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Green Strategy, Eco-Efficiency, and Intellectual Capital: Empirical Study in Indonesia

Suwandi[1*]

[1)] Accounting Study Program, Faculty of Economics and Business, Universitas Muhammadiyah Gresik, Indonesia
*e-mail: suwandi@umg.ac.id
*Correspondence Author

ABSTRACT

Today, companies are not only responsible for a single bottom line, which is the value of the company reflected in economic conditions. However, companies must be responsible for triple bottom lines, including economic, social and environmental. This is because economic conditions alone are not enough to ensure the value of the company grows sustainably. Therefore, companies must balance economic performance with social and ecological performance. This study aims to prove the influence of eco-efficiency, green strategy, intellectual capital, and firm size on firm value. In addition, this study also aims to prove the moderating effect of intellectual capital on the influence of eco-efficiency and green strategy on firm value. The data in this study comes from the annual reports of companies listed on the Indonesia Stock Exchange during 2017 to 2022 which were selected using purposive sampling method. Data analysis was carried out using Moderated Regression Analysis (MRA). The results showed that firm value is influenced by eco-efficiency, intellectual capital, green strategy, and firm size. In addition, the results also show that intellectual capital can strengthen the influence of eco efficiency and green strategy on firm value. The implications of the results of this study confirm that company managers need to pay attention and focus not only on the company's economic performance but also social and environmental performance, so as to create maximum company value.

Keywords: eco-efficiency; firm value; green strategy; intellectual capital; SDGs; size

JEL Classification: M41; M42

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INTRODUCTION

According to (Sudana, 2015), profit maximisation is considered inappropriate as a guideline for decision-making in the financial sector. This is because profit maximisation is short-term oriented, ignoring risk factors and social responsibility. Given that this goal is not suitable, financial experts formulate the company's goal to maximise the company's value.

Husnan & Pudjiastuti (2015) states that firm value is the price that prospective buyers are willing to pay if the company is sold. The higher the company value, the higher the level of prosperity achieved by shareholders.

Currently, companies are not only responsible for a single bottom line, namely the value of the company as reflected in economic conditions. However, companies must be responsible for triple bottom lines, including economic, social, and environmental (Lako, 2015). This is because economic conditions alone are not enough to ensure the value of the company grows

sustainably. The way that companies can develop sustainably is by balancing economic performance with social and ecological performance.

Green consumers and producers will grow significantly. Companies should also consider green competition in their business strategies (DeBoer et al., 2017) . There is a growing expectation in society to build companies to take the initiative in their business processes to conform to the concept of eco-efficiency. This concept defines efficiency that includes aspects of natural resources and energy or production processes that minimise the use of raw materials, water, and energy as well as the environmental impact per unit of product (Kementerian Lingkungan Hidup, 2003).

In contrast, in October 2019, Indonesia was ranked as the 7th most polluted country in the world (www.idx.co.id). In early 2021, several forest and land fires occurred in several regions in Indonesia, including Central Kalimantan, North Sumatra, Riau, and many more, causing several cities in Indonesia to declare air pollution hazard status (Kompas.com, 2021).

Efforts made by the Ministry of Environment in responding to environmental issues have been carried out for a long time, namely by launching the Company Performance Rating Assessment Programme (PROPER) in 2002. The purpose of PROPER is to encourage corporate governance in environmental management through information instruments. The best environmental performance assessment rating (gold) can explain the company's value better than other ratings (green, blue, red, and black). The company can use the rating as a basis for decision making by internal and external parties.

In addition, the topic of the environment is a topic that needs to be studied and researched, given the negative impact on the environment in Indonesia from the activities of companies that are not aware of the importance of innovation that prioritises environmental aspects. The application of the concept of eco-efficiency can provide added value for the company and increase the efficiency of the price of a product by considering the company's environmental impact. This research is a combination of research that discusses the effect of Green Strategy on firm value for example (Soewarno et al, 2019; Dewi & Ajeng, 2020) and research that discusses the effect of eco-efficiency on firm value for example, (Panggau & Septiani, 2017; Avianti & Isbanah, 2019; Rais et al, 2020). This study adds intellectual capital as a moderator variable because in some previous studies it was found that intellectual capital affects firm value both as an independent variable and as a moderator variable, for example Sari et al, 2019; Achyani et al, 2020; WBCSD, 2000).

According to Dewi & Ajeng (2020), if the company can create economic and environmental balance, then the sustainability of the company will be achieved. Creating value for stakeholders requires managers to optimise financial performance, social performance and environmental performance. A high level of productivity and innovation in a company can help achieve and maintain the value of the company itself. Green strategy is one of the keys for companies to create a competitive advantage if done regularly and applied to their business processes. According to Dewi & Ajeng (2020), green innovation can also be used as a tool for marketing activities to increase market share. In research conducted by

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Soewarno et al (2019) and Salvatore (2005), green innovation strategies give a positive signal to Firm Value. Therefore, from the above explanation, the following hypothesis can be obtained:

H_1: Green strategy has a significant positive effect on firm value.

Panggau & Sepiani (2017) stated that businesses that have implemented eco-efficiency in their operational activities have several advantages, such as improving the image of the company itself, increasing the company's stock price, and having a better company value than companies that do not implement eco-efficiency. According to Dewi & Ajeng (2020), eco-efficiency is a concept that encourages companies to develop their level of environmental performance, or at least equivalent to economic performance. This effort can reduce environmental impacts and excessive resource consumption. The results of this study state that eco-efficiency has an influence on financial performance. This is in accordance with research (Panggau & Septiani, 2017;Rais et al, 2020; Agustia et al, 2019) which states that for stakeholders, eco-efficiency is a positive signal to increase the value of the company which will ultimately increase the value of the company. Based on the explanation above, the hypothesis is formulated as follows:

H_2 : Eco-efficiency has a significant positive effect on firm value

According to Achyani et al (2020), intellectual capital is the total value of the company that describes the company's intangible assets sourced from three pillars, namely human capital, structural capital, and customer capital. By adding value and increasing the competitive advantage of the company's business, intellectual capital is said to have an impact on firm value. Based on knowledge-based theory, if the company can utilise intellectual capital to improve the company's performance, the company's value will increase. This is stated in research Sari & Dwirandara (2019) and WBCSD (2000), intellectual capital can give a positive signal to the value of the company. The characteristics of the intellectual capital variable in this study are as a quasi moderator, which is a variable that can be an independent variable and at the same time a moderating variable. High company value makes investors choose to invest in the company. With good management and utilisation of intellectual capital, the company's financial performance will be high, resulting in competitive advantage and added value for the company. Based on the explanation above, the following hypothesis is formulated:

H_3 : Intellectual capital strengthens the effect of green strategy on firm value

H_4 : Intellectual capital strengthens the effect of eco-efficiency on firm value

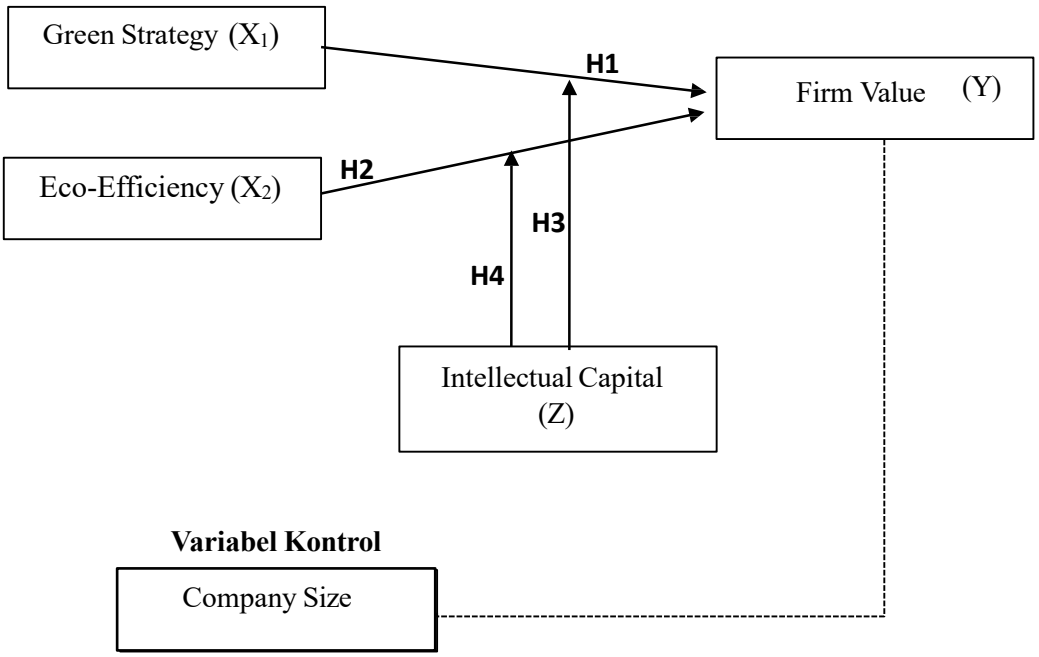


Figure 1. Research Model

RESEARCH METHOD

1. Sample

The type of data used in this study is secondary data taken from the company's financial statements and annual reports from the period 2017-2022. The method of determining the sample in this study using purposive sampling technique. The sample selection is based on the following criteria: (a) Non-service companies listed on the Indonesia Stock Exchange (IDX) in 2017-2022; (b) Non-service companies that publish annual reports or sustainability reports that can be downloaded through the IDX website or each company's website during the 2017-2022 period in a row; (c) Companies that participate in the Company Performance Rating Assessment in Environmental Management (PROPER) from the Ministry of Environment in 2017-2022.

2. Operational Definition and Measurement of Variables

In this study, there are several types of variables, namely independent variables, moderating variables, control variables, and dependent variables. The following are the variables used in this study.

Dependen Variable (Y)

The dependent variable in this study is Firm Value. Company Value measurement can be proxied by using Tobin's Q. Tobin's Q ratio can be calculated using the formula version (Chung et al, 1994) which refers to research (Rais et al, 2020).

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$$Q = (MVS+MVD)/RVA$$

Where,

Q = Tobin's Q

MVS = Market Value of all outstanding share

MVD = Market Value of all debt

RVA = Replacement Value of all production capacity

Independent Variable (X)

The independent variables used in this study are green strategy and eco-efficiency. The green strategy variable refers to research (Soewarno et al, 2019), measuring green strategy using the scoring method, which uses 4 (four) green items, namely vision, mission, values, and strategies related to green strategy.

Table 1. Measurement of Green Strategy Variables

Variabel	Indicators
Green Strategy	1. The company selects the least polluting product materials to conduct product development or design, 2. The company selects the material of the product that consumes the least energy and resources to carry out product development or design, 3. The company uses the least (reduced) product material for the product in conducting product development or design, 4. The company carefully uses whether the product is easy to recycle, reuse, and degradable to conduct product development or design.

Source: (Chen et al., 2006).

The second independent variable is Eco-efficiency measured by giving a value of 1 for companies that are eco-efficient and 0 for companies that are not eco-efficient. In this study, a company can be said to be an eco-efficient company if the company has ISO 14001 certification.

Moderation Variable

The moderator variable used in this study is Intellectual Capital as measured by the Value Added Intellectual Capital (VAIC) method. VAIC™ measures the intellectual property of the organisation which is used as a BPI (Business Performance Indicator) designed by (Pulic, 1998) which refers to the research of Sari & Dwirandara (2019). VAIC™ is the sum of the previous 3 components, namely: VACA, VAHU, and STVA, which are prorated by the formula:

VAIC™ = Value added Intellectual Capital

VACA = Value added capital employed

VAHU = Value added human capital

STVA = Value added structural capital

Control Variable

In this study, firm size is used as a control variable. Firm Size is the scale of a company which can be seen from the amount of total assets, log size, stock market value and others. The size of a company can affect the ability to bear the risks that may arise from the risks that will be faced (Pratama et al, 2016). Referring to research (Dewi & Ajeng, 2020) in this study the company's research is measured in Log of total assets formulated by:

$$Size = L(n)\ Total\ asset$$

3. Data Analytics Techniques

The data obtained from the data that has been collected is then analysed using the Moderated Regression Analysis (MRA) technique with the help of SPSS version 22.0 software. The analysis stages include descriptive statistical tests, classical assumption tests, and hypothesis testing. Research variables are defined operationally to facilitate measurement in accordance with relevant indicators. The form of the regression equation in this study is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \quad (1)$$
$$Y = \alpha + \beta_1 X_1 * X_3 + \beta_2 X_2 * X_3 + \beta_4 X_4 + \varepsilon \quad (2)$$

Where
α: Constant; β: Coefficient; ε: Error; Y: Firm Value; X_1: green strategy; X_2: eco-efficiency; X_3: intellectual capital; X_4: size

RESULT & DISCUSSION

Research Data Sampling Process

The stages that have been carried out in this study identify the samples that will be used in this study. In this study, the sampling process carried out was using purposive sampling method. The results of checking the companies listed on the IDX in 2017-2022 in this study are as follows.

Table 2. Results of the Research Sampling Process

Company Sector	Total Before Data Selection	Total After Data Selection
Healthcare	14	6
Basic Materials	70	5
Consumer Non Cyclicals	63	2
Industrials	37	4
Energy	53	5
Consumer Cyclicals	82	15
Infrastructures	36	6

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Property & Real Estates	48	9
Number of listed companies on the IDX 2017-2022	403	52

Source: data processed by researchers

Table 2 above shows that the sampling process that has been carried out shows that the number of companies used in this study after selecting the data is 52 companies. Furthermore, these 52 companies will be observed from 2017 to 2022. Thus, the number of observations made in this study is 312 observations. The reduction in the amount of research data is due to several reasons, namely (1) there are company annual reports that cannot be accessed, (2) there are companies that do not present complete research data, especially for green strategy and eco efficiency variables. Therefore, companies that do not meet the criteria are removed from the list of companies used in this study.

Statistics Descriptive

The first test conducted in this study is a descriptive statistical test. This test is carried out with the aim of providing an overview of the research data that has been collected in this study through the minimum, maximum, average, and standard deviation values. Table 3 below presents the results of descriptive statistical tests that have been carried out in this study.

Table 3. Descriptive Statistics Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
Eco Efficiency	312	0	1	0,33	0, 470
Tobins'Q	312	0,05	22,56	1,4680	2,52858
Modal Intelektual	312	2,03	24,07	16,34	6,67
Ukuran Perusahaan	312	8,33	37,89	27,37	5,35
Green Strategy	312	0	4	2,46	1,150
Valid N (listwise)	312				

Source: data processed

Table 3 presents data from the variables used in this study. The eco-efficiency variable has a minimum value of 0, a maximum of 1, and an average of 0.33. This indicates that the number of ISO certifications found from 52 companies that became research samples during 2017 to 2022 was 33% or 103 observations studied in this study.

Table 3 shows that the Tobin's Q variable has a minimum value of 0.05; a maximum of 22.56; and an average of 1.4680. This indicates that there are two categories of research data for Tobin's Q in this study, namely Tobin's Q less than 1, indicating that there are observations that indicate that there are companies that are classified as *undervalued* because their book value is higher than their market value. This can attract interested parties to buy the company. Furthermore, there is a Tobin's Q value of more than 1 which indicates that there are companies that are classified as expensive *(overvalued)*, thus attracting parties who want to imitate the company's business model in order to benefit as well.

Table 3 shows that the intellectual capital variable measured by the Value Added Intellectual Coefficient (VAIC) formula has a minimum value of 2.03; a maximum value of 24.07; and an

average of 16.34. These results indicate that the companies sampled in this study during 2017 to 2022 have a positive value so that the company has succeeded in creating value (value creation efficiency) from tangible and intangible assets.

Table 3 shows that the company size variable measured by the natural logarithm of the total asset value shows a minimum value of 8.33; a maximum value of 37.89; and an average of 27.37. These results indicate that the companies sampled in this study during 2017 to 2022 have a large size.

Classical Assumption Test

The classical assumption test in this study was carried out to ensure that the regression model in this study met the BLUEs (Best Linear Unbiased Estimators) criteria. The classic assumption test in this study was carried out by conducting a normality test, multicollinearity, and heteroscedasticity test. The first test carried out is the normality test which aims to determine whether the data distribution in this study is normal or not. The normality test is carried out by conducting the Kolmogorov Smirnov test (K-S test) and the shape of the P-plot. Table 4 and Figure 2 below present the results of the normality test that has been carried out in this study.

Table 4. Normality Test Results

		Unstandardized Residual
N		312
Normal Parameters[a,b]	.0000000	0,00
	.98851498	2,601
Most Extreme Differences	.029	0,056
	.029	0,056
	-.025	-0,038
Kolmogorov-Smirnov Z		0,029
Asymp. Sig. (2-tailed)		0,200[c,d]

a. Test distribution is Normal.
b. Calculated from data.

Source: Output SPSS

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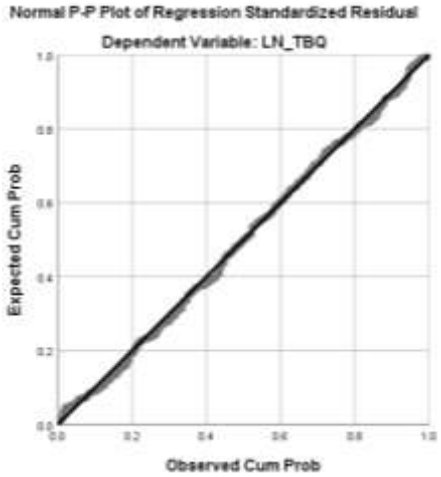


Figure 2. P-Plot Uji Normalitas

Table 4 above shows the Kolmogorov Smirnov results that have been carried out in this study. The significance value shows a value of 0.200 so that this value shows that it is greater than 0.05. Thus, the K-S test results show that this research data has a normal data distribution. The results of this normality test are also supported by Figure 2, where the histogram shows that the curve formed forms an arch in the middle and the points on the P-Plot approach the diagonal line in the middle.

The second classic assumption test carried out in this study is the multicollinearity test. The multicollinearity test is carried out to see the relationship or correlation that occurs between each variable. A good regression model should not have a correlation between the independent variables. This test is carried out by looking at the Tolerance value and the Variance Inflation Factor (VIF) value of each independent variable. The regression model is said to be good if it has a tolerance value of more than 0.1 and VIF less than 10. Table 5 below shows the results of the multicollinearity test that has been carried out in this study.

Table 5. Multicollinearity Test Results

Variable	Tolerance	VIF
Eco Efficiency	0,948	1,055
Modal Intelektual	0,952	1,051
Ukuran Perusahaan	0,961	1,040
Green Strategy	0,947	1,056

Source: Output SPSS

The third classic assumption test carried out in this study is the autocorrelation test. The autocorrelation test is carried out to be able to see if there is a correlation between a period and previous periods. A good regression model should not have a correlation between a period and previous periods. This test is done by looking at the Durbin Watson (DW) value. The regression model is said to be good if it has Durbin Watson (DW) more than DU and 4-DU. Table 6 below shows the results of the multicollinearity test that has been carried out in this study.

Table 6. Autocorrelation Test Results

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0,366[a]	0,134	0,123	0,99493	2,123

a. Predictors: (Constant), Green Strategy, UKP, VAIC, Eco Efficiency
b. Dependent Variable: LN_TBQ
Source: Output SPSS

The last classic assumption test is to conduct a heteroscedasticity test. This test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. In this study, the heteroscedasticity test was carried out based on the scatterplot. A good regression model does not experience heteroscedasticity which is indicated by a scatter plot pattern that spreads and does not form a certain pattern. Figure 3 below shows the results of the heteroscedasticity test that has been carried out in this study.

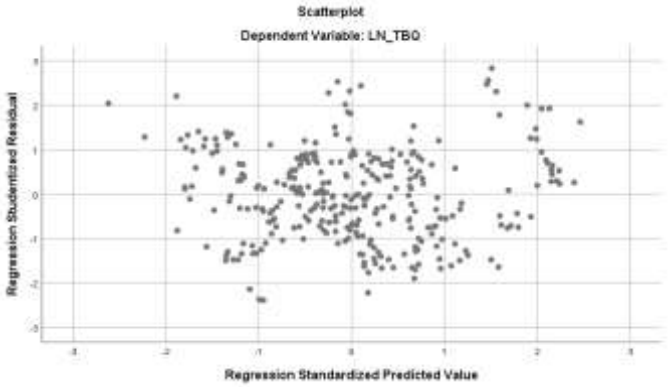


Figure 3. Heteroscedasticity Test

Research Hypothesis Test

The last stage in data analysis is to test the research hypothesis. This stage consists of several testing processes, namely the coefficient of determination (R^2) test, simultaneous test (F test), direct effect test, and sobel test. Table 7 below presents the results of hypothesis testing that has been carried out in this study.

Table 7. Hypothesis Test Results

Relationship	Coefficient	t-value	Sig.	Information

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Eco-Efficiency → Firm Value	0,266	18,857	0,000	Significant
Intellectual Capital → Firm Value	0,385	6,376	0,000	Significant
Green Strategy → Firm Value	0,349	1,997	0,047	Significant
Size → Firm Value	0,044	5,761	0,000	Significant
Eco-Efficiency * Intellectual Capital → Firm Value	0,210	5,088	0,000	Significant
Green Strategy * Intellectual Capital → Firm Value	0,230	1,998	0,046	Significant
Sig. F test Model 1				0,000
Sig. F test Mode Model 2				0,000
Coefficient of Determination Model 1				0,741
Coefficient of Determination Model 2				0,737

Source: Output SPSS

Table 7 above shows some important research results, namely that firm value is influenced by eco-efficiency, intellectual capital, green strategy, and firm size. In addition, the results also show that intellectual capital can strengthen the influence of eco-efficiency and green strategy on firm value. Thus, hypotheses $_{H1}$,$_{H2}$, $_{H3}$, and $_{H4}$ in this study are accepted.

The Effect of Green Strategy on Firm Value

The results of this study indicate that green strategy has a positive influence on firm value. This is indicated by the coefficient value and significance resulting from the regression test that has been carried out. The regression test results show that the coefficient value is 0.349 and the significance value is 0.047. Thus, the results of this study indicate that if the value of green strategy increases by 1 value, it will cause an increase in firm value by 0.349. Thus, the first hypothesis of this study (H_1) which states that green strategy has a positive effect on firm value in this study is accepted.

The results of this study are in line with the explanation conveyed by [9], which states that if the company can create an economic and environmental balance, then the sustainability of the company will be achieved. Creating value for stakeholders requires managers to optimise financial performance, social performance, and environmental performance. A high level of productivity and innovation in a company can help achieve and maintain the value of the company itself. Green strategy is one of the keys for companies to create a competitive advantage if done regularly and applied to their business processes. According to [9], green innovation can also be used as a tool for marketing activities to increase market share. In research conducted by [8] and [16], green innovation strategy gives a positive signal to Firm Value.

The Effect of Eco-Efficiency on Firm Value

The results of this study further show that eco-efficiency has a positive influence on firm value. This is indicated by the coefficient value and significance resulting from the regression test that has been conducted. The regression test results show that the coefficient value is 0.266 and the significance value is 0.000. Thus, the results of this study indicate that if the value of eco-efficiency increases by 1 value, it will cause an increase in firm value by 0.266. Thus, the first hypothesis of this study (H_2) which states that eco-efficiency has a positive effect on firm value in this study is accepted.

The results of this study are in line with the explanation conveyed by [10] which states that business people who have implemented eco-efficiency in their company's operational activities have several advantages, such as increasing the image of the company itself, increasing the company's stock price, and having better company value than companies that do not implement eco-efficiency. According to [9], eco-efficiency is a concept that encourages companies to develop their level of environmental performance, or at least equivalent to economic performance. This effort can reduce environmental impacts and excessive resource consumption. The results of this study state that eco-efficiency has an influence on financial performance. This is in accordance with research [10], [17] and [12] which state that for stakeholders, eco-efficiency is a positive signal to increase the value of the company which will ultimately increase the value of the company.

Moderating Effect of Intellectual Capital on the Effect of Green Strategy and Eco-Efficiency on Firm Value

The results of this study further show that intellectual capital can strengthen the effect of green strategy and eco-efficiency on firm value. This is shown from the coefficient value and significance resulting from the regression test that has been conducted. The regression test results show that the coefficient values are 0.210 and 0.230, while the significance values are 0.000 and 0.046. Thus, the results of this study indicate that if the intellectual capital owned by the company is getting better, the effect of green strategy and eco-efficiency on firm value will also be stronger.

The results of this study are in line with the explanation presented by [14] which states that intellectual capital is the total value of the company that describes the company's intangible assets sourced from three pillars, namely human capital, structural capital, and customer capital. By adding value and increasing the competitive advantage of the company's business, intellectual capital is said to have an impact on firm value. Based on knowledge-based theory, if the company can utilise intellectual capital to improve the company's performance, the company's value will increase. This is stated in research [13] and [15], intellectual capital can give a positive signal to the value of the company. The characteristics of the intellectual capital variable in this study are as a quasi moderator, which is a variable that can be an independent variable and at the same time a moderating variable. High company value makes investors choose to invest in the company. With good management and utilisation of intellectual capital, the company's financial performance will be high, resulting in competitive advantage and added value for the company.

CONCLUSION

The purpose of this study is to prove the influence of eco-efficiency, green strategy, intellectual capital, and company size on company value. In addition, this study also aims to prove the moderating effect of intellectual capital on the influence of eco-efficiency and green strategy on company value. The results of the study indicate that eco-efficiency, intellectual capital, green strategy, and company size affect company value. In addition, the results of the

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study also show that intellectual capital can strengthen the influence of eco-efficiency and green strategy on company value. The results of this study support the application of the triple bottom line concept, namely company value reflected in the balance between profit, people, and planet. Therefore, the emphasis of the results of this study emphasizes that company managers need to pay attention and focus not only on the company's economic performance but also on social and environmental performance, so as to be able to create maximum company value.

The results of this study can be used as a reference for academics who want to conduct similar research in the future or also by practitioners such as company managers, investors, and regulators. However, the limitations of the study also need to be considered so that the use of the results of this study is appropriate. The first limitation of this study is the number of companies excluded from the research sample is very large because these companies do not have the required research data. Therefore, further research needs to consider measuring the green strategy variable so that not too many companies are eliminated. The second limitation of this study is related to the problem of normality of research data. This is most likely due to the Covid-19 phenomenon in 2020 and 2021, which caused the distribution of research period data to experience differences that were quite disruptive to the level of data normality. Therefore, further research is expected to extend the number of research periods in the future to increase data variation. Thus, the effect of Covid-19 in 2020 and 2021 can be reduced on data normality.

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