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AUTHORS	Thabiso Sthembiso Msomi Odunayo Magret Olarewaju Mabutho Sibanda

ARTICLE INFO	Thabiso Sthembiso Msomi, Odunayo Magret Olarewaju and Mabutho Sibanda (2025). Nexus of Intellectual capital efficiency components and firm value in listed Sub-Saharan Africa insurance companies: A static and dynamic approach. *Insurance Markets and Companies*, *16*(2), 124-140. doi:10.21511/ins.16(2).2025.10
DOI	http://dx.doi.org/10.21511/ins.16(2).2025.10
RELEASED ON	Friday, 28 November 2025
RECEIVED ON	Saturday, 19 April 2025
ACCEPTED ON	Monday, 06 October 2025
LICENSE	This work is licensed under a Creative Commons Attribution 4.0 International License
JOURNAL	"Insurance Markets and Companies"
ISSN PRINT	2616-3551
ISSN ONLINE	2522-9591
PUBLISHER	LLC "Consulting Publishing Company "Business Perspectives"
FOUNDER	LLC "Consulting Publishing Company "Business Perspectives"

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
61	0	8

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Thabiso Sthembiso Msomi (South Africa), **Odunayo Magret Olarewaju** (United States), **Mabutho Sibanda** (South Africa)

NEXUS OF INTELLECTUAL CAPITAL EFFICIENCY COMPONENTS AND FIRM VALUE IN LISTED SUB-SAHARAN AFRICA INSURANCE COMPANIES: A STATIC AND DYNAMIC APPROACH

Type of the article: Research Article

Received on: 19th of April, 2025
Accepted on: 6th of October, 2025
Published on: 28th of November, 2025

Thabiso Sthembiso Msomi, Ph.D. Student, College of Law and Management Studies, School Accounting, Economics & Finance, University of KwaZulu-Natal, South Africa. (Corresponding author)

Odunayo Magret Olarewaju, Professor of Accounting, Faculty of Accounting, Department of Accounting, Metro State University, United States.

Mabutho Sibanda, Professor of Finance, College of Law and Management Studies, School Accounting, Economics & Finance, University of KwaZulu-Natal, South Africa.

Abstract

This study investigates the nexus between Intellectual Capital efficiency (ICE) components and firm value in Sub-Saharan African (SSA) insurance companies. The study employed a modified Value-Added Intellectual Coefficient (VAIC™) model, incorporating components such as Value-Added Capital Coefficient (VACA), Structural Capital Value-Added Coefficient (SCVA), Value-Added Human Capital Coefficient (VAHC), and Innovation Capital Efficiency (VAHC2). These components were integrated to calculate the VAIC, offering a holistic assessment of value-creation efficiency within SSA insurance firms. Static and dynamic panel data analyses were employed to estimate the relationship between the ICE components and Tobin's Q ratio, serving as a proxy for firm value. A positivist approach and descriptive quantitative methods were used in this study. The study analyzed panel data from 122 insurance firms across 46 SSA countries over the period 2010–2022, sourced from databases including Wharton Research Data Services, S&P CapitalIQ, and Refinitiv Eikon. The VAIC™ model was applied by integrating various ICE components to comprehensively evaluate the value creation efficiency in SSA insurance firms. The findings indicate significant variation in the impact of ICE components on firm value across SSA insurance companies. Specifically, higher VAIC™ values are associated with enhanced firm performance, underscoring the critical role of intellectual capital in value creation within this sector. This research contributes to the body of knowledge by demonstrating the applicability of the VAIC™ Model in SSA's insurance sector and underscoring the relevance of intellectual capital management in driving financial outcomes. Practical implications include informing policymakers, executives, and investors about optimizing intellectual resources to foster sustainable growth and resilience in SSA insurance.

Keywords intellectual capital efficiency, firm value, SSA insurance companies, VAIC™ model, Tobin's Q ratio

JEL Classification G20, G22

INTRODUCTION

The insurance industry is a fundamental pillar of the modern financial system, serving as both a stabilizing mechanism and a catalyst for economic growth. It performs multiple functions beyond risk mitigation – it mobilizes savings, channels long-term investments, and supports financial inclusion. Through the redistribution of risks and the provision of financial protection, insurance strengthens the resilience of households, firms, and governments, thereby contributing to overall economic stability.

In Sub-Saharan Africa (SSA), this role is particularly significant given the region's exposure to macroeconomic volatility, climatic shocks, and social vulnerabilities. Yet, despite its potential, the insurance mar-

Conflict of interest statement:
Author(s) reported no conflict of interest

http://dx.doi.org/10.21511/ins.16(2).2025.10

ket in SSA remains underdeveloped, with persistently low penetration rates and limited contribution to GDP. These structural weaknesses hinder the sector's ability to perform its economic functions effectively and to sustain competitiveness in a rapidly evolving global financial environment.

Financial performance in insurance companies depends on the efficient management of resources and the ability to adapt to dynamic market conditions. Among the factors influencing this performance, the structure of financing and the utilization of internal capabilities play a central role. In developing markets, constraints such as limited access to capital, high borrowing costs, and institutional fragility intensify the challenges of maintaining solvency and growth.

At the same time, the increasing importance of intangible assets such as human expertise, organizational knowledge, and innovation capacity underscores the strategic value of intellectual resources in the insurance industry. These assets not only shape operational efficiency but also determine how effectively firms can respond to changing customer needs, regulatory shifts, and technological disruption. In knowledge-intensive sectors like insurance, the capacity to manage and leverage intellectual capital has become a key source of sustainable competitive advantage.

Understanding the interaction between financial structure and intangible resource efficiency is thus essential for identifying pathways to improved performance and long-term viability in Sub-Saharan Africa's insurance sector.

1. LITERATURE REVIEW

The insurance industry plays a crucial role in financial systems by mobilizing savings, facilitating long-term investments, and enhancing economic stability (Shafiee, 2022; Saddam & Jaafar, 2021). In Sub-Saharan Africa (SSA), the sector is particularly important given the region's exposure to economic and social risks. However, insurance penetration remains low, averaging 2.78% compared to a global rate of 7.2% (AIO, 2020; Swiss Re Institute, 2022). Despite its potential, the industry faces persistent inefficiencies – more than 60% of insurers continue to rely on outdated business models, while employee productivity remains below international benchmarks (McKinsey & Company, 2024; Allianz Research, 2024). These conditions underline the relevance of financial and intellectual resources as key determinants of performance in the insurance sector. Decisions regarding capital structure directly influence firms' ability to sustain growth and stability (Daou et al., 2013; McKinsey & Company, 2024). At the same time, the growing importance of intangible assets – such as human, structural, and innovation capital – highlights their role in creating long-term value (Alfawaire & Atan, 2021; Khattak & Shah, 2020; Wong et al., 2015; Rehman et al., 2022; Rahimpour et al., 2020; Uagbale-Ekatah & Udeh, 2022).

The resource-based theory (RBT) posits that the ability of a business to generate value is inherently tied to the resources it owns and controls. For a resource to contribute to sustained competitive advantage, it must exhibit key characteristics such as rarity, inimitability, and non-substitutability. The fundamental premise of RBT is that firms are inherently different due to their unique combination of resources both tangible and intangible, as well as their organizational capabilities to leverage these assets effectively. When firms cultivate and refine these resources, they transform into core competencies that drive long-term competitive advantage (Barney, 1991). A deeper examination of RBT reveals that organizational assets can be categorized into three primary groups: tangible assets, intangible assets, and organizational capabilities (Kamaluddin & Rahman, 2013). Tangible assets encompass physical infrastructure, raw materials, financial capital, real estate, and technological resources such as computers. On the other hand, intangible assets such as brand equity, corporate reputation, and intellectual property are often unseen yet play a crucial role in sustaining competitive differentiation (Grant, 1996). Beyond these, organizational capabilities represent a firm's ability to integrate and utilize assets, human expertise, and operational processes to transform inputs into valuable outputs (Galbreath, 2005). In the context of insurance companies, Intellectual Capital a significant portion of an organization's asset base. Given that IC encompasses intangible resources and organizational competencies, it aligns with the strategic resource classification of RBT and holds immense potential for value creation when effectively managed (Grant, 1996). Thus, understanding the efficiency of IC components is essential in evaluating its impact on firm value within the insurance sector.

VAHC refers to the efficiency with which a firm utilizes its human capital to generate value (Simić & Ognjanović, 2019). This component evaluates the effectiveness and productivity of human capital within an organization. Mohammad and Bujang (2019) and Rahimpour et al. (2020) have shown that a higher VAHC positively correlates with better financial performance in various industries, suggesting that skilled and motivated employees contribute significantly to firm value. Wong et al. (2015) demonstrate that human capital significantly influences the market value of firms in the Hong Kong market, indicating a direct correlation between well-managed human capital and higher firm value. Crowley and McCann (2018) provided evidence that firms with higher human capital efficiency tend to exhibit better financial performance, particularly in innovation-driven industries. Veltri and Silvestri (2011) identified that human capital efficiency is a crucial determinant of firm value in Italian companies, highlighting the role of skilled and efficient human resources in competitive industries. Chadwick and Flinchbaugh (2021) emphasized the role of human capital in strategic HR management practices, linking it directly to firm performance and competitive advantage. Crowley and McCann (2018) further demonstrate that firms with higher human capital efficiency exhibit superior financial outcomes, particularly in innovation-driven industries. The insurance sector, which relies heavily on specialized knowledge and expertise, is expected to benefit significantly from high VAHC levels. Higher levels of VAHC positively influence Tobin's Q ratio in insurance companies, indicating that investment in employee skills and knowledge enhances firm value.

SCVA pertains to the efficiency with which a firm leverages its non-human storehouses of knowledge, such as databases, organizational charts, process manuals, strategies, routines, and anything that supports employees' productivity (Abbood, 2022). SCVA measures the efficiency of organizational structures, processes, and systems in leveraging intellectual capital. Hakkak et al. (2016) find that firms with well-structured and integrated systems tend to have higher intellectual capital efficiencies and, consequently, enhanced firm value. Rehman et al. (2022) establish that structural capital plays a critical role in enhancing the effectiveness and efficiency of human capital, thereby contributing to overall firm performance. Rehman et al. (2022) find that structural capital significantly contributes to the market performance of firms in Islam, demonstrating the importance of well-structured internal processes and systems. Allameh (2018) indicated that structural capital positively affects organizational learning and innovation, which in turn boosts firm performance and market valuation. Bayraktaroglu et al. (2019) underscored the importance of structural capital in the knowledge-management process and its impact on firm performance, particularly in knowledge-intensive industries. A well-structured and integrated system enhances the efficiency of human capital, leading to superior firm performance (Hakkak et al., 2016). Rehman et al. (2022) found that firms with robust structural capital experience improved market performance and innovation capabilities, as efficient organizational structures and processes optimize the utilization of intellectual capital.

Capital Employed measures how effectively a firm utilizes its physical and financial capital to generate value (Soewarno & Tjahjadi, 2020). This component is crucial in capital-intensive industries, such as insurance. VACA assesses the efficiency with which capital is employed to generate revenue and intellectual capital. Studies by Avci and Nassar (2017) and Welly et al. (2021) indicate that the optimal allocation of financial resources and effective management of capital contribute positively to firm value, as reflected in Tobin's Q ratio. Nawaz and Haniffa (2017) illustrated that efficient capital employment is a significant predictor of firm performance, emphasizing the importance of the judicious use of financial and physical resources. Asare et al. (2017) find that VACA is positively associated with firm performance in emerging insurance market companies, suggesting that firms

http://dx.doi.org/10.21511/ins.16(2).2025.10

that efficiently employ their capital tend to perform better. Kuttu et al. (2023) identify a strong correlation between VACA and firm performance in insurance companies in Ghana, highlighting the role of capital efficiency in enhancing market value. Ibrahimy and Raman (2019) demonstrate that firms with higher VACA tend to achieve better market valuations in Malaysia, underscoring the importance of capital efficiency in competitive markets. Capital efficiency plays a crucial role in asset-intensive industries such as insurance. Avci and Nassar (2017) and Welly et al. (2021) found that optimal capital allocation enhances firm value, as reflected in Tobin's Q ratio. Ibrahimy and Raman (2019) observed a similar relationship in Malaysian insurance firms, indicating that efficient capital management leads to better market valuations, suggesting that effective capital allocation and management contribute significantly to firm value.

VAHC2 measures the effectiveness with which an organization leverages its innovation capital to generate value. Innovation capital includes the knowledge assets utilized to create new products, services, processes, or business models. This component focuses on a firm's ability to innovate and create new intellectual capital. Bayraktaroglu et al. (2019) emphasize the role of innovation in creating sustainable competitive advantages for insurance firms. Manzaneque et al. (2017) observed that higher levels of VAHC2, including Research and Development (R&D) investments, patents, and new product development, drive growth, market differentiation, and ultimately lead to higher firm value. They further argue that innovation capital is a crucial driver of firm value in knowledge-intensive industries. Rahko (2014) found that R&D expenditure, a proxy for innovation capital, is strongly correlated with market value. Ni et al. (2021) show that firms with higher innovation outputs tend to have higher market valuations. Celenza and Rossi (2013) found that innovation efficiency is a critical determinant of firm value in listed Italian companies. Rahko (2014), Gao and Chou (2015), Gerhart and Feng (2021), Alfawaire and Atan (2021), Uagbale-Ekatah and Udeh (2022) and Amankwah-Amoah and Medase (2024) suggest that firms with high innovation capital efficiency tend to outperform their competitors and achieve higher Tobin's Q ratios because of their ability to adapt and innovate in dynamic market environments. Studies highlight the growing importance of innovation in sustaining competitive advantage (Bayraktaroglu et al., 2019; Manzaneque et al., 2017). Firms that invest in Research & Development (R&D), technological advancements, and knowledge creation tend to experience higher firm value (Ni et al., 2021; Ayinaddis et al., 2024).

VAIC™ is a metric designed to measure the efficiency and productivity of both tangible and intangible assets within an organization (Marzo, 2022). It focuses primarily on the effectiveness of Intellectual Capital and employed capital, which includes systemic and Human Capital. According to Ahmed and Hussin (2023), VAIC™ is intended to provide critical information for management, shareholders, and stakeholders, enabling them to monitor and assess the overall efficiency and value-added potential of a company's resources. They explained that VAIC measures the value-added (VA) by subtracting inputs (IN) from outputs (OUT), excluding labor costs from inputs to focus on intellectual contributions. Empirical literature consistently supports a positive relationship between intellectual capital and corporate performance (Asutay & Ubaidillah, 2023). Intellectual Capital, defined as shared knowledge embedded in employees and organizational routines, is crucial for a sustainable competitive advantage (Rehman et al., 2022). Ni et al. (2021) conducted a study on Taiwanese listed companies and found a positive relationship between intellectual capital and market value, suggesting that firms with higher VAIC scores tend to achieve superior market valuations. This study underscores the importance of intellectual capital in enhancing firm value, particularly in knowledge-intensive industries. Bhattu-Babajee and Seetanah (2022) examined the role of intellectual capital in the performance of Mauritian insurance companies and found a positive correlation between VAIC™ and both financial performance and market valuation. Further, Chen et al. (2014) and Mohammad and Bujang (2019) explored the Malaysian insurance sector and reported that firms with higher VAIC scores demonstrated better market valuations, as evidenced by higher Tobin's Q ratios. Prior studies consistently report a positive relationship between VAIC™ and firm performance (Ahmed & Hussin, 2023; Kuttu et al., 2024). Intellectual capital efficiency plays a vital role in determining market valuation, particularly in knowledge-intensive industries (Rehman et al., 2022). This study reinforces the argument that the efficient utilization of intellectual capital is crucial for enhancing firm value in the insurance industry. They further suggest that firms with higher VAIC™ scores tend to achieve superior market valuations, indicating that effective management of intellectual capital is crucial for enhancing firm value.

Following the literature review, this study aims to examine the relationship between intellectual capital efficiency components and firm value in Sub-Saharan African insurance companies using a modified VAIC™ model and panel data analysis.

The hypotheses are as follows:

H1: *Value-added human capital coefficient (VAHC) has a positive impact on the firm value of insurance companies.*

H2: *Structural capital value-added coefficient (SCVA) has a positive impact on the firm value of insurance companies.*

H3: *Value-added capital coefficient (VACA) has a positive impact on the firm value of insurance companies.*

H4: *Innovation capital efficiency (VAHC2) has a positive impact on the firm value of insurance companies.*

H5: *Value added intellectual coefficient (VAIC™) has a positive impact on the firm value of insurance companies.*

2. METHODOLOGY

This study primarily focused on insurance firms, employing a positivist perspective and a descriptive and quantitative research approach. During a certain timeframe, there were 178 insurance firms from 46 SSA countries in the population. A revised version of the Cochran Formula was used to determine the sample size of 122. The time frame spanning from 2010 to 2022 was analyzed using secondary data acquired from reliable sources such as Wharton Research Data Services (WRDS), S&P CapitalIQ, and Refinitiv Eikon. The decision to select 2010 as the year to study the post-GFC dynamics and changes in the insurance firm of SSA was reasonable and necessary to understand how it has performed over time and how it has responded to economic challenges. This study utilized panel data collected over 13 years from 46 nations located in SSA. The dataset had 1464 observations, each corresponding to a distinct company, totaling 122 firms.

The modified VAIC™ has been extensively used for measuring intellectual capital (IC) (Xu & Wang, 2018). This study followed the five essential phases proposed by Ahmad (2023) to apply the model. It is noteworthy that this study is unique as it explores IC in SSA, a region where no previous studies have applied this newly modified model, particularly in the context of insurance companies.

The added value (VA) is the difference between a company's production and its inputs: $VA = OUT - IN$. Here, OUT represents earnings from all goods and services sold, while IN includes all expenditures, excluding labor costs (Massa et al., 2017). Mathematically, $VA = OP + EC + D + A$, where OP is the operating profit, EC is the employee cost, D is depreciation, and A is amortization.

The value-added capital coefficient ($VACA$) measures the additional value produced per unit of capital employed (Olarewaju & Msomi, 2021). $VACA$ indicates how effectively a business uses its tangible assets, aligning with Resource-Based Theory (RBT) which emphasizes the management of both tangible and intangible assets to gain a competitive edge (Abbasi Kamardi et al., 2022). Mathematically, $VACA = VA/CA$, where CA is capital employed (book value of total assets minus intangible assets).

Human capital (HC) is represented by payroll expenses. The value-added human capital coefficient ($VAHC$) is the value generated per unit of investment in employees (Marzo, 2022). According to the RBT model, high-quality human capital is crucial for producing added value and enhancing competitive edge, ultimately improving financial outcomes (Ayub et al., 2017). Mathematically, $VAHC = VA/HC$, where HC is total employee

http://dx.doi.org/10.21511/ins.16(2).2025.10

cost. Innovation capital efficiency (*VAHC*2) is represented by *VAHC*2 = *VA/R&D*. Research and Development (R&D) is an essential strategic investment for companies and institutions. It plays a vital role in fostering innovation, improving the competitive edge, and positively affecting long-term financial performance. Efficient management has the potential to result in long-term growth, enhanced operational effectiveness, and increased shareholder value.

The structural capital value-added coefficient (*SCVA*) demonstrates value creation by the firm's structural capital (de Matos Pedro et al., 2020). Since *HC* contributes to value creation, *SC*'s contribution is inversely related to that of *HC* (Urban & Joubert, 2017). Mathematically, *SCVA* = *SC/VA*, where *SC* = *VA* – *HC*.

The overall efficiency of value creation in a business is indicated by *VAIC*™. A higher *VAIC* value signifies greater productivity by adding value to the total capital of the organization. The model incorporates control variables such as *RISK*, *SIZE*, and Leverage (*LEVE*). The key assumption of the *VAIC*™ method is that labor should be considered an asset rather than an expense. Mathematically, the model is expressed as

$$VAIC_{it}^{TM} = VACA_{it} + SCVA_{it} + VAHC_{it} + VAHC2_{it} + \varepsilon_{it},$$
$$\text{where } VA = OP + EC + D + A, \quad (1)$$
$$VACA = \frac{VA}{CA}, \quad SCVA = \frac{SC}{VA},$$
$$SC = VA - HC, \quad VAHC = \frac{VA}{HC},$$

and *VAHC*2 represents research and development costs.

$$Tobin's\,Q_{it} = \beta_i + \beta_1 VAIC_{it}^{TM} + \beta_2 Risk_{it} + \beta_3 Size_{it} + \beta_4 Leve_{it} + \varepsilon_{it}, \quad (2)$$

$$Tobin's\,Q_{it} = Tobin's\,Q_{i(t-1)} + \beta_1 VAIC_{it}^{TM} + \beta_2 Risk_{it} + \beta_3 Size_{it} + \beta_4 Leve_{it} + \varepsilon_{it}, \quad (3)$$

$$Tobin's\,Q_{it} = \beta_i + \beta_1 VACA_{it} + \beta_2 SCVA_{it} + \beta_3 VAHC_{it} + \beta_4 VAHC2_{it} + \beta_5 Risk_{it} + \beta_6 Size_{it} + \beta_7 Leve_{it} + \varepsilon_{it}, \quad (4)$$

$$Tobin's\,Q_{it} = Tobin's\,Q_{i(t-1)} + \beta_1 VACA_{it} + \beta_2 SCVA_{it} + \beta_3 VAHC_{it} + \beta_4 VAHC2_{it} + \beta_5 Risk_{it} + \beta_6 Size_{it} + \beta_7 Leve_{it} + \varepsilon_{it}. \quad (5)$$

To estimate Models 4 and 5, which have been specified for this study, both static and dynamic panel analyses were employed. The control variables included underwriting risk, firm size, and leverage ratio. Underwriting risk was measured as the ratio of claims paid to net premiums received, reflecting the insurer's exposure to risk in underwriting activities. Firm size, denoted as "*Size*," was represented by the logarithm of the total assets of the insurer, providing a standardized measure of the scale of operations. The leverage ratio, indicated as "*Leve*," was calculated as the ratio of total debt to total assets, serving as an indicator of the insurer's financial structure and reliance on borrowed funds relative to its overall asset base.

To investigate the effects of individual components of IC on FP in sub-Saharan African insurance companies, the study employed both static and dynamic panel analysis, namely, FE (FE) and random effect (RE) models, and dynamic panel analysis using the two-step system generalized method of moments (SYS-GMM). FE and RE estimations were used as the static approaches. According to Allison (2009), the FE model solves the problem of heterogeneity bias and higher-level variance. It estimates only the within-group effects, which makes it simple and persuasive. By contrast, the RE model incorporates random coefficients, complex variance functions, and cross-level interactions, making it readily extendable. While the FE model is regarded as the gold standard or default approach, and the RE model is a multi-level model (Schurer & Yong, 2012). To determine the most reliable estimator between FE and RE, the Wu-Hausman test (WHT) was applied. The WHT distinguished between FE and RE by assessing whether the regressors were correlated with the individual effects. Under the null hypothesis, there was no correlation, and RE was more efficient and thus preferred. Under the alternative hypothesis, the regressors were correlated with the individual effects, making FE consistent and, therefore, appropriate.

Dynamic panel analysis (GMM) was used. The GMM approach was chosen because it permitted flexible identification and employed a customary weighting matrix that produced an efficient estimator even under conditional heteroskedasticity. Additionally, the GMM method minimized a certain norm of the sample averages of the moment conditions and could, therefore, be considered a special case of minimum. In the study, GMM estimators were employed as they addressed endogeneity and produced efficient results with several restricted time dimensions. It is noteworthy that, unlike prior studies on IC which predominantly employed either static or dynamic panel regression models in isolation, the present study adopts a more comprehensive methodological approach by concurrently utilizing both static and dynamic panel estimations. This dual-modelling strategy enables a more nuanced and robust examination of the relationship between IC and firm performance. Moreover, a series of rigorous post-estimation diagnostic tests were systematically conducted to assess model adequacy, ensuring the statistical soundness, reliability, and overall validity of the estimated models.

3. RESULTS AND DISCUSSION

3.1. Pre-estimation tests

This section discusses descriptive statistics, correlation analysis, and unit root and cointegration tests to depict the nature of the data used in this study.

The data presented in Table 1 include various financial metrics and descriptive statistics. The mean value of T*obin's* Q is 5.3509, indicating a high average market valuation compared with the replacement value of assets. However, the median was much lower at 0.2972, suggesting significant skewness, as confirmed by the high skewness value of 36.6526. The data had extreme outliers, with a maximum of 4301.837 and a minimum of –164.3701, leading to a high standard deviation of 111.7728. The mean *VAIC* is 29.0726, with a median of 15.1641, indicating generally high efficiency in value creation through intellectual capital. A skewness of 6.0481 and kurtosis of 54.9923 highlight the presence of outliers and a heavy-tailed distribution. The average *VACA* is 0.5799, indicating moderate efficiency in value-added capital employed. The median was slightly higher at 0.6036, and the extreme value ranged from –175.6910 to 358.7256, resulting in a high standard deviation of 11.12131. The structural capital value-added has a mean of 0.8802 and a median of 0.9051, indicating consistent structural capital efficiency. The distribution is negatively skewed, with a value of –3.0621 and has a high kurtosis of 17.3604.

Human Capital Efficiency shows a mean of 23.0046 and median of 10.5377, suggesting significant differences in human capital efficiency across firms. The distribution had extreme values, reflected in the high skewness (6.0214) and kurtosis (53.3564). Innovation Capital Efficiency has a mean of 91.7060, which is significantly higher than the median of 4.4080, indicating a high variability. This is further supported by the standard deviation of 2011.742 and extremely high maximum value of 76983.16. The distribution was heavily skewed (36.1323) and had a very high kurtosis (1371.521). The risk metric has a mean of 0.4145 and a median of 0.0528, with extreme values of up to 43.4948 and a skewness of 21.3977, suggesting that most firms have low risk, but some have extremely high risk. The kurtosis was also very high at 651.5793.

Table 1. Descriptive statistics

Variable	*TOBINS'Q*	*VAIC™*	*VACA*	*SCVA*	*VAHC*	*VAHC2*	*RISK*	*SIZE*	*LEVE*
Mean	5.3509	29.0726	0.5799	0.8802	23.0046	91.7060	0.4145	3.3370	2.4750
Median	0.2972	5.1641	0.6036	0.9051	10.5377	4.4080	0.0528	3.2137	0.7276
Maximum	4301.8370	692.9569	358.7256	0.9990	642.3054	76983.16	43.4948	5.6253	276.9620
Minimum	–164.3701	–16.3023	–175.6910	0.0000	0.0000	–2750.893	0.0000	0.0000	0.0000
Std. Dev.	111.7728	49.92850	11.12131	0.1171	42.9382	2011.742	1.3596	1.1276	14.9363
Skewness	36.6526	6.0481	17.9164	–3.0621	6.0214	36.1323	21.3977	0.2441	10.5046
Kurtosis	1402.395	54.9923	737.7652	17.3604	53.3564	1371.521	651.5793	2.0810	134.9030
Jarque-Bera	1.28E+08	1.85 E+05	3.51 E+07	15842.55	174252.2	1.22E+08	2.74 E+05	70.3895	1.15 E+05
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

http://dx.doi.org/10.21511/ins.16(2).2025.10

Table 2. Correlation matrix

Variable	*VAIC™*	*VACA*	*SCVA*	*VAHC*	*VAHC2*	*RISK*	*SIZE*	*LEVE*
VAIC™	1.0000	0.2423	0.2588	0.8388	0.1482	0.0253	0.0550	0.1566
VACA	0.2423	1.0000	–0.0076	0.0219	–0.1041	–0.0389	–0.0330	–0.1686
SCVA	0.2588	–0.0076	1.0000	0.3497	0.0366	–0.0422	0.1387	0.0697
VAHC	0.8388	0.0219	0.3497	1.0000	0.1967	0.0604	0.0321	0.2381
VAHC2	0.1482	–0.1041	0.0366	0.1967	1.0000	0.0719	0.0320	0.2394
RISK	0.0253	–0.0389	–0.0422	0.0604	0.0719	1.0000	–0.2337	0.6072
SIZE	0.0550	–0.0330	0.1387	0.0321	0.0320	–0.2337	1.0000	0.0812
LEVE	0.1566	–0.1686	0.0697	0.2381	0.2394	0.6072	0.0812	1.0000

Firm Size shows a mean of 3.3370 and a median of 3.2137, indicating moderate consistency in firm sizes. The skewness was relatively low at 0.2441, and the kurtosis was also low at 2.0810, suggesting a fairly normal distribution. Leverage has a mean of 2.4750 and a median of 0.7276, indicating that some firms are highly leveraged, whereas most firms have low leverage. The high standard deviation of 14.9363 and skewness of 10.5046 indicate significant outliers and a heavy-tailed distribution.

In Table 2, the correlation coefficient results show the degree of relationship among the explanatory variables under consideration in this study, including *TOBINS'Q, VAIC, VACA, SCVA, VAHC, VAHC2, RISK, SIZE*, and *LEVE*. *VAIC™* has a strong positive correlation with VAHC (0.8388), indicating that firms with higher intellectual capital efficiency tend to have higher human capital efficiency. This strong correlation suggests that investments in human capital contribute significantly to overall intellectual capital efficiency. *VAIC* also showed moderate positive correlations with *SCVA* (0.2588) and *VACA* (0.2423), although they were much weaker than those of *VAHC*. The correlation with *VAHC2* is lower (0.1482), suggesting that innovation capital plays a role in intellectual capital efficiency, but to a lesser extent. Correlations with other variables, such as *RISK* (0.0253), *SIZE* (0.0550), and *LEVE* (0.1566), were weak, indicating that these factors had little direct impact on *VAIC*.

VACA showed a very weak correlation with the other variables. Its highest positive correlation was with *VAIC* (0.2423), and its correlation with *VAHC* (0.0219) was almost negligible. The negative correlations with V*AHC*2 (–0.1041) and *LEVE* (–0.1686) suggest that as capital employment efficiency increases, innovation capital efficiency and leverage tend to decrease slightly. *SCVA* has a positive correlation with VAIC (0.2588) and V*AHC* (0.3497), indicating that structural capital efficiency somewhat aligns with both intellectual and human capital efficiency. The correlations with the other variables are weak, with the highest being with *SIZE* (0.1387), suggesting that larger firms might have slightly better structural capital efficiency.

VAHC is strongly correlated with *VAIC* (0.8388), reinforcing the importance of human capital to overall intellectual capital efficiency. It also showed a moderate correlation with SCVA (0.3497) and a weaker, though still positive, correlation with V*AHC*2 (0.1967). Correlations with *LEVE* (0.2381) indicate that firms with higher human capital efficiency may have higher leverage. *VAHC*2 shows a weak positive correlation with *VAHC* (0.1967) and *LEVE* (0.2394), suggesting some alignment between innovation, human capital efficiency, and leverage. Its correlations with the other variables are weak, indicating that innovation capital efficiency is relatively independent of these factors.

RISK has a strong positive correlation with *LEVE* (0.6072), which suggests that higher leverage is associated with higher risk. Its negative correlation with *SIZE* (–0.2337) indicates that larger firms tend to have lower risk. Correlations with other variables are weak, implying that risk is not strongly influenced by intellectual, human capital efficiency, or structural capital efficiency. *SIZE* shows weak correlations with most variables, with the highest being *SCVA* (0.1387), suggesting a slight tendency for larger firms to have better structural capital efficiency. The negative correlation with *RISK* (–0.2337) indicates that larger firms generally face lower risk. *LEVE* is strongly and positively correlated with *RISK* (0.6072), in-

Table 3. Stationarity or unit root test

Variable	Levin, Lin & Chu t*		Im, Pesaran & Shin W-Stat		ADF – Fisher Chi-Square		PP – Fisher Chi-Square	
	Statistic	*p*-value	Statistic	*p*-value	Statistic	*p*-value	Statistic	*p*-value
TOBINS'Q I(0)	–48.1350	0.0000	–7.59685	0.0000	349.327	0.0000	359.8110	0.0000
VAIC™ I(0)	–11.5864	0.0000	–5.98351	0.0000	434.368	0.0000	464.4910	0.0000
VACA I(0)	4.4558	1.0000	–2.45218	0.0071	290.485	0.0143	436.0420	0.0000
SCVA I(1)	–7.0158	0.0000	–8.97385	0.0000	478.387	0.0000	1029.260	0.0000
VAHC I(0)	–28.6427	0.0000	–7.52843	0.0000	438.419	0.0000	427.6210	0.0000
*VAHC*2 I(0)	–164.145	0.0000	–18.0476	0.0000	361.562	0.0000	532.1540	0.0000
RISK I(1)	9.9070	1.0000	–5.84310	0.0000	422.136	0.0000	949.4620	0.0000
SIZE I(0)	–5.4338	0.0000	–1.21611	0.1120	305.993	0.0025	293.9550	0.0099
LEVE I(1)	52.0722	1.0000	813.942	0.0000	475.621	0.0000	813.942	0.0000

dicating a significant relationship between higher leverage and higher risk. It also shows moderate correlations with *VAHC* (0.2381) and *VAHC*2 (0.2394), suggesting that firms with higher leverage may invest more in human and innovative capital efficiency.

Thus, the low or weak correlation between the variables under study revealed the absence of multicollinearity problems in establishing a linear and dynamic linear relationship among the variables, and as such, established the independence of the explanatory variables under investigation. It must be noted that the dataset for this study was made of variables consisting of cross section and time series, and as such, the need to examine the stationarity among the variables. Hence, Table 3 presents the stationary results.

In Table 3, the results of the stationarity or unit root test are presented to examine the short-run relationship among the variables under consideration in this study. The test was carried out using Levin, Lin, and Chu t* to test for the group unit root or stationarity, Im, Pesaran, and Shin W-Stat, ADF-Fisher Chi-Square, and PP-Fisher Chi-Square to test for the individual variables' stationarity or unit root. From the results presented in Table 3, it was discovered in absolute terms that *TOBINSQ, VAIC™, SCVA, VAHC*, and *VAHC*2 across all the groups of 120 cross-sections. All four tests (*LLC, IPS, ADF, PP*) indicate that *TOBINS'Q* is stationary at level (I(0)), with *p*-values of 0.0000 across all tests, strongly rejecting the null hypothesis of a unit root. Similarly, *VAIC* is found to be stationary at level (I(0)) as all tests show *p*-values of 0.0000, indicating strong evidence against the presence of a unit root.

The results for the *VACA* are mixed. The LLC test shows non-stationarity (*p*-value of 1.0000), whereas the IPS, ADF, and PP tests indicate stationarity with *p*-values of 0.0071, 0.0143, and 0.0000, respectively. Given these mixed results, further investigation or additional tests are needed to confirm its stationarity. All tests indicate that *SCVA* is stationary after first differencing (I(1)), with *p*-values of 0.0000, suggesting that SCVA has a unit root and becomes stationary only after differencing. *VAHC* is stationary at level (I(0)), as all tests return *p*-values of 0.0000, confirming that it does not have a unit root. *VAHC*2 is also stationary at level (I(0)) with all tests showing *p*-values of 0.0000, indicating strong evidence of stationarity. The results indicate that RISK is stationary after first differencing (I(1)). The LLC test shows non-stationarity (*p*-value of 1.0000), but the other tests (IPS, ADF, and PP) indicate stationarity with *p*-values of 0.0000, suggesting that it becomes stationary after differencing. The stationarity results for *SIZE* were somewhat mixed. The LLC and PP tests show stationarity (p = 0.0000 and 0.0099, respectively), while the IPS test shows non-stationarity (*p*-value of 0.1120), and the ADF test indicates stationarity (p = 0.0025). Despite some variation, the majority suggest that the *SIZE* is likely stationary at level (I(0)). *LEVE* was found to be stationary after first differencing (I(1)). The LLC test shows non-stationarity (*p*-value of 1.0000), but the IPS, ADF, and PP tests indicate stationarity with *p*-values of 0.0000, suggesting that the *LEVE* becomes stationary after differencing. Evidently, it can be emphasized that all the intellectual variables under consideration were stationary and, as such, established the short-run equilibrium relationship among the variables.

http://dx.doi.org/10.21511/ins.16(2).2025.10

3.2. Panel least square analysis (Using TOBINS'Q)

Table 4 presents the results of the pooled, fixed, and random effect panel least squares methods used to assess financial performance, measured by *TOBIN'S Q*, in relation to *VACA, SCVA, VAHC, VAHC*2*, RISK, SIZE*, and *LEVE*. The analysis indicated a linear relationship between TOBIN'S Q and these variables. Specifically, the results in Table 4 for the pooled panel least squares model show that *VAHC*2*, RISK*, and *SIZE* have a positive relationship with Tobin's Q of the selected firms, while *VACA, SCVA, VAHC*, and *LEVE* have a negative relationship with *TOBIN's Q*. The positive contributions of *VAHC*2, *RISK*, and *SIZE* to *Tobin's Q* were 0.0557%, 1.3277%, and 0.9780%, respectively, suggesting that these factors enhance firms' financial performance. Conversely, the negative impacts of *VACA, SCVA, VAHC*, and *LEVE* on *TOBIN's Q* were observed to reduce financial performance by 0.2545%, 5.4680%, 0.0335%, and 0.2691%, respectively. These findings imply that innovation capital efficiency, risk management, and firm size are crucial for improving financial performance, whereas capital efficiency, structural capital, human capital efficiency, and leverage may detract from it. These results are supported by several studies. Xu and Wang (2018) highlights the importance of innovation capital in enhancing firm value. Ahmad (2023) emphasized the role of efficient risk management in financial performance. Vo (2018) discuss the impact of capital management on firm value, while Eldaia (2025) note the significance of human capital in the firm value of insurance organizations.

The fixed effect panel least square model showed that *VAHC*2, *RISK*, and *SIZE* were positively related to *TOBINS'Q* and thus enhanced the performance of the selected firms by 0.0559%, 1.2054%, and 0.4064%, respectively, thus enhancing the performance of the selected firms, while the impacts of *VACA, SCVA, VAHC*, and *LEVE* on *TOBINS'Q* were negative, thus reducing the financial performance of the selected firms by 0.2598%, 0.5405%, 0.0282%, and 0.1480%, respectively. The fitted random effect model showed that *VAHC2, RISK*, and *SIZE* contributed positively to TOBINS'Q and thus enhanced the performance of the firms selected by 0.0558%, 1.3676%, and 0.6377%, respectively, while *VACA, SCVA, VAHC*, and *LEVE* were negative in relation to *TOBINS'Q* and, as such, limited the financial performance of the selected firms to 0.2593%, 1.4509%, 0.0310%, and 0.2347%, respectively. Thus, there is a need for the firms under consideration to enhance their intellectual capital, as measured by *VACA, SCVA, VAHC*, and *LEVE* for better performance. The probability values with ($p < 0.05$) indicated that the estimated parameters were statistically significant in assessing the *TOBINSQ* of the selected firms under consideration in this study. In addition, the probability of the F-statistics ($p < 0.05$) showed the statistical significance of the fitted panel least-squares models and their validity, reliability, and

Table 4. Panel least square method (*TOBINS'Q, VACA, SCVA, VAHC, VAHC*2*, RISK, SIZE, LEVE*)

Source: Researcher's Computation (2024).

Variable	Pooled Effect Panel Model		Fixed Effect Panel Model		Random Effect Panel Model	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
C	2.8256	0.1523	0.0024	0.9991	0.2546	0.9053
VACA	–0.2545	0.0000	–0.2598	0.0000	–0.2593	0.0000
SCVA	–5.4680	0.0126	–0.5405	0.8113	–1.4509	0.5040
VAHC	–0.0335	0.0000	–0.0282	0.0000	–0.0310	0.0000
VAHC2	0.0557	0.0000	0.0559	0.0000	0.0558	0.0000
RISK	1.3277	0.0000	1.2054	0.0000	1.3676	0.0000
SIZE	0.9780	0.0000	0.4064	0.2788	0.6377	0.0390
LEVE	–0.2691	0.0000	–0.1480	0.0012	–0.2347	0.0000
–					S.D.	Rho
Cross-section random	–				5.0469	0.2953
Idiosyncratic random	–				7.7966	0.7047
R-squared	0.9929	–	0.9955	–	0.9943	–
Adjusted R-squared	0.9929	–	0.9951	–	0.9943	–
F-statistic	31409.13	0.0000	2531.517	0.0000	39266.62	0.0000

appropriateness for assessing the contributions of *VACA*, *SCVA*, *VAHC*, *VAHC*2, *RISK*, *SIZE*, and *LEVE* to the *TOBINS'Q* of the firms under consideration. The Idiosyncratic random error term with a rho value of 0.7047 revealed a strong correlation between the individually selected firms and the cross-sectional error term of 0.2953.

3.3. Post estimation test

Table 5 shows the results of the Hausman test for the cross-sectional random effect. The chi-square value 21.8092 > 14.0670 and the probability value of 0.0027 < 0.05 revealed the study does not reject the fitted random effect model in assessing the existing relationship among the financial variables such as *TOBINS' Q*, *VACA*, *SCVA*, *VAHC*, *VAHC*2, *RISK*, *SIZE*, and *LEVE* under investigation. Thus, there was a preference for the fitted random-effect model. This made the random effects model appropriate for examining the impact of intellectual capital and other identified financial variables on the performance of the firms under consideration. This also implies that the random effects model is efficient, consistent, and sufficient, and hence leads to the residual cross-sectional dependence test presented in Table 6.

The results presented in Table 6 show the residual cross-section dependence test, which was performed using the Breusch-Pagan LM and Pesaran scale LM tests. Thus, Breusch-Pagan LM and Pesaran scale LM value of 15,494.87 ($p < 0.05$) and 68.9116 ($p < 0.05$) for the pooled effect model, Breusch-Pagan LM, and Pesaran scale LM value of 15,041.30 ($p < 0.05$) and 65.1160 ($p < 0.05$) for the fixed effect model and Breusch-Pagan LM, and Pesaran scale LM value of 15,090.07 ($p < 0.05$) and 65.5241 ($p < 0.05$) for the random effect model respectively showed the rejection of no cross-section dependence. Hence, this implies that there was a cross-sectional dependence among the financial variables such as *TOBINS'Q*, *VACA*, *SCVA*, *VAHC*, *VAHC*2, *RISK*, *SIZE*, and *LEVE* as the measured financial performance and intellectual capital of the various firms currently investigated.

Table 7 shows the predictive power of the fitted panel least square models, including the pooled, fixed, and random effect models, for investigating

Table 5. Correlated random effects – Hausman test

Source: Researchers' Computation, 2024.

Test cross-section random effects			Prob.
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	
Cross-section random	21.8092	7	0.0027

Cross-section random effects test comparisons				
Variable	Fixed	Random	Var(Diff.)	Prob.
VACA	–0.2598	–0.2593	0.0000	0.4574
SCVA	–0.5405	–1.4509	0.4097	0.1549
VAHC	–0.0282	–0.0310	0.0000	0.0669
VAHC2	0.0559	0.0558	0.0000	0.0013
RISK	1.2054	1.3676	0.0056	0.0311
SIZE	0.4064	0.6377	0.0454	0.2779
LEVE	–0.1480	–0.2347	0.0011	0.0095

Table 6. Residual cross-section dependence test for the fitted panel models

Null hypothesis: No cross-section dependence (correlation) in weighted residual
Periods included: 13
Cross-sections included: 120
Total panel (balanced) observations: 1560

Test	Pooled Effect Model		Fixed effect Model		Random effect Model	
	Statistic	Prob	Statistic	Prob	Statistic	Prob
Breusch-Pagan LM	15,494.87	0.0000	15,041.30	0.0000	15,090.07	0.0000
Pesaran scaled LM	68.9116	0.0000	65.1160	0.0000	65.5241	0.0000
Pesaran CD	1.0845	0.2781	–0.8843	0.3765	–0.1753	0.8608

Note: No cross-section dependence (correlation) in residuals.

http://dx.doi.org/10.21511/ins.16(2).2025.10

Table 7. Predictive power of the fitted models

Metric	Pooled Effect Model	Fixed effect Model	Random effect Model
RMSE	9.3548	7.4725	7.5371
MAE	2.7066	2.0535	2.0615
MAPE	302,675.1	172,352.6	178,205.7
TIC	0.0418	0.0334	0.0337
Bias P	0.0000	0.0000	0.0000
VarP	0.0017	0.0011	0.0015
Covar P	0.9982	0.9988	0.9984

the effect of intellectual capital on financial performance. The predictive power was determined by the root mean square error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE), Theil inequality coefficient (TIC), and variance proportion (VarP). Thus, Table 7 reveals that the RMSE of the fixed effect panel model with a value of 7.4725 was the smallest when compared with the pooled and random effect panel models with values of 9.3548 and 7.5371, respectively. The MAE of the fitted panel model at least squares revealed that the fixed effect model had the smallest value of 2.0535 in comparison with the pooled and random effect models with values of 2.7066 and 2.0615, respectively. In addition, the MAPE of the fitted panel least square models for examining the infrastructural expenditure on financial performance measured by return on asset revealed that the fixed effect model (172,352.6 was the smallest when compared with the pooled and random effect models (302,675.1 and 178,205.7, respectively). The results of TIC and VarP also indicated that the fixed effects model had the smallest value in comparison with the pooled and random effects models. Therefore, it can be stressed that fitted fixed effect panel model is optimal and efficient panel least square model to estimate and examine the contribution of intellectual capital on the return on asset the measured of financial performance of the firms under consideration.

3.4. Dynamic panel generalized method of moments (GMM) (Using TOBINS' Q)

Table 8 presents the results of the dynamic panel generalized method of moments (GMM) used to investigate firm performance through *TOBIN's Q* and its re-

Table 8. Dynamic panel GMM (*TOBINS' Q, VACA, SCVA, VAHC, VAHC*2, *RISK, SIZE, LEVE*)

Variable	First Differences Panel GMM Model	
	Coef.	Prob.
C	–	–
TOBINS' Q (–1)	–0.0026	0.0000
VACA	–0.2628	0.0000
SCVA	0.7426	0.0000
VAHC	–0.0327	0.0000
VAHC2	0.0559	0.0000
RISK	–0.1517	0.0000
SIZE	–0.5050	0.0000
LEVE	–0.2485	0.0000
R-squared	–	–
Adjusted R-squared	–	–
F-statistic	–	–
Instrument Rank	123	–
J-statistic	325.9713	0.0000

Arellano-Bond Serial Correlation Test				
Test order	m-Statistic	Rho	SE (rho)	Prob.
AR (1)	NA	–6814.3346	NA	NA
AR (2)	–1.1394	–18342.4961	16097.8437	0.2545

lationship with *TOBIN's Q* (–1), *VACA, SCVA, VAHC, VAHC*2, *RISK, SIZE*, and *LEVE*. The dynamic first-difference panel GMM was selected for this study because the estimated coefficient for *TOBIN'S Q* (–1) was –0.0026%, which is greater than the –0.0027% obtained from the dynamic fixed–effect panel model. This indicates that the dynamic difference GMM is more appropriate than the dynamic system GMM. The fitted dynamic difference panel GMM results show that *SCVA* and *VAHC*2 are positively related to *TOBIN's Q*, enhancing the financial performance of the selected firms by 0.7426% and 0.0559%, respectively. Conversely, *TOBIN'S* Q (–1), *VACA, VAHC, RISK, SIZE*, and *LEVE* have negative relationships with TOBIN'S Q, reducing financial performance by 0.0026, 0.2628, 0.0327, 0.1517, 0.5050, and 0.2485%, respectively.

These findings align with and diverge from the conclusions of other scholars. Xu and Wang (2018) and de Matos Pedro et al. (2020) supported the positive impact of structural capital and innovation capital efficiency on firm performance, emphasizing the importance of these factors in value creation. However, the negative relationship between *VACA* and financial performance contrasts with Vo (2018), who argued that the effective utilization of capital employed should enhance firm value. Similarly, Anwar and Siddiqui (2020) find that human capital is crucial for firm success, which is inconsistent with the negative impact observed in this study. Ahmad et al. (2023) and Ayub et al. (2017) highlight the significance of risk management and firm size, respectively, in improving financial outcomes. The findings of this study are on the negative impact of RISK and SIZE align with Larmou and Vafeas (2010), who note that excessive risk and large size could lead to inefficiencies and reduced firm performance. Urban and Joubert (2017) discuss the adverse effects of high leverage on firm value, which is supported by the negative impact found in this study. Finally, Massa et al. (2017) highlight the potential negative effects of previous financial performance (*TOBIN'S Q* –1) on current performance, aligning with the negative coefficient observed.

The probability values with ($p < 0.05$) revealed that the estimated parameters were statistically significant in evaluating the *TOBINS Q* of the firms considered for this study. From the results presented in Table 8, it was revealed that the number of instruments (123) > the number of groups or cross sectional (120) used for the estimated parameters of the fitted dynamic difference panel GMM model, which may indicate the bias of the fitted model; however, the Sargan/Hansen test was carried out using the J-Statistic value (325.9713) with *p*-value < 0.05, which showed that the overidentifying restriction was rejected and, as such, implied that the result obtained evidently showed the validity of the instrument. Hence, the appropriateness and reliability of the dynamic difference panel GMM in examining the relationship between financial performance (*TOBINS' Q*) and intellectual capital of the firms selected for this study. The Arellano-Bond test using the AR (2) statistic value (–7.9890) with *p*-value > 0.05, revealed a serial correlation when using the dynamic difference panel GMM model for the estimated result.

This study set out to examine the relationship between intellectual capital efficiency components and firm value in Sub-Saharan African insurance companies using a modified VAIC™ model and dynamic panel GMM estimation. The findings reveal a mixed pattern regarding the five hypotheses. The first hypothesis, which proposed that the *VAHC* positively influences firm value, is not supported. Results show a negative and significant impact of *VAHC* on *TOBIN'S Q*, suggesting that increases in human capital efficiency do not translate into improved firm value for the sampled firms. Conversely, the second hypothesis is supported, as *SCVA* exhibits a positive and significant relationship with firm value, indicating that organizational systems, structures, and processes play a central role in enhancing firm performance. The third hypothesis, which anticipated a positive effect of the *VACA*, is rejected because *VACA* shows a negative and significant association with firm value, implying that the sampled firms may be inefficient in utilizing their capital employed. The fourth hypothesis is supported: *VAHC*2 positively and significantly affects firm value, confirming that innovation activities are beneficial for the financial performance of insurance firms. Although the overall *VAIC*™ was not directly estimated, the results associated with its components offer partial support for the fifth hypothesis, indicating that intellectual capital contributes unevenly to firm value, with structural and innovation capital showing positive effects and human capital and capital employed showing negative effects.

http://dx.doi.org/10.21511/ins.16(2).2025.10

CONCLUSION

The main aim of this study was to examine the relationship between intellectual capital efficiency components and firm value in Sub-Saharan African insurance companies using a modified VAIC™ model and panel data analysis. This study contributes to the Resource-Based Theory (RBT) by demonstrating how intellectual capital components, particularly innovation capital, serve as strategic resources that can enhance firm performance. The findings align with the theoretical perspective that firms can gain a competitive advantage by effectively leveraging intangible assets. Additionally, this research extends the application of the VAIC™ model to the SSA insurance sector, providing empirical evidence of how intellectual capital efficiency influences firm value in emerging economies.

The findings of this study have several managerial and practical implications. Firms should prioritize investments in innovation capabilities, including fostering a culture of innovation, investing in R&D, and leveraging technological advancements to enhance product offerings and operational efficiencies. Developing and retaining talented employees, providing continuous training, and fostering a conducive work environment are essential for improving intellectual capital efficiency. Moreover, optimizing structural capital by improving organizational processes, knowledge management systems, and intellectual property management can contribute to higher firm valuation. Risk management strategies should also be a priority for firms, particularly those facing high financial leverage. Effective risk management can include diversifying funding sources, maintaining adequate liquidity, and implementing rigorous financial controls. Firms should also focus on optimizing their capital structure to reduce excessive leverage, which can negatively impact firm value.

In this study, the value-added Intellectual Coefficient model was employed to gauge Intellectual Capital efficiency among listed insurance companies in SSA. Future research could explore alternative models for measuring Intellectual Capital to compare and contrast the results, potentially revealing different insights. Additionally, replicating this study across other economic regions of the African continent could enrich our understanding by incorporating pertinent factors affecting insurance businesses such as climate change, economic volatility, and governmental regulations as control variables. This approach provides a broader perspective on how intellectual capital components influence firm value in different regional contexts, contributing to more robust and comprehensive findings in the fields of intellectual capital management and corporate performance.

AUTHOR CONTRIBUTIONS

Conceptualization: Thabiso Sthembiso Msomi.
Data curation: Thabiso Sthembiso Msomi.
Formal analysis: Thabiso Sthembiso Msomi.
Funding acquisition: Thabiso Sthembiso Msomi.
Investigation: Thabiso Sthembiso Msomi.
Methodology: Thabiso Sthembiso Msomi.
Project administration: Thabiso Sthembiso Msomi.
Resources: Thabiso Sthembiso Msomi.
Software: Thabiso Sthembiso Msomi.
Supervision: Odunayo Magret Olarewaju, Mabutho Sibanda.
Validation: Thabiso Sthembiso Msomi.
Visualization: Thabiso Sthembiso Msomi.
Writing – original draft: Thabiso Sthembiso Msomi.
Writing – review & editing: Odunayo Magret Olarewaju, Mabutho Sibanda.

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