

VALUE-ADDED INTELLECTUAL CAPITAL DISCLOSURE AND FINANCIAL PERFORMANCE OF QUOTED INDUSTRIAL GOODS FIRMS IN NIGERIA



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ABSTRACT

Despite the recognition of intellectual capital, there is growing concern that many industrial firms in Nigeria are not fully leveraging their intellectual capital, potentially limiting their financial performance and overall competitiveness. This study examined the value-added intellectual capital disclosure and financial performance of quoted industrial firms in Nigeria, from 2012 to 2023. The population comprises all the twenty-one (21) quoted industrial goods firms in Nigeria while filtering criteria was used to arrive at a sample size of seventeen (17) quoted industrial goods firms. The hypotheses were tested using random effect regression model. The results showed that structural capital efficiency has a significant positive effect on return on assets of quoted consumer goods firms in Nigeria for the period under review. However, capital employed efficiency (CEE) and human capital efficiency (HCE) have insignificant positive effects on return on assets (ROA) of quoted consumer goods firms in Nigeria for the period under review. The study recommended that the consumer goods firms should focus on improving how they allocate and utilize their capital resources. By carefully monitoring and optimizing capital employed, firms can ensure that their assets generate maximum returns. This may involve investment in technologies and processes that streamline operations and reduce inefficiencies. Also, the consumer goods firms should prioritize continuous investment in the education and training of their workforce. Training programs should focus on enhancing technical skills, leadership abilities, and industry-specific knowledge to ensure employees can contribute to the firm's operational and financial goals.

Keywords: Capital Employed Efficiency; Financial Performance, Human Capital Efficiency; Structural Capital Efficiency; Value-Added Intellectual Capital Disclosure;

INTRODUCTION

In today's competitive business environment, the implication of intellectual capital as a driver of financial performance has garnered increasing attention globally. As organizations strive for sustainable growth and competitive advantage, the effective management and disclosure of intellectual capital—comprising human capital, structural capital, and capital employed has become crucial. Human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE) are recognized as key determinants of a firm's value creation and overall financial performance. Globally, firms across various industries are investing in their intellectual capital to enhance innovation, operational efficiency, and financial outcomes (Smriti & Das, 2021; Agostini et al., 2022). The growing emphasis on knowledge-based assets underscores the need for transparent disclosure and strategic management of intellectual capital to align with investors' expectations and market demands (Secundo et al., 2020).

In Africa, the concept of intellectual capital is gaining traction as businesses recognize its potential to drive economic growth and enhance competitiveness. However, the adoption and integration of intellectual capital practices vary widely across the continent. African firms, particularly in emerging markets, face unique challenges such as limited access to resources, infrastructural deficits, and varying levels of managerial expertise. Despite these challenges, there is a growing awareness of the role of intellectual capital in improving organizational performance and value creation. African firms are increasingly focusing on leveraging their human, structural, and capital resources to foster innovation and operational excellence (Nyarko et al., 2022). The demand for effective intellectual capital management and disclosure is rising as investors and stakeholders seek more comprehensive information to make informed decisions (Marzo et al., 2022).

In Nigeria, the industrial sector plays a pivotal role in the nation's economy, contributing significantly to GDP and employment. The effectiveness of intellectual capital management in Nigerian industrial firms has become a critical area of interest, particularly in light of the challenges faced by the sector. Nigerian industrial firms are increasingly recognizing the importance of human capital efficiency, structural capital efficiency, and capital employed efficiency in driving their financial performance (Akintoye *et al.*, 2021). Human capital, including the skills and expertise of employees, is essential for innovation and operational success. Structural capital, comprising organizational processes and systems, supports efficient operations and value creation. Capital employed, representing the financial resources invested in the firm, is crucial for achieving growth and profitability (Nadeem *et al.*, 2020).

In the contemporary business landscape, the intangible assets of a firm, collectively referred to as intellectual capital, have increasingly become critical drivers of competitive advantage and financial performance. Intellectual capital, encompassing human capital, structural capital, and capital employed, represents the knowledge-based resources that organizations leverage to achieve sustained growth and profitability. As the global economy becomes more knowledge-intensive, the importance of managing and disclosing intellectual capital has gained prominence, particularly among firms in sectors where innovation, efficiency, and strategic resource allocation are vital (Iazzolino & Laise, 2022).

Financial performance is a key measure of a firm's ability to generate revenue, sustain profitability, and maximize shareholder value. It is often assessed using financial indicators such as return on assets (ROA) (Al-Shubiri *et al.*, 2022). Strong financial performance reflects efficient resource utilization, effective cost management, and strategic decision-making that enhances a firm's market position (Nguyen & Nguyen, 2021). In the context of intellectual capital, financial performance is influenced by the extent to which firms leverage intangible assets such as human capital, structural capital, and relational capital to drive innovation and productivity (Pulic, 2020).

The industrial sector in Nigeria, a significant contributor to the nation's GDP and employment, faces numerous challenges, including global competition, economic volatility, and the need for sustainable growth strategies. For quoted industrial firms in Nigeria, efficiently managing and disclosing intellectual capital is essential not only for maintaining competitiveness but also for enhancing financial performance. However, there is a growing recognition that these firms may not fully capitalize on the potential of their intellectual capital due to inadequate management practices and disclosure (Akinyomi, 2021).

Despite the recognized importance of intellectual capital, many Nigerian firms still struggle with inadequate disclosure practices and limited understanding of how to effectively leverage these assets for financial performance (Okere *et al.*, 2023). The study aims to address this gap by examining the impact of human capital efficiency, structural capital efficiency, and capital employed efficiency on the financial performance of quoted industrial firms in Nigeria.

In the contemporary global economy, intellectual capital has become a critical asset for firms, particularly in the industrial sector, where the ability to innovate and maintain operational efficiency directly impacts financial performance. Intellectual capital—comprising human capital, structural capital, and capital employed—is increasingly seen as a key driver of competitive advantage and value creation (Secundo *et al.*, 2020; Smriti & Das, 2021). Despite this recognition, there is growing concern that many industrial firms in Nigeria are not fully leveraging their intellectual capital, potentially limiting their financial performance and overall competitiveness.

Human capital, which includes the skills, expertise, and innovative capacities of employees, is essential for organizational success. Effective human capital management is associated with improved financial outcomes, yet the specific impact of human capital efficiency on the financial performance of Nigerian industrial firms remains underexplored (Abeysekera, 2021). In many cases, Nigerian firms may lack the necessary frameworks or strategies to optimize the potential of their human capital, resulting in missed opportunities for value creation.

Structural capital, which encompasses the processes, systems, and organizational culture that support a firm's operations, is another critical component of intellectual capital. Structural capital efficiency is known to enhance a firm's capacity to innovate and sustain long-term performance (Marzo *et al.*, 2022). However, the extent to which Nigerian industrial firms effectively manage their structural capital and its impact on financial performance has not been adequately studied. The lack of clear evidence on this relationship limits the ability of these firms to implement effective strategies for structural capital management.

Capital employed efficiency, which reflects how well a firm utilizes its financial resources to generate value, is crucial for achieving profitability and growth. Research has shown that firms with higher capital employed efficiency tend to experience better financial outcomes (Nadeem et al., 2020). However, there is limited empirical evidence on how Nigerian industrial firms manage their capital employed and the consequent effects on their financial performance. The inadequate exploration of the relationships between human capital efficiency, structural capital efficiency, and capital employed efficiency on the financial performance of quoted industrial firms in Nigeria presents a gap in both academic literature and practical business strategies. This gap is particularly concerning given the critical role that the industrial sector plays in Nigeria's economic development.

This study seeks to address this gap by systematically examining the effects of human capital efficiency, structural capital efficiency, and capital employed efficiency on the financial performance of quoted industrial firms in Nigeria. By doing so, it aims to provide empirical insights that can inform better intellectual capital management and disclosure practices within the Nigerian industrial sector, ultimately contributing to enhanced financial performance and competitiveness.

Some of these studies for example Abraham and Okee (2023), Arumona and Daniel (2022) and Obalakumo and Odogu (2022) carried out in Nigeria were done in other subsectors while this present study was conducted in the industrial goods sector in Nigeria. The empirical works have equally shown that some of the studies for example Abraham and Okee (2023), Arumona and Daniel (2022), Mehmet and Ubaidillah (2023) carried out in recent times regarding human capital efficiency, structural capital efficiency, capital employed efficiency and financial performance in Nigeria and other countries of the world were not current in the data used for the analysis to reflect the current economic realities as all the data were within 2020 and below except the work of Ofierohor *et al.* (2024) whose data cover up to 2023. These identified gaps in literature call for further study in this area which necessitated this study the value-added intellectual capital disclosure and financial performance of quoted industrial firms in Nigeria, to update the data up to 2023, use appropriate panel regression technique and cover only the periods of IFRS implementation in Nigeria.

The main objective of this study is to examine the value-added intellectual capital disclosure and financial performance of quoted industrial firms in Nigeria. The study specifically intends to (i) examine the effect of human capital efficiency on financial performance of quoted industrial firms in Nigeria; (ii) determine the effect of structural capital efficiency on financial performance of quoted industrial firms in Nigeria; and (iii) evaluate the effect of capital employed efficiency on financial performance of quoted industrial firms in Nigeria. To achieve the objectives of this study, the following null hypotheses were formulated to be tested based on the specific objectives of the study as follow: H₀₁: Human capital efficiency has no significant effect on financial performance of quoted industrial firms in Nigeria; H₀₂: Structural capital efficiency has no significant effect on financial performance of quoted industrial firms in Nigeria; and H₀₃: Capital employed efficiency has no significant effect on financial performance of quoted industrial firms in Nigeria.

REVIEW OF RELATED LITERATURE

Financial Performance

Financial performance refers to a firm's ability to generate profit and create value for shareholders through effective use of its resources. It is commonly evaluated using financial indicators such as return on assets (ROA), return on equity (ROE), earnings per share (EPS), revenue growth, and return on investment (ROI) (Mawardi & Pratama, 2020; Wang et al., 2021). Alshubiri (2021) further describes financial performance as the overall financial health of an organization measured through profitability, liquidity, and solvency ratios, reflecting how efficiently a firm utilizes its assets to generate income and maintain stability. Similarly, Ali et al. (2022), Chen and Yang (2023), and Jain et al. (2024) emphasize that financial performance represents the outcome of a firm's operational and strategic activities, often assessed through key performance indicators such as profit margins, cash flow, ROA, ROE, and other value-based measures. In this study, financial performance is defined as the overall financial results of a firm evaluated through key financial performance indicators.

Return on Assets (ROA)

Damodaran (2014) described return on assets (ROA) as the effectiveness of a firm in earning returns from its assets, calculated prior to accounting for the effects of financing. In other words, it is an indication of how well a firm uses its assets to make earnings irrespective of its capital structure. ROA, according to Higgins (2015), is assets' productivity—that is, net income (or earnings) divided by assets. This reflects the straightforward correspondence between the income generated and the asset base utilized to generate it. In Berk and DeMarzo (2020) definition, ROA is net income plus interest expense divided by total book value of a firm's assets. This one takes the benefit of the interest tax shield, thereby capturing returns available to both equity

and debt investors. Allen *et al.* (2020) described ROA as a metric that defines the amount of income available for equity and debt holders for every dollar invested in all assets. This definition emphasizes the effectiveness of asset utilization in generating returns to all providers of capital.

Value-Added Intellectual Capital Disclosure

Value-Added Intellectual Capital (VAIC) is a framework used to measure how efficiently a firm utilizes its intellectual capital components—human capital, structural capital, and capital employed—to create value (Secundo *et al.*, 2020; Marzo *et al.*, 2022). It evaluates the contribution of intangible assets to organizational performance and reflects a firm's ability to leverage knowledge-based resources for value creation and long-term growth (Iazzolino & Laise, 2022). In contrast, Intellectual Capital Disclosure (ICD) refers to the reporting of information related to a firm's intellectual capital, including human resources, innovation processes, and relational assets, to provide stakeholders with insights into how these resources contribute to firm value (Smriti & Das, 2021; Nyarko *et al.*, 2022). Such disclosure improves transparency, strengthens investor confidence, and enhances corporate accountability (Okere *et al.*, 2023). In this study, Intellectual Capital Disclosure is defined as the voluntary or mandatory reporting of information related to a firm's intellectual capital resources.

Human Capital Efficiency (HCE)

Human Capital Efficiency (HCE) refers to the ability of a firm to generate value from its workforce by effectively utilizing employees' skills, knowledge, and experience (Wang & Chang, 2020; Sardo *et al.*, 2021). It measures how efficiently an organization converts investments in human capital—such as training, education, and employee development—into financial performance and organizational value (Xu & Liu, 2021). Scholars such as El-Bannany and Hussein (2022), Nimtrakoon (2022), and Kim and Li (2023) emphasize that HCE reflects the contribution of human resources to value creation, innovation, and long-term competitiveness, particularly in knowledge-intensive industries. In this study, Human Capital Efficiency is defined as the ratio of value added by a firm's human resources to the total investment in those resources.

Structural Capital Efficiency (SCE)

Structural Capital Efficiency (SCE) refers to the effectiveness with which a firm utilizes its non-human resources—such as organizational processes, information systems, databases, intellectual property, and corporate culture—to create value and improve performance (Chen *et al.*, 2020; Khan & Ali, 2021). It reflects how efficiently a firm's internal structures support business operations, innovation, and strategic objectives (Tan & Hamid, 2021). Scholars such as Hossain *et al.* (2022), Nimtrakoon (2022), and Martínez-Conesa and Soto-Acosta (2023) emphasize that SCE enables firms to leverage organizational systems and knowledge infrastructure to enhance productivity, sustain competitive advantage, and achieve long-term financial performance. In this study, Structural Capital Efficiency is defined as the effectiveness with which a firm's non-human resources, such as organizational processes, databases, intellectual property, and corporate culture, contribute to value creation.

Capital Employed Efficiency (CEE)

Capital Employed Efficiency (CEE) refers to the effectiveness with which a firm utilizes its capital resources to generate revenue and profits. It measures how efficiently invested capital—both equity and debt—is converted into value and financial returns (Zhang & Zhang, 2020; Singh & Rao, 2021). Scholars such as Yuan and Zhou (2021) and Pérez *et al.* (2022) describe CEE as the ratio of value added or earnings to capital employed, indicating how well a firm uses its capital to support growth and profitability. Ahmed and Arif (2022) and Lee and Kim (2023) further emphasize that CEE is an important indicator of operational efficiency and financial health, particularly in capital-intensive industries. In this study, Capital Employed Efficiency is defined as the measure of how effectively a firm utilizes its employed capital to generate revenue and achieve growth. In addition, Human Capital Theory, proposed by Gary S. Becker in the early 1960s, explains that investments in human resources—such as education, training, and health—enhance employees' skills and productivity, leading to improved organizational performance, higher economic returns, and sustainable competitive advantage.

Theories underpinning the study

The study is in line with the resource-based view (RBV) because the theory highlighting the importance of optimizing financial resources as a strategic asset for achieving sustained competitive advantage. Efficient management of capital employed ensures that a firm maximizes its financial performance by generating higher returns on investments, maintaining a strong capital structure, and strategically allocating resources to drive growth.

The study is in line with the human capital theory because the theory highlights the importance of investing in and effectively utilizing human resources to achieve higher productivity and performance. The theory illustrates how enhanced human capital contributes to better financial performance by improving efficiency, productivity, and competitive advantage. The study is in line with the intellectual capital theory because the theory highlighting the importance of internal organizational systems and processes in enhancing productivity, innovation, and long-term stability. Efficient structural capital supports better financial performance by enabling organizations to operate more effectively, innovate continuously, and maintain stability in a competitive environment.

Empirical review

Several empirical studies have examined the relationship between intellectual capital and financial performance. Ofierohor et al. (2024) found that human capital and green intellectual capital expenditures significantly improved the profitability of financial institutions in Nigeria, while structural capital had an insignificant negative effect and relational capital showed a negative significant effect. Similarly, Abraham and Okee (2023) reported that human capital efficiency significantly improved return on equity of listed insurance firms in Nigeria, whereas structural capital efficiency and capital employed efficiency had positive but insignificant effects. Mehmet and Ubaidillah (2023) also found that intellectual capital positively influenced the profitability of Islamic banks, with human capital efficiency and capital employed efficiency being the most influential components. Likewise, Akkas and Asutay (2022) showed that intellectual capital disclosure significantly affected the performance of Islamic banks in GCC countries. In Nigeria, Arumona and Daniel (2022) revealed that capital employed efficiency significantly improved return on assets of non-financial firms, while structural capital efficiency had a negative effect. Similarly, Obalakumo and Odogu (2022), Sulaiman et al. (2021), and Okoye and Emeneka (2021) found that human capital efficiency and capital employed efficiency significantly enhanced firm performance indicators such as ROCE, EPS, and economic value added.

Evidence from other countries also highlights the importance of intellectual capital in improving firm performance. Erliana (2019) found that the Value Added Intellectual Coefficient (VAIC) positively influenced the financial performance of banking firms in Indonesia, although its individual components showed limited impact. Harry et al. (2018) reported that capital employed efficiency significantly influenced firm value in Indonesian retail and real estate firms, while human and structural capital were not significant. Similarly, Rashedul et al. (2017) found a significant relationship between VAIC and profitability of commercial banks in Bangladesh. Earlier studies such as Ihyaul et al. (2016), Wasim et al. (2011), Dominique and Talita (2011), Mushun (2011), and Azlina et al. (2011) also confirmed that intellectual capital—particularly human capital and capital employed efficiency—contributes positively to corporate financial performance. However, many of these studies were conducted outside Nigeria, which may limit the generalization of their findings to the Nigerian business environment.

METHODOLOGY

This study adopted an ex post facto research design to examine the relationship between intellectual capital and financial performance using existing secondary data. The population comprised twenty-one (21) consumer goods firms listed on the Nigerian Exchange (NGX) as of December 31, 2023, from which seventeen (17) firms were selected as the sample covering the period 2012–2023. The selection was based on criteria that the firms must be actively operating in Nigeria, must have been listed on the NGX at least one year before the adoption of International Financial Reporting Standards (IFRS) in 2012, and must have had their shares consistently traded during the study period. Data for the study were obtained from the annual reports and accounts of the sampled firms. Panel data analysis using the Random Effects Model was employed to analyze the relationship between intellectual capital and financial performance with the aid of STATA 15 software, and the econometric model was adapted from Sulaiman et al. (2021). The study also applied the Value-Added Intellectual Coefficient (VAIC™) method developed by Pulic (2000, 2001, 2002) to measure value creation efficiency through human capital, structural capital, and capital employed using information from firms' financial statements.

Model Specification

Financial performance is proxied by return on assets which is measure using profit after tax divided by total assets and is a function of three explanatory variables such as Capital Employed Efficiency (CEE), Human Capital Efficiency (HCE) and Structural Capital Efficiency (SCE) as adapted from Sulaiman *et al.* (2021).

Therefore;

$$ROA = f(CEE, HCE, SCE)$$

The expression in the equation is expressed econometrically as follows into a model:

$$ROA_{it} = \alpha_0 + \beta_1 CEE_{it} + \beta_2 HCE_{it} + \beta_3 SCE_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

Where:

$\beta_1, \beta_2, \beta_3$ are parameters to be estimated with a-priori expectations > 0 .

ROA = Return on Assets

CEE = Capital Employed Efficiency

HCE = Human Capital Efficiency

SCE = Structural Capital Efficiency

α = Constant

e = Error term

i = Firms

t = Periods

Variables Measurement and Justification

Table 1 below explains the variables measurement under study.

Variable	Acronym	Type of variable	Measurement	Justification
Financial Performance	ROA	Dependent	This is the profit after tax divided by total assets.	Abraham and Okee (2023), Mehmet and Ubaidillah (2023) and Ofierohor <i>et al.</i> (2024).
Capital Employed Efficiency	CEE	Independent	This is the total value added divided by capital employed.	Abraham and Okee (2023), Arumona and Daniel (2022) and Mehmet and Ubaidillah (2023).
Human Capital Efficiency	HCE	Independent	This is the total value added divided by human capital.	Abraham and Okee (2023), Erlana (2019) and Obalakumo and Odogu (2022).
Structural Capital Efficiency	SCE	Independent	This is the total structure capital divided by value added.	Abraham and Okee (2023), Arumona and Daniel (2022) and Okoye and Izedonmi (2021).

Source: Researcher's Compilation, 2024.

DATA PRESENTATION AND ANALYSIS

Data Presentation

The data of seventeen (17) consumer goods firms regarding Return on Assets (ROA), capital employed efficiency (CEE), human capital efficiency (HCE) and structural capital efficiency (SCE) are presented in appendix B.

Data Analysis and Results

The data were analysed with the aid of Stata 15 software using Descriptive Statistics, Pearson Correlation, Shapiro-Wilk Normality Test, Variance Inflator Factor, Heteroscedasticity test, Breusch-Pagan Lagrangian Multiplier test, Hausman specification test and Random Effect Model based on the data attached in appendix B and the detailed results are equally attached in appendix C.

Descriptive Statistics

Table 2 Summary of Descriptive Statistics of the Entire Data Set.

Variable	Obs	Mean	Std. Dev.	Min.	Max.
ROA	204	0.077	.095	-0.14	0.59
CEE	204	8.156	1.064	6.252	9.970
HCE	204	6.960	0.547	3.614	7.986
SCE	204	0.219	0.105	0.011	0.578

Source: Researcher's Computation using STATA 15 software, 2024

Table 2 presents the descriptive statistics of the variables used in the study. Return on assets (ROA) has a minimum value of -0.14, a maximum of 0.59, and a mean value of 0.077. Its standard deviation of 0.095 exceeds the mean, indicating a right-skewed distribution. Capital employed efficiency (CEE) ranges from 6.252 to 9.970 with a mean of 8.156 and a standard deviation of 1.064, suggesting a left-skewed distribution. Human capital efficiency (HCE) has a minimum value of 3.614, a maximum of 7.984, and a mean of 6.960, with a standard deviation of 0.547, also indicating a left skew. Similarly, structural capital efficiency (SCE) ranges from 0.011 to 0.578 with a mean value of 0.219 and a standard deviation of 0.105, showing a left-skewed distribution during the study period.

Pearson Correlation

Table 3 below is the Pearson correlation matrix for the data set to show the extent of associations between the variables. The decision rule is that if a pair or more of the independent variables is equal to or above 0.85, there is a presence of multicollinearity in the model but if the independent variables is less than 0.85, there is no presence of multicollinearity in the model.

Variable	FV	CEE	HCE	SCE
ROA	1			
CEE	0.0223	1		
HCE	0.0274	0.3894	1	
SCE	-0.0231	-0.1535	-0.1609	1

Source: Researcher's Computation using STATA 15 software, 2024

The correlation matrix determines the degree of relationships between the proxies of an independent variable and the dependent variable. It is also used to show whether there is an association among the proxies of independent variable themselves, to detect if a collinearity problem exists in the model. The result from table 3 shows that there exist about 2% positive and weak relationships between capital employed efficiency (CEE) and return on assets (ROA) of quoted consumer goods firms in Nigeria from the correlation coefficient of 0.0223. The table also shows that there is an approximately 3% positive and weak relationship between human capital efficiency (HCE) and return on assets (ROA) of quoted consumer goods firms in Nigeria, from the correlation coefficient of 0.0234.

Furthermore, the table shows 3% negative and weak relationships between structural capital efficiency (SCE) and return on assets (ROA) of quoted consumer goods firms in Nigeria, from the correlation coefficient of -0.0231. Finally, the relationships between proxies of independent variable themselves have low coefficients which are below the threshold of 0.85 as suggested by (Gujarati, 2003).

Variance Inflator Factor (VIF) Results

Table 4: Variance Inflator Factor (VIF)

Variable	VIF	1/VIF
HCE	1.19	0.837827
CEE	1.19	0.839959
SCE	1.04	0.964514
Mean VIF	1.14	

Source: Researcher's Computation using STATA 15 software, 2024.

In a bid to further test the absence of multicollinearity problem among the exogenous variables, colinearity diagnostics test were observed. The decision rule is that if the values of VIF and 1/VIF are up to 10 and 1 and above, there is a presence of multicollinearity in the model but if the values of VIF and 1/VIF are less than 10 and 1 respectively, there is no presence of multicollinearity in the model. The results of Variance Inflation Factors (VIF) and the Inverse Variance Inflation Factors (1/VIF) values portray no multicollinearity problem in the data as their values are less than 10 and 1 respectively (Gujarati, 2003) as presented in table 4. This point to the fact that the variables are well selected and fit in the same regression model because the multicollinearity problem is absent in the model, which is one of the requirements for regression analysis.

Shapiro-Wilk Normality Test

Table 5 below shows the results of the normality test conducted with the use of Shapiro-Wilk Normality Test. The decision rule is if P-Value > 0.05, the residual is normally distributed but if P-Value is equal to or < 0.05, the residual is not normally distributed.

Variable	obs	W	v	z	Prob>z
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Residual	203	0.92640	11.123	5.547	0.00000
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Source: Researcher's Computation using STATA 15 software, 2024.

Figure 2: Normal Distribution Curve

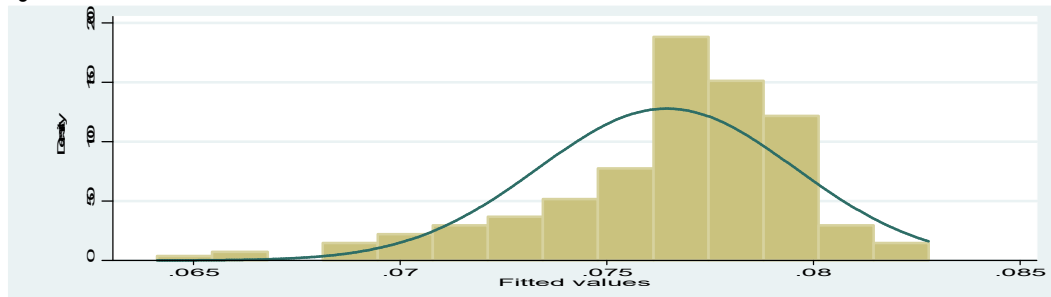


Table 5 above shows the probability value of the residual which is not normally distributed. This result is further collaborated by the normal distribution curve presented in figure 2 above. This indicates that one of the basic assumptions of the linear regression technique is violated. This was corrected in this study using robust regression technique as specified.

Heteroscedasticity test

Table 6: Heteroscedasticity test

Type of test	Chi2	P-Value
Heteroscedasticity Test	2.56	0.1096

Source: Researcher's Computation Using STATA 15 software, 2024.

To establish that the data for this study was robust for the model, a heteroscedasticity test was carried out. The decision rule is that if the P-value ≤ 0.05 , there is a problem of heteroscedasticity but if the P-value > 0.05 , there is no problem of heteroscedasticity. The study revealed that the data is homoscedastic; as the basic linear regression model is reliable. This can be confirmed from the heteroskedasticity result in table 6 which revealed the chi2 value of 2.56 with a p-value of 0.1096. This indicates that one of the assumptions of linear regression is fulfilled as it does not satisfy the classical linear regression assumption of homoskedasticity (constant error variance).

Breusch-Pagan Lagrangian Multiplier Test

Table 7 below presents the result of the Breusch-Pagan Lagrangian Multiplier test conducted. The decision rule of Breusch-Pagan Lagrangian Multiplier Test is that if the P-value is equal to and less than 0.05, the random effect model is appropriate if otherwise, the pooled ordinary least square regression is appropriate.

Variable	Chibar2	P-Value
ROA	20.86	0.0000

Source: Researcher's Computation using STATA 15 software, 2024.

Considering the result of Random Effect Model (REM) regression, the Breusch-Pagan Lagrangian Multiplier test was conducted to give an insight into an actual test to be carried out between Random Effect Model and Pooled Ordinary Least Square Regression. From the Breusch-Pagan Lagrangian Multiplier test, the chibar2 value of (20.86) and the probability of (0.00) in table 7 above, therefore, suggests that REM is more appropriate instead of Pooled Ordinary Least Square.

Hausman Specification Test

Table 8 below presents the result of a Hausman specification test.

Chi2	1.05
Prob. Chi2	0.234

Source: Researcher's Computation using STATA 15 software, 2024.

The data for this study is panel and panel data can lead to an error term that is clustered and possibly correlated over time. This is because each consumer goods firms may have its entity-specific characteristic that can determine its information (that is

unobserved heterogeneity). And this may bias the outcome variable or even the explanatory variables. As such, there is a need to control for that. The decision rule of Hausman specification test is that if the prob. Chi2 is equal to and less than 0.05, the fixed effect model is appropriate if otherwise, the random effect model is more appropriate. The Hausman test was carried out and shows that the random effect model is more appropriate. This can be confirmed from the Chi2 value of 1.05 with a p-value of 0.234 in table 8 above which is not significant at any level of significance as suggested

Intellectual Capital and Financial Performance Using Random Effect Model (REM)

Table 9 below is the random effect regression model conducted.

Variable	Coefficients	z-value	Prob.
Cons.	7.502	13.03	0.000
CEE	0.217	0.65	0.518
HCE	0.069	0.91	0.363
SCE	0.723	2.36	0.018
R-sq overall	0.5001		
Wald chi2	66.47		
Prob. > chi2	0.0009		

Source: Researcher's Computation using STATA 15 software, 2024.

Table 9 above shows that 50% variation of return on assets (ROA) is predicted by the combined effect of capital employed efficiency (CEE), human capital efficiency (HCE) and structural capital efficiency (SCE) with (Overall R-sq of 0.5001). This indicates that the model of the study is fit and the independent variables are properly combined and used. The Wald chi2 value of 66.47 with a P-value of 0.0009 signified that the model is fit for the study.

Discussion of Findings

Capital Employed Efficiency and Firm Value

This study revealed that capital employed efficiency (CEE) has an insignificant positive effect on return on assets (ROA) of quoted consumer goods firms in Nigeria for the period under review. This implies that an increase in capital employed efficiency will increase the return on assets (ROA) of quoted consumer goods firms in Nigeria by 0.217. This finding is in line with the a-priori expectation of the researcher because capital employed efficiency is expected to increase the return on assets of quoted consumer goods firms in Nigeria. The finding is also in line with the resource-based view (RBV) because the theory highlighting the importance of optimizing financial resources as a strategic asset for achieving sustained competitive advantage. Efficient management of capital employed ensures that a firm maximizes its financial performance by generating higher returns on investments, maintaining a strong capital structure, and strategically allocating resources to drive growth. The capital employed efficiency has an insignificant positive effect on return on assets of quoted consumer goods firms in Nigeria for the period under review. This finding is supported by the findings of Abraham and Okee (2023) and Erlana (2019). However, it is not in line with the findings of Arumona and Daniel (2022) and Mehmet and Ubaidillah (2023).

Human Capital Efficiency and Return on Assets

The study also reveals that human capital efficiency has an insignificant positive effect on return on assets (ROA) of quoted consumer goods firms in Nigeria for the period under review. This implies that an increase in human capital efficiency will increase the return on assets (ROA) of quoted consumer goods firms in Nigeria by 0.069. This finding is in line with the a-priori expectation of the researcher because human capital efficiency is expected to increase the return on assets of quoted consumer goods firms in Nigeria. The finding is also in line with the human capital theory because the theory highlights the importance of investing in and effectively utilizing human resources to achieve higher productivity and performance. The theory illustrates how enhanced human capital contributes to better financial performance by improving efficiency, productivity, and competitive advantage. The human capital efficiency has an insignificant positive effect on return on assets of quoted consumer goods firms in Nigeria for the period under review. This finding is in agreement with the finding of Erlana (2019) but not in line with the findings of Mehmet and Ubaidillah (2023) and Obalakumo and Odogu (2022).

Structural Capital Efficiency and Firm Value

The study further reveals that structural capital efficiency has a significant positive effect on return on assets of quoted consumer goods firms in Nigeria for the period under review. This implies that an increase in structural capital efficiency will increase the return on assets of quoted consumer goods firms in Nigeria by 0.723. The finding is in line with the a-priori expectation of the researcher because structural capital efficiency positively increases the return on assets of quoted consumer goods firms in Nigeria. The finding is also in line with the intellectual capital theory because the theory highlighting the importance of internal organizational systems and processes in enhancing productivity, innovation, and long-term stability. Efficient structural capital supports better financial performance by enabling organizations to operate more effectively, innovate continuously, and maintain stability in a competitive environment. The structural capital efficiency has a significant positive effect on firm value of quoted consumer goods firms in Nigeria for the period under review. This finding is in line with the finding of Arumona and Daniel (2022), Sulaiman *et al.* (2021) and Okoye and Izedonmi (2021). However, the finding disagrees with the findings of Abraham and Okee (2023), Mehmet and Ubaidillah (2023) and Ofierohor *et al.* (2024).

CONCLUSION AND RECOMMENDATIONS

The capital employed efficiency plays a crucial role in enhancing the return on assets of quoted consumer goods firms in Nigeria. The consumer goods firms that optimize their capital resources can generate more income relative to their assets, leading to improved overall performance. This highlights the importance of sound capital management strategies for consumer goods firms. By efficiently managing and deploying capital, firms can maximize asset utilization, reduce wastage, and enhance operational productivity, thereby improving financial outcomes.

Human capital efficiency reflects the ability of employees to maximize the productive use of a firm's resources. When employees are well-trained, motivated, and possess the necessary expertise, they are able to drive innovation, improve operational processes, and enhance productivity, all of which positively impact the firm's profitability. The findings indicate that consumer goods firms with a high level of human capital efficiency can achieve better financial outcomes, as their workforce is better equipped to optimize asset utilization.

Firms with high structural capital efficiency are better positioned to leverage their organizational capabilities to generate higher returns from their assets. The optimization of workflows, advanced information systems, and a culture that promotes knowledge sharing can improve overall efficiency and productivity, which directly contributes to an increase in financial performance.

Based on the above conclusion, the following recommendations are proffered:

- i. Consumer goods firms should focus on improving how they allocate and utilize their capital resources. By carefully monitoring and optimizing capital employed, firms can ensure that their assets generate maximum returns. This may involve investment in technologies and processes that streamline operations and reduce inefficiencies.
- ii. Consumer goods firms should prioritize continuous investment in the education and training of their workforce. Training programs should focus on enhancing technical skills, leadership abilities, and industry-specific knowledge to ensure employees can contribute to the firm's operational and financial goals.
- iii. Consumer goods firms should continuously assess and improve their internal processes to enhance efficiency. Streamlining workflows, reducing redundancies, and eliminating bottlenecks will lead to better utilization of resources and higher returns on assets. Firms can use tools like process mapping, automation, and lean management techniques to optimize operations.

REFERENCES

- Abeysekera, I., Li, F., & Lu, Y. (2021). Financial disclosure quality and sustainability disclosure quality. A case in China. *PLoS One*, 16(5), e0250884.
- Abraham, R., & Okee, C. F. (2023). Intellectual capital and financial performance of listed insurance companies in Nigeria. *International Academy Journal of Business Administration Annals*, 9(5), 35-53.
- Agostini, L., Nosella, A., & Cubico, S. (2022). Intellectual capital management and company performance: The moderating role of industry type. *Journal of Business Research*, 140, 22-32.
- Ahmed, M., & Arif, M. (2022). Capital employed efficiency and its effect on corporate profitability: A case study of the banking sector. *Asian Journal of Finance & Accounting*, 14(1), 115-134. <https://doi.org/10.5296/ajfa.v14i1.18156>
- Akintoye, I. R., Aremu, O. S., & Adegbe, F. F. (2021). Human capital efficiency and financial performance of selected quoted companies in Nigeria. *International Journal of Research in Business and Social Science*, 10(1), 100-112.

- Akkas, E. & Asutay, M. (2022). Intellectual capital disclosure and financial performance nexus in Islamic and conventional banks in the GCC countries. *International Journal of Islamic and Middle Eastern Finance and Management*, 1-31.
- Ali, M., Naseem, M. A., & Khan, M. T. (2022). Financial performance and its determinants in the banking sector: Evidence from South Asia. *Journal of Banking & Finance*, 130, 106101.
- Allen, F., Brealey, R. A., & Myers, S. C. (2020). Principles of corporate finance (13th ed.). McGraw-Hill Education.
- Alshubiri, F. (2021). The impact of financial performance on firm value: Evidence from Gulf Cooperation Council (GCC) countries. *Journal of Financial Risk Management*, 10(3), 241-258. <https://doi.org/10.4236/jfrm.2021.103015>
- Alshubiri, F. N. (2022). The financial competition, concentration and structure of financial performance nexus in the financial sector of Oman. *Economic Change and Restructuring*, 55(2), 451-475.
- Arumona, J. O., & Daniel, E. (2022). Capital employed and structural capital efficiency and financial performance of listed non-financial companies in Nigeria. *International Journal of Humanities Social Science and Management (IJHSSM)*, 2(5), 324-341.
- Azlina, R., Ruhaya, A., & Amrizah, K. (2011). Human capital efficiency and firm performance: An empirical study on Malaysian technology industry. *SHS Web of Conferences*, 36, 2-11.
- Chen, M. C., Cheng, S. J., & Hwang, Y. (2020). Structural capital efficiency and firm performance: Evidence from Taiwan. *Journal of Business Research*, 120, 116-128.
- Chen, S., & Yang, Y. (2023). Assessing financial performance in the digital era: The role of fintech adoption. *Journal of Business Research*, 144, 486-497.
- DeMarzo, P. (2020). *Corporate finance* (5th ed.). Pearson Education.
- Dominique, R., & Talita, A. (2011). Intellectual capital and corporate financial performance of selected listed companies in Indonesia. *Malaysian Journal of Economic Studies*, 48(1), 61-77.
- El-Bannany, R., & Hussein, B. (2022). Value-added intellectual capital and financial performance: evidence from Mauritian companies. *Journal of Accounting in Emerging Economies*, 12(3), 486-506.
- Erliana, B. (2019). Analysis of value added intellectual capital to the financial performance of listed banking companies in Indonesia. *International Journal of Contemporary Accounting*, 1(1), 59-74.
- Gujarati, D. N. (2003). *Basic Econometrics* (4th ed.). McGraw-Hill.
- Harry, A. P., Sulaeman, R. N., & Zaenal, A. (2018). Intellectual capital and stock market performance of retail trade and property and real estate industry in Indonesia. *Journal of Accounting, Finance and Auditing Studies*, 4(3), 105-122.
- Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *Stata Journal*, 7(3), 281-312.
- Hossain, M., Islam, R., & Khan, M. A. (2022). Structural capital efficiency and corporate sustainability: Evidence from the banking sector. *Sustainability*, 14(3), 1276.
- Iazzolino, G., & Laise, D. (2022). Intellectual capital and financial performance in European SMEs: A meta-analysis. *Journal of Intellectual Capital*, 23(5), 871-892.
- Ihyaul, U., Rizqiyah, & Ahmad, W. J. (2016). Intellectual capital performance: A comparative study between financial and non-financial industry of Indonesian biggest companies. *International Journal of Economics and Financial Issues*, 6(4), 1436-1439.
- Jain, R., Gupta, S., & Sharma, V. (2024). Financial performance metrics for assessing corporate sustainability: A systematic review. *Journal of Business Finance & Accounting*, 51(2), 204-223.
- Khan, M. A., & Ali, Q. B. (2021). The role of intellectual capital in organizational performance. *Journal of Intellectual Capital*, 22(4), 567-584.
- Lee, J., & Kim, S. (2023). Evaluating capital employed efficiency and its impact on firm value: Evidence from the technology sector. *Journal of Business Finance & Accounting*, 50(2), 145-162.
- Martinez-Conesa, I., & Soto-Acosta, P. (2023). Structural capital and firm performance: The moderating role of environmental uncertainty. *Journal of Business Research*, 150, 202-218.
- Marzo, G., Scarpino, E., & Vecchi, A. (2022). The impact of intellectual capital on firm performance in Italian SMEs: A dynamic capabilities perspective. *Journal of Intellectual Capital*, 23(4), 759-782.
- Mawardi, W., & Pratama, A. (2020). Financial performance analysis: A study of profitability, liquidity, and leverage. *Journal of Economics and Business*, 12(2), 101-112.
- Mehmet, A., & Ubaidillah (2023). Examining the impact of intellectual capital performance on financial performance in Islamic banks. *Journal of the Knowledge Economy*, 1-33.
- Mushun, W. (2011). Measuring intellectual capital and its effect on financial performance: Evidence from the capital market in Taiwan. *Front. Bus. Res. China*, 5(2), 243-265.

- Nadeem, M., Gan, C., & Nguyen, C. (2020). The importance of intellectual capital for firm performance: Evidence from Australia. *Asian Business & Management*, 19(3), 292-313.
- Nimtrakoon, S. (2022). Structural capital efficiency and firm performance: Evidence from Southeast Asia. *Journal of Knowledge Management*, 26(3), 543-563.
- Nyarko, S. I., Alhassan, A. L., & Kyereboah-Coleman, A. (2022). Intellectual capital efficiency and firm value: The role of board diversity in Sub-Saharan Africa. *African Development Review*, 34(2), 281-294.
- Obalokumo, A. P., & Odogu, L. I. (2022). Intellectual capital accounting and financial performance of listed manufacturing firms in Nigeria. *International Journal of Research Publication and Reviews*, 3(11), 2035-2045.
- Odogu, I. (2022). Intellectual capital accounting and financial performance of listed manufacturing firms in Nigeria. *International Journal of Accounting and Finance Research*, 8(2), 45-56.
- Ofierohor, U. E., Emeka, O., & Ayeeni, E. O. (2024). Intellectual capital and performance of financial institutions quoted in the Nigerian stock exchange. *Asian Journal of Economics, Finance and Management*, 6(1), 101-114.
- Okere, W., Isenmila, P., & Ikpefan, O. (2023). Intellectual capital disclosure and its effect on the financial performance of listed firms in Nigeria. *African Journal of Business Management*, 17(1), 45-58.
- Okoye, N. J. F., & Izedonmi, P. F. (2021). Value-added intellectual coefficients and economic value added of quoted service firms in Nigeria. *International Journal of Advanced Academic Research*, 7(11), 22-42.
- Pérez, J., Martínez, J., & López, J. (2022). The role of capital employed efficiency in corporate financial performance: Evidence from Spain. *European Journal of Finance*, 28(3), 273-291.
- Pulic, A. (2020). Intellectual capital and corporate performance. *International Journal of Learning and Intellectual Capital*, 17(1), 77-97.
- Rashedul, H., Niaz, M., & Mohammad, F. A. (2017). Impact of intellectual capital on profitability - conventional versus Islamic banks. *Journal of Accounting, Finance and Auditing Studies*, 3(2), 64-80.
- Sardo, F., Serrasqueiro, Z., & Alves, H. (2021). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management*, 94, 102-118.
- Secundo, G., Dumay, J., Schiuma, G., & Passiante, G. (2020). Intellectual capital in the age of big data: Establishing a research agenda. *Journal of Intellectual Capital*, 21(5), 763-788.
- Singh, R., & Rao, S. (2021). Measuring capital employed efficiency in Indian firms: A sectoral analysis. *Journal of Applied Finance & Banking*, 11(2), 75-90.
- Smriti, N., & Das, N. (2021). The impact of intellectual capital on firm performance: A study of Indian firms. *Journal of Intellectual Capital*, 22(2), 360-380.
- Sulaiman, E. A., Kasum, A. S., & Musa, W. A. (2021). Intellectual capital efficiency and market based financial performance: Evidence from listed conglomerate companies. *Corporate & Business Strategy Review*, 2(2), 31-42.
- Tan, H. P., & Hamid, S. A. (2021). The role of structural capital efficiency in enhancing firm performance: Evidence from Malaysia. *Journal of Intellectual Capital*, 22(1), 115-135.
- Wang, X., Sun, H., & Li, J. (2021). The influence of financial performance on corporate sustainability: Empirical evidence from Chinese listed companies. *Sustainability*, 13(8), 4127.
- Wasim, U. R., Chaudhary, A. R., Hafeez, U. R., & Ayesha, Z. (2011). Intellectual capital performance and its impact on corporate performance: An empirical evidence from modaraba sector of Pakistan. *Australian Journal of Business and Management Research*, 1(5), 08-16.
- Xu, J., & Liu, F. (2021). The impact of intellectual capital on firm performance: Evidence from China's manufacturing sector. *Journal of Intellectual Capital*, 22(4), 567-585.
- Yuan, X., & Zhou, L. (2021). Capital employed efficiency and financial performance in emerging markets. *Journal of Financial Management*, 49(1), 128-144. ;
- Zhang, H., & Zhang, M. (2020). Capital employed efficiency and its impact on firm performance: Evidence from the manufacturing sector. *International Journal of Financial Studies*, 8(4), 65.