

Human Capital Efficiency, Structural Capital Efficiency, and Relational Capital Efficiency as Determinants of Financial Performance: Panel Evidence from Deposit Money Banks in Nigeria (2015–2024)

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DOI: 10.56201/ijefm.v11.no7.2026.pg354.367

Abstract

This study investigates the effect of intellectual capital efficiency on the financial performance of deposit money banks (DMBs) in Nigeria. Anchored in human capital theory and the resource-based view, the study decomposes intellectual capital into three components: human capital efficiency (HCE), structural capital efficiency (SCE), and relational capital efficiency (RCE) following the Value Added Intellectual Coefficient (VAIC) methodology of Pulic (2000, 2004), and examines their individual and joint effects on return on assets (ROA), return on equity (ROE), and earnings per share (EPS). An ex-post facto research design was adopted, using secondary panel data drawn from the audited annual reports of thirteen (13) purposively sampled DMBs listed on the Nigerian Exchange Group (NGX) over the period 2015–2024, yielding 130 firm-year observations. Descriptive statistics, Pearson correlation, and panel regression (fixed/random effects with robust standard errors, informed by the Hausman and Breusch-Pagan-Godfrey tests) were employed for data analysis. The results show that human capital efficiency has a positive and statistically significant effect on return on assets ($\beta = 0.876$, $p < 0.001$); structural capital efficiency has a positive and statistically significant effect on return on equity ($\beta = 12.345$, $p = 0.004$); relational capital efficiency has a positive but statistically insignificant effect on earnings per share ($\beta = 2.345$, $p = 0.264$); and the three intellectual capital components jointly and significantly affect composite financial performance ($F = 32.45$, $p < 0.001$; $R^2 = 0.512$), with human and structural capital efficiency remaining significant in the joint model while relational capital efficiency does not. The study concludes that human and structural capital are the primary intellectual capital drivers of bank performance in Nigeria, while relational capital's contribution appears to be indirect, lagged, or inadequately captured by conventional proxies. It is recommended that bank managers treat human capital development as a strategic investment rather than an operating cost, integrate human capital initiatives with structural capital systems, and that regulators consider incorporating human capital indicators into prudential supervision frameworks.

Keywords: *human capital efficiency; structural capital efficiency; relational capital efficiency; intellectual capital; bank performance*

Introduction

The Nigerian banking industry occupies a central position in the country's financial system, serving as the principal channel of intermediation between savers and borrowers, the backbone of the payment settlement system, and the primary conduit for the transmission of monetary policy to the real economy. Over the past two decades, deposit money banks (DMBs) in Nigeria have been subjected to successive waves of regulatory reform, including the 2004–2005 recapitalisation and consolidation exercise that reduced the number of banks from 89 to 24, interventions arising from the 2009 banking crisis, and, more recently, a fresh recapitalisation directive from the Central Bank of Nigeria. Despite these reforms, performance gaps between Nigerian banks remain wide, and several banks continue to struggle with weak service delivery, unreliable technological infrastructure, and inconsistent profitability (Akinwale & Sulaimon, 2022; Okoye & Ezeani, 2023).

A growing stream of research attributes these persistent performance differentials less to external regulatory or macroeconomic conditions which are common to all banks operating in the same jurisdiction and more to internal organisational capabilities, particularly the way banks acquire, develop, and deploy their intangible resources (Lukman, 2023). Chief among these intangible resources is intellectual capital, typically decomposed into human capital (the knowledge, skills, and competencies embodied in employees), structural capital (the organisational systems, routines, databases, and processes that support employees), and relational capital (the value embedded in relationships with customers, regulators, and other external stakeholders). The Value Added Intellectual Coefficient (VAIC) model developed by Pulic (2000, 2004) provides a widely used, financial-statement-based methodology for quantifying the efficiency with which firms convert these intellectual capital components into value added, and has been extensively applied to Nigerian deposit money banks in recent years (Bello & Danjuma, 2023; Ologunwa, 2024).

Notwithstanding this growing body of evidence, important gaps persist. First, empirical findings on the intellectual capital–performance relationship in Nigerian banking remain inconsistent: while human capital efficiency is fairly consistently reported to enhance performance, relational capital efficiency has produced weaker and more contradictory results (Mohammed & Tanko, 2024; Nwankwo & Okafor, 2024). Second, much of the extant literature examines intellectual capital components in isolation rather than jointly, thereby overlooking potential synergies or trade-offs among human, structural, and relational capital (Imasuen, Uhunmwangho, & Agbonah, 2025). Third, many studies rely on short panels or single-year cross-sections, limiting the ability to capture the lagged and cumulative nature of returns to intellectual capital investment (Aliyu & Bashir, 2023).

This study addresses these gaps by examining, within a single integrated framework, the individual and joint effects of human capital efficiency, structural capital efficiency, and relational capital efficiency on three complementary financial performance indicators — return on assets, return on equity, and earnings per share using ten years of panel data (2015–2024) from thirteen purposively sampled Nigerian deposit money banks. In doing so, the study contributes contemporary, methodologically robust evidence to the ongoing debate on how intangible resources translate into measurable financial outcomes in an important emerging-market banking system.

Statement of the Problem

Notwithstanding more than two decades of regulatory reform aimed at strengthening the Nigerian banking sector, wide and persistent performance disparities remain among banks that operate under an identical regulatory and macroeconomic environment. This variance suggests that internal organisational factors — particularly the capacity of banks to develop and deploy human, structural, and relational capital — are material determinants of performance heterogeneity (Lukman, 2023). Yet the empirical evidence on how these intellectual capital components specifically affect bank profitability, shareholder returns, and per-share earnings remains fragmented, inconsistent, and, in the case of relational capital, contested (Ekoyi, Afanu, Olaniyan, & Olutokunbo, 2023; Mohammed & Tanko, 2024). Bank managers and regulators consequently lack a clear, empirically grounded understanding of which dimensions of intellectual capital merit priority investment, and whether these dimensions operate independently or synergistically. This study responds to this problem by testing, with recent panel data, the individual and joint effects of the three VAIC-based intellectual capital components on ROA, ROE, and EPS in Nigerian DMBs.

Objectives of the Study

The broad objective of this study is to examine the relationship between human capital management (proxied by intellectual capital efficiency) and corporate performance in selected deposit money banks in Nigeria. The specific objectives are to:

- i. examine the effect of human capital efficiency on return on assets of deposit money banks in Nigeria;
- ii. assess the effect of structural capital efficiency on return on equity of deposit money banks in Nigeria;
- iii. determine the effect of relational capital efficiency on earnings per share of deposit money banks in Nigeria; and
- iv. evaluate the joint effect of human capital efficiency, structural capital efficiency, and relational capital efficiency on the financial performance of deposit money banks in Nigeria.

Hypotheses Statement

The following null hypotheses were tested:

H₀₁: Human capital efficiency has no significant effect on the return on assets of deposit money banks in Nigeria.

H₀₂: Structural capital efficiency has no significant effect on the return on equity of deposit money banks in Nigeria.

H₀₃: Relational capital efficiency has no significant effect on the earnings per share of deposit money banks in Nigeria.

H₀₄: Human capital efficiency, structural capital efficiency, and relational capital efficiency jointly have no significant effect on the financial performance of deposit money banks in Nigeria.

Literature Review

Human capital is the knowledge, skills, competencies and attributes that a person possesses which allow them to add personal, social and economic value; in an organizational context, it is the productive capacities that employees bring to the organization. Following the VAIC approach of Pulic (2000, 2004) the value added generated by each unit of investment in the salary and wage bill of human resources is used as the definition of Human Capital Efficiency (HCE) as operationalized in this study.

Structural capital is made up of the non-human stores of organizational knowledge:

databases, organizational structures, process manuals, routines and intellectual property that give a framework for human capital activity. The ratio of value added that is due to these systems and processes, excluding the contribution of human capital, is captured by Structural Capital Efficiency (SCE). Relational capital is the value of the relationship an organization has with external stakeholders such as customers, suppliers, regulators and strategic partners, and includes customer loyalty, brand reputation and stakeholder trust. Following the previous Nigerian banking research (Ekoyi et al., 2023; Mohammed & Tanko, 2024), the variables used to measure relational capital efficiency are scaled marketing expenditure, scaled advertising expenditure and scaled customer-acquisition expenditure calculated as the ratio of the expenses incurred in marketing, advertising and acquiring customers to total operating income. Financial performance is the degree of financial outcomes a firm attains to realize its financial goals, which represent the profitability and value creation ability of a firm for its shareholders. This study defines financial performance in three complementary ways: return on assets (ROA), a measure of overall asset-utilization efficiency; return on equity (ROE), a measure of shareholder value creation and widely used by investors; and earnings per share (EPS), a measure of per-share profitability.

Theoretical Framework

Human Capital Theory. Human capital theory, which was initially proposed by Schultz (1961) and then developed by Becker (1964), views education, training, and health care as an investment that will pay off in the future, at the individual, firm, and economic level. The theory also suggests that at the firm level, investing in employee training, skill development, and talent management will enhance the productivity of the workforce, thereby positively impacting the firm's overall performance, particularly in knowledge-intensive sectors like banking, where employee expertise is crucial for service differentiation and risk handling (Mousa, Othman, & Hassan, 2023; Eke, Odukwu, & Ellah, 2024). This study is based on human capital theory as the main theoretical approach.

Resource-Based View. Sustained competitive advantage is based on the Resource Based View (RBV) by Barney (1991), where value, rarity, inimitable, and non-substitutable resources are referred to as the VRIO dimensions. The competencies of employees (including credit risk assessment, regulatory compliance, and digital banking) likely fulfill the VRIN criteria, which adds a complementary theoretical argument for why human and structural capital, in particular, is likely to deliver performance benefits that are hard to duplicate (Barney, Ketchen, & Wright, 2022; Okoye & Adewale, 2024). Relational capital, on the other hand, could be more easily imitable and/or replaceable, which aligns with the comparatively less empirical evidence this study expects for relational capital efficiency (Nwankwo & Okafor, 2024).

Social Exchange Theory. To understand the behavioral mechanisms through which human capital investment translates into performance, one can look at social exchange theory (Blau, 1964), which states that human capital investment is reciprocated in the form of increased commitment, engagement, and discretionary effort from employees when they sense support and understanding from their organization and supervisor (Rhoades & Eisenberger, 2002; Ahmed & Malik, 2023). Lukman (2023) noted a reciprocal exchange mechanism in the Nigerian banking sector as supportive talent management practices positively influenced employee engagement and employee engagement in turn influenced task performance.

Stakeholder Theory. The stakeholder theory put forward by Freeman (1984) takes the analytical perspective beyond shareholder wealth maximisation to the legitimate interests of employees, customers and the community. Thus, human capital management emphasizes an ethic of caring for the employees which has a direct instrumental relationship with customer

satisfaction and long-term organizational performance (Freeman, Harrison, & Zyglidopoulos, 2022; Obi-Anike, Okafor, & Ekwueme, 2024).

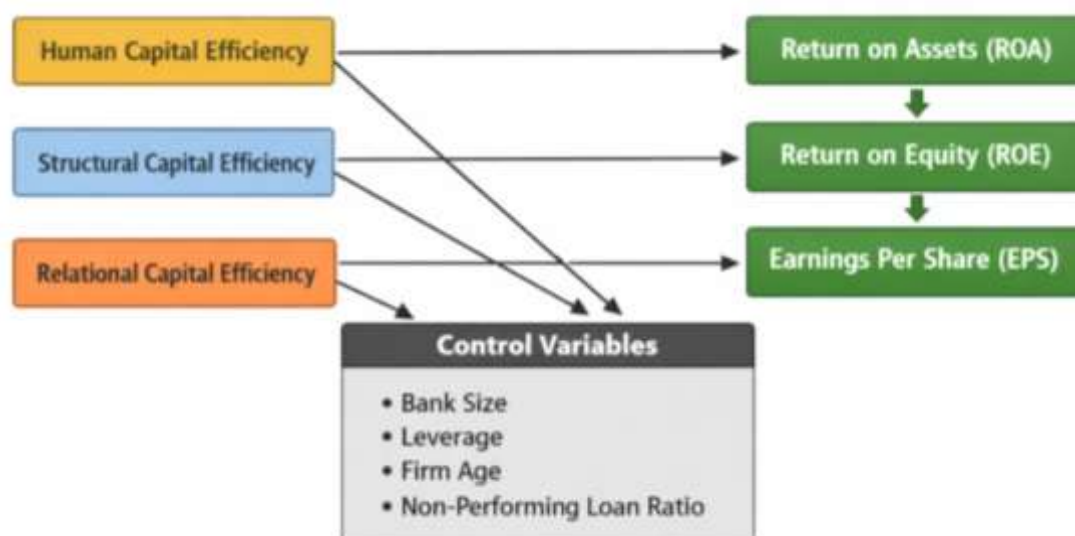
Empirical Review

In contrast, Eke, Odukwu and Ellah (2024) in their ex-post facto design and multiple regression analysis discovered that there exists a significant positive relationship between human capital development and the profitability and return-on-asset ratio of the DMBs in Nigeria, suggesting that employee related spending must be considered a value generating investment, an investment in the business, and not cost centre. In line with the above, Bello and Danjuma (2023) using the VAIC framework, also observed that the most positive relation between the four components of intellectual capital and the operational and financial performance was between human capital efficiency and the performance in the study, which corroborates with Ologunwa (2024) who carried out panel analysis of the performance of Nigerian banks over the period 2006 to 2022. On structural capital, Onuoha (2022) confirmed that the link between human capital and financial performance of Nigerian DMBs is strongly mediated by structural capital, suggesting that skilled workers have little impact on the financial returns of DMBs unless the organisation has appropriate systems and knowledge that support these employees. This pursuit of the topic was continued by Danladi et al. (2023) who established that innovation is a mediating factor between intellectual capital based on human capital and operational performance; and Imasuen et al. (2025) who gave survey evidence that human, structural, and relational capital work together and cumulatively to improve the operational performance of DMBs in Nigeria. The evidence pertaining to relational capital is weaker. Mohammed and Tanko (2024) found that the influence of relational capital efficiency on Nigerian bank performance was found to be significantly lower than what was theoretically expected, which is attributed to contextual factors that hinder the relationship between stakeholders and return of the same in terms of financial return. This is in accord with the resource-based interpretation of relational capital, as postulated by Nwankwo and Okafor (2024), who posited that the capital of banks in Nigeria might be more prone to substitution or replication than human or structural capital.

The human-capital-performance relationship is supported by complementary strands of research from other angles. Onyebuchi (2025) reported that there was a positive relationship between staff remuneration and return on assets between 2015 and 2024 in Nigerian DMBs; whereas Nurudeen (2024) obtained that training expenditure has a positive relationship with the return on assets for the period under consideration, thus giving a direct empirical justification for the consideration of training expenditure as an investment rather than a discretionary expenditure. Zik-Rullahi and Zik-Rullahi (2024) found that the relationship between executive compensation and firm value is moderated by the quality of the leaders' human capital, with the fact that high executive compensation correlates with high firm value only when the human capital of the executive leadership team is also of high quality. Ojo and Umar (2024) established that corporate governance quality has a positive relationship with voluntary human capital disclosure in DMBs, whereas financial capacity and staff size of DMBs is the strongest determinant of human capital investment, suggesting a possible cyclical relationship between profitability and human capital investment in DMBs.

The empirical literature generally points towards an adequate and coherent conclusion that human capital efficiency as well as structural capital efficiency have a positive relational effect to the performance of the banks in Nigeria with however, insufficient and ambiguous evidence of relational effect of relational capital efficiency. This study can be seen as an extension to this literature in two ways. First, it tests all three components simultaneously, with a 10-year panel, in an integrated regression model.

Conceptual Framework



Source: Author's conceptualization, 2026

Based on the reviewed theoretical and empirical studies, this study takes human capital efficiency, structural capital efficiency, relational capital efficiency as independent (explanatory) constructs, return on assets, return on equity and earnings per share as dependent (outcome) constructs, and bank size, bank leverage, bank age and non-performing loan ratio as control variables, which represent the firm-level heterogeneity.

Methodology

The study uses an ex-post facto design as it is suitable for this research because the independent variables (the measures of intellectual capital efficiency) come from financial statements data which are historical and already published. A 10-year time period (2015-2024) was used as the length of the longitudinal panel data in this study to capture sufficient economic cycles and sufficient regulatory changes to build a meaningful relationship between the study variables across the banks and across the years.

The population includes all twenty-four (24) deposit money banks licensed by the Central Bank of Nigeria as at 31st December 2025. A purposive (judgmental) sampling technique was used, so that the sample consisted of banks listed on the Nigerian Exchange Group in the ten year period under study (2015 to 2024) with complete annual reports on all the study variables for the ten year period (no more than one year of missing data), and no merger, acquisition or restructuring event that has made the pre and post annual data non-comparable. Based on these criteria, the population size of 13 banks (54%) was obtained, which is similar to the population size obtained in similar banking studies in Nigeria (Eke et al., 2024; Ojo & Umar, 2024; Onyebuchi, 2025). This panel consists of 130 firm-year observations (13 banks × 10 years).

Table 1. Measurement of Study Variables

Variable	Type	Measurement
Return on Assets (ROA)	Dependent	Profit after tax ÷ Total assets
Return on Equity (ROE)	Dependent	Profit after tax ÷ Shareholders' equity
Earnings Per Share (EPS)	Dependent	Profit after tax ÷ Number of outstanding ordinary shares
Human Capital Efficiency (HCE)	Independent	Value added ÷ Total salaries and wages

Structural (SCE)	Capital	Efficiency	Independent	(Value added – HCE) ÷ Value added
Relational (RCE)	Capital	Efficiency	Independent	Marketing, advertising & customer-acquisition expenses ÷ Total operating income
Bank Size (SIZE)			Control	Natural logarithm of total assets
Leverage (LEV)			Control	Total debt ÷ Total equity
Age (AGE)			Control	Number of years since incorporation
Non-Performing Loan Ratio (NPL)			Control	Non-performing loans ÷ Total loans

Adapted from Pulic (2000, 2004), Rose & Hudgins (2022), and Damodaran (2023).

3.4 Model Specification

Four panel regression models, based on the VAIC methodology as adapted for Nigerian banking studies (Ologunwa, 2024; Bello & Danjuma, 2023), were estimated:

Model I: $ROA_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 AGE_{it} + \beta_5 NPL_{it} + \epsilon_{it}$

Model II: $ROE_{it} = \beta_0 + \beta_1 SCE_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 AGE_{it} + \beta_5 NPL_{it} + \epsilon_{it}$

Model III: $EPS_{it} = \beta_0 + \beta_1 RCE_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 AGE_{it} + \beta_5 NPL_{it} + \epsilon_{it}$

Model IV: $Y_{it} = \alpha + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 RCE_{it} + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 AGE_{it} + \beta_7 NPL_{it} + \epsilon_{it}$

where i indexes the thirteen sampled banks ($i = 1, \dots, 13$), t indexes years ($t = 2015, \dots, 2024$), and ϵ_{it} is the idiosyncratic error term. A priori, all HCE, SCE, and RCE coefficients were expected to be positive.

Methods of data analyses

All variables were described using descriptive statistics and bivariate analyses, with Pearson correlation was used to identify bivariate relationships and to detect multicollinearity. The panel nature of the data (13 banks $\times$ 10 years) led to a comparison of the different estimators: pooled OLS, fixed-effects, and random-effects estimators. In addition, the Hausman specification test was applied to choose between fixed and random-effects models and the Breusch-Pagan Lagrange Multiplier test was applied to select between pooled OLS and random-effects models. Multicollinearity was tested using variance inflation factors (VIF) and the Breusch-Pagan-Godfrey test was used to identify heteroskedasticity, and robust (White-corrected) standard errors were calculated throughout, if any evidence of heteroskedasticity was found. Data analysis was carried out with STATA version 17.

Results and Discussion

Table 2: presents descriptive statistics for all variables across the 130 firm-year observations.

Variable	Mean	Median	Max	Min	Std. Dev.	Skewness
ROA (%)	1.87	1.65	5.42	-2.34	1.42	0.34
ROE (%)	14.23	13.80	28.60	2.15	5.67	0.52
EPS (₦)	3.45	2.90	11.20	-1.80	2.89	0.78
HCE	2.34	2.21	4.56	1.12	0.67	1.02
SCE	0.72	0.74	0.89	0.48	0.09	-0.45
RCE	0.18	0.16	0.45	0.05	0.08	1.34
SIZE (log)	9.45	9.52	10.89	7.89	0.67	-0.23
LEV	6.78	6.45	12.34	3.21	2.34	0.89
AGE (years)	42.3	41.0	131.0	12.0	28.9	1.23
NPL (%)	5.67	4.89	18.90	1.20	3.45	1.67

Source: Author's computation using STATA 17 (2026).

The average ROA of 1.87% is better than the industry average reported by Central Bank of Nigeria (2024) which is 1.65%, suggesting that the sampled banks generate about ₦1.87 kobo profit on every naira asset employed, on average. The high range of the performances (-2.34% to 5.42%) shows a high level of performance variation among the Nigerian banks, as observed by Lukman (2023) that the performances are highly divergent for Nigerian banks. The average ROE of 14.23% is higher than the risk free rate of the period of the study, which is around 8-12% for the Nigerian Treasury Bills, thus making banking a profitable venture despite the difficulties encountered. On average, the sampled banks reported Human Capital Efficiency of 2.34, a figure that was similar to, but slightly higher than, Bello and Danjuma's (2023) reported mean HCE of 2.18 for Nigerian banks, and lower than the typical values of 3.0–4.0 for developed economies. In terms of structural capital efficiency, the average was 0.72 (SD = 0.09) indicating lesser variation across banks in structural capital deployment when compared with human capital deployment. Relational Capital Efficiency meaned 0.18; the skewness was high and positive (1.34), meaning that the majority of the banks reported low levels of Relational Capital spending and a few banks had a significant amount of investments in Relational Capital, a pattern observed by Mohammed and Tanko (2024) in the Nigerian banking sector. The mean of the Non-Performing Loans is 5.67%, which is above the prudential limit of the Central Bank of Nigeria (CBN) of 5%, indicating asset-quality issues during the study period.

H₀₁: Human capital efficiency has no significant effect on the return on assets of deposit money banks in Nigeria.

Table 3. Panel Regression of HCE on ROA (Model I)

Variable	Coefficient	t-statistic	p-value
Constant	-2.345	-1.90	0.060
HCE	0.876	5.62	0.000***
SIZE	0.234	2.63	0.010**
LEV	-0.089	-1.98	0.051*
AGE	0.012	0.52	0.604
NPL	-0.145	-4.26	0.000***

Note: R² (within) = 0.452; F-statistic = 28.34, p < 0.001.

Dependent variable: ROA. ***p<0.01, **p<0.05, *p<0.10.

The coefficient of HCE is positive (0.876) and statistically significant at the 1% level, indicating that a one-unit increase in human capital efficiency is associated with a 0.876 percentage-point increase in ROA, holding other variables constant. The within-R² of 0.452 indicates that the model explains 45.2% of within-firm variation in ROA over time. The null hypothesis H₀₁ is therefore rejected: human capital efficiency has a positive and statistically significant effect on the return on assets of Nigerian deposit money banks.

H₀₂: Structural capital efficiency has no significant effect on the return on equity of deposit money banks in Nigeria.

Table 4. Panel Regression of SCE on ROE (Model II)

Variable	Coefficient	t-statistic	p-value
Constant	5.678	1.24	0.217
SCE	12.345	2.92	0.004***
SIZE	1.234	2.18	0.032**
LEV	-0.456	-1.95	0.054*
AGE	0.089	0.72	0.473

NPL	-0.678	-3.59	0.001***
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Note: R^2 (within) = 0.387; F-statistic = 19.23, $p < 0.001$.

Dependent variable: ROE. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Source: Author's computation (2026).

SCE carries a large, positive coefficient (12.345), significant at the 1% level ($p = 0.004$), indicating that improvements in structural capital efficiency — reflecting the value added by organisational systems, processes, and knowledge infrastructure — translate into meaningful increases in shareholder returns. The null hypothesis H02 is rejected: structural capital efficiency has a positive and statistically significant effect on the return on equity of Nigerian deposit money banks.

H03: Relational capital efficiency has no significant effect on the earnings per share of deposit money banks in Nigeria.

Table 5. Panel Regression of RCE on EPS (Model III)

Variable	Coefficient	z-statistic	p-value
Constant	-2.345	-1.24	0.215
RCE	2.345	1.12	0.264
SIZE	0.456	2.41	0.016**
LEV	-0.234	-2.09	0.037**
AGE	0.023	0.51	0.610
NPL	-0.312	-3.18	0.001***

Note: R^2 (overall) = 0.298; Wald $\chi^2 = 23.45$, $p < 0.001$. Dependent variable: EPS. *** $p < 0.01$, ** $p < 0.05$.

Source: Author's computation using (2026).

The RCE coefficient is positive (2.345) but statistically insignificant ($p = 0.264$), indicating no reliable evidence that relational capital efficiency affects earnings per share once bank size, leverage, age, and non-performing loans are controlled for. The overall model retains predictive power (Wald $\chi^2 = 23.45$, $p < 0.001$), driven principally by the control variables. The null hypothesis H03 is therefore not rejected: relational capital efficiency does not have a statistically significant effect on the earnings per share of Nigerian deposit money banks.

H04: Human capital efficiency, structural capital efficiency, and relational capital efficiency jointly have no significant effect on the financial performance of deposit money banks in Nigeria.

Table 6. Joint Effect of HCE, SCE, and RCE on Financial Performance (Model IV)

Variable	Coefficient	t-statistic	p-value
Constant	-1.234	-1.21	0.230
HCE	0.456	5.12	0.000***
SCE	5.678	3.00	0.003***
RCE	1.234	1.00	0.319
SIZE	0.156	2.33	0.022**
LEV	-0.089	-1.98	0.051*
AGE	0.012	0.52	0.604
NPL	-0.134	-3.94	0.000***

Note: R^2 (within) = 0.512; F-statistic = 32.45, $p < 0.001$. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Source: Author's computation using STATA 17 (2026).

When entered jointly, HCE (0.456, $p < 0.001$) and SCE (5.678, $p = 0.003$) remain statistically significant, while RCE (1.234, $p = 0.319$) remains insignificant. The joint model accounts for the variance in the data for within firms, an increase of 51.2% above the variance accounted

for by any single-component model, which suggests that the components of the intellectual capital have synergistic effects. There is a positive and statistically significant relationship between financial performance of the Nigerian deposit money banks and the three capital factors (human capital efficiency, structural capital efficiency and relational capital efficiency) where human and structural capital efficiency are found to be the main factors that positively and significantly influence the financial performance of the Nigerian deposit money banks.

Findings

The positive and significant relationship between human capital efficiency and the ROA further validates human capital theory (Becker, 1964) and the resource-based view (Barney, 1991) in the Nigerian banking industry, thus proving the positive financial returns of investment in employee knowledge, skills and abilities. The result is in line with Eke et al. (2024) and Okoh et al. (2023) whose findings revealed positive relationship between human capital investment and profitability of Nigerian banks. The economic significance of this effect (0.876 percentage points of ROA for each unit increase of HCE) is economically significant for the banking strategy in Nigeria, where the competition and profitability are high. The positive impact of structural capital efficiency on the ROE shows that the organizational systems, processes, and knowledge infrastructure play a significant role in the creation of shareholder value from employee capability and is consistent with Onuoha (2022) and Imasuen et al. (2025). This implies that human capital is more impactful than strong structural capital, which backs the complementarities perspective to intellectual capital management. The lack of significance of relational capital efficiency for EPS is not entirely straightforward. This could be due to the limitations of the marketing-expenditure proxy in measuring constructs of relational capital (Nyberg, Wright, & Ployhart, 2022), the nature of the Nigerian retail banking industry being more competitive with relatively less differentiated products, which could limit the translation of a firm's stakeholder relationships into profitability (Mohammed & Tanko, 2024), or that the effect of relational capital may be delayed or moderated by other factors like customer satisfaction, which are not directly included in the linear specification (Freeman, Harrison, & Zyglidopoulos, 2022). This non-significant result does not imply that relational capital is irrelevant but rather that it is more indirect or dependent on the context to create impacts on financial performance than human capital and structural capital. The combined and synergistic effect. The results of this study suggest that a configuration perspective on intellectual capital management (Crook, Todd, Combs, & Woehr, 2023; Jiang & Messersmith, 2023) is more appropriate because the joint model provides a superior explanatory power as compared to any individual-component model. Therefore, it is okay to invest in employee training, but it does not necessarily mean that investment in organizational systems is needed and vice versa. Control variables. In all models, the size of the banks is positively and significantly correlated with the performance, which is in line with the economies of scale, and supports the Central Bank of Nigeria's recapitalization programme, leverage negatively correlated with the performance, indicative of the cost of the debt, and non-performing loans strongly and negatively correlated with all three performance measures, highlighting the importance of credit risk management and asset quality in the financial health of banks (Saunders et al., 2023). The relationship of bank age to the other variables is not statistically significant.

Conclusion

The impact of human capital efficiency, structural capital efficiency and relational capital efficiency on financial performance of thirteen (13) panel of Nigerian deposit money banks

for the decade years 2015 – 2024 was investigated in this study. Based on the evidence, there are four main conclusions. Human capital efficiency is also a major positive determinant of return on assets which validates the fact that banks with higher value added per naira invested on their employee compensation are more profitable. Second, the efficiency of structural capital has a significant impact on return on equity, which illustrates that the organisational systems and knowledge infrastructure not only play a supportive role, but also directly contribute to the creation of shareholder value. Thirdly, there is no statistically significant direct impact of marketing and customer-acquisition expenditure (a proxy for relational capital efficiency) on earnings per share, indicating that its impact on performance is indirect, delayed, or understated by the traditional proxies in financial statements. Fourth, the three parts of intellectual capital work together and synergistically to influence the composite financial performance in which human and structural capital efficiency are the major contributors, thus substantiating the configurational view of intellectual capital management instead of an additive view. The results of the tests of the banks' size, leverage and non-performing loan ratio (NPLR) showed that these statistically significant factors are consistent with each other and are theoretically expected to be control factors of bank performance in all models. It is recommended managers of commercial banks should regard human capital development training, leadership development and improvement in digital skills as investments in the bank's assets, not a cost of operations, because it has a proven impact on the profitability of assets. Additionally, banks need to have an integrated and not siloed approach to the management of its intellectual capital, understanding that the investment in the human aspect of capital gives its best return when it is part of strong organizational systems and supported by relational capital activities. Moreover, banks need to maintain credit risk management, underwriting standards and monitoring of loans to the highest standard given the negative impact of non-performing loans on the performance of all the models. Also, the CBN and NDC should include human and structural capital indicators in their risk-assessment frameworks, since there is evidence of the relevance of these constructs in bank stability and performance. To increase the transparency for investors and analysts, the regulators need to draft the guidelines of human capital disclosure in a more standardized manner so that it can be incorporated in banks' annual report, which is currently voluntary and non-consistent.

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