

Intellectual Capital and Operational Efficiency of Listed Firms in Nigeria: The Moderating Role of Ownership Structure

Romoke Rafiat Busari

University of Ibadan, Oyo State, Nigeria

Correspondence: rr.busari@ui.edu.ng

Abstract

This study investigates the moderating role of ownership structure on the relationship between intellectual capital disclosure and operational efficiency in listed non-financial firms in Nigeria. Utilizing panel data from listed non-financial firms in Nigeria spanning from 2014 to 2023, the study employs an ex-post facto research design. Descriptive statistics, correlation analysis and Generalized Method of Moments (GMM) regression technique are employed to address endogeneity concerns and ensure robust estimations. Intellectual capital is proxy by human capital, structural capital and relational capital; operational efficiency is proxy by operating profit margin and asset turnover while control variables include firm size, leverage and firm age. Key findings reveal that the interaction between ownership structure and human capital has a significant positive effect on operational efficiency. However, the interaction between ownership structure and structural capital has a significant negative effect on operating profit margin; thus, ownership structure demonstrates a dual role. It enhances the positive effects of human and relational capital on profitability but diminishes structural capital's influence. The study concludes that ownership concentration can both facilitate and constrain the translation of intellectual capital into operational efficiency, depending on the capital component and efficiency measure.

Keywords: Intellectual capital, operational efficiency, ownership structure, operating profit margin; asset turnover.

Introduction

The increasing complexity and dynamism of modern economies have necessitated a shift in how businesses create and sustain value. Historically, tangible assets, such as land, equipment and raw materials, were considered the primary drivers of organizational value. With the advent of the knowledge-based economy, intellectual capital (IC) has emerged as a critical factor influencing organizational performance and competitiveness (Gherghina *et al.*, 2020). Intellectual capital is broadly defined as the intangible resources and competences possessed by an organization, including human capital, structural capital and relational capital, which collectively drive innovation, efficiency and long-term sustainability (Ali *et al.*, 2021a; Mehralian *et al.*, 2024). In Nigeria, where non-financial firms form a significant segment of the corporate sector, the strategic management of intellectual capital is crucial to improving operational efficiency and ensuring global competitiveness.

Operational efficiency focuses on organization's capacity to deliver maximum output with minimal input in terms of cost, time and resource consumption. It has emerged as a cornerstone of sustained business competitiveness and long-term performance in today's rapidly evolving global economy. As firms navigate complex and dynamic business environments, the ability to optimize internal processes, eliminate waste, and maximize productivity becomes increasingly crucial. Operationally efficient firms are not only better equipped to reduce overhead costs and streamline workflow but are also more agile in responding to market fluctuations, consumer preferences and technological advancements. Such firms are more likely to realize enhanced value creation, improved profitability and sustained market relevance through the strategic deployment of both tangible and intangible resources (Handoyo *et al.*, 2023).

In recent years, scholarly attention has increasingly turned toward the role of intellectual capital in driving operational efficiency, particularly within non-financial firms. Unlike physical capital or financial assets, intellectual capital, comprising human capital, structural capital and relational capital, encompasses the intangible yet important resources that underpin innovation, strategic decision-making and organizational learning. Human capital refers to the knowledge, skills and

competencies possessed by employees; structural capital includes internal systems, databases, organizational routines and culture; while relational capital pertains to the quality of relationships with external stakeholders, such as customers, suppliers, and partners (Chatterjee *et al.*, 2023). These dimensions of intellectual capital are not only interdependent but also collectively influence a firm's capacity to innovate, adapt and sustain superior performance over time.

The extent to which firms are able to harness and convert intellectual capital into operational efficiency, however, is rarely a straightforward process. Rather, it is often mediated by contextual factors, chief among them being ownership structure. Ownership structure, broadly defined, reflects the configuration of equity ownership among various stakeholders, including institutional investors, managerial ownership, government entities, founding families, foreign multinationals and public shareholders (Alkurdi *et al.*, 2021). This governance trait plays Ownership structure plays an important function in shaping managerial incentives, decision-making processes, accountability mechanisms and organizational' productivity. For instance, firms with concentrated ownership may benefit from more direct oversight and alignment between owners and managers, thereby facilitating swift implementation of efficiency-enhancing strategies. In contrast, firms with dispersed ownership structures may foster greater transparency and stakeholder engagement but face coordination challenges and weaker control over operational strategies.

In the Nigerian corporate context, ownership structures are particularly diverse and complex. The landscape includes a heterogeneous mix of state-owned enterprises, family-controlled businesses, foreign subsidiaries and publicly listed corporations, each with distinct managerial styles, governance frameworks and operational cultures (Okafor, 2023). Different ownership models inherently foster different organizational behaviors, attitudes toward innovation, investment in human capital, and approaches to leveraging knowledge resources (Merriman, 2017). As intellectual capital becomes increasingly central to achieving sustainable competitive advantage in the knowledge economy, insights into how ownership structure shapes its utility can inform governance reforms, capacity-building initiatives and strategic

management practices with long-term operational goals, ultimately improving firm's operational efficiency. However, contextual relevance of these insights to Nigeria remains underexplored.

Furthermore, the moderating effect of ownership structure introduces an additional layer of complexity to the intellectual capital-operational efficiency relationship. Scholars argue that ownership structures shape strategic priorities and influence the extent to which intangible assets are leveraged to achieve efficiency gains (Ahmed *et al.*, 2022). Empirical investigations in this area are particularly scarce in Nigeria, underscoring the need for rigorous research to illuminate these dynamics and provide actionable insights for stakeholders. Also, the non-financial sector, comprises of industries such as manufacturing, agriculture and telecommunications and they are crucial to Nigeria's economic growth and diversification efforts. Therefore, understanding how intellectual capital contributes to operational efficiency in this sector is critical for policymakers, investors and corporate managers seeking to enhance productivity and resilience in the face of economic and regulatory challenges (Gupta and Raman 2021).

Therefore, this study seeks to address critical knowledge gaps by examining the interplay between intellectual capital, operational efficiency and ownership structure among listed non-financial firms in Nigeria. By integrating theoretical frameworks and empirical evidence, the research aims to provide an understanding of how intangible assets can be effectively harnessed to enhance corporate performance in the context of emerging economies. This investigation is timely and relevant, given the increasing emphasis on knowledge-driven development and the strategic importance of operational efficiency in achieving sustainable economic growth in Nigeria.

Literature Review

Intellectual Capital

Intellectual Capital (IC) refers to the intangible assets within an organization that drive its competitive advantage and contribute significantly to its success (Truong & Nguyen, 2023). In recent decades, the concept of Intellectual Capital (IC) has evolved through various

definitions and perspectives. It is frequently regarded as a blend of knowledge-based assets that enhance an organization's overall capacity for innovation (Dancaková & Glova, 2024). It includes human capital (the knowledge and skills of employees), structural capital (the systems and processes of the organization), and relational capital (the external relationships and networks) (Abdelfattah *et al.*, 2024).

However, Skhvediani *et al.* (2023) suggested that Intellectual capital typically contributes positively to a company's value creation and enhances its market value. It can also be seen as a dynamic collection of resources that gives a competitive edge for firms' if efficiently managed well thus enhancing their overall performance. According to Cabrilo *et al.* (2024) Intellectual Capital is an intangible asset that helps align a company's internal knowledge, ultimately leading to value creation. it represents a non-monetary asset with inherent value that helps drive profit generation. The typical understanding of intellectual capital is that it represents a non-monetary asset with inherent value that helps drive profit generation; As a result, studying and evaluating the added value generated by intellectual capital is increasingly important due to the rising significance of intangible assets in driving efficient operations and enhancing business competitiveness (Skhvediani *et al.*, 2023).

In the academic discourse surrounding the impact of intellectual capital on organizational performance, several frameworks have been developed. At its core, intellectual capital represents the intangible resources that contribute to a firm's competitive advantage, going beyond traditional financial metrics. This study examines the effect of intellectual capital on the operational efficiency moderated by ownership structure; with focus on the key components of intellectual capital which are human capital, structural capital and relational capital.

Human Capital

Human Capital refers to the skills, knowledge, expertise and experience of employees within an organization (Aman-Ullah *et al.*, 2022). Human Capital is seen as a vital component of intellectual capital, playing a key role in driving its growth and improving overall performance (McDowell *et al.*, 2018). It is vital for innovation, strategic decision-making, and problem-solving, all of which are essential for enhancing

operational efficiency. A highly skilled and motivated workforce can significantly improve a firm's productivity, streamline processes, and reduce operational costs, leading to better performance (Li *et al.*, 2021). According to Kuzminov *et al.* (2019), human capital includes the knowledge, skills and physical abilities that individuals acquire and develop throughout their lives. This accumulation enables them to realize their full potential and contribute meaningfully to members of the collective. However, Aman-Ullah *et al.* (2022) shares the point that the key to gaining and maintaining a competitive advantage lies in possessing and developing unique resources that are difficult to replicate. These resources are largely rooted in an organization's human capital, which encompasses the competencies of its employees, including their knowledge, skills, expertise, and abilities. For Nigerian firms, the development of human capital becomes particularly important given the challenges related to skill gaps and access to advanced training (Okolie *et al.*, 2020).

Structural Capital

Structural capital includes the organizational systems, processes, technologies, intellectual property, and culture that support the firm's operations (Lee *et al.*, 2023). This form of capital helps firms to streamline their internal processes, optimize resource allocation, and enhance operational effectiveness. It includes elements such as culture, routines, databases, processes, patents, copyrights, and trademarks. Structural capital efficiency (SCE) is measured as the ratio of SC to total value added (Skhvediani *et al.*, 2023). Effective use of structural capital, such as advanced IT systems, automated processes, and well-defined operational procedures, can help Nigerian firms overcome infrastructural limitations and increase efficiency (Okoye & Okerekeoti, 2021). Additionally, structural capital includes the firm's ability to create and manage processes that can reduce operational redundancies, thus improving productivity and overall firm performance (Huang & Huang, 2020). It is a crucial component of intellectual capital that offers significant benefits to a company and demands increased attention from managers (Beltramino *et al.*, 2020).

Relational Capital

Relational capital refers to the value derived from the relationships an organization maintains with its stakeholders, including customers, suppliers, business partners, and regulatory bodies (Ramírez-Solis *et al.*, 2022). It encompasses trust, reputation, and social networks that contribute to the overall success and sustainability of a business. Strong relational capital allows firms to build credibility, foster loyalty, and create a supportive ecosystem that enhances business operations. In Nigeria, relational capital is particularly significant due to the complex and often informal nature of business transactions. Establishing strong relationships with suppliers can enhance negotiation power, reduce procurement costs, and ensure a steady supply of essential inputs, mitigating risks associated with supply chain disruptions (Bekanwah *et al.*, 2020).

Operational Efficiency

Operational efficiency refers to the capacity of an organization to deliver goods or services in the most cost-effective way, while maintaining high levels of quality. It is a multifaceted concept that involves process optimization, resource management and the effective utilization of intellectual capital. It is a critical factor that directly impacts a firm's performance and competitive positioning, especially in non-financial firms listed in emerging markets like Nigeria. For firms to remain competitive, improving operational efficiency means reducing operational costs, optimizing processes, and enhancing productivity without compromising on the quality of products or services (Handoyo *et al.*, 2023). In the context of this study, operational efficiency is an important concept as it directly links to the effective utilization of intellectual capital (IC), which can enhance a firm's ability to manage costs, increase productivity, and achieve higher performance outcomes. Operational efficiency is commonly assessed by comparing the output produced by the firm with the input resources used in the production or delivery process. The greater the output produced for a given set of inputs, the higher the level of operational efficiency (Mankins, 2017). For listed non-financial firms in Nigeria, improving operational efficiency is essential due to the often-challenging business environment,

characterized by infrastructure deficits, regulatory complexity, and intense competition (Adoghe *et al.*, 2023). This makes it crucial for firms to adopt strategies and leverage resources like intellectual capital effectively to drive operational efficiency and sustainability.

A key driver of operational efficiency is process optimization, which refers to the systematic approach to identifying and improving the key processes that contribute to an organization's operations (Handoyo *et al.*, 2023). In non-financial firms, particularly those operating in Nigeria, the optimization of processes such as supply chain management, production scheduling, customer service, and internal operations can help reduce redundancies, minimize delays, and streamline workflows. For instance, the adoption of information technology (IT) and automation tools can significantly enhance operational efficiency by reducing manual labour and eliminating errors, thus ensuring smoother and faster operations (Nazir & Fan, 2024). These technological advancements, as part of structural capital (a key dimension of intellectual capital), can significantly contribute to a firm's operational efficiency by providing the infrastructure for innovation and cost-effective service delivery.

Ownership Structure

Ownership structure refers to the distribution of ownership rights within a firm, significantly influencing its governance, decision-making processes, and operational efficiency. The ownership structure of a firm can be categorized into various types, including family ownership, state ownership, institutional ownership, and individual ownership. Each type carries distinct governance mechanisms, affecting the strategic direction, operational effectiveness, and overall performance of a firm (Camisón-Zornoza *et al.*, 2020).

In this study, the focus is on managerial ownership, a type of ownership structure that pertains to the proportion of a firm's shares owned by its executives or managers. Managerial ownership is particularly relevant in understanding the relationship between ownership and operational efficiency because it directly aligns the interests of management with that of shareholders. When managers hold significant shares in the firm, they are more likely to make decisions that maximize shareholder value since their personal wealth is tied to the

firm's performance. As a result, the agency problem, where the interests of management diverge from those of shareholders, is mitigated (Jensen & Meckling, 1976).

The Relationship Between IC and Operational Efficiency

The relationship between IC and operational efficiency is multi-dimensional. Human Capital enhances operational efficiency by ensuring that employees possess the skills and knowledge necessary to drive innovation and streamline operations (Cabrilo *et al.*, 2024). Skilled employees identify opportunities for cost reduction, process improvement, and innovation, leading to enhanced competitiveness. Structural Capital ensures that organizational processes and technologies are optimized for efficiency (Handoyo *et al.*, 2023). Modern IT systems, automated tasks, and standardized procedures reduce costs, minimize errors, and improve productivity. Relational Capital contributes to operational efficiency by fostering strong external relationships with stakeholders. This includes improving demand forecasting, reducing transaction costs, and increasing customer retention (Ramírez-Solis *et al.*, 2022).

Theoretical Foundation

The theoretical framework for this study draws on the "Resource-Based View" (RBV) theory to explore how ownership structure influences operational efficiency through intellectual capital in listed non-financial firms in Nigeria. The resource-based view theory posits that firms gain sustainable competitive advantages by acquiring, developing and optimally utilizing resources that are valuable, rare, tangible, inimitable, intangible and non-substitutable (Mailani *et al.*, 2024). IC consists of three primary components: human capital; structural capital and relational capital. This theory is particularly relevant for non-financial firms listed in Nigeria, as these companies often operate in competitive markets where human and relational capital can be significant drivers of both innovation and operational efficiency. Furthermore, the application of the theory to intellectual capital suggests that firms with strong IC are able to exploit their knowledge, organizational processes, and relationships to achieve greater operational efficiency. Also, the ability to effectively

combine human, structural, and relational capital with other resources, such as financial capital, technological capabilities, and access to markets, is essential for achieving operational efficiency and sustainable growth (Handoyo *et al.*, 2023). In the context of ownership structure, the “RBV” provides an interesting lens for understanding how the distribution of ownership influences the development, management and utilization of intellectual capital, thus impacting operational efficiency.

Empirical Review

Extant research studies carried out on the subject matter reported diverse findings. As evidenced by the work of Hamdan *et al.* (2017) who investigate how corporate governance can moderate the link between IC efficiency and operational performance of listed firms in Saudi between the period 2012 to 2014; found that corporate governance significantly and positively moderates the link between IC and operational performance. Also, Smriti and Das (2019) using manufacturing firms in India, found that firms with higher intellectual capital investments in human and structural capital reported better financial performance, which reflects enhanced operational efficiency. Shahwan and Habib (2020) provided evidence for the sampled listed firms operating in Egypt that the occurrence of financial distress cannot be linked to corporate governance practices while IC efficiency lessens the occurrence of firms’ financial distress.

Furthermore, Camisón-Zornoza *et al.* (2020) found that concentrated ownership, particularly among family and institutional investors, tends to enhance operational efficiency by mitigating agency problems. Gupta and Raman (2021) reported that intellectual capital positively influence the operational efficiency of the observed listed firms operating in the Indian financial sector from the year 2008 to 2018. Furthermore, Ramírez *et al.* (2021) empirically analyzed whether “family ownership (ownership structure) moderated the link between IC and performance” among Spanish firms operating in the manufacturing sector spanning from 2000 to 2013 and concluded that IC gives competitive advantages to firms thus positively affecting their performance. Also, family ownership moderated the relationship between IC and performance.

Ahmed et al. (2022) reported that performance is substantially and favorably influenced by both IC efficiency and ownership structure for the observed firms operating in the non-financial sector in Malaysia from the year 2016 to 2020. Mukaro *et al.* (2023) conducted a study on the role of intellectual capital in enhancing organizational performance. They found that human capital and structural capital play significant role in improving operational efficiency, as employees' skills and knowledge are crucial for developing innovative products and processes. Similarly, Asutay and Ubaidillah (2024) reported that IC has direct impact on the sampled "islamic banks" profitability. Chukwu et al. (2025) conducted a study in Nigeria and reported that for the sampled listed insurance firms, human capital (one of the components of IC) is directly related to financial performance. Also, Paunović et al. (2025) reported that for the sampled listed Serbian firms, IC enhances sustainable financial performance. Soewarno and Ramadhan (2025) revealed for the sampled listed firms in Indonesia, both ownership structure and IC enhance firms' value. Contrarily, Singhania and Panda (2025) evaluated that disclosure of IC among the observed listed firms in India adversely affect financial performance. Thus, the hypotheses of the study are stated as:

H₀: Ownership structure has no significant moderating role on the relationship between intellectual capital and operational efficiency of firms operating in non-financial sector in Nigeria.

Research Methods

This study employs an ex-post facto research design. The population for this study consists of 109 listed non-financial firms in Nigeria that are publicly traded on the Nigerian Exchange Group, from 2014-2023. These firms operate across various industries, including manufacturing, services, agriculture, and construction, which are essential sectors of the Nigerian economy. Sample size of 76 listed non-financial firms is purposively and carefully selected in order to ensure sufficient large representation of firms to draw meaningful conclusions. Data used for the study are collected from secondary source of the sampled firms audited annual reports and accounts. Panel data regression model, GMM I and GMM step II are used as the estimation techniques. The model for the study is stated in econometric form as stated below:

$$OPPM_{it} = \beta_0 + \beta_1 EDLE * PSOE_{it} + \beta_2 PPTC * PSOE_{it} + \beta_3 CTSS * PSOE_{it} + \beta_4 FIZI_{it} + \beta_5 DETA_{it} + \beta_6 FIAG_{it} + \varepsilon_{it} \quad (1)$$

$$ASTO_{it} = \beta_0 + \beta_1 EDLE * PSOE_{it} + \beta_2 PPTC * PSOE_{it} + \beta_3 CTSS * PSOE_{it} + \beta_4 FIZI_{it} + \beta_5 DETA_{it} + \beta_6 FIAG_{it} + \varepsilon_{it} \quad (2)$$

where: *OPPM* is the operating profit margin; *ASTO* is the asset turnover; *EDLE* is the average education level and experience; *PSOE* is the percentage of shares owned by managerial executives; *PPTC* is the number of patents or proprietary technologies; *CTSS* is customer satisfaction score, number of strategic partnerships; *FIZI* represents firm size; *DETA* denotes leverage; *FIAG* is the firm age; β_0 represents constant term; $\beta_1, \beta_2, \beta_3$ denotes coefficients for the explanatory variables; ε_{it} is the error term, capturing unobserved factors influencing operational efficiency.

Description of Variables

Independent variable: Intellectual Capital (IC) is the independent variable. Intellectual Capital (IC) represents the knowledge-based assets of a firm, encompassing human, structural and relational capital. Human capital is assessed by evaluating the average level of education and experience of the firm's workforce. Structural capital is measured by indicators such as the number of patents or proprietary technologies the firm holds. Relational capital is measured by customer satisfaction scores and the number of strategic partnerships or alliances the firm maintains.

Moderating variable: The moderating variable in this study is Ownership Structure (OS). It refers to the distribution of ownership rights among the firm's shareholders, with a particular focus on "managerial ownership". This is measured by managerial ownership, which represents the percentage of shares owned by company executives and directors.

Dependent variable: The dependent variable in this study is Operational Efficiency (OE). It is a measure of how efficiently a firm uses its assets and resources to generate revenue and profit. It is measured using two key performance indicators: Operating Profit Margin and Asset Turnover.

Table 1: Measurement of Variables

Variable	Measurement	Literature (Prior Stuies)
Independent variable		
Intellectual capital (IC)	-Human capital: Average education level and experience of work force. -Structural capital: Number of patents or proprietary technologies. -Relational capital: Customer satisfaction score, number of strategic partnerships.	Handoyo <i>et al.</i> (2023); Lee <i>et al.</i> (2023)
Moderating variable		
Ownership Structure (OS)	-Managerial ownership: Percentage of shares owned by managerial executives.	Ogabo <i>et al.</i> (2021)
Dependent variable		
Operational Efficiency (OE)	-Operating profit margin: Measures by the ratio of operating profit to sales turnover. -Asset Turnover: Measures by the ratio of net sales to average total assets.	Lee <i>et al.</i> (2023) Lee <i>et al.</i> (2023)
Control variables		
Firm Size	Measured as natural logarithm of total assets.	Obaje & Abdullahi (2021); Asutay and Ubaidillah. (2024).
Firm Age	Difference between current year and founding year	Obaje & Abdullahi (2021)
Leverage	Debt to equity ratio	Singhanian and Panda (2025).

Results and Discussion

Descriptive Statistics Analysis

In this section, the study presents key statistical information for the independent, dependent, and mediating variables of interest. Each

variable is described based on its mean, standard deviation, maximum, and minimum values. Table 1 provides the descriptive statistics for the study.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
oppm	750	-7.532	79.392	-703.130	249.560
asto	750	0.839	0.734	0.000	8.040
huca	740	3.919	5.413	-16.330	73.380
stca	750	0.572	1.819	-24.000	20.420
rela	750	0.222	0.278	-1.220	5.850
owns	750	20.348	25.578	0.000	100.740
fsiz	750	7.075	0.848	5.030	9.380
deta	750	65.854	40.252	-20.780	395.450
fira	750	27.447	13.499	1.000	57.000

Source: Author (2025)

The descriptive statistics provide an overview of the key variables in this study, revealing insights into their central tendencies, variability and distribution patterns. The average value of operating profit margin (oppm) is -7.532, with a standard deviation of 79.392. The negative mean suggests that, on average, the sampled non-financial firms in Nigeria experienced operational losses over the period. The wide range between the minimum value of -703.130 and the maximum of 249.560 indicates substantial variability in operational efficiency across firms. Asset turnover (asto) has a mean value of 0.839, indicating that, on average, the firms generate approximately 84 kobo in revenue for every one naira of assets employed. The standard deviation of 0.734 and a range from 0.000 to 8.040 show notable variation in how efficiently firms utilize their assets to generate revenue. The minimum value of zero suggests that some firms may not be generating revenue relative to their asset base, possibly due to idle assets or operational challenges. Conversely, the maximum value reflects firms that are highly efficient in asset utilization.

For the independent variables, human capital (huca) has an average value of 3.919, with a substantial standard deviation of 5.413. The high variability emphasizes disparities in the emphasis and efficiency of human capital investment among firms. Structural capital (stca) reports an average of 0.572 with a standard deviation of 1.819. The high variability may reflect differences in how firms develop and leverage their

internal systems, processes, and intellectual properties to enhance efficiency. Relational capital (rela) has a mean value of 0.222 and a standard deviation of 0.278. The relatively low mean suggests that most firms have modest relational capital, implying potential areas for strategic improvements in external relationships, such as partnerships and customer networks.

The moderating variable, ownership structure (owns), has a mean of 20.348 and a relatively high standard deviation of 25.578. This variability suggests that ownership structure could influence how intellectual capital translates into operational efficiency, aligning with the study's objective of examining its moderating role. Among the control variables, Firm size (fsiz) has a mean value of 7.075 and a low standard deviation of 0.848, with values ranging from 5.030 to 9.380. This indicates that the sampled firms are moderately sized, with limited variation. Leverage (deta) shows a high average of 65.854 and a substantial standard deviation of 40.252, suggesting that most firms rely heavily on debt financing.

Correlation Analysis

In examining the association among the variables, this study employed the Spearman rank correlation coefficient (correlation matrix), and the results are presented in Table 3.

Table 3: Correlation Analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) oppm	1.000								
(2) asto	0.110	1.000							
(3) huca	0.429	0.327	1.000						
(4) stca	0.214	0.049	0.658	1.000					
(5) rela	0.488	0.568	0.519	0.178	1.000				
(6) owns	-	-	-	0.015	-	1.000			
(7) fsiz	0.100	0.086	0.030		0.003				
(8) deta	0.197	0.121	0.335	0.240	0.068	-	1.000		
(9) fira	-	-	-	-	-	0.331	0.111	0.026	1.000
	0.420	0.088	0.217	0.057	0.333				
	-	0.253	-	-	0.090	-	0.127	0.014	1.000
	0.046		0.035	0.143		0.395			

Source: Author (2025)

The findings indicate that there is a positive association between operating profit margin (0.110) and asset turnover during the period under study. Human capital (0.429) has a positive association with operating profit margin. Structural capital (0.214) and relational capital (0.488) are also positively associated with operating profit margin. Furthermore, human capital (0.327) and relational capital (0.568) are positively associated with asset turnover. The findings reveal that ownership structure (-0.100) is negatively associated with operating profit margin. A similar negative association is observed between ownership structure (-0.086) and asset turnover, implying that ownership concentration may not necessarily enhance asset utilization efficiency. Among the control variables, Firm Size (0.197) shows a positive association with operating profit margin. Also, firm Size (0.121) is positively associated with asset turnover. However, Leverage (-0.420) is negatively associated with operating profit margin.

Similarly, leverage (-0.088) has a weak negative association with asset turnover. The correlation results also indicate that firm age (-0.046) has a weak negative association with operating profit margin, while it is positively associated with asset turnover (0.253). The results indicate the absence of multicollinearity as all associations among the independent variables appear to be moderate. However, to confirm the absence of multicollinearity, a more robust check using the Variance Inflation Factor (VIF) test is conducted and the results is presented in Table 4.

Regression Analyses

Specifically, to examine the cause-effect between operating profit margin and asset turnover as the dependent variables and the independent variables- human capital, structural capital and relational capital, as well as to test the formulated hypothesis, the study employs a panel regression analysis (OLS)- which serves as the baseline estimate. GMM Step 1 and Step 2 are conducted to correct for the potential presence of endogeneity and for a better robust estimation and reliable estimate. Thus, the GMM results, along with the OLS pooled regression findings, are presented and discussed below.

Table 4: Intellectual Capital and Operational Efficiency: The Role of Ownership Structure

	OPPM	OPPM	OPPM	ASTO	ASTO	ASTO
Variables	OLS	GMM I	GMM II	OLS	GMM I	GMM II
huca	1.910** (0.021)	-0.950 (0.521)	-0.892*** (0.000)	0.002 (0.799)	-0.019** (0.015)	-0.019*** (0.000)
stca	2.449 (0.174)	7.047* (0.002)	7.216*** (0.000)	0.006 (0.701)	0.004 (0.752)	0.001 (0.779)
rela	6.524 (0.651)	29.654 (0.215)	28.315*** (0.000)	1.048*** (0.000)	1.354*** (0.000)	1.347*** (0.000)
owns	-0.134 (0.437)	-0.391 (0.333)	-0.325*** (0.000)	0.001 (0.495)	0.006*** (0.005)	0.006*** (0.000)
ownshuca	-0.001 (0.960)	0.008 (0.779)	0.007*** (0.000)	-0.000 (0.302)	0.000 (0.134)	0.000*** (0.000)
ownsstca	-0.064 (0.286)	-0.107 (0.148)	-0.112*** (0.000)	0.001 (0.136)	0.000 (0.550)	0.000*** (0.000)
ownsrela	1.484** (0.012)	0.811 (0.339)	0.827*** (0.000)	0.006 (0.244)	-0.011** (0.016)	-0.014*** (0.000)
fsiz	5.002 (0.156)	- (0.460)	-18.340*** (0.000)	0.063** (0.046)	0.696*** (0.000)	0.541*** (0.000)
deta	-0.481*** (0.000)	- (0.033)	-0.323*** (0.000)	0.000 (0.850)	0.002 (0.070)	0.001*** (0.000)
fira	0.698*** (0.002)	0.583 (0.599)	0.613*** (0.000)	0.007*** (0.001)	- (0.000)	-0.024*** (0.000)
L.oppm		0.289* (0.000)	0.289*** (0.000)		0.029*** (0.000)	
L.asto					0.205*** (0.000)	0.201*** (0.000)
Intercept	-43.327 (0.108)	140.70 (0.458)	126.928** (0.000)	-0.075 (0.755)	- (0.000)	-2.927*** (0.000)
Observations	740.000	666.00 0	666.000	740.000	666.000	666.000
R ²	0.1471			0.2086		
Adj R ²	0.1354					
F-stat						
Sargan	2.459{0.329}					2.459{0.329}
AR1	- 4.401{0.000}	- 4.401{0.000}	- 4.401{0.000}	- 4.401{0.000}	- 4.401{0.000}	- 4.401{0.000}

AR2	-	-
VIF	0.838{0.236} 1.28	1.28 0.838{0.236}

Notes: *p-values are in parentheses. *** $p < .01$, ** $p < .05$*

Table 4 presents the results obtained from the estimation of the models using the OLS regression method for both the operating profit margin model (OPPM) and the asset turnover model (ASTO). For the operating profit margin model, the results indicate that the dependent variable has an R-Square value of 0.1471. This suggests that the independent and control variables account for approximately 14.71% of the systematic variation in operating profit margin. Similarly, for the asset turnover model, the OLS regression yields an R-Square value of 0.2086, meaning that the independent and control variables explain 20.86% of the variation in asset turnover. Furthermore, for GMM step one and step two, the results presented in Table 4 indicate significant F-statistics values across both models, suggesting that overall, the GMM step I and step II results are suitable for statistical inference. However, this study utilizes GMM step II for hypothesis testing.

The test for multicollinearity using the Variance Inflation Factor (VIF) yields a mean VIF of 1.28 for both operating profit margin and asset turnover models. This value is well below the threshold of 10, indicating that multicollinearity is not an issue in either model, and none of the independent variables need to be excluded.

Test of Hypothesis and Discussion of Findings

The results obtained from the Generalized Method of Moments (GMM II) regression model presented in Table 4 revealed that the interaction between ownership structure and human Capital [coef. = 0.007 (0.000)] has a significant positive effect on operating profit margin. This suggests that ownership structure strengthens the relationship between human capital and operational efficiency, likely due to increased investment in employee development, better management practices and stronger oversight by shareholders. Similarly, in the second model measuring asset turnover, ownership structure and human capital [coef. = 0.000 (0.000)] also exhibit a significant positive effect, indicating that firms with a more structured ownership composition benefit from human capital investments in improving asset utilization and productivity. This

is in line with the findings from the studies of (Ramírez *et al.*, 2021; Ahmed *et al.*, 2022). Hence, the null hypothesis that ownership structure has no significant moderating role on the relationship between intellectual capital (human capital) and operational efficiency is rejected in both models.

The results further indicate that the interaction between ownership structure and structural capital [coef. = -0.112 (0.000)] has a significant negative effect on operating profit margin. This suggests that ownership structure weakens the impact of structural capital on operational efficiency, potentially due to bureaucratic decision-making processes or inefficiencies in internal systems (Beltramino *et al.*, 2020). However, in the second model measuring asset turnover, ownership structure and structural capital [coef. = 0.000 (0.000)] exhibit a significant positive effect, implying that while concentrated ownership may constrain the benefits of structural capital in profitability, it enhances firms' ability to utilize assets effectively.

Regarding the interaction between ownership structure and relational capital, the results in the operating profit margin model [coef. = 0.827 (0.000)] indicate a significant positive effect on operational efficiency. This implies that ownership structure enhances the role of relational capital in improving firm performance, likely due to better stakeholder relationships, increased investor confidence and stronger external collaborations. This support prior findings from the studies of (Bekanwah *et al.*, 2020).

However, in the asset turnover model, ownership structure and relational capital [coef. = -0.014 (0.000)] exhibit a significant negative effect, suggesting that while relational capital benefits profitability under certain ownership structures, it may not always translate into efficient asset utilization.

The findings suggest that ownership structure plays a crucial moderating role in the relationship between intellectual capital and operational efficiency, with varying effects across different components of intellectual capital. Furthermore, the findings of this studies highlight the need for management to integrate human capital strategies within ownership structures that foster accountability and resource allocation. From a regulatory perspective, policymakers should promote governance

frameworks that ensure investment in human capital aligns with long-term efficiency rather than short-term cost-cutting. Investors, particularly institutional shareholders, can interpret these findings as a signal that firms with strategic ownership structures are better positioned to leverage human capital for operational gains. For shareholders, both local and foreign, this underscores the importance of scrutinizing ownership compositions to assess whether they facilitate or hinder human capital-driven efficiency. Also, they should view relational capital as a critical determinant of profitability, particularly in firms where ownership structures actively influence external business networks. Also, financial analysts should incorporate human capital efficiency and ownership concentration in evaluating firms' asset utilization capacities. Likewise, shareholders, both local and foreign, should view relational capital as a critical determinant of profitability, particularly in firms where ownership structures actively influence external business networks.

Conclusion

This study investigates the moderating role of ownership structure on the relationship between intellectual capital disclosure and operational efficiency in listed non-financial firms in Nigeria. The significant findings of this study reveal that the interaction between ownership structure and human capital has a significant positive effect on operating profit margin and asset turnover, indicating that concentrated ownership enhances human capital investment's contribution to operational efficiency. Also, the interaction between ownership structure and structural capital has a significant negative effect on operating profit margin but a positive effect on asset turnover, suggesting that while ownership concentration constrains profitability due to bureaucratic inefficiencies, it enhances asset utilization efficiency. Furthermore, the interaction between ownership structure and relational capital has a significant positive effect on operating profit margin, implying that concentrated ownership fosters stakeholder engagement, leading to profitability. However, the effect on asset turnover is negative, indicating that relational capital does not necessarily improve asset utilization.

A major takeaway from this study is that ownership structure is a double-edged sword in corporate governance. While it enhances human

capital investment and relational capital's role in profitability, it can also introduce inefficiencies in structural capital management and restrict the operational flexibility needed for optimal asset utilization. These insights provide a nuanced understanding of how governance mechanisms interact with intellectual capital components to shape firm performance.

The study recommends that firms should ensure that ownership structures facilitate rather than constrain the efficient deployment of human, structural, and relational capital; they should also strengthen stakeholders' engagement mechanism. Corporate managers should prioritize workforce development, leadership training, and employee engagement programs. This study contributes to the body of knowledge in corporate governance and intellectual capital management by providing empirical evidence on the moderating role of ownership structure in the intellectual capital-operational efficiency nexus. Empirically, this study enriches the literature by employing the GMM estimation technique, which addresses endogeneity concerns often neglected in corporate governance research.

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