

INTELLECTUAL CAPITAL AND FIRM PERFORMANCE: THE MODERATING ROLE OF CSR IN SRI LANKA'S MATERIALS SECTOR

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ABSTRACT

This study examines the moderating effect of Corporate Social Responsibility on the relationship between Intellectual Capital and firm performance, focusing on companies listed on the Colombo Stock Exchange in Sri Lanka from 2016 to 2022. Using a sample of 18 firms in the material sector, data were analysed through descriptive statistics, correlation analysis, variance inflation factor analysis, and panel data analysis in E-Views. The findings indicate that Human Capital Efficiency and CSR significantly impact Return on Assets (ROA). In contrast, structural capital efficiency and capital employed efficiency did not exhibit substantial effects on return on equity (ROE). The Hausman test results suggest that a random effects model is appropriate for ROA, while a fixed effects model is suitable for ROE. Based on these findings, businesses should prioritise investments in human capital through employee training, development, and innovation to enhance financial performance. Additionally, firms should align CSR initiatives with their strategic goals to maximise benefits. Policymakers can use these insights to establish industry-specific regulations encouraging sustainable business practices and resource efficiency. Furthermore, investors and stakeholders can leverage this knowledge to assess financial sustainability and CSR effectiveness, leading to informed investment decisions that align with long-term value creation. This study contributes to intellectual capital, CSR, and financial performance literature, offering practical implications for corporate leaders, policymakers, and investors.

Keywords: *Intellectual Capital, Corporate Social Responsibility, Firm Performance, Human Capital Efficiency and Structural Capital*

1. INTRODUCTION

Research on intellectual capital (IC) and firm performance has emerged as a critical area of inquiry due to the increasing recognition of intangible assets as key drivers of competitive advantage and sustainable growth in knowledge-based economies (Tran et al., 2022; Ahmed & Hussin, 2023). Over the past decade, studies have evolved from focusing solely on financial capital to incorporating IC components such as human, structural, and relational capital (Wanigasekara et al., 2022; Ahmed & Hussin, 2023). Concurrently, corporate social responsibility (CSR) has gained prominence as a strategic mechanism that enhances firm reputation and stakeholder relations, influencing firm performance (Tran et al., 2022; Utomo et al., 2020). Empirical evidence indicates that firms engaging in CSR activities often experience

improved financial outcomes and market valuation, underscoring the practical significance of integrating CSR with IC management (Indriastuti et al., 2024). For instance, in emerging markets, CSR and intellectual capital have been linked to firm value creation and competitive advantage, highlighting their relevance in dynamic business environments (Tran et al., 2022; Hermawan et al., 2024).

Despite extensive research, the impact of IC and CSR on firm performance remains inconclusive, particularly in emerging economies where institutional and market conditions differ markedly (Tran et al., 2022). Several studies report positive effects of IC on financial performance, while others find mixed or negative associations when CSR is considered (Tetteh et al., 2024). Moreover, the moderating or mediating role of CSR in the IC performance nexus is underexplored, with conflicting findings on whether CSR amplifies or diminishes the value of intellectual capital (Tran et al., 2022; Anggraini et al., 2021). This knowledge gap is pronounced in specific sectors and geographies, such as Sri Lanka's materials sector, where empirical evidence is scarce despite the sector's economic importance (Jeewanthi et al., 2023; Beddewela & Fairbrass, 2016). The absence of consensus limits the development of integrated frameworks that can guide managerial and policy decisions to optimise intangible asset utilisation and social responsibility for enhanced firm outcomes (Tran et al., 2022).

The conceptual framework underpinning this review draws on the resource-based view (RBV) and stakeholder theory, which collectively explain how firms leverage internal intangible resources and engage stakeholders through CSR to achieve superior performance (Tran et al., 2022; Hasrullah & Triyonowati, 2024; Zahid et al., 2024). IC encompasses human, structural, and relational capital as critical intangible assets that create competitive advantage (Tran et al., 2022; Ahmed & Hussin, 2023). CSR represents firms' voluntary commitments to social and environmental responsibilities, which can moderate the effectiveness of IC in driving firm performance (Tran et al., 2022; Anggraini et al., 2021). This integrated framework guides the examination of how CSR influences the relationship between IC and firm performance in Sri Lanka's materials sector, as Sri Lanka is an emerging market. Its production and activities are geared towards its further growth. In the post-war period in Sri Lanka, all business organisations focus on expanding their business activities to the next level. So, businesses are changing daily to a knowledge-based economy. Continuous innovations and technological updates of IC create a knowledge-based economy. In Sri Lanka, a few studies are related to intellectual capital, especially listed companies on the CSE. Based on that research, their results and findings have led to contradictory results. Prior studies found that Human Capital (HCE) and Structural Capital efficiency (SCE) have no significant relationship with profitability and ROA. In contrast to that, both HCE and SCE negatively impact financial performance. Emerging Market describes the new market structures arising from digitalisation, regulations, globalisation and open standards that shift the balance of economic power from the sellers to buyers. Capital efficiency and SCE show a significant positive relationship with the financial performance of the companies. Despite some researchers stating that some components of IC negatively impact financial performance and some studies providing general and mixed results. In

recent years, there has been increasing awareness and emphasis on CSR in Sri Lanka, driven by domestic and international pressure. As businesses strive to meet global sustainability standards, integrating CSR into their strategies has become essential. However, the extent to which CSR affects financial performance, especially when combined with IC, is under-researched in the Sri Lankan context. Further, Sri Lanka has faced significant economic challenges in recent years, including political instability, inflation, and fluctuations in foreign investment. These challenges have pressured businesses to improve their financial performance while aligning with sustainable business practices. The study is crucial as it provides insights into how CSR, when aligned with IC management, can contribute to improved financial outcomes, such as ROA and ROE. Businesses can enhance their resilience and long-term sustainability in a challenging economic environment. Therefore, the present study aims to fill that gap by exploring the moderating role of CSR in the relationship between Intellectual Capital and firm performance, specifically in material sector companies listed on the CSE.

The core objective of the study is to examine the impact of IC on the moderating role of CSR

2. LITERATURE REVIEW

The relationship between IC and firm performance has been widely explored, with numerous studies demonstrating a significant positive impact of IC components on organisational outcomes. Empirical evidence highlights HCE and SCE as the primary drivers of enhanced performance, particularly in emerging markets where knowledge resources are becoming central to competitive advantage (Tetteh et al., 2024; Wanigasekara et al., 2022; Ahmed & Hussin, 2023). Adopting standardised models such as the Value-Added Intellectual Coefficient (VAIC) has facilitated comparability across studies and provided a solid theoretical foundation for measuring IC effectiveness (Ahmed & Hussin, 2023). Evidence from countries such as Sri Lanka, Indonesia, and Vietnam supports the generalizability of this relationship across diverse institutional contexts (Tran et al., 2022; Surjandari et al., 2019). However, several studies reveal inconsistent findings, particularly regarding the effects of relational capital and capital employed efficiency, suggesting variability in how IC components influence firm outcomes depending on sectoral and environmental dynamics (Pratama et al., 2024; Sholikhah & Hermawan, 2022). Moreover, some research reports non-significant or even adverse effects, underscoring potential limitations related to contextual differences and measurement approaches. At the same time, the heavy reliance on cross-sectional designs limits causal inference.

A growing stream of literature emphasises the role of CSR as a moderator that can strengthen the positive influence of IC on firm performance. Empirical findings from emerging economies indicate that firms leveraging CSR alongside IC achieve better financial and market outcomes, as CSR initiatives enhance stakeholder relationships, brand reputation, and operational legitimacy (Tetteh et al., 2024; Iqbal et al., 2019). Studies show that integrating sustainability objectives and CSR disclosures into strategic planning amplifies the returns on intellectual resources, enabling firms to

capture long-term competitive advantages (Arif et al., 2025; Indriastuti et al., 2024). RBV suggests that CSR complements IC by creating intangible assets such as goodwill and trust. At the same time, Stakeholder Theory highlights CSR's role in aligning firm actions with stakeholder expectations, thereby reinforcing performance outcomes (Arif et al., 2025). However, contradictory findings persist, with some studies reporting insignificant or even negative impacts of CSR on firm performance (Sholikhah & Hermawan, 2022). These inconsistencies often arise from methodological variations, particularly the widespread reliance on disclosure-based CSR indices that may not adequately capture the qualitative depth of CSR practices. Furthermore, limited sector-specific investigations, especially within Sri Lanka's materials industry, create a knowledge gap in understanding the contextual nuances of CSR effectiveness (Jeewanthi et al., 2023; Beddewela & Fairbrass, 2016).

Methodologically, literature has evolved with the adoption of advanced econometric techniques such as system generalised method of moments (GMM), moderated regression analysis, and structural equation modelling (SEM) to ensure robust findings (Hasrullah & Triyonowati, 2024; Tetteh et al., 2024). Longitudinal panel designs enhance the reliability of results by capturing dynamic effects of IC and CSR on performance across multiple years (Tran et al., 2022; Indriastuti et al., 2024). Moreover, combining financial indicators (e.g., ROA, ROE, Tobin's Q) with non-financial performance metrics (e.g., innovation capability, customer satisfaction) offers a more holistic assessment of organisational outcomes (Wanigasekara et al., 2022; Tsai & Mutuc, 2020). Nonetheless, significant methodological heterogeneity persists across studies, as variations in sample size, industry focus, and data sources pose challenges to comparability. Several studies rely heavily on secondary data from annual reports or sustainability disclosures, which may introduce measurement bias due to incomplete or inconsistent reporting practices. Additionally, few studies adequately address endogeneity concerns or reverse causality between IC, CSR, and performance, raising questions about the robustness of causal claims (Jeewanthi et al., 2023).

Regional and sector-specific research provides further insights into the Sri Lankan context, where integrating IC and CSR practices is increasingly relevant for firm competitiveness and sustainability. Evidence from emerging economies suggests that institutional settings, regulatory environments, and market dynamics shape how IC and CSR interact to influence firm performance (Ranatunga et al., 2023; Wanigasekara et al., 2022). In Sri Lanka, studies highlight the importance of stakeholder engagement and legitimacy-seeking behaviors in shaping CSR practices, particularly within industries facing heightened environmental and social scrutiny (Beddewela & Fairbrass, 2016). Research focusing on manufacturing and materials sectors demonstrates that firms in resource-intensive industries face distinct challenges, such as sustainability reporting obligations and pressure to manage environmental risks, which intensify the strategic importance of IC and CSR (Hasrullah & Triyonowati, 2024). However, the literature lacks comprehensive empirical evidence targeting the materials sector, creating opportunities for future research to explore sector-sensitive dynamics that may influence the IC–CSR–performance nexus (Jeewanthi et al., 2023).

From a theoretical standpoint, studies commonly apply frameworks such as RBV, Stakeholder Theory, and Legitimacy Theory to conceptualize the joint role of IC and CSR in driving firm performance (Arif et al., 2025). Recent work has moved toward integrated models incorporating mediating and moderating variables to capture the complex interdependencies among IC, CSR, and firm outcomes (Hasrullah & Triyonowati, 2024; Lin et al., 2015). These approaches recognize the potential for non-linear relationships and bidirectional effects, suggesting that CSR not only enhances the performance benefits of IC but may also itself be influenced by knowledge-based resources (Jeewanthi et al., 2023; Zhang et al., 2021). Despite these advances, inconsistencies remain regarding the operationalization of IC components and the measurement of CSR intensity, leading to fragmented findings and limited cumulative knowledge (Cancemi, 2023). Moreover, integrating multiple theoretical lenses is rare, representing an untapped opportunity to develop more comprehensive frameworks for understanding value creation in knowledge-driven economies.

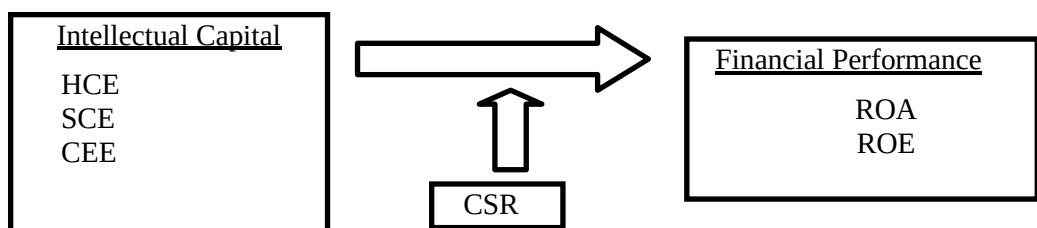
Practical implications of this literature underscore the strategic value of investing in intellectual capital and embedding CSR initiatives into organizational models. Firms that effectively leverage these intangible assets are better positioned to signal quality to investors, attract key stakeholders, and sustain competitive advantage (Indriastuti et al., 2024). Studies identify threshold effects and component-specific impacts of IC, suggesting that targeted resource allocation—particularly toward human and structural capital development—yields more substantial performance benefits (Tetteh et al., 2024). Similarly, CSR integration supports market legitimacy and customer loyalty, amplifying the performance effects of IC when strategically aligned with business objectives (Ahmad et al., 2022; LumbanGaol et al., 2021). However, managerial recommendations remain generalized, with limited attention to the materials sector or the Sri Lankan context, constraining their direct applicability (Jeewanthi et al., 2023). The dynamic nature of IC and CSR practices also highlights the need for continuous managerial adaptation, which is insufficiently addressed in current frameworks.

3. METHODOLOGY

3.1 Sampling

The data was collected using a simple random sampling method from 18 listed companies in the Materials sector in Sri Lanka that are traded on the Colombo Stock Exchange.

3.2 Conceptual Framework



Source: Author's compilation (2024)

Figure 1: Conceptual Framework 53

Table 01: Operationalization

Variable	Indicators	Measurement	Source
HCE	Human capital efficiency	VA/HC	Tran et al .,(2022)
SCE	Structural capital efficiency	$(VA - HC)/VA$	
CEE	Capital employed efficiency	VA/CE	
ROA	Return on Assets	$net\ income / total\ assets$	
ROE	Return on Equity.	$net\ income / total\ equity$	
CSR	Corporate social responsibility	CSR Index	

Source: Author's compilation (2024).

3.3 Hypothesis

H1: CSR significantly moderates the impact of intellectual capital on Return on Assets.

$$ROA = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 CSR + (\beta_5 HCE * CSR) + (\beta_6 CEE * CSR) + (\beta_7 SCE * CSR) + \varepsilon \text{-----}(1)$$

H2: CSR significantly moderated the impact of intellectual capital on Return on Equity

$$ROE = \beta_0 + \beta_1 HCE + \beta_2 SCE + \beta_3 CEE + \beta_4 CSR + (\beta_5 HCE * CSR) + (\beta_6 CEE * CSR) + (\beta_7 SCE * CSR) + \varepsilon \text{-----}(2)$$

4. DATA ANALYSIS

Table 02: Fixed effect

Variable	Coeffi	ROA			Coeffi	ROE		
		Std. Err	t-Stat	Prob.		Std. Err	t-Stat	Prob.
C	-5.241	4.129	-1.269	0.208	-1.594	3.049	-0.522	0.602
HCE	-0.653	1.144	-0.571	0.569	0.962	0.698	1.377	0.171
SCE	8.5625	6.640	1.289	0.201	0.0281	4.690	0.005	0.995
CEE	2.0642	0.6777	3.045	0.003	1.652	0.482	3.427	0.000
CSR	0.4797	1.167	0.410	0.682	-0.326	0.846	-0.385	0.700

HCE_CSR	0.3399	0.3243	1.0481	0.297	-0.141	0.208	-0.677	0.499
SCE_CSR	-1.9330	1.8769	-1.029	0.306	0.439	1.318	0.333	0.739
CEE_CSR	-0.3141	0.1826	-1.71	0.089	-0.196	0.135	-1.455	0.148
R-squared				0.740	R-squared			0.716
Adjusted R-squared				0.659	Adjusted R-squared			0.6951
F-statistic				9.142	F-statistic			33.568
Prob(F-statistic)				0.002	Prob(F-statistic)			0.046

Source: From the statistical output

The results indicate that CEE has a significant positive effect on both ROA ($\beta = 2.064$, $p = 0.003$) and ROE ($\beta = 1.652$, $p = 0.0009$), highlighting the importance of efficient resource utilisation in improving firm performance in Sri Lanka's materials sector. In contrast, HCE and SCE show no significant impact. Moreover, CSR does not significantly moderate the relationship between intellectual capital and firm performance, suggesting that CSR practices in this sector are not effectively integrated to enhance financial outcomes.

Table 03: Random effect

ROA					ROE				
Variable	Coeffi	Std. Err	t-Stat	Prob.	Coeffi	Std. Err	t-Stat	Prob.	
C	-4.614	4.018	-1.148	0.2537	-1.744	2.684	-0.649	0.517	
HCE	-0.110	1.031	-0.106	0.915	0.862	0.61975	1.391	0.167	
SCE	6.313	6.334	0.996	0.3214	0.458	4.13366	0.110	0.911	
CEE	1.941	0.648	2.991	0.003	1.648	0.425	3.877	0.000	
CSR	0.303	1.127	0.269	0.788	-0.280	0.746	-0.375	0.708	
HCE_CSR	0.194	0.298	0.652	0.515	-0.113	0.184	-0.614	0.540	
SCE_CSR	-1.326	1.788	-0.741	0.460	0.318	1.163	0.274	0.784	
CEE_CSR	-0.282	0.177	-1.593	0.114	-0.192	0.119	-1.618	0.108	
R-squared				0.5108	R-squared				0.711
Adjusted R-squared				0.4744	Adjusted R-squared				0.690
F-statistic				14.026	F-statistic				32.79
Prob(F-statistic)				0.01	Prob(F-statistic)				0.025

(Source: From the statistical output)

The above Table 02 demonstrates that the results indicate that CEE has a significant positive impact on both ROA ($\beta = 1.9415$, $p = 0.0035$) and ROE ($\beta = 1.6486$, $p = 0.0002$), highlighting that efficient utilisation of financial and physical resources is a key driver of firm performance in Sri Lanka's materials sector. In contrast, HCE and SCE show no significant effects on either ROA or ROE. Additionally, the interaction terms between CSR and all IC components are statistically insignificant ($p > 0.05$), indicating that CSR does not moderate the relationship between intellectual capital and firm performance. The R-squared value for ROA is 0.5108, indicating that the model accounts for 51.08% of the variation in ROA. In contrast, the R-squared for ROE is 0.7117, which accounts for 71.17% of the variation in ROE. The F-statistics for ROA (14.02, $p = 0.01$) and ROE (32.79, $p = 0.025$) indicate that the overall models exhibit statistical significance. The adjusted R-squared values indicate a superior model fit for ROE at 69.00% compared to ROA at 47.44%. The findings demonstrate that CEE significantly influences ROA and ROE, whereas other variables and their interactions with CSR do not exert a meaningful effect.

Table 04: Hausman Test

	ROA		ROE	
Test Summary	Chi-Sq. Statistic	Prob.	Chi-Sq. Statistic	Prob.
Cross-section random	4.644593	0.7032	33.34828	0.01

Source: From the statistical output

The results of the Hausman Test provide insights into the suitable model for analysing ROA and ROE. The Chi-Square Statistic for ROA is 4.6446, accompanied by a p-value of 0.7032, exceeding the threshold of 0.05. This indicates that the random effects model is more appropriate, as the null hypothesis that the random effects model offers an efficient and unbiased estimation remains unchallenged. In contrast, the Chi-Square Statistic for ROE is 33.3483, accompanied by a p-value of 0.01 below the threshold of 0.05. This indicates a preference for the fixed effects model, as the null hypothesis has been rejected in favour of this approach, which more effectively addresses individual-specific variations. Consequently, the study implements the random effects model for ROA and the fixed effects model for ROE to guarantee precise and dependable outcomes.

The analysis results indicate that both hypotheses (H1 and H2) are rejected because the moderating effect of CSR on the relationship between IC and firm performance is not statistically significant. For H1, which proposed that CSR moderates the impact of IC on ROA, all interaction terms HCE $\times$ CSR ($p = 0.2979$), SCE $\times$ CSR ($p = 0.3063$), and CEE $\times$ CSR ($p = 0.0895$) are above the 0.05 significance threshold, suggesting that CSR does not influence the relationship between IC and ROA. Similarly, H2, which hypothesised a moderating effect of CSR on ROE, is also rejected as the interaction terms HCE $\times$ CSR ($p = 0.4996$), SCE $\times$ CSR ($p = 0.7398$), and CEE $\times$ CSR ($p = 0.1489$) are not significant. These findings imply that in the context of Sri Lanka's materials sector, CSR practices are either limited in scope or primarily compliance-oriented,

failing to enhance the effectiveness of IC in improving financial performance. This outcome is consistent with prior studies, such as Sholikhah & Hermawan (2022), which similarly observed that CSR does not continually strengthen the IC and firm performance link when CSR strategies are not deeply integrated into business operations.

5. CONCLUSIONS AND RECOMMENDATIONS

The findings of this study reveal that among the components of IC, CEE plays a significant and positive role in enhancing firm performance, as reflected by its substantial impact on both ROA ($\beta = 2.0642$, $p = 0.003$) and ROE ($\beta = 1.6524$, $p = 0.0009$). This indicates that firms in Sri Lanka's materials sector gain superior financial outcomes primarily through efficiently utilizing financial and physical resources. These results are found that capital efficiency is a critical determinant of profitability, particularly in resource-intensive industries. Similarly, Tetteh et al. (2024) and Wanigasekara et al. (2022) reported that effective tangible and financial capital management leads to improved performance in emerging markets.

In contrast, HCE and SCE exhibit no significant relationship with firm performance for both ROA and ROE. This aligns with prior studies who also observed that HCE and SCE did not significantly influence profitability among Sri Lankan listed firms. However, the findings diverge from studies such as Ahmed & Hussin (2023), which emphasise HCE and SCE as critical drivers of competitive advantage in knowledge-based economies. One plausible explanation is that firms in Sri Lanka's materials sector may not effectively leverage knowledge-based resources, relying more on physical capital rather than human expertise or process innovation to drive financial success.

Furthermore, the study examined the moderating role of CSR on the relationship between IC and firm performance. The results demonstrate that CSR does not significantly moderate the influence of HCE, SCE, or CEE on either ROA or ROE, as all interaction terms were statistically insignificant ($p > 0.05$). These findings contradict prior evidence from Indriastuti et al. (2024) and Arif et al. (2025), highlighting that integrating CSR strategies with IC enhances financial outcomes by improving stakeholder trust, brand reputation, and operational legitimacy. However, the results are in line with studies such as Sholikhah & Hermawan (2022), which found that CSR does not always generate measurable financial benefits, particularly when CSR activities are symbolic rather than strategic. The insignificant moderating effect of CSR in this study lies in the Sri Lankan context. Prior research suggests that many firms adopt CSR primarily to comply with regulatory requirements or respond to stakeholder pressures, rather than integrating it as a core strategic driver of value creation (Beddewela & Fairbrass, 2016). In the materials sector, CSR initiatives often focus on environmental compliance, community welfare programs, or donations, which may not directly translate into profitability or shareholder value. This perspective is reinforced by Jeewanthi et al. (2023), who highlight that CSR in Sri Lanka tends to be reporting-oriented rather than performance-oriented, limiting its ability to strengthen the link between intellectual resources and financial outcomes.

The overall model fit supports the reliability of these findings. The ROA model explains 74.02% of the variation in financial performance ($R^2 = 0.7402$), with an adjusted R^2 of 0.6592, indicating a strong explanatory power. Similarly, the ROE model accounts for 71.64% of the variation ($R^2 = 0.7164$), with an adjusted R^2 of 0.6951, demonstrating substantial model robustness. The F-statistics for both models (ROA: $F = 9.14$, $p = 0.002$; ROE: $F = 33.57$, $p = 0.046$) confirm that the models are statistically significant and appropriate for evaluating the determinants of firm performance in the materials sector.

Overall, the findings underscore that capital efficiency remains the primary driver of firm performance in Sri Lanka's materials sector, whereas human and structural capital provide limited financial benefits. Moreover, while CSR has gained increasing attention in emerging markets, its influence as a strategic enhancer of IC value appears limited, possibly due to the industry's transactional or symbolic nature of CSR practices. These results contribute to the broader debate on the IC-CSR-performance nexus by demonstrating that the effectiveness of CSR as a performance enabler depends heavily on how deeply it is integrated into organizational strategies and resource management frameworks.

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