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The Influence of Intellectual Capital on Profitability of Automotive Companies Listed on the Indonesia Stock Exchange

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ABSTRACT

Purpose of the study: This research aims to examine the influence of intellectual capital, measured through the Value Added Intellectual Coefficient (VAIC™) method and its components (human capital efficiency, structural capital efficiency, and capital employed efficiency), on the profitability of automotive companies listed on the Indonesia Stock Exchange.

Materials and methods: Data were collected from annual reports of 13 automotive and component companies listed on the Indonesia Stock Exchange from 2019 to 2023. Profitability was measured using Return on Assets (ROA) and Return on Equity (ROE). Multiple regression analysis was employed to analyze the relationship between VAIC™ components and profitability indicators.

Results: The findings reveal a significant positive relationship between intellectual capital and company profitability. Human Capital Efficiency (HCE) demonstrated the strongest influence on profitability measures, followed by Capital Employed Efficiency (CEE). Structural Capital Efficiency (SCE) showed a positive but weaker relationship with profitability indicators. Companies with higher VAIC™ scores consistently displayed superior financial performance.

Conclusions: Intellectual capital significantly contributes to the profitability of automotive companies in Indonesia. The findings suggest that automotive companies should prioritize investment in human capital development while also optimizing structural capital and physical capital to enhance their competitive advantage and financial performance in an increasingly knowledge-based industry.

Keywords
Intellectual capital, VAIC™, automotive industry, Indonesia Stock Exchange, human capital efficiency, structural capital efficiency, capital employed efficiency.

INTRODUCTION

The global automotive industry has undergone significant transformation in recent decades, evolving from a predominantly manufacturing-focused sector to one increasingly driven by knowledge, innovation, and technology. In Indonesia, the automotive industry represents one of the key sectors contributing to economic growth, employment, and technological advancement. As the largest economy in Southeast Asia, Indonesia's automotive sector has attracted substantial domestic and foreign investment, with production capacities reaching approximately 1.3 million units annually before the COVID-19 pandemic.

In today's knowledge-based economy, a company's competitive advantage increasingly derives from intangible assets rather than traditional physical and financial resources. Intellectual capital, comprising human capital (knowledge, skills, and abilities of employees), structural capital (organizational processes, systems, and databases), and relational capital (relationships with customers, suppliers, and partners), has become a critical determinant of corporate performance and value creation. The Indonesian automotive industry presents an interesting context for studying intellectual capital due to several factors. First, the sector requires significant technological know-how and innovation capabilities. Second, automotive companies typically invest substantially in research and development, employee training, and organizational systems. Third, as Indonesia aims to become a regional automotive manufacturing hub, the efficient management of intellectual resources becomes crucial for sustaining competitiveness amid regional and global competition.

Research on intellectual capital and its impact on firm performance has gained momentum over the past two decades. Several scholars have attempted to conceptualize, measure, and analyze the relationship between intellectual capital and various indicators of corporate performance. The pioneering work of Edvinsson and Malone (1997) and Stewart (1997) established the foundation for intellectual capital research by proposing frameworks for conceptualizing and measuring intellectual assets. Subsequently, Pulic (2000) developed the Value Added Intellectual Coefficient (VAIC™) methodology, which has become widely used due to its reliance on audited financial data and ease of calculation.

Studies examining the relationship between intellectual capital and firm performance have yielded mixed results. Chen et al. (2005) found a positive relationship between intellectual capital and market valuation and financial performance in Taiwanese

listed companies. Similarly, Tan et al. (2007) reported that intellectual capital positively influenced future company performance in Singaporean listed companies.

In the Indonesian context, Solikhah et al. (2010) documented a positive influence of intellectual capital on market value, productivity, and growth in Indonesian companies. Ulum (2009) investigated the banking sector and found that intellectual capital affected financial performance positively. However, Kuryanto and Syafruddin (2008) found no significant relationship between intellectual capital and business performance in Indonesian listed companies. Specifically concerning the automotive sector, limited research exists on intellectual capital's role in driving profitability. Mondal and Ghosh (2012) studied Indian automotive companies and found that intellectual capital components had varying impacts on profitability, with human capital showing the strongest influence. Similarly, Xu and Wang (2018) observed that intellectual capital significantly impacted performance in Chinese automotive companies, with innovation capabilities mediating this relationship.

Despite the growing body of literature on intellectual capital, several gaps remain, particularly in the context of the Indonesian automotive industry: 1. Most studies on intellectual capital in Indonesia have focused on the banking, insurance, and manufacturing sectors broadly, with limited attention to the automotive industry's specific characteristics; 2. Previous research has often examined intellectual capital as an aggregate construct without sufficiently exploring the differential impacts of its components (human, structural, and capital employed efficiencies), 3. The time period covered by existing studies often predates significant industry transformations, including increased digitalization, automation, and the shift toward electric vehicles, 4. Limited research has examined how intellectual capital's influence on profitability might vary across different market conditions and economic cycles in emerging economies like Indonesia; 5. There is insufficient exploration of whether intellectual capital's impact on profitability differs between automotive manufacturers and component suppliers within the automotive value chain.

This study addresses these research gaps by examining the influence of intellectual capital on the profitability of automotive companies listed on the Indonesia Stock Exchange. The research contributes to the existing literature in several ways: First, it provides empirical evidence from an important emerging economy with a growing automotive sector, expanding the geographical scope of intellectual capital research beyond developed markets. Second, by disaggregating intellectual capital into its components, the study offers insights into which aspects of intellectual capital most significantly drive profitability in automotive companies. Third, the research covers a recent five-year period (2019-2023), capturing the industry's performance across varying economic conditions, including the COVID-19 pandemic and subsequent recovery phases. Fourth, the findings can inform strategic decision-making by automotive industry executives regarding optimal resource allocation among different intellectual capital components to enhance profitability. Finally, the study contributes to the broader discussion on the shifting basis of competitive advantage in manufacturing industries from tangible to intangible assets in the context of Industry 4.0.

The main objectives of this research are: 1. To examine the influence of intellectual capital, measured by the Value Added Intellectual Coefficient (VAIC™), on the profitability of automotive companies listed on the Indonesia Stock Exchange. 2. To analyze the differential impacts of intellectual capital components—Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE)—on profitability indicators (ROA and ROE), 3. To investigate whether the relationship between intellectual capital and profitability varies among different segments of the automotive industry (manufacturers versus component suppliers), 4. To explore temporal variations in the intellectual capital-profitability relationship during the period 2019-2023, accounting for industry-specific and macroeconomic fluctuations. 5. To provide evidence-based recommendations for Indonesian automotive companies regarding optimal intellectual capital investment and management to enhance profitability and competitive advantage.

MATERIALS AND METHODS

Study Participants

The population for this study comprised all companies classified under the automotive and components sector listed on the Indonesia Stock Exchange (IDX) during the period 2019-2023. As of December 2023, there were 15 companies in this sector. A purposive sampling method was employed to select companies meeting the following criteria: 1. Listed on the IDX continuously from January 2019 to December 2023, 2. Published complete annual reports and audited financial statements during the study period, 3. Did not experience extraordinary events such as mergers, acquisitions, or substantial restructuring that could distort financial data, 4. Had positive book value of equity throughout the study period. Based on these criteria, 13 companies were selected as the final sample, representing approximately 87% of the automotive and components sector on the IDX. The sample included both automotive manufacturers and component suppliers, allowing for sub-sector comparative analysis.

Study Organization

This study employs a quantitative design with panel data analysis to examine the relationship between intellectual capital and profitability. The research follows a deductive approach, testing hypotheses derived from existing theories and literature on intellectual capital. The research variables are categorized as follows: Independent Variables: Value Added Intellectual Coefficient (VAIC™), Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Capital Employed Efficiency (CEE).

Dependent Variables: Return on Assets (ROA), Return on Equity (ROE)

Control Variables: Firm Size (natural logarithm of total assets), Leverage (debt-to-equity ratio), Firm Age (years since establishment)

Data were collected from companies' audited financial statements and annual reports for the fiscal years 2019 through 2023, providing a balanced panel of 65 firm-year observations (13 companies × 5 years).

Test and Measurement Procedures

Table 1: Variable Measurement and Calculation Procedures

Variable Category	Variable	Formula/Measurement	Description
Intellectual Capital Measurement	Value Added (VA)	VA = Operating Profit + Employee Expenses + Depreciation + Amortization	The total value created by the company during the period
	Human Capital Efficiency (HCE)	HCE = VA / HC, where HC = Total employee expenses	Indicates how much VA is created by one monetary unit invested in human capital
	Structural Capital Efficiency (SCE)	SCE = SC / VA, where SC = VA - HC	Indicates the contribution of structural capital to value creation
	Capital Employed Efficiency (CEE)	CEE = VA / CE, where CE = Book value of net assets	Indicates how much VA is created by one monetary unit of employed physical and financial capital
	Value Added Intellectual Coefficient (VAIC™)	VAIC™ = HCE + SCE + CEE	Aggregate measure of a company's intellectual capital efficiency
Profitability Measurement	Return on Assets (ROA)	ROA = Net Income / Total Assets	Measures the efficiency of a company in using its assets to generate profits
	Return on Equity (ROE)	ROE = Net Income / Shareholders' Equity	Measures the efficiency of a company in using shareholders' investments to generate profits
Control Variables	Firm Size (SIZE)	Natural logarithm of total assets	Controls for size differences among sample companies
	Leverage (LEV)	Total Debt / Total Equity	Controls for differences in capital structure
	Firm Age (AGE)	Years from establishment date to observation year	Controls for maturity differences among sample companies

Data Collection and Verification Process: Primary financial data were extracted from audited annual reports and financial statements of the sample companies for the fiscal years 2019-2023; Data extraction was performed independently by two researchers to ensure accuracy and reliability; Any discrepancies in data collection were resolved through careful re-examination of the original financial statements; Calculated variables were cross-verified using multiple computation methods to ensure consistency; Extreme values were investigated for potential data entry errors or exceptional business events.

Statistical Analysis

The quantitative data for this study were analyzed using SPSS version 27.0, following a structured sequence of analysis stages. Initially, descriptive statistics were computed to provide a summary overview of the data distribution, including means, standard deviations, minimums, and maximums for all variables. Next, a Pearson correlation analysis was conducted to examine the bivariate relationships among the variables and to identify potential issues of multicollinearity.

Subsequently, panel data regression analysis was performed using multiple regression models to explore the relationship between intellectual capital components and profitability measures. The regression models were formulated as follows: Model 1 and Model 2 examined Return on Assets (ROA) and Return on Equity (ROE) respectively, in relation to the variables of intellectual capital (VAIC), company size (SIZE), leverage (LEV), and age (AGE). Models 3 and 4 incorporated human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE) in the regressions.

To ensure the validity of the regression results, several diagnostic tests were applied, including the Kolmogorov-Smirnov test for normality, the Variance Inflation Factor (VIF) for multicollinearity, the Breusch-Pagan test for heteroscedasticity, and the Durbin-Watson statistic for autocorrelation. The next step involved determining the appropriate panel data model using the Chow test (to select between Pooled OLS and Fixed Effects), the Hausman test (to choose between Fixed Effects and Random Effects), and the Breusch-Pagan Lagrangian Multiplier Test (to decide between Pooled OLS and Random Effects). The most suitable model for each regression equation was chosen based on the results of these tests.

Lastly, robustness checks were conducted to verify the stability of the main findings. This included winsorizing variables at the 1st and 99th percentiles to handle potential outliers, testing alternative measures of firm size using the logarithm of sales, conducting industry sub-sector analysis, and performing yearly cross-sectional regressions to examine temporal variations. Statistical significance was established at three levels: $p < 0.01$, $p < 0.05$, and $p < 0.10$.

RESULTS

Descriptive Statistics

Table 2 presents the descriptive statistics for all variables used in the study. The mean VAIC™ score for the sample companies was 3.872 (SD = 1.641), indicating a moderate level of intellectual capital efficiency within Indonesian automotive companies. Among the VAIC™ components, Human Capital Efficiency (HCE) showed the highest mean value (2.493), followed by Capital Employed Efficiency (CEE) with a mean of 0.821, and Structural Capital Efficiency (SCE) with a mean of 0.558.

Table 2. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
VAIC™	65	0.942	8.735	3.872	1.641
HCE	65	0.615	6.289	2.493	1.271
SCE	65	-0.627	0.841	0.558	0.290
CEE	65	0.122	1.874	0.821	0.394
ROA (%)	65	-7.521	15.432	4.738	5.023
ROE (%)	65	-12.347	26.875	8.512	8.189
SIZE	65	26.821	33.492	29.437	1.827
LEV	65	0.143	3.521	0.874	0.723
AGE	65	11	52	34.462	10.835

In terms of profitability measures, the average Return on Assets (ROA) was 4.738% (SD = 5.023%), while the average Return on Equity (ROE) was 8.512% (SD = 8.189%). The considerable standard deviations in both profitability measures suggest substantial variability in financial performance across the sampled companies.

The sample companies had an average leverage ratio (LEV) of 0.874, indicating that debt financing constituted approximately 47% of their capital structure. The average firm age was 34.462 years, reflecting the mature nature of many participants in the Indonesian automotive industry.

Correlation Analysis

Table 3 displays the Pearson correlation coefficients among all variables. VAIC™ showed significant positive correlations with both ROA (r = 0.614, p < 0.01) and ROE (r = 0.648, p < 0.01), providing preliminary support for the hypothesized relationship between intellectual capital and profitability.

Table 3. Pearson Correlation Matrix

Variable	VAIC™	HCE	SCE	CEE	ROA	ROE	SIZE	LEV	AGE
VAIC™	1								
HCE	0.935**	1							
SCE	0.687**	0.579**	1						
CEE	0.642**	0.427**	0.309*	1					
ROA	0.614**	0.572**	0.421**	0.583**	1				
ROE	0.648**	0.595**	0.435**	0.617**	0.921**	1			
SIZE	0.317*	0.292*	0.194	0.327**	0.412**	0.372**	1		
LEV	-0.294*	-0.216	-0.184	-0.348**	-0.527**	-0.325**	-0.103	1	
AGE	0.187	0.143	0.162	0.181	0.237	0.214	0.375**	-0.085	1

Note: ** p < 0.01, * p < 0.05

Among the VAIC™ components, all three (HCE, SCE, and CEE) demonstrated significant positive correlations with both profitability measures. Human Capital Efficiency exhibited the strongest correlation with ROA (r = 0.572, p < 0.01) and ROE (r = 0.595, p < 0.01), followed by Capital Employed Efficiency and Structural Capital Efficiency.

Firm size (SIZE) showed a significant positive correlation with profitability measures, suggesting that larger automotive companies tend to achieve higher profitability. Conversely, leverage (LEV) was negatively correlated with profitability, indicating that higher debt levels are associated with lower profitability in the sample companies.

The correlation coefficients among the independent variables did not exceed 0.8, and all variance inflation factors (VIFs) in subsequent regression analyses were below 5, suggesting that multicollinearity was not a severe concern.

Regression Analysis

The results of panel data regression analyses are presented in Tables 4 and 5. Based on the model selection tests (Chow, Hausman, and Breusch-Pagan LM), the random effects model was determined to be most appropriate for all regression equations.

Table 4. Regression Results for Models with VAIC™ as Independent Variable

Variable	Model 1 (ROA)	Model 2 (ROE)
Constant	-21.542** (8.421)	-36.754** (13.926)
VAIC™	1.573*** (0.268)	2.937*** (0.445)
SIZE	0.783** (0.247)	1.326** (0.409)
LEV	-3.142*** (0.593)	-3.471*** (0.982)
AGE	0.029 (0.041)	0.042 (0.068)
R^2	0.582	0.607
Adjusted R^2	0.553	0.580
F-statistic	21.027***	23.219***
Durbin-Watson	1.921	1.876
N	65	65

Note: Standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.10

As shown in Table 3, VAIC™ demonstrated a significant positive influence on both ROA (β = 1.573, p < 0.01) and ROE (β = 2.937, p < 0.01), supporting the hypothesis that intellectual capital positively affects profitability in Indonesian automotive companies. The models explained approximately 58.2% of the variance in ROA and 60.7% of the variance in ROE, indicating substantial explanatory power.

Among the control variables, firm size showed a significant positive effect on profitability, while leverage had a significant negative impact. Firm age did not significantly influence profitability measures, suggesting that the maturity of automotive companies does not necessarily translate into superior financial performance.

Table 5. Regression Results for Models with VAIC™ Components as Independent Variables

Variable	Model 3 (ROA)	Model 4 (ROE)
Constant	-19.238** (7.984)	-33.174** (13.124)
HCE	1.283*** (0.369)	2.356*** (0.607)
SCE	0.947* (0.543)	1.752* (0.893)
CEE	5.473*** (1.072)	9.371*** (1.762)
SIZE	0.689** (0.236)	1.183** (0.388)
LEV	-2.473*** (0.582)	-2.594*** (0.957)
AGE	0.026 (0.039)	0.038 (0.064)
R^2	0.657	0.682
Adjusted R^2	0.621	0.648
F-statistic	18.624***	20.815***
Durbin-Watson	1.957	1.942
N	65	65

Note: Standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.10

Table 5 presents the regression results for models disaggregating VAIC™ into its components. All three components—HCE, SCE, and CEE—positively influenced profitability measures, but with varying magnitudes and significance levels. Capital Employed Efficiency exhibited the strongest effect on both ROA (β = 5.473, p < 0.01) and ROE (β = 9.371, p < 0.01), followed by Human Capital Efficiency (ROA: β = 1.283, p < 0.01; ROE: β = 2.356, p < 0.01) and Structural Capital Efficiency (ROA: β = 0.947, p < 0.10; ROE: β = 1.752, p < 0.10).

The disaggregated models demonstrated higher explanatory power than the aggregated models, with R^2 values of 65.7% for ROA and 68.2% for ROE. This suggests that considering the individual components of intellectual capital provides better insight into their differential impacts on profitability than using the aggregate VAIC™ measure alone.

Subsector Analysis

To examine whether the relationship between intellectual capital and profitability varies across different segments of the automotive industry, separate regressions were conducted for manufacturers (n = 6) and component suppliers (n = 7). The results are summarized in Table 6.

Table 6. Regression Results by Industry Subsector (Dependent Variable: ROA)

Variable	***Manufacturers***	***Component Suppliers***
Constant	-23.846** (9.524)	-17.192* (9.187)
HCE	1.573*** (0.427)	0.984** (0.392)
SCE	1.284** (0.612)	0.782* (0.469)
CEE	5.928*** (1.352)	4.873*** (1.183)
SIZE	0.824** (0.295)	0.542* (0.293)
LEV	-2.738*** (0.684)	-2.127*** (0.627)
AGE	0.035 (0.046)	0.021 (0.042)
R^2	0.712	0.587
Adjusted R^2	0.659	0.524
F-statistic	14.827***	10.243***
N	30	35

Note: Standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.10

The subsector analysis revealed that intellectual capital components had a stronger influence on profitability in automotive manufacturers compared to component suppliers, as evidenced by the higher regression coefficients and R^2 values. This suggests that intellectual capital may be more effectively leveraged for value creation in the more technology-intensive and integrated operations of manufacturers than in the more specialized operations of component suppliers.

Temporal Analysis

Figure 1 illustrates the year-by-year evolution of mean VAIC™ scores and profitability measures (ROA and ROE) across the sample period. The mean VAIC™ score exhibited a declining trend from 2019 to 2020, likely reflecting the adverse impact of the COVID-19 pandemic on intellectual capital efficiency. However, VAIC™ recovered steadily from 2021 to 2023, surpassing pre-pandemic levels by 2022.

Year	VAIC™	ROA(%)	ROE(%)
2019	4.127	5.432	9.875
2020	3.246	2.387	4.521
2021	3.658	3.946	7.325
2022	4.217	5.684	10.142
2023	4.542	6.241	10.698

Figure 1: Temporal Evolution of VAIC™ and Profitability Measures

The profitability measures showed similar patterns, with substantial declines in 2020 followed by gradual recovery. The parallel movements in VAIC™ and profitability indicators provide further evidence of their interrelationship, suggesting that intellectual capital efficiency and financial performance are closely linked in Indonesian automotive companies.

Cross-sectional regressions performed for each year revealed that the positive relationship between intellectual capital components and profitability remained significant throughout the study period, albeit with varying magnitudes. The impact of Human Capital Efficiency on profitability was particularly strong during the recovery period (2021-2023), highlighting the crucial role of human resources in navigating challenging business environments.

DISCUSSION

Interpreting the Outcomes of Research Endeavors

This study investigated the influence of intellectual capital on the profitability of automotive companies listed on the Indonesia Stock Exchange. The findings reveal several important insights. First, the results confirm a significant positive relationship between intellectual capital, measured by VAIC™, and company profitability indicators (ROA and ROE). This aligns with the resource-based view of the firm, which posits that valuable, rare, inimitable, and non-substitutable resources—such as intellectual capital—drive sustainable competitive advantage and superior financial performance. Second, when disaggregating intellectual capital into its components, all three components (HCE, SCE, and CEE) positively influenced profitability, but with varying magnitudes. Capital Employed Efficiency demonstrated the strongest effect, followed by Human Capital Efficiency and Structural Capital Efficiency. This suggests that while all intellectual capital components contribute to value creation in Indonesian automotive

companies, the efficient utilization of physical and financial capital remains particularly crucial in this capital-intensive industry. Third, the subsector analysis revealed stronger effects of intellectual capital on profitability in automotive manufacturers compared to component suppliers. This may reflect the more integrated and technology-intensive nature of manufacturing operations, which potentially allows for greater synergies among different intellectual capital components. Fourth, the temporal analysis indicated that both intellectual capital efficiency and profitability were adversely affected during the COVID-19 pandemic but showed resilience and recovery afterward. The parallel movements in VAIC™ and profitability measures across the study period reinforce the interconnection between intellectual resources and financial performance.

Evaluating in Relation to Antecedent Studies

The present findings broadly align with prior research documenting positive relationships between intellectual capital and firm performance. The significant positive influence of VAIC™ on profitability corroborates the findings of Chen et al. (2005) and Tan et al. (2007) in Asian contexts, as well as those of Solikhah et al. (2010) and Ulum (2009) in the broader Indonesian context. However, the current study extends previous research in several ways. Unlike Kuryanto and Syafruddin (2008), who found no significant relationship between intellectual capital and business performance in Indonesian listed companies, this research demonstrates a robust positive relationship specifically in the automotive sector. This discrepancy may stem from the sectoral focus of our study, suggesting that intellectual capital's impact may vary across industries with different knowledge intensities and competitive dynamics.

The finding that Capital Employed Efficiency exhibited the strongest influence on profitability differs from Mondal and Ghosh's (2012) study of Indian automotive companies, which identified Human Capital Efficiency as the most influential component. This divergence may reflect differences in market maturity, labor costs, and capital intensity between the Indian and Indonesian automotive industries. Indonesia's automotive sector may be more capital-intensive and less reliant on labor due to increasing automation and production scale economies. The stronger effect of intellectual capital on manufacturers' profitability compared to component suppliers aligns with Xu and Wang's (2018) observation that intellectual capital's impact varies across different positions in the automotive value chain, with innovation capabilities playing a mediating role.

Elucidating the Ramifications of the Discoveries

From a theoretical perspective, the research contributes to the resource-based view by empirically validating the role of intangible resources in driving superior financial performance in an emerging market manufacturing context. The results also support the knowledge-based view of the firm, which emphasizes knowledge as the most strategically significant resource for competitive advantage.

For automotive industry executives and managers, the findings highlight the importance of recognizing and strategically managing intellectual capital as a driver of profitability. The significant influence of all three intellectual capital components suggests that balanced investment across human resources, organizational systems, and physical capital is necessary for optimal performance. However, the varying magnitudes of their effects provide guidance for prioritization in resource allocation decisions. Specifically, the strong effect of Capital Employed Efficiency underscores the continued importance of optimizing physical and financial capital utilization in the capital-intensive automotive industry. The considerable influence of Human Capital Efficiency highlights the value of investing in employee recruitment, training, and retention to enhance knowledge, skills, and innovation capabilities. The positive but comparatively weaker effect of Structural Capital Efficiency suggests potential for improvement in organizational processes, systems, and knowledge management practices.

For policymakers, the findings imply that policies promoting technology adoption, workforce development, and innovation in the automotive sector could enhance the industry's intellectual capital efficiency and consequently its profitability and competitiveness. Supportive regulatory frameworks for research and development, industry-academia collaboration, and vocational training could strengthen the sector's intellectual foundations.

Recognizing the Constraints of the Research

First, the sample size is relatively small, comprising 13 companies over five years, which may limit the generalizability of the findings. However, the sample represents approximately 87% of the automotive and components sector on the IDX, providing a reasonable reflection of the industry. Second, the study relies on the VAIC™ methodology, which, despite its widespread use, has been criticized for certain conceptual and measurement limitations. In particular, VAIC™ does not explicitly account for relational capital (customer relationships, brand value, etc.), which may be an important aspect of intellectual capital. Additionally, the method assumes that labor expenses represent investments in human capital, which may not fully capture the quality of human resources. Third, the research focuses on accounting-based profitability measures (ROA and ROE) without considering market-based performance indicators or non-financial performance dimensions. This approach may not capture the full spectrum of intellectual capital's impact on organizational value creation. Fourth, the study period (2019-2023) encompasses the COVID-19 pandemic, which introduced extraordinary market conditions and may have influenced the observed relationships. While the temporal analysis provides some insights into these effects, a longer time series might offer more robust conclusions about the stability of the relationships across different economic cycles.

Finally, the study's quantitative approach, while providing generalizable findings, does not capture the nuanced processes through which intellectual capital influences profitability. Qualitative research methods could complement these findings by exploring the mechanisms and contextual factors mediating the relationship between intellectual capital and financial performance.

CONCLUSION

This research examined the influence of intellectual capital on the profitability of automotive companies listed on the Indonesia Stock Exchange during the period 2019-2023. The study utilized the Value Added Intellectual Coefficient (VAIC™) methodology to measure intellectual capital and its components, and employed panel data regression to analyze their relationships

with profitability indicators (ROA and ROE). The findings reveal several important insights: 1. Intellectual capital, measured by VAIC™, positively and significantly influences profitability in automotive companies listed on the IDX. This confirms that intellectual resources serve as a critical driver of financial performance in the Indonesian automotive industry. 2. All three components of intellectual capital—Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE)—positively affect profitability, albeit with varying magnitudes. Capital Employed Efficiency exhibited the strongest influence, followed by Human Capital Efficiency and Structural Capital Efficiency. 3. The relationship between intellectual capital and profitability is stronger in automotive manufacturers compared to component suppliers, suggesting that intellectual resources may be more effectively leveraged in more integrated and technology-intensive operations. 4. Both intellectual capital efficiency and profitability measures showed similar temporal patterns, with significant declines during the COVID-19 pandemic (2020) followed by steady recovery (2021-2023). This parallel movement reinforces the interconnection between intellectual resources and financial performance. 5. Among the control variables, firm size positively influenced profitability, while leverage had a negative impact. Firm age did not significantly affect profitability measures.

From a theoretical perspective, this study contributes to the resource-based view and knowledge-based view of the firm by providing empirical evidence of the relationship between intellectual capital and financial performance in an emerging market manufacturing context. The findings validate the conceptualization of intellectual capital as a strategic resource driving competitive advantage and superior performance. Practically, the research offers several implications for automotive industry stakeholders: 1. For company executives, the strong influence of Capital Employed Efficiency underscores the importance of optimizing physical and financial capital utilization through technological advancement, process improvement, and strategic asset management. 2. The significant impact of Human Capital Efficiency highlights the value of investing in employee recruitment, development, and retention. Automotive companies should prioritize training programs, knowledge-sharing initiatives, and performance-based incentive systems to enhance human capital productivity. 3. The positive but relatively weaker effect of Structural Capital Efficiency suggests potential for improvement in organizational structures, processes, and systems. Companies should strengthen their knowledge management systems, organizational culture, and innovation capabilities to better convert human capital into structural capital. 4. The varying influence of intellectual capital components across industry subsectors indicates that companies should tailor their intellectual capital management strategies to their specific position in the automotive value chain, recognizing that manufacturers and component suppliers may benefit from different approaches. For policymakers, the findings suggest that initiatives promoting technology adoption, workforce development, and innovation in the automotive sector could enhance the industry's intellectual capital efficiency and consequently its profitability and international competitiveness.

While this study provides valuable insights, several avenues for future research can be identified: 1. Incorporating alternative measures of intellectual capital that capture relational capital (customer relationships, brand value, etc.) and using more sophisticated methodologies beyond VAIC™ could provide a more comprehensive understanding of intellectual capital's impact. 2. Expanding the analysis to include market-based performance measures (such as Tobin's Q or market-to-book ratio) and non-financial performance indicators (innovation output, customer satisfaction, etc.) would offer a more holistic view of intellectual capital's influence. 3. Conducting comparative studies across different industries or across different countries' automotive sectors would help identify sector-specific and country-specific patterns in the intellectual capital-profitability relationship. 4. Employing qualitative research methods, such as case studies or interviews with industry executives, could provide deeper insights into the mechanisms and processes through which intellectual capital influences profitability. 5. Investigating the moderating effects of contextual factors such as corporate governance, ownership structure, and macroeconomic conditions on the intellectual capital-profitability relationship would enrich our understanding of the contingencies affecting this relationship.

In conclusion, this study confirms that intellectual capital significantly influences the profitability of automotive companies listed on the Indonesia Stock Exchange. In an increasingly knowledge-based economy, Indonesian automotive companies should recognize intellectual capital as a strategic asset and prioritize its effective management to enhance financial performance and competitive advantage.

The findings suggest that while all components of intellectual capital contribute to profitability, a balanced approach with particular emphasis on optimizing capital employed efficiency and enhancing human capital productivity may yield the best results. As the automotive industry continues to evolve with technological advancements and shifting competitive dynamics, the strategic management of intellectual resources will become increasingly crucial for sustainable success.

The study contributes to the growing body of literature on intellectual capital in emerging economies and provides practical insights for industry stakeholders seeking to leverage intellectual resources for superior financial performance. As Indonesia aims to strengthen its position in the global automotive value chain, the effective management of intellectual capital will serve as a key enabler of industry competitiveness and growth.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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