), indicating a downward pressure on EPS,

though this effect was not statistically significant ($p = 0.1447$). This suggests that while AI adoption may involve high implementation costs or operational adjustments, its impact on short-term earnings remains inconclusive based on the data. Similarly, board size showed a negative but statistically insignificant effect on EPS, implying that changes in the number of board members had little or no measurable influence on shareholder earnings during the study period.

Gender diversity on the board revealed a more substantial effect, with a coefficient of -15.98 and a p -value of 0.0544 , making it marginally significant at the 10% level. This result suggests a potential short-term negative relationship between increased female board representation and EPS. While this does not necessarily indicate a negative impact of diversity itself, it may reflect transitional challenges or underutilized potential in corporate governance structures. The variable representing managerial ownership structure (MOS) also had a negative but insignificant effect, suggesting no clear link between managerial ownership structure and earnings performance.

The overall model showed an R-squared of 0.3772 and an adjusted R-squared of 0.2388 , indicating that approximately 24% of the variation in EPS is explained by the independent variables within the firms over time. The F-statistic was significant at the 5% level ($p = 0.0185$), meaning that the model as a whole is statistically reliable in explaining variations in EPS. The Durbin-Watson statistic of 2.05 shows no strong evidence of autocorrelation in the residuals, enhancing the credibility of the estimates. Despite the limited significance of individual predictors, the model provides valuable insights into how internal governance and technology adoption may influence financial performance in Nigerian breweries.

Test of Hypothesis

H₀₁: There is no significant relationship between Artificial Intelligence, Board Characteristics and Earnings per Share in Listed Nigerian Breweries.

The regression results of the objective revealed that the model was statistically significant overall ($p = 0.0185$), indicating that the combination of Artificial Intelligence and board characteristics collectively influences Earnings per Share (EPS). Among the variables, gender diversity had a marginally significant negative impact ($p = 0.0544$), suggesting that while inclusion efforts are growing, they may not yet translate into higher earnings for shareholders—possibly due to token representation, resistance to change, or transitional costs associated with reshaping governance norms. The overall explanatory power of the model was modest, with an adjusted R-squared of 0.24 , meaning about a quarter of the variation in EPS is captured by the predictors.

Artificial Intelligence, board size, and managerial ownership structure were all statistically insignificant in relation to EPS. Although AI had a large negative coefficient (-2.83), its p -value (0.1447) indicated that this relationship could not be confidently affirmed. This may reflect the high initial costs of AI integration without immediate financial returns or limited strategic alignment between AI deployment and profitability objectives. Managerial ownership and board size likewise showed no significant effect, highlighting that these governance features alone may not directly affect earnings outcomes. Despite the mixed significance of individual variables, the model's overall validity supports rejecting the null hypothesis (H_{03}) and affirms that a collective relationship exists between the predictors and EPS in listed Nigerian breweries.

Summary

The analysis examined the impact of Artificial Intelligence (AI) and board characteristics—including board size, gender diversity, and managerial ownership structure—on Earnings Per Share (EPS) of listed Nigerian breweries over the period 2014–2023. The fixed effects regression results revealed that, collectively, AI and board characteristics significantly influence EPS, as indicated by the overall model significance ($p = 0.0185$). Among the individual variables, gender diversity was marginally significant at the 10% level, exhibiting a negative coefficient, while AI, board size, and managerial ownership structure were statistically insignificant. These findings suggest that while board composition and AI adoption interact to shape earnings outcomes, the immediate effects of technological investments and certain governance attributes may be limited or transitional. The adjusted R-squared of 0.2388 indicates that approximately 24% of the variation in EPS is explained by the combined predictors, highlighting those other factors beyond AI and board characteristics also contribute to earnings performance.

CONCLUSION

The study concludes that the interplay between Artificial Intelligence and board characteristics has a measurable, though modest, influence on EPS in Nigerian breweries. Gender diversity on boards showed a potential short-term negative effect, which may reflect challenges associated with integrating diverse perspectives into decision-making or transitional adjustments in governance practices. While AI adoption, board size, and managerial ownership structure did not individually demonstrate significant impacts on EPS, their collective contribution confirms that governance structures and technology adoption remain relevant to shaping financial outcomes. These results underscore the importance of aligning board competencies, composition, and strategic AI initiatives to achieve sustainable improvements in earnings performance.

Recommendations

Based on the findings, Nigerian breweries should focus on strengthening the strategic alignment between AI initiatives and board oversight to fully realize potential financial benefits. Boards should leverage diversity not only for representation but also to actively enhance decision-making and innovation outcomes, possibly through capacity-building programs and clearer role definition for female directors. Additionally, firms should consider optimal board sizes and managerial ownership structures that promote effective oversight without impeding agility or decision-making efficiency. Finally, while AI investments may not yield immediate EPS improvements, sustained commitment, proper integration with operational strategies, and continuous monitoring can help ensure that technological adoption translates into long-term earnings growth.

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