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INTELLECTUAL CAPITAL AND FIRM PERFORMANCE: EVIDENCE FROM HIGH-SENSITIVITY INDUSTRIES IN VIETNAM

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ABSTRACT

Purpose – This paper explores the relationships among intellectual capital, its components, and firm performance in Vietnam's high-sensitivity sectors, considering the lack of component-based research in emerging countries.

Design/methodology/approach – The analysis employs an unbalanced panel based on 1,682 firm-year observations of 111 firms quoted on the stock exchanges of Ho Chi Minh City and Hanoi from four high-sensitivity sectors over 2000-2024. Intellectual capital is estimated by Value-Added Intellectual Coefficient (VAIC) and the efficiencies of its components – human, structural, and capital employed, while the proxy of firm performance is Return on Assets (ROA). A two-step system GMM estimation is used to tackle problems of performance persistence, firm-specific effects, and endogeneity.

Findings – There is a positive relation between aggregate intellectual capital and performance, which confirms the aggregate hypothesis. In the joint component framework, structural capital efficiency and capital employed efficiency are positively associated with performance and confirm their respective hypotheses. Human capital efficiency is found to be negative, which means that the positive hypothesized relationship is not confirmed. No second-order serial correlation was found, and instrumental variables were validated.

Originality/value – This paper offers component-based empirical findings for high-sensitivity industries in an understudied transition country. The dynamic approach distinguishes the impact of organizational systems, human capital, and capital usage on performance. Future research may include relational and innovation-based measurements.

Practical implications – Managers have to match the development of knowledge management systems and processes with workforce training and productive use of capital. Government authorities should complement skills enhancement with improving digital infrastructure and innovations.

Social implications – An effective transformation of knowledge and capital resources into performance may enhance productivity and competitiveness of knowledge-based industries in Vietnam.

1. Introduction

In the knowledge-based economy, competitiveness of organizations largely hinges on their intangible assets especially in sectors where innovation, skills, and capabilities are fundamental to value generation. Intellectual capital, commonly referred to as human capital, structural capital and capital employed efficiency, has been cited as a critical determinant of organizational performance. Despite the recognition of the value generation capability of intellectual capital (Delgado-Verde et al., 2016; Inkinen, 2015; Kweh et al., 2019), there has not been much empirical evidence of the same in emerging and transition economies. In Vietnam, for instance, firms have become increasingly dependent on intellectual capital assets following their transition towards innovation-led economic growth in sectors such as information technology, communication services, healthcare and consumer innovation sectors (Nguyen, 2023; Nguyen et al., 2022; Tung & Binh, 2022).

Though there is ample literature regarding intellectual capital, little empirical evidence has been generated in relation to the differing impact of intellectual capital elements on performance in knowledge-based sectors. Such firms are highly sensitive to intellectual capital owing to the fact that their competitive advantage greatly hinges on knowledge, innovation capability, brand value, skilled labour force and organizational systems and not tangible resources. This study seeks to investigate the effects of intellectual capital and its elements on performance in selected high-sensitivity industries through dynamic panel estimation.

Firm performance is referred to as the ability of the firm to generate profits as well as the efficient utilization of its resources. The return on assets will be used as the main performance measure since it shows managerial effectiveness as well as resource efficiency. The intellectual capital will be measured through Value Added Intellectual Coefficient framework consisting of human capital efficiency, structural capital efficiency and capital employed efficiency. This study contributes to the literature through the disaggregation of effects through the use of firm-level panel data. Unlike studies that have made use of static models, this study makes use of two-step System Generalized Method of Moments estimator to control for the problem of endogeneity, unobservable firm heterogeneity, dynamic performance persistence and reverse causality.

The high-sensitivity industries have been defined to mean industries where the competitive advantage of the organization greatly relies on intellectual capital assets. Consistent with existing literature on intellectual capital and knowledge-based sectors (Kianto et al., 2013; Petty & Guthrie, 2000; Wang & Chang, 2005), this study will focus on communication services, information technology, healthcare and consumer discretionary firms. They are characterized by rapid technological change, skilled labour force, research and development intensity and organizational system. Financial institutions are however excluded owing to regulatory capital requirement as well as their unique organizational systems which might distort intellectual capital measurement.

The study uses panel data from firms listed on the Ho Chi Minh Stock Exchange and Hanoi Stock Exchange between 2000 and 2024. The remainder of the paper presents the theoretical foundation and hypotheses, methodology and data, empirical findings, discussion and implications, and conclusions and future research directions.

2. Literature review

2.1. Background theories

The link between intellectual capital and firm performance, especially when we consider industries with high reliance on intangible resources, can be explained with the help of Resource-Based View, Knowledge-Based View, and Dynamic Capabilities Theory. According to Resource-Based View, the firms

obtain sustained competitive advantage as long as they possess valuable, rare, inimitable, and non-substitutable resources. Intellectual capital meets these requirements because it represents the knowledge, skills, and abilities of the employees, processes of the organization, technologies, and business relationships that cannot be easily copied by competitors. The findings of Barney (1991) and Wernerfelt (1984) suggest that the intangible resources provide more persistent competitive advantage than the physical and financial assets in knowledge-based industries.

Intellectual capital refers to the knowledge, skills, experience, processes, and business relationships that are required for value creation and competitiveness. In the current study, it will be measured with the help of Value-Added Intellectual Coefficient (VAIC) model developed by Pulic (2000). This model is based on the idea of viewing the intellectual capital as the process of value creation and measuring its effectiveness through assessment of the efficiency of conversion of tangible and intangible resources into performance results (Bontis et al., 2000). It is composed of human capital efficiency, structural capital efficiency, and capital employed efficiency – all of them are measures of the valuable resources discussed in the Resource-Based View.

The Knowledge-Based View theory states that knowledge is the most strategically important organizational resource. Organizations are viewed as knowledge repositories, whose performance depends on their ability to create, integrate, share, and utilize their expertise effectively. According to Grant (1996), the processes that ensure coordination and use of knowledge become key factors in good organizational performance. Thus, investments in employee training, research and development, knowledge management systems, and organizational learning can increase the amount of intellectual capital. The interrelation of the tacit and explicit knowledge allows organizations to support their continuous learning, innovations, and adaptation, as Nonaka (2009) suggests. Moreover, external business relationships with customers, suppliers, and other stakeholders can be beneficial for acquiring the knowledge and creating the value, as Freeman (2010) argues in the stakeholder theory. Investments in expertise and organizational capabilities can also be used to indicate the quality of the firm and its future prospects, according to Spence (1973).

Finally, the theory of Dynamic Capabilities explains how firms manage their intellectual resources in response to changes in competitive environment. According to Teece et al. (1997), the dynamic capabilities represent the ability to integrate, develop, and transform the external and internal competencies in response to changes in market. In the same way, Zahra and George (2002) highlight the importance of absorptive capacity – the ability to recognize, absorb, and apply the external knowledge. All these theories together suggest that the intellectual capital positively impacts performance through the efficient use, integration, and renewal of human, structural, and capital resources.

2.2. Empirical studies

Empirical literature has explored the effects of intellectual capital and its different dimensions such as human capital, structural capital, and capital employed on corporate performance with regard to knowledge-based businesses. Empirically, intellectual capital is found to improve profitability, productivity, innovation ability and growth of organizations across various institutions. Human capital, which is comprised of skills, knowledge, experience and innovativeness of employees, is one of the key dimensions. It has been shown that human capital is positively correlated with innovation and productivity in Indian pharmaceutical firms, Spanish technology businesses and high-technology businesses in China (Mangayarkarasi & Mugunthan, 2025; Martín-de-Castro et al., 2011; Wang et al., 2016). Similar results have been found in Vietnam, where capabilities of employees contribute

significantly to the growth and innovation of businesses (Kim & Tran, 2024; Nguyen, 2023).

Structural capital, which includes organizational routines, databases, patents, technological infrastructure and other organizational processes, contributes to the performance of organizations by helping them accumulate and use knowledge properly. For example, Kim and Lee (2018) found that investments in the research infrastructure, automation and organizational processes increased innovation and profitability of South Korean electronics firms. Cabello-Medina et al. (2011) demonstrated that organizational capacities help convert knowledge into innovation. In Vietnam, structural systems concerned with organizational compliance, innovation routines and data management were found to be more valuable together with strong human capital (Trieu et al., 2025).

A systems approach assumes that performance effects of intellectual capital components would be greater when they act as a system than individually. Researches using the value-added intellectual coefficient and its extensions corroborate the complementary relationship between intellectual capital components (Akkas & Asutay, 2022; Pulic, 2000). Findings from Taiwan, India and Vietnam show that intellectual capital efficiency predicts return on assets and return on equity, especially in rapidly evolving technology-related sectors (Kim & Tran, 2024; Mangayarkarasi & Mugunthan, 2025; Wang & Chang, 2005). Innovation capability and absorptive capacity can act as mediators of the relationship and facilitate the conversion of intellectual capital into performance (Elrehail et al., 2024; Limijaya et al., 2021; Trieu et al., 2025).

It is also crucial to take into account capital employed efficiency. Vo and Tran (2018) discovered that the effect of intellectual capital on the performance of Thai banks was mostly determined by capital employed efficiency, while investments in human capital could reduce short-term profitability but positively affect long-term performance. Intellectual capital improves financial performance of banks in developing countries (Vo & Tran, 2022). At the macroeconomic level, national intellectual capital has positive effects on economic growth through relationships with institutional quality and international trade (Vo et al., 2025). This gives us an impetus to study Vietnamese non-banking firms using dynamic panel approaches (Vo & Tran, 2025).

Finally, the effects of intellectual capital depend on the industry and institutional environment (Kianto et al., 2013; Petty & Guthrie, 2000). In particular, intellectual capital is especially important for information technology sector, healthcare industry, communication services industry and other innovation-related industries. With Vietnam's shift towards innovation-driven development, intellectual capital becomes increasingly important for listed firms of those industries (Nguyen et al., 2022; Tung & Binh, 2022).

2.3. Hypothesis development

The hypotheses are based on the Resource-Based View and Knowledge-Based View, which view intellectual capital as a strategic resource that helps improve firm performance. As per Pulic's (2000) Value Added Intellectual Coefficient (VAIC) approach, the intellectual capital consists of human capital efficiency, structural capital efficiency, and capital employed efficiency, while the composite index reflects the combined value added impact of these variables.

Human capital efficiency refers to the knowledge, skills, creativity, and problem-solving ability of the employees. The variable is especially important in sectors like information technology, healthcare, communications, etc. Previous studies have shown that the higher the human capital efficiency, the better is the likelihood of innovation and profitability (Mangayarkarasi & Mugunthan, 2025; Wang et al., 2016). It has also been found in Vietnam that the development of the workforce and knowledge management contributes to the

success of the firms (Kim & Tran, 2024; Nguyen, 2023). Thus:

Hypothesis H1: Human capital efficiency positively affects firm performance.

Structural capital efficiency is the ability of organizational processes, databases, intellectual property, culture, and systems to store and use knowledge. The process of automation, standardization of procedures, and protection of intellectual property may help increase the efficiency of operations and sustained performance (Kim & Lee, 2018). Additionally, the structural capital serves as the organizational base by means of which Vietnamese firms can convert the knowledge of the employees into innovation and compliance results (Nguyen et al., 2022). Thus:

Hypothesis H2: Structural capital efficiency positively affects firm performance.

Capital employed efficiency is the efficiency of the use of tangible and financial resources for creating value. According to Pulic (2000), the capital employed interacts with intellectual resources in generating economic value. Additionally, empirical research has found the link between efficient capital usage and profitability and asset turnover (Singhania & Panda, 2025), especially in the capital constrained setting like Vietnam (Nguyen et al., 2022). Thus:

Hypothesis H3: Capital employed efficiency positively affects firm performance.

Finally, the overall intellectual capital reflects the complementary impact of human capital, structural capital, and capital efficiency. Composite intellectual capital has been linked to the profitability, innovation, and market value in various settings (Delgado-Verde et al., 2016; Inkinen, 2015; Wang et al., 2016). Thus:

Hypothesis H4: Intellectual capital measured by Value Added Intellectual Coefficient positively affects firm performance.

3. Methodology

3.1. Data

The unbalanced panel dataset will be used in this study to analyze firms that are listed in the Ho Chi Minh City Stock Exchange and Hanoi Stock Exchange between 2000 and 2024. The sample will consist only of companies belonging to those industries that are highly dependent on intellectual capital, meaning that companies in which the success is mostly based on human capital, innovation capacity, organizational structure, and relations (Kianto et al., 2013; Petty & Guthrie, 2000). Therefore, the sample will include the firms in communication services, information technology, healthcare, and consumer discretionary industries. It is worth mentioning that financial institutions are not included since they have specific accounting practices that lower the comparability of Value-Added Intellectual Coefficient with the non-financial firms (Kianto et al., 2013; Petty & Guthrie, 2000; Singhania & Panda, 2025).

Data cleaning was done using several criteria. Those firm-year observations that did not provide information to calculate the elements of the intellectual capital or control variables were omitted. Additionally, those firm-years without sufficient consecutive-year data for the use of lagged variables were also removed. To avoid the problem of survivorship bias, the delisted firms were included in the analysis if there was enough information left. In total, after the cleaning process, there are 111 firms and 1,682 firm-years observations in the sample. The unbalanced nature of the data set is caused by patterns of firms' entry and exit as well as availability of data and is compatible with the System GMM model estimation.

This choice is justified by the fact that these industries are highly innovation-based and early adopters of digital transformation in Vietnam. Previous studies have shown that companies in these industries heavily rely on intellectual

assets and educated employees to generate value (Kim & Tran, 2024; Nguyen, 2023; Tung & Binh, 2022). Missing values were imputed with listwise deletion on firm-year level without any interpolation. The continuous variables were winsorized at 1st and 99th percentiles to reduce the influence of outliers but still keep data intact. The dispersion of the rest of the measures of human and structural capital efficiency corresponds with their denominator sensitivity.

3.2. Models

To accurately estimate the relationship between intellectual capital and firm performance, this study employs the Two-step System Generalized Method of Moments (SGMM) estimator. SGMM is particularly well-suited for dynamic panel data settings where the dependent variable is influenced by its past values, and where endogeneity, unobserved firm-specific effects, and measurement errors may bias standard estimators (Arellano & Bover, 1995; Blundell & Bond, 1998). Given that firm performance (measured by return on assets) is inherently persistent over time and that intellectual capital indicators may be endogenously determined, affected by firm performance or other latent variables, SGMM offers robust instrumentation by using internal instruments derived from lagged variables. This approach has been widely applied in intellectual capital research to account for dynamic effects and correct potential simultaneity biases (Chen et al., 2005; Trieu et al., 2025), making it methodologically appropriate for this study's objectives.

$$Performancev_{i,t} = \beta_0 + \beta_1 Performance_{i,t-1} + \beta_2 IC_{i,t} + \beta_3 Control_{i,t} + \varepsilon_{i,t}$$

in which:

i indexes firms, and t indexes years;

$Performancev_{i,t}$ is the performance of firm i at year t, measured by ROA;

$IC_{i,t}$ is the intellectual capital of firm i at year t, measured by VAIC and its components including HCE, SCE and CEE;

$Control_{i,t}$ are the control variables including size, leverage, liquidity and age;

$\varepsilon_{i,t}$ is error term;

$\beta_{0\to3}$ are the coefficients.

Appendix 1 *(see Appendix 1 online)* presents the definitions and measurement methods for all variables used in this study. The dependent variable, return on assets (ROA), is calculated as net income divided by total assets, capturing the firm's profitability relative to its asset base. The core explanatory variables are derived from the Value-Added Intellectual Coefficient (VAIC) framework, comprising human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE). VAIC is computed as the sum of these three components. HCE reflects the value created per unit of personnel expenses, while SCE measures the contribution of organizational infrastructure, and CEE indicates how effectively the firm utilizes its tangible capital. Control variables include firm size (logarithm of total assets), leverage (total debt to total assets), liquidity (current ratio), and firm age (years since establishment). A dummy variable for COVID-19 (covid) is included to account for the economic shock during the pandemic. In the context of Vietnam, the impact of COVID-19 was most significant in the years 2020 and 2021 due to prolonged lockdowns, supply chain disruptions, and constrained consumer demand; therefore, the covid variable is coded as 1 for these years and 0 otherwise.

Consistent with most intellectual capital studies, firm performance is proxied by ROA because it reflects the efficiency with which firms convert resources and knowledge into profitability. ROA captures internal value creation processes better than market-based measures in an emerging economy context where market efficiency and investor sentiment may distort Tobin's Q and ROE. Therefore, ROA is the most suitable and widely accepted accounting-based measure for intellectual capital research.

Reverse causality is a critical concern in the relationship between intellectual capital and firm performance because better performing firms can increase their investments in human, structural and capital resources, which in turn affect subsequent performance. To address this issue, we specify a dynamic model in which current performance depends on its own lagged value and treat intellectual capital variables as potentially endogenous. The two-step System Generalized Method of Moments estimator exploits internal instruments based on lagged levels and differences of the explanatory variables, which helps to mitigate simultaneity and reverse causality between performance and intellectual capital (Arellano and Bover, 1995; Blundell and Bond, 1998). The validity of this approach is assessed through the Arellano Bond tests for serial correlation and the Hansen test of over identifying restrictions. It should be noted that VAIC captures the efficiency of intellectual capital based on accounting data and does not fully measure all dimensions of intellectual capital, such as relational capital or qualitative knowledge assets. However, VAIC remains one of the most widely used proxies in empirical research because of its comparability across firms and data availability.

4. Results and discussions

4.1. Descriptive analysis

Appendix 2 *(see Appendix 2 online)* provides the descriptive statistics for all variables used in the analysis, based on 1,682 firm-year observations. The mean return on assets (ROA) is 7 percent, indicating moderate profitability across the sampled firms, with a relatively low standard deviation of 6 percent. The distribution of ROA is positively skewed (0.66), suggesting that while most firms earn modest returns, a few achieve significantly higher profitability. Regarding the components of intellectual capital, human capital efficiency (HCE) exhibits a high standard deviation (1.10) and a wide range from -9.71 to 11.63, indicating substantial variation in how effectively firms utilize their human resources. Notably, HCE is positively skewed (2.54) and displays extreme kurtosis (39.58), highlighting the presence of several firms with unusually high or low values. Structural capital efficiency (SCE), with a mean of 0.73, also displays a large spread and high kurtosis, but its distribution is negatively skewed, implying that most firms are concentrated at higher levels of structural capital efficiency, while a few exhibit negative or exceptionally low values.

Capital employed efficiency (CEE) and the composite VAIC measure show more stable distributions. CEE has a mean of 0.10 with a relatively narrow range and modest skewness (0.72), suggesting consistent efficiency in capital utilization among firms. VAIC, which aggregates the three components, has a mean of 1.1 and limited variation, indicating that overall intellectual capital performance is relatively stable across firms in the sample. Although VAIC is computed as the sum of HCE, SCE, and CEE, its dispersion is smaller because extreme values in HCE and SCE tend to offset each other in the aggregation. In addition, winsorization reduces the influence of extreme observations, resulting in a more stable distribution for the composite VAIC index

Among the control variables, firm size (log of total assets) is symmetrically distributed, while leverage shows moderate variation with a mean of 44 percent debt to total assets. Liquidity is more dispersed, with a maximum of 15.81 and strong positive skewness (2.83), indicating that while most firms maintain moderate liquidity, a few retain very high cash ratios. Firm age ranges from 1 to 43 years, with an average of approximately 16 years, reflecting a diverse mix of both mature and younger firms in the dataset.

4.2. Results

Table 1 provides the two-stage System GMM estimation of the effect of intellectual capital on the firm's performance measured by return on assets. In all models, the lagged ROA is found to

be positive and significant implying persistence in the firm's profitability. The overall Value-Added Intellectual Coefficient (VAIC) has a positive effect on the performance of the firm at 10% significance (coefficient = 0.0247; t = 1.80). Thus, the hypothesis about the contribution of intellectual capital to the value creation in the firm is partly confirmed.

However, the disaggregated effect reveals heterogeneity. The efficiency of human capital is found to be negative and significantly different from zero (coefficient = −0.0015; t = −3.37). The result contradicts the expected direction of the coefficient. The inefficiency of human capital utilization, high labor costs or delay in the training could be the explanation of the result. The explanation might be the measurement bias of the human capital efficiency variable which is an accounting measure and does not capture the quality of employees. Therefore, the negative sign of the coefficient implies efficiency rather than economic insignificance of human capital.

Table 1. Two-step System GMM results

Dependent var	**ROA**	**ROA**	**ROA**	**ROA**	**ROA**
L.ROA	0.3317***	0.3879***	0.3848***	0.3178***	0.3521***
	[2.75]	[3.25]	[4.19]	[2.89]	[3.12]
VAIC	.0247*				
	[1.80]				
HCE		-0.0015***			-0.0012**
		[3.37]			[2.19]
SCE			0.0123*		0.0105*
			[1.51]		[1.92]
CEE				0.0226*	0.0218**
				[1.85]	[2.34]
SIZE	-0.0192***	0.0059*	0.0131*	-0.0040	0.003
	[2.79]	[1.75]	[1.60]	[-0.45]	[-0.72]
LEV	-.1259**	-0.1333**	-0.1342**	-0.1323**	-0.129**
	[2.01]	[2.08]	[2.37]	[2.41]	[2.47]
LIQ	0.0026**	0.0021*	0.0082*	0.0034**	0.0029**
	[2.00]	[1.90]	[1.53]	[2.19]	[2.32]
AGE	-0.0002	-0.0009**	-0.0004**	-0.0026***	-0.0019**
	[-0.49]	[-2.32]	[2.22]	[2.89]	[2.48]
COVID	-0.0031	-0.0119	-0.0131	-0.0088	-0.009
	[-0.48]	[-1.60]	[-1.52]	[-1.11]	[-1.43]
cons	0.5852***	-0.0486***	-0.0336***	0.2462***	0.1342***
	[3.01]	[2.86]	[2.86]	[3.04]	[3.24]
Wald test	Wald chi2 p < 0.001	Wald chi2 p < 0.001	Wald chi2 p < 0.001	Wald chi2 p < 0.001	Wald chi2 p < 0.001
AR (1)	p = 0.002	p = 0.001	p = 0.001	p = 0.000	p = 0.000
	[z = -3.05]	[z = -3.18]	[z = -2.16]	[z = -3.14]	[z = -1.42]

Dependent var	ROA	ROA	ROA	ROA	ROA
AR (2)	p = 0.379 [z = -0.88]	p = 0.550 [z = -0.60]	p = 0.420 [z = -0.43]	p = 0.416 [z = -0.81]	p = 0.39 [z = -0.51]
Hansen test	p = 0.428 [chi2(93) = 94.83]	p = 0.417 [chi2(87) = 89.12]	p = 0.136 [chi2(84) = 82.03]	p = 0.448 [chi2(84) = 85.04]	p = 0.41 [chi2(84) = 84.01]
Observations	1682	1682	1682	1682	1682
No. Instruments	101	95	95	92	92
No. Groups	111	111	111	111	111

Note: ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively; t-statistics are in parenthesizes.

Table 1 reports the two-step System Generalized Method of Moments estimates of the effects of intellectual capital on firm performance, measured by return on assets. Across all specifications, lagged return on assets is positive and statistically significant, confirming persistence in firm profitability. The aggregate Value-Added Intellectual Coefficient is positively associated with performance at the 10% level (coefficient = 0.0247; t = 1.80), supporting the view that intellectual capital contributes to firm value creation.

However, the decomposed results reveal heterogeneous effects. Human capital efficiency is negative and highly significant (coefficient = −0.0015; t = −3.37), contrary to the proposed hypothesis. This result may indicate inefficient labor deployment, excessive personnel costs, or delayed returns from training and skill development. It may also reflect limitations of the accounting-based measure, which captures current labor expenses but not qualitative employee capabilities. Therefore, the negative coefficient should be interpreted as a short-term efficiency effect rather than evidence that human capital lacks economic value.

5. Conclusion & Recommendation

5.1. Conclusion

This study aimed to examine the impact of intellectual capital and its components: human capital efficiency, structural capital efficiency, and capital employed efficiency on firm performance, with a specific focus on industries that are highly sensitive to intangible assets. In line with the main research objective, the results provide robust empirical evidence that supports the proposed hypotheses regarding the significance of intellectual capital in shaping firm performance.

This study investigates the impact of intellectual capital and its components on firm performance in high sensitivity industries in Vietnam. The results confirm that intellectual capital is an important determinant of performance in knowledge intensive sectors and underline the central role of intangible assets in emerging markets. The research contributes to literature by employing a dynamic panel method to reveal the differentiated effects of human, structural and capital resources, thereby adding a component-based perspective to existing studies on intellectual capital. From a practical perspective, the study highlights the importance of developing knowledge management, organizational systems and capital efficiency as strategic priorities for firms operating in rapidly changing environments. These findings extend the understanding of intangible value creation and provide useful implications for managers, policymakers and investors in transition economies.

From a theoretical perspective, the results lend strong support to the Resource-Based

View and Knowledge-Based View of the firm, both of which emphasize intangible assets as key drivers of competitive advantage and firm success (Barney, 1991; Grant, 1996). The positive roles of structural and capital employed efficiency underscore the value of organizational routines and asset utilization, especially in industries where speed-to-market and adaptability are essential (Teece et al., 1997). The negative coefficient of human capital efficiency may reflect limitations identified by Dynamic Capabilities Theory, where intangible assets must be effectively mobilized and integrated within organizational processes to translate into performance gains (Zahra & George, 2002). Moreover, this divergence aligns with some empirical studies that have cautioned against assuming universal positive effects of human capital without accounting for organizational absorptive capacity and industry-specific challenges (Trieu et al., 2025; Wang et al., 2016).

These findings are partly consistent with previous studies. The positive roles of structural capital efficiency and capital employed efficiency are in line with Wang and Chang (2005) and Kweh et al. (2019), who also highlight the importance of organizational systems and capital utilization for profitability. However, the negative association between human capital efficiency and performance differs from several studies that find a positive direction (Nguyen, 2023; Kim & Tran, 2024). This divergence can be explained by the industry characteristics of Vietnam, where human capital investments may not be efficiently transformed into innovation or productivity gains without adequate organizational and financial resources.

From a contribution standpoint, this study advances the understanding of intellectual capital by applying a dynamic methodological framework to a previously under-researched emerging market context. It adds value by distinguishing the distinct impacts of each VAIC component, allowing scholars and practitioners to refine their focus on the most performance-enhancing aspects of intangible resources. Moreover, by concentrating on high-sensitivity industries and incorporating real-world disruptions such as the COVID-19 pandemic, this research highlights how intellectual capital operates under dynamic external conditions. It contributes to the theoretical and practical discourse on how firms in transition economies can optimize knowledge assets to sustain long-term competitive performance. Because the empirical analysis is based on observational panel data, the results should be interpreted as associations rather than causal effects, and the implications should be considered with appropriate caution.

5.2. Recommendations

Based on the empirical associations identified in this study, several implications can be suggested for managers, policymakers, and investors. Given the significant role of capital employed efficiency and structural capital efficiency in enhancing firm performance, the findings suggest that managers may benefit from prioritizing the efficient deployment of tangible and structural resources. Firms in high intellectual capital-sensitive industries, such as communication services, healthcare, information technology, and consumer discretionary, may improve performance by investing in digital infrastructure, knowledge management systems, and process automation. These tools can enhance internal coordination and innovation capacity, which, as the findings suggest, directly support performance outcomes. Managers must also regularly evaluate the efficiency of capital employed, ensuring that physical and financial resources are aligned with value-generating activities. The positive effect of capital employed efficiency found in this study reflects the importance of asset productivity, especially in capital-constrained environments like Vietnam, where optimal resource use is essential for maintaining profitability.

The surprising negative relationship between human capital efficiency and firm

performance underscores the importance of not only attracting talent but also managing and integrating it effectively. HR leaders should shift their focus from purely increasing personnel expenditures to enhancing the return on those investments. This may involve building stronger links between employee development programs and firm-level outcomes, such as innovation and productivity. Training initiatives should be designed to improve both individual capabilities and collective organizational learning. Additionally, firms should evaluate their compensation structures to ensure that salary growth is performance-based and not disconnected from value creation. This result highlights that excessive or inefficient investment in human resources without adequate utilization may reduce firm profitability.

The results suggest that policymakers may consider supporting initiatives that enable knowledge-intensive firms to thrive in Vietnam's emerging economy. This includes offering tax incentives for R&D investment, facilitating intellectual property protection, and supporting digital transformation initiatives, especially for small and medium-sized enterprises (SMEs). The results of this study suggest that firms gain more from structural and capital efficiency than from raw human capital input alone. Therefore, public policy should not only promote education and training but also encourage firms to institutionalize that knowledge through robust organizational systems. Furthermore, policies aimed at improving access to capital markets for innovation-intensive firms can support better capital employed efficiency, contributing to long-term industrial competitiveness.

The findings indicate that investors may consider focusing on traditional financial metrics. The results indicate that structural and capital efficiency are better indicators of firm value than human capital intensity alone. Analysts should focus on firms that demonstrate consistent returns on invested capital and evidence of knowledge infrastructure, such as innovation capacity, digitization, and customer management systems. In the context of Vietnamese markets, where investor information asymmetry remains a concern, examining intellectual capital disclosures and VAIC components can enhance the quality of investment decision-making.

Industry groups and business associations have an important role in facilitating knowledge sharing and benchmarking best practices in intellectual capital management. Given the inter-firm performance differences observed in the study, especially across VAIC components, associations should promote collaborative learning environments where firms can share strategies for improving capital utilization and structuring knowledge systems. These platforms can also provide training and support for firms struggling to translate human capital investments into measurable outcomes, thereby improving sector-wide performance.

5.3. Limitations & further research

The study faces several limitations. The first one is that the sample includes only publicly traded firms in the Ho Chi Minh City Stock Exchange and the Hanoi Stock Exchange. The Value-Added Intellectual Coefficient (VAIC) approach used in the study is widespread in many studies, but it measures efficiency-based intellectual capital without taking into account qualitative components such as the quality of innovation, employee involvement, relational trust, and knowledge sharing. Additionally, its measure of human capital efficiency may be underestimated as it fails to capture the value of developing employees in the long run, which might explain the observed negative correlation. Finally, performance in the study is estimated by the return on assets index. Although it provides an indicator of efficiency which remains relatively stable over time, it does not capture all market-based measures of performance.

It will be worth investigating furthermore comprehensive measures of intellectual

capital, including intellectual property, employee turnover, innovations generated, and knowledge-sharing within organizations. Future studies can also consider performance indicators such as return on equity or Tobin's Q. It would be interesting to use different methods such as mixed-methods approach, cross-country comparison, the instrumental variables approach, or natural experiment to draw stronger conclusions. The effect of digital transformation and environmentally, socially, and governance-related intellectual assets should also be studied.

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Data Availability

Data available upon reasonable request (contact corresponding author).

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