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The mediating role of green supply chain management in the relationship between eco-efficiency and SMEs sustainability performance

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The purpose of this study is to analyze the relationship between eco-efficiency and sustainability performance, the relationship between eco-supply chain management and sustainability performance and analyze the mediating role of Eco-Supply Chain Management on the relationship between eco-efficiency and sustainability performance. The study method is a quantitative survey which is executed through the partial least square structural equation model (SEM-PLS) with a statistical data processing tool, namely SmartPLS 4.0 software. Research data was obtained by distributing online questionnaires through social media designed using a Likert scale of 7. Respondents in this study were 590 SMEs owners in Java Island, Indonesia. The results of the study indicate that eco-efficiency had a positive and significant effect on sustainability performance, green supply chain management (GSCM) had a positive and significant effect on sustainability performance. GSCM also plays a full mediating role in the relationship between eco-efficiency and sustainability performance. This research is expected to be a source of reference for further research in discussing issues related to the implementation of eco-efficiency and GSCM.

1. Introduction

Continuous business competition increasingly requires companies to show their performance in improving and maintaining the values that exist within the company. One of them is by increasing sustainability within the company. Sustainability in reporting is an important step that can be achieved in corporate sustainability. Investors, regulators, and other stakeholders are increasingly expanding in developing sustainable reporting practices. According to Fu et al. (2023), interest in greater transparency and accountability of corporate reporting of corporate strategy can encourage trust and help markets function more efficiently in driving organizational progress, sustainability, and economic growth. Increasing and significant developments and progress have led to global competition in the corporate environment, so that regulators and stakeholders are increasingly demanding companies to show their performance in improving and maintaining corporate value. Many companies want to improve their corporate image in the eyes of society (Haudi et al., 2023). This is due to the growing development of the business world in developing countries, companies can show every advantage they have so that not only people are interested but can also invite investors to invest in their companies. However, with the existence of intense business

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competition to generate maximum profits, social inequality and environmental damage will increase due to uncontrolled activities related to resources to increase company profits. According to Ferreira et al. (2023), companies are not only required to seek maximum profits but must also pay attention to their social and environmental responsibilities.

According to de Souza et al. (2018), eco-efficiency is a strategy that combines the concept of economic efficiency based on the principle of efficient use of natural resources. Eco-efficiency can also be interpreted as a strategy that produces a product with better performance, using less energy and natural resources. By implementing eco-efficiency, the goal of eco-efficiency can be achieved, namely reducing the environmental impact per unit produced and consumed so that profits can be achieved due to competitiveness by reducing the resources needed to form better products and services. According to Brady et al. (1999), GSCM plays an important role for sustainability in the industry. Companies need to apply the green supply chain management (GSCM) concept because it relates to operational efficiency in their supply chain. This concept is also implemented as a company strategy to advance their brand image, thereby gaining the trust of customers, and gaining more market share. Given the importance of implementing GSCM in a company, this concept is no longer an option but an obligation for all members of supply chain management. Therefore, it requires the involvement of all stakeholders in the entire supply chain for the successful implementation of the GSCM concept. In addition, GSCM practice and performance evaluation is also very important since it determines the success of GSCM implementation in the company. According to AlKhidir and Zailani (2009) and de Souza Moraes et al. (2018), evaluation of GSCM practices and performance has been extensively researched, but there has been no research on clear measurement matrices regarding the level of GSCM implementation in companies. In other words, there is no publication that adopts a matrix to measure the level of GSCM implementation in companies. The GSCM implementation level measurement matrix functions to determine the extent to which GSCM is implemented through the level or level of implementation.

Corporate sustainability is defined by Carvalho, et al. (2017) and de Souza Moraes et al. (2018) as a form of meeting the needs of company stakeholders without sacrificing future interests. Ferreira et al. (2023) and Fu et al. (2023) explained in their research that corporate sustainability performance is a multidimensional concept based on sustainable initial ideas that replace traditional understandings of corporate performance which only represent appreciation to capital owners. Sustainability performance includes financial benefits, environmental protection, and social responsibility. Actual sustainability performance is very important since the growing concern of stakeholders and managers about environmental sustainability and existing social conditions, there has been a revolution in the form of financial report disclosure so that it is at the stage of using sustainability report disclosure. Sustainability performance is a form of accountability and communication of how company activities contribute positively or negatively to sustainable development. Pham et al. (2021) in their research in Sweden showed that sustainability reports have a positive effect on company performance.

GSCM is a strategic approach in the field of supply chain that focuses on sustainable practices in every aspect of the supply chain. The main objective is to reduce negative impacts on the environment and promote more efficient use of resources. In this context, GSCM means always considering and incorporating the principles of sustainability and environmental sustainability in the processes of product procurement, production, transportation, storage, and distribution. This includes selecting environmentally friendly raw materials, using renewable energy, reducing waste, responsible waste management, and optimizing logistics to reduce greenhouse gas emissions. GSCM is not only about minimizing negative impact, but also about creating positive value. In this sense, we must always look for opportunities to present new innovations that are environmentally friendly, such as using the latest technology for energy efficiency, developing environmentally friendly products, and collaborating with suppliers who share the same sustainability principles.

The purpose of this study is to analyze the relationship between eco-efficiency and sustainability performance, to analyze the relationship between eco-supply chain management and sustainability performance and to analyze the mediating role of Eco-Supply Chain Management on the relationship between eco-efficiency and sustainability performance.

2. Literature review

2.1 Eco-efficiency

Niero et al. (2017) Eco-efficiency is a company strategy to improve the environment in the company's operational activities so that it can increase stock prices and increase company value. Every company must be responsible for managing the environment and its surroundings by reducing any operational activities that can have an impact on environmental pollution such as air, water, and soil pollution. Eco-efficiency is a company benchmark in carrying out the company's environmental management concept. So, it can be concluded that eco-efficiency is a combined concept between the concepts of economic efficiency and ecological efficiency, where the use of natural resources is kept to a minimum for maximum results and the ecological balance is maintained. aims to reduce environmental impacts due to production and consumption processes. By applying environmental concepts, companies can produce goods or services that have excess benefits but at the same time minimize the negative environmental impacts of excessive consumption of resources and reduce costs. There are three important messages in the concept of eco-efficiency according to Mosovsky et al. (2000) and Niero et al. (2017) namely first, complementary improvement of ecological and economic performance. Second, improving environmental performance

should no longer be viewed only as charity or donations, but as a competition. Then the third, eco-efficiency is a complement and supports sustainable development. Eco-efficiency has a very important role for environmental management. In achieving the goals and targets of environmental management, namely conservation and sustainable development, the principle of eco-efficiency is needed in its implementation. In other words, eco-efficiency has a major role in the implementation of environmental management goals and targets. Several previous studies tested the involvement of eco-efficiency with company value. Previous research conducted by Machado et al. (2023) stated that eco-efficiency on firm value has a significant positive effect on performance. This means that it can be proven that companies that apply the concept of eco-efficiency maintain higher values than others. Research conducted by Kulak et al. (2016), Martínez et al. (2023) and Machado et al. (2023) on the relationship between eco-efficiency and firm value for companies in the cement sub-sector and pulp and paper sub-sector within a period of 3 years resulted in the conclusion that eco-efficiency as an environmental policy has a low or negative effect on company value.

H_1: *Eco-efficiency has a positive and significant impact on sustainability performance.*
H_2: *Eco-efficiency has a positive and significant impact on GSCM.*

2.2 Green Supply Chain Management (GSCM)

According to Niero et al. (2017), GSCM is known as a newer concept than Supply Chain Management (SCM). GSCM is a sustainable development for companies that has emerged as a new innovative SCM approach that is important for every organization to achieve financial benefits and environmental benefits simultaneously in order to reduce negative impacts and risks in the environment. GSCM is a concept to integrate supply chain management with environmental thinking that aims to reduce waste, emissions, energy and solid waste. Primarily, green supply chain management involves a "greening phase" with supply chain activities as the definition of supply chain management covering all involved parties such as suppliers, manufacturers, distributors, wholesalers, retailers etc., which adds "green" in SCM encompassing a series of activities green in all their SCM activities. Supply chain management can integrate environmental management practices into the entire supply chain management to achieve greener supply chain management and maintain competitive advantage as well as to increase business profits and market share objectives. Machado et al. (2023) and Majewski et al. (2020) define GSCM as management that ranges from green purchasing to integrated supply chains from suppliers, to factories, to customers and reverse logistics, which *closes the loop*. Meanwhile, according to another opinion, GSCM is an integration of environmental thinking into SCM, including product design, material sourcing and selection, manufacturing processes, delivery of final products to consumers and end-of-life management of products after their use.

H_3: *GSCM has a positive and significant impact on sustainability performance.*

2.3 Sustainability performance

Corporate sustainability is defined by Niero et al. (2017) as a form of fulfilling the needs of company stakeholders without sacrificing future interests. Majewski et al. (2020), Michelsen et al. (2006), Mosovsky et al. (2000) and Niero et al. (2017) explained in their research that corporate sustainability performance is a multidimensional concept based on sustainable initial ideas that replace traditional understandings of corporate performance which only represent appreciation to capital owners. Sustainability performance usually refers to the Triple Bottom Line (TBL) concept which includes financial benefits, environmental protection, and social responsibility. Actual sustainability performance is very important since it is seen as a corporate strategy that is used as the best business technique for current and future needs. Simultaneously with the growing concern of stakeholders and managers about environmental sustainability and existing social conditions, there has been a revolution in the form of financial report disclosure so that it is at the stage of using sustainability report disclosure. Sustainability performance is a form of accountability and communication of how company activities contribute positively or negatively to sustainable development. Michelsen et al. (2006), Michelsen et al. (2010), Mosovsky et al. (2000) and Niero et al. (2017) in their studies showed that sustainability reports have a positive effect on company financial performance. According to Elkington (1997: 37), sustainable performance is a report that contains not only information about a company's financial performance but also non-financial information consisting of information about corporate social and environmental activities that enable the company to grow sustainably.

3. Method

This research method is a quantitative survey, analysis of research data is performed using structural equation modeling partial least squares (SEM-PLS) with statistical data processing tools, namely SmartPLS 4.0 software. The research data was obtained by distributing online questionnaires through social media which were designed using a Likert scale of 7. The respondents in this study were 590 SMEs owners in Java Island, Indonesia. The stages of data analysis are validity test, reliability test and significance test or hypothesis test. Fig. 1 shows the structure of the proposed study.

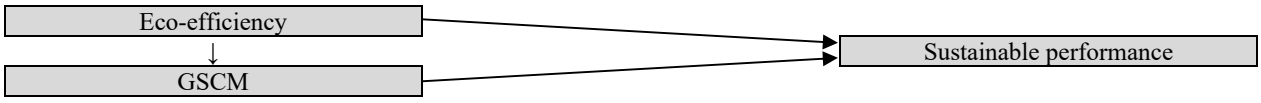

Fig. 1. Research Model

4. Result and discussion

4.1 Path Coefficients

Evaluation of the path coefficient is used to show how strong the effect or influence of the independent variable on the dependent variable. While the determination coefficient (R-Square) is used to measure how much the endogenous variables are influenced by other variables. The R^2 result is 0.67 and above for endogenous latent variables in the structural model, indicating the effect of exogenous variables (which influence) on endogenous variables (which are influenced) is included in the good category. Path Coefficients on Research Framework of Acievement Motivation can be described in Fig. 2.

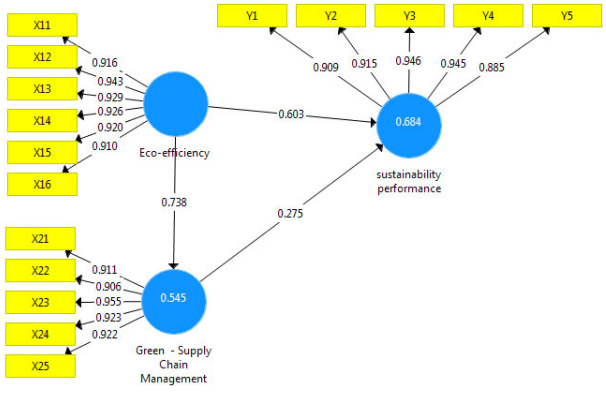

Fig. 2. Validity Testing

All indicators of many research variables have outer loading values > 0.7. However, it seems that there are still some indicators that have an outer loading value < 0.7. The outer loading value between 0.5 - 0.6 is considered sufficient to meet the requirements of convergent validity (Purwanto et al., 2022). The data above shows that there are no variable indicators whose outer loading values are below 0.5, so that all indicators are declared feasible or valid for research use and can be used for further analysis.

4.2 Reliability and Average Variance Extracted (AVE)

Reliability of each variable shows the high coefficient in term Cronbach's Alpha and Composite Reliability (more than 0.700) and also Average Variance Extracted (AVE – measured the convergent validity) of each variable have met the criteria of validity (more than 0.500) as described in Table 1. In the SEM-PLS analysis, a construct is declared reliable if it has a composite reliability value of >0.6 and is reinforced by a Cronbach's Alpha value >0.7.

Table 1
Reliability and AVE Testing

No	Variables	Cronbach's Alpha	Composite Reliability	AVE
1	Eco-efficiency	0.813	0.913	0.617
2	Green - Supply Chain Management	0.916	0.954	0.765
3	Sustainability performance	0.934	0.953	0.835

R^2 (R Square)

R^2 value can be used to assess whether certain endogenous and exogenous variables have a substantive effect. R^2 results of 0.67, 0.33, and 0.19 indicate that the model is "good", "moderate", and "weak".

Table 2
The results of R-Square and adjusted R-Square values

No	Variables	R Square	R Square Adjusted
1	sustainability performance	0.684	0.683

Based on Table 2, the R Square value is 0.684, which means that 68.4% of the variation or change in sustainability performance is influenced by Eco-efficiency and GSCM, while the remaining 31.6 % is explained by other causes. So it can be said that the R-Square on the sustainability performance variable is moderate.

Hypotheses Testing

Hypothesis testing is performed by paying attention to the original value sample estimates (O) to determine the direction of the relationship between variables, as well as t-statistics (T), and p-values (P) to determine the level the significance of the relationship. The original sample value approaching +1 indicates a positive relationship, while the value close to -1 indicates a negative relationship. The t-statistics value is more than 1.96 or the p-value is smaller than the significance level (<0.05) indicating that a relationship between variables is significant. The results of testing the research hypothesis can be seen in Fig. 3 and Table 3.

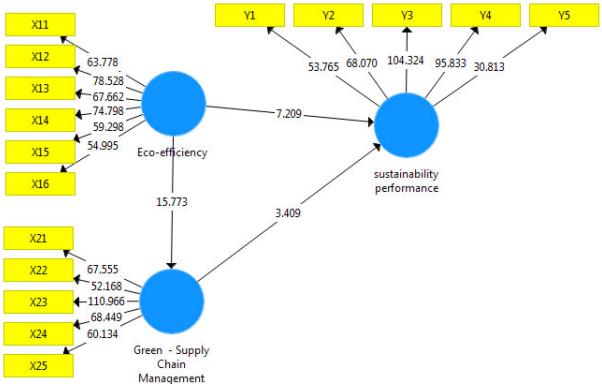

Fig. 3. Hypothesis Testing

Based on the path coefficients mentioned above it can be found that all research hypotheses were tested as described on the Table 3 below.

Table 3
Hypotheses Testing for direct effect

No	Hyphoteses	Path Coefficients	Significant Level	Results
1	Eco-efficiency → Sustainability performance	0.603	0.001, p<0.050	Accept the Hypothesis
2	GSCM → Sustainability performance	0.275	0.000, p<0.050	Accept the Hypothesis
3	Eco-efficiency→Supply Chain Management	0.378	0.001, p<0.050	Accept the Hypothesis

Based on the hypothesis test, it is obtained that the t value is greater than 1.96 and the p value is less than 0.050 so that it is concluded that all relationships between variables are significant

Table 4
Hypotheses Testing for indirect effect

No	Hyphoteses	T value	Significant Level	Results
1	Eco-efficiency → GSCM → sustainability performance	3.321	0.000, p<0.050	Accept the Hypothesis

Indirect effect test (indirect effect) can be done with the condition that the results of the path coefficient of the direct effect of the research model is significant. At an earlier stage it has been proven that the results of the direct influence test of this research model are significant so that an indirect effect test can be carried out. Based on the hypothesis test, it is obtained that the t value is greater than 1.96 and the p value is less than 0.050 so that it is concluded that all relationships between variables are significant, GSCM mediates the relationship between eco-efficiency on sustainability performance.

VAF Testing

The estimated results of changes in the value of the direct influence path coefficient in this model will be further analyzed using the method. Variance Accounted Floor (VAF). Based on the VAF calculations to test the effect of the Green - Supply Chain Management variable as a mediator between the effect of Eco-efficiency on sustainability performance is 0.283 or 28.3%. From these results it can be concluded that Green - Supply Chain Management has a partial mediating effect. The table also shows the VAF value for the Green - Supply Chain Management variable as a mediator between the effect of Eco-efficiency on sustainability performance of 0.575 or 57.5%. Based on the VAF value it can be interpreted that GSCM is a partial mediation so that there are other intervening variables that can become intervening variables for other models that are not examined in this research.

Eco-efficiency relationship to sustainability performance

Based on the results of the analysis, it was found that the p-value was 0.001 <0.50, so it was concluded that Eco-efficiency had a positive and significant impact on sustainability performance, this result was in line with AL-Khatib et al. (2023), AlKhidir et al. (2009 and Burnett et al. (2007).

The effect of GSCM on sustainability performance

Based on the results of the analysis, it was found that the p value was 0.000 <0.50, so it was concluded that GSCM has a positive and significant impact on sustainability performance, this result is in line with Kulak et al. (2016), Arijanto et al. (2022) and Permana et al. (2022).

Eco-efficiency relationship to GSCM

Based on the results of the analysis, it was found that the p value was 0.001 <0.50, so it was concluded that Eco-efficiency had a positive and significant effect on GSCM, this result is in line with Pal et al. (2023), Ravi (2015) and Sheng et al. (2023).

GSCM plays an important role for sustainability in the industry. Companies need to apply the GSCM concept since it relates to operational efficiency in their supply chain. This concept is also implemented as a company strategy to advance their brand image, thereby gaining customer trust. Given the importance of implementing GSCM in a company, this concept is no longer an option but an obligation for all members of supply chain management. Therefore, it requires the involvement of all stakeholders in the entire supply chain for the successful implementation of the GSCM concept. In addition, GSCM practice and performance evaluation are also very important since they determine the success of GSCM implementation in the company.

5. Practical Implications

Often, product wastes are dominated by the type of packaging used. In Green Supply Chain Management, product design is encouraged to accommodate environmentally friendly values. Suppliers are also a party that deserves attention when we want to implement GSCM. This is because choosing suppliers who are also aware of sustainability values is no less important in the concept of GSCM. Some aspects of suppliers that we can evaluate include environmental practices, their compliance with various environmental regulations, and how they are trying to reduce the negative impact on the environment. Transportation and logistics processes are one of the biggest contributors to negative impacts on the environment from the entire supply chain. Where much of the greenhouse gas emissions are produced by vehicles that carry products to the next place, GSCM is focused on reducing these greenhouse gas emissions by optimizing delivery routes, utilization of environmentally friendly transportation technology, and maximizing load capacity to reduce the number of vehicles and trips. The next application of GSCM is waste management and recycling. These two things are clearly one of the main issues generated by the overall supply chain management. All businesses can start their implementation by applying an effective waste management system, prioritizing reducing waste at the source, and looking for ways to recycle or reuse the products or materials used.

6. Conclusion

The results of this study have indicated that Eco-efficiency has a positive and significant effect on sustainability performance and GSCM has a positive and significant effect on sustainability performance. GSCM plays a fully mediated role in the relationship of Eco-efficiency on sustainability performance. Suggestions that can be given by researchers based on the results of this study are: for future researchers, they can conduct research populations in other sector companies listed on the Indonesia Stock Exchange so that they are not only limited to manufacturing companies but for all companies that implement eco-efficiency and GSCM and obtain different research results so that they can be used as new reference material and for further researchers, can add proxies and other moderating variables that can influence this variable, for example the funding structure to see whether the company is able to develop strategies related to the funding structure in managing usage natural resources efficiently and this will affect the value of the company. Company size can also affect this variable because the bigger the company size, the better it is to increase the responsibility. This research is expected to provide benefits to several parties: a) Theoretical Benefits: The results of this research are expected to be useful for the development of environmental science. This research is expected to increase literacy in implementing eco-efficiency strategies to strengthen company value. b) Practical Benefits: 1. For Companies: This research can be used as a reference as a basis in the form of advice and information for companies in consideration of decision making. Through this research, the company is expected to be able to evaluate production activities that have been planned to review business activities within the company by carrying out product efficiency and reducing waste to minimize risks to the environment due to production activities. For Investors: This research can be used as an information medium that will assist investors in considering and choosing which companies are responsible for environmental preservation 3. For the Government: The government is expected to make clear regulations related to environmental management for companies, so that companies strive to preserve the environment through eco-efficiency. 4.

For future researchers, this research is expected to be a source of reference for further research in discussing issues related to the implementation of eco-efficiency and GSCM.

GSCM has an important role in the modern business world which is increasingly concerned about the environment. In this article, we have seen that GSCM not only provides benefits for the environment, but also provides several significant advantages for businesses. From competitive advantage and operational efficiency to environmental risk mitigation and regulatory compliance, green supply chain management plays a crucial role in shaping a company's sustainability and success. By implementing sustainable practices in the supply chain, companies can differentiate themselves from competitors, reduce operational costs and build a strong brand reputation.

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