The Influence of CEO Characteristics and Green Innovation on Financial Performance

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ABSTRACT

Coal companies today are not only required to generate profits but also to demonstrate leadership that is responsive to change and committed to environmental sustainability. In this context, CEO characteristics and green innovation are considered two key factors that may influence a company's financial performance. This study aims to examine whether CEO education and experience, as well as green process and product innovation, affect financial performance. The object of this study is coal sub-sector companies listed on the Indonesia Stock Exchange during the 2022–2023 period. The data used in this study were obtained from the companies' annual reports and sustainability, and were analyzed using the multiple linear regression method. The findings reveal distinct patterns in everyday information needs between early-career and more experienced librarians. Newer librarians' needs fell into personal, general, and official categories, whereas seasoned librarians were more engaged in information behaviors linked to full professional participation. Participants reported obtaining information through various channels, including the Internet, colleagues, media, and formal institutions. The concept of information grounds—spaces where librarians interact and share knowledge—was defined by the interplay of place, content, and social connections. Information sharing emerged as a vital component within these environments.
Conclusion. The research results show that green products, green processes, CEO education, and CEO experience have an impact on financial performance.

1. INTRODUCTION

The advancement of globalization has intensified business competition both nationally and internationally. To survive and grow, companies are required to innovate, including encouraging employee contributions as strategic resources (Dwiastuti & Etikariena, 2020). In addition to innovation, financial performance is also a crucial indicator for assessing a company's health and determining investment prospects (Sudianto, 2023). One emerging innovative strategy is green innovation. The Indonesian government has promoted the implementation of a green economy through Law No. 7 of 2021 and Law No. 3 of 2014 on Industry, which mandate the adoption of green industry standards. Through green innovation, companies can improve efficiency, protect the environment, and build investor trust.

A successful example of this strategy is demonstrated by PT Bukit Asam Tbk (PTBA), which not only reported positive financial performance but also developed environmentally friendly initiatives such as solar power plants, wood pellets, and coal downstreaming. This indicates that green innovation has a tangible impact on a company's financial performance. However, a company's success is also influenced by the role of its leadership. CEO characteristics particularly education and experience are believed to significantly affect company performance. CEOs with higher education levels tend to possess stronger analytical and managerial abilities (Ghardallou et al., 2020), although some studies argue that educational background does not always have a significant impact (Haneul et al., 2023). Meanwhile, CEO experience is consistently associated with more mature decision-making and improved performance quality (Sallemi & Zouari, 2023; Saleh et al., 2020).

On the other hand, green innovation is divided into two types: product innovation and process innovation. Product innovation involves creating environmentally friendly goods that enhance a company's market value and competitiveness (Millenia & Murwaningsari, 2023), while process innovation reflects efficiency in resource utilization and waste management (Xie et al., 2019). Both play a crucial role in supporting long-term sustainability and profitability. Given these findings, along with the inconsistencies in previous studies, this research aims to analyze the influence of CEO characteristics and green innovation on corporate financial performance.

2. LITERATURE REVIEW

Literature Review

Signaling Theory

Spence (1973) defined a signal as an effort by the information provider to accurately convey an issue to another party, so that the receiving party is willing to invest despite uncertainty. With clear and credible signals, the information recipient can make more confident decisions, even under uncertain conditions.

Stakeholder Theory

Stakeholder theory was first introduced by Freeman (1984), who stated that stakeholders are groups or individuals who can work together to achieve shared goals. In this theory, each stakeholder has an influence on the organization's decisions and sustainability. Therefore, management is required to pay attention to and accommodate their needs and expectations. By thoroughly understanding the role of stakeholders, companies can develop more sustainable strategies and build harmonious relationships with various relevant parties.

Financial Performance

Financial performance is an analysis conducted to assess the extent to which a company has implemented financial management practices properly and correctly (Hutabarat, 2020). A company's financial performance can be evaluated using various financial ratios, which reflect aspects such as profitability, liquidity, solvency, and activity.

CEO Characteristics

Characteristics can be defined as the entirety of aspects that reflect an individual's morality, personality, behavior, temperament, traits, personal attributes, and disposition, which together form a complete personal identity (Sulaeman, 2024). Based on this explanation, characteristics encompass all elements that represent various aspects such as morality, personality, behavior, temperament, traits, personal attributes, and disposition.

Green Innovation

Green innovation is divided into two forms: green product innovation and green process innovation (Zameer et al., 2021). According to Afum et al. (2021), green product innovation can have a positive impact on green competitive advantage.

Based on the previous explanation, the variables in this study consist of independent and dependent variables. The conceptual framework aims to explain the influence of the independent variables on the dependent variable as follows:

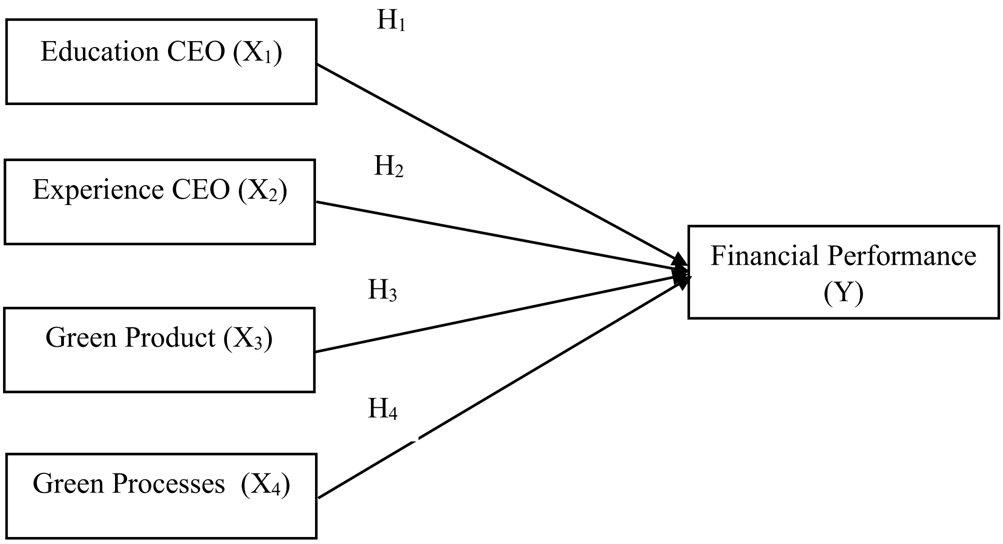

Figure 1. Research Model

Based on the previously presented conceptual framework, the hypotheses in this study can be formulated as follows:

H1: CEO education has a positive effect on financial performance.

H2: CEO experience has a positive effect on financial performance.

H3: Green innovation through green processes has a positive effect on financial performance.

H4: Green innovation through green products has a positive effect on financial performance.

3. METHODS

This study employs quantitative data, as it focuses on measuring the relationship between CEO characteristics, green innovation, and financial performance in numerical terms. The population in this study consists of all energy companies in the coal sub-sector listed on the Indonesia Stock

Exchange (IDX). From this population, the researcher applied purposive sampling with the following criteria:

1. Companies that published annual reports from 2019 to 2023.
2. Companies with available research data.
3. Companies that have planned and implemented green product or process innovations.

Thus, the sample in this study includes all energy sector companies in the coal sub-sector listed on the Indonesia Stock Exchange (IDX) that meet the previously stated criteria.

Operational definition refers to the boundaries and methods used to measure the variables under investigation. The operational definitions established in this study are used to measure the concepts and variables employed (Iriani et al., 2022). The following are the operational definitions and variable measurements used in this research:

Financial Performance

Financial performance is a depiction of a company's financial condition over a specific period, both in terms of fund acquisition and fund allocation. Return on Assets is measured using the following formula, as stated by Alex & Andi (2022), Danti & Mey (2024), and Eri et al. (2024):

$$\text{Return on Asset} = \frac{Net\ Profit}{Assets}$$

CEO Education

According to Wijaya et al. (2024), the CEO's level of education is measured using an ordinal dummy variable, scored based on the highest level of education attained. Scores range from 1 to 3, where a score of 1 is assigned to CEOs with a Bachelor's degree (S1), 2 for Master's degree holders (S2), and 3 for those with a Doctoral degree (S3). This measurement aims to quantitatively reflect the CEO's educational level, which can then be used to analyze its impact on company performance or other strategic decisions.

CEO Experience

CEO experience is measured by the number of years the CEO has held the position. This measurement represents the level of knowledge and understanding the CEO has of the company, gained through the duration of their leadership.

Green Product Innovation

Green product innovation in this study is measured using a dummy variable, where companies that develop green products are assigned a value of 1, and those that do not are assigned a value of 0.

Green Process Innovation

Green process innovation is measured based on the total expenditure a company allocates to minimize its environmental impact.

$$\text{Green process} = \Sigma \text{ Environmental Costs}$$

The data analysis technique used in this study is Multiple Linear Regression Analysis, as the research aims to examine the influence of more than one independent variable on the dependent variable (Kurniawan, 2019). The following is the multiple linear regression equation used in this study:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Explanation:

Y : Financial Performance

a : Constant

β_1–β_4 : Regression Coefficients

X_1 : CEO Education

X_2 : CEO Experience

X_3 : Green Innovation through Green Processes

X_4 : Green Innovation through Green Products

e : Error Term

4. RESULTS AND DISCUSSION

Descriptive Test

Descriptive analysis aims to describe the characteristics of the data for each variable under study by presenting the minimum, maximum, mean, and standard deviation values. The following table presents the results of the descriptive test:

Table 1. Results of Descriptive Analysis

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Financial Performance	93	-0,26	62	12,90	16,837
CEO Education	93	1	3	1,49	0,490
CEO Experience	93	1	30	6,89	6,282
Green Product	93	0	1	0,61	0,490
Green Process	93	2.383	43.306.186	2.583.437,60	6.223.467,745

Based on the results, the financial performance variable has a minimum value of -0.26, a maximum value of 62, a mean of 12.90, and a standard deviation of 16.837. The CEO education variable has a minimum value of 1, a maximum value of 3, a mean of 1.49, and a standard deviation of 0.490. The CEO experience variable has a minimum value of 1, a maximum value of 30, a mean of 6.89, and a standard deviation of 6.282. The green product variable has a minimum value of 0, a maximum value of 1, a mean of 0.61, and a standard deviation of 0.490. The green process variable has a minimum value of IDR 2,383, a maximum value of IDR 43,306,186, a mean of IDR 2,583,437.60, and a standard deviation of IDR 6,223,467.745.

Hypothesis Testing

Hypothesis testing aims to examine the influence of independent variables on the dependent variable, both simultaneously and partially.

Adjusted R^2 (Coefficient of Determination) Test

The coefficient of determination represents the extent to which changes or variations in the dependent variable can be explained by changes or variations in the independent variables (Kurniawan, 2019). The following is the coefficient of determination test used in this study:

Table 2. Coefficient of Determination Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.412[a]	.169	.111	15.871

Table 2 shows that the Adjusted R Square value is 0.111, indicating that CEO education, CEO experience, green products, and green processes collectively explain 11.1% of the variation in financial performance. The remaining 88.9% is explained by other factors outside the model.

F-Test (Model Feasibility Test)

The F-test in this study aims to determine whether the model can be considered feasible. The following presents the F-test used in this research:

Table 3. Simultaneous F-Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4417.508	6	736.251	2.923	.012[b]
	Residual	21662.148	86	251.885		
	Total	26079.656	92			

A significance value of 0.000 (< 0.05) indicates that the regression model is feasible for testing the relationship between the independent and dependent variables.

Partial t-Test

The t-test aims to determine the effect of each independent variable on the dependent variable individually. The following presents the partial t-test used in this study:

Table 4. Partial t-Test

Variable	Coefficient	Significance	Description
CEO Education	4,139	0,013	Hypothesis accepted
CEO Experience	0,004	0,009	Hypothesis accepted
Green Product	8,030	0,033	Hypothesis accepted
Green Process	2,376	0,004	Hypothesis accepted

The results of the t-test in this study indicate that all hypotheses are accepted:

1. CEO education has a significant and positive effect on financial performance.
2. CEO experience has a significant and positive effect on financial performance.
3. Green product have a significant and positive effect on financial performance.

4. Green processes have a significant and positive effect on financial performance.

5. Discussion

The findings of this study indicate that H1 is accepted, meaning that CEO education has a significant positive effect on company performance. CEOs with higher levels of education, such as advanced degrees (bachelor's or master's), tend to have broader knowledge and stronger analytical skills. These attributes play an important role in strategic decision-making and financial management, which can enhance performance (Ghardallou et al., 2020).

The acceptance of H2 suggests that CEO experience significantly and positively affects company performance. Sallemi and Zouari (2023) explain that a company's performance should correlate with the CEO's experience. A CEO requires professional expertise to integrate new technologies into the company, leveraging past experience to support better decision-making (Suherman et al., 2023). A manager with industry-specific experience brings greater human capital through their knowledge and expertise. Moreover, such experience facilitates easier access to external financing (Alzoubi, 2019; Saleh et al., 2020).

The acceptance of H3 indicates that green products significantly and positively impact company performance. According to Sari (2024), green product innovation is one of the key factors that influence company performance. By developing environmentally friendly products, companies not only demonstrate their commitment to sustainability but also strengthen their position in the market. This type of innovation allows companies to create added value through cleaner, safer, and more sustainable products, which can enhance competitiveness and thereby improve financial performance (Millenia & Etty Murwaningsari, 2023).

The results also show that H4 is accepted, meaning green processes have a significant positive impact on company performance. Green innovation is not only about creating new products but also transforming how companies operate, optimizing production processes, and innovating business models to reduce environmental impact (Noor, 2025). Green innovation is a form of innovation that not only aims at achieving efficiency and profitability but also integrates environmental sustainability into every business process. Companies implementing green innovation often undergo significant changes from product design and production methods to resource management and marketing strategies. Xie et al. (2019) state that green processes positively influence financial performance.

Conclusion

The results of the study indicate that CEO education and experience, as well as green process and product innovation, have a positive impact on financial performance. These findings reinforce the understanding that companies led by individuals with strong backgrounds and those actively engaged in environmentally friendly innovations tend to exhibit better financial performance. This research is expected to serve as a consideration in strategic decision-making, particularly for companies operating in the coal mining qsub-sector.

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