The Influence of Carbon Emission Disclosure, Intellectual Capital, and Independent Commissioners on Firm Value

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Abstract: *This study investigated the impact of carbon emission disclosure, intellectual capital measured by value added capital employed, value added human capital, and structural capital value added, and independent commissioners on firm value. The identified problem was the inconsistency of prior study results regarding these variables and the fluctuations in firm value due to external factors like climate crisis and economic volatility. Utilizing quantitative methods, the study analyzed annual and sustainability reports from 34 industrial sector companies listed on the IDX during 2020-2023. Multiple linear regression analysis was applied. The findings indicated that carbon emission disclosure and value added human capital had a significant positive effect on firm value. Conversely, value added capital employed exhibited a significant negative effect, while structural capital value added and independent commissioners showed no significant impact on firm value. The study concluded that environmental transparency and human resource optimization have the potential to increase firm valuation, whereas suboptimal physical capital efficiency can diminish it.*

Keywords*: Carbon Emission Disclosure, Firm Value, Independent Commissioner, Industrial Sector, Intellectual Capital.*

1. Introduction

Firm value serves as a reference for management in evaluating business actions to create value. For investors, firm value acts as a benchmark for assessing investment performance (Koller et al., 2020). Firm value reflects all of management's efforts in operating the company (Santo, 2024). Firm value is not only influenced by financial performance and internal company factors, external factors such as environmental conditions, geopolitical tensions, changing economic conditions, and industry digitalization also contribute to fluctuations in firm value (Guida, 2025). Amidst volatile and uncertain economic conditions, companies that unable to respond to the global

climate crisis and economic volatility risk losing market confidence (Perdichizzi et al., 2024).

From 1990 to 2021, global greenhouse gas emissions increased by 51%, with the industrial sector being the fastest and most significant contributor to this increase, rising by 225% since 1990 (Ge et al., 2024). In Indonesia, the industrial sector is also one of the largest contributors to carbon emissions (Zuhriyah, 2024). Research conducted by Damas et al. (2021), Hardiyansah et al. (2021), Putri & Agustin (2023), and Yuliandhari et al. (2023) shows that carbon emission disclosure positively affects firm value. However, studies by Hadiwibowo et al. (2023) and Rachmadhika & Firmansyah (2025) indicate a negative impact of carbon emission disclosure on firm value. Conversely, research by Anggita et al. (2022) and Asyifa & Burhany (2022) found no significant effect of carbon emission disclosure on firm value.

The current era of VUCA (volatile, uncertainty, complexity, ambiguity) globalization, with its rapid technological advancements, compels companies to compete more fiercely. The import tariff policy by President Donald Trump is an example of economic volatility that led to a nearly 20% decrease in US imports by April 2025. This policy ultimately impacted the valuation of companies reliant on global supply chains (Guida, 2025). Ahmed et al. (2022) state that investing in intellectual capital can enhance a company's competitive advantage Nguyen & Doan (2020) explain that intellectual capital encompasses the value of a company, employee knowledge, capabilities, ideas, business training, and other aspects not recorded in the company's statement of financial position, which are then classified into three components: value added capital employed (VACA), value added human capital (VAHU), and structural capital value added (STVA).

These three components of intellectual capital are expected to create added value for the company. Research by Herawati & Riswandari (2022), Maghfiroh et al. (2024), Marcellina et al. (2022), and Trisanti et al. (2023) shows that VACA has a positive effect on firm value. In contrast, studies by Mustafa et al. (2024) and Sultan & Supri (2021) indicate that VACA has no significant effect on firm value Aryanindita & Pramono (2023) and Afriyani & Suzan (2021) explain that the contribution of physical capital efficiency actually reduces firm value. In research by Herawati & Riswandari (2022), Maghfiroh et al. (2024), Marcellina et al. (2022), Nguyen & Doan (2020), and Trisanti et

al. (2023), VAHU is stated to have a positive effect on firm value. However, research by Ahmed et al. (2022) shows that VAHU has a negative effect on firm value. Harmono (2023) states that VAHU has no significant effect on firm value, Mustafa et al. (2024) further explain that VAHU has no significant effect on firm value in the insurance and financial services sector. Regarding the STVA component of intellectual capital, research by Ahmed et al. (2022), Marcellina et al. (2022), and Nguyen & Doan (2020) indicates that STVA positively affects firm value. Conversely, Harmono (2023), Herawati & Riswandari (2022), and Maghfiroh et al. (2024) show that STVA has no significant effect on firm value.

Good corporate governance is an important factor for companies in their operations. Within a framework of Good Corporate Governance (GCG), independent commissioners play a crucial role in enhancing oversight. This is aimed at reducing conflicts of interest between principals and agents, while also minimizing the risk of errors and fraudulent practices (Veny & Putri, 2023; Yusra & Sulistyowati, 2023). Research by Afifah & Suwarno (2024), and Setiawan et al. (2023) shows that independent commissioners have a significant positive effect on firm value. In contrast, Saragih & Handayani (2022) shows that the results of independent commissioners have a significant negative influence on the company's value. Research conducted by Dirman et al. (2020), Utami & Paramita (2024), and Yusra & Sulistyowati (2023) Indicates independent commissioners have no significant influence on the value of the company.

The formulation of the problem in this study consists of: 1) How does the disclosure of carbon emissions affect the value of the company? 2) How does value added capital employed affect the value of the company? 3) How does value added human capital affect the value of the company? 4) How does the structural value of capital added affect the value of the company? 5) How does the independent commissioner affect the value of the company. Based on the formulation of the problem that has been prepared, this study aims to determine the influence of carbon emission disclosure, intellectual capital components, and independent commissioners on the firm value. The novelty of this research is found in the research model that combines the variables of carbon emission disclosure, the intellectual capital component, and the proportion of independent commissioners as independent variables in the regression equation model in this study to determine its impact on the company's value. Based on the phenomenon, problem

formulation, and inconsistency of results in previous studies, the author is interested in conducting a study titled "The Effect of Carbon Emission Disclosure, Intellectual Capital, and Independent Commissioners on Firm Value" which will be conducted on industrial sector companies listed on IDX in 2020-2023.

In examining the influence of carbon emission disclosure, intellectual capital, and corporate commissioners on company value, stakeholder theory Freeman (1984) and signaling theory Spence (1973) is used to explain the influence of independent variables on dependent variables. Stakeholder theory complements by showing how such practices help companies meet the expectations of various parties, build legitimacy, and ultimately increase company value. Meanwhile, signaling theory explains how carbon emission disclosures, intellectual capital, and independent commissioners serve as positive signals that reduce information asymmetry and increase market confidence. Veny et al. (2025) explain that positive signals encourage an increase in firm value due to a positive response from investors. Referring to the explanation that has been presented, the hypothesis of this research is formulated as follows:

H1: Carbon Emissions Disclosure has a significant positive effect on Firm Value.
H2: Value Added Capital Employed has a significant positive effect on Firm Value.
H3: Value Added Human Capital has a significant positive effect on Firm Value.
H4: Structural Capital Value Added has a significant positive effect on Firm Value.
H5: Independent Commissioners have a significant positive effect on Firm Value.

2. Research Methods

This study aims to test and provide empirical evidence on the influence of independent variables on dependent variables. The independent variables in this study consist of Carbon Emission Disclosure measured using the content analysis index of the Carbon Disclosure Project (Choi et al., 2013; Rachmadhika & Firmansyah, 2025), VACA, VAHU, STVA measured using the VAIC Pulic model formula (Trisanti et al., 2023), Independent Commissioners as measured by the proportion of independent commissioners to all members of the board of commissioners (Saragih & Handayani, 2022), and the dependent variables of the firm value as measured by Tobin's Q (Rachmadhika & Firmansyah, 2025).

Table 1. Variable Operational Definition

No.	Variable	Measurement	Scale
1.	Firm Value (Y)	$Tobin's\ Q = \frac{MVE + BVL}{BVA}$	Ratio
2.	Carbon Emmision Disclosure (X1)	$\frac{Number\ of\ Disclosures}{Total\ Disclosure\ Items\ (18)}$	Ratio
3.	Value Added Capital Employed (X2)	$\frac{Value\ Added}{Capital\ Employed}$	Ratio
4.	Value Added Human Capital (X3)	$\frac{Value\ Added}{Human\ Capital}$	Ratio
5.	Structural Capital Value Added (X4)	$\frac{Structural\ Capital}{Value\ Added}$	Ratio
6.	Independent Commissioner (X5)	$\frac{Number\ of\ Independent\ Commissioner}{Total\ Board\ Members}$	Ratio

Source: Data processed by the author (2025)

This research was conducted using a quantitative method using secondary data in the form of annual and sustainability reports. The population in this study includes all industrial sector companies listed on IDX in 2020 – 2023. The selection of research samples used the purposive sampling method with the following criteria:

1. Industrial sector companies listed on IDX consistently during the research period.
2. The company publishes annual reports consecutively during the research period.
3. The company publishes annual reports using the rupiah currency.
4. The company publishes its annual report presented with a cut-off date of December 31.
5. The company did not experience a capital deficiency during the study period.

The data test of this study will use SPSS version 26 to be tested in a multiple linear regression equation model. Then the data will be tested with descriptive statistical tests, classical assumption tests, and hypothesis tests that refer to (Ghozali, 2021).

3. Results and Discussion

This research processes data collected through annual and sustainability reports of companies in the industrial sector in 2020 – 2023. The results of the selection of company data samples showed that 34 companies had met the research sample criteria.

Table 2. Sample Selection Results

NO.	SAMPLE CRITERIA	AMOUNT

1.	Industrial sector companies listed on IDX consistently during the research period.	48
2.	Companies that do not publish annual reports consecutively during the study period.	(5)
3.	The company publishes annual reports that use currencies other than the rupiah.	(3)
4.	The company publishes an unpresented annual report with a December 31 cut-off date.	(1)
5.	Companies that experienced capital deficiency during the study period.	(5)
Research sample		34
Research period: Year 2020-2023		4 Years
Data examined		136
Data outlier		(18)
Research data		118

Source: Data processed by the author (2025)

The processed research data has gone through classical assumption testing consisting of the Kolmogorov-Smirnov test for normality test, VIF for multicollinearity test, Durbin-watson test for autocorrelation, and Glejser test for heteroscedasticity (Ghozali, 2021; Sihabudin et al., 2021; Yoda, 2024). This study employs multiple linear regression analysis, alongside tests for the coefficient of determination, model accuracy (F-test), and partial significance (t-test) of the research data.

3.1. Results of Determination Coefficient Test Analysis (R2)

Table 3. Coefficient Determination Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.704[a]	0.495	0.472	0.32679152	0.911

Source: Data processed using SPSS version 26 (2025)

The Adjusted R Square value is 0.472. This means that 47.2% of the variation in the dependent variable is explained by five independent variables in this regression model. The remaining 52.8% came from factors outside the model that were not discussed in this study.

3.2. Results of F Test Analysis

Table 4. F Test

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	11.720	5	2.344	21.949	.000[b]
	Residual	11.961	112	0.107		
	Total	23.681	117			

Source: Data processed using SPSS version 26 (2025)

The results of the F test showed a significance value of 0.000, which is lower than the significance level of 0.05. This indicates that this regression model is ready for use for further testing.

3.3. Results of the Analysis of the t Test

Table 5. t test

Coefficients[a]					
Model		Unstandardized Coefficients	t	Sig.	Results
		B			
1	(Constant)	0.602	4.033	0.000	
	CED	0.227	2.086	0.039	H1 Accepted
	VACA	-0.484	-6.115	0.000	H2 Rejected
	VAHU	0.143	9.443	0.000	H3 Accepted
	STVA	-0.005	-0.444	0.658	H4 Rejected
	KI	0.075	0.242	0.809	H5 Rejected

Source: Data processed using SPSS version 26 (2025)

Table 5. shows the results of the partial hypothesis test of each independent variable against the dependent variable, namely the firm value. From the test results, it was found that the disclosure of carbon emissions and value added human capital partially has a significant positive influence on the company's value, while value added capital employed has a significant negative influence on the company's value. The other two variables, namely structural capital value added and independent commissioners, do not have a significant influence on the value of the company.

3.4. Discussion

3.4.1. The Effect of Carbon Emission Disclosure on Firm Value

The test results showed a significance value of 0.039, which was below the significance limit of 0.050, as well as a coefficient of 0.227. H1 is accepted, which means the disclosure of carbon emissions has a significant positive impact on the value of the company. The high transparency of carbon emissions encourages positive investor appreciation of the company's actions so that the company's valuation increases. These findings confirm the signaling theory that information disclosure can be used as a clue by

investors to the condition of the company. The results of this study are also supported by research previously conducted by Damas et al. (2021), Hardiyansah et al. (2021), and Yuliandhari et al. (2023) which explains that the disclosure of carbon emissions has a positive effect on the value of the company.

3.4.2. The Effect of Value Added Capital Employed on Firm Value

VACA shows a significance of 0.000 less than 0.050 and a coefficient of -0.484, which causes H2 to be rejected. This means that VACA significantly negatively impacts the company's value. The contribution of physical capital efficiency actually reduces the value of the company. This means that excessive or inefficient physical capital investment actually lowers investor perception of the company because ineffective physical capital investment cannot produce added value commensurate with the value of the company's investment. These findings are reinforced by the results of the study Afriyani & Suzan (2021) and Aryanindita & Pramono (2023) which also shows the contribution of physical capital efficiency to decreasing the value of the company.

3.4.3. The Effect of Value Added Human Capital on Firm Value

VAHU has a significance value of 0.000 less than 0.050 and a coefficient of 0.143. H3 was accepted, and it can be concluded that VAHU has a significant positive impact on the firm value. Competent and productive human resources are able to encourage the company's operational activities to run better so as to produce an effective workflow in reducing costs and increasing the company's profits. The results of this study confirm the signaling theory, efficient investment in human resources is a positive signal in considering investor decisions. These results are also in line with research previously conducted by Herawati & Riswandari (2022), Marcellina et al. (2022), and Trisanti et al. (2023) which explains management that can manage the company's human resources efficiently and is able to create added value for the company.

3.4.4. The Effect of Structural Capital Value Added on Firm Value

The significance value of STVA is 0.658, which is greater than 0.050. This led to H4 being rejected, and it was concluded that STVA had no significant impact on the company's value. Structural capital contributions such as systems, organizational culture, or intellectual property, are considered not to be able to affects value that is reflected in the company's share price. The economic value of structural capital is difficult to measure directly and quantitatively. The measurement of structural capital variables can be said to

take into account the innovation component in monetary units and not represent the actual situation so that the calculation only uses residual of the value added and human capital (Puspita & Wahyudi, 2021). In line with Harmono (2023), Herawati & Riswandari (2022), and Maghfiroh et al. (2024) which also concluded that investment in structural capital does not have a significant influence on the company's valuation.

3.4.5. The Influence of Independent Commissioners on Firm Value

The significance of this variable is 0.809, exceeding 0.050. H5 was rejected, and it can be concluded that independent commissioners do not have a significant impact on the value of the company. Investors have not considered the proportion and composition of independent board members as the main indicator in assessing the company's prospects or reputation. The existence of independent commissioners is also often considered only as a form of compliance with GCG regulations because the average number of independent commissioners in sample companies is only 1.46 who only meet the minimum requirements for GCG practices, namely at least 1 independent commissioner in the company in accordance with the POJK No. 57 /POJK.04/2017 which explains the implementation of good corporate governance. The results of this study are in line with the research previously conducted by Dirman et al. (2020), Utami & Paramita (2024), and Yusra & Sulistyowati (2023) which explains that the company's independent commissioner has not been able to become a real instrument to effectively supervise management.

4. Conclusion

The study aims to examine the impact of factors such as carbon emission transparency, investment in intellectual capital (VACA, VAHU, and STVA), and the proportion of independent commissioners to firm value. The focus of this research is industrial companies listed on the Indonesia Stock Exchange (IDX) in the period 2020 to 2023. From the results of the tests that have been carried out, it was found that the disclosure of carbon emissions and value added human capital has a significant positive influence on the value of the company, while value added capital employed actually has a negative influence on the value of the company, while structural capital value added and independent commissioners have no significant influence on the value of the company. From the results of the research, it can be concluded that businesses that are more transparent about environmental issues and maximize the contribution of human

resources have the potential to increase the valuation of their company. Meanwhile, non-optimal physical capital efficiency has the potential to reduce the company's value.

The process of working on and preparing this research is not spared from a number of limitations that can affect the results and interpretation, some of which are the measurement of carbon emission disclosure variables through the content analysis method which depends on the quality and completeness of the analyzed documents so that it has the potential to cause bias and inconsistencies in the measurement process. The authors also take into account data from sample companies that do not publish sustainability reports and do not disclose carbon emissions in certain years during the measurement period of carbon emission disclosure variables. The formula for measuring the variable structural capital value added in the VAIC formula of the Pulic model only takes into account the residue of value added with human capital so that the value of structural capital is greatly influenced by the size of the employee load and is less able to accurately represent the strength of the organizational structure.

For future research preparation, it is expected to consider extending the data period and expanding the scope of the sample, using alternative measurement methods for CED such as GRI-based content analysis and intellectual capital measurement using other measurement models such as MVAIC, as well as adding control variables such as company size, profitability, or researching other sectors to examine the influence of variables This research is in other sectors. The mediating or moderation effects of external environmental effects such as investor and regulatory pressures may also be considered for future research.

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