

Bridging Green Intellectual Capital and Green Organizational Culture toward Green Performance: A Green Innovation Perspective

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Abstract: This study investigates the effects of green intellectual capital and green organizational culture on green performance, with green innovation as the mediator variable. Based on the natural resource-based view and knowledge-based theory, a quantitative explanatory methodology is used. Data were collected from the owners and managers of 250 environmentally oriented SMEs employing purposive sampling, which operate their businesses in an environmentally friendly manner. Valid and reliable measurement scales were applied, and the data were analyzed using structural equation modeling (SEM) to examine the direct and indirect effects. The findings reveal that green intellectual capital and green organizational culture positively and directly affect green innovation. In addition, a green organizational culture directly affects green performance. However, green intellectual capital has no direct effect on green performance. Instead, green intellectual capital affects green performance via green innovation. Moreover, green innovation mediates between green intellectual capital and green performance, and between green organizational culture and green performance. This study demonstrates that knowledge about environmentalism and organizational culture should be translated into innovative practice to achieve sustainable outcomes. The study implies that environmentally oriented SMEs should have strong green competence, a high level of environmental knowledge, and an organizational culture that supports innovation. From a practical perspective, it is recommended that owners/managers participate in environmental management training programs, implement green operations, and join the innovation cooperation network. Government policy could be directed to provide green training, green incentives, and technical support. This study expands the literature on the effects of green intellectual capital and green organizational culture on the green performance of environmentally oriented SMEs.

Keywords: *green intellectual capital, green organizational culture, green innovation, green performance*

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INTRODUCTION

The global concern about sustainability is now growing amid the acceleration of environmental issues such as global warming, environmental pollution, and the abuse of natural resources (Lajara et al., 2022; Li et al., 2023). Furthermore, the growth and business activities are progressing more rapidly. As concerns about pollution and

environmental damage are recognized, businesses tend to adopt greener business practices (Sudirman et al., 2024; Tjahjadi et al., 2023). As a result, the organization is expected to have a concern for and a balance between environmental and economic objectives in measuring its environmental and economic performance (Vadithe et al., 2025; Roxas & Chadee, 2016). In the end, the measure of this balance is green performance, which can indicate the extent to which a business organization can meet environmental objectives while continuing to expand commercialization (Singh et al., 2020). Among many sustainable actions, Green Innovation has been widely considered a successful strategy that leads to better Green Performance and enhances sustainable competitive advantage (Liu et al., 2022; Chao & Juo, 2021). The stakeholders have consequently urged business organizations, especially MSMEs, to adopt green action and strategies to be socially accepted and gain greater competitive advantage in the current dynamic environment (Badghish & Soomro, 2024; Sembiring et al., 2023).

Managing internal resources while addressing growing environmental demands is the most urgent sustainability issue for small and medium-sized enterprises (SMEs) (Jirakraisiri et al., 2021). However, SMEs often face greater constraints than large companies in terms of financial resources, technologies, expertise, and management capabilities. Therefore, it will be more difficult for SMEs to implement green management practices, especially in developing countries (Liu et al., 2022; Gharib et al., 2023). In light of this, Green intellectual capital (GIC) (comprising environmentally related knowledge, skills, and relationships) is considered a significant intangible asset for enabling green innovation and sustainable development (Elzek et al., 2024; Martínez-Falcó et al., 2023). While the quality and quantity of environmental knowledge are a prerequisite, a Green organizational culture is indispensable for the effective accumulation and utilization of GIC (Song & Yu, 2018). Green organizational culture (GOC) refers to employees' environmental values, beliefs, and attitudes, which further shape their environmental behavior (Roespinoedji et al., 2019; Imran et al., 2021). For SMEs, fostering such a culture is not easy due to concerns about short-term business survival and efficiency. However, if SMEs can foster a strong GOC, implementing environmental management practices will become more manageable, thereby improving business performance (Ahmad et al., 2023; Qu et al., 2022). Several studies suggest that GOC fosters green innovation and business performance, both directly and indirectly (Legese et al., 2026; Hadjri et al., 2019).

Due to increasing global demand for sustainable business operations, much academic attention has been directed towards the green performance of SMEs (Sharma et al., 2021; Lajara et al., 2022). Green performance should be viewed not only in terms of environmental outcomes but also in the capacity of SMEs to compete on a long-term basis and maintain their sustainability (Hossain et al., 2022; Muisyo & Qin, 2021; Chao & Juo, 2021). It is in this area that green innovation has emerged as a key mechanism through which SMEs may reconcile the use of environmental strategies with their role as predictors of organizational performance (Liu et al., 2022; Zhang & Maelah, 2026). Green innovation in the form of products, processes, or managerial practices helps SMEs enhance green performance and attain competitive advantage in the marketplace (Achmad & Wiratmadja, 2025; Awwad Al-Shammari et al., 2022). However, the performance impacts of green innovation have yielded inconsistent results in many studies. Much like the studies by Tang et al. (2018) and Song & Yu (2018), many studies have found that the effectiveness of green innovation varies across contexts and

depends on the organization's internal characteristics, such as managerial commitment, organizational culture, and strategy orientation. This lack of consistency reflects that green innovation does not work in isolation but instead relies on the firm's resources and capabilities.

According to RBV theory, GIC can be considered a strategic resource that can confer SMEs a valuable knowledge-based competitive advantage (Liu et al., 2022; Zhang & Maelah, 2026). Green intellectual capital comprises green human capital, green structural capital, and green relational capital. All of these enable an SME to improve its performance in managing environmental issues and pursuing environmental opportunities (Abrudan et al., 2022; Ramadana et al., 2025). SMEs in developing countries generally face challenges in developing all three dimensions of GIC due to limited access to training on environmental matters, green technology, and external sustainability-related networks. Indeed, Chao & Juo (2021) showed that GIC affects both green innovation and green performance, and Green Innovation is an important mediating factor. The same conclusion was reached by Khan et al. (2021) and Li et al. (2023), who identified GIC as an intangible resource that influences business sustainability. However, the literature also suggests that there is no direct link between GIC and business performance: in this case, the business must have internal capabilities and processes to convert environmental knowledge into tangible, creative outputs (Abrudan et al., 2022). So we need to investigate how internal resources and organizational processes influence the green performance.

Green intellectual capital (GIC) is a resource-based perspective that considers knowledge-based competitive advantage resources within the company (Liu et al., 2022; Zhang & Maelah, 2026). Green intellectual capital is divided into green human capital, green structural capital, and green relational capital and is thought to influence how an organization can most effectively respond to environmental concerns (Abrudan et al., 2022; Ramadana et al., 2025). Chao & Juo (2021) also found that GIC and green innovation significantly affect green innovation and green performance, and that green innovation functions as an important mediator. This was demonstrated by Khan et al. (2021) and Li et al. (2023), who found that GIC, as an intangible asset, can stimulate green innovation and improve organizational sustainability. Despite the foregoing, several studies have shown that the effect of GIC on performance is not direct but is mediated by organizational capacity mechanisms, such as dynamic capacities (Abrudan et al., 2022). This suggests the need to consider organizational resources and processes to understand green performance.

On the contrary, knowledge-based theory posits that knowledge serves as an important resource in generating innovation and competitive advantages (Buhaya & Metwally, 2024; Liu et al., 2022). From this perspective, Green organizational culture (GOC) serves as an essential instrument for generating and transferring environmental knowledge within an organization (Widiyati & Murwaningsari, 2021; Enbaia et al., 2024). Green organizational culture involves values, beliefs, and norms that stimulate pro-environmental behaviors and sustainable innovation (Sandra et al., 2025; Bhatti et al., 2022). Empirical evidence indicates that GOC positively impacts green innovation and organizational performance (Chandra et al., 2021; Legese et al., 2026). According to Gürlek & Tuna (2018) and Enbaia et al. (2024), green organizational culture had an indirect positive impact on competitive advantage through mediating the green innovation. Besides, Imran et al. (2021) and Bhatti et al. (2022) also showed that green

organizational culture had an impact on organizational performance through mediating the green innovation and environmental performance.

Despite investigations into the relationship among GIC, GOC, and green performance, most research in this field has only partially considered the relationship; none have established a full conceptual framework for all three elements (Enbaia et al., 2024; Lajara et al., 2022). Some research treats GIC as an internal factor without considering organizational culture; others treat green organizational culture without considering knowledge-based capabilities. Moreover, the mediation of green innovation shows full, partial, and no mediation effects across studies (Sumayyah et al., 2025; Nawangsari et al., 2025). The aforementioned inconsistencies create a theoretical gap that requires synthesis.

One significant limitation in prior studies is the failure to integrate green intellectual capital and green organizational culture in the explanation of green performance. Secondly, the mediating role of green innovation has not been thoroughly investigated within a holistic, simultaneous conceptual framework. Thirdly, many studies on the relationship between green intellectual capital, green organizational culture, green innovation, and green performance have been confined to developed countries; developing countries exhibit distinct characteristics and have distinct factors for promoting sustainable practice. Given this gap, the study aims to investigate the role of green intellectual capital and green organizational culture in strengthening green performance through green innovation. This exploration is grounded in the logic of the RBV and the Knowledge-Based View. The argument is that internal resources and knowledge can be valuable sources of competitive advantage in achieving sustainable performance. Thus, the GOC is an enabling mechanism for optimally exploiting these resources, while GIC is considered a strategic resource in this case.

RESEARCH METHODS

Research Design

This study uses a quantitative, explanatory research design to test the causal relationships among variables in the proposed conceptual model (Turner, 2020). This approach was chosen because it provides empirical evidence on the influence of green intellectual capital and green organizational culture on green performance, with green innovation as a mediating factor. The study was conducted cross-sectionally, with data collected over a specific time period to describe the research object's current conditions.

Conceptual Models and Hypotheses

This research conceptual model was developed by integrating the resource-based view (RBV) and knowledge-based theory (KBT). This model uses green innovation as a mediating variable and positions green intellectual capital and green organizational culture as independent factors that affect green performance as the dependent variable. The direct effects of GIC on GI and GP, the effects of GOC on GI and GP, and the effects of GI on GP are among the theories put forward based on this paradigm. Furthermore, the mediation hypothesis examines whether green innovation may strengthen the relationship between GOC and GIC in terms of green performance. The goal of this model is to provide a thorough knowledge of how businesses work internally to achieve sustainability-based performance. This research formulates and briefly develops the following hypotheses:

- H1: Green Intellectual Capital influences Green Innovation
- H2: Green Intellectual Capital affects Green Performance
- H3: Green Organizational Culture influences Green Innovation
- H4: Green Organizational Culture influences Green Performance
- H5: Green Innovation has an impact on Green Performance
- H6: Green Innovation mediates the relationship between Green Intellectual Capital and Green Performance
- H7: Green Innovation mediates the relationship between Green Organizational Culture and Green Performance

Population and Sample

The population in this study was all green MSMEs operating in North Sumatra, namely businesses that have adopted environmentally friendly practices in their production, distribution, and waste management processes. The research sample was determined using a purposive sampling technique based on certain criteria (Creswell, 2014), including having green practice activities, having been in operation for at least 2 years, and having a clear organizational structure. Based on these criteria, a sample of 250 green MSMEs was selected, spanning sectors such as the creative industry, food and beverages, and environmentally friendly crafts. This sample size was considered adequate for Structural Equation Modeling (SEM)-based analysis.

Data Collection Method

The data collection method in this study used a structured questionnaire survey distributed both in person and online to MSME owners and managers. Respondents were selected because they were deemed to have sufficient knowledge regarding strategy, innovation, and organizational culture in their companies. The questionnaire was structured using a five-point Likert scale, ranging from strongly disagree to agree strongly.

Measurement of Variables

The measurement instruments used in this study were adopted and adapted from well-established scales that have been validated in prior research. Green Intellectual Capital (GIC) was measured as a second-order construct consisting of three dimensions: green human capital, green structural capital, and green relational capital, adapted from the scale developed by Liu et al. (2022). Green human capital reflects employees' environmental knowledge, skills, and commitment; green structural capital captures organizational systems, procedures, and environmental management practices; while green relational capital assesses environmentally oriented relationships with customers, suppliers, and other stakeholders. Green Organizational Culture (GOC) was measured using indicators adapted from Imran et al. (2021), focusing on organizational values, norms, and practices that encourage environmental responsibility and sustainability-oriented behavior. Green Innovation (GI) was assessed using indicators adapted from Li et al. (2023) that cover environmentally friendly product and process innovation. Finally, Green Performance (GP) was measured using indicators adapted from Chao & Juo (2021), including environmental performance outcomes, pollution reduction, resource efficiency, waste minimization, and overall environmental improvement. All measurement items were assessed using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Data Analysis Technique

The data analysis technique in this study used Partial Least Squares-based Structural Equation Modeling (PLS-SEM) with SmartPLS software. This method was chosen because it can analyze complex relationships among latent variables and is suitable for research with moderate sample sizes (Hair et al., 2019). The analysis was conducted in two stages: evaluation of the measurement model (outer model) to test the validity and reliability of the constructs, and evaluation of the structural model (inner model) to examine the relationships between variables and the research hypotheses. Furthermore, mediation effects were tested using a bootstrapping approach to assess the significance of indirect effects.

RESULTS AND DISCUSSION

Respondent Description

In this study, respondents' descriptions include various demographic and business characteristics, such as gender, age, education level, business length, and industry sector. These variables were selected because they have the potential to influence perceptions, decision-making, and the implementation of environmentally-based practices within organizations. Furthermore, mapping respondent characteristics also allows researchers to identify data distribution patterns and ensure that the sample used reflects the actual conditions of green MSMEs in North Sumatra. By comprehensively understanding respondent profiles, the interpretation of the analysis results becomes more contextual and relevant.

Table 1. Demographics Respondents

Category	Item	Frequency	Percentage (%)
Gender	Male	107	42.8
	Female	143	57.2
Age (Years)	20–30	44	17.6
	31–40	85	34
	41–50	55	22
	>50	66	26.4
	Senior High School	91	36.4
Education	Diploma	69	27.6
	Bachelor's Degree	80	32
	Master's Degree	10	4
	<1	33	13.2
Length of Business (Years)	1–5	97	38.8
	6–10	70	28
	11–15	40	16
	>15	10	4
Type of business	Recycled Product MSMEs	87	34.8
	Organic Food MSMEs	53	21.2
	Sustainable Fashion MSMEs	65	26
	Others	45	18

Source: Processed Data (2026)



Table 2 shows the characteristics of the respondents. The majority of the respondents are women (57.2%, 143 people), followed by men (42.8%, 107 people). According to age, the biggest proportion was between 31-40 years (85 people) (34%), then followed by >50 years (66 people) (26.4%), ages between 41-50 years (55 people) (22%), ages between 20-30 years (44 people) (17.6%). According to the educational background of the respondent, the majority were at the high school level (91 people) (36.4%), then bachelor's degree (80 people) (32%), diploma (69 people) (27.6%), then master's degree (10 people) (4%). According to the duration of doing business, majority of the respondents had 1-5 years (97 people) (38.8%), followed by 6-10 years (70 people) (28%), 11-15 years (40 people) (16%), less than 1 year (33 people) (13.2%), then more than 15 years (10 people) (4%). The type of business was dominated by recycled product MSMEs (87 units) (34.8%), followed by sustainable fashion (65 units) (26%), organic food (53 units) (21.2%), and others (45 units) (18%).

Measurement Model Evaluation

The evaluation of the measurement model in PLS-SEM assesses the validity and reliability of the latent constructs. Convergent validity is assessed through factor loadings (≥ 0.70 ; exploratory ≥ 0.60) and AVE (≥ 0.50). Internal reliability is measured using Composite Reliability and Cronbach's Alpha, with values ≥ 0.70 (Hair et al., 2019). Fulfilling all these criteria is essential to ensure that the constructs can accurately represent the variables before structural model analysis is conducted.

Table 2. Outer Model Measurement Results

Constructs/items	Outer Loading	Cronbach's alpha	CR	AVE
Green Intellectual Capital		0.892	0.932	0.820
GIC1	0.862			
GIC2	0.929			
GIC3	0.924			
Green Organizational Culture		0.958	0.980	0.960
GOC1	0.978			
GOC2	0.982			
Green Innovation		0.853	0.931	0.872
GI1	0.936			
GI2	0.931			
Green Performance		0.899	0.951	0.907
GP1	0.966			
GP2	0.938			

According to the measurement model evaluation results in Table 2, all constructs used in this study provided good validity and reliability. All indicators' outer loadings are greater than 0.70, indicating that all items strongly represent the latent construct. Also, Cronbach's alpha and composite reliability (CR) values for all variables were above 0.70, indicating good internal consistency. Moreover, AVE values were greater than 0.50, which shows good convergent validity. Overall, the findings indicate good measurement quality for the instrument in this study. With good measurement quality for the instrument, the structural model can be evaluated by the variables.

To test the discriminant validity, discriminant validity requires that latent constructs should be separable, that is, they measure a different concept compared to other constructs. Discriminant validity reflects how well a construct represents the concept more uniquely than other constructs. The evaluation has been done by the

Fornell-Larcker criterion, and the square root of the AVE is greater than the correlation of the construct.

Table 3. Discriminant Validity Results

	Green Innovation	Green Intellectual Capital	Green Organizational Culture	Green Performance
Green Innovation	0.934			
Green Intellectual Capital	0.305	0.905		
Green Organizational Culture	0.216	0.210	0.980	
Green Performance	0.232	0.113	0.270	0.952

Source: Processed Data (2026)

The results of the discriminant validity test indicate that all constructs have met the Fornell-Larcker criteria, where the square root of the AVE value for each variable is higher than the correlation between other constructs. The values on the diagonal, namely green innovation (0.934), green intellectual capital (0.905), green organizational culture (0.980), and green performance (0.952), are consistently greater than the relationships between variables outside the diagonal. This confirms that each construct has unique characteristics and explains the variance in its indicators more dominantly than other constructs in the model. Thus, there is no indication of overlapping problems among the constructs, suggesting good discriminant validity and making the research model suitable for further analysis.

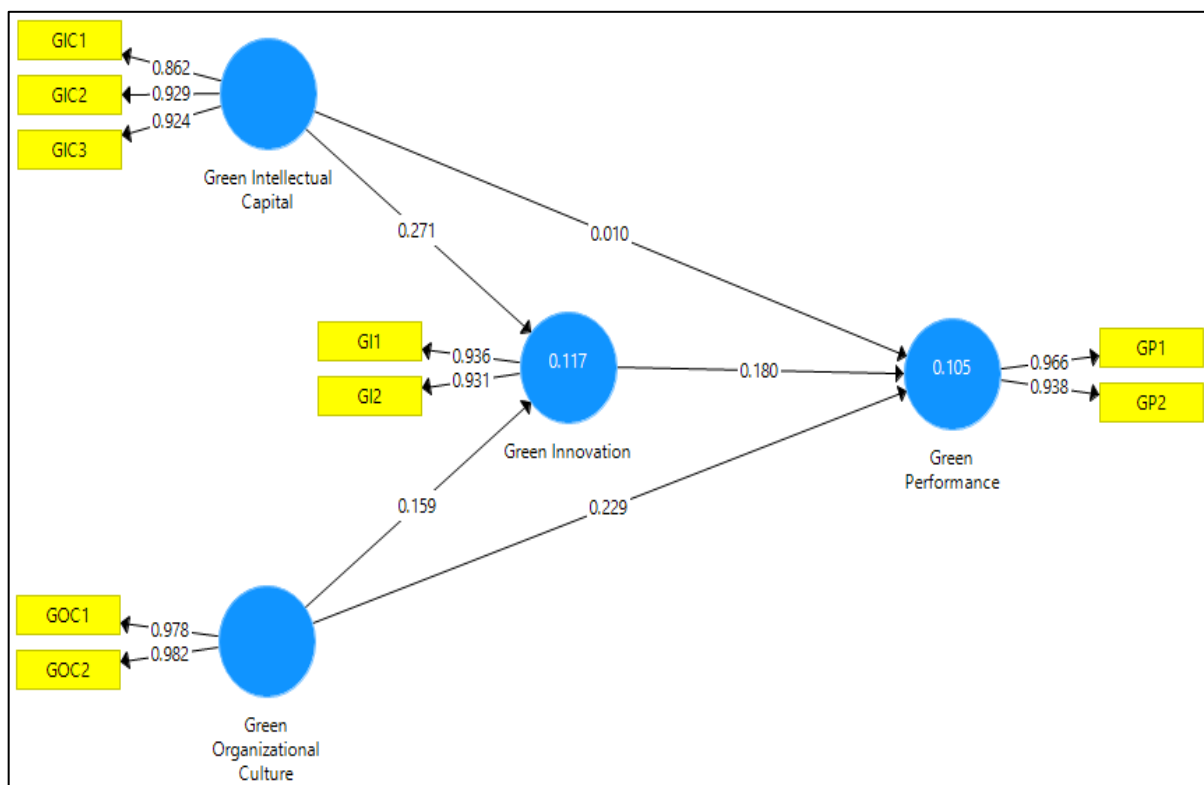


Figure 1. Outer Model Results

Source: Processed Data (2026)

Structural Model Results

Structural model evaluation in PLS-SEM aims to test causal relationships between latent constructs and assess the predictive ability of the developed model. The assessment uses path coefficients to test hypotheses, which must be statistically significant ($p < 0.05$ or $t > 1.96$). Furthermore, the coefficient of determination (R^2) is used to measure the ability of the independent variables to explain the dependent variable, with values of 0.75 (strong), 0.50 (moderate), and 0.25 (weak) considered strong, moderate, and weak, respectively (Hair et al., 2019).

Table 4. Calculation results of the R-Square Value

Variable	R Square	R Square Adjusted
Green Innovation	0.117	0.110
Green Performance	0.105	0.094

Source: Processed Data (2026)

From Table 4, the R-Square values suggest that green innovation has R-Square=0.117 and Adjusted R-Square=0.110. Therefore, only 11.7% of green innovation can be explained by green intellectual capital and green organizational culture, while the remaining variables beyond the model explain the balance. Besides, the R-Square for green performance is 0.105, and the Adjusted R-Square is 0.094, implying that only 10.5% of the green performance can be explained by the factors included in the model. As the common criteria are concerned, the value is rather weak; hence, the model is not very reliable for prediction. There are other factors affecting green innovation and performance that have not yet been considered.

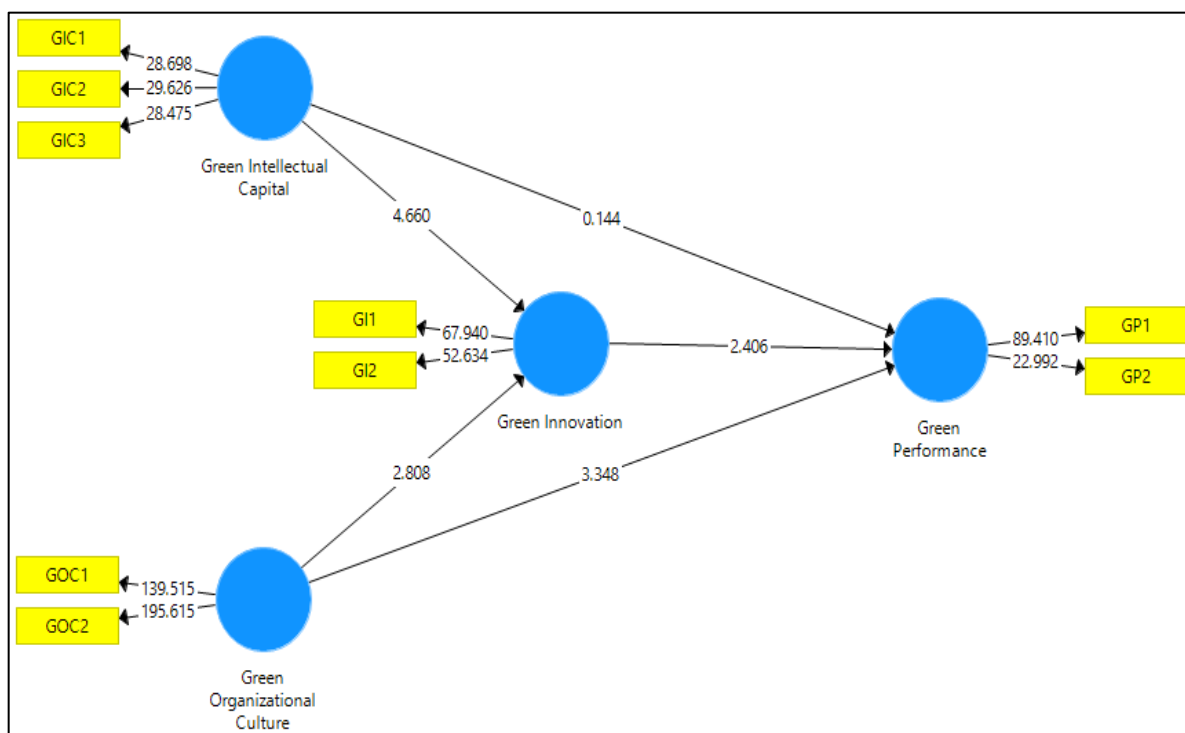


Figure 2. Hypothesis Testing Results

Source: Processed Data (2026)

Table 5. Hypothesis Test Results

Path Between Variables	Coefficient	t-count	P-Value	Conclusion
Green Intellectual Capital >> Green Innovation	0.271	4,660	0.000	Accepted
Green Organizational Culture >> Green Innovation	0.159	2,808	0.005	Accepted
Green Intellectual Capital >>Green Performance	0.010	0.144	0.885	Rejected
Green Organizational Culture >>Green Performance	0.229	3,348	0.001	Accepted
Green Innovation >>Green Performance	0.180	2,406	0.016	Accepted

Source: Processed Data (2026)

In terms of the results of hypotheses testing based on Table 5, it is found that green intellectual capital has positive and significant impact on green innovation (= 0.271; t = 4.660; p = 0.000), similarly green organizational culture has positive and significant impact on green innovation (= 0.159; t = 2.808; p = 0.005), but green intellectual capital does not have significant impact on green performance (= 0.010; t = 0.144; p = 0.885), therefore hypothesis is rejected; whereas green organizational culture has positive and significant impact on green performance (= 0.229; t = 3.348; p = 0.001). It is also found that green innovation has a significant impact on green performance (= 0.180; t = 2.406; p = 0.016).

Mediation Test Analysis

In the PLS-SEM approach, mediation testing is conducted using bootstrapping techniques to assess the significance of indirect effects. A mediation effect is declared significant if the t-statistic value is > 1.96 or the p-value is < 0.05. Furthermore, the type of mediation can be determined based on the significance of the direct and indirect effects: full mediation if the direct effect is insignificant but the indirect effect is significant, and partial mediation if both are significant (Hair et al., 2019).

Table 6. Mediation Test Results

Path Between Variables	Coefficient	t-count	P-Value	Conclusion
Green Intellectual Capital >> Green Innovation >>Green Performance	0.049	2,268	0.024	Accepted
Green Organizational Culture >> Green Innovation >>Green Performance	0.029	1,719	0,086	Rejected

Source: Processed Data (2026)

In line with the outcomes of mediation tests illustrated in Table 6, the test on the mediation of green innovation between green intellectual capital and green performance shows that it has mediated, because it has a coefficient value equal to 0.049, t = 2.268, and P value = 0.024(<0.05); therefore, the hypothesis is accepted. This implies that an organization's capabilities in managing environmentally related intellectual capital can enhance green performance by creating environmentally friendly innovation. However, the mediation of green organizational culture on green performance through green innovation is not statistically significant. Despite the value of t being 1.719, which indicates a relationship, the P value is above the accepted confidence interval, and hence the indirect effect is not statistically significant. In other words, green organizational culture directly affects green performance, beyond its effects through innovation mechanisms.

Discussion

The findings above indicate that green intellectual capital is significantly related to green innovation. This suggests that the ability of an organization to deal with environmental-based knowledge within the firm, in terms of HR competencies, organizational systems, or external relationships, is the key factor affecting green innovation. According to the resource-based theory, intellectual capital is a strategic resource that drives competitive advantage in innovation. These results also align with the findings of Chao & Juo (2021) and Li et al. (2023), which state that a strengthened environmental knowledge capability is beneficial for developing an organization's ability to generate innovative green products and services. Green organizational culture also had a positive and significant effect on green innovation, suggesting that sustainability-oriented corporate norms, values, and practices foster inventive behavior. From a theoretical perspective, Organizational culture acts as a mechanism that accelerates innovation by promoting knowledge creation and dissemination, according to the knowledge-based theory. This result is consistent with Gürlek & Tuna (2018) and Chandra et al. (2021), who conclude that the internalization of environmental values into organizational operations is conducive to creativity and innovation. A flexible, interactive culture is crucial for MSMEs to accelerate the transition to greener practices.

However, it is found that green performance does not have a significant direct relationship with green intellectual capital. This means that ideal performance does not occur by having ecologically oriented knowledge and resources in hand. This has implications for a theoretical perspective: conversion mechanisms, such as innovation, are necessary for internal resources to affect performance. These findings supported the existence of an indirect relationship between performance and intellectual capital, which is affected by the organization's capacity to utilize that knowledge (Abrudan et al., 2022). On the contrary, it is found that green organizational culture significantly relates to green performance. It implies that green operational conduct can be directly affected by sustainability-oriented norms and values in an organization. Organizational culture influences performance because a strong culture can improve resource efficiency and environmental performance by fostering consistency in company procedures and decisions. These findings align with those of Imran et al. (2021), who found that an organization's environmental performance depends strongly on its green culture. In addition, it is revealed that green innovation significantly influences green performance and becomes a mechanism for performance improvement. Green innovation allows organizations to develop more efficient processes and products, reduce waste, and gain a competitive edge. According to the innovation theory, an organization's capacity to create sustainable innovation can provide long-term competitive advantage (Tang et al., 2018).

In addition, the mediation analysis indicated that green innovation mediates the relationship between green intellectual capital and green performance. This result indicates that an organization's environmental knowledge must be translated into innovation to influence performance (Lajara et al., 2022; Chao & Juo, 2021). This provides a bridge between the resource-based view and the knowledge-based theory; knowledge is not just a resource but also requires processing through innovation. On the other hand, a green organizational culture does not mediate green performance, with green innovation as the mediator. These results conflict with previous literature, indicating that green organizational culture has a significant mediating effect on green

performance through green innovation (García-Machado & Martínez-Ávila, 2019; Imran et al., 2021). These findings indicate that organizational culture has a more direct impact on green performance rather than through innovation mechanisms. In the context of MSMEs, green operational practices can be implemented through a simple, flexible work culture without a complex innovation mechanism. This finding shows that, in this particular research context, an organization's capacity influences its green performance through organizational culture.

CONCLUSION AND RECOMMENDATIONS

The findings of this research indicate that both Green Intellectual Capital (GIC) and Green Organizational Culture (GOC) exert a positive and significant influence on Green Innovation among MSMEs. In the subsequent, Green Innovation exerts a significant positive impact on Green Performance, showing its function as a strategic mediator in achieving sustainable business outcomes. GOC has a direct positive impact on Green Performance. However, the Green Intellectual Capital has no direct relationship with Green Performance. It has an indirect positive impact on Green Performance mediated through Green Innovation, which was confirmed as a significant mediating mechanism. In other words, Green Innovation does not mediate the relationship between GOC and Green Performance. This leads us to conclude that a part of internal, knowledge-based resources has a direct positive impact on sustainable outcomes through an innovative process. At the same time, a green organizational culture can directly contribute to green performance.

By integrating the RBV and knowledge-based theories within a single research framework, this research makes an academic contribution to theory development by providing empirical evidence on the role of green innovation in mediating the relationship between internal resources and environmental performance. This research primarily contributes to the assertion that long-term competitive advantage depends not only on owning a firm's resources but also on its ability to process and transform those resources into significant innovation. This research has significant practical implications, suggesting that organizations, especially green MSMEs, must establish a green organizational culture. It is also suggested that businesses must increase their Green Intellectual Capital. It is necessary to combine Green Organizational Culture with the ability to utilize and transform knowledge into valuable green innovation through a systematic approach in the innovation process so that green MSMEs can gain a competitive advantage.

This study is constrained by several limitations, which are discussed below. First, the low R values for green innovation (0.117) and green performance (0.105) show that the proposed model accounts for a small fraction of the variation in the endogenous variables. Although the predicted links are statistically significant, green innovation and green performance are multidimensional constructs that other constructs can influence in the model. Potential variables that could have been omitted include organizational culture, environmental leadership, technological capability, regulatory pressure, stakeholder pressure, market competition, and resource availability. However, these variables were not included due to scope and time constraints, which may reduce the study's predictive validity.

To facilitate this, it is recommended for MSMEs to enhance investment in developing green capability (training, collaboration, new technology etc.), developing

green value system within their daily operational mechanism, to guarantee sustained green innovation process and future research can be conducted in further considering the impact of other variables like regulatory pressure, market orientation, digital capability and longitudinal model of organizational change dynamics in the digital era. Given the relatively low R value achieved in this research, it is also suggested that future research be conducted to extend the current model's framework by including additional variables. These other factors, such as environmental leadership, organizational culture, technological capability, regulatory pressure, stakeholder support, and market dynamics, might offer a stronger explanation.

REFERENCES

- Abrudan, D. B., Rafi, N., Daianu, D. C., & Kalyar, M. N. (2022). Linking green intellectual capital with green innovation: Examining the roles of green dynamic capabilities and motivation to achieve legitimacy. *Agricultural Economics (Czech Republic)*, 68(7), 250–258. <https://doi.org/10.17221/97/2022-AGRICECON>
- Achmad, F., & Wiratmadja, I. I. (2025). Organizational performance and competitive advantage in SMEs: The role of green innovation and knowledge management. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(2), 100532. <https://doi.org/10.1016/j.joitmc.2025.100532>
- Ahmad, F., Hossain, M. B., Mustafa, K., Ejaz, F., Khawaja, K. F., & Dunay, A. (2023). Green HRM practices and knowledge sharing improve environmental performance by raising employee commitment to the environment. *Sustainability*, 15(6), 5040. <https://doi.org/10.3390/su15065040>
- Awwad Al-Shammari, A. S., Alshammrei, S., Nawaz, N., & Tayyab, M. (2022). Green human resource management and sustainable performance with the mediating role of green innovation: A perspective of new technological era. *Frontiers in Environmental Science*, 10, 1–12. <https://doi.org/10.3389/fenvs.2022.901235>
- Badghish, S., & Soomro, Y. A. (2024). Artificial intelligence adoption by SMEs to achieve sustainable business performance: Application of technology-organization-environment framework. *Sustainability*, 16(5). <https://doi.org/10.3390/su16051864>
- Bhatti, M. A., Alyahya, M., Juhari, A. S., & Alshiha, A. A. (2022). Green HRM practices and employee satisfaction in the hotel industry of Saudi Arabia. *International Journal of Operations and Quantitative Management*, 28(1), 100–120. <https://doi.org/10.46970/2022.28.1.6>
- Buhaya, M. I., & Metwally, A. B. M. (2024). Green intellectual capital and green supply chain performance: Do external pressures matter? *Cogent Business & Management*, 11(1). <https://doi.org/10.1080/23311975.2024.2349276>
- Chandra, K., Arafah, W., & Basri, Y. Z. (2021). Analysis of the effect of green organizational culture on organizational performance and competitive advantages of green through green innovation in manufacturing industries. *Journal of Hunan University (Natural Sciences)*, 48(6), 112–121. <https://doi.org/10.55463/issn.1674-2974.53.1.1>
- Chao, H. W., & Juo, W. J. (2021). An environmental policy of green intellectual capital: Green innovation strategy for performance sustainability. *Business Strategy and the Environment*, 30(7), 3241–3254. <https://doi.org/10.1002/bse.2800>

- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.).
- Elzek, Y. S., Soliman, M., Al Riyami, H., & Scott, N. (2024). Talent management and sustainable performance in travel agents: Do green intellectual capital and green servant leadership matter? *Current Issues in Tourism*, 27(19), 3115–3130. <https://doi.org/10.1080/13683500.2023.2252560>
- Enbaia, E., Alzubi, A., Iyiola, K., & Aljuhmani, H. Y. (2024). The interplay between environmental ethics and sustainable performance: Does organizational green culture and green innovation really matter? *Sustainability*, 16(23). <https://doi.org/10.3390/su162310230>
- García-Machado, J. J., & Martínez-Ávila, M. (2019). Environmental performance and green culture: The mediating effect of green innovation, an application to the automotive industry. *Sustainability*, 11(18). <https://doi.org/10.3390/su11184874>
- Gharib, M., Alam, M. S., Hawaldar, I. T., Murshed, M., Khan, U., Alvarado, R., & Rehman, I. U. (2023). Roles of green intellectual capital facets on environmental sustainability in Oman. *Economic Research-Ekonomska Istraživanja*, 36(3). <https://doi.org/10.1080/1331677X.2022.2149591>
- Gürlek, M., & Tuna, M. (2018). Reinforcing competitive advantage through green organizational culture and green innovation. *The Service Industries Journal*, 38(7–8), 467–491. <https://doi.org/10.1080/02642069.2017.1402889>
- Hadjri, M. I., Perizade, B., Zunaidah, & Farla, W. (2019). Green human resource management, green organizational culture, and environmental performance: An empirical study. *Advances in Economics, Business and Management Research*, 100, 138–143. <https://doi.org/10.2991/icoi-19.2019.25>
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
- Hossain, M. I., Heng, T. B., Lee, C. L., Ong, T. S., & Islam, M. T. (2022). Green human resource management, top management commitment, green culture, and green performance of Malaysian palm oil companies. *International Journal of Technology*, 13(5), 1106–1114. <https://doi.org/10.14716/ijtech.v13i5.5818>
- Imran, M., Arshad, I., & Ismail, F. (2021). Green organizational culture and organizational performance: The mediating role of green innovation and environmental performance. *Jurnal Pendidikan IPA Indonesia*, 10(4), 515–530. <https://doi.org/10.15294/jpii.v10i4.32386>
- Jirakraisiri, J., Badir, Y. F., & Frank, B. (2021). Translating green strategic intent into green process innovation performance: The role of green intellectual capital. *Journal of Intellectual Capital*, 22(7), 43–67. <https://doi.org/10.1108/JIC-08-2020-0277>
- Khan, N. U., Anwar, M., Li, S., & Khattak, M. S. (2021). Intellectual capital, financial resources, and green supply chain management as predictors of financial and environmental performance. *Environmental Science and Pollution Research*, 28(16), 19755–19767. <https://doi.org/10.1007/s11356-020-12243-4>
- Lajara, M. B., Sáez, Z. P., Martínez-Falcó, J., & Ruiz-Fernández, L. (2022). The effect of green intellectual capital on green performance in the Spanish wine industry: A structural equation modeling approach. *Complexity*, 2022. <https://doi.org/10.1155/2022/6024077>

- Legese, M. A., Zhou, S., Tiruneh, W. A., & Ying, H. (2026). How green HRM enhances sustainable organizational performance: A capability-building explanation through green innovation and organizational culture. *Sustainability*, 18(2), 764. <https://doi.org/10.3390/su18020764>
- Li, W., Bhutto, M. Y., Waris, I., & Hu, T. (2023). The nexus between environmental corporate social responsibility, green intellectual capital and green innovation towards business sustainability: An empirical analysis of Chinese automobile manufacturing firms. *International Journal of Environmental Research and Public Health*, 20(3), 1–20. <https://doi.org/10.3390/ijerph20031851>
- Liu, D., Yu, X., Huang, M., Yang, S., Isa, S. M., & Hu, M. (2022). The effects of green intellectual capital on green innovation: A green supply chain integration perspective. *Frontiers in Psychology*, 13, 1–14. <https://doi.org/10.3389/fpsyg.2022.830716>
- Martínez-Falcó, J., Sánchez-García, E., Millan-Tudela, L. A., & Marco-Lajara, B. (2023). The role of green agriculture and green supply chain management in the green intellectual capital-sustainable performance relationship: A structural equation modeling analysis applied to the Spanish wine industry. *Agriculture*, 13(2). <https://doi.org/10.3390/agriculture13020425>
- Muisyo, P. K., & Qin, S. (2021). Enhancing the firm's green performance through green HRM: The moderating role of green innovation culture. *Journal of Cleaner Production*, 289, 125720. <https://doi.org/10.1016/j.jclepro.2020.125720>
- Nawang Sari, L. C., Siswanti, I., Arijanto, A., & Wahyu, M. (2025). From knowledge to action: Exploring green intellectual capital's role in sustainable organizational performance for millennials. *International Review of Management and Marketing*, 15(1), 82–90. <https://doi.org/10.32479/irmm.17546>
- Qu, X., Khan, A., Yahya, S., Zafar, A. U., & Shahzad, M. (2022). Green core competencies to prompt green absorptive capacity and bolster green innovation: The moderating role of organization's green culture. *Journal of Environmental Planning and Management*, 65(3), 536–561. <https://doi.org/10.1080/09640568.2021.1891029>
- Ramadana, M., Masnita, Y., Yusran, H. L., & Jurnal, T. (2025). Green intellectual capital and innovation: Keys to sustainable environmental performance in manufacturing. *International Journal of Scientific Research and Management*, 13(4), 8788–8799. <https://doi.org/10.18535/ijssrm/v13i04.em12>
- Roespinoedji, R., Saudi, M. H. M., Hardika, A. L., & Rashid, A. Z. A. (2019). The effect of green organizational culture and green innovation in influencing competitive advantage and environmental performance. *International Journal of Supply Chain Management*, 8(1), 278–286. <http://ir.unikl.edu.my/jspui/handle/123456789/23372>
- Roxas, B., & Chadee, D. (2016). Knowledge management view of environmental sustainability in manufacturing SMEs in the Philippines. *Knowledge Management Research & Practice*, 14(4), 514–524. <https://doi.org/10.1057/kmrp.2015.30>
- Sandra, D., Yasri, Y., & Syahrizal. (2025). The influence of green organizational culture as a moderator on the determinants of triple bottom line performance in Indonesian hospitals. *International Journal of Innovative Research and Scientific Studies*, 8(1), 728–740. <https://doi.org/10.53894/ijirss.v8i1.4418>
- Sembiring, L. D., Setyawati, A., Indajang, K., Astuti, W. S., & Sudirman, A. (2023). Analysis of increasing the competitiveness of MSME business through entrepreneurial

- competence, entrepreneurial orientation, and customer relationship management. *FIRM Journal of Management Studies*, 8(2), 250–261. <https://doi.org/10.33021/firm.v8i2.4575>
- Sharma, S., Prakash, G., Kumar, A., Mussada, E. K., Antony, J., & Luthra, S. (2021). Analysing the relationship of adaption of green culture, innovation, green performance for achieving sustainability: Mediating role of employee commitment. *Journal of Cleaner Production*, 303, 127039. <https://doi.org/10.1016/j.jclepro.2021.127039>
- Singh, S. K., Giudice, M. D., Chierici, R., & Graziano, D. (2020). Green innovation and environmental performance: The role of green transformational leadership and green human resource management. *Technological Forecasting and Social Change*, 150, 119762. <https://doi.org/10.1016/j.techfore.2019.119762>
- Song, W., & Yu, H. (2018). Green innovation strategy and green innovation: The roles of green creativity and green organizational identity. *Corporate Social Responsibility and Environmental Management*, 25(2), 135–150. <https://doi.org/10.1002/csr.1445>
- Sudirman, A., Kusuma, Rr. C. S., Halim, F., & Sembiring, L. D. (2024). Analysis of the mediation effect of green competitive advantage: Reviewing the influence of green innovation on SMEs' business performance. *International Journal of Business, Law, and Education*, 5(2), 2617–2627.
- Sumayyah, S., Damayanti, R. W., & Zahara, I. (2025). Green innovation, green accounting, and performance: The moderating role of green intellectual capital. *Journal of Accounting and Investment*, 26(1), 270–297. <https://doi.org/10.18196/jai.v26i1.24362>
- Tang, M., Walsh, G., Lerner, D., Fitza, M. A., & Li, Q. (2018). Green innovation, managerial concern and firm performance: An empirical study. *Business Strategy and the Environment*, 27(1), 39–51. <https://doi.org/10.1002/bse.1981>
- Tjahjadi, B., Agastya, I. B. G. A., Soewarno, N., & Adyantari, A. (2023). Green human capital readiness and business performance: Do green market orientation and green supply chain management matter? *Benchmarking: An International Journal*, 30(10), 3884–3905. <https://doi.org/10.1108/BIJ-10-2021-0622>
- Turner, D. P. (2020). Sampling methods in research design. *Headache*, 60(1), 8–12. <https://doi.org/10.1111/head.13707>
- Vadithe, R. N., Rajput, R. C., & Kesari, B. (2025). Impact of green HRM implementation on organizational sustainability in IT sector: A mediation analysis. *Sustainable Futures*, 9, 100507. <https://doi.org/10.1016/j.sftr.2025.100507>
- Widiyati, D., & Murwaningsari, E. (2021). Achieving green competitive advantage through organizational green culture, business analytics and collaborative competence: The mediating effect of eco-innovation. *International Journal of Social and Management Studies (IJOSMAS)*, 2(4), 98–113. <https://doi.org/10.5555/ijosmas.v2i4.57>
- Zhang, J., & Maelah, R. (2026). How green intellectual capital shapes competitive advantage through AI-driven green innovation: An empirical study in the manufacturing industry. *Future Technology*, 5(2), 241–254. <https://doi.org/10.55670/fpll.futech.5.2.23>