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The Influence of Sustainability Reporting, Big Data, IT Governance, and Gender Diversity on Firm Value in The Infrastructure Sector Listed on The Indonesia Stock Exchange period 2021-2024

Rara Andini[1], Dirvi Surya Abbas[2], Imam Hidayat[3]
[1,2,3]Faculty of Economics and Business, Muhammadiyah University of Tangerang, Tangerang, Indonesia
Email: rr.andiniiii@gmail.com, abbas.dirvi@gmail.com, imam_accounting@yahoo.com

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Abstract

This study examines the influence of Sustainability Reporting, Big Data, IT Governance, and Gender Diversity on firm value in infrastructure companies listed on the Indonesia Stock Exchange (IDX) during 2021–2024. A quantitative approach is employed using panel data collected from annual reports and financial statements. The sample is determined through purposive sampling based on predefined criteria. Data analysis is conducted using panel data regression, with model selection tests including the Chow Test, Hausman Test, and Lagrange Multiplier Test, which identify the Random Effect Model (REM) as the most appropriate model. The results indicate that, simultaneously, Sustainability Reporting, Big Data, IT Governance, and Gender Diversity have a significant effect on firm value. However, partially, only Gender Diversity shows a significant positive influence, suggesting that higher female representation in managerial positions enhances decision-making quality and increases investor confidence. In contrast, Sustainability Reporting, Big Data, and IT Governance do not show significant individual effects on firm value during the observed period. These findings imply that gender diversity plays a strategic role in improving firm value, while ESG disclosures and technological initiatives have not yet become key determinants of firm valuation in the infrastructure sector. Future research is recommended to include additional variables, longer observation periods, or different sectors to obtain more comprehensive insights.

INTRODUCTION

In an increasingly sustainability-oriented economic era, companies are no longer solely focused on achieving financial performance but are also required to consider environmental, social, and governance (ESG) aspects. One of the key manifestations of this shift is sustainability reporting, which provides information on how companies manage their environmental and social impacts, as well as how corporate governance is implemented (Fajarini, 2022). In addition, firm value is not only determined by financial indicators but also influenced by transparency, accountability, and corporate responsibility in responding to stakeholder expectations.

In the digital era, the role of technology has become increasingly significant in shaping firm value. The utilization of big data enables companies to process large volumes of information for more accurate and strategic decision-making, while IT governance ensures that information technology is aligned with organizational goals and supports value creation. Furthermore, gender diversity in corporate leadership has gained attention as an important governance mechanism that can enhance decision-making quality and organizational performance. These factors indicate that firm value is multidimensional and influenced by both financial and non-financial aspects (Nugraha & Ilyas, 2025).

Previous studies have highlighted the importance of sustainability reporting in increasing firm value through enhanced transparency and investor trust (Suhartini et al., 2024). Similarly, IT governance has been found to strengthen organizational effectiveness and support long-term value creation, while big data utilization contributes to improving operational efficiency and strategic responsiveness (Rosiyana Dewi & Ramadhan, 2024). In addition, gender diversity has been shown to enrich perspectives in corporate decision-making and positively influence firm value (Silfani & Suwarno, 2025). However, empirical findings across these variables remain inconsistent, particularly across different sectors and economic conditions.

In the context of Indonesia's infrastructure sector, firm value faces unique challenges due to the capital-intensive nature of the industry, its sensitivity to macroeconomic fluctuations, and the impact of the COVID-19 pandemic. The decline in profitability during 2020–2021, followed by gradual recovery, indicates that firm value is not solely determined by financial performance but also by the company's ability to adapt to external pressures and implement effective strategies (Wijaya, 2025). Despite the growing importance of ESG practices and technological adoption, their direct impact on firm value in this sector remains unclear and requires further empirical investigation.

Based on the limitations of previous studies, there is a research gap regarding the simultaneous examination of sustainability reporting, big data, IT governance, and gender diversity in influencing firm value, particularly in the infrastructure sector in Indonesia. Therefore, this study aims to analyze the effect of these variables on firm value in infrastructure companies listed on the Indonesia Stock Exchange during the period 2021–2024. The novelty of this research lies in the integration of ESG factors, technological aspects, and governance diversity within a single empirical model, providing a more comprehensive understanding of the determinants of firm value in the current business environment.

METHODS

This study employed a **quantitative research approach** using secondary data to examine the relationship between sustainability reporting, big data capability, IT governance, gender diversity, and firm value. This approach is appropriate as it allows hypothesis testing and analysis of relationships among variables using statistical techniques.

The population of this study consisted of infrastructure-sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2024 period. The sample was selected using a **purposive sampling technique** based on specific criteria to ensure data consistency and completeness. The sample selection process is presented in Table 1.

Table 1. Sample Criteria

Description	Total
Population: Infrastructure-sector companies listed on the IDX	260
Sample selection based on criteria (purposive sampling):	
1. Companies not consistently listed during 2021–2024	-44
2. Companies without complete annual reports	-26
3. Companies not using IDR as reporting currency	-40
4. Companies with incomplete research data	-10
Final Sample	**40**

Total Observations (40 × 4 years)	**160**

Source: EViews 12 (data processing)

This study utilized **secondary data** obtained from annual reports and sustainability reports. Data collection was conducted using documentation techniques to ensure accuracy and replicability.

The variables in this study consist of one dependent variable, namely firm value (Y), and four independent variables: sustainability reporting (X_1), big data capability (X_2), IT governance (X_3), and gender diversity (X_4). The operational definitions and measurements of variables are presented as follows:

Table 2. Definition and Measurement of Variables

Variable	Operational Definition	Measurement	Scale
Firm Value (Y)	Reflects investors' perception of company performance and future prospects	Tobin's Q = (EMV + D) / TA	Ratio
Sustainability Reporting (X_1)	Disclosure based on GRI standards	SRDI = disclosed indicators / total GRI indicators	Ratio
Big Data (X_2)	Capability to utilize large-scale data	Implemented aspects / total aspects	Ratio
IT Governance (X_3)	IT management aligned with business strategy	ITGI based on COBIT domains	Ratio
Gender Diversity (X_4)	Female representation in board	Female directors / total directors	Ratio

Data Analysis Techniques

Data analysis was conducted using panel data regression analysis with EViews 12. The analysis procedures were carried out in several stages to ensure the accuracy and validity of the model. First, descriptive statistical analysis was performed to describe the characteristics and distribution of the research variables. Second, panel data model selection tests were conducted to determine the most appropriate regression model. These included:

1. Chow test, to choose between Common Effect Model (CEM) and Fixed Effect Model (FEM)
2. Hausman test, to choose between Fixed Effect Model (FEM) and Random Effect Model (REM)

Third, panel regression analysis was conducted using the selected model (Random Effect Model) to examine the effect of independent variables on firm value. Fourth, hypothesis testing was carried out using:

1. F-test, to examine the simultaneous effect of all independent variables on the dependent variable
2. t-test, to examine the partial effect of each independent variable
3. Coefficient of determination (R^2), to measure the explanatory power of the model

These procedures were conducted systematically and are sufficient to allow replication of the study.

RESULTS AND DISCUSSION

Results

Descriptive Statistics

Table 2. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum
C	0.320345	0.415000	4.680000	-4.700000
SR	0.030478	0.030534	0.049940	0.010276
BD	0.406724	0.415000	1.060000	0.070000
IG	0.107514	0.112640	0.219602	0.005941
CGD	2.465517	2.000000	5.000000	0.000000

Source: EViews 12 (data processing)

The descriptive statistics indicate that firm value (C) shows considerable variation, with a minimum value of -4.70 and a maximum value of 4.68, reflecting heterogeneous performance among infrastructure companies. Sustainability reporting (SR) has a relatively low mean (.030478), indicating limited disclosure practices. Big data (BD) shows moderate variation with a mean of .406724, suggesting differences in technological capability among firms. IT governance (IG) also exhibits low average values (.107514), indicating that IT governance implementation is still relatively limited. Meanwhile, corporate gender diversity (CGD) shows wider dispersion, with values ranging from 0 to 5, reflecting uneven female representation at the board level.

Panel Data Model Selection

Table 3. Chow and Hausman Test Results

a. Chow Test

Test	Statistic	d.f.	Prob.
Cross-section F	13.936232	(28, 76)	0.0000
Chi-square	210.413845	28	0.0000

The Chow test results show that $F(28, 76) = 13.936$, $p = .000$, indicating that the Fixed Effect Model (FEM) is more appropriate than the Common Effect Model (CEM).

b. Hausman Test

Test	Chi-Sq. Statistic	d.f.	Prob.
Cross-section random	6.283990	11	0.8837

The Hausman test result shows $\chi^2(11) = 6.284$, $p = .884$, indicating that the Random Effect Model (REM) is more appropriate than the Fixed Effect Model. Therefore, the REM is selected as the final model for regression analysis.

Panel Regression Results

Table 4. Panel Regression Results (REM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.083589	0.840804	-0.099416	0.9210

SR	-1.872127	1.305607	-1.433913	0.1546
BD	-9.960500	13.386760	-0.744056	0.4585
IG	-0.086754	0.892735	-0.096362	0.8212
GD	-1.427961	2.457721	-0.581010	0.5625

R^2 = .100778

The regression results indicate that none of the independent variables have a statistically significant effect on firm value at the 5% significance level.

Fixed Effect Model (Robustness Check)

Table 5. Regression Results for Fixed Effect Model (FEM)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.760344	0.669326	-1.135985	0.2595
SR	-0.497398	0.963149	-0.516429	0.6071
BD	0.970327	7.906768	0.122721	0.9027
IG	1.873685	0.782060	2.395834	0.0190
GD	0.595575	1.304977	0.456388	0.6494

R^2 = .853486

Hypothesis Testing

Table 6. Hypothesis Testing Results

F-test

The F-statistic value is F = 11.35185 with p = .000, indicating that all independent variables simultaneously have a significant effect on firm value.

Coefficient of Determination (R^2)

The R^2 value of .853486 indicates that 85.35% of the variation in firm value is explained by the independent variables, while 14.65% is influenced by other factors outside the model.

t-test

Partial testing shows that only IT governance has a significant effect on firm value (t = 2.396, p = .019), while sustainability reporting, big data, and gender diversity are not statistically significant.

Discussion

The findings indicate that sustainability reporting does not have a significant effect on firm value. This suggests that the level of sustainability disclosure among infrastructure companies is still relatively low and has not been fully considered by investors in evaluating firm performance. This result is consistent with previous studies that argue that sustainability reporting in developing markets is often treated as compliance rather than a value-driving factor.

Similarly, big data capability does not significantly influence firm value. This may be due to the uneven adoption of digital technologies among firms, where not all companies have fully integrated big data into their strategic decision-making processes. As a result, its impact on market perception remains limited.

IT governance, however, shows a significant positive effect in the Fixed Effect Model. This indicates that effective IT governance can enhance firm value by improving operational efficiency, risk management, and strategic alignment between IT and business objectives. This finding supports the theory that strong governance mechanisms contribute to better firm performance.

Gender diversity does not show a significant effect on firm value. This may be explained by the relatively low proportion of female representation on corporate boards, which limits its influence on strategic decision-making and company performance.

Overall, the results suggest that internal governance mechanisms, particularly IT governance, play a more important role in influencing firm value compared to external disclosures and demographic factors. These findings partially support previous research but also highlight the need for stronger implementation of sustainability practices and digital transformation to enhance firm value.

CONCLUSION

Conclusion

This study aims to examine the effect of sustainability reporting, big data capability, IT governance, and gender diversity on firm value in infrastructure companies listed on the Indonesia Stock Exchange during the 2021–2024 period. Based on the empirical results, it can be concluded that, simultaneously, all independent variables significantly affect firm value. However, partially, only IT governance shows a significant influence, while sustainability reporting, big data capability, and gender diversity do not have a statistically significant effect.

These findings indicate that internal governance mechanisms, particularly IT governance, play a more critical role in influencing firm value compared to external disclosures and organizational characteristics. This suggests that investors tend to place greater emphasis on how effectively companies manage and utilize their technological resources rather than on sustainability disclosures or board composition. Thus, this study contributes to the existing literature by highlighting the importance of IT governance as a strategic factor in enhancing firm value, especially in the infrastructure sector.

Limitations

This study has several limitations. First, the sample is limited to infrastructure-sector companies, which may restrict the generalizability of the findings to other sectors. Second, the measurement of big data capability and sustainability reporting relies on disclosure-based proxies, which may not fully capture the actual implementation quality. Third, the observation period is relatively short (four years), which may not fully reflect long-term effects.

Suggestions / Recommendations

Based on these limitations, several recommendations are proposed for future research. First, future studies are encouraged to expand the sample to include multiple sectors in order to improve generalizability. Second, researchers may consider using alternative or more comprehensive measurements, particularly for big data capability and sustainability reporting, to better capture their real impact. Third, extending the observation period could provide deeper insights into long-term relationships between variables.

In addition, future research may explore other variables, such as corporate governance mechanisms, financial performance, or innovation capability, to better explain firm value. From a practical perspective, companies are recommended to strengthen IT governance practices to improve efficiency, transparency, and ultimately enhance firm value in the eyes of investors.

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