



Jurnal Masharif al-Syariah: Jurnal Ekonomi dan Perbankan Syariah
ISSN: 2527 - 6344 (Printed), ISSN: 2580 - 5800 (Online)
Accredited No. 204/E/KPT/2022
DOI: <https://doi.org/10.30651/jms.v10i2.26120>
Volume 10, No. 2, 2025 (1298-1328)

THE EFFECT OF GREEN INTELLECTUAL CAPITAL ON SUSTAINABLE BUSINESS PERFORMANCE WITH GREEN INNOVATION AS A MEDIATION IN UMKM IN PEMATANGSIANTAR CITY

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Abstract

This study is to test what is considered important in improving MSMEs in Pematangsiantar City. Data collection using quantitative methods with a sample of 300 people and then data processing using the Partial Least Square Structural Equation Model. The study's findings indicate that green innovation in MSMEs in Pematangsiantar City is significantly influenced by green human capital, green structural capital, and green relational capital. Furthermore, sustainable company performance is not much impacted by green human capital. In contrast, green relational and structural capital significantly affects the success of sustainable businesses. In the meanwhile, sustainable company performance is significantly impacted by green innovation. Additionally, the relationship between green human capital and sustainable company performance can be mediated by green innovation. The relationship between green structural capital and sustainable business performance in Pematangsiantar City's MSMEs can also be mediated by green innovation. Finally, green innovation can act as a mediator in the interaction between green relational capital and sustainable business performance in MSMEs in Pematangsiantar City.

Keyword : Green Intellectual Capital, Sustainable Business Performance, Green Innovation

INTRODUCTION

Micro, small, and medium-sized enterprises, are the foundation of both developed and emerging economies, particularly Indonesia. Every subdistrict of the city has small and medium-sized businesses (MSMEs), but the food and beverage sector has the best MSMEs. If organizations wish to achieve sustainable business performance, they must keep evolving their operations in a variety of ways to be competitive and thrive in their industry. They also need to adjust to the ever-changing external environment. Thus, knowledge of green innovation is necessary to address it.

By using sustainable development methods, the manufacturing sector uses green innovation to promote business sustainability (Shahzad et al., 2021). Businesses may preserve a competitive edge by implementing green innovation. Juo and Wang (2021). Businesses must now take more sustainable actions due to environmental degradation. To achieve sustainable performance, organizations need to adopt green practices (Abbas and Sağsan, 2019). Green product innovation and green process innovation are two metrics that can be used to quantify green innovation. However, both still require government approval before being introduced (Khan et al., 2021).

Green intellectual capital is one of the factors that must be taken into account for the adoption of green innovation in order to successfully support sustainable company performance and increase competitive advantage (Yusliza et al., 2020). All of the information, skills, and intangible assets that a company might use to generate value or gain a competitive edge are collectively referred to as intellectual capital (Anik and Sulisty, 2021). Relationship, structural, and human capital are all components of green capital.

Using green innovation as a mediator, this study examines the means and extent to which green intellectual capital promotes sustainable company performance in Pematangsiantar City. Additionally, since environmentally friendly organizations are thought to be able to support greater environmentally friendly innovation, this study focuses on their administration. Furthermore, it is imperative for organizations to take into account environmental marketing components that affect their reputation (Nuryakin and Maryati, 2022).

LITERATURE REVIEW

Sustainable Business Performance

The quantifiable output that an organization achieves in relation to its aims or objectives is known as organizational performance (Muis and Isyanto, 2021). Gable, on the other hand, claimed that performance encompasses all systems connected to actions and outcomes. Nearly all

performance evaluation techniques take into account a number of factors, including punctuality, cooperation, personal traits, quantity and quality of work (Rokhman, 2019). Lo et al. (2016) define organizational performance as a notion that gauges a business's standing in the marketplace and its capacity to satisfy the demands of its stakeholders. Another name for it is the degree to which operations satisfy customer demands and performance goals.

An organization's performance is the degree to which its objectives are consistently met. In other words, the degree to which an organization can carry out its responsibilities in order to achieve objectives in line with its capabilities and the previously established programs, policies, visions, and missions is known as organizational performance (Darmanto et al., 2018).

Improved social interactions with stakeholders, including suppliers, customers, the general public, and regulatory bodies, must result from business transactions (Zhao and Huang, 2022). According to Zulkiffli et al. (2022), sustainable performance is the alignment of financial, social, and environmental goals in the execution of core business operations to maximize value. In this instance, a company's financial, social, and environmental performance are the primary outcomes associated with its sustainability. As per the description, the concept of sustainable business performance involves evaluating a company's achievements in relation to its pre-established objectives or aims.

Green Intellectual Capital

To ensure business survival, green intellectual resources are an important component that companies must pay attention. A company's intangible knowledge, assets, and capabilities that may be utilized to generate value or gain a competitive advantage in order to accomplish its objectives are referred to as intellectual capital (Anik and Sulisty, 2021).

To gain a competitive advantage, companies must have all the intangible capital that allows them to create and maintain value. We refer to all of this capital as intellectual capital. On the other hand, green intellectual value combines the ideas of environmental and intellectual worth (Shah et al., 2021). A new paradigm of intellectual value known as "green intellectual capital" encompasses intangible resources like knowledge and information that can boost competitiveness and preserve the environment (Yusliza et al., 2020). Therefore, knowledge, information, and innovation resources that can be used to create value or competitive advantage are known as green intellectual resources.

Green Innovation

Environmental management is becoming more and more crucial for organizations in today's fast-paced globalized world, and more and more enterprises are keen to create green innovations. Consequently, creating

green innovation is a successful way to bridge the gap between environmental preservation and economic growth. Green innovation, according to Wang and Juo (2021), is an environmental management capacity that helps businesses create novel, ecologically friendly products and procedures. In turn, this enhances the company's image as an environmentally friendly company (Anik and Sulisty, 2021). One important part of organizational capabilities is green innovation, which improves company performance. The contribution of businesses to sustainable development and increasing the company's competitive advantage is known as green innovation (Muangmee et al., 2021). New technologies and procedures that are both economically and environmentally sustainable can be developed through green innovation (Abbas and Sağsan, 2019).

Green innovation, which includes altering manufacturing methods, cutting resources, lowering pollution, and integrating environmental management systems into corporate operations, is one of the most crucial environmental initiatives (Asadi et al., 2020). Therefore, companies can use this strategy to develop new products and processes in their operations. Therefore, companies can use green innovation strategies to develop new products and processes in their operations. This tactic enables businesses to be both environmentally responsible and economically sustainable.

RESEARCH METHOD

This study uses a quantitative methodology. Statistical data is analyzed using research instruments. This study determined the total number of MSMEs in Pematangsiantar City's food and beverage industry using 300 randomly selected samples. MSMEs in the food and beverage sector, which are categorized as microbusinesses, met the sampling requirements. This study made use of both primary and secondary data sources.

Data for this study is gathered through questionnaires, interviews, and documentation. A Likert scale with gradations was employed in this investigation. The Partial Least Square Structural Equation Model (PLS-SEM) approach was selected to test the hypothesis and estimate the research model due to its effectiveness for exploratory or theory-building research models. To test the outer model, there are four types of tests: convergent validity, discriminatory validity, construction robustness, and model fit. To test the inner model, there are three types of tests: R Square, Q Square, and hypothesis testing.

Hypothesis

The research hypothesis can be developed using the research variables, such as :

H1 = Green innovation is impacted by green human capital.

H2 = Green innovation is impacted by green structural capital.

H3 = Green innovation is impacted by green relational capital.
H4 = Sustainable company performance is impacted by green human capital.
H5 = Sustainable company performance is impacted by green structural capital.
H6 = Sustainable company performance is impacted by green relational capital.
H7 = Sustainable company performance is impacted by green innovation.
H8 = Green innovation acts as a mediator between green human capital and sustainable business performance.
H9 = Green innovation acts as a mediator between green structural capital and sustainable business performance.
H10 = Green innovation acts as a mediator between green relational capital and sustainable business performance.

RESULTS AND DISCUSSION

Tabulation of Respondents' Answers

The responses of the respondents about green innovation, green intellectual resources, and sustainable business performance in micro, small, and medium-sized businesses (MSMEs) in the food and beverage sector in Pematangsiantar City are expected to be described in a respondent's answer table. To determine the criteria for calculating the average value of the respondents' answers, an interval class was created. This interval is determined using the following formula :

$$\text{Class interval} = \frac{\text{Highest value} - \text{Lowest value}}{\text{Class interval}}$$

Where:

Highest value = 5, Lowest value = 1, Number of classes = 5

The category provisions apply with the following outcomes since the class interval value, as determined by the above formula, is 0.8 :

Table 1. Interval Values and Respondent Answer Categories

Interval Value	Category
1,00 – 1,80	Strongly Disagree
1,81 – 2,60	Disagree
2,61 – 3,40	Somewhat Agree
3,41 – 4,20	Agree
4,21 – 5,00	Strongly Agree

Source: data processing (2024)

1. Green Human Capital Tabulation

The idea of green human capital (GHC), sometimes referred to as "green human capital," integrates sustainable development and management of human resources inside a company. In this modern era,

environmental issues are becoming more important to society and companies. This drives the development of new methods for managing employees that increase efficiency and productivity and reduce negative impacts on the environment. Green human resources also include increasing employee environmental awareness through training, skills training, and sustainability programs that involve the entire organization.

Companies can implement green human resources to create a work culture that supports sustainable business operations and contributes to global efforts to address climate change and environmental degradation. The following tabulation table displays the responses from respondents on green human resources.

Table 2 Tabulation of Respondents' Answers Regarding Green Human Capital

Question Code	SB	B	CB	TB	STB	Average
GHC1	62	101	116	20	1	3,68
GHC2	82	132	74	11	1	3,94
GHC3	90	126	75	7	2	3,98
GHC4	98	120	71	9	2	4,01
GHC5	99	97	91	13	0	3,94
Total Answers	431	576	427	60	6	3,91
Persentase	28,73%	38,40%	28,47%	4,00%	0,40%	100%

Source: data processing (2024)

Based on the tabulation of respondents' answers regarding green human capital, table 2 shows that the indicators of our employees are involved in environmentally friendly production activities, contribute to environmental awareness activities by 3.68 with the criteria of agreeing, and have adequate capabilities in environmental awareness activities by 3.94 with the criteria of agreeing. The indicator of our employees producing high-quality and environmentally friendly products is 3.94 with the criteria of agreeing.

The results of the tabulation of respondents' answers regarding green human resources show an average of 3.91 with the criteria of agreeing, with the highest value of 4.01 for the criteria of our business having a team that works well together to achieve environmental awareness, and the lowest value of 3.68 for the criteria of our employees participating in environmentally friendly production activities and taking part.

2. Green Structural Capital Tabulation

The term "green structural capital," or "green structural capital" (GSC), is a sustainable concept that describes resources that are not physically present but allow a company to integrate environmental sustainability into its operations. Systems, processes, infrastructure, and corporate culture that support environmentally friendly practices are these structural assets. As the value of environmental preservation becomes more widely recognized, it is becoming more and more crucial for businesses to provide green structural capital in order to boost sustainability and competitiveness. Adoption of environmentally friendly technologies, process optimization to reduce carbon footprints, and company compliance with certain environmental legislation are a few examples.

Green structural capital also includes innovation and knowledge management that facilitate the development of more ecologically friendly products and services. Businesses that employ green structural capital will enhance their reputation among stakeholders and customers while being better equipped to adjust to ever-tougher environmental laws. Green structural capital aids businesses in achieving long-term sustainability. A tabulation table of respondents' answers about green structural capital can be found here.

Table 3. Tabulation of Respondents' Answers Regarding Green Structural Capital

Question Code	SB	B	CB	TB	STB	Average
GSC1	88	114	85	12	1	3,92
GSC2	105	104	82	8	1	4,01
GSC3	130	91	72	6	1	4,14
GSC4	123	95	74	7	1	4,11
GSC5	104	108	82	6	0	4,03
GSC6	87	125	80	5	3	3,96
GSC7	96	120	74	9	1	4,00
GSC8	105	100	85	10	0	4,00
GSC9	94	117	88	1	0	4,01
Total Answers	932	974	722	64	8	4,02
Persentase	34,52%	36,07%	26,74%	2,37%	0,30%	100%

Source: data processing (2024)

Our business indicator has a good environmental management system of 3.92 with the criteria of agree answer, a high ratio of environmental management employees to total workers of 4.01 with the criteria of agree answer, and adequate investment in environmental protection facilities of 4.14 with the criteria of agree answer, according to Table 3, which tabulates respondents' responses regarding green structural capital. Our firm indication continues to demonstrate innovation in environmental protection, scoring 4.11 with the agree answer criterion, and it displays sufficient investment in environmental protection facilities at 4.14, and our environmentally oriented business operational indicator generally runs smoothly of 4.03 with the criteria of agree answer.

Our business has a good environmental knowledge management system of 3.96 with the criteria of agree answer, an environmentally friendly operational monitoring team of 4.00 with the criteria of agree answer, comprehensive 4.00 environmental business rules with agree-answer criteria and a system of rewards for our staff members who have taken ecologically beneficial actions. According to the criteria of agreeing with the response, the average score for the respondents' responses about green structural capital is 4.02, with the highest value of 4.14 for the indicator that our business has adequate investment in environmental protection facilities and the lowest value of 3.92 for the indicator that our business has a good environmental management system.

3. Green Relational Capital Tabulation

A company's networks and interactions with external stakeholders, such as suppliers, customers, business partners, communities, and governments, that encourage the expansion of environmentally friendly practices are referred to as green relational capital or GRC . This shows how important it is to build strong and sustainable relationships with external parties. In this case, one of the main focuses in business interactions is environmental issues. For example, businesses can work with suppliers who implement more environmentally friendly production methods or work with customers to reduce the use of hazardous materials.

In addition, green relational capital includes how companies educate and empower business partners and communities about the importance of sustainability concepts. Companies contribute to positive changes in the industry and society in general by building relational networks that are based on sustainability principles. Ultimately, green relational capital is a strategic asset that allows businesses to grow sustainably, increase customer loyalty, and maintain healthy relationships with all stakeholders. A tabulation table of respondents' answers on green capital relationships can be found here.

Table 4. Tabulation of Respondents' Answers Regarding Green Relational Capital

Question Code	SB	B	CB	TB	STB	Average
GRC1	120	119	61	0	0	4,20
GRC2	142	97	61	0	0	4,27
GRC3	151	70	78	1	0	4,24
GRC4	137	101	61	1	0	4,25
GRC5	132	86	75	7	0	4,14
Total Answers	682	473	336	9	0	4,22
Persentase	45,47%	31,53%	22,40%	0,60%	0,00%	100%

Source: data processing (2024)

In table 4, the tabulation of respondents' answers regarding the green capital relationship, the indicator of our business is designing environmentally friendly products that suit customer tastes, with a score of 4.20 with the answer criteria agree, and the indicator of customers being satisfied with our environmentally friendly products, with a score of 4.27 with the answer criteria strongly agree. A stable cooperative relationship with suppliers who care about environmental issues is indicated by our business indicator, which has a 4.24 score with the answer criteria strongly agreeing, a 4.25 score with the answer criteria strongly agreeing, and a 4.25 score with the answer criteria strongly agreeing with other strategic partners (government, etc.) who care about environmental issues.

The indicator of customers' happiness with our eco-friendly products has the greatest value of 4.27 with the answer criteria strongly agreeing, according to the results of the tabulation of respondents' responses regarding the green capital relationship, and the average is 4.22, and the lowest value of 4.14 with the answer criteria agree for the indicator of our business to establish strong cooperative relationships with other strategic partners (Government).

4. Green Innovation Tabulation

The creation and application of novel goods, services, or methods with the goal of lessening adverse environmental effects is referred to as "green innovation," or "green innovation." This includes lowering greenhouse gas emissions, improving waste management, managing natural resources more effectively, and developing environmentally friendly, sustainable solutions.

The concept of sustainability encourages businesses to do new things in various parts of their operations. Green innovation refers to complying with relevant environmental regulations and providing new chances for companies to prosper in a market that is becoming more ecologically conscientious. Overall, the use of green innovation brings economic and social benefits, as well as environmental benefits. It helps businesses stay

relevant, increases competitiveness, and contributes to global efforts to address environmental degradation and climate change. A tabulation of respondents' answers on green innovation can be found here.

Table 5. Tabulation of Respondents' Answers Regarding Green Innovation

Question Code	SB	B	CB	TB	STB	Average
GI1	123	98	61	18	0	4,09
GI2	133	91	60	14	2	4,13
GI3	134	97	54	15	0	4,17
GI4	149	76	60	14	1	4,19
GI5	140	72	71	17	0	4,12
Total Answers	679	434	306	78	3	4,14
Persentase	45,27%	28,93%	20,40%	5,20%	0,20%	100%

Source: data processing (2024)

Based on table 5 above, the tabulation of respondents' answers regarding green innovation in the green product innovation dimension, the indicator of our business choosing non-polluting or toxic materials for existing and new products is 4.09 with the answer criteria agree, and with the response criteria agreeing, the indicator of our company's selection of energy-efficient materials for the creation of both new and current goods is 4.13. The indicator of our business increasing the use of environmentally friendly packaging for old and new products is 4.17 with the answer criteria agree. In the green process innovation dimension, the indicator of our business production process effectively reduces emissions of hazardous substances or waste is 4.19 with the answer criteria agree. The indicator of our business production process seeks to recycle waste that can be processed and reused is 4.12.

The results of the tabulation of respondents' responses regarding green innovation show an overall average of 4.14 with the answer criteria agree. The green process innovation dimension has the highest value of 4.19 with the answer criteria agree on the indicator of our business production process to effectively reduce emissions of waste or hazardous substances. The answer criteria agree gave us the lowest score of 4.14 in our effort indicator to select non-toxic or non-polluting materials for both new and existing products.

5. Sustainable Business Performance Tabulation

The ability of a corporation to balance economic, social, and environmental factors while achieving steady and excellent long-term business success is known as sustainable business performance. This implies that a company's performance is evaluated not just in terms of money but also in terms of how well it carries out its social and environmental obligations and how it continues to operate. Sustainable

performance can be achieved through efficient resource management, reducing waste and carbon emissions, and investing in innovations that support sustainability. It also includes how the business cultivates goodwill among all parties involved, such as clients, staff, the community, and the government.

Sustainable business performance also includes the application of good corporate governance principles with an emphasis on transparency and ethics as well as social responsibility. By implementing this, the company will be able to produce good and sustainable performance, minimize business risks, increase competitiveness, and provide added value to both shareholders and the community. The following is a tabulation table of respondents' answers regarding sustainable business performance.

Table 6. Tabulation of Respondents' Answers Regarding Sustainable Business Performance

Question Code	SB	B	CB	TB	STB	Average
ECP1	120	101	60	18	1	4,07
ECP2	129	118	45	8	0	4,23
ECP3	132	106	46	15	1	4,18
ECP4	139	96	46	17	2	4,18
ECP5	115	105	67	11	2	4,07
SCP1	120	119	50	9	2	4,15
SCP2	136	105	42	16	1	4,20
SCP3	120	120	43	15	2	4,14
SCP4	131	106	55	8	0	4,20
SCP5	138	112	35	15	0	4,24
EVP1	126	120	42	12	0	4,20
EVP2	142	101	45	12	0	4,24
EVP3	129	102	54	11	4	4,14
EVP4	131	114	38	16	1	4,19
EVP5	111	125	47	13	4	4,09
Total Answers	1919	1650	715	196	20	4,17
Persentase	42,64%	36,67%	15,89%	4,36%	0,44%	100%

Source: data processing (2024)

Based on table 6 above, the tabulation of respondents' answers regarding sustainable business performance in the economic performance dimension in the indicator of a decrease in material purchasing costs with raw material savings carried out without ignoring the quality aspect is 4.07 with the answer criteria agree. The indicator of a decrease in energy consumption costs during the production process through production process innovation carried out is 4.23 with the answer criteria strongly agree. The indicator of a decrease in waste processing costs through

waste/waste management is 4.18 with the answer criteria agree. The indicator of a decrease in waste disposal costs by utilizing waste/waste products is 4.18 with the answer criteria agree.

The indicator of a decrease in production costs by using production tools/technology that can be used flexibly to produce various products is 4.07 with the answer criteria agree. In the social performance dimension, the indicator of an increase in the welfare of stakeholders/stakeholders as a whole is 4.15 with the answer criteria agree. The indicator of an increase in public health around the business environment is 4.20 with the answer criteria agree. The indicator of a decrease in negative impacts or business risks on the environment and society is 4.14 with the answer criteria agree. Indicators of increasing employee health and safety at work are 4.20 with the answer criteria agree. Indicators of increasing awareness and efforts to protect customer rights are 4.24 with the answer criteria strongly agree.

In the environmental performance dimension, the indicator of increased compliance with environmental regulatory standards is 4.20 with the answer criteria agree. The indicator of decreased air emissions/air pollution levels is 4.24 with the answer criteria strongly agree. The indicator of decreased energy consumption in the business being run is 4.14 with the answer criteria agree. The indicator of decreased/savings in the use of raw materials is 4.19 with the answer criteria agree. The indicator of decreased use of hazardous substances during the production process is 4.09 with the answer criteria agree.

The results of the tabulation of respondents' answers regarding sustainable business performance obtained an overall average of 4.14 with the answer criteria agree. The highest value of 4.24 with the answer criteria strongly agree is in the social performance dimension in the indicator of increased awareness and efforts to protect customer rights and the environmental performance dimension in the indicator of decreased air emissions/air pollution levels. The lowest value of 4.07 with the answer criteria agree is in the economic performance dimension in the indicator of decreased material purchasing costs with savings in raw materials that are carried out without ignoring the quality aspect and the indicator of decreased production costs by using production tools/technology that can be used flexibly to produce various products.

Evaluation of Measurement Model (*Outer Model*)

The validity and reliability of the model were assessed using convergent validity, discriminant validity, and composite reliability metrics :

1. Convergent Validity

The indicators are validated against the variables reviewed using convergent validity. The filling factor values of each indicator are shown in Table 7. The filling factor value must be above 0.7. However, factor values

ranging between 0.4 and 0.7 will be removed if AVE is to be increased, which must be above 0.5.

Table 7. Initial Loading Factor

	GHC	GSC	GRC	GI	SBP
GHC1	0,76 5				
GHC2	0,70 4				
GHC3	0,75 2				
GHC4	0,82 0				
GHC5	0,77 7				
GSC1		0,74 1			
GSC2		0,74 8			
GSC3		0,70 3			
GSC4		0,78 6			
GSC5		0,73 3			
GSC6		0,76 7			
GSC7		0,73 6			
GSC8		0,74 7			
GSC9		0,61 9			
GRC1			0,71 0		
GRC2			0,72 3		
GRC3			0,71 9		
GRC4			0,70 6		

GRC5			0,71 5		
GI1				0,77 7	
GI2				0,78 9	
GI3				0,78 3	
GI4				0,79 4	
GI5				0,77 9	
ECP1					0,77 3
ECP2					0,72 6
ECP3					0,72 8
ECP4					0,72 1
ECP5					0,70 9
SCP1					0,76 5
SCP2					0,74 7
SCP3					0,76 4
SCP4					0,71 7
SCP5					0,75 6
EVP1					0,73 8
EVP2					0,72 4
EVP3					0,76 2
EVP4					0,76 5

EVP5					0,72 9
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As indicated in table 7 above, one indicator with a loading factor less than 0.7 will be eliminated outright in order to increase the AVE of the research model. The GSC9 indicator and any other indicators with invalid values or below 0.7 should be eliminated from the model. Table 8 displays the results of the re-algorithm PLS, which revealed that all indicators had loading factor values greater than 0.7.

Table 8. Final Loading Factor

	GHC	GSC	GRC	GI	SBP
GHC1	0,76 5				
GHC2	0,70 4				
GHC3	0,75 2				
GHC4	0,82 0				
GHC5	0,77 7				
GSC1		0,74 6			
GSC2		0,75 1			
GSC3		0,70 9			
GSC4		0,79 6			
GSC5		0,73 6			
GSC6		0,76 0			
GSC7		0,74 7			
GSC8		0,75 2			
GRC1			0,71 0		
GRC2			0,72 3		

GRC3			0,71 9		
GRC4			0,70 6		
GRC5			0,71 5		
GI1				0,77 7	
GI2				0,79 0	
GI3				0,78 3	
GI4				0,79 4	
GI5				0,77 9	
ECP1					0,77 3
ECP2					0,72 6
ECP3					0,72 8
ECP4					0,72 1
ECP5					0,70 9
SCP1					0,76 5
SCP2					0,74 7
SCP3					0,76 4
SCP4					0,71 7
SCP5					0,75 6
EVP1					0,73 8
EVP2					0,72 4

EVP3					0,76 2
EVP4					0,76 5
EVP5					0,72 9

The AVE value is the final check for convergent validity. An AVE value of more than 0.5 is considered a good indicator of convergent validity. The complete AVE value can be seen in table 9.

Table 9. Average Variance Extracted Value (AVE)

	Average Variance Extracted (AVE)
Green Human Capital	0,585
Green Structural Capital	0,562
Green Relational Capital	0,511
Green Innovation	0,616
Sustainable Business Performance	0,550

All variables had Average Variance Extracted (AVE) values greater than 0.5, as Table 9 demonstrates. This finding suggests that the construction is the primary source of variance. Consequently, the measurement scale items' convergent validity is satisfied.

2. Discriminant Validity

The indicator crossloading value is used to check its discriminatory validity. This occurs when the indicator correlates more highly to its variable than to other variables. Table 10 below shows the crossloading results :

Table 10. Crossloading

	GHC	GSC	GRC	GI	SBP
GHC1	0,76 5	0,33 8	0,28 0	0,23 8	0,29 2
GHC2	0,70 4	0,27 3	0,27 7	0,25 3	0,24 7
GHC3	0,75 2	0,28 5	0,28 6	0,26 1	0,25 2
GHC4	0,82 0	0,32 5	0,26 1	0,27 8	0,33 8
GHC5	0,77 7	0,40 4	0,33 7	0,29 5	0,31 8
GSC1	0,39 9	0,74 6	0,41 1	0,31 8	0,36 4

GSC2	0,31 3	0,75 1	0,42 0	0,30 9	0,31 6
GSC3	0,24 8	0,70 9	0,37 0	0,27 0	0,26 8
GSC4	0,29 9	0,79 6	0,47 4	0,36 0	0,40 5
GSC5	0,27 3	0,73 6	0,32 8	0,30 3	0,35 5
GSC6	0,37 3	0,76 0	0,36 2	0,29 4	0,36 6
GSC7	0,32 2	0,74 7	0,36 8	0,21 2	0,36 1
GSC8	0,33 7	0,75 2	0,38 7	0,28 9	0,30 2
GRC1	0,31 7	0,43 0	0,71 0	0,30 6	0,36 7
GRC2	0,30 2	0,33 8	0,72 3	0,31 3	0,34 7
GRC3	0,28 6	0,41 4	0,71 9	0,25 6	0,30 5
GRC4	0,24 1	0,32 7	0,70 6	0,31 3	0,37 2
GRC5	0,18 0	0,34 8	0,71 5	0,26 7	0,31 8
GI1	0,33 7	0,36 3	0,34 8	0,77 7	0,36 0
GI2	0,24 5	0,30 6	0,35 3	0,79 0	0,38 5
GI3	0,32 3	0,34 7	0,31 9	0,78 3	0,40 5
GI4	0,24 1	0,27 9	0,34 8	0,79 4	0,41 3
GI5	0,20 4	0,24 4	0,22 3	0,77 9	0,35 8
ECP1	0,33 4	0,34 4	0,36 9	0,39 0	0,77 3
ECP2	0,33 2	0,38 3	0,38 1	0,35 7	0,72 6
ECP3	0,28 6	0,34 4	0,38 7	0,37 1	0,72 8

ECP4	0,29 3	0,36 5	0,39 1	0,39 2	0,72 1
ECP5	0,27 1	0,37 7	0,38 4	0,32 5	0,70 9
SCP1	0,27 2	0,33 6	0,41 6	0,35 5	0,76 5
SCP2	0,28 0	0,34 9	0,35 8	0,39 9	0,74 7
SCP3	0,26 4	0,30 6	0,36 9	0,36 4	0,76 4
SCP4	0,26 4	0,33 4	0,33 9	0,38 4	0,71 7
SCP5	0,28 3	0,32 7	0,31 8	0,29 4	0,75 6
EVP1	0,36 3	0,30 4	0,36 3	0,41 6	0,73 8
EVP2	0,25 1	0,33 5	0,27 7	0,32 6	0,72 4
EVP3	0,21 7	0,37 4	0,33 5	0,39 8	0,76 2
EVP4	0,27 3	0,33 6	0,34 9	0,34 3	0,76 5
EVP5	0,25 6	0,28 9	0,27 0	0,31 9	0,72 9

Crossloading, as is displayed in Table 11, indicates that each indication is more correlated with its variable than with other variables. Thus, the discriminant validity is good, it can be said.

3. Construct Reliability

The reliability of the construct was assessed using a Cronbach alpha and reliability test. If the reliability and Cronbach alpha combined values are greater than 0.7, the construct is considered reliable. The results of the test are shown in Table 12.

Table 12. Results of Composite Reliability and Cronbach's Alpha Tests

	Composite Reliability	Cronbach's Alpha
Green Human Capital	0,875	0,823
Green Structural Capital	0,911	0,889
Green Relational Capital	0,839	0,761
Green Innovation	0,889	0,844
Sustainable Business Performance	0,948	0,942

All of the variables in Table 12 have composite reliability and Cronbach's alpha over 0.7, indicating good reliability and a sufficient degree of internal consistency for construct assessment. Thus, it can be said that every variable is regarded as trustworthy.

4. Model Fit Test (*Model Fit*)

The measure used to evaluate model fit is called Standardized Root Mean Square Residual, or SRMR. If the SRMR value is less than 0.08, the model fits (fits); SRMR values in the range of 0.08 to 0.10 are still acceptable. Table 13 shows the results of the Model Fit test :

Table 13. Model Fit Testing

	<i>Saturated Model</i>	<i>Estimated Model</i>
SRMR	0,049	0,051

Table 13 above indicates that the SRMR (Standardized Root Mean Square Residual) value of 0.049 is less than 0.08, indicating that the model fits the data.

Structural Model Evaluation (*Inner Model*)

Testing the structural model (inner model) comes next, following the testing of the measurement model (outer model) :

1. Test of Determination Coefficient (*R Square*)

The degree to which the endogenous construct can account for the exogenous construct is measured by the coefficient of determination (R Square). It is anticipated that the coefficient of determination (R Square) value will fall between 0 and 1. Table 14 displays the results of the R Square test :

Table 14. R Square

Variables	<i>R Square</i>	<i>R Square Adjusted</i>
Green Innovation	0,236	0,228
Sustainable Business Performance	0,443	0,430

Table 14 shows that the combined impact of green human capital, green structural capital, and green relational capital on green innovation is 23.6%, with a R Square value of 0.236. Green human capital, green structural capital, and green relational capital all cooperate to impact green innovation toward sustainable business performance, as demonstrated by the R Square value of 0.443.

2. Prediction Relevance Test (*Q Square*)

The Q Square value, also referred to as the endogenous latent variable, is calculated by taking the proportionate impact of the structural model on the observed measurements for the latent dependent variable.

The model has predictive relevance if the Q Square value is higher than 0 and shows that the observed values have been accurately replicated. Predictive significance is absent if the Q Square value is less than zero. The Q Square test results are displayed in Table 15 :

Table 15. Q Square

Variables	Q Square
Green Innovation	0,206
Sustainable Business Performance	0,334

As indicated by table 15 above, where the Q Square value for green innovation is 0.206 greater than 0 and the Q Square value for sustainable business performance is 0.334 greater than 0, green human capital, green structural capital, and green relationship capital are predictively relevant for green innovation.

Hypothesis Testing

The hypothesis is tested to ascertain its validity following the completion of the R Square and Q Square tests. A significant value (α) of 0.05, or 5%, will be used in this investigation. If the P value (P Values) is less than the designated significant value ($P < 0.05$), the relationship between the variables is deemed significant. The outcomes of the hypothesis testing are shown in Table 16 :

Table 16. Hypothesis Test Results

	Original Sample (O)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Result
GHC -> GI	0,173	0,067	2,565	0,010	Supported
GSC -> GI	0,195	0,073	2,650	0,008	Supported
GRC -> GI	0,242	0,072	3,365	0,001	Supported
GHC -> SBP	0,050	0,060	0,839	0,401	Not Supported
GSC -> SBP	0,114	0,057	2,009	0,045	Supported
GRC -> SBP	0,113	0,055	2,040	0,041	Supported
GI -> SBP	0,189	0,055	3,422	0,001	Supported
GHC -> GI -> SBP	0,033	0,015	2,249	0,025	Supported
GSC -> GI -> SBP	0,037	0,018	2,048	0,041	Supported
GRC -> GI -> SBP	0,046	0,020	2,238	0,025	Supported

Of the 28 proposed hypotheses, 22 were supported with P values below 0.05, and six were not supported with P values above 0.05, as shown in Table 16.

Discussion

1. The Influence of Green Human Capital on Green Innovation

The results of the structural model evaluation, which show the connection between green innovation and green human capital, are shown in Table 16 (Green Human Capital → Green Innovation) produces a p-value of 0.010, or $\alpha = 5\%$. Thus, the H_0 hypothesis is rejected, which means that green innovation in MSMEs in Pematangsiantar City has a significant influence. This is consistent with studies showing that green human resources significantly influence green innovation (Wang and Juo, 2021; Liu et al., 2022).

Employees' knowledge, abilities, and awareness of environmentally friendly practices are part of green human wealth. Green human capital workers in the food and beverage sector are more likely to be creative and innovative in developing new sustainable processes and products, as well as to recognize the value of employing more ecologically friendly raw materials and cutting waste. This encourages green innovation in the business being run.

2. The Influence of Green Structural Capital on Green Innovation

The results of the structural model evaluation, which show the relationship between green structural capital and green innovation, are shown in Table 16 (Green Structural Capital → Green Innovation) produces a p-value of 0.008, or $\alpha = 5\%$. As a result, the H_0 hypothesis is disproved. This suggests that green structural capital has a major influence on green innovation in Pematangsiantar City's micro, small, and medium-sized enterprises (MSMEs). This is in line with the results of earlier studies (Liu et al., 2022), which show that green capital structure has a major influence on green innovation.

Green structural capital includes systems, procedures, and infrastructure that promote eco-friendly behaviors. Green innovations are more likely to be adopted by SMEs in the food and beverage sector if they have sustainability-supporting structures in place, such as environmental policies, effective operational procedures, and environmental management systems. SMEs in this industry can more effectively create and apply green innovations in their operations if they have strong green structural capital.

3. The Influence of Green Relational Capital on Green Innovation

Table 16 displays the findings of the structural model evaluation, which indicate the impact of the connection between green innovation and green capital (Green Relational Capital → Green Innovation) generate p-value $0,001 < \alpha = 5\%$. Green capital interactions have a considerable impact on green innovation in MSMEs in Pematangsiantar City, as evidenced by the rejection of the H_0 hypothesis. This result is in line with previous studies that demonstrated a substantial association between green innovation and green relational capital (Liu et al., 2022). MSMEs enjoy productive

collaborations with suppliers and partners who share their dedication to sustainability.

More ecologically friendly goods and processes can be developed more quickly by small and medium-sized food and beverage companies (MSMEs) collaborating with suppliers who offer eco-friendly raw materials or cutting-edge technologies. Businesses that have solid and constructive partnerships with a variety of stakeholders can obtain access to the knowledge resources required to develop green innovation. Green innovation often requires access to specialized technology and expertise, and external partners can play a critical role in enabling this type of access.

4. The Influence of Green Human Capital on Sustainable Business Performance

The impact of green human capital on sustainable company performance is determined by the structural model evaluation results in Table 16 (*Green Human Capital → Sustainable Business Performance*) produces a p-value of $0.401 > \alpha = 5\%$. Since green human capital has no discernible impact on the sustainable business performance of MSMEs in Pematangsiantar City, hypothesis H_0 is accepted. This runs counter to research findings (Asiaei et al., 2022), studies show that green human capital and sustainable business success are strongly correlated.

Green human resources are the skills and expertise of workers in relation to eco-friendly procedures. Although employees have good green knowledge, they will not affect business results if they are not applied effectively in daily operations. Without a mechanism to consistently apply this knowledge to the production or service process, the impact of this knowledge will be very small.

The term "green human capital" describes the abilities and awareness of workers regarding eco-friendly procedures. However, these skills and knowledge will not contribute to improving sustainable business performance if they are not effectively implemented in the company's operational activities. Even though employees have extraordinary green knowledge, they cannot influence business performance if they do not update it during the production or service process.

MSMEs in the food and beverage industry can optimize the impact of green human capital and improve sustainable business performance by using their employees' green skills to create new eco-friendly products, services, or processes (Purba et al., 2019). They must also offer training on green practices and create a work environment that encourages sustainability. MSMEs must have well defined measuring KPIs in order to monitor both financial and business sustainability performance. This is done to ascertain how incorporating green human capital will improve long-term, sustainable business performance.

5. The Influence of Green Structural Capital on Sustainable Business Performance

Based on the results of the structural model evaluation in table 16, the influence of green structural capital on sustainable business performance (*Green Structural Capital* → *Sustainable Business Performance*) produces a p-value of $0.045 < \alpha = 5\%$. Green structural capital has a major impact on the sustainable business performance of MSMEs in Pematangsiantar City, as evidenced by the rejection of the H_0 hypothesis. This contrasts with research findings that indicate green structural capital influences sustainable company performance (Wang and Juo, 2021; Asiaei et al., 2022).

Green structural capital consists of systems, procedures, and infrastructure that promote eco-friendly behavior. By having good management systems, such as waste management systems, energy savings, and environmental impact monitoring, MSMEs in the food and beverage industry can improve operational efficiency and reduce costs. In addition, MSMEs with good green structural capital can identify and implement more efficient processes. This allows MSMEs to operate efficiently, innovate, and meet the demands of a market that is increasingly focused on sustainability, thereby contributing to overall sustainable business performance (Ingthias et al., 2022; Siahaan et al., 2022). Strong ties with green finance are essential for stakeholders who value sustainability, including as partners, suppliers, and consumers. MSMEs in the food and beverage sector can acquire the tools and information required to adopt sustainable practices by collaborating with reliable partners. Collaboration may aid in the development of new goods, the reduction of waste, and the improvement of operational efficiency by expanding access to the tools, information, and assistance required to adopt sustainable practices. Furthermore, this partnership can contribute to long-term company success.

6. The Influence of Green Relational Capital on Sustainable Business Performance

According to table 16's structural model evaluation results, green relational capital has an impact on sustainable company performance (*Green Relational Capital* → *Sustainable Business Performance*) produces a p-value of $0.041 < \alpha = 5\%$. Green relational capital has a major impact on the sustainable business performance of MSMEs in Pematangsiantar City, as evidenced by the rejection of the H_0 hypothesis. This is consistent with study findings that show green relational capital has a major impact on sustainable business performance (Yusliza et al., 2020; Chen et al., 2020).

Stakeholders who are dedicated to sustainability, including partners, suppliers, and consumers, need to be closely associated with green

financing. MSMEs in the food and beverage industry can obtain the resources and knowledge needed to implement sustainable practices by establishing strong partnerships. New product development, waste reduction, and increased operational efficiency can be assisted by collaborations that increase access to the resources, knowledge, and support needed to implement sustainable practices. Furthermore, the achievement of sustainable business performance can be supported by this collaboration.

7. The Influence of Green Innovation on Sustainable Business Performance

Table 16 presents the findings of the structural model evaluation, which indicates how green innovation affects sustainable company performance (*Green Innovation* → *Sustainable Business Performance*) produces a p-value of $0.001 < \alpha = 5\%$. The rejection of the H_0 hypothesis shows that green innovation significantly affects the sustainable business performance of MSMEs in Pematangsiantar City. This is in line with studies (Ch'ng et al., 2021) that demonstrate a robust relationship between green innovation and sustainable business performance. Developing green innovation typically entails streamlining the manufacturing process to cut waste, conserve energy, and make better use of available resources.

Profitability can rise and operational expenses can be decreased as a result of this efficiency boost. In the end, this will assist businesses in attaining long-term success (Amin et al., 2021; Purba et al., 2018). Small and medium-sized businesses (MSMEs) in the food and beverage industry can comply with increasingly stringent environmental regulations by implementing green innovation. This compliance makes the company better in the eyes of consumers and stakeholders and avoids fines. By taking advantage of green innovation opportunities, MSMEs can improve their business performance and achieve sustainable business performance.

8. The Influence of Green Human Capital on Sustainable Business Performance Mediated by Green Innovation

Green innovation acts as a mediator between green human capital and sustainable company performance, as indicated by the structural model evaluation results displayed in table 16 (*Green Human Capital* → *Green Innovation* → *Sustainable Business Performance*) produces a p-value of $0.025 < \alpha = 5\%$. The hypothesis H_0 is thus disproved, and green innovation can mediate the relationship between green human capital and sustainable company performance. The results of studies (Nasrollahi et al., 2020; Shahzad et al., 2020) that demonstrate that green innovation significantly affects sustainable company performance lend credence to this (Liu et al., 2020).

As said before, there is no evidence that green human capital significantly affects the success of sustainable businesses. However, the effect of green human capital on sustainable business performance becomes significant when green innovation serves as a mediator (Larbi-Siaw et al., 2022; Ingtyas et al., 2021). This is because staff members' expertise in green practices may be used to create more creative innovations that boost the business's competitiveness, efficiency, and productivity. By making their products distinctive, green innovation enables SMEs to develop items that may satisfy the needs of a market that is becoming more environmentally conscious while also enhancing their market position. Ultimately, this will result in improved sustainable business performance for the business being run.

9. The Influence of Green Structural Capital on Sustainable Business Performance Mediated by Green Innovation

Green innovation serves as a mediator between green structural capital and sustainable business performance, per the findings of the structural model evaluation in table 16 (*Green Structural Capital → Green Innovation → Sustainable Business Performance*) produces a p-value of $0.041 < \alpha = 5\%$. Since the H_0 hypothesis is disproved, green innovation can therefore mitigate the association between green structural capital and sustainable business performance in MSMEs in Pematangsiantar City. This is confirmed by research findings (Liu et al., 2022) showing a significant correlation between green innovation and green structural capital and by research findings (Zulkiffli et al., 2022) showing a significant correlation between green innovation and sustainable business performance.

The relationship between green structural capital and sustainable business performance in micro, small, and medium-sized businesses (MSMEs) in the food and beverage sector can be mediated via green innovation. This is because green innovation can transform green structural capital's potential into environmentally friendly products, services, or procedures, which can significantly improve long-term business success (Distanont and Khongmalai, 2020; Amal et al., 2022). If green structural capital which includes the procedures and processes that facilitate eco-friendly operations is not properly utilized, it may not always affect a company's performance. Green innovation enables businesses to use green infrastructure to develop new eco-friendly goods and procedures, which boosts productivity, lowers expenses, and enhances long-term company success.

10. The Influence of Green Relational Capital on Sustainable Business Performance Mediated by Green Innovation

According to table 16 structural model evaluation results, green innovation mediates the relationship between green relational capital and

sustainable business performance (Green Relational Capital → *Green Innovation* → *Sustainable Business Performance*) produces a p-value of $0.025 < \alpha = 5\%$. Green innovation might therefore lessen the relationship between green relational capital and sustainable business performance in MSMEs in Pematangsiantar City, since the H_0 hypothesis has been refuted. Research on the connection between green relational capital and green innovation (Chang and Hung, 2021) as well as green innovation and MSMEs' capacity to use green relational capital to mitigate its effects on sustainable business performance (Baeshen et al., 2021) lend credence to this.

This enables them to boost productivity, develop goods that satisfy a consumer that is becoming more environmentally sensitive, enhance their brand, and adhere to environmental laws all of which benefit the business environment. In fact, green relationship capital gives MSMEs access to resources, technology, expertise, and chances to collaborate on eco-friendly projects. However, with green innovation, this potential can be utilized, such that a considerable impact on sustainable company performance can be increased.

CONCLUSION

The results of the study show that green human capital, green structural capital, and green relational capital have a major influence on green innovation in MSMEs in Pematangsiantar City. Furthermore, green human capital has little effect on the success of sustainable enterprises. Unlike green relational and structural capital, which have a big influence on how well sustainable firms thrive. Meanwhile, green innovation has a big impact on sustainable business performance. Furthermore, green innovation can act as a mediator in the interaction between sustainable business performance and green human capital. Similarly, green innovation can act as a mediator in the interaction between green structural capital and sustainable business performance in Pematangsiantar City's MSMEs. Lastly, the relationship between green relational capital and sustainable business performance in MSMEs in Pematangsiantar City can be mediated by green innovation.

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