



## The effect of environmental, social, and governance (ESG) disclosure, and intellectual capital on company financial performance

Olivia Mora Gracia F, Shiddiq Nur Rahardjo

Department of Accounting, Diponegoro University, Semarang, Indonesia

### Abstract

This study analyzes the impact of Environmental, Social, and Governance (ESG) and Intellectual Capital (IC) disclosure on the financial performance of manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2021 to 2023. Using a quantitative approach with purposive sampling, the research examines ESG Disclosure, Intellectual Capital Disclosure, and Value Added Intellectual Coefficient components, including Human Capital Efficiency, Structural Capital Efficiency, and Capital Employed Efficiency, in relation to Return on Assets through multiple linear regression. The results indicate that ESG Disclosure, Intellectual Capital Disclosure, Structural Capital Efficiency, and Capital Employed Efficiency have a positive and significant effect on Return on Assets, demonstrating their contribution to enhancing company profitability. Conversely, Human Capital Efficiency exhibits a negative and insignificant relationship with Return on Assets, suggesting that investment in human capital has not yet provided an optimal financial impact.

**Keywords:** Environmental, Social, and Governance (ESG) Disclosure, Intellectual Capital Disclosure, Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE).

### Introduction

Companies face increasingly complex economic dynamics, necessitating sustainable competitiveness to achieve business objectives. Intensifying competition requires companies to possess a competitive advantage. One key indicator of success in competition is the improvement of financial performance, which can be measured through profitability. High profitability reflects efficiency in resource management and enhances investor confidence. To identify the factors influencing financial performance, it is essential to consider variables that lead to practical steps implemented by management concerning corporate activities, such as corporate accountability in environmental, social, and governance (ESG) aspects, as well as the role of intangible assets that significantly contribute to the company's competitive advantage (intellectual capital).

Environmental, Social, and Governance (ESG) plays a crucial role in financial performance, as it comprises a series of corporate operational activities that not only focus on profit but also emphasize environmental, social, and good corporate governance principles (Antonius & Ida, 2023) [3]. Indonesia has increasingly recognized the importance of ESG by releasing the Phase II Roadmap for Sustainable Finance by the Financial Services Authority (2021–2025) as an initial step to raise awareness and build the capacity of the Financial Services Industry (FSI) in implementing ESG aspects and adapting to climate change towards a low-carbon economy. This Phase II Roadmap aims to establish a comprehensive and sustainable financial ecosystem by involving all relevant stakeholders and fostering cross-sector collaboration. One of the strategic plan's objectives is to prioritize the integration of ESG considerations into all operational activities, focusing on the development of a fully sustainable financial ecosystem (Otoritas Jasa Keuangan, 2021) [19].

A recent measurement approach related to corporate transparency is Environmental, Social, and Governance Disclosure (ESGD) (Buallay, 2019) [7]. ESGD serves as a

new measurement method to support corporate transparency. ESG disclosure has become increasingly common among publicly listed companies in recent years as management seeks to integrate stakeholder needs, meet investor demands, and enhance corporate credibility in response to crises and business competition (Aydoğmuş *et al.*, 2022) [6].

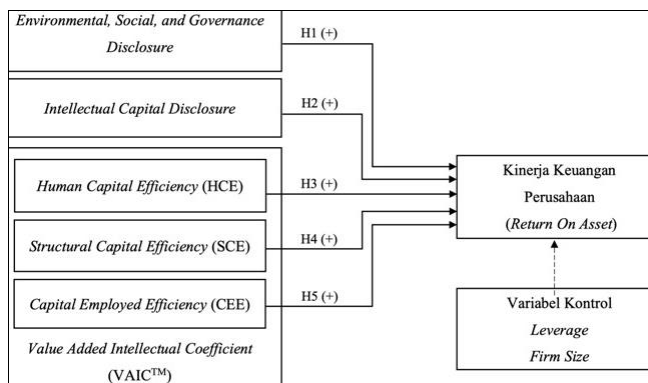
According to Cahyati (2012) [8], a company's financial performance, based on competitive advantage, can be achieved by utilizing its resources (assets). Corporate assets are divided into two categories: tangible assets, which have physical substance, and intangible assets, which do not have physical substance. Lamusu (2019) [17] states that to attract investors, business owners have begun to realize that competitiveness does not solely depend on the ownership of physical assets but rather on innovation, information systems, organizational management, and human resources. Intellectual capital plays a crucial role as an intangible asset that positively impacts financial performance by contributing to operational efficiency, accelerating innovation processes, and strengthening sustainable business strategies. Optimizing intangible assets such as knowledge, skills, and business relationships ultimately enhances productivity and profitability. Furthermore, intellectual capital also contributes to building corporate reputation, attracting investment, and creating a competitive advantage that is difficult for competitors to replicate. This enables companies to be more adaptive to market changes and maintain stronger competitiveness in the long term. Empirical research has been conducted across various countries and industries to examine the impact of intellectual capital and its disclosure, with most studies utilizing the Value Added Intellectual Capital Coefficient (VAIC™) model proposed by Pulic (2000) [21] as an indicator of intellectual capital performance. VAIC™ consists of three key components derived from corporate resources: Human Capital Efficiency (HCE), Structural

Capital Efficiency (SCE), and Capital Employed Efficiency (CEE).

HCE reflects employees' skills, knowledge, innovation, and capabilities. SCE represents the contribution of structural capital in value creation, including organizational processes, procedures, technology, information resources, and intellectual property rights. Examples of structural capital include strategies, organizational networks, patents, and brands. Meanwhile, CEE serves as an indicator for measuring the efficiency of financial and physical capital in generating added value for the company. The Value Added Intellectual Capital Coefficient assists in evaluating the efficiency of capital utilization in creating value.

**Literature Review**

This section explains the relationships among the variables in this study. Financial performance, measured by Return on Assets (ROA), is used as the dependent variable. The independent variables include Environmental, Social, and Governance (ESG) Disclosure, Intellectual Capital Disclosure, and the components of the Value Added Intellectual Coefficient (VAIC™), which consist of Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE). To enhance the accuracy of the analysis, control variables such as leverage and firm size are also included. Based on the relationships among these variables, the conceptual framework is illustrated in the following Fig.



**Fig 1:** Research Framework

**The Effect of Environmental, Social, and Governance Disclosure (ESGD) on Corporate Financial Performance**

In stakeholder theory, ESG disclosure serves as a dialogue between companies and their stakeholders. Therefore, companies continuously strive to disclose information about their business activities to shape stakeholder perceptions and expectations (Safriani & Utomo, 2020) [26]. ESG disclosure, which encompasses environmental, social, and governance aspects, functions as a means for stakeholders to assess a company's sustainability and future prospects.

Transparent ESG disclosure can strengthen corporate reputation, enhance customer loyalty, and reduce operational and compliance risks, ultimately supporting profitability growth. The higher the level of ESG disclosure, the greater the potential improvement in corporate financial performance. Stakeholders can support companies either as consumers of their products or as financial contributors. Through financial support, companies can increase working capital, expand operations, and ultimately boost profits from sales. This profit growth leads to an increase in Return on

Assets (ROA), which positively impacts corporate financial performance.

This assertion is supported by the findings of Ghazali & Zulmaita (2020) [15], Kengkathran (2019) [16], and Wan-Hussin *et al.* (2021) [34], which indicate that ESG disclosure has a significant positive influence on corporate financial performance, using ROA as a proxy. Based on this explanation, the proposed hypothesis for testing is:

**H1:** Environmental, Social, and Governance Disclosure (ESGD) has a positive effect on corporate financial performance.

**The Effect of Intellectual Capital Disclosure (ICD) on Corporate Financial Performance**

According to Yi & Davey (2010) [37], the increasing awareness of the importance of intellectual capital has encouraged companies to voluntarily disclose information about intellectual capital in their annual reports to enhance transparency between management and various stakeholders. In the era of a knowledge-based economy, intellectual capital reflects a company's future potential, making it inadequate to assess corporate value solely based on physical assets. Based on stakeholder theory, transparent and comprehensive intellectual capital disclosure can enhance stakeholders' trust in the company. When stakeholders have better access to information regarding the company's intellectual assets, such as knowledge, innovation, and branding, they are more likely to form a positive assessment of the company's performance and future prospects. The company's efforts to strengthen stakeholder trust are expected to contribute to improved performance, thereby increasing profitability as measured by ROA.

A study conducted by Tricahya Avilya & Ghozali (2022) [31] on manufacturing companies found that intellectual capital disclosure positively influences financial performance as measured by ROA. Similarly, research by Arifin (2020) [4] on manufacturing companies indicated that intellectual capital measured using the VAIC model has a significant positive effect on corporate profitability as reflected in the ROA ratio. Therefore, if a company can effectively manage and develop its intellectual capital, it will be able to utilize its assets more efficiently. This in turn will increase net profit and provide a competitive advantage for the company. Based on this explanation, the proposed hypothesis for testing is

**H2:** Intellectual Capital Disclosure (ICD) has a positive effect on corporate financial performance

**The Effect of Human Capital Efficiency (HCE) on Corporate Financial Performance**

According to Reed (2000) [25], human capital extends beyond the tangible physical assets of a company, such as the number of employees, and encompasses intangible elements derived from competence, attitude, and intellectual agility. In this study, human capital is measured using Human Capital Efficiency (HCE), which is one of the components of VAIC™, by comparing the company's expenditures on employees with the value added they generate. HCE is achieved when increased salary and benefits expenses align with a corresponding increase in company revenue. This explanation aligns with the Resource Based Theory (RBT). From the RBT perspective, HCE, which refers to a company's ability to effectively

manage and utilize its human resources, is a valuable asset that can provide a competitive advantage (Wright *et al.*, 1994) [35]. By optimizing HCE, companies can enhance productivity, innovation, and flexibility, enabling them to better respond to changes in the business environment. Efficiently managed employee skills, knowledge, and capabilities contribute to improved product or service quality, cost reduction, and new product development. Therefore, companies with high HCE will strengthen their competitive advantage and achieve better financial performance. The findings of Thakur (2017) [30] on public and private sector banks listed on the Indian Stock Exchanges demonstrate that HCE has a significant positive effect on financial performance as measured by ROA. Similarly, research conducted by Amalia & Rokhyadi (2020) [2] on companies in the advertising, printing, and media subsectors indicates that value-added human capital has a significant positive impact on financial performance based on the ROA ratio. Based on this explanation, the proposed hypothesis for testing is:

**H3:** Human Capital Efficiency (HCE) has a positive effect on corporate financial performance

**The Effect of Structural Capital Efficiency (SCE) on Corporate Financial Performance**

Structural Capital Efficiency (SCE), as a component of VAIC™, encompasses software systems, distribution networks, supply chains, brands, organizational management processes, and customer loyalty (Tan *et al.*, 2007). According to the Resource-Based Theory (RBT), organizations that possess unique and non-generic organizational policies and procedures, software, research and development programs, training courses, and patents can create a competitive advantage (Akmalia & Rohman, 2021) [1]. From the RBT perspective, organizations with superior resources can achieve sustainable competitive advantages.

SCE represents a rare and unique resource, as each company has distinct characteristics that differentiate it from others. Therefore, it is crucial for management to leverage these unique aspects to enhance corporate value and financial performance (Soewarno & Tjahjadi, 2020). Xu & Zhang (2021) [36] state that high SCE enables companies to overcome inefficiencies while driving increased sales and profitability. This statement is supported by the findings of Dadashinasab & Sofian (2014) [12], Astari & Darsono (2020) [5], and Arifin (2020) [4], which indicate that SCE has a significant positive effect on ROA as an indicator of corporate financial performance. Based on this explanation, the proposed hypothesis for testing is:

**H4:** Structural Capital Efficiency (SCE) has a positive effect on corporate financial performance

**The Effect of Capital Employed Efficiency (CEE) on Corporate Financial Performance**

Capital Employed Efficiency (CEE) is an indicator of a company's ability to utilize all available resources in the form of physical capital (capital employed) and financial capital (Ulum, 2017) [32]. Capital employed refers to the total capital investment required by a company to operate and provides insights into how effectively the company utilizes this capital. Pulic (2000) [21] states that intellectual capital resources cannot function without the support of physical capital. Therefore, CEE, as a component of

VAIC™, integrates the measurement of intellectual capital along with physical capital. According to the Resource-Based Theory (RBT), a company's performance will improve if it can effectively utilize its current and fixed assets (physical capital) in its operations. The presence of physical capital serves as a guarantee for the sustainability of the company's business.

The effective utilization of CEE can enhance return on assets (ROA) as a measure of corporate financial performance since the capital used represents the value of assets contributing to the company's ability to generate revenue (Ratnadi *et al.*, 2021) [24]. This argument is also supported by other researchers, such as Devi *et al.* (2017) [13] and Putri *et al.* (2023) [22], who state that CEE has a significant positive effect on corporate financial performance, as measured by ROA. Based on this explanation, the proposed hypothesis for testing is:

**H5:** Capital Employed Efficiency (CEE) has a positive effect on corporate financial performance.

**Research Method**

This study examines the influence of five independent variables and two control variables on a single dependent variable, namely corporate financial performance. The following presents the operational definitions of the variables and the measurement of the variables to be tested in this research:

**Table 1:** Operational Definition of Variables

Type of Variable	Variables	Formula
Dependent	Return On Asset (ROA)	Laba Bersih / Total Aset x 100%
	Environmental, Social, and Governance Disclosure (ESGD)	Bloomberg ESG Score
Independent	Intellectual Capital Disclosure (ICD)	Index Intellectual Capital ICD = $\sum \frac{D_i}{M} \times 100\%$
	Value Added Intellectual Coefficient (VAIC™)	Value Added = Operating Profit+ Employee Cost+ Depreciation+ Amortization
	Human Capital Efficiency (HCE)	HCE = Value Added / Human Capital
	Structural Capital Efficiency (SCE)	SC = Value Added – Human Capital SCE = Structural Capital / Value Added
	Capital Employed Efficiency (CEE)	CEE = Value Added / Capital Employed
	Control	Leverage
	Firm Size	Ln (Total Asset)

**Notes:** Human Capital= Employee Cost Capital Employed= Total Equity

The hypothesis in this study is tested using multiple regression analysis with classical assumption tests as a prerequisite for the validity of the regression model. The resulting regression equation is as follows:

$$ROA_t = \alpha + \beta_1 ESGD_t + \beta_2 ICD_t + \beta_3 HCE_t + \beta_4 SCE_t + \beta_5 CEE_t + \beta_6 LEV + \beta_7 FSIZE + t\epsilon$$

**Result and Discussion**

Descriptive statistical analysis provides a general overview of the sample size, minimum value, maximum value, mean,

and standard deviation of the sample. The table below presents the descriptive statistics of the conducted study:

**Table 2:** Descriptive statistics

	N	Min	Max	Mean	Std. Dev
ESGD	117	16.45	70.69	44.8241	13.30831
ICD	117	0.47	0.94	0.7294	0.13135
HCE	117	1.02	12.55	4.8478	2.69132
SCE	117	0.00	0.95	0.7301	0.17433
CEE	117	0.01	1.30	0.2182	0.17019
LEV	117	0.00	1.60	0.4421	0.38240
FSIZE	117	27.42	33.73	30.5847	1.37970
ROA	117	-0.01	0.19	0.0727	0.05223

Source: Output SPSS 26, 2025

The classical assumption tests have validated the data, confirming its suitability for hypothesis testing, which includes the coefficient of determination (R<sup>2</sup>) test, F-test, and t-test.

**Table 3:** Coefficient of Determination (R<sup>2</sup>) Test

Model Summary <sup>b</sup>				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.635 <sup>a</sup>	0.403	0.364	0.04164

Source: Output SPSS 26, 2025

Based on the test table, the adjusted R<sup>2</sup> value is 0.364, indicating that the independent variables ESGD, ICD, HCE, SCE, CEE, along with the control variables leverage and firm size, collectively explain 36.4% of the variation in financial performance (ROA). Meanwhile, the remaining 63.6% is influenced by other variables or factors not included in this regression model.

**Table 4:** F-Test

ANOVA <sup>a</sup>					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.127	7	0.018	10.499	0.001 <sup>b</sup>
Residual	0.189	109	0.002		
Total	0.316	116			

Source: Output SPSS 26, 2025

The F-test results in the table show an F-statistic value of 10.499 with a significance level of 0.001 (<0.05). Therefore, it can be interpreted that the independent variables simultaneously influence the dependent variable, ROA.

**Table 5:** t-Test

Coefficient				
Model	Unstandardized Coefficients		t	ig.
	β	Std. Error		
(Constant)	0.145	0.088	1.647	0.102
ESGD	0.002	0.000	4.797	0.001
ICD	0.069	0.031	2.254	0.026
HCE	-0.003	0.002	-1.843	0.068
SCE	0.081	0.024	3.418	0.001
CEE	0.049	0.024	2.030	0.045
LEVERAGE	-0.024	0.011	-2.136	0.035
FSIZE	-0.008	0.003	-2.521	0.013

Source: Output SPSS 26, 2025

Based on the results of the t-test in table 5, the model equation can be formulated as follows:

$$ROA = 0,145 + 0,002ESGD + 0,069ICD - 0,003HCE + 0,081SCE + 0,049CEE - 0,024LEV - 0,008FSIZE$$

**Environmental, Social, and Governance Disclosure (ESGD) Positively Affects Corporate Financial Performance**

The hypothesis testing results indicate that ESGD has a positive and significant impact on the financial performance of manufacturing sector companies, with a coefficient value of 0.002 and a significance level of 0.001. The positive relationship between ESG disclosure and ROA suggests that companies that prioritize environmental, social, and governance aspects tend to exhibit better financial performance. This study supports stakeholder theory, which emphasizes that companies are not only accountable to shareholders but also to various stakeholders, including society and the environment. When companies proactively integrate ESG aspects into their business practices—such as maintaining environmental sustainability, fostering positive social relationships, and implementing transparent governance—these efforts can contribute to improved financial performance.

Efficiency in resource utilization through environmentally friendly policies can reduce operational costs, social responsibility initiatives can enhance employee productivity and customer loyalty, while good corporate governance can attract investors and mitigate business risks. Transparent ESG disclosure reflects a company’s commitment to risk management and social responsibility, thereby increasing public trust and strengthening its competitive advantage within the industry. Therefore, the positive relationship between ESG and ROA indicates that companies that uphold social, environmental, and governance responsibilities tend to achieve superior financial performance, aligning with stakeholder expectations. These findings align with previous research conducted by Aydoğmuş *et al.* (2022) [6], Chininga *et al.* (2024) [9], Pradana & Laksito (2023) [20], and Veeravel *et al.* (2024) [33], which concluded that ESG disclosure positively influences financial performance as measured by ROA. Thus, this study demonstrates that manufacturing companies in Indonesia that are more transparent in ESG disclosure tend to achieve better financial performance.

**Intellectual Capital Disclosure Positively Affects Corporate Financial Performance**

The hypothesis testing results indicate that ICD has a positive and significant impact on the financial performance of manufacturing sector companies, with a coefficient value of 0.031 and a significance level of 0.026. The positive relationship between ICD and ROA suggests that companies that are more transparent in disclosing their intellectual capital tend to achieve better financial performance. This study supports stakeholder theory, which emphasizes that companies have responsibilities toward various stakeholders, including employees, customers, investors, and the broader society. By transparently disclosing intellectual capital, companies can demonstrate their commitment to sustainability and responsible resource management. Intellectual capital comprises human capital, structural capital, and relational capital, all of which

contribute to innovation, operational efficiency, and value creation for stakeholders.

When companies actively disclose information related to intellectual capital, it not only reflects a commitment to transparency but also helps stakeholders assess the company's growth potential and business sustainability. Efficient management of intellectual capital—such as investments in employee training, research and development, and relationship management with customers and business partners—can enhance corporate productivity and innovation. Consequently, high-quality ICD serves as a positive signal to investors and other stakeholders, increasing market confidence and strengthening the company's position in the industry. Therefore, the positive relationship between ICD and ROA indicates that companies with greater transparency in intellectual capital disclosure tend to achieve superior financial performance, aligning with stakeholder expectations.

These findings are consistent with previous research conducted by Cuzzo *et al.* (2017) <sup>[11]</sup>, dan Ramadhan & Laksito (2022) <sup>[23]</sup>, which found that ICD positively influences financial performance as measured by ROA. This study, therefore, illustrates that manufacturing companies in Indonesia that are more transparent in disclosing intellectual capital can achieve better financial performance. Effective ICD implementation not only enhances short-term profitability but also supports long-term value creation through continuous innovation and more efficient management of intellectual resources, in line with stakeholder expectations.

### **Human Capital Efficiency (HCE) Does Not Affects Corporate Financial Performance**

The hypothesis testing results indicate that HCE has a negative but insignificant impact on the financial performance of manufacturing sector companies, with a coefficient value of -

0.003 and a significance level of 0.068. The negative relationship between HCE and ROA suggests that corporate investments in human capital development have not yet fully yielded optimal results in enhancing profitability. However, since the significance value exceeds 0.05, this relationship is not statistically strong enough to be conclusively established. Descriptive statistical results show that the average HCE in the manufacturing sector is 4.84, indicating that companies within the sample have been relatively effective in optimizing their human capital. However, this does not necessarily translate into improved financial performance.

This study does not align with the Resource Based Theory (RBT), which emphasizes that a company's competitive advantage can be derived from leveraging unique and inimitable resources, particularly human capital. The negative and insignificant results may be explained by the possibility that investments in human capital development, such as training and incentives, have yet to produce optimal returns in the short term. Human capital encompasses employee skills, knowledge, experience, and capabilities, all of which contribute to operational efficiency. However, ineffective management of these resources may impose additional costs on the company.

These findings are consistent with previous studies conducted by Akmal & Rohman (2021) <sup>[1]</sup>, Astari & Darsono (2020) <sup>[5]</sup>, Dwipayani & Prastiwi (2014) <sup>[14]</sup>, which

suggest that HCE may have a negative and insignificant impact on financial performance as measured by ROA. Therefore, this study illustrates that manufacturing companies in Indonesia investing heavily in human capital need to optimize their management strategies to ensure that such investments yield positive financial outcomes. Effective HCE implementation depends not only on the amount of investment in human resources but also on aligning human capital management strategies with corporate business objectives and stakeholder expectations.

### **Structural Capital Efficiency (SCE) Positively Affects Corporate Financial Performance**

Based on the results of hypothesis testing, structural capital efficiency has a positive and significant effect on ROA, with a coefficient value of 0.081 and a significance level of less than 0.001. These results indicate that companies with higher structural capital efficiency tend to have better financial performance. Structural capital efficiency reflects the extent to which a company can utilize its structural capital, including systems, processes, and technology, to support value creation. With an average structural capital efficiency of 0.73, it can be concluded that the companies in the sample demonstrate a relatively high level of structural capital efficiency, which contributes to increased profitability.

This study supports the Resource-Based Theory, which emphasizes that a company's competitive advantage can be achieved through the utilization of unique and difficult to imitate internal resources, including structural capital.

Companies with strong systems, procedures, and networks can enhance operational efficiency and support sustainable innovation. With effective structural capital, companies can reduce reliance on individual human capital, thereby creating more stable longterm value.

These findings align with previous research conducted by Chowdhury (2018) <sup>[10]</sup>, Antonius & Ida (2023) <sup>[3]</sup>, dan Tang (2024). Thus, this study illustrates that manufacturing sector companies in Indonesia with more efficient structural capital management can achieve better financial performance.

### **Capital Employed Efficiency (CEE) Positively Affects Corporate Financial Performance**

Referring to the hypothesis testing output, the efficiency of physical capital used in company operations has a positive and significant effect on ROA, with a coefficient value of 0.049 and a significance level of 0.045. This positive result indicates that the higher the efficiency in utilizing capital invested in productive assets, the better the company's financial performance.

This study aligns with the Resource-Based Theory, which states that capital employed, represented by the net asset value, is part of a company's resources that contribute to creating sustainable competitive advantage. Companies that can optimize the use of their capital in production and operational activities tend to achieve higher efficiency, thereby increasing returns for shareholders and other stakeholders. Efficiency in capital utilization also reflects a company's ability to manage its available assets to generate greater revenue compared to the costs incurred.

These findings are consistent with previous studies conducted by Sugiarti (2018) <sup>[28]</sup>, Arifin (2020) <sup>[4]</sup>, dan Nawaz & Ohlroge (2023) <sup>[18]</sup>, which stated that capital employed efficiency has a positive effect on financial

performance. Thus, the positive and significant relationship between capital employed efficiency and ROA indicates that companies with more efficient utilization of working capital tend to achieve better financial performance.

### Conclusion

This study analyzes the impact of Environmental, Social, and Governance (ESG) disclosure, Intellectual Capital (IC), and the components of VAICTM, including Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE), on financial performance, as proxied by Return on Assets (ROA), in manufacturing companies listed on the Indonesia Stock Exchange for the 2021–2023 period. The findings indicate that ESG Disclosure (ESGD), Intellectual Capital Disclosure (ICD), SCE, and CEE have a positive and significant effect on ROA, suggesting that transparency in ESG and IC, strong infrastructure, and efficient capital utilization contribute to improved profitability. Meanwhile, HCE exhibits a negative and insignificant relationship with ROA, indicating that human capital efficiency has not yet provided an optimal impact on profitability.

This study has several limitations that should be considered for future research, such as verifying ICD through third parties to enhance accuracy and utilizing multiple data sources to minimize bias. Additionally, future studies should cover a longer period and a broader range of industries to obtain more representative results.

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