The Role Of Gender Diversity In Increasing ESG Performance Through Intellectual Capital

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Abstract: This study examines whether intellectual capital mediates the association between board gender diversity and ESG performance. The samples were selected based on criteria that included all non-financial companies registered on the Indonesia Stock Exchange. The total observations are 257 in the period 2017 to 2022. ESG scores were obtained from the Refinitiv Eikon database as a proxy for ESG performance, intellectual capital proxied by the value-added intellectual coefficient (VAIC) model, and directors' gender diversity proxied by the percentage of female directors. The results show intellectual capital mediates the association between board gender diversity and ESG performance. These results suggest that board gender diversity positively affects ESG performance if the company has intellectual capital that adds value to create competitiveness. This study aims to help companies understand the importance of gender diversity in managing and utilising intellectual capital to improve the company's ESG performance.
Keywords: Intellectual Capital; ESG Performance; Gender Diversity of Directors.

Abstrak: Penelitian ini menguji apakah *intellectual capital* berperan dalam memediasi hubungan antara keberagaman gender direksi dan kinerja ESG. Sampel penelitian dipilih berdasarkan kriteria yang mencakup semua perusahaan non keuangan yang terdaftar di Bursa Efek Indonesia. Total observasi sebanyak 257 dalam periode 2017 sampai dengan 2022. Skor ESG yang diperoleh pada database Refinitiv Eikon sebagai proksi dari kinerja ESG, model *Value added intellectual coefficient* (VAIC) sebagai proksi dari *intellectual capital*, dan keberagaman gender direksi diproksikan dengan persentase direktur wanita. Hasil penelitian menunjukkan bahwa terdapat peran mediasi *intellectual capital* pada hubungan keberagaman gender direksi dan kinerja ESG. Hasil ini menunjukkan bahwa keragaman gender dewan direksi berhubungan positif dengan kinerja ESG jika perusahaan memiliki modal intelektual yang memberikan nilai tambah untuk menciptakan daya saing. Pentingnya penelitian ini adalah untuk membantu perusahaan memahami pentingnya keberagaman gender dalam mengelola dan memanfaatkan *intellectual capital* untuk meningkatkan kinerja ESG perusahaan.
Kata Kunci: Intellectual Capital; Kinerja ESG; Keberagaman Gender Direksi.

INTRODUCTION

The issue of corporate sustainability is increasingly becoming a concern for stakeholders such as investors, regulators, and researchers. This emphasises that companies are responsible for behaving sustainably and minimising negative environmental and social impacts (Eliwa et al., 2019). Corporate sustainability can be measured by considering three significant factors: environmental, social, and governance (ESG). These three factors are used as considerations by investors in assessing company performance. Investors will be attracted to invest in companies with better ESG performance as a sustainable investment.

ESG performance is the ESG disclosure reported by the company in its sustainability report. Various independent parties assess ESG performance based on the ESG disclosures

made by the company. Based on this assessment, an ESG score measures ESG performance. The ESG performance was measured based on the ESG score values in the Refinitiv Eikon database. The higher ESG score reflects the fulfilment of the three ESG factor criteria.

The role of directors can be optimised to increase ESG performance because the directors act as managers of the company. The directors have diverse demographic characteristics. Several of these characteristics can determine a company's success in improving its performance (Pucheta-Martinez & Gallego-Álvarez, 2020).

Gender diversity is one of the demographic characteristics of directors, which also supports improved ESG performance. The directors' gender diversity represents the formation of directors consisting of males and females. Presenting the roles of women and men in company leadership is very beneficial for the company. This is because gender-diverse board members have different talents and leadership styles in decision-making. Previous studies have found that board gender diversity is beneficial for improving ESG performance (Shakil et al., 2021; Naciti, 2019; Romano et al., 2020; Wu et al., 2021; Yadav & Prashar, 2022; Bhatia & Marwaha, 2022).

Board gender diversity will optimally improve ESG performance if supported by adequate company resources. One such resource is intellectual capital. Intellectual capital can create competitive advantages that are useful for improving business performance. In alignment with the resource-based view theory (Barney, 1991), intellectual capital utilised optimally can establish the company's competitive advantage.

Intellectual capital can provide a competitive advantage if managed effectively. Therefore, the leadership role of directors as managers is needed in optimising intellectual capital. Women directors have an essential role in the management of the firm. Presenting women as the directors can avoid conflicts of interest because women can make decisions that are profitable for shareholders so that they can optimise the intellectual capital (Nadeem et al., 2019) and ultimately increase company value (Pucheta-Martinez & Gallego-Álvarez, 2020). Several previous researchers, such as (Minoja & Romano, 2021), (Fajriyanti et al., 2021), (Nakyeyune et al., 2022), (Bananuka et al., 2021), and (Bananuka et al., 2022) found that intellectual capital can improve ESG performance.

The literature has provided evidence that board gender diversity can directly increase ESG performance. In addition, gender diversity is also positive with intellectual capital efficiency, while intellectual capital is proven to enhance ESG performance directly. So, it can be assumed that intellectual capital also indirectly influences the association among the gender diversity of directors in improving ESG performance. However, based on literature studies, no empirical evidence has been found regarding the indirect role of director's gender diversity in improving ESG performance through intellectual capital. Therefore, this study examines whether gender diversity of directors improves ESG performance through the intermediary of intellectual capital.

This research focuses on registered companies in Indonesia. Regulations in Indonesia require registered companies to present sustainability reports, so researchers argue that by making sustainability reporting mandatory, companies in Indonesia will try to optimise company management and its resources to improve ESG performance. This is useful for the company to maintain good relations with various parties external to the company and maintain its reputation so that investors consider it good. Apart from that, Indonesia has a two-tier board system with two board functions, including the board commissioner and the board directors. Researchers argue that gender diversity in the

separation of board system functions will benefit the company in improving its performance. This research focuses on the directors essential in managing the company.

In the existing literature, research on the effect of gender diversity of directors on corporate ESG performance is still not comprehensive. As far as the literature review is concerned, there is no empirical study that examines the role of intellectual capital as a resource that can be discovered and utilised by company directors so that it can provide benefits to the company in improving ESG performance. This research seeks to fill this gap by examining the indirect role of gender diversity of directors in improving corporate ESG performance through intellectual capital. In addition, previous research focuses on countries that adopt a one-tier board system. This is also the novelty of this research, which is modelling intellectual capital as a mediator in the relationship between gender diversity of the board of directors and ESG performance in companies in Indonesia that adhere to the two-tier board system by focusing on the board of directors as managers.

This study makes an academic contribution to the development of science by expanding the research of (Shazad et al., 2019), (Shakil et al., 2020) and (Yadav & Prashar, 2022), namely by modelling intellectual capital as an intermediary in the association of board gender diversity and ESG performance. Future research can refer to this research as reference material for related research topics.

This research provides practical benefits for various parties in decision-making. For internal company parties, especially company leaders, to develop their sustainability strategy through optimising corporate governance and various existing resources to improve ESG performance. Optimising corporate governance can create good control management so that company operations run well. Competitive advantage can be obtained by optimising company resources to compete in the business world and increase value for the company.

For parties external to the company, especially investors, investors can decide to invest in the firm by assessing the ESG and intellectual capital performance. In addition, the results of this research can provide insight for regulators regarding the importance of gender diversity of company directors in improving firm performance. So, it can be a reference in formulating policies related to gender diversity on company boards to support company performance.

THEORETICAL REVIEW

Resource-based View Theory. The resource-based view theory, developed by Barney in 1991, is defined as a theory that states that companies can achieve excellence depending on the resources available so that it can direct companies to run a sustainable business. Companies have resources in the form of tangible and intangible resources. These two types of resources can be used to improve company operations. Therefore, companies need to optimise their resources to create sustainable advantages.

Several criteria determine whether resources become a competitive advantage for a company. The resource must be rare, valuable, inimitable, and irreplaceable. Companies need these four criteria to realise a competitive advantage that directs the company to sustainability and increases competitiveness in the business world. *Intellectual capital* is a valuable asset of the company that has an advantage. This is because intellectual capital includes resources with characteristics that can create a competitive advantage. Optimally managing and utilising intellectual capital can achieve a competitive advantage so that the

company has added value that is useful for helping maintain company sustainability while improving company performance.

Companies need the role of directors to be able to utilise intellectual capital in order to create a competitive advantage. The director is a human resource with the potential and ability to generate value for the company. Optimising the role of the directors requires characteristics that must be possessed by the board members in order to manage the company's resources better. These characteristics support the board's role in managing and utilising intellectual capital resources to create a competitive advantage expected to improve ESG performance.

ESG Performance. Environmental, social and governance (ESG) is a guideline for companies in supporting the achievement of sustainable development goals. ESG serves as a benchmark in the development carried out by the company. Implementing ESG benefits companies, increasing profitability and value (Aydogmus et al., 2022). ESG performance is a sustainability practice comprising three aspects: environmental, social, and governance. These three aspects are related to corporate sustainability because they are essential in measuring its performance. Corporate sustainability reporting is a concern for investors in making investment decisions. Investors will be more interested in companies that report their sustainability performance, which will influence their performance (Laskar, 2018).

Gender Diversity Of Directors. The company has internal and external corporate governance mechanisms (Mahrani & Soewarno, 2018). Internal corporate governance mechanisms relate to stakeholders directly related to the internal company, such as the directors and commissioners, audit committee, institutional ownership, and managerial ownership. Meanwhile, the company's external governance mechanisms relate to external auditors, debtors, investors, and legal institutions.

Discussing the company's internal governance, a director significantly influences company management. The role of directors is very important in making decisions for the company, so board members must have characteristics that can facilitate the application of better corporate governance. The diverse characteristics of directors can support the achievement of good governance, which will be beneficial for improving company performance.

According to (Fernández-Temprano & Tejerina-Gaite, 2019), the diversity of board characteristics can be seen from demographic factors, which include age, education, gender, nationality, and experience. This research focuses on the gender diversity of directors, which is to be analysed for its influence on corporate ESG performance.

Gender diversity of directors refers to the composition of the board of directors consisting of male and female directors. Both have different characteristics so that diversity will provide colour to the company's leadership process. Diversity will create diverse ideas, thoughts, skills and expertise (Tejedo-Romero et al., 2017) that will benefit the company.

Intellectual Capital. Intellectual capital includes intangible assets that can bring benefits to the company. Intellectual capital optimisation will allow the company to compete so that the company's performance will increase. Intellectual capital, developed by Pulic in 2004, states that intellectual capital comes from all company resources that can create value. Intellectual capital consists of two components, namely human capital and structural capital. However, it is necessary to consider financial and physical capital for resource efficiency that will bring value to the company, namely, capital employed.

Value-added intellectual coefficient (VAIC) is a model that displays information about the efficiency of value creation from the company's tangible and intangible assets. The VAIC model starts with how the company creates added value, which is an indicator to evaluate the business's success and shows the company's ability to generate value.

The measurement of intellectual capital with the VAIC model involves three main factors, namely structural capital efficiency (SCE), human capital efficiency (HCE), and capital employed efficiency (CEE). Structural capital efficiency is an indicator that explains the importance of structural capital contribution in generating added value. Human capital efficiency determines the amount of added value generated for each monetary unit spent on human capital. Capital employed efficiency is the added value created for each monetary unit spent using physical resources. Combining the three factors produces the VAIC value, where the higher the value produced indicates the company's better ability to generate value.

The Role Of Intellectual Capital As Mediation. Gender diversity of directors is a human resource owned by the company that has an essential role in increasing company performance. Companies need the role of directors to manage company resources to create company resources into added value that can increase competitive advantage for the company. Previous studies have found that gender diversity can increase financial performance (Shahzad et al., 2020; Pucheta-Martinez & Gallego-Álvarez, 2020) and ESG performance in companies (Wu et al., 2021); (Shakil et al., 2020); (Romano et al., 2020); (Gurol & Lagasio, 2021); (Bhatia & Marwaha, 2022).

The directors are part of the internal corporate governance mechanism, essential in realising company goals. The directors are responsible for managing and making decisions that can affect the company's long-term performance and sustainability. Therefore, members of the directors who have characteristics that can support the performance of board members in making decisions are needed. One of them is the female presence of the directors. Women are considerate and careful in making decisions, so the female presence of the directors can prevent conflicts within the company (Nadeem et al., 2019).

Companies with more women directors have the potential to select good corporate sustainability performance. This is because women have a higher social spirit, so they will pay more attention to their decisions' environmental and social impacts (Gurol & Lagasio, 2021). In addition, women are cautious in making decisions to prevent conflicts within the company. Therefore, it is hoped that the female presence of the directors will support better company management, thereby improving ESG performance.

The diverse gender composition of the directors means that the company has diverse human resources to create varied innovations to manage the company as well as possible, ultimately improving company performance. This is consistent with (Shazad et al., 2019), who found that the firm's financial performance increases with the presence of female directors. Apart from that, if at least three women are in the composition of the directors, it also has beneficial benefits in increasing the company's sustainability performance (Yadav & Prashar, 2022).

Companies have diverse resources that can be utilised to improve ESG performance. The resources consist of tangible and intangible assets. Intangible assets in the form of information and knowledge are Intellectual capital. The director's role can optimise the efficiency of intellectual capital. A director with a diverse gender composition represents females' role in the company's management. Women are considered to have a high level of responsibility in business management. Therefore, the presence of female directors can

improve the company's performance. The literature shows that the presence of female directors can improve intellectual capital efficiency (Nadeem et al., 2019; Shahzad et al., 2020; Smriti & Das, 2022).

Gender diversity is one of the characteristics of diversity in the directors, which contributes to supporting the optimisation of company resources. Gender diversity represents both male and female board members, each with their problem-solving and decision-making characteristics. Women directors can use their expertise and knowledge to improve intellectual capital efficiency (Smriti & Das, 2022).

Optimising intellectual capital can add value for the company so that the company has a competitive advantage that can be utilised to improve ESG performance. This has been proven by (Minoja & Romano, 2020), (Nakyeyune et al., 2022), (Bananuka et al., 2021), and (Bananuka et al., 2022). The association of intellectual capital and ESG performance can be elaborated using the resource-based view theory, which states that intellectual capital can create competitiveness to maintain the company's existence so that it can compete and continue to improve its performance.

Several researchers have previously studied the mediating role of intellectual capital. (Nakyeyune et al., 2022) show that intellectual capital fully mediates the association between knowledge management practices and sustainability reporting in Uganda. Thus, intellectual capital helps create value so that knowledge management practices improve reporting practices through more efficient intellectual capital. (Tumwebaze et al., 2021) show that the association between directors' effectiveness and IFRS adoption in Uganda was mediated by intellectual capital. This shows that more than simply having influential directors is needed to increase the level of IFRS adoption if you have adequate intellectual capital.

Furthermore, (Shahzad et al., 2020) found that intellectual capital could fully mediate the relationship between gender diversity and financial performance in the US. It indicates that gender diversity on company boards helps companies obtain valuable resources, such as intellectual capital, to direct companies to increase financial performance (Shahzad et al., 2020).

The literature shows that gender diversity in directors can directly improve ESG performance and intellectual capital efficiency. Meanwhile, intellectual capital has also been proven to be able to improve ESG performance. So, it can be assumed that intellectual capital is an intermediary for the gender diversity of directors in improving ESG performance.

H1: Gender diversity of directors improves ESG performance through intellectual capital.

H1(+)
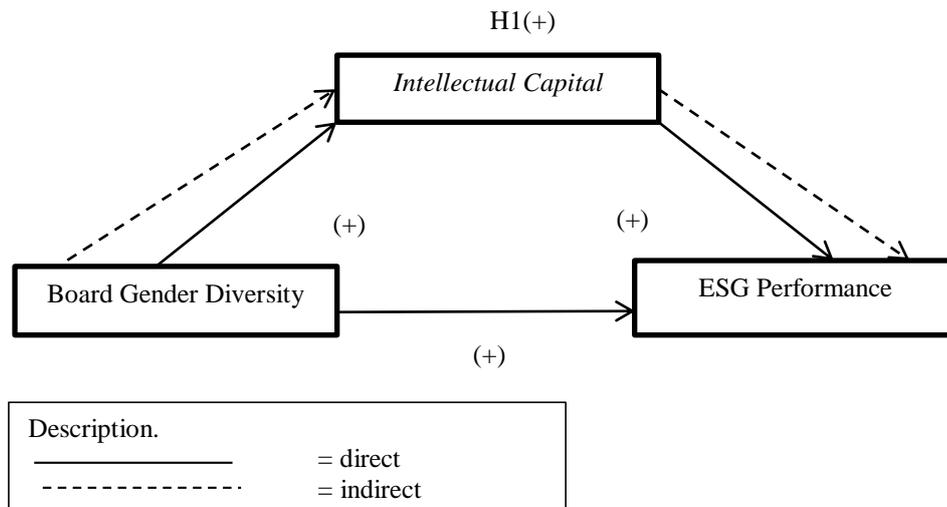
Figure 1. Research Model
Source: Processed data, 2023

Research Outline. This study examines the role of board gender diversity in improving ESG performance indirectly through intellectual capital. The conceptual framework underlying the development of the research hypothesis is shown in **Figure 1**. The hypothesis that the board of directors' gender diversity improves ESG performance through intellectual capital is shown by the dotted line. The straight line shows the direct relationship between variables from previous research. The positive association between gender diversity and ESG performance is shown by (Wu et al., 2021), (Shakil et al., 2020), (Romano et al., 2020), (Gurol & Lagasio, 2021), (Bhatia & Marwaha, 2022). A positive association between gender diversity and intellectual capital was shown by (Nadeem et al., 2019), (Shahzad et al., 2020), and (Smriti & Das, 2022). The direct relationship between intellectual capital and ESG performance is shown by (Minoja & Romano, 2020), (Nakyeyune et al., 2022), (Bananuka et al., 2021), and (Bananuka et al., 2022).

METHODS

Samples and Procedures. This quantitative research describes the research object using statistical testing tools for hypothesis testing. This research analyses intellectual capital as an intermediary in the relationship between the gender diversity of directors and ESG performance in companies registered on the Indonesia Stock Exchange for the 2017 to 2022 period. The period began in 2017 because, in that year, registered companies in Indonesia began to be required to carry out sustainability reporting. This regulation is written in Financial Services Authority Regulation 51/POJK.03/2017 concerning implementing sustainable finance for financial service institutions, issuers, and public companies.

Secondary data was used and sourced from Refinitiv Eikon and annual reports. The purposive sampling technique was used in sample selection based on predetermined criteria, including non-financial companies registered on the Indonesian Stock Exchange (BEI) from 2017 to 2022. These companies reported annual reports and companies with ESG scores and complete data for 2017 to 2022.

Table 1. Sample Selection

Criteria	2022	2021	2020	2019	2018	2017	Total
Non-financial companies in Indonesia registered on the Indonesian stock exchange	825	766	713	668	619	566	4,157
Companies for which ESG scores are not available	(766)	(716)	(673)	(632)	(583)	(530)	(3,900)
Number of companies in the sample	59	50	40	36	36	36	257

Source: Processed data, 2023

The testing period in this research starts from 2017 to 2022. The number of samples in each period is different due to data availability. The final sample size from 2017 to 2022 was 257 observations with unbalanced panel data conditions. The selected samples are presented in **Table 1.**

Dependent Variable. The dependent variable in this study is ESG performance. Measuring ESG performance refers to research by (Lestari & Adhariani, 2022) using the ESG score value available in the Refinitiv Eikon. The ESG score reflects a comprehensive score to assess a company's sustainability practices based on its self-reported environmental, social and governance information.

Independent Variable. The director's gender diversity is the independent variable of this study. The variable measurement is based on the research of (Shahzad et al., 2020), namely, by using the percentage of women directors.

Mediating Variables. Intellectual capital mediates between a director's gender diversity and ESG performance. Referring to (Shahzad et al., 2020), intellectual capital is measured using the value-added intellectual component (VAIC) model. The VAIC measurement stages are presented in **Table 2.**

Table 2. VAIC Measurement Stages

Component	Measurement	Information
Value added (VA)	VA = OUT – IN	VA = value added OUT = Total income IN = total operating costs minus salary costs and employee benefits
Human capital efficiency (HCE)	HCE = VA/HC	HC = Cost of employee salaries and benefits
Structural capital efficiency (SCE)	SCE = SC/VA	SC = VA – HC
Capital employed efficiency (CEE)	CEE = VA/CE	CE = book value of assets
Value Added Intellectual Coefficient (VAIC)	VAIC = HCE + SCE + CEE	Intellectual capital efficiency

Source: Processed data, 2023

Table 2 shows several stages of VAIC measurement. The first step is done by calculating the value added (VA). This aims to determine how the company generates added value with its resources. The second step is to calculate human capital efficiency (HCE). In this measurement, it can be seen how much the contribution of human resources

in creating added value. The third step is to calculate structural capital efficiency (SCE). Structural capital (SC) represents the processes and structures run by the company in the form of hardware, software, patents, and so on that positively impact the productivity of human resources. The fourth step is to calculate capital employed efficiency (CEE). Capital employed (CE) is the company's physical capital obtained by subtracting its total assets from its intangible assets. CEE measures the added value generated from the use of CE. The last step is calculating VAIC by summing up HCE, SCE and CEE.

Control Variables. The control variables used refer to several previous studies. The control variables used include company age, board size, leverage, total assets, ROE, market value equity, and ROA. **Table 3** presents the control variables of this study. The first control variable is FIRMAGE. FIRMAGE or company age shows how long the company has been established and operates. The second control variable is LEV, or leverage ratio, which shows the capability of a company to finance its debts with its assets. The third control variable is BOARD SIZE, which represents the number of directors in a company. The fourth control variable is TA or total assets, which shows the company's size based on the amount of assets it has. The fifth control variable is ROA or return on assets ratio, which measures the capability of the company to generate profitability. The sixth control variable is MVE or market value of equity to proxy the firm size based on the assessment of market participants. The last control variable is ROE or return on equity ratio, which shows the capability of the company to generate profits for capital owners.

Research Model. This research hypothesises that gender diversity of directors improves ESG performance through intellectual capital. Testing the research hypothesis uses a two-stage least squares approach, namely testing with two stages. In the first stage, the test determines the direct effect of gender diversity in directors on intellectual capital. In the first testing stage, fitted values will be obtained, which will be tested in the second stage. This is done to obtain unbiased variables. In the second stage, the test is to determine the indirect effect of director gender diversity on ESG performance through intellectual capital. The research model for the first testing stage uses model (1), and the regression model for the second stage uses model (2).

$$\text{VAIC}_{i,t} = \beta + \beta1 BGD_{i,t} + \beta2 FIRMAGE_{i,t} + \beta3 LEV_{i,t} + \beta4 BOARDSIZE_{i,t} + \beta5 MVE_{i,t} + \beta6 ROA_{i,t} + e_{i,t} \dots\dots\dots (1)$$

$$ESG_{i,t} = \beta + \beta1 BGD_{i,t} + \beta2 VAIC\hat{}_{i,t} + \beta3 FIRMAGE_{i,t} + \beta4 LEV_{i,t} + \beta5 BOARDSIZE_{i,t} + \beta6 TA_{i,t} + \beta6 ROE_{i,t} + e_{i,t} \dots\dots\dots (2)$$

Table 3. Operationalisation of Control Variables

Variable	Variable name	Information	Reference
FIRMAGE	Company age	Company age in the observation period	Shahzad et al., 2020; Lestari & Adhariani, 2022; Bhatia & Marwaha, 2022
LEV	Leverage	The ratio of total debt to total assets	Shahzad et al., 2020; Lestari & Adhariani, 2022; Yadav & Prashar, 2022; Nadeem et al., 2019; Bhatia & Marwaha, 2022
BOARD SIZE	Size of the directors	Total number of directors	Shahzad et al., 2020; Yadav & Prashar, 2022; Nadeem et al., 2019

TA	Company size	Natural logarithm of total assets	Lestari & Adhariani, 2022; Yadav & Prashar, 2022; Nadeem et al., 2019; Bhatia & Marwaha, 2022
ROA	Return on assets	The ratio of net profit after tax to total assets	Yadav & Prashar, 2022; Bhatia & Marwaha, 2022
MVE	Market value equity	The natural logarithm of the market value of a company's equity	Scafarto et al., 2021
ROE	Return on equity	The ratio of net profit after tax to total equity	Noorkhaista & Sari, 2017

Source: Processed data, 2023

Data Analysis Method. Data processing uses the panel data regression with the help of the Stata program. The two-stage least square approach was used to test the indirect role of intellectual capital on the association between board gender diversity and ESG performance. Descriptive statistical tests were conducted to obtain an overview of the data used in this study. This study also conducted a Pearson correlation test to see the linear relationship between two variables. The test was conducted using Stata software and based on a significance level of 1 per cent, 5 per cent, and 10 per cent. The relationship between two variables is positive if the resulting value is positive, but a negative relationship occurs if the resulting value is negative.

Outlier data testing was conducted to detect patterns or values in the research data set. Outlier data testing is done using the box plot method in Stata software. Each research variable will be tested with this method. If it is indicated that there are outlier data in a variable, then treatment will be carried out with winsorised data to overcome it. Furthermore, to test the research hypothesis, we will use new variables that have been motorised.

This research hypothesis testing uses equation models (1) and (2). Each model will be tested using the Hausman test to determine the appropriate data processing model. The goal is to determine whether the fixed or random effect model is appropriate for data processing methods. The decision is taken based on the resulting significance level. The fixed effect model is selected if the prob chi-square is smaller than 0.050. However, the random effect model is selected if the prob chi-square is greater than 0.050.

The test is continued with the Breusch-Pagan LM test if the selected model is a random effect. This aims to determine the data processing model between random and common effects. The decision is taken based on the resulting significance level. The selected model is random effect if the prob chi-square is smaller than 0.050. However, the selected model has a common effect if the prob chi-square is greater than 0.050.

Hypothesis Testing. The first step in hypothesis testing is determining whether the regression model is feasible. The basis for decision-making is done with the F test, namely by looking at the output value shown in the Anova table with a significance level of 0.050 (α equals 5 per cent). The regression model is feasible if the probability value is smaller than α. Meanwhile, if the probability value is greater than α, then the regression model is not feasible. Then, proceed with testing the coefficient of determination to test how much the ability of the independent variable explains the variation in the dependent variable. The results of testing the coefficient of determination are seen from the resulting R square. The

R square value ranges from zero to one. If the R square value is closer to one, the independent variables in the model are increasingly able to explain the variation in the dependent variable.

Hypothesis testing is done using the two-stage least square method. The two-stage least square approach method is done in two stages. The first stage is to determine the fitted values of the equation (1) model. This first stage is done to overcome the endogeneity problem. The second stage is to test the equation model (2) with the new variables generated in stage one. The test is based on a significance level (α) of 5 per cent. If the significance value obtained is smaller than (α) 5 per cent, there is an indirect relationship through the mediating variable.

Sensitivity Testing. Sensitivity testing aims to determine whether the main test is sensitive to several proxy measurements. The sensitivity test is conducted by changing the proxy for measuring the gender diversity of directors. The sensitivity analysis carried out was by replacing the gender diversity measurement of directors with the Blau index and a dummy variable, which has a value of one if the company has at least one female director and a value of zero if not (Nadeem et al., 2019).

Measuring diversity with the Blau index better reflects diversity in each diversity characteristic (Kusumastuti et al., 2022). Measuring the director's gender diversity using the Blau index is using the following formula.

$$ \text{Bi} = 1 - \sum_{i=1}^{2} P_i^2 \quad \text{..} \quad (3) $$

Where i is the number of gender categories of directors, there are two, namely men and women, P_i is the proportion of the directors in each category. Zero is the minimum value of the Blau Index, and the maximum is one. A Blau index value of zero indicates no diversity, while a Blau index value close to one indicates the presence of diversity.

RESULTS

Descriptive Statistics. The results of descriptive statistical testing are presented in **Table 4**. The average ESG score is 46.790, and the resulting standard deviation is 19.419. The standard deviation is smaller than the average, so the ESG scores of the sample companies do not vary much. ESG has a minimum value of 8.1623, showing that some sample companies pay less attention to the company's ESG performance, so the score obtained is low. The maximum ESG value is 85.234, indicating a high ESG score.

Directors' gender diversity (BGD) shows an average value of 13.389 and a standard deviation 16.025. There is a high variation in the gender diversity of directors in the sample companies because the standard deviation is higher than the average. Intellectual capital (VAIC) shows an average value of 5.747 with a standard deviation of 4.886, which means that the VAIC value in the sample companies does not vary too much. The sample companies in the observation period demonstrated the ability to create added value in intellectual capital amounting to IDR 5,747 from IDR 1 utilised from 2017 to 2022. The minimum VAIC value of -7.260 for companies with the BUMI code in the energy sector occurred in 2020. A negative VAIC value means that the company has yet to get added value from every rupiah used to invest in intellectual capital.

Table 4. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
ESG	257	46.790	19.419	8.162	85.234
BGD	257	13.389	16.025	0	60
VIC	257	5.747	4.886	-7.260	21.660
FIRMAGE	257	47.140	24.275	8	138
LEV	257	0.509	0.300	0.006	1.543
BOARDSIZE	257	6.778	2.029	2	15
TA (in billions of IDR)	257	61,443	65,187	388.88	413,297
ROA	257	0.079	0.098	-0.213	0.583
MVE (in billions of IDR)	257	68,357	98,536	590	700,000
ROE	257	0.145	0.373	-2.896	2.384

ESG is the ESG score from Refinitiv Eikon; ENV is the environmental score; SOC is a social score; GOV is the governance score; BGD is the percentage of women on the total directors; VAIC is a proxy for intellectual capital (VAIC= HCE+SCE+CEE); FIRMAGE is the age of the company; LEV is the leverage ratio (ratio of total debt to total assets); BOARDSIZE is the number of members of the directors; TA is total assets; ROA is return on assets (ratio of net profit after tax to total assets); MVE is the market value of equity; ROE is return on equity (ratio of net profit after tax to total equity).

Source: Output Software *Stata* 14.2, 2023

Company age (FIRMAGE) has an average value of 47.140 and a standard deviation of 24.275. Company age in the sample has less variation because the standard deviation is lower. The minimum age value of the sample companies is eight, indicating that all sample companies have been operating for quite a long time, and none are start-ups. The maximum value of company age reaches 138 years, indicating the existence of companies that continue to be able to compete and maintain the sustainability of their operations. The sample company has an average leverage value (LEV) of 0.509 and a standard deviation 0.300. This indicates that, on average, all sample companies have debt that can be covered with half their assets.

The size of the directors (BOARD SIZE) shows an average value of 6.778 and a standard deviation of 2.029. On average, sample companies have several directors that only vary a little. Total assets (TA) show an average value of IDR 61,443 (in billion rupiah) with a higher standard deviation of 65,187, thus indicating that there is variation in the total assets of the sample companies.

The return on assets (ROA) ratio shows an average value of 0.079 and a standard deviation of 0.098, which means high variation in the ROA produced by the sample companies. The market value of equity (MVE) has an average value of IDR 68,357 (in billions of rupiah) with a higher standard deviation of IDR 98,536 (in billions of rupiah). A much higher standard deviation indicates a high variation in the market value of equity of the sample companies. The return on equity (ROE) ratio has an average value of 0.145 and a standard deviation of 0.373, which means that the ROE in the sample companies varies.

Table 5. Pearson Correlation Test

	ESG	BGD	VIC	FIRM AGE	LEV	BOARD SIZE	TA	ROA	MVE	ROE
ESG	1.000									
BGD	0.082	1.000								
VIC	-0.107*	0.149**	1.000							

	ESG	BGD	VIC	FIRM AGE	LEV	BOARD SIZE	TA	ROA	MVE	ROE
FIRM AGE	0.343***	0.005	-0.125**	1.000						
LEV	-0.238***	-0.317***	0.050	0.084	1.000					
BOARD SIZE	0.169**	-0.015	0.125**	0.280***	-0.069	1.000				
TA	0.129**	-0.080	-0.040	0.068	0.153**	-0.036	1.000			
ROA	0.003	0.043	0.315***	0.183**	-0.198**	0.046	-0.130**	1.000		
MVE	0.174**	-0.049	0.226***	0.443***	-0.029	0.401***	0.050	0.396***	1.000	
ROE	-0.067	-0.027	0.399***	0.144**	-0.053	0.013	-0.056	0.887***	0.397***	1.000

***,**,* equal to p-value significant at 1 per cent, 5 per cent, 10 per cent

Source: Output Software *Stata* 14.2, 2023

Pearson Correlation Test. **Table 5** shows the results of Pearson correlation testing. The table shows the relationship between the two variables. Some show a positive relationship, and some show a negative relationship. It can be seen that the gender diversity of the board of directors (BGD) has a positive correlation with ESG performance. The positive correlation indicates that the more diverse the gender composition of the board of directors, the more the company's ESG performance increases. Gender diversity of directors (BGD) is also positively correlated with intellectual capital (VAIC). This shows that the more diverse the gender composition of the company's board of directors, the better the intellectual capital efficiency. Intellectual capital (VAIC) has a negative correlation with ESG performance. If intellectual capital efficiency increases, the company's ESG performance decreases, and vice versa.

They are testing Research Hypotheses. Two-stage testing was carried out to test the research hypothesis. The first stage was to obtain fitted values from the regression equation model (1). The second stage was carried out to test the significance of the mediation role using the fitted values obtained in the first stage. **Table 6** summarises the results of the two-stage test. The Chow, Hausman, and LM test results showed that the panel data estimation model suitable for the first and second-stage testing is a random effect. The regression model with a random effect model is a model that uses the Generalized Least Square (GLS) method, so no classical assumption test is needed. Outlier data was tested using each variable's box plot method. On variables where outliers are detected, a winsorised treatment of a maximum of 10 per cent is carried out to overcome them. Testing was carried out with new variables obtained after the winsorisation process.

Testing the feasibility of the model is carried out using the likelihood ratio test, where the prob chi-square is used to see whether the independent variables are jointly related to the dependent variable. Based on a significance level of 5 per cent, if the prob chi-square is smaller than 5 per cent, the independent variables jointly influence the dependent variable. The prob chi-square is smaller than 5 per cent for both equation models. This shows that all equation models have described the association between all independent variables and the dependent variable.

Table 6. Hypothesis Testing Results

Variable	Prediction	Stage 1 VIC	Stage 2 ESG
Constant		-8.033	-46.018
		(0.026)	(0.002)
BGD	+	0.018**	0.083
		(0.029)	(0.414)
VAIC^	H1+		3.989**
			(0.037)
FIRMAGE	+	-0.027***	0.723***
		(0.003)	(0.000)
LEV	-	0.600*	-5.401
		(0.057)	(0.145)
BOARDSIZE	+	0.053	-0.925**
		(0.245)	(0.045)
MVE	+	0.387***	
		(0.001)	
ROA	+	15.369***	
		(0.000)	
TA	+		2.057***
			(0.000)
ROE	+		-94.549***
			(0.000)
R square		0.210	0.158
Prob chi-square Information		0.000	0.000
Observation		257	257
Condition		*unbalanced*	*unbalanced*

***,**,* equal to (p-value) significant at 1 per cent, 5 per cent, 10 per cent

ESG is the ESG score from Refinitiv Eikon; BGD is the percentage of women directors; VAIC is a proxy for intellectual capital (VAIC= HCE+SCE+CEE); FIRMAGE is the age of the company; LEV is the leverage ratio; BOARDSIZE is the number of directors; TA is total assets; ROA is return on assets; MVE is the market value of equity; ROE is return on equity.

Source: Output Software *Stata* 14.2, 2023

The coefficient of determination for the equation model in the first stage shows an R square of 0.210. The meaning is that all independent variables can explain the dependent variable by 21.020 per cent, while other variables outside the model influence 79.980 per cent. In the second stage of the equation model, the R square is 0.158, which means that all independent variables are simultaneously able to explain 15.860 per cent of the dependent variable and 84.140 per cent is influenced by other variables not examined in the model.

The first testing stage examines the relationship between board gender diversity (BGD) and intellectual capital (VAIC). This first stage is carried out to obtain the fitted value to produce an unbiased exogenous variable. In **Table 6**, the gender diversity of directors shows a positive and significant association (at α equal to 5 per cent) with Intellectual capital, which is proxied by VAIC, so fitted values can be obtained from equation model (1). These results align with expectations that gender diversity of directors has a role in increasing intellectual capital efficiency.

The results of testing the control variables in the first stage show that company age (FIRMAGE) is negatively and significantly related to VAIC. The leverage ratio (LEV) is positively and significantly related to VAIC. These two control variables show the

opposite direction to expectations. Meanwhile, the director's size (BOARD SIZE) is independent of VAIC. The market value of equity (MVE) and return on assets (ROA) ratio show a positive and significant association with VAIC.

Furthermore, to test the mediation hypothesis of intellectual capital in the relationship between board gender diversity and ESG performance, it will be concluded based on the first stage of testing and test results in the second stage in **Table 6**. Looking at **Table 6** in the first stage of testing, the gender diversity of directors (BGD) is related significantly positively (at α equal to 5 per cent) to the efficiency of intellectual capital (VAIC). In the second testing stage, the VAIC^ variable showed a significant positive direction (at α equal to 5 per cent) towards the ESG variable. Thus, this research hypothesis supports that intellectual capital mediates the association between board gender diversity and ESG performance.

The control variable used in the hypothesis testing model, namely model (2), shows varying direction and significance. Company age (FIRMAGE) is positively and significantly related (at α equal to 1 per cent) to ESG. The leverage ratio (LEV) does not affect ESG. Board size (BOARD SIZE) is negatively related (at α equal to 5 per cent) to ESG. Total assets (TA) are significantly positively related (at α equal to 1 per cent) to ESG, and ROE is negatively and significantly related (at α equal to 1 per cent) to ESG variables.

Sensitivity Testing Results. Sensitivity testing aims to test whether the test results are sensitive to the measurement of the independent variable. In the primary test, the director's gender diversity is measured based on the percentage of women in the composition of the directors. The sensitivity of directors' gender diversity is measured using the Blau index formula and a dummy variable (DBGD) for the female presence of directors. The testing method uses two-stage least squares, and the panel data estimation method uses a random effects approach.

They are measuring The Gender Diversity Of Directors Using The Blau Index. The first sensitivity test was carried out by replacing the measurement method for the director gender diversity variable with the Blau index. The researchers used the Blau Index to measure the level of board diversity. The Blau Index is used because it is considered capable of reflecting the diversity of each board's diversity characteristics (Kusumastati et al., 2022). The test results for sensitivity analysis by replacing the variable measurement of director gender diversity with the Blau index are presented in **Table 7**.

Descriptive statistical testing shows that with a total of 257 observations, the average BLAU (Blau index) is 0.180 with a standard deviation value of 0.188, while the minimum value produced is zero and the maximum value produced is zero point five. Companies with increasingly diverse gender composition of directors will produce a Blau index value close to one. The descriptive statistics show that the gender diversity of directors in sample companies, as measured by the Blau index, is quite varied because the average and standard deviation values are almost the same. A minimum value of zero means that sample companies do not have gender diversity in directors. In contrast, a maximum value of zero point five indicates that the highest gender diversity index is only in sample companies with 50 per cent female board members.

Table 7. Blau Index Sensitivity Test Results

Variable	Prediction	Blau Index	
		Stage 1	Stage 2
Constant		-7.714	-45.890
		(0.035)	(0.002)
BLAU	+	1.387***	3.679
		(0.006)	(0.577)
VAIC^	+		4.061**
			(0.035)
FIRMAGE	+	-0.027**	0.726 ***
		(0.018)	(0.000)
LEV	-	0.599*	-5.646
		(0.081)	(0.132)
BOARDSIZE	+	0.051	-0.932**
		(0.201)	(0.046)
MVE	+	0.376***	
		(0.002)	
ROA	+	15.430***	
		(0.000)	
TA	+		2.056 ***
			(0.000)
ROE	+		-95.190***
			(0.000)
R square		0.213	0.157
Prob chi-square Information		0.000	0.000
Observation		257	257
Condition		*unbalanced*	*unbalanced*

***,**,* equal to (p-value) significant at 1 per cent, 5 per cent, 10 per cent

ESG is the ESG score from Refinitiv Eikon; BLAU is the Blau index to measure the gender diversity of directors; VAIC is a proxy for intellectual capital (VAIC= HCE+SCE+CEE); FIRMAGE is the age of the company; LEV is the leverage ratio; BOARDSIZE is the number of directors; TA is total assets; ROA is return on assets; MVE is the market value of equity; ROE is return on equity.

Source: Output Software *Stata* 14.2, 2023

Table 7 for the sensitivity test results shows that in the first stage, the gender diversity of directors, as measured by the Blau index, has a significant favourable influence on VAIC. In the second stage, VAIC^ was positive and significant (α equal to 5 per cent). This shows an indirect influence on the association of gender diversity of directors as proxied by the Blau index and ESG performance through intellectual capital. This sensitivity test result is consistent with the main test results that VAIC^ is positive and significant (at α equal to 5 per cent). Thus, the sensitivity test results have confirmed the primary test, so it can be said that the main test is not sensitive to the proxy for measuring director gender diversity.

The results of testing control variables in sensitivity testing show consistency with the main test results. All control variables in the sensitivity test show the same direction and level of significance as the primary test. Thus, the sensitivity test results of replacing directors' gender diversity measurements with the Blau index are robust for all variables.

They are measuring The Gender Diversity Of Directors With Dummy Variables. The next sensitivity test was conducted by replacing the measurement method for the director gender diversity variable with a dummy variable (DBGD). The sample was

categorised into two groups, with a score of one if there is at least one female director in the sample company and a score of zero if there is no female director (Nadeem et al., 2019). The results of sensitivity testing are presented in **Table 8**.

The results of sensitivity testing for replacing directors' gender diversity measurements with DBGD in **Table 8** show that the VAIC variable in the second stage of testing is positive and significant (at α equal to 5 per cent). The results confirm the primary test, such that gender diversity of directors improves ESG performance through intellectual capital. These results indicate that the primary test is not sensitive to proxy measurements of board gender diversity.

Table 8. Dummy Variable Sensitivity Test Results (DBGD)

Variable	Prediction	Dummies Variable	
		Stage 1	Stage 2
Constant		-6.752	-47.541
		(0.064)	(0.002)
DBGD	+	0.486***	-1.636
		(0.002)	(0.317)
VAIC^	+		4.500**
			(0.018)
FIRMAGE	+	-0.026**	0.734 ***
		(0.018)	(0.000)
LEV	-	0.576*	-6.422*
		(0.091)	(0.092)
BOARDSIZE	+	0.034	-0.852*
		(0.391)	(0.061)
MVE	+	0.348***	
		(0.005)	
ROA	+	15.729***	
		(0.000)	
TA	+		2.088 ***
			(0.000)
ROE	+		-98.998***
			(0.000)
R square		0.213	0.156
Prob chi-square Information		0.000	0.000
Observation		257	257
Condition		*unbalanced*	*unbalanced*

***,**,* equal to (p-value) significant at 1 per cent, 5 per cent, 10 per cent

ESG is the ESG score from Refinitiv Eikon; DBGD is worth one if there are female board members and 0 if there are no female board members; VAIC is a proxy for intellectual capital (VAIC= HCE+SCE+CEE); FIRMAGE is the age of the company; LEV is the leverage ratio; BOARDSIZE is the number of directors; TA is total assets; ROA is return on assets; MVE is the market value of equity; ROE is return on equity.

Source: Output Software *Stata* 14.2, 2023

This sensitivity test shows a change in the significance level in the LEV and BOARD SIZE variables to ESG. LEV is negatively and not significantly related to ESG in the primary test. In contrast, in this sensitivity test, LEV is negatively and significantly related (at α equal to 10 per cent) to ESG. BOARD SIZE in the primary test shows a negative and significant association (α equal to 5 per cent), but the significance level drops to 10 per

cent in sensitivity testing. These results indicate that sensitivity testing with replacement DBGD measurements is robust on all variables except LEV and BOARDSIZE.

DISCUSSION

The test results in the first stage show that the gender diversity of directors has a coefficient value of 0.018 and is positive with a probability level of 0.029, smaller than 0.05. The findings of this study indicate that the gender diversity of directors is positively and significantly related to intellectual capital. This means that the more gender diversity increases in the composition of the board of directors, the more the value of intellectual capital increases. With the board's gender diversity, there are human resources with diverse ideas, thoughts, skills and expertise so that intellectual capital can be utilised to generate added value for the company. This provides benefits for the company because the company gets a competitive advantage from well-managed intellectual capital. Therefore, companies should consider having a composition of male and female directors. This is consistent with (Shahzad et al., 2020) and (Nadeem et al., 2019), who found a significant positive effect on the association between gender diversity and intellectual capital. However, contrasting results were found by (Chiucchi et al., 2018), who found a negative effect on the association between gender diversity and intellectual capital. Some studies even report that gender diversity is not associated with intellectual capital (Nadeem et al., 2017; Noorkhaista & Sari, 2017).

Furthermore, the second testing stage tested the research hypothesis by focusing on the effect of intellectual capital as a mediator. The test results show that intellectual capital has a coefficient value of 4.500 and a positive sign with a probability level of 0.018, smaller than 0.050. These results suggest that the data support this research hypothesis. This implies an indirect role exists in the association between board gender diversity and ESG performance through intellectual capital. This means that board gender diversity will improve ESG performance if the company has sufficient intellectual capital.

The board's gender diversity presents a composition of male and female directors, creating a board of directors with various expertise, skills, ideas and thoughts. This diversity provides benefits in the implementation of company operations. The company has more opportunities to explore the potential of its intellectual capital resources to advance its ESG performance. This is important for the company and its stakeholders, as it can provide insights into the company's ESG performance that will be useful for decision-making. The diverse composition of the directors is vital in implementing the company's ESG practices as this positively impacts the company's ESG performance (Wasiuzzaman & Wan Mohammad, 2020). Therefore, companies should consider having both male and female directors.

The results of this study also benefit company stakeholders, especially investors and regulators. Investors will likely choose companies with good ESG performance to invest their funds as a sustainable investment. In addition, investors will also choose to invest in companies with better intellectual capital resources because intellectual capital is a valuable resource that can generate advantages for companies so that companies will be better able to compete in the business world. Furthermore, the critical role of gender diversity in the composition of the directors in managing resources to improve the company's ESG performance will help regulators create new policies that all companies must follow.

With a diverse gender composition of the directors, the company can utilise intellectual capital resources to create a competitive advantage to improve ESG performance. The test results prove that the resource-based view theory is proven on ESG performance. This result aligns with (Shahzad et al., 2020), who found that intellectual capital can mediate the association between gender diversity and corporate financial performance. Previous research (Shakil et al., 2020), (Yadhav & Prashar, 2022) was extended by modelling intellectual capital as a mediating factor in the association between board gender diversity and ESG performance in non-financial sector firms. The positive association between board gender diversity and ESG performance occurs due to adequate intellectual capital resources.

Some control variables showed different effects than expected. Company age (FIRMAGE) is positively and significantly related to ESG. This result is in line with expectations that the longer the company's operations show the company's ability to maintain the sustainability of its business. Good company performance is demonstrated by companies that still exist in the business world because to maintain the sustainability of their business, companies will try to improve their performance.

The leverage ratio (LEV) does not affect ESG. Thus, the company's ability to pay off its debt has no impact on improving ESG performance. Board size (BOARD SIZE) is negatively related to ESG. This result is the opposite of expectations. The larger the directors, the more ESG performance decreases. The free rider phenomenon possibly causes this; some board members need to have the potential to support increased firm performance. In addition, the increasing number of board members is likely to trigger internal company conflict, which can decrease company performance.

Total assets (TA) are positively related to ESG. Companies that have more significant assets show better company ESG performance. This is because the company has many assets that can be utilised to manage the firm optimally so that the firm's performance will increase. ROE is negatively and significantly related to ESG variables. This means that a higher return level for shareholders cannot improve the company's ESG performance.

CONCLUSION

This research examines intellectual capital's role in mediating the association between board gender diversity and ESG performance. The total sample observed was 257 non-financial companies listed on the IDX in an unbalanced condition from 2017 to 2022. Sample companies have ESG scores from the Refinitiv Eikon database for at least one observation period. The observation period for this research is 2017 to 2022. At the beginning of this period, the Financial Services Authority (OJK) began requiring sustainability reporting for public companies in Indonesia as written in Financial Services Authority Regulation Number 51/POJK.03/2017. Data for the research was obtained from the Refinitiv Eikon database and each company's annual reports.

The hypothesis testing results are positive and significant, which means that the gender diversity of directors is related to better ESG performance through intellectual capital. The results of sensitivity testing by replacing the gender diversity measurement of directors show results that are no different from the primary test. The results align with prior research (Shahzad et al., 2020) that, based on the resource-based view theory, gender diversity in directors has a role in finding and utilising intellectual capital resources to

provide competitive advantages that can direct companies to improve environmental performance, social, and governance.

This study provides implications for companies, namely, that companies can develop better sustainability strategies to improve ESG performance by considering the diverse gender composition of directors to manage and utilise intellectual capital resources that can generate added value for the company. In addition, it also provides implications for regulators, that regulators can consider drafting policies related to the gender diversity of directors in the company to support the improvement of company performance. Until now, no regulation requires companies in Indonesia to present the role of women in corporate leadership. Given the important role of women in supporting sustainability practices in companies, regulators need to consider drafting policies that require companies in Indonesia to present gender diversity on the company's board of directors. Furthermore, investors can use the results of this study as a reference in making investment decisions by considering the company's sustainability performance and how it behaves in its efforts to manage and utilise its resources to produce good ESG performance.

There are limitations in the research process, so improvements are needed for future researchers. First, the sample used in this research needs to be more diverse because it only focuses on Indonesia and is limited to companies with ESG scores. Future research can add research samples from various countries that have various ESG-related policies as comparison material. Second, this research uses the ESG score values in the Refinitiv Eikon database to measure the company's sustainability performance. Future research can use data from different databases to measure company sustainability performance to obtain more complete data, such as Bloomberg, Sustainalytics, and S&P Global. Finally, intellectual capital is limited to the measurement of VAIC value. Future research can replace the intellectual capital measurement method with MVAIC and A-VAIC values or use all three measurement methods to compare the results.

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