*LAUTECH Journal of Accounting, Finance and Contemporary Management Research (JAFACOMAR); Volume 2, Issue 1; 2025.*

# Value Relevance of Intellectual Capital in Market Valuation of Nigerian Listed Services Firms

AIGIENOHUWA, Osarenren Osasere (PhD, ACTI, ACIB, ACA, CFA, CFP, FCCA)*[1];
Iyamu Evelyn Omorotionmwan (PhD, FCA) *[2]

[1]Department of Business Administration, University of Benin, Benin City, Nigeria
[2]Department of Accounting, Wellspring University, Benin City, Nigeria

***E-mail of Correspondence Author**: blessedosas@yahoo.com*

## ABSTRACT

This study investigated the value relevance of intellectual capital in the market valuation of listed services firms in Nigeria. This study adopted a quantitative panel research design, focusing on a population of 22 listed services firms in Nigeria across various NGX-classified sub-sectors from 2012 to 2023. The analysis was based on a balanced sample of 98 firm-year observations drawn from firms with consistent data availability. Specifically, it examined the effect of Human Capital, Relational Capital, and Structural Capital on Market Capitalisation using robust linear regression on panel data covering 2012 to 2023. The findings revealed that Human Capital and Structural Capital had positive and statistically significant impacts on market capitalisation, whereas Relational Capital exhibited an insignificant effect. Firm Size, used as a control variable, was also significantly associated with market value, while Leverage was not. The results underscore the critical role of internal intangible assets in enhancing firm valuation within the Nigerian services sector. Based on the findings, it is recommended that policymakers and corporate decision-makers in Nigeria strengthen corporate governance practices that promote the strategic development of human and structural capital. Additionally, service firms should adopt integrated reporting frameworks to better communicate the intangible value they create, particularly in human capability and operational infrastructure. A more consistent and value-based investment in relational capital may also be needed to convert external linkages into measurable financial outcomes.

**Keywords:** Intellectual Capital, Market Capitalisation, Human Capital, Structural Capital.

## Introduction

In the contemporary shift toward a knowledge-driven global economy, firms compete increasingly on intangible assets collectively referred to as intellectual capital (IC)) which encompass employee expertise (human capital), external networks (relational capital), and organizational systems (structural capital). These assets often underpin sustainable competitive advantage and superior market valuation more effectively than traditional tangible resources alone. While international studies attest to the critical role of IC in explaining firm value (Jian & Feng, 2020), evidence from Nigeria's service sector comprised of non-financial, non-telecom firms such as hospitality, logistics, publishing, and support services listed on the Nigerian Exchange Group (NGX) remains sparse and fragmented.

A small but growing body of Nigerian research suggests that IC matters for market outcomes. Efesiri, et al. (2022) examined thirty-one NGX-listed firms (across various sectors) over 2016–2021, finding that overall Modified-VAIC) and by extension its components (positively and significantly affects market valuation (Efesiri et al., 2022). However, their aggregate approach did not isolate which IC pillars drive value. Otuya (2023) focused specifically on listed service companies from 2011–2022 and reported that human capital efficiency and relational capital efficiency both exhibit significant positive associations with shareholders' wealth, whereas structural capital efficiency showed a positive but non-significant link (Otuya, 2023). Similarly, a study of 117 quoted companies spanning 2018–2022 found mixed effects of structural and human capital efficiencies on market value, with capital-employed efficiency dominating (Ibrahim & Abubakar, 2023). More broadly, Knowledge Economy research confirms that IC influences financial performance in non-financial service firms, though it stops short of value relevance analysis (Awolu & Salami, 2022).

Despite these insights, none of the extant studies disaggregate expense-based proxies for human capital (training intensity), relational capital (marketing intensity), and structural capital (IT-expense intensity) to test their individual value relevance in the service subsector. Yet annual reports of NGX-listed service firms (such as Academy Press Plc., NAHCO Plc., and Trans-Nationwide Express Plc.) reveal consistent investments in staff training, brand-building, and digital infrastructure. Without component-level evidence, managers and investors in Nigeria's service economy lack precise guidance on which intangible investments most effectively enhance market valuation.

To fill this gap, the present study examines three pure IC components (human capital (proxied by training-expenditure intensity), relational capital (marketing-expenditure intensity), and structural capital - IT-related operating-expense intensity) and their individual effects on shareholders'wealth for a panel of listed Nigerian services firms over recent years. By employing expense-based measures (aligned with the proxies used in human and relational capital research), this paper isolates the intangible drivers of firm value, offering actionable insights for resource allocation. The findings will enable service-sector executives to prioritize intangible-asset investments and help investors and policymakers appreciate the non-financial determinants of market valuation in an emerging-market context.

## Review of Literature and Hypothesis Development

### Empirical Review

### Human Capital and Market Valuation

Human capital refers to the knowledge, skills, experience, and competencies possessed by employees that contribute to a firm's productivity and long-term value creation. As noted by Pulic (2000), human capital is a key element of intellectual capital, reflecting the capabilities of personnel to generate value through innovation, decision-making, and performance. Market valuation refers to the perceived value of a firm as determined by investors in the capital market, typically reflected in its stock price and overall market capitalization. market capitalisation is widely used to measure a firm's market valuation, representing the total market value of a company's outstanding shares of stock. It reflects investors' collective assessment of a firm's current worth and future earning potential, with increases in market capitalisation indicating strong investor confidence and perceived growth prospects (Bodie, et al, 2021). Unlike financial performance, which involves asset replacement costs, market capitalisation offers a more direct and observable indicator of firm valuation in real-time capital markets

A number of recent Nigerian studies confirm that investments in human capital—particularly training and broader human-resource efficiency—are positively linked to market-based valuation metrics, though the precise proxy and context matter. Obulor and Ohaka (2020) analyze training costs for quoted manufacturing firms (2008–2017) and show that higher employee training expenditure significantly improves financial performance indicators, implying potential uplifts in financial performance in knowledge-intensive contexts (Obulor & Ohaka, 2020). Umar and Abubakar (2024) examined human capital efficiency (HCE) across

58 listed non-financial service firms over 2012–2022 and report that improvements in HCE positively and significantly drive market value of equity (MVE) highlighting that expense-based measures of human capital matter for investor perceptions (Umar & Abubakar, 2024).

Godwin and Udeh (2021) specifically test staff training and development costs against financial performance for 76 non-financial service firms (2010–2020) and find no significant direct effect of training expenditure on financial performance, suggesting that not all human-capital outlays immediately translate into market re-rating (Godwin & Udeh, 2021). By contrast, Otuya, et al. (2023), focusing on 17 listed service companies (2011–2022), isolate training-expenditure intensity as a pure human-capital proxy and demonstrate a significant positive effect on financial performance, underscoring that in the services subsector, targeted training investments can be value-relevant (Otuya, et al., 2023).

Complementary evidence from manufacturing and agribusiness contexts further supports a positive link. A study of listed agribusiness firms over 2016–2021 finds that aggregate Modified-VAIC, driven largely by human capital components, significantly predicts financial performance (Efesiri, et al., 2022), indirectly pointing to the importance of human-capital efficiency. Finally, while not market-valuation per se, Obi and Emeneka (2021) show that higher HCE significantly boosts Economic Value Added (EVA) among 51 NGX-quoted service firms (2010–2019), suggesting that more efficient human capital tends to translate into value creation that markets eventually price in (Okoye & Emeneka, 2021).

This mixed but largely supportive evidence underpins our hypothesis that training-expenditure intensity will have a positive, significant effect on financial performance for listed Nigerian services firms.

**$H_{01}$:** Human capital (IT-related operating-expense intensity) has no significant effect on Tobin's Q of listed Nigerian services firms.

**Relational Capital and Market Valuation**

Relational capital refers to the value derived from a firm's relationships with external stakeholders such as customers, suppliers, and strategic partners, which can enhance brand loyalty, customer retention, and ultimately firm value. According to Marr and Roos (2005), relational capital encompasses the trust, reputation, and cooperation a firm builds in its external environment, making it a critical component of intellectual capital Relational capital)

investments in marketing, branding, and customer-oriented activities (has been shown in several Nigerian contexts to carry a positive, though sometimes varying, association with market valuation metrics likefinancial performance. Otuya, et al. (2023), in their analysis of 17 NGX-listed service firms over 2011–2022, explicitly disaggregate VAIC components and find that relational capital efficiency (proxied within the VAIC model by marketing and customer-related expenses) is significantly and positively related to shareholders' wealth (Otuya, et al., 2023). This provides direct evidence that, in the services subsector, branding and customer-focused outlays contribute to how investors price firms.

In the broader NGX-wide study by Efesiri, et al. (2022), although relational capital is not separately reported in their regression tables, their aggregate Modified-VAIC results (which embed relational capital) show a robust positive effect onfinancial performance across 31 listed firms from 2016–2021, implying that relational investments play a meaningful role alongside human and structural capital (Efesiri, et al., 2022).

Aliyu & Ofurum, (2024) ound that relational capital efficiency (akin to marketing/customer expense relative to value added) had a positive but statistically insignificant effect on bank performance, indicating that in regulated industries, market reactions to relational investments may be muted

Beyond Nigeria, Buallay, et al. (2020) in the GCC banking context demonstrate that relational capital efficiency positively influences financial performance, lending indirect support to its value-relevance. While not Nigeria-specific, these international parallels underscore that if properly measured and disclosed, relational capital can drive market and financial outcomes.

In summary, the most compelling Nigerian evidence is provided by Otuya et al. (2023), who focused on listed service firms, and by the aggregate VAIC-based findings of Efesiri et al. (2022). When considered alongside the industry-specific insights from Aliyu and Ofurum (2024) on deposit money banks, these studies collectively support the selection of marketing expenditure intensity as a reliable, expense-based proxy for relational capital. Accordingly, this study hypothesizes that relational capital will exert a positive and significant influence on financial performance within Nigeria's services sector.

**$H_{02}$:** Relational capital has no significant effect on Tobin's Q of listed Nigerian services firms.

**Structural Capital and Market Valuation**

Structural capital refers to the institutionalized knowledge, systems, processes, databases, and technologies that support employees' productivity and sustain the organization's operations beyond individual contributions. According to Edvinsson and Malone (1997), structural capital includes everything that remains in the company when employees go home, such as organizational routines, IT systems, patents, and procedures that enhance efficiency and value creation. Empirical studies in Nigeria consistently find that structural capital (proxied by investments in organizational systems and technology) tends to have a positive but often statistically insignificant effect on market valuation (Tobin's Q).

Otuya, et al. (2023), in their panel of 17 NGX-listed service firms over 2011–2022, report that while structural capital efficiency (within a VAIC framework) carries a positive coefficient in relation to Tobin's Q, it fails to achieve statistical significance ($p > .05$). This aligns with their earlier finding in the pure service-sector context that structural capital's coefficient, though positive, does not reach conventional significance levels.

A sector-wide study by Efesiri, et al. (2022) across 31 NGX-listed firms (2016–2021) demonstrates that aggregate Modified-VAIC robustly predicts Tobin's Q, but their diagnostics indicate that the structural component contributes less explanatory power than human or relational pillars, even if not reported separately in regressions. Focusing on financial institutions, an analysis of Deposit Money Banks finds that structural capital efficiency has a positive but non-significant relationship with Tobin's Q ($p = 0.644$), confirming that IT and systems investments in highly regulated contexts may not immediately translate into market re-rating.

Umar & Dandago (2023) study of 58 listed non-financial service firms (2012–2022) applies a modified VAIC and regresses both ROE and Tobin's Q on IC components. While results vary by performance measure, the structural capital coefficient on Tobin's Q is positive but statistically weak, mirroring the Nigerian service-sector pattern of under-recognized IT investments.

Collectively, these Nigerian-context studies suggest that although firms are expanding spending on IT platforms, process automation, and digital infrastructure, investors may undervalue or discount these expenditures, possibly due to delayed or opaque benefit

realization. This body of evidence justifies our focused use of IT-expense intensity as a clean, expense-based proxy for structural capital and motivates our formal hypothesis:

**$H_{03}$:** Structural capital (IT-related operating-expense intensity) has no significant effect on Tobin's Q of listed Nigerian services firms.

**Theoretical Framework**

The study is underpinned by two interrelated theoretical frameworks: the Resource-Based View (RBV) and Signaling Theory. These frameworks collectively explain how investments in intangible resources—such as human capital, relational networks, and structural capabilities—can create competitive advantage and influence investor perception, thereby affecting market valuation as measured by financial performance.

The Resource-Based View, originally developed by Barney (1991), posits that a firm's internal resources, when they are valuable, rare, inimitable, and non-substitutable (VRIN), form the basis of sustained competitive advantage. Intellectual capital fits squarely within this framework. Human capital, comprising employee skills and knowledge, is considered a strategic asset that cannot be easily replicated by competitors. Relational capital, expressed through marketing strength and customer loyalty, creates firm-specific relationships that reinforce market position. Structural capital, such as IT systems and organizational processes, supports the efficient deployment of other resources. These resources are particularly important for service firms, which are more reliant on people, processes, and external relationships than physical assets (Barney, 1991; Grant, 1996).

Supporting the RBV, Signaling Theory (Spence, 1973) provides a complementary lens through which to interpret the relationship between intellectual capital and market valuation. According to this theory, firms send signals to the market through observable investments and disclosures. Training expenses, marketing outlays, and IT investments may serve as credible signals to investors about a firm's long-term strategic orientation and innovation capacity. Especially in markets characterized by information asymmetry, such as Nigeria's, these signals can shape investor expectations and influence firm valuation. As noted by Connelly, et al. (2011), effective signaling improves transparency and builds investor confidence, both of which are critical in emerging markets where institutional trust may be lower.

Thus, the integration of RBV and Signaling Theory provides a robust conceptual foundation for this study. While RBV explains why intellectual capital contributes to firm value from a strategic resource perspective, Signaling Theory explains how those investments are interpreted by the capital market and reflected in valuation metrics. Together, they justify the inclusion of training expenditure, marketing expenses, and IT-related costs as explanatory variables for assessing the value relevance of intellectual capital in Nigerian listed service firms.

**Methodology**

This study investigated the value relevance of intellectual capital components, specifically human capital, relational capital, and structural capital, on the market valuation of listed Nigerian services firms. Market capitalisation is employed as the dependent variable to reflect the forward-looking market value of these firms relative to their underlying asset base. The study adopted a quantitative panel data design, capturing both cross-sectional and time-series variations for a balanced sample of 20 service-sector firms listed on the Nigerian Exchange Group (NGX) over the period 2012 to 2023. This approach enables robust inference on the dynamic relationship between intangible resource investments and firm value.

**Table 1: Industry Distribution of Sampled Firms**

| Industries | Freq. | Percent |
|---|---|---|
| Industrials | 10 | 45.45 |
| Consumer Services | 6 | 27.27 |
| Communication | 2 | 9.09 |
| Consumer Goods | 1 | 4.55 |
| HealthCare | 1 | 4.55 |
| Oil & Gas | 1 | 4.55 |
| Utilities | 1 | 4.55 |
| Total | 22 | 100 |

**Source:** Author's compilations (2025)

The table presents the distribution of sampled firms across various industries. The Industrials sector accounts for the largest share, comprising 45.45% of the sample (10 firms), followed by Consumer Services with 27.27% (6 firms). The Communication sector contributes 9.09%, while the Consumer Goods, HealthCare, Oil & Gas, and Utilities sectors each represent 4.55% of the total sample. In total, 22 firms were sampled, reflecting diverse industry representation.

The research is anchored on a positivist epistemological stance, emphasizing observable and quantifiable relationships between variables. Purposive sampling was used to select only those service firms with consistently available financial data and complete disclosures on training costs, marketing expenses, and IT-related operating expenses during the study period. Secondary data were sourced from audited annual reports, firm fact books, and corporate websites, ensuring the credibility and uniformity of the financial data used for analysis.

All variables are defined based on established accounting and finance literature. The dependent variable, financial performance, is computed as the ratio of market value of equity plus total liabilities minus cash and cash equivalents, to total assets. This captures investors' assessment of firm value relative to replacement cost. The first independent variable, human capital, is proxied by training expenditure intensity, calculated as training cost divided by revenue. The second independent variable, relational capital, is measured by marketing expenditure intensity, representing marketing expenses divided by revenue. The third independent variable, structural capital, is captured through IT expense intensity, computed as the ratio of IT-related operating expenses to total revenue. These proxies reflect annual outlays toward enhancing intangible capabilities.

The study specifies the following model:

$$\text{Market Capitalisation}_{it} = \beta_0 + \beta_1 HUM_{it} + \beta_2 REL_{it} + \beta_3 STR_{it} + \beta_4 FSIZE_{it} + \beta_5 FAGE_{it} + \varepsilon_{it}$$

Where: $\text{Market Capitalisation}_{it}$ = Market valuation of firm *i* at time *t;*

$HUM_{it}$ = Human capital (training expenditure / revenue);

$REL_{it}$ = Relational capital (marketing expenditure / revenue);

$STR_{it}$ = Structural capital (IT expenses / revenue);

$FSIZE_{it}$ = Firm size (log of total assets);

$FAGE_{it}$ = Firm age (years since incorporation); and

$\varepsilon_{it}$ = Error term

Panel regression technique wa employed to estimate the model. Both fixed and random effects estimators were considered, with the Hausman specification test guiding the selection of the appropriate estimator. The final regression model was implemented using the random effects specification where no correlation was found between the unobserved firm-specific effects and the regressors.

A range of diagnostic tests were conducted to ensure the robustness and reliability of the estimates. To check for multicollinearity, the Variance Inflation Factor (VIF) was computed, with thresholds below 10 considered acceptable. The Breusch–Pagan/Cook–Weisberg test was applied to detect heteroskedasticity in the residuals. The Wooldridge test for autocorrelation was conducted to assess serial correlation across firm panels. Model specification accuracy was tested using the Ramsey RESET test, and normality of residuals was assessed using the Shapiro–Wilk test. All statistical analyses were conducted using STATA software.

Through this empirical design, the study ensures methodological rigor in assessing whether and how human, relational, and structural capital investments influence the market valuation of listed service firms in Nigeria.

## 4. Data Presentation and Analysis

### Descriptive Statistics

**Table 2: Descriptive Statistics**

| Variable | Mean | Median | Max | Min | Std. Dev | N |
|---|---|---|---|---|---|---|
| Market Capitalisation (MC) | 6.9 | 1.7 | 720 | 0.16 | 46 | 243 |
| Human Capital (HUM) | 1.1 | 0.63 | 5 | 0 | 1.1 | 149 |
| Relational Capital (REL) | 4.2 | 2 | 50 | 0.0015 | 6.9 | 173 |
| Structural Capital (STR) | 0.91 | 0.62 | 7.9 | 0.022 | 0.98 | 137 |
| Firm Size (FSA) | 16 | 16 | 19 | 11 | 1.6 | 248 |
| Financial Leverage (LEV) | 80 | 59 | 1379 | 10 | 106 | 248 |

**Source:** Author's computation (2025) using STATA 17.0.

The descriptive statistics reveal substantial variation in the market valuation and intellectual capital components among Nigerian listed services firms. Market capitalisation, the dependent variable, has a mean of approximately ₦6.89 million and a median of ₦1.67 million, with a wide range from ₦158,000 to as high as ₦720 million. This large discrepancy between the mean and median, along with a high standard deviation of ₦46.5 million, suggests the presence of significant outliers and a positively skewed distribution, indicating that a few very large firms dominate market value in the services sector.

Human capital, measured as training expenditure relative to revenue, shows a mean of 1.1% and a median of 0.63%, suggesting that most firms allocate modest resources to employee development. The maximum observed ratio is 5%, while some firms reported no investment at all, reflecting varying human capital investment strategies across firms. Relational capital, proxied by marketing expenditure as a percentage of revenue, also shows considerable

dispersion. The mean is 4.2%, but the median is just 2%, and the maximum reaches 50%, indicating that while most firms adopt moderate marketing practices, a few allocate significantly higher resources, potentially to maintain competitive positioning or brand visibility.

Structural capital, represented by IT investment as a share of revenue, averages 0.91% with a median of 0.62%, a maximum of 7.9%, and a minimum of 0.022%. These figures indicate that most firms invest modestly in technology infrastructure, though some demonstrate more aggressive digital investment strategies. Firm size, measured as the natural logarithm of total assets, is relatively normally distributed, with a mean and median of 16, and a range from 11 to 19. This reflects moderate variability in firm scale within the sample.

Lastly, financial leverage presents notable dispersion, with a mean value of 80%, a median of 59%, and an exceptionally high maximum of 1,379%. This indicates that while many firms maintain relatively conservative capital structures, others are highly leveraged, possibly due to aggressive financing strategies or sector-specific dynamics. Overall, the statistics underscore the heterogeneity in capital structure and intellectual capital deployment among listed service firms in Nigeria, highlighting the need for robust empirical analysis to understand how these factors influence market valuation.

**Diagnostic Tests**

Normality Tests

**Table 3: Normality Test Results Using Skewness/Kurtosis and Shapiro–Wilk Methods**

| Variable | Obs | Pr (Skewness) | Pr (Kurtosis) | Adj Chi2(2) | Prob>Chi2 | Shapiro-Wilk W | SW V | SW z | SW Prob>z |
|---|---|---|---|---|---|---|---|---|---|
| MC | 243 | 0.0000 | 0.0000 | - | 0.0000 | 0.08755 | 161.404 | 11.812 | 0.0000 |
| HUM | 149 | 0.0000 | 0.0577 | 23.56 | 0.0000 | 0.85434 | 16.851 | 6.401 | 0.0000 |
| REL | 173 | 0.0000 | 0.0000 | - | 0.0000 | 0.59281 | 53.567 | 9.092 | 0.0000 |
| STR | 137 | 0.0000 | 0.0000 | - | 0.0000 | 0.69217 | 33.147 | 7.899 | 0.0000 |
| FSA | 248 | 0.0773 | 0.2895 | 4.27 | 0.118 | 0.98242 | 3.165 | 2.68 | 0.00368 |
| LEV | 248 | 0.0000 | 0.0000 | - | 0.0000 | 0.40181 | 107.727 | 10.883 | 0.0000 |

**Keys**: MC - Market Capitalisation; HUM - Human Capital; REL - Relational Capital; STR - Structural Capital; FSA - Firm Size; and Lev - Financial Leverage

**Source:** Author's computation (2025) using STATA 17.0.

The normality test results for the variables used in this study suggest significant deviations from the normal distribution for most of the data.

Starting with the Skewness/Kurtosis test for normality, which jointly examines whether the data distribution is symmetric (skewness) and mesokurtic (normal kurtosis), we observe that the p-values for market capitalisation (MC), human capital (HUM), relational capital (REL), structural capital (STR), and financial leverage (LEV) are all less than 0.05. This indicates a statistically significant rejection of the null hypothesis of normality for these variables. Only firm size (FSA) shows a p-value of 0.118 for the joint chi-square test, suggesting that it does not significantly deviate from normality.

The Shapiro–Wilk W test further supports this conclusion. The W-statistics for all variables except firm size are far below 1, with very small p-values (all < 0.01), confirming strong departures from normality. For instance, market capitalisation has a W of 0.08755 and a p-value of 0.00000, highlighting extreme non-normality likely due to high skewness or outliers. Similarly, financial leverage (LEV) has a W of 0.40181 and p-value of 0.00000, suggesting substantial asymmetry and dispersion.

On the other hand, firm size (FSA) stands out with a W-statistic of 0.98242 and a p-value of 0.00368. While this still indicates a statistically significant deviation from normality at the 1% level, the W-statistic is close to 1, suggesting only a mild departure compared to the other variables.

In summary, the data strongly violate the assumption of normality for most variables, which implies that regression estimations and hypothesis testing should consider robust linear regression to ensure validity and accuracy of the inferences.

Correlation Analysis

**Table 4: Pearson Correlation Matrix**

| Variable | MC | HUM | REL | STR | FSA | LEV |
|---|---|---|---|---|---|---|
| MC | 1 | | | | | |
| HUM | -0.0878 | 1 | | | | |
| REL | -0.0429 | -0.1533 | 1 | | | |
| STR | -0.0194 | 0.2819 | 0.0919 | 1 | | |
| FSA | 0.2296 | 0.1334 | -0.1824 | 0.0316 | 1 | |
| LEV | -0.0579 | -0.0544 | 0.0192 | -0.0594 | -0.4299 | 1 |

**Source:** Author's computation (2025) using STATA 17.0.

The correlation matrix provides insight into the linear relationships among the variables in this study Market Capitalisation, Human Capital, Relational Capital, Structural Capital, Firm Size, and Leverage based on a sample of 98 observations. Market Capitalisation exhibits a weak positive correlation with Firm Size (0.2296), indicating that larger firms tend to have higher market values, a finding consistent with theoretical expectations. Its associations with Human Capital (-0.0878), Relational Capital (-0.0429), Structural Capital (-0.0194), and Leverage (-0.0579) are negative and very weak, suggesting that the direct relationships between intellectual capital components and market value are minimal at the bivariate level.

Human Capital shows a modest positive correlation with Structural Capital (0.2819), implying that firms that invest in employee development are also likely to invest in organizational systems and infrastructure. Other correlations involving Human Capital are weak and do not suggest meaningful linear relationships. Relational Capital is slightly negatively correlated with Firm Size (-0.1824), possibly indicating that smaller firms allocate more resources to relationship-building activities. Structural Capital's correlations with other variables are all below 0.10, reinforcing its statistical independence in this dataset.

Firm Size displays a moderate negative correlation with Leverage (-0.4299), suggesting that larger firms are less dependent on debt financing, a pattern often observed in emerging market contexts such as Nigeria. Leverage, on the whole, maintains weak correlations with all intellectual capital variables, reinforcing its distinct role as a control variable in the regression analysis. Overall, the matrix indicates no signs of multicollinearity, as all pairwise correlation coefficients fall well below the critical threshold of ±0.70. These findings validate the appropriateness of including all variables in subsequent regression analyses while supporting the theoretical rationale for firm size and leverage as control variables. The weak direct associations between market capitalisation and the intellectual capital components further suggest that any significant effects observed in the regression model will likely depend on more complex multivariate interactions.

Multicollinearity Test

**Table 5: Variance Inflation Factor (VIF) Table**

| Variable | VIF | 1/VIF |
|---|---|---|
| FSA | 1.29 | 0.777646 |
| LEV | 1.23 | 0.809882 |
| HUM | 1.14 | 0.879505 |
| STR | 1.11 | 0.899754 |
| REL | 1.08 | 0.926915 |
| Mean VIF | 1.17 | |

**Source:** Author's computation (2025) using STATA 17.0.

The table presents the Variance Inflation Factor (VIF) results for the independent variables included in the regression model: Firm Size (FSA), Leverage (LEV), Human Capital (HUM), Structural Capital (STR), and Relational Capital (REL). VIF quantifies the extent of multicollinearity, or linear correlation, between each predictor variable and all other predictors in the model. All VIF values fall well below the commonly accepted threshold of 10, with the highest VIF observed for Firm Size (FSA) at 1.29 and the lowest for Relational Capital (REL) at 1.08. The mean VIF is 1.17, which is very low, indicating that multicollinearity is not a concern in this model. The inverse VIF values (1/VIF), which reflect the proportion of variance in a variable that is independent of other predictors, are all close to 1, further confirming the absence of strong linear relationships among the explanatory variables.

The low VIFs imply that the estimated regression coefficients are likely to be stable and reliable, with minimal distortion due to multicollinearity. This enhances the interpretability and credibility of the regression results, supporting the validity of inferences drawn about the individual effects of intellectual capital components on market valuation.

**Heteroskedasticity Test**

**Table 6: Breusch–Pagan Heteroskedasticity Test**

| Test | Null Hypothesis | Test Statistic (Chi2) | p-Value | Decision |
|---|---|---|---|---|
| Breusch-Pagan / Cook-Weisberg test for heteroskedasticity | Constant variance | 192.85 | 0 | Reject H0 (evidence of heteroskedasticity) |

**Source:** Author's computation (2025) using STATA 17.0.

The Breusch–Pagan / Cook–Weisberg test for heteroskedasticity evaluates whether the variance of the residuals from a regression model is constant (homoskedasticity) or varies across observations (heteroskedasticity). In the displayed table, the null hypothesis ($H_0$) assumes that the residuals have constant variance.

The test result shows a chi-square statistic of 192.85 with a p-value of 0.0000. Since the p-value is far below the conventional significance level of 0.05, we reject the null hypothesis. This indicates strong evidence of heteroskedasticity in the regression model.

The presence of heteroskedasticity violates a key assumption of the classical linear regression model, potentially leading to biased standard errors and invalid statistical inferences (e.g., misleading t-tests and confidence intervals). As a corrective measure, the model should be estimated using robust standard errors (e.g., Huber-White sandwich estimators) to ensure reliable and consistent inference.

**Autocorrelation Test**

**Table 7: Portmanteau and collapsed tests from xtdpdserial**

| Test Type | Chi2 Statistic | Degrees of Freedom | Null Hypothesis | Prob > Chi2 |
|---|---|---|---|---|
| Portmanteau Test | 12 | 12 | No autocorrelation | 0.4457 |
| Collapsed Test (Seasonal Differences) | 9.8425 | 8 | No autocorrelation | 0.2763 |
| Collapsed Test (First Differences) | 7.8785 | 8 | No autocorrelation | 0.4454 |
| Fully-Collapsed Portmanteau Test | 0.515 | 1 | No autocorrelation | 0.473 |

**Source:** Author's computation (2025) using STATA 17.0.

The autocorrelation diagnostics presented in the collapsed test of first differences indicate that there is no significant autocorrelation in the panel dataset. Specifically, the test yields a chi-square statistic of 7.8785 with 8 degrees of freedom and a corresponding p-value of 0.4454. Since the p-value exceeds the conventional 5% significance threshold, we fail to reject the null hypothesis that there is no autocorrelation of any order. This result implies that the residuals of the differenced panel regression model are not serially correlated. Consequently, the model

satisfies one of the key assumptions of panel data estimation, enhancing the reliability of the coefficient estimates and the validity of inferences drawn from the model. The absence of autocorrelation also supports the robustness of the dynamic specification, particularly when applying GMM estimators or other methods sensitive to serial dependence.

Model Specification Test

**Table 8: Ramsey RESET test result**

| Test | Null Hypothesis | F-statistic | Degrees of Freedom | Prob > F |
|---|---|---|---|---|
| Ramsey RESET Test | Model has no omitted variables | 19.05 | (3, 89) | 0 |

**Source:** Author's computation (2025) using STATA 17.0.

The Ramsey RESET test results reveal a statistically significant indication of model misspecification. The test yields an F-statistic of 19.05 with degrees of freedom (3, 89) and a corresponding p-value of 0.0000. Since the p-value is well below the 5% significance level, we reject the null hypothesis that the model has no omitted variables. This outcome suggests that the current model may be excluding relevant predictors or that there are nonlinear relationships not properly accounted for by the model's functional form. The implication is that the model, as presently specified, may not fully capture the underlying data-generating process, which could lead to biased or inconsistent coefficient estimates. As a result, further model refinement is recommended—possibly by including interaction terms, polynomial terms, or additional explanatory variables—to enhance specification accuracy and improve the model's explanatory power.

**Panel Structure Verification**

**Table 9: Breusch and Pagan Lagrangian Multiplier (LM) test for random effects**

| Test | Statistic | p-Value | Decision |
|---|---|---|---|
| Breusch-Pagan LM (Var(u) = 0) | 0.00 | 1.0000 | Do not reject null hypothesis |

**Source:** Author's computation (2025) using STATA 17.0.

The Breusch and Pagan Lagrangian Multiplier (LM) test was employed to assess whether a random effects model would be preferable to a pooled ordinary least squares (OLS) regression in modeling the relationship between intellectual capital components and market capitalisation. The test evaluates whether unobserved heterogeneity across firms—captured as random effects—is statistically significant. The results returned a chi-bar squared statistic of 0.00 with

a p-value of 1.0000, leading to the failure to reject the null hypothesis that the variance of the random effects is zero.

Given this result, there was no statistical justification for adopting a random effects model over the pooled OLS model. However, diagnostic tests indicated the presence of heteroskedasticity and potential model misspecification. Consequently, the analysis advanced with a robust linear regression approach, which corrects for heteroskedasticity and provides consistent standard errors. This decision enhances the reliability of the estimated coefficients and inference, ensuring that the findings on the value relevance of intellectual capital components are not biased by violations of classical regression assumptions.

**Regression Analysis**

**Table 10a: Table: Robust Regression Model Summary**

| Statistic | Value |
|---|---|
| Number of Observations | 98 |
| F-Statistic (F(5, 92)) | 15.13 |
| Prob > F (Overall Significance) | 0.0000 |

Table10b: Robust Linear Regression Results

| Variable | Coefficient (Coef.) | Std. Error | t-Statistic | P-Value | 95% Confidence Interval |
|---|---|---|---|---|---|
| Human Capital | 410,941.90 | 150,703.00 | 2.73 | 0.008 | [111,632.70, 710,251.10] |
| Relational Capital | -18,154.62 | 21,754.12 | -0.83 | 0.406 | [-61,360.18, 25,050.94] |
| Structural Capital | 828,111.00 | 250,441.90 | 3.31 | 0.001 | [330,711.80, 1,325,510.00] |
| Firm Size - Control | 646,135.50 | 115,561.40 | 5.59 | 0.000 | [416,620.50, 875,650.50] |
| Leverage - Control | 28.82 | 1,184.76 | 0.02 | 0.981 | [-2,324.23, 2,381.86] |
| Constant | -8,893,095.00 | 1,934,676.00 | -4.60 | 0.000 | [-12,700,000, -5,050,661] |

**Source:** Author's computation (2025) using STATA 17.0.

The results of the robust regression, as presented in Tables 10a and 10b, provide compelling insights into the determinants of market capitalization among listed Nigerian services firms based on intellectual capital components and control variables.

From Table 10a, the overall model is statistically significant, as indicated by the F-statistic of 15.13 and a corresponding p-value of 0.0000. This implies that, collectively, the independent variables Human Capital, Relational Capital, Structural Capital, Firm Size, and Leverage explain a significant portion of the variation in market capitalization at the 1% level of significance. The number of observations used in the model was 98.

The results presented in Table 10b summarize the individual effects of each variable on market capitalization. Human Capital demonstrates a statistically significant positive impact, with a coefficient of approximately ₦410,942,000 and a p-value of 0.008. This indicates that increased investment in human capital contributes significantly to firm value. In contrast, Relational Capital has a negative but statistically insignificant coefficient (₦–18,154,620; p = 0.406), implying no reliable influence on market capitalization. Structural Capital stands out with a strong and significant positive effect (₦828,111,000; p = 0.001), confirming its role in enhancing firm market value.

Among the control variables, Firm Size is positively and significantly related to market capitalization, with a coefficient of ₦646,135,500 ($p < 0.000$), reinforcing the notion that larger firms command higher market valuations. Leverage, however, exhibits no meaningful effect (coefficient = ₦28.82; p = 0.981), suggesting that a firm's debt level does not significantly influence its market value within this sample. Lastly, the negative and significant constant (–₦8.89 billion; $p < 0.000$) indicates that, in the absence of these predictors, market capitalization would be substantially lower, underscoring their collective importance.

**Discussion of findings and Hypotheses testing**

**Human capital and Market Capital**

The first hypothesis of this study states that: *"Human capital does not significantly affect the market valuation of listed services firms in Nigeria."* This hypothesis was tested using robust linear regression, which accommodates heteroskedasticity and outliers. The results in Table 10b indicate that Human Capital has a positive and statistically significant effect on Market Capitalisation, with a coefficient of ₦410,941,900 and a p-value of 0.008 ($p < 0.01$). Since the p-value is below the 5% significance threshold, the null hypothesis is rejected, implying that Human Capital significantly influences the market valuation of services firms in Nigeria.

The positive and significant relationship between Human Capital and Market Capitalisation aligns with several empirical studies. For instance, Aliyu and Ibrahim (2022) found a significant effect of human capital on firm value among listed Nigerian service firms. Similarly, Udoh and Ogbole (2023) reported a positive association between human capital investment and stock market performance, supporting the argument that skilled personnel enhance firm reputation and investor confidence. Furthermore, Onyekwelu and Uchenna (2020) concluded that human capital efficiency contributes significantly to firms' valuation in the service sector. Conversely, some studies do not corroborate this finding. Uduak and Friday (2021), for example, reported an insignificant relationship between human capital and market performance, citing inconsistencies in the measurement of human-related intangibles. Nweze and Enekwe (2020) also found no clear evidence of human capital's influence on firm valuation in their study of Nigerian quoted companies. Similarly, Ejeagbasi and Ugochukwu (2021) argued that many service firms in Nigeria underreport human capital investments, limiting its observed relevance in valuation models.

The divergence in these findings may stem from differences in measurement proxies, sample periods, or sectoral contexts. In this study, Human Capital was proxied by training expenditure relative to revenue, which may capture a more performance-driven aspect of workforce development compared to generic HR cost indicators used in other studies. Additionally, sector-specific dynamics in Nigeria's services industry—where intangible resources like customer service, brand image, and professional competence are central—could amplify the effect of human capital on market outcomes. Differences in regulatory disclosure standards and firm-level commitment to intellectual capital reporting could also explain the contrasting evidence in prior research. Overall, the results support the theoretical postulation that firms with superior human capital are better positioned to attract investor interest and sustain competitive advantage in knowledge-intensive industries.

**Relational capital and Market Capital**

The second hypothesis of this study is stated as follows: *"Relational capital does not significantly affect the market valuation of listed services firms in Nigeria."* To test this hypothesis, the robust linear regression model was employed to account for the presence of heteroskedasticity and potential data irregularities. The coefficient estimate for Relational Capital was -₦18,154,620, with a p-value of 0.406. Given that the p-value exceeds the 5%

significance threshold, the result is statistically insignificant, and the null hypothesis is not rejected. This outcome implies that relational capital does not have a significant impact on the market valuation of Nigerian listed services firms, as measured by market capitalisation.

This finding is consistent with the results of some prior studies that reported no significant relationship between relational capital and firm market valuation. For instance, Akinyemi and Ogundele (2021) found that relational capital had no substantial influence on the stock prices of listed communication and hospitality firms in Nigeria. Similarly, the work of Nweze and Enekwe (2020) reported an insignificant association between relational investments and firm value, suggesting that external relationships may not directly translate into measurable market benefits in certain Nigerian contexts. Ejeagbasi and Ugochukwu (2021) also observed a weak and statistically insignificant effect of relational capital on financial performance in their evaluation of services firms. However, other studies report a contrasting outcome. Udoh and Ogbole (2023), for instance, found that firms with strong customer relationships and marketing presence enjoy higher market confidence and increased firm value. In the same vein, Aliyu and Ibrahim (2022) noted that relational capital, particularly strategic alliances and customer loyalty programs, positively affects market performance. Onyekwelu and Uchenna (2020) also demonstrated that effective stakeholder engagement enhances firm reputation and ultimately boosts market capitalisation.

The disparity in these results may be attributed to differences in the operationalization of relational capital, variations in market structure, or disclosure practices among firms. In this study, relational capital was proxied by marketing expenses relative to revenue, which may not fully capture the depth and quality of firm relationships with customers, suppliers, or partners. Additionally, in the Nigerian context, many service firms do not disclose comprehensive data on relationship-building initiatives, leading to measurement limitations. Moreover, market participants may perceive relational assets as intangible and less verifiable, thereby discounting their influence in valuation compared to more tangible components like human or structural capital. These variations highlight the contextual sensitivity of intellectual capital relevance and suggest the need for broader and more nuanced indicators to better reflect the strategic value of relational capital.

**Structural capital and Market Capital**

The third hypothesis of the study is stated as follows: *"Structural capital does not significantly affect the market valuation of listed services firms in Nigeria."* To test this hypothesis, a robust linear regression analysis was conducted to ensure reliability in the presence of heteroskedasticity. The results show that structural capital has a positive and statistically significant coefficient of ₦828,111,000, with a p-value of 0.001. This implies that, holding other factors constant, a one-unit increase in structural capital is associated with an ₦828,111.00 increase in market capitalisation. Given the p-value is less than the 5% threshold, the null hypothesis is rejected, thereby establishing that structural capital significantly affects the market valuation of Nigerian listed services firms.

The positive and significant effect of structural capital aligns with several prior empirical studies. For example, Ezejiofor and Ezeagba (2021) found that firms with robust internal systems, such as technology infrastructure and organizational processes, tend to enjoy improved investor valuation in Nigeria's service sectors. Similarly, Nwaolisa and Udeh (2023) observed that investments in IT systems and process efficiency contribute meaningfully to higher market value among firms listed in the Nigerian Exchange Group. Izedonmi and Ibhadode (2020) also confirmed that structural capital plays a critical role in enhancing firm credibility, innovation, and consequently market performance. On the contrary, some studies report conflicting findings. Anyaogu and Uche (2021), for instance, found no significant link between structural assets and firm value, suggesting that such assets may be undervalued or poorly perceived by investors. Likewise, Olowokere and Akanbi (2022) argued that while structural capital may enhance internal operations, it often fails to signal market value due to weak disclosures. Udeh and Anene (2020) also reported insignificant influence of structural capital on market indicators, especially in smaller, less capital-intensive firms.

These mixed findings could be attributed to varying firm sizes, disclosure standards, and industry-specific factors. Larger service firms in Nigeria may have more transparent reporting and recognizable structural investments (e.g., branded systems, automated processes), which are more likely to be factored into market valuation. In contrast, smaller or less visible firms may not enjoy the same investor attention, even with strong structural capital. Furthermore, the differences in measurement proxies (such as IT expenses, R&D, or process documentation) may lead to inconsistencies in reported significance across studies. This highlights the

importance of adopting comprehensive and standardized proxies for structural capital and ensuring adequate corporate transparency to enhance investor trust and valuation relevance.

## Conclusion and Recommendations

This study examined the value relevance of intellectual capital components—human capital, relational capital, and structural capital—on the market valuation of listed services firms in Nigeria. Using robust linear regression analysis, the results revealed that both human capital and structural capital exerted statistically significant and positive effects on market capitalisation, while relational capital was not significant. These findings underscore the growing importance of intangible assets in driving investor confidence and firm valuation in the services sector, especially as economies shift towards knowledge-based and technology-intensive activities. In light of these findings, it is recommended that Nigerian service firms intensify investments in employee development, innovation, and digital infrastructure to enhance their intellectual capital stock. Policymakers and regulators, such as the Financial Reporting Council of Nigeria (FRCN), should provide sector-specific guidelines for the disclosure of intellectual capital metrics in corporate reports to improve transparency and comparability. Furthermore, firms should strategically communicate their intellectual capital strengths to stakeholders through integrated reporting, enabling better market recognition and valuation of these intangible drivers of corporate success.

## References

Akinsulire, O. O (2022). Effects of Intellectual Capital Cost on Performance of Selected Deposit Money

Banks. (2022). *International Journal of Research in Social Sciences and Innovative Studies*, *6*(5), 834–844.

Aliyu, A. S., & Ofurum, C. O. (2024). *Intellectual capital and financial performance of deposit money banks in Nigeria*. *International Journal of Accounting and Financial Management*, 10(12), 190–207.

Awolu, J. O., & Salami, D. O. (2022). Knowledge economy: How intellectual capital drives financial performance of non-financial service firms in Nigeria. *International Journal of Economics, Commerce and Management, 10*(4), 45–61.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. https://doi.org/10.1177/014920639101700108

Bodie, Z., Kane, A., & Marcus, A. J. (2021). *Investments* (12th ed.). McGraw-Hill Education.

Buallay, H., Hamdan, A., & Hussainey, K. (2020). Intellectual capital efficiency and financial performance: Evidence from GCC banks. *Journal of Intellectual Capital*, *21*(4), 567–586.

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: A review and assessment. *Journal of Management*, 37(1), 39–67. https://doi.org/10.1177/0149206310388419

Edvinsson, L., & Malone, M. S. (1997). *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. Harper Business.

Efesiri, P. M., Okoye, E. I., & Nwoye, U. J. (2022). Empirical evaluation of effects of intellectual capital efficiency on firm's value in some selected listed firms on Nigerian Exchange Group. *International Journal of Research in Social Science and Humanities*, *3*(6), 16–37.

Godwin, A. O., & Udeh, F. N. P. (2021). Effect of human resource accounting on firms' value: A study of selected firms quoted on the Nigerian Stock Exchange. *International Journal of Trend in Scientific Research and Development*, *6*(1), 208–218.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(S2), 109–122. https://doi.org/10.1002/smj.4250171110

Ibrahim, M., & Abubakar, S. (2023). Intellectual capital and market performance of Nigerian quoted companies: Evidence from post-2018 data. *Central African Journal of Finance and Accounting*, *8*(2), 102–118.

Jian, X., & Feng, L. (2020). The impact of intellectual capital on firm performance: A modified and extended VAIC model. *Journal of Competitiveness*, *12*(1), 161–176.

Marr, B., & Roos, G. (2005). A strategy perspective on intellectual capital. *Intellectual Capital and Knowledge Management*, 5(1), 69 80. https://doi.org/10.1108/14691930510592715

Obulor, O., & Ohaka, J. (2020). Training cost and financial performance nexus: Sector analysis of quoted manufacturing firms in Nigeria. *Research Journal of Finance and Accounting*, *10*(18), 83–92.

Okoye, N. J., & Emeneka, O. L. (2021). Human capital efficiency and economic value added of quoted service firms in Nigeria (2010–2019). *International Journal of Advances in Engineering and Management*, *3*(10), 331–345.

Otuya, S. (2023). Intellectual capital and shareholders' wealth: Evidence from listed service companies in Nigeria. *International Journal of Applied Business and Management Sciences*, *5*(1), 105–120.

Otuya, S., Adebayo, T., & Nwankwo, P. (2023). Efficient management of intellectual capital and shareholders' wealth in listed Nigerian service firms. *International Journal of Applied Business and Management Sciences*, *5*(1), 121–136. arfjournals.com

Pulic, A. (2000). VAIC™ – An accounting tool for IC management. *International Journal of Technology Management*, 20(5 8), 702 714. https://doi.org/10.1504/IJTM.2000.002891

Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, 87(3), 355–374. https://doi.org/10.2307/1882010

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, *1*(1), 15–29. https://doi.org/10.2307/1991374

Umar, A., & Dandago, K. I. (2023). *The knowledge economy: How intellectual capital drives financial performance of non-financial service firms in Nigeria*. *FUDMA Journal of Accounting and Finance Research*, 1(2), 113–122. https://doi.org/10.33003/fujafr-2023.v1i2.42.113-122

Umar, A., & Abubakar, K. S. (2024). Human resources efficiency: A means of bridging the divide between digital economy theories and practical realities of non-financial firms in Nigeria. *FUDMA Journal of Accounting and Finance Research*.

Uzochukwu, E., & Egwu, P. (2021). Intellectual capital and firm value of quoted consumer goods companies in Nigeria: Post-IFRS adoption evidence. *African Journal of Business and Economic Research*, *16*(3), 78–94.