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Integrating Lean-Green Waste Reduction into Supply Chain Strategy: Evidence from the Indonesian Automotive Industry

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Abstract: The application of the Lean and Green Management System (LGMS) and Lean and Green Waste Reduction Technique (LGWRT) has become a focal point for companies aiming to enhance operational efficiency and environmental sustainability. This study examines the implementation of LGMS and LGWRT and their impact on Lean and Green Business Results (LGBR) in the Indonesian industrial sector. By integrating lean and green principles, LGMS assists companies in eliminating waste, minimizing resource usage, and reducing emissions. Simultaneously, LGWRT aims to decrease waste through environmentally friendly and efficient techniques, supporting productivity and cost reduction. Using a quantitative method based on survey data from manufacturing companies, the findings reveal that these approaches significantly improve green business outcomes, including enhanced energy efficiency, lower carbon emissions, and reduced operational costs. Additionally, LGMS and LGWRT enable companies to meet strict environmental regulations and improve their public image. The study concludes that the combination of LGMS and LGWRT positively impacts environmental performance and competitive advantage through improved profitability and process efficiency. These findings encourage more companies in Indonesia to adopt lean and green approaches for achieving optimal business sustainability.

Keyword: Lean and Green Management System (LGMS), Lean and Green Waste Reduction Technique (LGWRT), Lean and Green Business Result (LGBR)

INTRODUCTION

Lean and Green concepts have become critical approaches in the industrial sector as companies strive for enhanced efficiency and sustainability. Lean Management emphasizes identifying and eliminating non-value-added activities in production processes, improving efficiency and reducting costs. Originating in Japan during the 1950s as the Toyota Production System (TPS), Lean Management has since been widely adopted across industries for its ability to streamline operations and imporove productivity (Valamede & Akkari, 2020), (JIT), teamwork, waste minimization, and continuous improvement. Additionally, it contributes to pollution prevention by enhancing the ratio of value-added activities to waste (Hajmohammad et al., 2013).

On the other hand, Green Management focuses on reducing environmental impacts through sustainable practices, including waste minimization, resource efficiency, and innovative environmental strategies. Green Management integrates environmental objectives into business strategies, offering a pathway to achieve sustainability, social responsibility, and competitive advantage (Haden et al., 2009).

This study investigates why the integration of Lean and Green Management Systems (LGMS) and Lean and Green Waste Reduction Techniques (LGWRT) is necessary and how these systems contribute to Lean and Green Business Results (LGBR). By combining lean and green principles, LGMS and LGWRT not only address waste elimination but also enhance business productivity and environmental compliance, ensuring long-term competitiveness in the evolving industrial landscape (Dües et al., 2013). The greater the amount of waste within a company, the more it impacts the company's efficiency. Minimizing waste in every production process is one of the key parameters of productivity.

METHOD

This study uses a sample consisting of 50 respondents from employees of manufacturing companies. Descriptive statistical measurements are necessary to see the general data picture, such as the mean, maximum, minimum, and standard deviation of each research variable in the implementation of lean and green management system, and lean and green waste reduction techniques in Indonesia towards lean and green business results.The total number of respondents obtained is 50, from 10 companies. This study focuses on automotive companies.

RESULTS AND DISCUSSION

Descriptive Statistical Test

This study used a sample of 50 respondents from manufacturing company employees. This descriptive statistical measurement needs to be done to see the general picture of data such as average (Mean), Highest (Max), Lowest (Min) and standard deviation of each research variable in the implementation of lean and green management systems, and lean and green waste reduction techniques in Indonesia on lean and green green business results.

Data collection

Data is taken from several automotive industry manufacturing companies. The following is the name of the company that was sampled and the number of samples taken:

Table1.Data Collection Company Name

Company Name	Industry Sector	Number of Respondents
PT. SGMW Motor Indonesia	Otomotif	5
PT.Samjin Brothread Indonesia	Otomotif	5
PT. PANLI	Otomotif	5
PT.Suzui Indomobil Motor	Otomotif	5
PT. MMKI	Otomotif	5
PT. Yamaha Panca	Otomotif	3
PT. Bridestone Tire Indonesia	Otomotif	6
PT. Dipo Otomotif	Otomotif	5
PT. Sentosa Cahya Abadi	Otomotif	5
PT. Cikarang Perkasa Mnufacturing	Otomotif	6
Total		50

The total number of respondents obtained was 50 respondents from 10 companies, this research focuses on automotive companies. The following are the results of filling out questionnaires based on 50 respondents from 10 automotive companies.

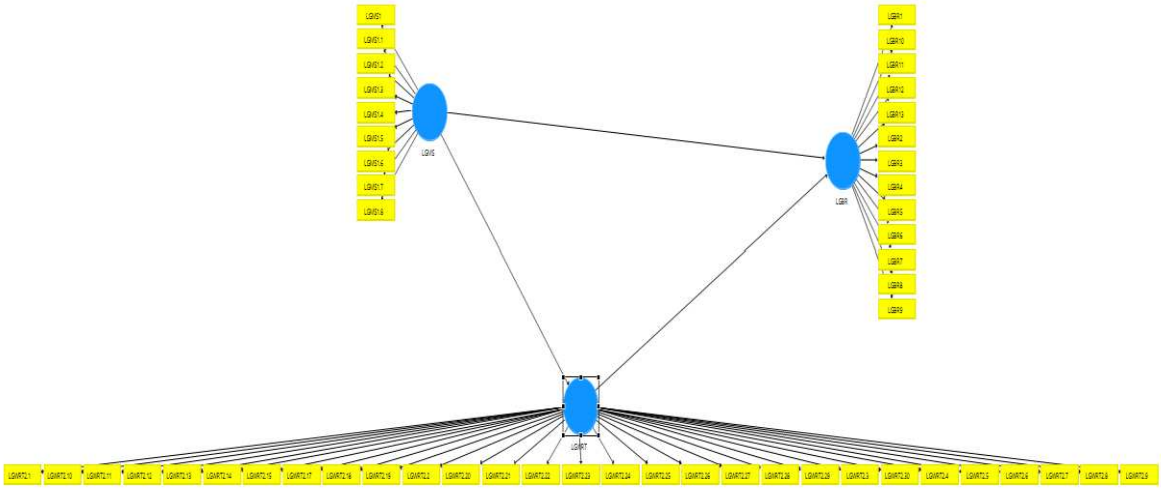

Figure 1. Initial Outer Model

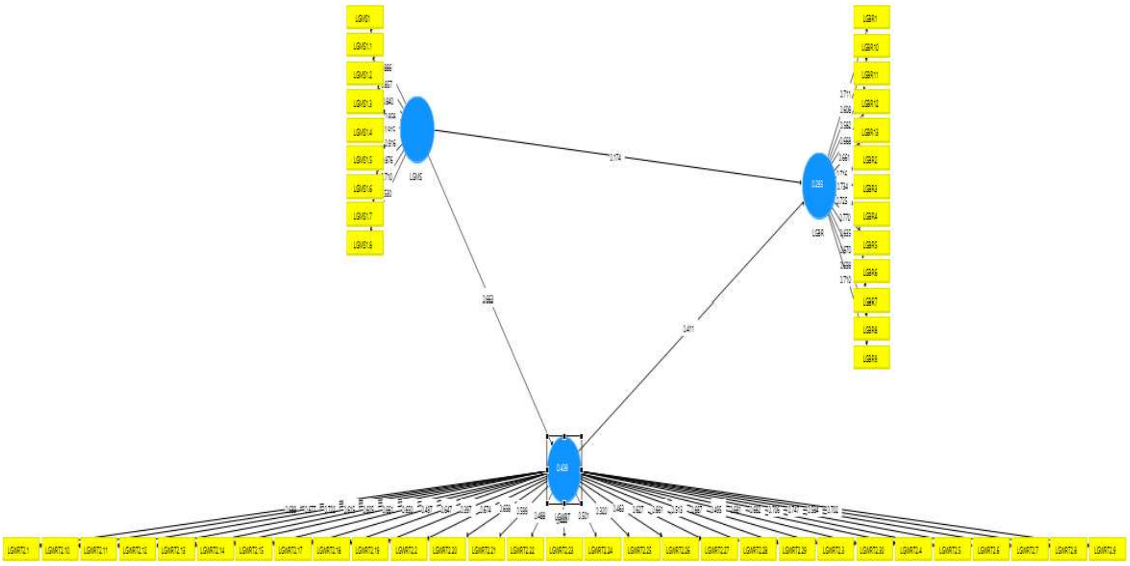

Figure 2. Initial Data Processing

Based on the model that has been processed, the results of several relationships from several experimental results are obtained:

1. Lean Green Management System (LGMS) has a positive and significant effect on Lean Green Waste Reduction Technique (LGWRT).
2. Lean Green Waste Reduction Technique (LGWRT) has a negative and insignificant effect on Lean Green Business Result (LGBR).
3. Lean Green Management System (LGMS) has a negative and insignificant effect on Lean Green Business Result (LGBR).

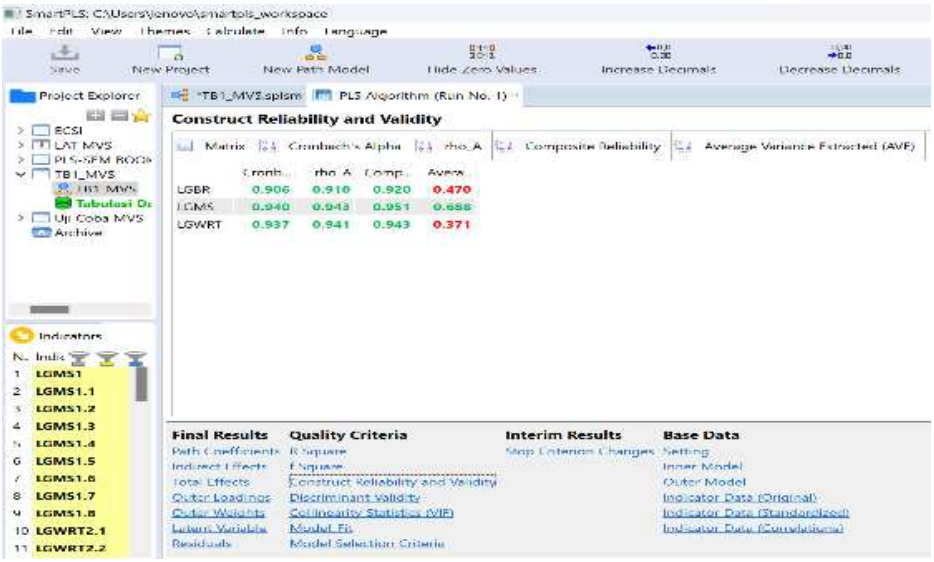

Figure 3. The Cronback Alpa value is> 0.7

Based on the figure above, it is stated that the Cronback Alpa value is> 0.7, which means that the data is declared reliable.

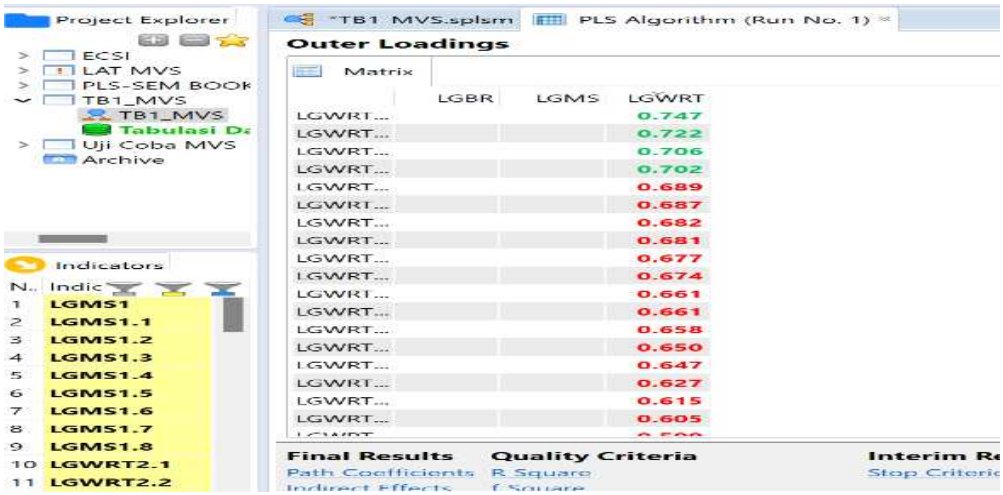

Figure 4. Outer Loading LGWRT

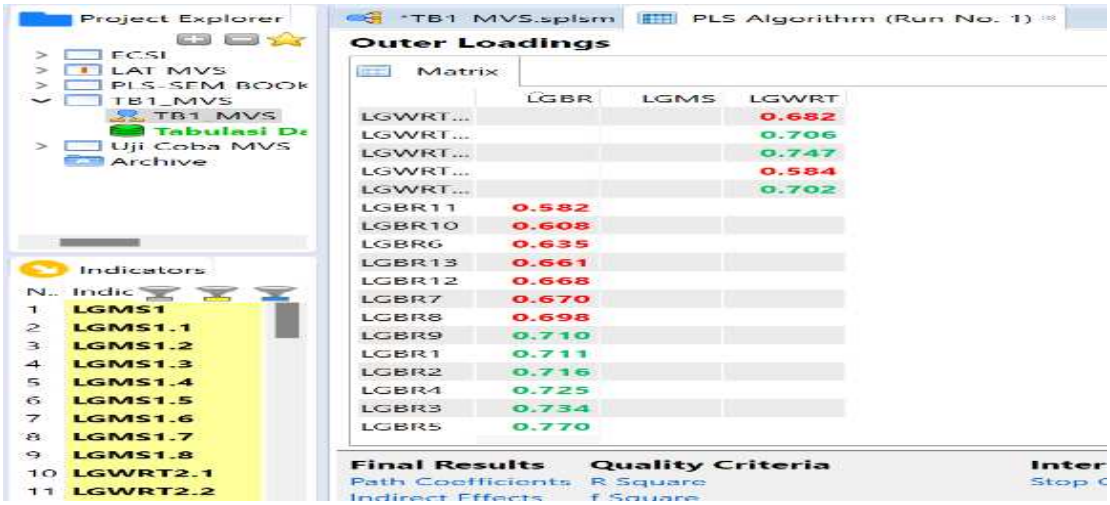

Figure 5. Outer Loading LGBR

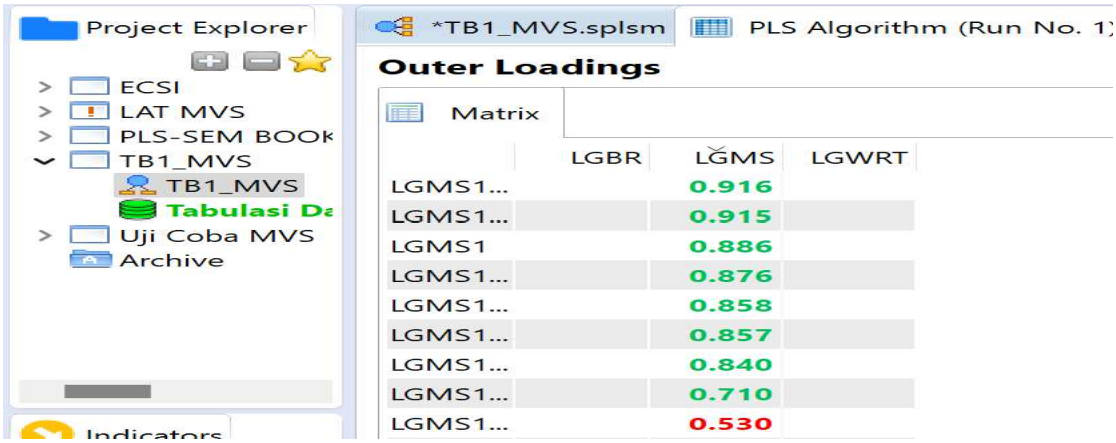

Figure 6. Outer Loading LGMS

Outer Model Improvement

From the initial model, the author deleted several statements whose ilia were less than 0.6, the following statements were deleted LGMS 1.8, LGBR 11, LGWRT 2.17, LGWRT 2.21, LGWRT 2.22, LGWRT 2.23, LGWRT 2.24, LGWRT 2.26, LGWRT 2.28, LGWRT 2.30 and LGWRT 2.8 as follows:

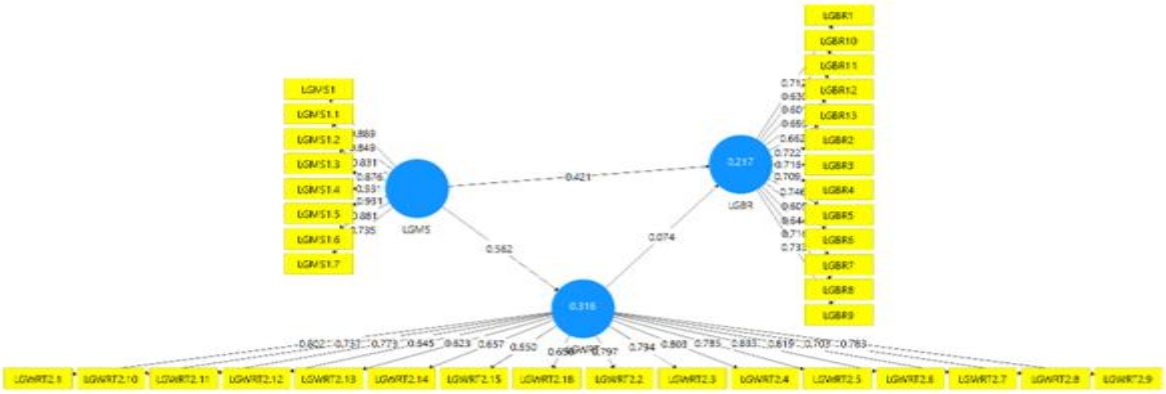

Figure 7. Outer Model Improvement

Based on the model that has been processed, the results of several relationships are obtained:

1. Lean Green Management System (LGMS) has a negative and insignificant effect on Lean Green Waste Reduction Technique (LGWRT).
2. Lean Green Waste Reduction Technique (LGWRT) has a negative and insignificant effect on Lean Green Business Result (LGBR).
3. Lean Green Management System (LGMS) has a negative and insignificant effect on Lean Green Business Result (LGBR).

Table 2. Path coefficient

LGBR11	0.601	LGBR11	0.601
LGBR6	0.605	LGBR6	0.605
LGBR10	0.630	LGBR10	0.630
LGBR7	0.644	LGBR7	0.644
LGBR13	0.662	LGBR13	0.662
LGBR12	0.693	LGBR12	0.693
LGBR4	0.709	LGBR4	0.709
LGBR1	0.712	LGBR1	0.712
LGBR3	0.716	LGBR3	0.716
LGBR8	0.716	LGBR8	0.716
LGBR2	0.722	LGBR2	0.722
LGBR9	0.733	LGBR9	0.733
LGBR5	0.746	LGBR5	0.746

Validity and Reliability The Improvement model construct that the Cronbach Alpha value is >0.06, which mean that the data is declared reliable.

Outer Model Results

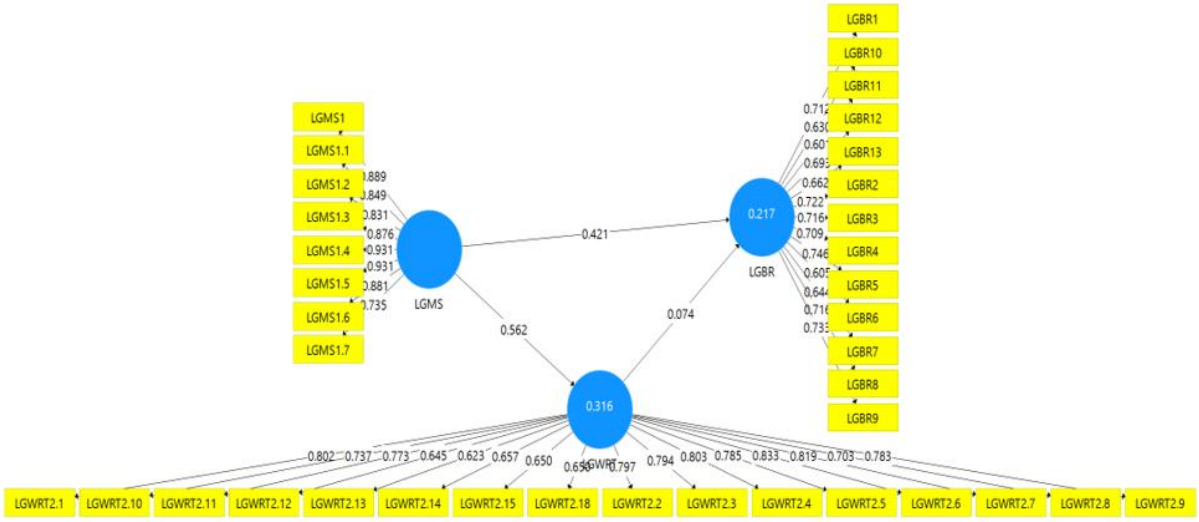

Figure 8. Model improvement hypothesis

CONCLUSION AND SUGGESTIONS

The implementation of Lean and Green Management System (LGMS) and Lean and Green Waste Reduction Technique (LGWRT) has a significant positive impact on environmentally friendly business outcomes in Indonesia's industrial sector. Both approaches assist companies in reducing waste, minimizing resource use, reducing emissions, and lowering operational costs. In addition, the implementation of LGMS and LGWRT also supports companies in meeting stricter environmental regulations and improving corporate image. Overall, the combination of these two approaches not only improves environmental performance, but also provides a competitive advantage through increased efficiency and profitability. These findings are expected to encourage more companies in Indonesia to adopt lean and green principles to achieve more optimal business sustainability.

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