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GREEN SUPPLY CHAIN MANAGEMENT DEVELOPMENT FOR IMPROVING THE ENVIRONMENTAL CONCERNS OF BUSINESS*

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Abstract

The green supply chain management (GSCM) is for protection of environmental, and industries can employ it to decrease side effects of environment and enhance proper application of energy and resources by considering the future. The purpose of this article is to use a quantitative-qualitative method to identify and develop a pattern of green supply chains in Indonesian industries and to examine the level of effectiveness and efficiency. The present study was conducted by examining the information of 21 companies engaged in Indonesian industries that have implemented GSCM in the last 5 years, during the years 2023-2024. For this purpose, green supply chain criteria showed that green process design, green innovation, green customers, environmental management approaches, and human resource management have the greatest impact on improving environmental performance, managing and optimizing energy consumption and cost of industries. The results showed that the use of GSCM decrease waste, resources, hence decreases energy consumption and environmental pollution. The employing of GSCM in industry, improve efficiency and performance. This article, which is the result of a descriptive-quantitative study, discusses and examines the current status of the GSCM, the characteristics and components of the green supply chain, and the benefits of establishing a green supply chain, so that managers can achieve competitive management by using GSCM.

Keywords: environmental management approaches, green customers, green innovation, green process design, human resource management

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1. Introduction

Sustainable development requires that companies consider social and environmental consequences in their activities. Sustainable development has been considered as a challenge for all businesses in recent years (Kumar and Chandrakar, 2012; Okoye et al., 2024). GSCM refers to the minimization or elimination of wastes including hazardous chemicals, gas emissions, energy and solid waste along the supply chain such as product design, material sourcing and production process selection, final product delivery and final product management (Arifin et al., 2024). Therefore, GSCM plays a main role in the overall environmental effect of each company involved in supply chain strategies and so helps to improve sustainability (Kumara et al. 2024; Singh et al., 2025). GSCM evolved from supply chain management. Increasing awareness of green practices prompted companies to operate in an ethical and social manner in their supply chains. Starting in 1995, GSCM attracted significant academic interest and received the most attention in 2015 (Htet et al., 2025; Ali et al., 2024; Susilowati et al., 2023). The benefits that can be obtained from supply chain management are well-known in the literature. Supply chain management increases the improvement by 60%, ranging from 10% to 60%. The cost of supply chain management is critical for its survival and growth; Because purchasing costs account for the largest share of revenue and sales (about 80%). According to Al Masri and Wimanda (2024), environmentally friendly behavior of companies is associated with significant increases in stock prices; while companies with ecologically harmful behavior face a decrease in stock prices.

The idea of GSCM is to reduce waste (energy, greenhouse gas emissions, chemical/hazardous waste, solid waste) along the supply chain (Wiredu et al., 2024; Huseynzadea and Abdullayeva, 2024; Nainggolan et al., 2024). Environmental issues have become a major concern for manufacturers under legislation and customer guidelines, especially in the developed countries. GSCM base their goals on six important topics: green process design, green innovation, green customers, environmental management approaches, human resource management, and green logistics (Fig. 1).

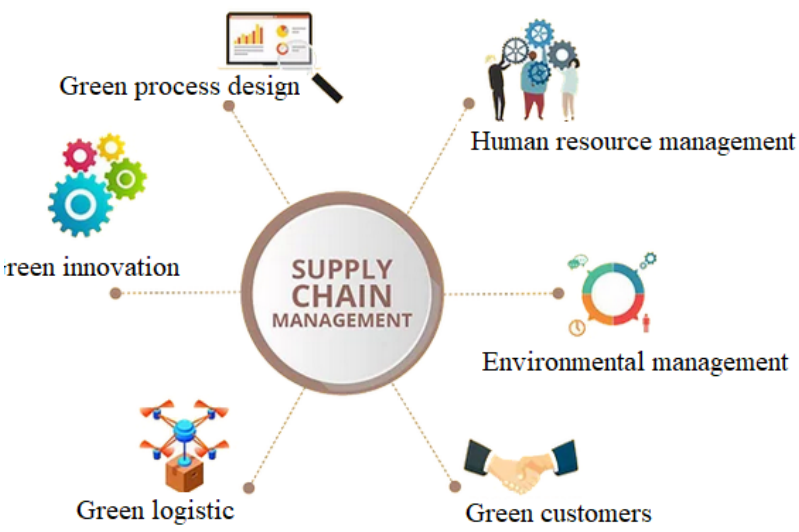

Fig. 1. GSCM variables

2. Method

The present research method is a descriptive-survey type of correlation and is included in the field studies. Since this research is a field research branch. Therefore, it includes various stages such as: description, recording, analysis and interpretation of existing conditions and finally contains suggestions. In this research, considering the subject, we are looking to examine the research objectives and issues using a questionnaire to examine the research hypotheses. In order to identify the requirements that need to be examined, the researcher has collected opinions based on the indicators desired by the researcher and has taken steps to shape the research hypotheses. In the field of research literature and theoretical issues related to the subject, existing sources (books, articles, websites, organizational documents and records) have been used.

This research is of an applied type in terms of classification based on the purpose. The statistical population of this research is senior managers of companies under the Indonesian industry. In this research, random sampling method is available and the 5-choice Likert scale has been used in the questionnaire. Finally, 154 questionnaires were distributed, and due to the incompleteness of some questionnaires, the final evaluation was based on 134 questionnaires. In order to collect information and for the final test of the research model, the questionnaire tool (Souhli and En-nadi, 2023; Valmohammadi and Rahmani, 2022) was used. To answer the questions of this questionnaire, a five-point Likert scale from completely agree to completely disagree was used. In the present study, in order to examine the face and content validity, the questionnaire was provided to a number of professors and experts in green management, and after applying the opinions of the experts and confirming the validity by them, the questionnaire was implemented and distributed among the statistical population. In order to examine the reliability of the research data, the reliability index was used, which includes three criteria: Cronbach's alpha and factor loading coefficients. In order to analyze the data and test the conceptual model of the research, the structural equation modeling technique with the partial least squares approach was used with SPSS and Smart-PLS software. First, in order to provide a proper interpretation of the data, the demographic characteristics of the respondents were examined and described using statistical tables and graphs using SPSS software and descriptive statistical techniques such as mean, frequency, and percentage.

3. Results

CA is a classic measure of reliability and a suitable measure for assessing internal consistency (internal consistency). Internal consistency indicates the degree of correlation between a construct and its related indicators (questions). A CA amount more than 0.7 shows acceptable reliability. Validity shows the correlation degree between a construct and its indicators, and the higher the correlation, the greater the fit (Alicha et al., 2024). In the case of validity, the critical value is 5.4. This means that validity values above 4.5 indicate acceptable convergent validity (Kusuma et al., 2025a; Kusuma et al., 2025b; Lazic et al., 2023). The reliability of constructs is not calculated in absolute terms but in terms of the correlation of their constructs with each other. If the composite reliability value for each construct is more than 0.7, it shows adequate internal reliability for the measurement models, and a value below 0.6 shows the absence of reliability. It is important to note that composite reliability is a better measure of Cronbach's alpha in structural modeling (Morvari et al., 2024).

In the structural equation approach in Smart Pls, three criteria of reliability, CV, and CR are employed to examine the performance of measurement models. The higher the factor loading of an indicator in relation to a specific structure, the greater the contribution of that indicator to explaining that structure. Also, if the factor loading of an indicator is negative, it shows the negative impact in presenting the relevant structure.

Table 1. CA, CV, and CR amounts for reliability test

Variables	*Cronbach's alpha*	*Composite reliability*	*Convergent validity*
green process design	0.953	0.843	0.789
green innovation	0.876	0.827	0.783
green customers	0.821	0.881	0.671
environmental management	0.865	0.810	0.664
human resource management	0.882	0.876	0.701
Sustainability	0.911	0.942	0.809

The question related to that indicator is designed in reverse. The criterion for the appropriateness of the factor loading coefficients is 0.5 (Okoye et al., 2024). In the present study, as shown in Table 2, all coefficients demonstrate the appropriateness of this criterion. All factor loadings are above 0.5 and are significant at the 99% confidence level. This means that the indicators (indicator variables) explain the conceptual variables well. As observed, Fig. 2 shows that all paths between variables in the model have been confirmed and are significant.

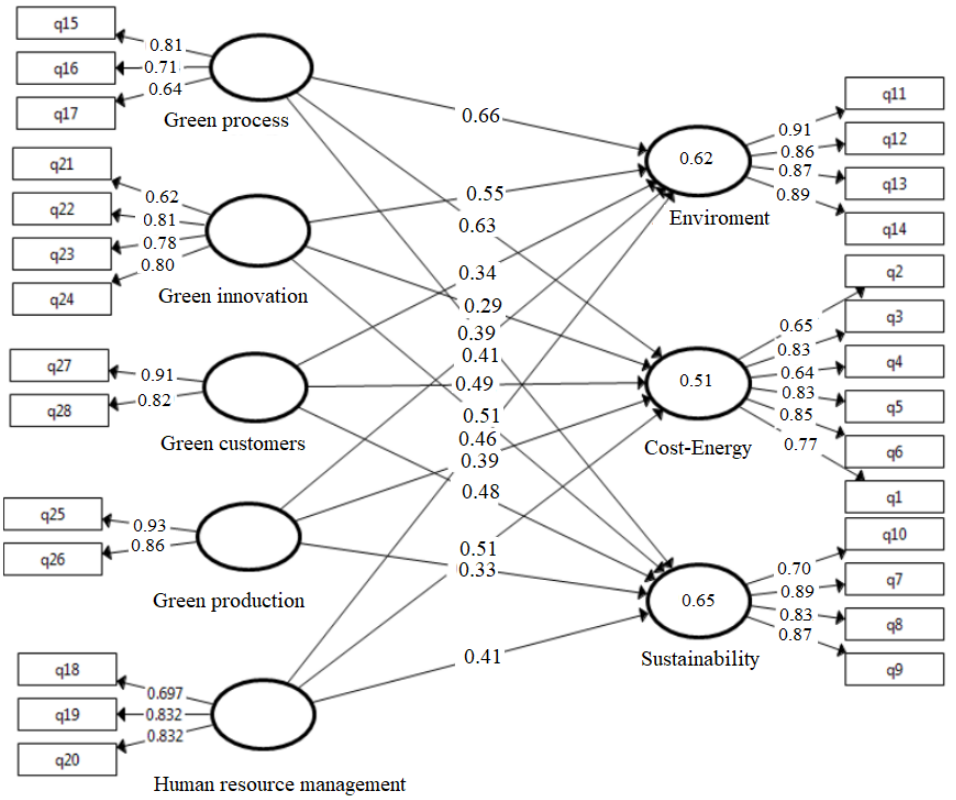

Fig. 2. Model in the case of standardized factor loading coefficients and t-test

Green process design has a direct impact on the environment. The findings indicated that green process design has a positive and significant effect of 0.66 on environmental performance. The results of this study are consistent with the research of Sun et al., (2021). It can also be stated

that, according to the results, it shows that the industries select their suppliers from among green suppliers in order to increase its environmental performance by purchasing the products it needs from them. Green innovation shows a direct impact on the company's cost. The results showed that green innovation has a positive and significant impact of 0.63 on economic performance. According to this results can be stated that if these industry purchase green products that are free of environmental pollutants and use them in their products, they will not only prevent environmental pollution, but also save on their costs and lead to improved company performance.

4. Conclusion

The GSCM originates from the theory of supply chain management and sustainable development approaches. Sustainable development is also one of the key issues to ensure the survival of the industry and requires the commitment and participation of all stakeholders. Manufacturing industries have considered the concept of green in their supply chain management to focus on environmental issues.

Given the increasing importance of environmental issues in the world and the numerous cases of pollution and environmental degradation in our country, not paying attention to issues related to environmental protection principles will cause irreparable damage to these industries in the future. Ignoring environmental issues will result in losses such as the accumulation of polluting units, changing methods, and the need for redesigns. Therefore, it is necessary to implement plans for implementing a GSCM system in the industry as the subject of this study. To this end, identifying key factors affecting the implementation of this system to solve environmental problems and manage it is a priority.

Decision-makers and managers, with knowledge of key factors affecting the improvement of environmental and sustainability issues in the company, can identify the necessary measures to focus on multiple enablers to achieve green and sustainable supply chains in the company and prevent and deal with obstacles to establishing and implementing a sustainable supply chain management system. Industries should use the ideas, innovations, and creativity of their employees to achieve better environmental results in the path of GSCM. Therefore, many experts recommend using green teams in this regard.

The steps of using a green team are: reviewing the environment, establishing an environmental program, establishing an environmental unit, creating working groups for environmental activities. The result of these cases is leading governments and politicians to take measures to encourage environmental protection, and all institutions that harm the environment in any way in their processes, production methods, or recycling are under pressure from society, governments, and customers who support the environment, and are forced to review their processes and supply chains. On the other hand, companies, considering the benefits that the supply chain, especially the green supply chain, provides for them, including creating a competitive advantage and attracting almost permanent customers (whose main concern and concern is the environment while meeting their own needs), which leads to greater profitability and sustainability in a very competitive market, commit themselves to using the green supply chain.

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