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ENVIRONMENTAL PERFORMANCE: THE CONTRIBUTION OF GREEN INTELLECTUAL CAPITAL AND ENVIRONMENTAL AWARENESS OF MANUFACTURING MSME BUSINESS

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Abstract

This study aims to examine and test the components of Green Intellectual Capital on Environmental Performance by looking at the role of Business Owners' Environmental Awareness in Moderating this relationship in MSMEs located in disaster affected areas of Palu, Sigi and Donggala (PASIGALA18). A quantitative research method was applied by distributing questionnaires to 60 business owners in the manufacturing MSME sector in the PASIGALA18 area and applying Moderated Regression Analysis using SPSS 27. The research findings reveal that the Green Intellectual Capital component contributes to Environmental Performance in the form of Green Human Capital (β1 = 0.604, p-value <0.001); Green Structural Capital (β2 = 0.252, p-value 0.012); and Green Relational Capital (β3 = 0.411, p-value 0.001). Meanwhile, Environmental Awareness shows a high explanatory power of the model. The role of environmental awareness strengthens all contributions of the Green Intellectual Capital component to the Environmental Performance of MSME actors. The findings indicate that investment in green knowledge, systems, and networks supported by increased business owner awareness significantly improves the environmental performance of MSMEs. The research has implications for local government policy recommendations to improve training programs for MSME actors to integrate Green Intellectual Capital and strengthen environmental awareness in achieving sustainable environmentally friendly production practices.

Keywords: ***Environmental Awareness, Environmental Performance, Green Intellectual Capital, MSMEs Manufacturing, PASIGALA18***

INTRODUCTION

The Micro, Small, and Medium Enterprises (MSME) sector in Indonesia faces serious problems in terms of environmental performance, manifested in rampant pollution due to poorly managed production waste. According to data from the Ministry of Environment and Forestry (2023), MSMEs in the manufacturing sector are one of the sub-sectors that generate waste from their production activities. The lack of an effective waste management system exacerbates this condition. MSME actors are focused on profit and neglect the surrounding environment, resulting in the accumulation of waste, pollution of surrounding waterways, and environmental pollution due to ineffective management of production waste. The performance of MSMEs is not only based on assessments related to production results, but also on the behavior of MSME actors in addressing waste management in their operations. Palu, Sigi, and Donggala are areas in Central Sulawesi that provide opportunities for their communities to assist in the recovery of cities after disasters through MSME units. The opportunities provided by the government to the community are not simply given without considering environmental factors. Therefore, the regency/city government issued a policy (2016) related to the business environment carried out by the community in supporting environmental performance through cleanliness, tidiness, sustainability, and concern for the utilization of resources in the environment surrounding the business. According to data from the Palu City Environment Agency, the percentage of plastic waste has increased by 10.4% of the total annual waste volume, which weighs 97,492 tons (Mohammad, 2024). The published policy is aimed at raising awareness among MSME actors in treating their business environment (Palu, 2021). The environmental performance of MSMEs can be measured based on the intelligence of business actors, which is the main basis for understanding the behavior of business actors towards their environment. In addition to generating profits for the company, the complexity of environmental challenges faced by business

actors requires a holistic understanding of the interaction between environmental performance, business strategy, and business capabilities. Optimal environmental performance is not only related to compliance with regulations, but also the ability of MSMEs to integrate environmentally friendly practices into the core business processes of entrepreneurs. From a dynamic capability perspective, business actors' environmental awareness plays a fundamental enabling role, prompting them to identify (sensing), utilize resources (seizing), and reconfigure (transforming) business assets and processes in response to environmental opportunities and threats (Diao & Li, 2014; Teece et al., 2009). Business environmental awareness points to the relationship between the environment and green business strategies by increasing business awareness to respond proactively to environmental changes and develop sustainable competitive advantages. The application of dynamic capability theory explains the correlation between MSMEs and high environmental awareness, which is able to reconfigure business resources and competencies in achieving superior environmental performance, thereby creating sustainable value (Ahmad et al., 2025).

Green intellectual capital supports business environmental performance. The skills, knowledge, experience, and innovation of business actors in protecting the environment for the development of sustainable competitive advantage by emphasizing business actor knowledge (Green Human Capital), environmentally friendly systems and processes (Green Structural Capital), and relationships with stakeholders (Green Relational Capital) that create company value are the main components of Green Intellectual Capital. According to Srouji et al. (2025), Green Intellectual Capital aims to measure business actors to continuously improve their capabilities in business operational activities by considering all aspects of assessment, including environmental performance. Several previous studies have stated the problems (Antwi-Boateng et al., 2025; Hariyono & Narsa, 2024; Kumar et al., 2025; Shahbaz et al., 2025) related to the application of Green Intellectual Capital practices in MSME actors and their environmental performance, which is still relatively low, indicating a gap between practice and theory. Therefore, moderation in the importance of increasing business actors' environmental awareness is important to explore in strengthening the correlation between these two aspects.

Environmental awareness among business actors is highlighted in providing the novelty of research to moderate Green Intellectual Capital and Environmental Performance. Not many previous studies have empirically explored the relationship between Green Intellectual Capital, Environmental Performance, and Environmental Awareness among MSME actors, especially in post-disaster cities, PASIGALA18. Previous studies have been limited to discussing the relationship between Green Intellectual Capital and Environmental Performance components, without linking Environmental Awareness, and presenting several other indicators (Aggarwal & Agarwala, 2023; Ahmad et al., 2025; Gidage & Bhide, 2025a, 2025b; Hariyono & Narsa, 2024; Hoang Thanh & Truong Cong, 2024; Kumar et al., 2025; Mansoor et al., 2021; Romadhon et al., 2025; Shahbaz et al., 2025; Srouji et al., 2025; Yusliza et al., 2020; Yusoff et al., 2019). Therefore, this study was conducted to explain the limitations of previous studies by examining the role of environmental awareness among MSME actors in following up on environmental performance through the practice of Green Intellectual Capital among MSME actors.

Based on the limitations of previous studies and research issues, this study aims to examine the relationship between Green Intellectual Capital and Environmental Performance as well as the role of environmental awareness among MSME manufacturers. This study contributes to the development of an environmental accounting framework that can be applied to MSME actors in Indonesia and provides strategic recommendations for optimizing environmental performance through effective intellectual capital management for MSME actors. In addition, the novelty offered in this study contributes to the literature on the gaps in previous studies so that it can be applied globally to the practices of global MSME actors. This research is expected to improve the quality of business actors in responding to environmental issues, further to environmental accounting among MSMEs through the provision of a framework based on empirical evidence that shows the value proposition of investing in Green Intellectual Capital and becomes the foundation for policy development that supports the implementation of sustainable accounting practices in the MSME sector, and contributes to the achievement of Sustainable Development Goals pillar 12 on Responsible Production and Consumption.

LITERATURE REVIEW

Dynamic Capabilities Theory

The Dynamic Capabilities Theory proposed by Teece et al. (1997) assumes that dynamic capabilities are a company's ability to integrate, build, and reconfigure its internal and external competencies to cope with changes in the business environment. In other words, dynamic capabilities are defined as the ability of a business entity to deliberately adapt, merge, and adjust to the business environment in order to respond to rapid changes in the business environment and maintain a sustainable competitive advantage (Diao & Li, 2014; Teece et al., 2009). The application

of dynamic capabilities in a business helps open up opportunities for entrepreneurs to create sustainable competitive advantages with capabilities that limit competitors from imitating the business development they have, because it is based on a combination of skills, resources, and organizational routines. Business actors in responding to an uncertain business environment and continuous revolution, dynamic capacity in business practices enables business actors to adapt to changes. In addition, innovation and business growth can continue to develop significantly in maintaining the suitability of business value in market assessment. Business capabilities emphasize three main aspects as previously stated by Teece, Pisano, and Shuen. Integration, development, and adjustment need to be the main concerns of business actors in developing their businesses without neglecting the interests of their environment. In this study, the implementation of dynamic capability theory explains the behavior and capabilities of existing MSME actors in responding to environmental issues in their business development process.

Environmental Performance

The essence of environmental performance in business practices emphasizes business actors' goal of achieving success. Environmental performance can be measured through an assessment of the environmental management system implemented. According to Shah et al. (2021), companies and business actors play a role in improving their environmental performance through activities that care for the environment, which are considered as tangible and intangible assets. Environmental activities require companies and business actors to disclose their environmental performance in their annual reports. Thus, the achievement of Good Corporate Governance can be realized through the reflection of corporate transparency and accountability in reporting environmental activities and providing environmental information to stakeholders in social responsibility reports on their contribution to the operational environment. Gidage & Bhide (2025b) reveal that environmental performance is a key indicator for investors in investing their funds to support company operations. The more environmental activities a company engages in, the greater the interest of investors in investing their capital. In this study, environmental performance in MSME actors is assessed as an indicator that can be measured through the knowledge, understanding, and ability of business actors to manage and protect their business environment, as well as their ability to develop innovations in environmentally friendly practices by considering the context of awareness and behavior of business actors. Thus, the measurement of environmental performance needs to be explored further in the context of the operational sustainability of MSME actors.

Environmental Awareness

Environmental awareness emphasizes public involvement in creating an environment free from waste problems. Environmental awareness shows that environmental improvement through the capabilities, knowledge, and willingness of the community, including business actors, to maintain the performance of the surrounding environment so that it is well maintained with cleanliness and tidiness. Environmental awareness has a broad meaning, but in the context of this study, it is defined as the knowledge and involvement of MSME actors in maintaining their attitudes, values, and abilities to preserve their business environment in a neat and clean condition. This study considers environmental awareness as a variable that can strengthen or weaken the relationship between entrepreneurs' environmentally friendly knowledge and their business environmental performance. Its presence in moderating both variables indicates the important role of environmental awareness among MSME actors in developing their businesses while paying attention to the surrounding environment. Thus, without proper environmental awareness among business actors, the state of the business environment can become an obstacle to business development. This is in line with that expressed by Perano et al. (2025) regarding the urgency of environmental awareness in community business practices.

Green Intellectual Capital

Green Intellectual Capital has indicators for measuring the intangible value of a company, which includes expertise, knowledge, and networks related to green innovation and environmental protection, both at the personal level and within the organizational structure of the company. The measurement indicators in Green Intellectual Capital consist of Green Human Capital, Green Structural Capital, and Green Relational Capital components that express the capabilities, knowledge, skills, experience, wisdom, attitudes, creativity, and loyalty of business actors in their business environment (Gidage & Bhide, 2025a). Green Structural Capital includes all unrecorded assets such as organizational policies, management systems, information technology, management perspectives, cultural values, reputation, patents, copyrights, and trademarks that support green innovation and environmental protection in business actors. Green Relational Capital refers to the interaction between business actors and stakeholders in efforts

to manage the environment and sustainable green innovation in their businesses. Romadhon et al. (2025) state that Green Intellectual Capital has a significant positive influence on the assessment of business environmental sustainability, which reflects the assessment of environmental performance. This shows that the skills and knowledge of business actors and corporate activities regarding environmental awareness are determining indicators that encourage the achievement of environmentally friendly and sustainable environmental performance.

Green Human Capital and Environmental Performance

Research conducted by Aggarwal & Agarwala (2023) shows that Green Human Capital has a positive relationship with environmental performance. This assessment is supported by research by Srouji et al. (2025) and Hoang Thanh & Truong Cong (2024), which states that with Green Human Capital, a company's environmental performance can be fulfilled properly. With the assessment of Green Human Capital on Environmental Performance in previous studies as mentioned above, this study indicates that Green Human Capital has a positive interaction with the environmental performance of MSME actors.

H1: Green Human Capital has a positive relationship with Environmental Performance.

Green Structural Capital and Environmental Performance

The findings of Yusoff et al. (2019) reveal a positive relationship between Green Structural Capital and environmental performance. This statement based on the test results is in line with the research by Sarwar & Mustafa (2024), which shows that Green Structural Capital and environmental performance are linked in a unidirectional measurement, meaning that Green Structural Capital is capable of measuring the environmental performance of business actors. Previous studies that reveal the relationship between the two encourage the formulation of research hypotheses so that it can be stated that Green Structural Capital has a positive relationship with the environmental performance of MSME actors.

H2: Green Structural Capital has a positive relationship with Environmental Performance.

Green Relational Capital and Environmental Performance

Yusliza et al. (2020) found that Green Relational Capital, which is a component of Green Intellectual Capital, has a positive influence on environmental performance. In line with these findings, Yusoff et al. (2019) revealed similar findings regarding the relationship between the two. The explanation above shows that Green Relational Capital and Environmental Performance have a measurable positive relationship in encouraging the development of MSME businesses. Therefore, this study concludes that Green Relational Capital and Environmental Performance have a positive relationship in the activities of MSMEs.

H3: Green Relational Capital has a positive relationship with Environmental Performance.

Green Human Capital, Environmental Performance and Environmental Awareness

The relationship between Green Human Capital and Environmental Performance is predicted to be strengthened by the awareness of MSME actors in maintaining the environment of their businesses. The findings revealed by Perano et al. (2025) explain that environmentally conscious behavioral actions have a positive practical influence on environmental performance based on pro-environmental capabilities and ethics. Thus, this study finds that awareness of environmentally conscious actions can strengthen the relationship between Green Human Capital and Environmental Performance.

H4: Environmental Awareness moderates the relationship between Green Human Capital and Environmental Performance.

Green Structural Capital, Environmental Performance and Environmental Awareness

Environmental awareness enhances Green Structural Capital and Environmental Performance in the business activities of MSME actors. Environmental awareness among MSME actors is defined as the belief among business actors that the environment can attract consumers. Business actors' policies in developing business activities that are aligned with environmental concerns demonstrate their awareness in improving their environmental performance. The findings revealed by Hoang Thanh & Truong Cong (2024) direct research in revealing the role of environmental awareness through moderation in the relationship between Green Structural Capital and Environmental Performance. Thus, the research formulates that:

H5: Environmental Awareness moderates the relationship between Green Structural Capital and Environmental Performance

Green Relational Capital, Environmental Performance and Environmental Awareness

In building relationships between business actors and other stakeholders to maintain the sustainability of the business environment, the environmental awareness of individual business actors is key to improving maximum business environmental performance and avoiding activities that harm the environment. Maintenance in these conditions demonstrates the awareness of business actors to improve their environmental performance. The findings of Sarwar & Mustafa (2024) indicate a strengthening relationship between business actors' behavior and environmental performance in cooperation between business actors. Thus, this study concludes that environmental awareness can strengthen the relationship between Green Relational Capital and the Environmental Performance of MSME Actors.

H6: Environmental Awareness moderates the relationship between Green Relational Capital and Environmental Performance.

The hypothesis proposed is:

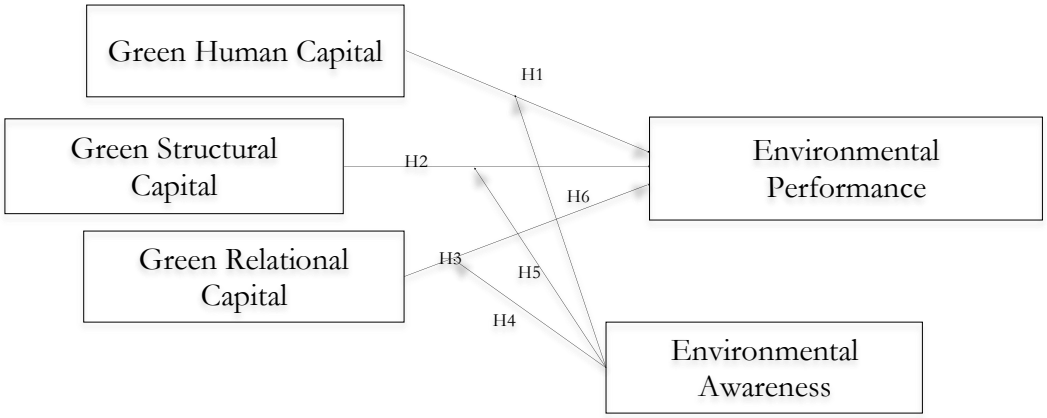

Figure 1. Research Construct

METHOD

Data Collection

This study examines the components of Green Intellectual Capital on Environmental Performance through the Environmental Awareness of MSME actors engaged in manufacturing, in terms of producing raw materials into products that are ready for sale using a numerical-quantitative approach. This study highlights the activities of MSMEs in the cities of Palu, Sigi, and Donggala that have built their businesses in the production sector, such as furniture, tofu and tempeh, copra, bricks, and fish seed cultivation. The research data was obtained from a questionnaire distributed based on sample criteria (MSMEs engaged in manufacturing) to 60 MSME actors who are business owners in the production sector. Business owners were selected as respondents because they were considered to have authority in managing their business locations, so that the behavior of business owners in monitoring their environment provided an accurate test of the research objectives. This study targets MSME actors in the manufacturing sector because the waste they produce is non-organic and organic waste that cannot be recycled, thus posing a potential threat to the environment, unlike MSMEs engaged in the food and beverage sector. MSME manufacturing activities tend to leave behind waste that cannot be reused, and MSME players often neglect their obligation to manage waste effectively. Therefore, this study focuses on MSME players in the manufacturing sector to examine interactive relationships that can contribute positively to MSME players' activities.

Techniques Analytic

The quantitative approach was used to analyze the relationship between the research variables. Variable measurements in the questionnaire were assessed using a Likert scale – (1) Strongly Disagree, (2) Disagree, (3) No Opinion, (4) Agree, (5) Strongly Agree – in explaining the operational activities of production in environmental management by MSME actors in Palu, Sigi, and Donggala. Moderated Regression Analysis (MRA) was the analysis technique applied in this study to determine the extent to which environmental awareness shapes the behavior of MSME actors in fulfilling the Green Intellectual Capital component of their business environmental performance. SPSS 27 is the statistical tool used in testing the linear regression analysis that is carried out gradually. SPSS is very relevant to apply because the researcher wants to reveal the calculation scheme in the structured statistical analysis

activities in this study. The calculation of the value of the moderation regression analysis model can be seen in the following final equation:

$EP = \alpha_1 + \beta_1 GHC + \beta_6 EA + \beta_7 GHC*EA + e_1$ ..... (1)
$EP = \alpha_2 + \beta_2 GSC + \beta_5 EA + \beta_8 GSC*EA + e_2$ ..... (2)
$EP = \alpha_3 + \beta_3 GRC + \beta_4 EA + \beta_9 GRC*EA + e_3$ ..... (3)

Keterangan:
EP = Environment Performance
α = Constant
β = Regression Coefficient
GHC = Green Human Capital
GSC = Green Structural Capital
GRC = Green Relational Capital
EA = Environment Awareness
e = Error Term

RESULTS AND DISCUSSION

Descriptive Statistics

The distribution of research instruments to 60 MSME actors who are business owners concluded a summary of research characteristics that revealed the range of values for the answers on the research instruments provided. Table 1 presents a summary of the values on the research instruments, including the number of respondents, minimum value, maximum value, average value, and standard deviation, which aim to measure the variability of data from the average value in the study.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
GHC	60	10.00	20.00	16.8500	1.72543
GSC	60	18.00	29.00	23.4833	2.87297
GRC	60	15.00	25.00	21.0000	2.13922
EP	60	16.00	30.00	25.5333	2.67104
EA	60	18.00	25.00	22.1000	1.84758

Source: SPSS 27 (2025)

The results in Table 1 form the basis for further testing. In classical assumption testing, the results show that the research instruments are significant and meet all the elements seen in validity and reliability testing, which show a significance value of less than 5%, Cronbach's Alpha exceeding 0.60, and no multicollinearity. Thus, the data in this study directly provide key findings in simplifying the analysis results found.

Table 2. Moderated Regression Analysis Results

	Unstandardized Coefficients		Standardized Coefficients	t	sig	Collinearity Statistic	
Variabel	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-1.782	2.971		-0.600	0.551		
GHC	0.604	0.145	0.390	4.160	0.000	0.545	1.826
GSC	0.252	0.097	0.271	2.610	0.012	0.444	2.253
GRC	0.411	0.119	0.329	3.457	0.001	0.528	1.893
EA	0.117	0.105	0.081	1.118	0.269	0.910	1.099
GHC*EA	0.928	0.282	0.301	3.291	0.002		
GSC*EA	0.689	0.266	0.262	2.590	0.012		
GRC*EA	0.985	0.257	0.331	3.835	0.000		
F Sig	0.000						
R square	0.737						
Adj. R square	0.717						

a. Dependent Variabel: Environment Performance

Source: SPSS 27 (2025)

Table 2 reveals the final results of the research testing. Data analysis results show that there is good disclosure between variables to be explained comprehensively regarding the interaction of research variables.

The Contribution of Green Human Capital to Environmental Performance

Environmental performance is shaped by the contribution of Green Human Capital, which emphasizes the ability to practice environmentally friendly production through training that improves knowledge and skills to work together as a team in carrying out tasks and responsibilities for maintaining the business environment, thereby minimizing the risk of environmental damage resulting from business production activities. The tests conducted in this study show a significant value (0.000) < 5%, which indicates that Green Human Capital plays an important role with a percentage of 60.4% (0.604) in the environmental performance of MSME manufacturing businesses. This finding emphasizes the importance of business actors' understanding of environmental maintenance, not merely as a routine, but emphasizing the important value of instinctive environmental maintenance to have a positive impact on the quality of the business environment of MSME actors.

Skills in environmentally friendly production practices in the processing of goods for sale are the main focus of the essence of Green Human Capital. This study reveals the significant contribution of business actors' understanding and skills in striving to utilize environmentally friendly production processes as the main key to the success of business environmental performance. Aggarwal & Agarwala (2023) emphasize the urgency of knowledge and skills that are in line with environmental performance, not only based on the irresponsible principles often practiced by parties who are negligent in maintaining the environment. However, Yusoff et al. (2019) found that Green Human Capital does not contribute significantly to environmental performance. However, the reinforcement of Srouji et al. (2025), Mansoor et al. (2021), and Hoang Thanh & Truong Cong (2024) strengthens the opinion of the contribution of Green Human Capital to environmental performance. Included in the category of businesses engaged in the production of tofu and tempeh, waterways that tend to experience pollution due to improper waste management contribute significantly when the remaining liquid waste is sterilized through filtration to separate the residue in the water solution, which serves to filter and reduce the vulnerability of amino acids and other organic compounds that can cause discomfort to the surrounding environment due to the unpleasant odors they produce. With knowledge and skills that compel business actors to give freedom to their environment to become healthy and presentable, it emphasizes the importance of a basic understanding of environmentally friendly production processes.

In addition, the research findings are in line with the assumptions of dynamic capability theory, which states that the ability of companies—in this study, revealing the behavior and capabilities of MSME owners—to integrate, build, and configure internal and external competencies in improving the business environment, which is gradually undergoing a revolution. The skills possessed by businesses in environmentally friendly practices encourage them to continue to actively adapt to every small change that occurs in their business environment in order to continue contributing to the development of a beautiful environment, as a form of responsibility and accountability of business owners, and the achievement of a common goal, namely business sustainability. This finding confirms the positive

impact of understanding waste management and responsible production on the environment to improve the environmental performance of businesses and make it part of the operational production process of business actors, taking into account factors of mutual interest for business sustainability, as stated by Paranoan et al. (2025) in describing non-conventional transaction activities in waste management at landfills.

The Contribution of Green Structural Capital to Environmental Performance

Table 2 shows that Green Structural Capital has a moderate contribution to improving environmental performance. Although the value in the test is not comparable to the results of the Green Human Capital test, the test of this variable emphasizes that the direct use of a good management system in environmental maintenance and environmentally friendly practices in the behavior of business actors to maintain their business environment is one of the factors that influence the quality of the business in terms of its environmental performance. A significant value (0.012) < 5% indicates that 25.2% of MSME owners who were the subjects of the study acknowledged the consistency of investment in environmentally friendly facilities, not only focusing on achieving profits in business, but also on innovation and creativity in reuse and concern for environmental values through a managed system (Gidage & Bhide, 2025b). The use of environmentally friendly management practices, as demonstrated by simple practices such as energy conservation, liquid and solid waste sorting, and environmentally friendly product design that does not cause serious environmental impacts, is the first step for business actors to demonstrate good environmental performance in the implementation of their environmentally friendly systems.

The findings of Hariyono & Narsa (2024) and Yusoff et al. (2019) agree in revealing the uniformity in aligning the opinions described in these findings, emphasizing the aspect of management integrated with technology and structured interactions based on standards. Companies that cancel environmental maintenance activities in their production processes tend to improve their environmental performance and operating income. The dynamic capability theory underlying this thinking reinforces that the existence of an integrated system that builds and adapts to changes in the environment supports business actors' understanding of the need to continuously improve their environmental performance. The magnitude of the moderated results makes the management system a form of business that can be developed by business actors in dealing with their business environment situation to continuously develop together with their business environmental performance. Thus, these findings reveal the best relationship in the use of sustainable systems in environmentally friendly production practices. Furthermore, the findings of Paranoan et al. (2025) reinforce the findings as a basis for thinking that a management system based on environmentally friendly practices is the main capital for business actors to continue to innovate and develop the quality of their business and environmental performance together.

The Contribution of Green Relational Capital to Environmental Performance

The essence of establishing close relationships for common goals is the basis for building continuous trust. The environmentally friendly business practices of MSMEs cannot be separated from the involvement of other parties who aim to improve environmental welfare through environmentally friendly production practices. This study reveals that Green Relational Capital contributes 41.1% to the formation of environmental performance, which is significantly (0.002) < 5% built on relationships established on trust in production practices where the first party (business owner), second party (customer), and third party (supplier and other interested parties) all -all want a business life that is free from periodic pollution from production activities so that they can jointly build innovations that lead to environmental maintenance practices through compliance with regulations by reducing the use of hazardous materials in production and switching to more environmentally friendly product designs and offering regular education not only internally within the business, but also to every consumer, supplier, and other parties directly or indirectly.

Mansoor et al. (2021) revealed that the relationship built between one party and another in elaborating green innovation to improve environmental performance enhances its quality, focusing not only on material aspects but also on non-material sustainable income generated from the accessibility of the surrounding community and business actors in improving their businesses, including a more sustainable corporate image due to the green practices implemented. This view is reinforced by the findings of Yusoff et al. (2019). With the relationships built through interactions between several parties, outside of business owners, it is easier to integrate and build on what already exists in relation to environmental conservation and be ready to adapt to any environmental changes through increased internal and external cooperation and competence within the company (Yusuf, 2025). The alignment in this dynamic capability theory shows the important role of other parties, because basically each party needs other parties in achieving sustainable goals in environmental maintenance so that the performance obtained from pollution

reduction supports business sustainability. This finding confirms that internal freedom in establishing relationships with other parties with the same goal, in the practice of environmentally friendly production to reduce environmental performance, is the basis for good communication management through sustainable cooperation, thereby creating material and non-material profits. In terms of spirituality, this assessment of cooperation builds on the interaction of the three main pillars of the human body so that the assessment of physical, mental, and spiritual achievements is fulfilled evenly and continuously.

The Role of Environmental Awareness in Strengthening Green Human Capital Relationships in Environmental Performance

Environmental awareness without action is merely a pipe dream without any concrete movement. Therefore, this study reveals that awareness of environmental preservation increases the knowledge and ability of MSME actors to practice environmentally friendly production, thereby encouraging business actors to continuously innovate to the maximum as a form of concern and awareness that it is the responsibility of business actors to improve the environment after production. With test results showing a value of 92.8% significantly (0.002) <5%, this study concludes that the business practices carried out by MSME actors consider the need to protect the environment in which they operate in order to reduce the negative impacts of their production activities. For example, improper management of copra waste (coconut production) triggers the spread of diseases that damage the aesthetics of the environment and creates air, soil, and water pollution in production areas.

With the awareness that builds innovative values in business actors in environmentally friendly business management, the abilities and knowledge of business actors related to production can have an impact that supports the environmental performance of their businesses. The findings are in line with the assumptions of dynamic capability theory and reinforce the views of Perano et al. (2025) in revealing the role of self-awareness in maintaining the business environment through capabilities and knowledge in improving its environmental performance. Thus, these findings can serve as a basis for implications on the business activities of MSME entrepreneurs to continue improving their skills in environmentally friendly production accompanied by a real awareness in strengthening the environmental performance of their businesses.

The Role of Environmental Awareness in Strengthening Green Structural Capital in Environmental Performance

Emphasizing awareness activities in environmental conservation through the use of environmentally friendly systems that cover business production processes enables MSME players to rapidly improve their environmental performance. Although only partially, Green Structural Capital contributes positively. However, the value obtained is still far from what could be achieved if MSME players were more aware of the need to improve their environmental performance. Practically, awareness of environmental conservation values through the use of simple systems such as energy-efficient production processes, and waste sorting to reduce post-production environmental pollution by switching to environmentally friendly raw materials, indicates that the quantitative value of 68.9% with a significance level of <5% (0.012) shows that the quality of the environment, with the contribution of the system and the awareness of MSME players, will improve in the long term as a form of investment in creating a going concern business. The findings support the assumptions of Dynamic Capabilities theory, which emphasizes the importance of integration, development, and adaptation to environmental performance through skills in selecting systems that promote environmental health in business (Diao & Li, 2014). Therefore, it can be concluded that the presence of positive moderation of environmental awareness in increasing the magnitude of influence on the contribution of Green Structural Capital to environmental performance can be a benchmark for field practices in all types of MSMEs in various sectors, not only limited to activities in the Manufacturing Sector.

The Role of Environmental Awareness in Strengthening the Relationship between Green Relational Capital and Environmental Performance

Good environmental performance cannot be separated from the concern and sense of responsibility of MSME actors. The implementation of cooperation in shaping business performance together with various parties, such as environmentalists, the surrounding community, and fellow business actors in carrying out environmentally friendly production, shows that the value of 98.5% on the moderation test of environmental awareness on the contribution of Green Relational Capital to environmental performance, which is significantly <0.05 (0.000), indicates that business actors are increasingly working together to create business areas that are free from environmental destruction. These findings show that the assumptions of dynamic capability theory are not only based

on assumptions but also on actual practices that can provide business actors with an understanding of how to integrate environmental values through environmentally friendly production by building networks of environmentalists in the surrounding community and other parties, as well as adapting to any changes that may harm the environment of their business (Sarwar & Mustafa, 2024). Therefore, with concern for the environment, business actors are able to increase profit orientation accompanied by attention to the maintenance of their business environment.

CONCLUSION

Based on the tests conducted, it shows that Green Human Capital, Green Structural Capital, and Green Relational Capital have a significant positive contribution to improving Environmental Performance. This research can have a major and beneficial impact on the motivation of MSME players to take environmental responsibility in processing products. These findings indicate that business owner awareness facilitates the sensing, seizing, and transforming processes described in dynamic capability theory, thereby making individuals more effective at translating knowledge, systems, and relationships into tangible environmental practices. Thus, investments in improving green competencies, strengthening environmentally friendly management systems, and developing stakeholder networks are more effective when accompanied by increased environmental awareness among MSME actors. This empirical conclusion reinforces the argument that the management of green intellectual capital integrated with the environmental awareness of business owners is a key mechanism for improving the environmental performance of MSMEs.

The research findings encourage practical interventions in the form of priority training for local governments for MSME actors to increase Green Human Capital, fiscal and non-fiscal incentives for investment in environmentally friendly infrastructure and systems (Green Structural Capital), as well as collaborative programs that strengthen the network of business actors, suppliers, consumers and environmentalist communities, with the integration of environmental awareness indicators in technical assistance so that the interventions are holistic. The interpretation of the findings was conducted with caution due to the limitations of the research, namely the relatively small sample size and focus on the geographical conditions of MSMEs in the PASIGALA18 manufacturing sector, which limited the generalizability of the findings. Further research is recommended to expand the sample coverage sectorally and geographically, adopt a longitudinal or experimental design, and apply a mixed-method approach to enrich the validity of indicators and understand the mechanisms of translating social relations into environmental practices.

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