Uncovering the Triadic Relationship: IC, Profitability, and Sustainability Reporting in Food, Beverage, and Agriculture Companies in Southeast Asia

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Abstract

This study investigates the relationship between intellectual capital (IC), profitability, and sustainability reporting in companies within the agriculture and food and beverage (F&B) sectors across three major ASEAN countries: Indonesia, Thailand, and the Philippines. In light of the COVID-19 pandemic, the urgency for businesses to leverage intangible assets has intensified, as these assets are pivotal for maintaining resilience and achieving sustainable competitive advantages. By analyzing the components of intellectual capital—human capital efficiency (HCE), structural capital efficiency (SCE), relational capital efficiency (RCE), and capital employed efficiency (CEE)—this research aims to elucidate their impact on corporate profitability and the role of sustainability reporting in enhancing financial performance. The findings are expected to contribute to a more comprehensive framework for managing and communicating corporate value, thereby facilitating better decision-making for companies and investors. This study also highlights the similarities in economic development and accounting frameworks among the selected countries, which allows for relevant comparisons and enhances the generalizability of the results to other ASEAN nations with comparable characteristics. Ultimately, this research underscores the critical importance of intellectual capital in navigating economic uncertainties and fostering long-term business success.

Keywords: COVID-19 pandemic; sustainability disclosure; modified value-added intellectual capital; profitability; panel data regression.

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A. INTRODUCTION

The COVID-19 pandemic profoundly disrupted the global business landscape, with pronounced effects in the ASEAN region (ASEAN, 2022; KPMG, 2020). This crisis prompted firms to reconfigure strategies amid escalating market volatility. A key outcome was the heightened valuation of intangible assets, particularly intellectual capital (Hasan et al., 2021; Uddin et al., 2022). Comprising knowledge, employee skills, and relational networks, intellectual capital has emerged as a cornerstone of sustained competitive advantage (Altarawneh & Box, 2017). Pre-pandemic valuations predominantly emphasized tangible assets like property and equipment, yet the crisis exposed their fragility. Intangibles, though harder to measure, exhibited superior resilience during disruptions (WIPO, 2024), enabling firms with robust intellectual capital to adapt more effectively (Gareis & Mayer, 2023).

Exacerbated by technological acceleration, evolving consumer preferences, and environmental imperatives, global complexity has amplified the strategic primacy of intellectual capital in building resilience and competitive edge. While the pandemic accelerated adaptive imperatives, the value of intellectual capital and sustainability practices in value creation was already acknowledged pre-crisis.

Sustainability reporting has evolved as a vital channel for conveying value creation and ethical governance (Pertiwi & Budiarti, 2023). By disclosing investments in human capital, innovation, and stakeholder ties, firms bolster investor confidence, appeal to eco-conscious consumers, and mitigate socio-environmental risks (Amran et al., 2024). ASEAN's heterogeneous yet rapidly expanding economies offer a compelling context. The pandemic further propelled digitalization in Southeast Asia, spurring technology adoption and shifts in consumer behavior (WEF, 2024), which heightened needs for digital talent and innovation.

Traditional sectors like agriculture and food & beverage (F&B) confront transformation driven by sustainability mandates, technological progress, and demand for ethical products. Challenges include climate impacts, supply chain vulnerabilities, and global goals like "Zero Hunger" (FAO, 2024; HBR, 2023). Robust intellectual capital management and transparent sustainability disclosures are indispensable for addressing these, underscoring the need to probe their links to profitability in ASEAN's agriculture and F&B sectors to balance financial and ecological imperatives. Integrating sustainability reporting with digital shifts yields both prospects and hurdles.

This research explores the nexus of sustainability reporting, intellectual capital, and firm profitability in Southeast Asia. Analyzing intellectual capital components—human capital efficiency (HCE), structural capital efficiency (SCE), relational capital efficiency (RCE), and capital employed efficiency (CEE)—alongside sustainability disclosures, it aims to yield actionable insights for firms and investors. Findings are poised to elucidate their synergistic role in post-pandemic value creation and competitiveness, especially amid rising intangible and sustainability priorities.

The analysis centers on agriculture and F&B firms in Indonesia, Thailand, and the Philippines, which collectively represent a significant ASEAN economic share and exhibit comparability. These nations share akin development levels, adherence to International

Financial Reporting Standards (IFRS) (Deloitte, 2024; FSRSC, n.d.; IFRS, 2024), geographic proximity, cultural affinities, and political stability—minimizing analytical distortions.

This delimited sample facilitates nuanced, context-rich analysis, curtails confounding variables, and bolsters internal validity. While broader inclusion might enhance external validity, the focus yields robust patterns applicable to analogous ASEAN economies and informs regional comparisons.

Employing financial data from 2020–2022, the study assesses intellectual capital and sustainability disclosures' effects on profitability during the pandemic-to-endemic transition. Lingering issues—economic turbulence, climate pressures, and stakeholder demands for sustainability—persist. Herein, intellectual capital and reporting enhance adaptability and risk mitigation. Firms with consistent sustainability disclosures signal transparency and foresight, traits prized by stakeholders. Ultimately, results promise a holistic view of value creation, aiding decision-making and affirming intellectual capital's role in resilience and sustainable growth.

B. LITERATURE REVIEW

This study is grounded in the Resource-Based Theory (RBT) as its core theoretical framework (Assensoh-Kodua, 2019; Wahyuni et al., 2023). RBT asserts that sustainable competitive advantage arises from resources that are valuable, rare, inimitable, and non-substitutable. Intellectual capital (IC)—encompassing human, structural, and relational dimensions—embodies these attributes as a pivotal intangible asset, driving enhanced performance and resilience. Likewise, rigorous sustainability practices and disclosures function as distinctive capabilities that elevate corporate reputation and stakeholder ties, augmenting the resource portfolio. Although value creation theory elucidates resource-to-value conversion, RBT provides a sharper focus on competitive sources and performance variances via IC and sustainability initiatives. This lens enables targeted scrutiny of internal capabilities shaping profitability, especially in agriculture and food & beverage (F&B) sectors.

Empirical evidence consistently links intellectual capital to superior firm profitability (Mohammad & Bujang, 2019; Tiwari, 2022; Ulum et al., 2017). Extending this, the present study posits that sustainability reporting, integrated with IC components, amplifies financial performance. Firms prioritizing sustainability disclosures often cultivate innovative cultures, robust stakeholder engagement, and adaptive capacities (Bronzetti et al., 2023; Eccles et al., 2014; Herremans et al., 2016; Wang, 2017), reinforcing IC's performance-enhancing role. Thus, this research advances prior work by probing the synergistic effects of Modified Value Added Intellectual Capital (MVAIC) elements and sustainability reporting on outcomes amid volatility, such as the COVID-19 era.

The COVID-19 crisis highlighted IC's indispensable role in bolstering resilience and stability. While extant research ties IC to profitability, few integrate sustainability reporting as a concurrent predictor. Addressing this, amid surging sustainability imperatives, the study examines human capital efficiency (HCE), structural capital efficiency (SCE), relational capital efficiency (RCE), and capital employed efficiency (CEE) alongside sustainability disclosures' joint impact on profitability.

Departing from single-country analyses, this investigation spans agriculture and F&B firms across Indonesia, Thailand, and the Philippines—sectors vital to regional economies and resilient to pandemic shocks. It applies the Modified Value Added Intellectual Capital (M-VAIC™) model, which holistically captures relational capital beyond human and structural facets. This methodology promises nuanced insights into how IC components and sustainability practices collectively drive financial performance.

H1: Capital Employed Efficiency (CEE) has a positive relationship with company profitability.
H2: Human Capital Efficiency (HCE) has a positive relationship with company profitability.
H3: Structural Capital Efficiency (SCE) has a positive relationship with company profitability.
H4: Relational Capital Efficiency (RCE) has a positive relationship with company profitability.
H5: Sustainability disclosure has a positive relationship with company profitability.

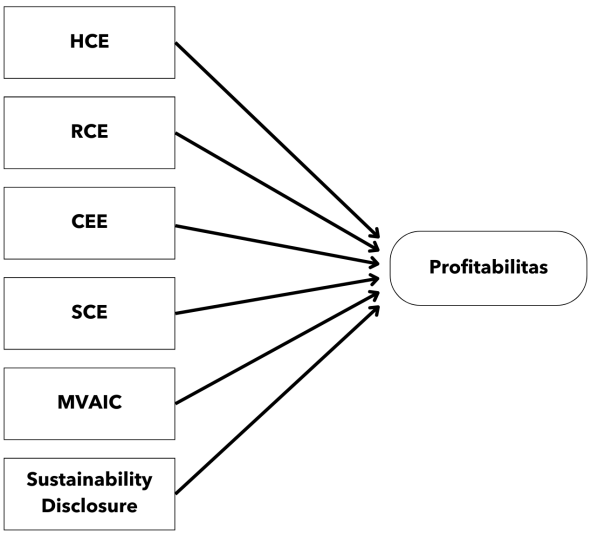

Figure 1. Research Framework

C. METHODS

Data analysis was performed using STATA software. Descriptive statistics—encompassing means, medians, standard deviations, minima, and maxima—were generated to characterize the dataset. Prior to hypothesis testing, classical assumption tests validated the regression model: normality assessments verified data distribution; multicollinearity diagnostics detected inter-variable correlations; and heteroscedasticity tests confirmed constant error-term variance. With assumptions satisfied, multiple regression analysis proceeded. Model fit was evaluated via the F-test (p-value) for overall significance, R-squared for explanatory power, and t-tests for individual predictor significance.

The sample includes publicly listed firms in the food & beverage (F&B) and agriculture sectors from the Indonesia Stock Exchange (IDX), Stock Exchange of Thailand (SET), and Philippine Stock Exchange (PSE). Secondary data were sourced from financial statements, annual reports, and sustainability disclosures via official exchange portals and company websites, spanning 2020–2022 to encapsulate COVID-19 impacts.

Profitability, the dependent variable and a core gauge of financial health, is proxied by Return on Assets (ROA), Return on Equity (ROE), and Earnings Before Interest and Taxes (EBIT) margin (Gupta et al., 2020). ROA measures asset utilization efficiency; ROE assesses shareholder returns; and EBIT margin evaluates pre-financing/tax operational performance.

Intellectual capital (IC), the primary independent variable, is quantified via the Modified Value-Added Intellectual Capital (M-VAIC) model, including human capital efficiency (HCE), structural capital efficiency (SCE), relational capital efficiency (RCE), and capital employed efficiency (CEE). This approach suits knowledge-intensive sectors by linking IC to value creation and advantage.

Sustainability reporting disclosure, another independent variable, proxies environmental, social, and governance (ESG) commitment. Beyond compliance, it strategically bolsters reputation, draws ethical investors/consumers, and curbs risks, potentially elevating performance. Pairing internal IC with external disclosures yields a holistic view of non-financial profitability drivers.

ROA = Net Income / Total Assets ROE = Net Income / Total Equity EBIT Margin = EBIT / Revenue

This study adopts the Modified Value-Added Intellectual Capital (M-VAIC) framework for its standardized methodology, which enables cross-industry and cross-country comparability. The model is straightforward to apply, relying on publicly available audited financial data that bolster reliability and mitigate informational constraints (Suksarmrong et al., 2023). Furthermore, M-VAIC extends the conventional VAIC model by integrating relational capital into intellectual capital assessment (Gupta et al., 2020). Following methodologies outlined by Jin and Xu (2022), Zéghal and Maaloul (2010), and Mohammad (2022), the subsequent formula is employed:

MVAIC = CEE + HCE + SCE + RCE

VA = Net Income + Interest + Tax + Employee Expenditure

$$CEE = \frac{VA}{Book\ value\ of\ net\ assets}$$

$$HCE = \frac{VA}{Total\ employee\ expenditure}$$

$$SCE = \frac{(VA - Total\ employee\ expenditure)}{VA}$$

$$RCE = \frac{Marketing,\ selling,\ and\ advertising\ expenses}{VA}$$

MVAIC = Modified Value-Added Intellectual Capital
CEE = Capital Employed Efficiency
HCE = Human Capital Efficiency
SCE = Structural Capital Efficiency
RCE = Relational Capital Efficiency
VA = Value Added
HC = Human Capital (total beban karyawan, termasuk pelatihan)
SC = Structural Capital (VA-HC)
RC = Relational Capital (biaya pemasaran)
CE = Capital Employed (nilai buku dari total asset)

EC = Employee Cost
VA = Value Added

Sustainability practices were measured using a binary dummy variable, denoting whether a firm issued a sustainability report in the subsequent year (1 = yes; 0 = no) (Fernandez-Feijoo et al., 2014). This approach yields a straightforward, quantifiable proxy for sustainability reporting disclosure.

D. RESULT

A purposive sampling strategy yielded a comprehensive dataset of 267 observations from 89 firms across three Southeast Asian countries: Indonesia (39 firms), Thailand (38 firms), and the Philippines (12 firms), spanning three years. Data collection faced hurdles, including inaccessible company websites and incomplete records on national stock exchange platforms, leading to the exclusion of affected samples to preserve dataset integrity. The variables examined include:

X1: Human Capital Efficiency (HCE)
X2: Resource Capital Efficiency (RCE)
X3: Capital Capital Efficiency (CCE)
X4: Structural Capital Efficiency (SCE)
X5: Sustainability
Y: Profitability

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Profitability	267	-1.1200	1.4110	-2.0982	7.0331
HCE	267	2.4730	2.1032	1.0066	19.1427
RCE	267	0.3588	0.3443	0	1.9655
CEE	267	0.3128	0.1823	0.0448	1.2451
SCE	267	0.4592	0.2305	0.0066	0.9478
Sustainability	267	0.6741	0.4695	0	1

Table 1's descriptive statistics reveal that human capital efficiency (HCE) exceeds other intellectual capital components across firms in Indonesia, Thailand, and the Philippines, indicating a pronounced emphasis on human resource development relative to alternative intangible assets. Profitability is operationalized via a Principal Component Analysis (PCA) index aggregating Return on Assets (ROA), Return on Equity (ROE), and Earnings Before Interest, Taxes, and Miscellaneous (EBITM). Sustainability disclosure is gauged by the issuance of sustainability reports during the study period. Notably, several sample firms omitted such reports in specific years, potentially influencing evaluations of their sustainability commitments and profitability interpretations.

Table 2: Pooled Least Square/Common Effect

Variables	Coef.	Std. Err.	t-test (P-Value)
HCE	-0.0490	0.0515	0.342
RCE	-0.1311	0.2297	0.569
CEE	2.8876	0.4336	0.000
SCE	2.4164	0.4697	0.000
Sustainability	0.1567	0.1653	0.344
F test (P-Value)	0.0000		
R-Squared	0.2285		

Table 2 shows the common effect model, which assumes that all cross-sectional units and time periods are homogeneous, thereby ignoring any individual-specific or time-specific differences in the dataset.

Table 3: Fixed Effect Model

Variables	Coef.	Std. Err.	t-test (P-Value)
HCE	-0.0648	0.1010	0.522
RCE	-0.3089	0.6132	0.615
CEE	2.7788	0.8789	0.002
SCE	2.1648	0.7794	0.006
Sustainability	0.4205	0.1727	0.016
sigma_u	1.0383		
sigma_e	0.8664		
rho	0.5895		

Table 3 reports fixed-effects (FE) model estimates, which control for unobserved entity-specific heterogeneity by permitting varying intercepts while holding slope coefficients constant. Model selection between pooled ordinary least squares (POLS) and FE relied on a Chow F-test, yielding a p-value of 0.000—well below the 0.05 threshold. This rejects the null hypothesis of POLS (H0) in favor of FE (H1), confirming the fixed-effects specification as optimal.

Table 4: Random Effect Model

Variables	Coef.	Std. Err.	t-test (P-Value)
HCE	-0.0499	0.0613	0.416
RCE	-0.1644	0.2957	0.578
CEE	2.8153	0.5117	0.000
SCE	2.3178	0.5181	0.000
Sustainability	0.3109	0.1490	0.037

F test (P-Value)	0.0000
sigma_u	0.9251
sigma_e	0.8664
rho	0.5327

Table 4 displays estimates from the random-effects (RE) model, which posits individual-specific intercepts as random variables varying across units. Panel estimator selection via the Hausman test produced a Prob > chi² of 0.000, below the 0.05 threshold, rejecting the null hypothesis of RE (H0) in favor of fixed effects (H1). Thus, the fixed-effects model emerges as the preferred specification.

Table 5: Classical Assumption Test

Variables	VIF	1/VIF
HCE	2.00	0.5004
RCE	1.99	0.5020
CEE	1.06	0.9400
SCE	1.06	0.9412
Sustainability	1.02	0.9759
Mean VIF	1.43	

This study applies a fixed-effects model for regression parameter estimation. Robustness was verified through classical assumption tests—normality, multicollinearity, heteroscedasticity, and autocorrelation—confirming adherence to Best Linear Unbiased Estimator (BLUE) criteria. Independent variables showed tolerance values exceeding 0.10 and Variance Inflation Factors (VIF) below 10, ruling out multicollinearity. Diagnostic results further evidenced no heteroscedasticity or autocorrelation, affirming the estimates' stability and validity.

Hypothesis Testing

The t-test assesses each independent variable's individual effect on the dependent variable. Here, predictors' impacts on the outcome are examined in isolation, with statistical significance inferred when the p-value ($P > |t|$) falls below the 0.05 threshold ($\alpha = 0.05$). Results are summarized as follows:

Table 6: Hypothesis Test

Independent Variables	F test (P-Value)	Hypothesis	Conclusion
X1 = HCE	0.522	Hypothesis rejected	X1 has no significant effect on Y.
X2 = RCE	0.615	Hypothesis rejected	X1 has no significant effect on Y.

X3 = CEE	0.002	Hypothesis accepted	X1 has a significant effect on Y.
X4 = SCE	0.006	Hypothesis accepted	X1 has a significant effect on Y.
X5 = Sustainability	0.016	Hypothesis accepted	X1 has a significant effect on Y.

The F-test evaluates the joint significance of all independent variables on the dependent variable (Y). Collective influence is deemed significant if Prob > F < 0.05 or the F-statistic exceeds the critical value. Fixed-effects estimates yield Prob > F < 0.05, confirming that X1, X2, X3, X4, and Z jointly and significantly affect Y.

The within R-squared (0.2081, or 20.81%) from feasible generalized least squares panel regression indicates that the independent variables (X1, X2, X3, X4, Z) explain 20.81% of variation in Y, with the residual 79.19% due to unmodeled factors.

E. DISCUSSION

Table 6 reveals that human capital efficiency (HCE) exerts no statistically significant effect on profitability in Indonesia, Philippines, and Thailand's food & beverage (F&B) and agriculture sectors. Diverging from broader IC literature, this aligns with sector- and region-specific dynamics: capital-intensive operations prioritize tangible assets like machinery and infrastructure, diluting HCE's short-term financial impact amid standardized processes (Inrico et al., 2023). While vital for innovation and strategy, HCE's benefits manifest indirectly via technology uptake, efficiency gains, and supply chain optimization—rather than direct metrics. Conventional HCE proxies may overlook knowledge creation and learning, which favor long-term over immediate outcomes. Centralized decision-making further attenuates employee-firm profitability links (Molthar & Indarti, 2021). Thus, HCE's role appears constrained, with performance hinging more on technology, strategy, and supply chains.

Relational capital efficiency (RCE) similarly shows insignificant profitability effects. In manufacturing-heavy agriculture and F&B—unlike services—external ties with stakeholders yield limited short-term gains, overshadowed by internal efficiencies and tangible assets. Proxies like advertising expenses often depress earnings without prompt returns (Firer & Mitchell Williams, 2003; Kujansivu & Lönnqvist, 2007; Mondal & Ghosh, 2012). Literature concurs, portraying such costs as current expenses inadequately signaling enduring relational value (Suherman, 2017; Chen et al., 2005; Diyanty et al., 2019; Nimtrakoon, 2015; Vetchagool, 2022; Weqar et al., 2020; Xu & Li, 2019). This underscores manufacturing-service divergences in relational capital's financial contributions.

Conversely, capital employed efficiency (CEE) positively and significantly influences profitability, apt for asset-reliant agriculture and F&B (J. Tarigan et al., 2019). Optimal capital deployment boosts operations, cash flows, and cost efficiencies (Inrico et al., 2023; Fitriaty et al., 2022), sustaining performance amid crises like COVID-19 (Firer & Mitchell Williams, 2003; Mondal & Ghosh, 2012; Ozkan et al., 2017; Sydler et al., 2014). Firms should thus

prioritize CEE to fortify competitiveness, enabling sustainability investments and technological resilience.

Structural capital efficiency (SCE) exhibits a robust positive profitability link, highlighting internal systems, processes, and knowledge infrastructures' role in productivity and innovation. Strong SCE curbs costs and elevates value (Inrico et al., 2023; Astari & Darsono, 2020; Bontis et al., 2000; Purwanto & Mela, 2021; E. S. Tarigan & Septiani, 2017; Vetchagool, 2022). It further bolsters sustainability via superior data handling and reporting, fostering a virtuous cycle of financial and ESG gains for enduring advantage.

Intellectual capital's profitability ties are nuanced: HCE and RCE lack direct significance, while CEE and SCE dominate in these tangible-asset sectors. Sustainability reporting (SR) complements this positively (Table 6). Resource-based theory frames SR as leveraging reputation and trust—hard-to-imitate intangibles attracting stakeholders and enhancing performance (Whetman, 2018; Petcharat & Zaman, 2019). Empirical support abounds, especially where governance embeds ESG (Faqih & Siswoyo, 2020). In ASEAN agriculture/F&B, SR amplifies internal efficiencies, positioning it as a strategic asset for transparency, resilience, and sustainable growth rather than a mere cost.

F. CONCLUSION

This study investigates the interplay of intellectual capital (IC), profitability, and sustainability reporting among Southeast Asian agriculture and food & beverage firms. Panel regression analyses, validated by classical assumption tests, affirm IC's pivotal role in resilience and performance amid disruptions like COVID-19. Human capital efficiency (HCE) and relational capital efficiency (RCE) show insignificant profitability effects across Indonesia, Thailand, and the Philippines; conversely, structural capital efficiency (SCE) and capital employed efficiency (CEE) exert significant positive impacts, underscoring system- and asset-oriented IC's primacy in these sectors.

Sustainability reporting bolsters the IC-profitability nexus indirectly via heightened transparency, stakeholder trust, and resource optimization. Addressing a literature gap, this work integrates IC and sustainability in a cohesive framework, yielding implications for leveraging intangibles and disclosures to secure enduring profitability and advantage. Post-pandemic, it emphasizes aligning IC management with sustainability reporting for sustained value creation and resilience.

G. LIMITATION

This study has several limitations. First, data availability constrained the analysis, as numerous firms—particularly smaller entities—lacked publicly accessible financial statements or sustainability reports, potentially introducing sample selection bias and restricting generalizability. Second, the geographical scope was confined to Indonesia, Thailand, and the Philippines, representing key yet incomplete segments of ASEAN's diverse institutional, industrial, and economic landscape, thereby tempering external validity.

Future research should mitigate these constraints through comprehensive data strategies, such as leveraging commercial financial databases or direct firm solicitations, alongside broader ASEAN coverage and industry diversification to yield more robust, generalizable insights.

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