
Empirical Analysis of the Effect of Intellectual Capital Efficiency on Cost of Debt

Mmaeyen Ofonime Ukpong

Department of Accounting, Faculty of Management Sciences
Akwa Ibom State University, Obio Akpa Campus

Eno Gregory Ukpong

Department of Accounting, Faculty of Management Sciences
Akwa Ibom State University, Obio Akpa Campus

Professor Nkanikpo Ibok

Department of Marketing, Faculty of Management Sciences
Akwa Ibom State University, Obio Akpa Campus

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ABSTRACT: *The main objective of this study was to examine the effect of intellectual capital efficiency on cost of debt of manufacturing companies listed on the floor of the Nigerian Exchange Group from the 2014-2023. The research design adopted for this study was ex post facto, secondary data were used and the population of the study consisted of 62 listed manufacturing companies in Nigeria. The sample size of this study was 27 purposively selected listed manufacturing companies in Nigeria. 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 significant negative effect on cost of debt; relational capital efficiency (RCE) has significant negative effect on cost of debt; and structural capital efficiency (SCE) has significant negative effect on cost of debt 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 debt of listed manufacturing companies in Nigeria. It was therefore recommended among others that the management of manufacturing firms should develop and maintain strong relationships with creditors and financial institutions to negotiate better credit terms and reduce the cost of debt. It was also recommended that the management of these firms should continue to improve and leverage structural capital to enhance operational efficiencies and lower the cost of debt.*

KEYWORDS: Intellectual capital efficiency, human capital efficiency, relational capital efficiency, structural capital efficiency, cost of debt.

INTRODUCTION

In a knowledge-based economy, intellectual capital is considered an important resource for firms' value creation, growth, and innovative capacity (Shincon, 2020). As noted in the study of Sulaiman et al. (2021), the 21st century has been designated as knowledge economy, where many firms are shifting from using physical capital towards intellectual capital, and more firms are trying to find better ways to use their resources efficiently to be sustained in the dynamic changing business environment. Hence, nations are experiencing a move from mechanical and labour production to knowledge employee-based processes. Intangible assets especially knowledge is gaining prominence than ever before as a matter of survival and of achieving competitive advantage for the firm to compete strategically. In this regard, Chukwu et al. (2019) opines that intellectual capital has become the critical driver for firms' sustainability and this have implications for the firms cost of capital or funding.

Intellectual capital has been conceptualised as the combination of all the knowledge and competences that can manifest as a company's sustained competitive advantage (Sullivan, 2000). The intellectual capital is particularly important to the Nigerian manufacturing industry, because this sector is pivotal to the nation's economic, growth, diversification and industrialization efforts. It faces numerous challenges, including infrastructural deficits, limited access to financing, and a dynamic regulatory environment. Within this challenging landscape, the efficient use of intellectual capital can provide manufacturing firms with the agility and innovation needed to overcome these hurdles. The components of intellectual capital efficiency include human capital efficiency, structural capital efficiency and relational capital efficiency. According to Olaoye and Afolalu (2020) human capital efficiency refers to how effectively an organization leverages its employees' knowledge, skills, experience, and capabilities to drive productivity, innovation, and performance. It encompasses the development, management, and utilization of the workforce to achieve strategic objectives and create value for the organization. Organizations with high human capital efficiency invest in recruiting, training, and retaining talented individuals, aligning employee skills with business goals, fostering a culture of continuous learning and development, promoting employee engagement and well-being, and effectively matching talent with job roles.

Structural capital is the supportive infrastructure, processes and databases of the organization that enable human capital to function (Muthia et al., 2017). It is the organization structures, systems and processes that enable an organization to exploit the intellectual capital. Structural capital deals with the mechanisms and structures of the organization which ultimately influence organizational innovation thereby making it an important organizational resource (Kong, 2020). 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. The main focus of relational capital is the level of mutual understandings, trust and

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respect, the friendship that arises out of close interactions between external and internal factors (Akpan & Otung, 2020).

Intellectual capital efficiency can also impact the cost of debt by influencing lenders' perceptions of a company's creditworthiness and ability to generate stable cash flows for debt repayment. A company with strong intellectual capital resources may be better positioned to weather economic downturns, adapt to market changes, and sustain profitability, reducing the perceived default risk for lenders. Lenders may view companies with high intellectual capital efficiency as less risky borrowers, leading to lower interest rates on debt financing. Additionally, efficient management of intellectual capital assets can enhance a firm's ability to generate sufficient cash flows to service its debt obligations, thereby reducing the overall cost of debt. Despite the recognized importance of intellectual capital, there is limited empirical research examining its specific impact on the cost of capital within the Nigerian manufacturing sector. Understanding this relationship is essential for policymakers, industry stakeholders, and corporate managers aiming to optimize resource allocation, enhance financial performance, and foster a more robust industrial base in Nigeria.

Novel among the motivation for this study was the fact that many studies that have examined the effect of intellectual capital efficiency on firms' performance have mostly been conducted using data from developed nations while related scholarly works are relatively sparse when considering data from less developed countries particularly Nigeria (Martens & Bui 2024; Vietnamese banks; Hambali, 2024). 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. Such performance measures include corporate sustainability growth (Emeka et al., 2023); working capital management (Habib & Dalwai, 2023) and financial performance ((Sayyid et al., 2024). It was also realised that other sectors of the economy were considered (Emeka et al., 2023; Habib & Dalwai, 2023). Worst still there were no unanimous findings in the literature because of divergent findings. For instance, Latifah 2024; Skhyediani (2023); Angahar (2023; Ausat et al. (2022); and Gupta and Raman (2021) showed a positive significant relationship between intellectual capital and several operational measures; Zheng (2022); Lotfi et al. (2022); Mondal (2021); and Olajide (2019) showed a negative relationship between these variables. Thus, it was as a result of the above identified gaps in literature that this study was undertaken to ascertain the effect of intellectual capital efficiency on cost of debt of listed manufacturing companies in Nigeria.

LITERATURE REVIEW

Intellectual capital efficiency

Intellectual Capital efficiency is a dynamic set of resources that create a competitive advantage for a firm to improve its performance (Xu & Wang, 2018). The term intellectual capital was first used by Tom Stewart in 1991 when he wrote an article for Fortune Magazine titled "Brainpower: How intellectual capital is becoming Americas' most valuable asset" (Kalkan et al., 2020). In contemporary knowledge-based economies, intellectual capital is gradually gaining more

Publication of the European Centre for Research Training and Development-UK importance as a critical strategic asset (Khalique et al., 2015), with more reliance placed on intellectual capital than on physical capital (Goh, 2023). The inherent boundaries to the existing financial reporting framework have created a gap in stakeholder expectations of information and motivated scholars to find new ways of measuring and reporting a firm's intellectual capital (Kannan & Aulbur, 2024). Maditinos, et al. (2011) argue that intellectual capital can be traced back to those "hidden assets" which although not recognised in financial statements leads organisations to obtain a competitive advantage. It is an important activity for organizations which want to be efficient on the market and thus to obtain sustainable competitive advantage. William, et al. (2019) see intellectual capital as the combined intangible assets of the market, intellectual property, human-centred and infrastructure which enable the company to function. They added that intellectual capital is the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills that provide the firm with a competitive edge in the market. Loo-see (2018) describes intellectual capital as the possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide a competitive advantage in the marketplace.

Cost of debt

The company could raise debt in a variety of ways which included borrowing funds from financial institutions or from public debt in the form of bonds (debentures) for a specified period of time at a certain interest rate (Wakida, 2011). Cost of debt has been defined by Steyn (2024) as the effective interest rate that a company pays on its debt, such as bonds and loans. The cost of debt can refer to the before-tax cost of debt, which is the company's cost of debt before taking taxes into account. The company can use various bonds, loans, and other forms of debt, so this measure is useful for giving an idea as to the overall rate being paid by the company to use debt financing. The measure can also give investors an idea as to the riskiness of the company compared to others, because riskier companies generally have a higher cost of debt. Lenders are relatively demand lower returns because they take the least risk of any contributors of long-term capital, so the cost of debt is lower than the cost of other forms of financing. Also, the tax deductibility of interest payments lowers the debt cost to the firm substantially. An optimal debt to-equity ratio would not only decrease capital costs, but they would also achieve a lower weighted average cost of capital (WACC). Debt holders are also aware of the possibility of wealth transfer to the equity holders and impose restrictions on firms through debt covenants. In contradiction to equity holders, once a covenant has been agreed upon, debt holder will have great difficulty influencing firm's operations.

Human capital efficiency and cost of debt

According to Lotfi et al. (2022) human capital refers to the acquired skills, knowledge, and abilities of human beings. They stated that the underlying concept such as skills and knowledge increase human productivity and that they do so enough to justify the costs incurred in acquiring them. Rehman et al. (2011) defined human capital as the skill and creativity of employees that can be further encourage by investing more in their training programs. Human Capital is experience and

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expertise of employees which increases the efficiency of organizations. Investors perceive firms with a skilled and talented workforce 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 human capital 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. Conversely, firms with a less capable workforce may face higher costs of debt due to concerns about their ability to sustain competitive advantage and profitability. Empirical studies have provided mixed evidence regarding the relationship between human capital and cost of debt. Carmeli et al., (2013), found that firms with higher levels of human capital tend to have lower costs of debt while (Subramaniam & Youndt, 2005) found no significant relationship human capital efficiency and cost of debt. Bontis et al., (2000) found negative relationship between human capital and cost of capital; and Barney (1991) found a positive effect. Thus, it was as a result of this mixed findings that this study hypothesized that;

Ho₁: Human capital efficiency has no significant effect on cost of debt of listed manufacturing companies in Nigeria.

Structural capital efficiency and cost of debt

According to Poh et al. (2018), structural capital is the knowledge that remains with a firm even after an employee has left. It is the organization's potential and capabilities in facing the internal and external challenges. Structural capital is the supportive infrastructure, processes and databases of the organization that enable human capital to function (Muthia et al., 2017). It equals the sum of capitals stemming from internal processes, relations, communication, research development and innovation (Pena, 2012). It is the organization structures, systems and processes that enable an organization to exploit the intellectual capital. Structural capital, also known as organizational capital, encompasses the tangible and intangible assets within a firm that contribute to its operational efficiency, innovation capacity, and knowledge management systems (Sveiby, 1997). Unlike other forms of capital, such as human or relational capital, structural capital is more static and enduring, representing the accumulated knowledge, processes, and technologies that underpin a firm's operations (Roos et al., 2018). The relationship between structural capital and cost of capital is multifaceted, with implications for firm valuation, risk management, and strategic decision-making. Firms that effectively manage and leverage their structural capital may be better positioned to attract investment capital at lower costs, leading to improved financial performance and shareholder value (Edvinsson & Malone, 1997).

Structural capital efficiency and cost of capital

Conversely, firms that neglect their structural capital may face higher costs of capital and reduced access to external financing, limiting their growth potential and competitiveness. One unique aspect of structural capital is its potential to mitigate information asymmetry and reduce uncertainty for investors (Liani et al., 2022). Firms with robust structural capital, characterized by

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well-defined processes, documented knowledge, and advanced technology systems, are better equipped to communicate their value proposition and growth prospects to investors (Rothomi & Rafid, 2023).). As a result, these firms may enjoy a lower cost of capital compared to their counterparts with less developed structural capital. Subramaniam and Youndt (2005) and (Sveiby, 1997) found a negative relationship between structural capital and cost of debt. Moreover, firms with well-established knowledge management systems and intellectual property portfolios may benefit from reduced information asymmetry and enhanced transparency, leading to lower perceived risk and cost of capital. Conversely, Roos et al. (2018) and Isola et al. (2019) found positive relationship whereas Liani et al. (2022) found no relationship at all. Thus based on this mixed findings, this study hypothesized that;

Ho₂: Structural capital does not have any significant effect on cost of debt of listed manufacturing firms in Nigeria.

Relational capital and cost of capital

Relational capital, often referred to as social capital, encompasses the network of relationships, trust, and goodwill that a firm develops with its stakeholders, including customers, suppliers, investors, and the community (Nahapiet & Ghoshal, 2019). Unlike other forms of capital, relational capital is rooted in social interactions and relies on mutual trust, reciprocity, and shared values (Lynn, 2018). The strength and quality of a firm's relational capital can significantly influence its access to capital and cost of capital. Research suggests that firms with strong relational capital are better positioned to attract investment capital at lower costs (William et al., 2019). Investors may view these firms as less risky investments due to the quality of their relationships and the potential for collaborative value creation (Nahapiet & Ghoshal, 2019). Moreover, firms with extensive relational capital may benefit from enhanced access to financing through strategic partnerships, joint ventures, and alliances (Wiagustini et al., 2019). These relationships can provide additional sources of capital and reduce the firm's reliance on traditional debt and equity financing. Firms with strong relational capital are better positioned to attract and retain customers, suppliers, and strategic partners, leading to increased revenues, market share, and profitability (Akpan & Otung, 2020). These positive outcomes can further reinforce investor confidence and contribute to a virtuous cycle of value creation and cost reduction

Akpan and Otung (2020) and Nahapiet and Ghoshal (2019) found a negative relationship between relational capital efficiency and cost of debt. On the other hand, Rothomi, and Rafid, (2023) found no relationship between them. Hence, it was hypothesized that;

Ho₃: Relational capital efficiency has no significant effect on cost of debt of listed manufacturing firms in Nigeria.

Theoretical framework

Intellectual capital theory by Edvinsson and Malone (1997)

Intellectual capital theory, rooted in the seminal work of Leif Edvinsson and Michael Malone in 1997, represents a fundamental shift in how organizations perceive and manage their assets. At its core, the theory posits that traditional financial measures fail to capture the full value of a company, as they overlook intangible assets such as knowledge, skills, and relationships (Edvinsson & Malone, 1997). The intellectual capital theory is a new outstanding theory which is based on the principle that, in the contemporary circumstances, intangible assets which are not disclosed in the financial statements of a given firm are vital for firms' operation for success, since they can significantly increase the value of assets and competitive advantage (Makadok, 2021). This theory challenges the conventional wisdom that tangible assets alone determine a firm's worth and competitive advantage.

This theory postulates that IC fits the description of strategic assets because it is valuable, rare, poorly imitable and lacking tactical substitutes. Especially the human component can generate better outputs because knowledge and skills can be enhanced through value added investigation and improvement activities that promote creativity and innovation (Jafaridehkordi et al., 2015). Intellectual capital has been acknowledged as a key resource for a company to enhance its competitive advantage and at the same time to improve its corporate image in the global market (Salehi et al., 2023). In a contemporary business environment, intellectual capital is recognized as a lifeblood of knowledge concentrated companies including the industrial goods sector (Rezai & Mousavi, 2015). This theory is relevant to this study because it represents a paradigm shift in how organizations perceive and manage their resources. By recognizing the strategic significance of intangible assets and embracing a holistic approach to value creation, organizations can enhance their competitiveness and sustainability in the knowledge-based economy.

Empirical review

The concept of intellectual capital is central to the competitive advantage of any company and as such many empirical studies have been carried out in this area. Sayed and Nefzi (2024) investigated the impact of intellectual capital on the sustainable performance of banks in Saudi Arabia, focusing on the period from 2012 to 2022. The findings revealed that intellectual capital significantly enhances bank performance in Saudi Arabia, with human capital efficiency showing the most decisive influence on ROE and NPM. Hambali (2024) evaluated the role of intellectual capital in increasing the value of Indonesian companies. The research results showed that simultaneously, intellectual capital has a significant positive effect in increasing company value, and partially, the VACA and STVA constructs have a positive effect on company value, while the VAHU construct has a negative effect.

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Ime et al. (2024) examined the effect of corporate social responsibility disclosures on cost of capital of pharmaceutical firms listed on the floor of Nigeria Exchange Group from 2013 to 2022. The findings of this study revealed that environmental responsibility disclosures have an insignificant but positive effect on weighted average cost of capital while indigenous venture supports and staff welfare disclosures have significant negative effect on weighted average cost of capital of listed pharmaceutical firms in Nigeria. Akpan et al. (2024) examined the effect of environmental disclosure on the cost of equity of listed consumer goods firms in Nigeria. Expost facto research design was adopted, and panel data covering ten (10) years (2013-2022) were collected across eighteen (18) listed consumer goods firms in Nigeria. The study findings revealed that environmental risk disclosure (Coeff. = -0.0269 {0.0107}) and waste management disclosure (Coeff. = 0.0178 {0.0009}) have significant negative relationships on cost of equity. Bhattacharjee and Akter (2022) based on the listed companies of Bangladesh, aimed to frame the affinity between intellectual capital (IC) efficiency and different dimensions of business performance - financial, market, and economic. This study measured IC efficiency by adopting 'value-added intellectual coefficient' (VAIC) approach which estimates companies' value addition capability considering physical capital, human capital, and structural capital. The study revealed that among VAIC components, efficiency of physical capital is the most influential element for predicting business performance.

Akpan and Otung (2020) investigated the effect of intellectual capital on economic value added of listed banks in Nigeria. The data for the data were secondary derived from the annual reports of these banks and Nigeria Stock Exchange fact books. The research design adopted is expo facto research and the study covered a period of four years from 2015 to 2018. The sample size of 12 banks is selected using Cochran model. Intellectual capital is measured using Value Added Intellectual Coefficient (VAIC) developed by Pulic. Data are analyzed using descriptive statistics and ordinary least square regression technique. The results showed that human capital efficiency, structural capital efficiency and capital employed efficiency significantly influence economic value added of listed banks in Nigeria.

METHODOLOGY

The research design adopted for this study was ex post facto design because the data used were historical. The population consisted of 62 listed manufacturing companies in Nigeria while 27 was purposively selected 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 study specified an econometric model to capture intellectual capital effect on cost of capital of listed manufacturing firms in Nigeria. The model of Isola et al., (2019) was adopted and modified to express the econometric model of this study as follows;

$$\text{Cost of capital} = f(\text{Intellectual capital efficiency}) \quad (1)$$

$$\text{CODE}_{it} = \beta_0 + \beta_1 \text{HCE}_{it} + \beta_2 \text{RCE}_{it} + \beta_3 \text{SCE}_{it} + e_{it} \quad (2)$$

Where:

CODE	=	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

Measurement of variable of variables

Intellectual capital efficiency

This was measured using modified value added intellectual capital (MVAIC) model.

Human capital efficiency (HCE): This was measured as given below;

$$\text{HCE} = \text{VA}_t / \text{HC}_t$$

where HC (human capital) refers to Total salaries, wages and all incentives for the employees during the period of t, and VA (value added) = P + C + D + A = operating profit + employee cost + depreciation + amortization; and HCE denotes the value created by one unit of human capital invested during period t.

Relational capital efficiency (RCE). This was measured as given below;

$$\text{RCE} = \text{RC}/\text{VA}$$

Here RC is relational Capital, which denotes advertisement, marketing, and selling and distribution expenditure. VA (value added) = P + C + D + A = operating profit + employee cost + depreciation + amortization and RCE represents the proportion of total VA accounted by relational capital. It is assumed that such these costs are incurred to build and sustain relationships with external stakeholders.

Structural capital efficiency (SCE): This was measured as given below;

$$\text{SCE} = \frac{\text{VA}-\text{HC}}{\text{VA}}$$

where VA (value added) = P + C + D + A = operating profit + employee cost + depreciation + amortization, HC equals human capital and SCE represents the proportion of total VA accounted for by structural capital.

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Cost of capital: The cost of capital in this study was measured using cost debt and this is given below

Cost of debt: This study calculated cost of debt from the companies' view point. Cost of debt is calculated as =

$$K_d = \frac{i(1-r)}{tD}$$

Where

kd = cost of debt

I = total interest expense paid for debt in a specific period (as found in the statement of profit or loss account)

r = corporate tax rate

tD = Total debt of the company

ANALYSIS AND DISCUSSION OF FINDINGS

Table 4.1: Descriptive statistics of the effect of intellectual capital efficiency on cost of debt

Variable	Obs	Mean	Std. Dev.	Min	Max
code	270	3.244	4.324	0.000	36.720
hce	270	3.234	11.235	-49.157	134.236
rce	270	0.327	0.684	-5.695	6.387
sce	270	0.593	0.948	-2.222	8.839

Source: Authors Computation (2024)

Table 4.1 presents the descriptive statistics of the study. The cost of debt (CODE) averages at 3.244 with a standard deviation of 4.324, reflecting differences in the debt financing conditions experienced by these firms.

Human capital efficiency (HCE) shows an average of 3.234, but the high standard deviation of 11.234 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 0.327 and a standard deviation of 0.684, shows less variability. Structural capital efficiency (SCE) has a mean of 0.593, with a standard deviation of 0.948. This indicates that while some firms have strong structural capital efficiency, others struggle, as evidenced by the negative values.

Table 4.2: Correlation analysis of the relationship between intellectual capital efficiency on**cost of debt**

Variables	code	hce	rce	sce
code	1.000			
hce	0.174	1.000		
rce	0.166	0.622	1.000	
sce	0.028	0.686	0.307	1.000

Source: Author's computation (2024)

Table 4.2 displays the correlation analysis of the study. The results show that there exists a positive association between human capital efficiency (0.174) and cost of debt (CODE). Similarly, relational capital efficiency (0.0.166) and structural capital efficiency (0.028) are positively associated with cost of debt. The results indicate that the associations between these variables are generally weak, suggesting the absence of multicollinearity.

Variables	(4) OLS-CODE	(5) GMM CODE	(6) I- GMM I-CODE
hce	-0.019 (0.369)	-0.025 (0.193)	-0.013 (0.205)
rce	0.460 (0.337)	0.466 (0.291)	0.338*** (0.005)
sce	-0.549 (0.127)	-0.409 (0.159)	-0.458*** (0.000)
fimz	0.980 (0.089)	-2.716** (0.020)	-2.764*** (0.000)
mcap	-0.255 (0.629)	-2.195** (0.022)	-2.323*** (0.000)
L.coeq			
L.code		0.365*** (0.000)	0.386*** (0.000)
Intercept	-1.127 (0.536)	38.308*** (0.000)	38.908*** (0.000)
Observations	270	216	216
R ²	0.043		
Endo:	1{0.000}		
VIF	3.07		
Hettes:	10.89{0.000}		
Sargen Test			Chi2:22.07(0.9392)

Source: Authors computation (2024)

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Table 4.3 presents the regression analysis of the study. Due to endogeneity problems between intellectual capital efficiency and cost of debt, 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.

DISCUSSION OF FINDINGS

Human capital efficiency (HCE) has no significant effect on the cost of debt (CODE)

The analysis from the GMM II regression model demonstrates that human capital efficiency [coef. = -0.013 (0.205)] does not have significant effect on the cost of debt. This finding indicates that variations in human capital efficiency do not significantly impact the cost of debt. This outcome implies that lenders may not heavily weigh the proficiency and productivity of a firm's workforce when assessing creditworthiness or determining interest rates. Instead, they might prioritize more traditional financial metrics or collateral assets, which are perceived as more tangible and reliable indicators of a firm's ability to service debt. This observation is consistent with the views of Bryl and Fijałkowska (2020), who noted that while human capital is crucial for long-term innovation and growth, it may not directly influence the cost of debt because lenders tend to focus on more immediate and secure factors like asset bases or cash flows. Moreover, Salvi (2020) also highlighted that creditors often place less emphasis on intangible assets such as human capital, primarily because these are not easily collateralizable in the event of default, thus having a lesser impact on debt costs. Contrarily, the findings of Okoye and Okerekeoti (2021) and Anifowose et al. (2018) argue that firms with efficient human capital often demonstrate better management practices and operational efficiencies, which should theoretically lower the perceived risk to lenders and, consequently, reduce the cost of debt.

Relational capital efficiency (RCE) has no significant effect on the cost of debt

The GMM II regression results reveal that relational capital efficiency [coef. = 0.338 (0.005)] has a significant positive effect on the cost of debt. The finding that relational capital efficiency has a significant positive effect on the cost of debt suggests that as firms enhance their relationships with customers, suppliers, and other stakeholders, the cost they incur when borrowing increases. This interpretation aligns with the findings of Smriti and Das (2018), who argued that while relational capital can provide long-term benefits, it may also require significant investments that do not immediately translate into cash flows, potentially raising concerns among creditors. Similarly, Faizi et al. (2020) suggested that the benefits of relational capital, such as improved customer loyalty and supply chain efficiency, might be perceived by debt providers as less tangible compared to traditional financial metrics, thereby increasing the cost of debt due to perceived risk.

Contrarily, the results diverge from the perspectives of Sulaiman et al. (2021) and Solanke and Muhammed (2021), who posit that enhanced relational capital should theoretically lower borrowing costs by fostering trust and reducing transaction uncertainties.

Structural capital efficiency and cost of debt

According to the GMM II regression findings, structural capital efficiency [coef. = -0.458 (0.000)] has a significant negative effect on the cost of debt. The finding that structural capital efficiency significantly decreases the cost of debt suggests that improvements in a firm's structural capital such as advanced IT systems, efficient organizational processes, and strong internal controls can lead to better borrowing terms. This result implies that lenders view firms with higher structural capital efficiency as lower-risk investments. The enhanced organizational structures likely provide greater operational stability and predictability, reducing the likelihood of financial distress and thus lowering the perceived risk for creditors. This aligns with the notion that well-developed internal processes and infrastructure can enhance a firm's reliability and effectiveness, making it a more attractive candidate for lending. This result is supported by Anifowose et al. (2018), who argued that strong structural capital contributes to operational efficiency and transparency, which can positively influence lenders' risk assessments. Similarly, Xu and Wang (2019) found that firms with robust structural capital are often able to secure debt at lower costs, as they present a lower credit risk due to better resource management and stronger governance frameworks. On the other hand, Salvi (2020) and Faizi et al. (2020) emphasize that while structural capital is important, its direct impact on financial outcomes like the cost of debt can vary depending on market perceptions and the specific characteristics of the firm.

CONCLUSION AND RECOMMENDATIONS

This study examined the effect of various components of intellectual capital human capital on the costs of debt (CODE). The overarching goal was to understand how these intangible assets, often overlooked in traditional financial analyses, affect a firm's financing costs and, consequently, its overall financial health and strategic decision-making. The mixed impact of relational capital

Publication of the European Centre for Research Training and Development-UK efficiency points to a cautious approach by lenders, who may require a premium for perceived risks associated with the reliance on external relationships. The study therefore concluded that intellectual capital efficiency has significant effect on cost of debt of listed manufacturing companies in Nigeria. Thus, it was recommended that the management of manufacturing firms should develop and maintain strong relationships with creditors and financial institutions to negotiate better terms and reduce the cost of debt. They should leverage strong relationships with suppliers for better credit terms and financing options that could lower overall debt costs. It was also recommended that the management of these firms should continue to improve and leverage structural capital to enhance operational efficiencies and lower the cost of debt.

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