

Intellectual Capital Efficiency and Cost of Capital among Listed Manufacturing Companies in Nigeria

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Abstract

Despite the shift from industrial-based economy to knowledge-based economy, traditional accounting has continued to focus more on the physical assets in their financial statements to the exclusion of intangible asset. The main objective of this study therefore was to examine the effect of intellectual capital efficiency on cost of capital of manufacturing companies listed on the floor of the Nigerian Exchange Group from the period of 2014-2023. The research design adopted for the study was ex post facto, secondary data were used and the population of the study consisted of 62 listed manufacturing companies out of which a sample size of 27 was purposively selected. The data used in this study were analyzed using the Generalized Method of Moment (GMM) regression analysis. The findings of this study revealed that human capital efficiency (HCE), has a significant positive effect on the cost of equity; relational capital efficiency (RCE) has no significant effect on cost of equity; while structural capital efficiency (SCE) has no significant effect on cost of equity of listed manufacturing companies in Nigeria. Based on the above findings, it was concluded that intellectual capital efficiency can significantly impact on the cost of capital of listed manufacturing companies in Nigeria. It was therefore recommended among others that management of listed industrial goods companies should utilize advanced customer relationship management (CRM) systems to efficiently manage their interactions with customers and create competitive advantage.

Keywords: Intellectual Capital Efficiency, Human Capital Efficiency, Relational Capital Efficiency, Structural Capital Efficiency, Cost of Capital, Manufacturing Companies, Nigerian Exchange Group.

1.0 Introduction

In today's fast-moving economy with the rapid growth of knowledge and technological innovations, the growth of organization has changed to cope with the changing environment. With mounting competitions in the global economy, intellectual capital has become the main ingredient and vital tool for organization to sustain their competitiveness and create more value (Christian et al., 2024). In a developing economy like Nigeria, intellectual capital has emerged as a critical driver of competitive advantage and corporate success. Intellectual capital efficiency refers to the effectiveness with which a company utilizes its intellectual capital to create value and achieve competitive advantage. Intellectual capital, encompassing human, structural and relational capital thus representing the intangible assets and knowledge resources that companies leverage to create value.

Human capital is the most important asset of an organization and a source of innovation and strategic renewal. Human capital is a sum of technical expertise, leadership ability, risk-taking, and problem-solving ability (Xiao et al., 2018). It is therefore an intangible asset or quality not listed on a company's statement of financial position. Relational capital efficiency refers to how effectively a company manages

and leverages its relationships with external stakeholders such as customers, suppliers, partners, investors and the community to create value, foster collaboration and drive performance (Akpan & Otung, 2020). Firms with strong relational capital efficiency prioritize stakeholder engagement, communication, and relationship-building to enhance reputation, credibility, and long-term partnerships (Rahman et al., 2020). According to Latifah (2024), structural capital efficiency relates to the effective utilization of intangible assets and organizational resources that support the business operations, processes, systems, and infrastructure. Aliyu (2019) defines cost of equity capital as the rate at which investors discount the expected dividends of the firm to determine its share value. Investors perceive firms with a skilled and talented intellectual capital as less risky investments due to their potential for innovation, productivity gains, and adaptability to changing market conditions (Bontis et al., 2000). As a result, firms with higher levels of intellectual may enjoy a lower cost of capital compared to their counterparts with less skilled employees (O'Boyle et al., 2022). This reduced cost of capital can translate into improved financial performance and valuation for the firm.

The shift from industrial-based economy to knowledge-based economy has underscored the importance of intellectual capital as a fundamental asset for modern organizations. Despite this shift, traditional accounting has continued to focus more on the physical assets in their financial statements to the exclusion of the more important assets, the intellectual capital. Consequently, managements are denied relevant and timely data which enables them to take vital decisions regarding her human capital, structural capital and relational capital, especially the cost implication of certain decisions. Also, manufacturing firms in Nigeria grapple with significant hurdles concerning intellectual capital efficiency due to limited access to financing, driven by high interest rates and stringent lending criteria which stifles investment in intellectual capital development. Additionally, the inadequate protection of intellectual property rights undermines the incentive for innovation and diminishes the value of intellectual assets, further impacting the cost of capital for listed manufacturing companies in Nigeria.

Empirical literature revealed that most of the studies on intellectual capital were conducted using data from developed nations while related scholarly works are relatively sparse when considering data from less developed countries particularly Nigeria (Chinnasamy et al., 2024 – Nigeria; Sayed & Nefzi, 2024–Saudi Arabia). In addition to this, majority of the studies on intellectual capital efficiency focused on other performance measures without trying to ascertain if it has any effect on cost of capital (Khurana & Sharma, 2024; Ozkan & Zeytinoglu, 2024; Sayyid et al., 2024). Worst still there was no conclusive finding because of varying finding thus giving room for more studies to be carried out in this area. Based on the above identified gaps, this study was undertaken to ascertain the effect of intellectual capital efficiency on cost of capital of listed manufacturing firms in Nigeria.

2.0 Literature Review and Hypotheses Development

Human Capital Efficiency and Cost of Capital

Human capital efficiency refers to the effectiveness with which a company utilizes its human capital, its employees' knowledge, skills, experiences, and abilities to create value and achieve its strategic objectives. It measures how well the workforce contributes to the company's overall performance and growth. Human capital is the most important asset of an organization and a source of innovation and strategic renewal (Xiao et al., 2018). Human capital is unique and differs from any other capital. It is needed for companies to achieve goals, develop and remain innovative. Peters and Imo (2023) pointed out that human capital is a reflection of education, knowledge, intuition, and skill. Human capital transforms to be one of the key successes for a company since it provides a competitive advantage in the

future. Human capital can as well be seen as the competence of an employee to create both tangible and intangible assets through contributing towards the continuous generation of ideas and knowledge.

Hsiung et al. (2023) found that intellectual capital is a significant determinate of firms cost of capital. On the other hand, Akpan et al. (2024) noted that environmental disclosures also affect firms' cost of capital. Chinnasamy et al. (2024) identified the impact of intellectual capital (IC) on the bank's performance using a cross-country approach with India and Gulf Cooperation Council (GCC) countries using the Skandia navigator model (SNM) and found a direct impact of human capital and customer focus on the performance of the selected banks in both India and GCC countries. Martens and Bui (2024) examined the relationship between IC and its components on Vietnamese banks from 2011 to 2018, utilizing the modified value-added intellectual coefficient (MVAIC) and stochastic frontier analysis to determine technical efficiency. They found that human capital efficiency does not have any influence on firms cost of capital. Based on the forgoing, this study hypothesized that;

H1: Human capital efficiency has no significant effect on cost of equity of listed manufacturing companies in Nigeria.

Structural Capital Efficiency (SCE) and Cost of Capital

Structural capital efficiency refers to the effectiveness with which a company leverages its organizational structures, processes, systems and infrastructure to create value and drive performance. According to Akpan and Otung (2020), a company's structural capital refers to its ability to adhere to the procedures and structures that support employee efforts to generate the highest suitable intellectual performance as well as increased profitability. Bontis et al., (2000) summited that structural capital consists of the supportive infrastructure, processes, and databases of the organization that enable human capital to function. Structural capital is owned by an organization and remains with an organization even when people leave. It includes: capabilities, routines, methods, procedures and methodologies embedded in organization (Brenner & André, 2020). Structural capital is the supportive infrastructure that enables the rest of an organization to function in a repeatable, scalable way (Khavandka et al., 2020).

Latifah (2024) examined the influence of intellectual capital and company size on company's performance. The findings showed that intellectual capital has a positive effect on company's performance. Ime et al. (2024) and noted that environmental disclosure is also among the major determinants of firms cost of capital just as the intellectual capital efficiency components. Habib and Dalwai (2023) explored the efficiency of intellectual capital (ICE) and working capital management (WCME) in the GCC industrial sector and its potential impact on cost of capital and found a negative relationship between them. Akpan and Otung (2020) investigated the effect of intellectual capital on economic value added of listed banks in Nigeria. The results showed that human capital efficiency, structural capital efficiency and capital employed efficiency significantly influence economic value added of listed banks in Nigeria. Salvi (2020) examined the impact of intellectual capital disclosure on the cost of equity capital in the context of integrated reporting, which represents the ultimate frontier in the field of corporate disclosure. Empirical outcomes indicate that intellectual capital disclosure levels have a significantly negative association with the cost of equity capital. Thus, based on these findings, this study hypothesized that;

H2: Structural capital does not have any significant effect on cost of equity of listed manufacturing companies in Nigeria.

Relational Capital Efficiency (RCE) and Cost of Capital

Another component of intellectual capital efficiency (ICE) is the relational capital efficiency (RCE). Relational capital efficiency refers to how effectively a company manages and leverages its relationships with external stakeholders such as customers, suppliers, partners, investors and the community to create value, foster collaboration and drive performance (Akpan & Otung, 2020). RCE provides the infrastructure and necessary resources for HCE and SCE to make the best use of resources in order to increase overall firm performance (Widowati & Pradono, 2017). Relational capital is defined as the organizational relation with internal and external associates of the firm, including customers, employees, suppliers, strategic alliance partners, stakeholders and industry associations. From Rahman et al. (2020) perspective, relational capital encompasses not just external ties inside a corporation, but also additional aspects such as reputation and brand.

Hambali et al. (2024) found in the empirical studies that firms with higher levels of relational capital tend to have lower costs of capital, as investors perceive them as more resilient, adaptable, and capable of sustaining competitive advantage over the long term. Wiagustini et al. (2019) concluded that firms with extensive relational capital benefit from enhanced access to financing through strategic partnerships, joint ventures, and alliances. Filippo et al. (2019) and Hatane et al. (2019) found no significant relationship between relational capital efficiency and cost of capital. Thus, this study hypothesized that;

H3: Relational capital efficiency does not have any significant effect on cost of equity of listed manufacturing companies in Nigeria.

Theoretical Framework

A number of theories have been used in the literature to support studies on intellectual capital efficiency. This study focused on Resource-based view theory. Resource-based view theory was propounded by Penrose in 1959 and Penrose stated that heterogeneity of resources provides firms unique characteristics for success and competitiveness and this shows that the key notion of resource based theory is heterogeneity of firms resources. According to the traditional resource based view of the firm, certain types of resources (both physical and human) owned by organization have the potential to generate competitive advantage, which ultimately leads to superior organizational performance (Barney, 1991; Ojali et al., 2023).

Resource based theory suggests that firms with superior intellectual capital resources are better positioned to achieve competitive advantage by leveraging their knowledge, skills, and relationships to create value and generate above-average returns. Grant (2016) and Ibrahim et al. (2023) classified resources into tangible assets, intangible assets and human resources with human being characterized as the most productive asset. Corporate reputation, corporate culture and employees Know-how were characterized as more influential than tangible assets as they are likely to meet Beltramino et al. (2020) four conditions outline. The RBT also states that a company's competitive advantage is derived from the company's ability to assemble and exploit an appropriate combination of resources.

Resource-Based View (RBV) theory was the anchor theory for this study because it gives framework for understanding the role of intellectual capital in shaping firm performance and cost of capital. According to Essien and Akpan (2024) noted that by emphasizing the strategic importance of internal resources and capabilities, RBV theory highlights the need for firms to invest in developing and leveraging their intellectual capital to achieve sustained competitive advantage and reduce their cost of capital.

3.0 Methodology

Ex post facto design was used to determine the effect of the explanatory variables on the dependent variable. This design was suitable for this study because the data used were historical and the researcher had no direct control over the variables involved. The population of this study was made up of 62 listed manufacturing companies in Nigeria. The sample size of this study was 17 listed consumer goods firms and 11 industrial goods firms giving a total of 27 manufacturing companies. This study employed purposive sampling technique to select 16 listed consumer goods firms in Nigeria as the sample size. Secondary data source was employed in this study. The data for this study were analysed using Generalized method of moment (GMM) regression analysis and the statistical packaged employed was STATA version 16.

Model specification

The model of this study was adapted from the work of Isola et al., (2019) and was modified to fit the objectives of this study as expressed below;

$$COEQ_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 RCE_{it} + \beta_3 SCE_{it} + e_{it} \quad (1)$$

Where:

- COEQ = Cost of equity
- HCE = Human capital efficiency
- RCE = relational capital efficiency
- SCE = Structural capital efficiency
- "{i}" = Cross section (Sample Companies)
- "t" = Time frame (2014 to 2023)
- e_{it} = Stochastic error term

Operationalization of Variables

The variables used in this study are operationalized as given in table 3.1 below;

Table 1: Operationalization of Variables

Variables	Measurement	Source	A prior sign
Cost of Equity Capital	= $\frac{\text{annual dividend}}{\text{Market capitalization}}$	Isola et al. (2019)	
Human Efficiency	Capital Value added/Expenditure on Total salaries, wages	Akpan & Otung, 2020	-
Relational Efficiency	Capital advertisement, marketing, and selling and distribution expenditure/value added	Akpan & Otung, 2020	-
Structural Efficiency	Capital $\frac{\text{Value added}-\text{Human Capital}}{\text{Value added}}$	Akpan & Otung, 2020	-

Source: Authors Operationalization, 2024.

4.0 Results and Discussion

Table 2: Descriptive Statistics of the effect of Intellectual Capital Efficiency on Cost of Capital

Variable	Obs	Mean	Std. Dev.	Min	Max
COEQ	270	4.364	7.516	0.000	70.400
HCE	270	4.542	12.879	-43.260	140.280
RCE	270	0.213	0.570	-4.190	5.850
SCE	270	0.675	0.706	-2.810	7.480

Source: Author's computation, 2024.

The descriptive statistics in Table 4.1 provide an overview of the key variables in the study. The average cost of equity (COEQ) stands at 4.364, with a considerable standard deviation of 7.516, indicating a wide variability in equity costs among firms. Human capital efficiency (HCE) shows an average of 4.542, but the high standard deviation of 12.879 and the range from -43.260 to 140.280 indicate significant disparities in how efficiently firms utilize their human capital. The negative minimum value suggests that some firms may have inefficiencies or losses in human capital. Relational capital efficiency (RCE), with a mean of 0.213 and a standard deviation of 0.570, shows less variability, yet the range from -4.190 to 5.850 implies notable differences in firms' effectiveness in leveraging their relationships. Structural capital efficiency (SCE) has a mean of 0.675, with a standard deviation of 0.706, and ranges from -2.810 to 7.480. This range indicates that while some firms have strong structural capital efficiency, others struggle, as evidenced by the negative values.

Table 3: Correlation Analysis

Variables	COEQ	HCE	RCE	SCE
COEQ	1.000			
HCE	0.399	1.000		
RCE	0.355	0.622	1.000	
SCE	0.155	0.686	0.307	1.000

Source: Author's Computation, 2024.

In the case of the correlation between cost of equity, cost of debt, and intellectual capital efficiency, table 4.2 shows that there exists a positive association between the of human capital efficiency (0.399) and of cost of equity. Similarly, relational capital efficiency (0.355) and structural capital efficiency (0.155) are positively associated with cost of equity. The results indicate that the associations between these variables are generally weak to moderate, suggesting that multicollinearity may not be a significant concern.

Table 4: Regression Analysis

Variables	(1) GMM I-COEQ	(2) GMM I-COEQ
HCE	0.021 (0.655)	0.023*** (0.000)
RCE	0.099 (0.921)	-0.025 (0.885)
SCE	-0.691 (0.288)	-0.505 (0.074)
Intercept	-4.666 (0.797)	-2.775 (0.684)
Observations	216	216
R ²		
Endo:		
VIF		
Sargen Test		Chi ² : 34(0.6534)

(*** =sig @ 5% significance level and P values are in parenthesis)

Due to endogeneity problems between intellectual capital efficiency and cost of capital, ordinary least squares (OLS) could not produce consistent and unbiased results (Nguyen et al., 2014). Therefore, to address the endogeneity issue, this study used GMM by following the prior studies (Bryl & Fijałkowska, 2020). Hambali et al., 2024).). In the case of GMM step one and step two, the result as presented in table 4.3 shows that the Chi2-statistics value is significant across the two models indicating that on the overall, the GMM step one and step two results for the models are fit for statistical inference. However, this study employed fixed-smoothing asymptotic to compare the one-step and two-step procedures. For the one-step procedure, the long run variance (LRV) estimator was used in computing the standard errors, leading to the popular heteroskedasticity and autocorrelation robust (HAR) standard errors.

On the other hand, for the two-step procedure, the LRV estimator not only appears in the standard error estimation but also plays the role of the optimal weighting matrix in the second step GMM criterion function. Under the fixed-smoothing asymptotic, the weighting matrix converges to a random matrix. As a result, the second step GMM estimator was not asymptotically normal but rather asymptotically mixed normal. The asymptotic mixed normality reflects the estimation uncertainty of the GMM weighting matrix and is expected to be closer to the finite sample distribution of the second step GMM estimator. Based on the foregoing, the power benefit of the two step GMM was justified and thus relied upon for hypotheses testing in this study.

Human Capital Efficiency and Cost of Equity

The results obtained from the GMM II regression model presented in Table 4 revealed that human capital efficiency [coef. = 0.023 (0.000)] has a significant positive effect on the cost of equity. This implies that an increase in human capital efficiency significantly increases the cost of equity for listed manufacturing firms in Nigeria during the period under study. This result implies that as firms enhance their human capital efficiency—through better training, development, or more effective utilization of their workforce—they might concurrently experience an increase in the cost of equity. This could be attributed to the fact that investments in human capital, while potentially improving long-term performance and innovation, may also signal higher short-term operational costs and risks to investors. Thus, the market

may require a higher return on equity as compensation for perceived uncertainties associated with these investments. This finding aligns with the perspectives of Hsiung et al. (2023) and Martens and Bui (2024) who suggest that while human capital is a critical driver of firm growth, it can also introduce variability in performance, thereby increasing the perceived risk profile. On the other hand, this result contradicts the findings of Salvi (2020), who found that enhanced human capital efficiency typically leads to a decrease in the cost of equity, as it generally improves firm performance and stability, thereby reducing the risk premium demanded by investors.

Relational Capital Efficiency and Cost of Equity

The GMM II regression results indicated that relational capital efficiency [coef. = -0.025 (0.885)] does not have a significant effect on the cost of equity. This result suggests that the market does not heavily weigh the efficiency with which firms manage their relationships with customers, suppliers, and other stakeholders when determining the equity cost for Nigerian manufacturing firms. This result implies that the value generated through relational capital, such as strong customer loyalty or robust supply chain partnerships, may not be immediately apparent to investors, or it may not be considered a critical factor influencing the firm's risk profile and, consequently, its cost of equity. This outcome aligns with the observations of Bryl and Fijałkowska (2020), who noted that in some markets, intangible assets like relational capital are undervalued or overlooked by investors, possibly due to the difficulty in quantifying their immediate financial benefits. Similarly, Wiagustini et al., (2019) found that while relational capital could enhance long-term firm value, its effects are not always reflected in market-based measures like the cost of equity, possibly due to investors' focus on more tangible short-term metrics. Conversely, this finding contradicts the conclusions of Faizi et al. (2020) and Okoye and Okerekeoti (2021), who argued that relational capital plays a crucial role in enhancing a firm's competitive advantage, which should theoretically lower the cost of equity by reducing perceived risks.

Structural Capital Efficiency and Cost of Equity

The findings from the GMM II regression model show that structural capital efficiency [coef. = -0.505 (0.074)] has a marginally insignificant effect on the cost of equity. This indicates that structural capital efficiency does not significantly influence the cost of equity. This result indicates that improvements in structural capital efficiency – such as enhancements in organizational routines, databases, and corporate culture – do not have a strong or clear impact on how the market prices the equity of these firms. This finding agrees with the views of Smriti and Das (2018), who noted that the benefits of structural capital, while critical for internal management and efficiency, often do not translate directly into market-based metrics like cost of equity due to their intangible nature. On the other hand, this result contradicts the findings of Sulaiman et al. (2021) and Faizi et al. (2020), who suggested that structural capital significantly impacts financial performance and market valuation.

5.0 Conclusion and Recommendations

The main problem addressed by this study was the exploration of how intellectual capital efficiency influences the cost of capital in the context of listed manufacturing firms in Nigeria. The study's key findings reveal a complex relationship between intellectual capital components and the cost of capital. Human capital efficiency was found to have a significant positive effect on the cost of equity; relational capital efficiency does not have significant effect on cost of equity; structural capital efficiency showed no impact on cost of equity capital. Thus, it was concluded that the components of intellectual capital have varying effect on cost capital of listed manufacturing companies in Nigeria.

It was thus recommended that the management of manufacturing companies should balance investment in human capital with other capital expenditures to ensure a diversified and stable growth as over reliance on human capital without complementary investments in technology or infrastructure might increase the perceived risk thereby increasing the of equity. It was also recommended that these companies should utilize advanced customer relationship management (CRM) systems to efficiently manage their interactions with customers, improve customer satisfaction and create competitive advantage.

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