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THE STRATEGIC ROLE OF GREEN INTELLECTUAL CAPITAL AND GREEN INFORMATION ACCOUNTING TO IMPROVE DECISION-MAKING QUALITY

O PAPEL ESTRATÉGICO DO CAPITAL INTELECTUAL VERDE E DA CONTABILIDADE DA INFORMAÇÃO VERDE PARA MELHORAR A QUALIDADE DA TOMADA DE DECISÕES

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Abstract
This study examines the relationship between each dimension of green intellectual capital namely, green human capital, relational capital, and structural capital as well as green accounting information, and quality in decision-making. A simple random sampling technique was used to select a sample of 185 manufacturing companies in Bali Province, Indonesia for this study. Questionnaires were sent to CEOs of companies chosen as part of the data collection process. Data analysis using SEM-PLS with WarpPLS 8.0 software. All aspects of green intellectual capital have a positive and significant relationship with the quality of decision-making. Additionally, green accounting information also reveals a significant positive relationship with decision-making quality. The findings suggest that intangible green assets and relevant environmental information become a strategic component in enhancing managerial decisions, especially in supporting sustainability goals. This study contributes to extending the natural resource-based view into decision-making theory by uniquely integrating green intellectual capital and green accounting information into a unified framework to enhance organizational decision-making. These findings confirm the relevance of integrating green intellectual capital and green

Resumo
Este estudo examina a relação entre cada dimensão do capital intelectual verde, nomeadamente, capital humano verde, capital relacional e capital estrutural, bem como informações de contabilidade verde, e a qualidade na tomada de decisões. Uma técnica de amostragem aleatória simples foi utilizada para selecionar uma amostra de 185 empresas manufatureiras na província de Bali, Indonésia, para este estudo. Questionários foram enviados aos CEOs das empresas selecionadas como parte do processo de coleta de dados. A análise dos dados foi realizada utilizando SEM-PLS com o software WarpPLS 8.0. Todos os aspectos do capital intelectual verde apresentam uma relação positiva e significativa com a qualidade da tomada de decisões. Adicionalmente, as informações de contabilidade verde também revelam uma relação positiva significativa com a qualidade da tomada de decisões. Os resultados sugerem que os ativos verdes intangíveis e as informações ambientais relevantes tornam-se um componente estratégico para aprimorar as decisões gerenciais, especialmente no apoio às metas de sustentabilidade. Este estudo contribui para a extensão da visão baseada em recursos naturais para a teoria da tomada de decisões, integrando

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accounting information in decision-making process, providing a model that other companies and regions can adapt and utilize.

Keywords: Decision-Making. Green Accounting. Green Human Capital. Green Relational Capital. Green Structural Capital.

de forma singular o capital intelectual verde e as informações de contabilidade verde em uma estrutura unificada para aprimorar a tomada de decisões organizacionais. Essas descobertas confirmam a relevância da integração do capital intelectual verde e das informações contábeis verdes no processo de tomada de decisão, fornecendo um modelo que outras empresas e regiões podem adaptar e utilizar.

Palavras-chave: *Tomada de Decisão. Contabilidade Verde. Capital Humano Verde. Capital Relacional Verde. Capital Estrutural Verde.*

1 INTRODUCTION

Awareness of the importance of preserving the environment and the drive to critically address global ecological problems have grown rapidly in recent decades. The rapid industrialization process and high costs of industrial activities pose challenges for developing countries seeking to achieve sustainable growth in the long term while still promoting prosperity (Liew *et al*., 2025; Wiredu *et al*., 2023). The integration of environmental and economic aspects into the decision-making process is a crucial element in achieving sustainable development (Brin & Nehme, 2021; Kukurba *et al*., 2021).

Quality decisions refer to a decision-making process based on appropriate and efficient information, which aligns with an organization's or an individual's goals and limitations. Green accounting information is crucial in enhancing the quality of decisions by incorporating environmental and social burdens into financial evaluations and policy-making. This approach supports sustainability and enhances the company's financial performance and responsibility.

In an environmentally oriented era, green accounting is essential to achieving global sustainability goals (Gonzalez & Mendoza, 2021; Nasir *et al*., 2024). Green accounting integrates sustainability aspects into the economic decision-making process. Information from green accounting plays a crucial role in decision-making because it combines environmental and social costs into financial analysis, ultimately promoting resource efficiency and environmental preservation. By providing comprehensive data on

environmental costs and benefits, green accounting enables organizations to make decisions that align with the sustainability targets set (Jha *et al*., 2024; Marota, 2024).

Green accounting information has a synergistic relationship with green intellectual capital, which includes green human capital, green relational capital, and green structural capital. This relationship highlights the importance of integrating environmental understanding with accounting to achieve sustainability goals in companies (Alnaim & Metwally, 2024; Asiaei, Jusoh, *et al*., 2022). The concept of green intellectual capital encompasses insights, expertise, and relationships within organizations that contribute to environmental conservation efforts. Organizations that prioritize intellectual capital tend to adapt more quickly to changing market situations and emerging trends, resulting in informed and relevant decision-making (Giampaoli *et al*., 2025; Jirakraisiri *et al*., 2021).

Previous research has emphasized the importance of responsible decision-making for the sustainability of companies, including in addressing issues such as greenwashing and utilizing digital environmental, social, and governance (ESG) data analysis to validate ethical and sustainable decisions (Komarova & Makovetskij, 2025). Although environmental issues have been a topic of discussion in recent years, to date, there have been no empirical studies examining the role of green intellectual capital and green accounting information in enhancing the quality of decision-making. The focus of previous studies has been more on the role of green intellectual capital in improving company performance and competitive advantage, such as Vukmirovic *et al*. (2024), Hermawan *et al*. (2024), Asiaei, Jusoh, *et al*. (2022), Dang and Wang (2022), and Yusliza *et al*. (2020). Likewise, green accounting information, which has so far been limited to its impact on company performance, for example, as seen in research by Pramuka *et al*. (2023), Zhao *et al*. (2025), and Khan and Gupta (2024b).

This study examines the impact of green intellectual capital and green accounting information on enhancing the quality of decision-making. Therefore, this research aims to design a decision-making quality model that incorporates the role of green intellectual capital and green accounting information, making an innovative contribution to this study. The study examines the manufacturing sector of companies operating in Indonesia. Indonesia is the only ASEAN country that is included in the top ten countries contributing to the world's manufacturing products (Waluyo, 2024a). In Indonesia, the manufacturing

industry is the primary sector of the economy, accounting for 17.18% of the Gross Domestic Product (GDP)(Waluyo, 2024b).

Despite making a positive contribution to the economy, manufacturing companies have a significant influence on the environment through energy use (Ashokan *et al*., 2024; Miralles *et al*., 2020), emissions (Egilmez *et al*., 2013; Katariya & Shukla, 2022), resource depletion (Niemann & Pisla, 2021; Nikolakis *et al*., 2024), and waste generation (Marulanda-Grisales & Figueroa-Duarte, 2021; Yuncu, 2021). Quality decisions are necessary to strike a balance between present and future needs, ensuring that the decisions made do not harm the resources that future generations will use.

This research contributes to the following: First, this study focuses on manufacturing companies in developing economies, particularly Indonesia, thereby enriching insights into environmentally friendly practices and their role in decision-making in these countries. Second, this study examines the strategic role of green accounting information in enhancing the quality of decision-making, which can improve understanding that integrating green accounting into financial reporting ensures managers have access to accurate and relevant information, thereby strengthening their ability to make informed decisions. Third, this study builds on previous research by proposing green practices as a key variable in determining the quality of decision-making. Finally, the natural resource-based view is supported by the results of this study.

2 LITERATURE REVIEW AND HYPOTHESES

2.1 Natural resource-based view

The natural resource-based approach is an extension of resource-based theory that highlights the importance of strategic natural resource utilization in achieving sustainable competitive advantage. The natural resource-based view (NRBV) emphasizes that a sustainable competitive advantage depends on a company's ability to develop environmental strategies that its competitors cannot match (Hart & Dowell, 2011; Tufan & Mert, 2023). Therefore, NRBV emphasizes the importance of a strategic decision-making process that considers environmental and sustainability impacts.

Effective strategic decision-making within the framework of NRBV often involves procedural rationality, i.e., a systematic and logical approach to the decision-

making process. It includes leveraging information processing capabilities to improve decision effectiveness and strengthen competitive advantage (Cao *et al*., 2019; Hakeem, 2024). The NRBV framework is strengthened through the integration of dynamic capabilities, which refers to a company's ability to integrate, develop, and reorganize internal and external competencies in response to rapidly changing environmental dynamics.

Natural resource management involves addressing complex and often conflicting issues. Decision-making in this context requires the integration of ecological, social, economic, and political factors (Khalifa, 2024; Nixon *et al*., 2022). Effective natural resource management and decision-making require the participation of various stakeholders with different interests. This collaborative approach is essential in ensuring the sustainable use of natural resources. Integrating reliable scientific information into decision-making is crucial for gaining public support and making informed, rational decisions. This understanding encompasses the role of science and scientists in comparison to managerial and policy authorities in shaping decisions regarding natural resources (Cross *et al*., 2022; Szaro & Peterson, 2004).

2.2 Green intellectual capital, green accounting information, and decision-making quality

Green intellectual capital is an intangible asset that encompasses knowledge, expertise, and organizational practices focused on supporting environmental conservation efforts. In general, green intellectual capital comprises three main components: green human capital, green relational capital, and green structural capital. Employees' environmental knowledge, skills and awareness are part of green human capital. Training and development are considered crucial in green human capital to enhance employees' ecological awareness and skills (Bombiak, 2022; Sarwar & Mustafa, 2023).

The environmental insight embedded in employees plays a role in helping companies respond to external pressures by developing environmentally friendly innovations and managerial practices (Astuti *et al*., 2023; Sánchez-García *et al*., 2025). With this increased capacity, employees can not only perform their daily tasks more sustainably but also become agents of change, driving green transformation throughout the organization. Therefore, developing environmentally friendly human resources is a

crucial strategic step for companies to maintain competitiveness and ensure business continuity.

Green relational capital encompasses the relationships and networks that organizations establish with external parties, such as customers, vendors, and partners, to support environmental conservation (Ali *et al*., 2021; Long & Liao, 2023). By enabling the exchange of information between organizations and stakeholders, this capital provides a vital information foundation for organizations to realize their expectations and necessities (Astuti *et al*., 2019, 2021). These strong, trusting relationships also foster effective collaboration in implementing environmentally friendly practices. Furthermore, green relational capital is crucial in strengthening a company's reputation as an entity that prioritizes social and ecological aspects.

Green structural capital includes institutionalized knowledge systems and processes that strengthen the organization's ecological sustainability. It encompasses policies, procedures, databases, and an organizational culture that promote environmentally friendly practices (Gharib *et al*., 2023; Sarwar & Mustafa, 2023). Certain structural capital receives legal protection and is categorized as intellectual property rights, officially owned by the company (Astuti *et al*., 2021, 2023). Implementing green structural capital helps organizations maintain the consistency and effectiveness of their long-term sustainability strategies. Furthermore, the existence of structured systems and processes facilitates transparent measurement and reporting of environmental performance.

Green accounting information is crucial in making strategic investment decisions, such as investing in environmentally friendly technologies or product lines that support sustainability (Dutta *et al*., 2020; Usatenko *et al*., 2025). Green accounting information benefits policymakers by enabling them to design more targeted regulations and policies that support sustainability. This collaboration between businesses and regulators can lead to more effective environmental policies (Khan & Gupta, 2024a; Nasir *et al*., 2024). Green accounting helps identify and measure environmental risks and liabilities, providing a holistic framework for assessing ecological consequences.

The quality of information, the decision-making mechanism, the characteristics of the decision-maker, and the context in which the decision is made all influence the quality of the decision-making process. Quality decision-making is a concept with multiple dimensions that can be evaluated from various viewpoints, including accuracy, integrity,

feasibility, timeliness, and efficiency (J. Wu *et al*., 2020; Zhai & Zheng, 2025). High-quality decisions depend heavily on the reliability of the information available. Inaccurate or incomplete information can lead to poor decisions. Awareness of the significant role of information quality is crucial for decision-makers to make informed choices.

2.3 Hypotheses

Green human capital plays a vital role in supporting green accounting information by providing the expertise and knowledge necessary for optimal environmental management. In the context of green accounting, green human capital plays a crucial role in the collection and reporting of data, which is essential for conducting sustainability audits and assessing an organization's environmental performance (H. Ahmed *et al*., 2023; DeSimone *et al*., 2021). They contribute to the process of identifying, recording, and reporting accurate and relevant ecological information. Organizations with strong green human resources tend to involve their internal audit roles more in sustainability evaluation, thereby ensuring that the green accounting information presented is accurate and trustworthy. The insights provided by green human resources can help develop corporate policies and strategies that enhance environmental performance, making them a crucial element in green accounting information (Alnaim & Metwally, 2024; Jha *et al*., 2024).

H1: Green human capital has a positive relationship with green accounting information.

The positive impact of green relational capital on ecological performance and business competitiveness emphasizes the importance of this capital in the context of broader green accounting information (Chuang & Huang, 2018; Rizavi *et al*., 2025). Substantial green relational capital facilitates more effective communication and collaboration with stakeholders, leading to more accurate and comprehensive environmental data collection and reporting (Alnaim & Metwally, 2024; Asiaei, Bontis, *et al*., 2022). Green relational capital fosters cooperation and the exchange of feedback between companies and external stakeholders, thereby enhancing the accuracy, relevance, and timeliness of green accounting information by aligning reporting practices with stakeholder needs and regulatory standards. Green relational capital facilitates the application of green accounting practices within supply chains, leading to improved

outcomes in both environmental and financial terms (R. Wu *et al*., 2022; Yu *et al*., 2020). Integrating green relational capital into accounting practice ensures that ecological factors are taken into the economic decision-making process.

H2: Green relational capital has a positive relationship with green accounting information.

Green structural capital supports the implementation and effectiveness of green accounting practices. One type of green accounting is environmental management accounting. Asiaei, Bontis, *et al*. (2022) and Alnaim and Metwally (2024) found that environmental management accounting is crucial in transforming green intellectual capital into improving environmental performance. The existence of solid green structural capital ensures that environmental data is collected and used in a structured manner, which in turn improves the accuracy and reliability of green accounting information (Asiaei, Bontis *et al*., 2022; Asiaei, Jusoh *et al*., 2022).

Reliable and consistent green accounting information relies on internal systems and IT infrastructure that are built to collect, analyse, and manage environmental data such as emissions, energy consumption, and waste output. By utilizing documented best practices, data repositories, and organizational knowledge, companies can reflect on past environmental performance and use those insights to enhance future reporting and strategic choices. When these processes are well-structured, green accounting data can be seamlessly integrated into broader organizational planning, ensuring that environmental factors are considered throughout the company.

H3: Green structural capital has a positive relationship with green accounting information.

Green accounting combines ecological costs and benefits into conventional accounting systems, facilitating more accurate and sustainable decision-making (Chukka *et al*., 2024; Dhar *et al*., 2022; Nasir *et al*., 2024). Including sustainability information in financial statements enhances the quality of those reports, providing a deeper description of company performance to support more informed decision-making (Aladwan, 2024; Qirem *et al*., 2023).

Green accounting offers crucial insights into environmental factors, including resource utilization, emissions, waste, and associated costs. This information enables managers to make informed, eco-friendly decisions, such as implementing sustainable technologies or enhancing resource efficiency. Accurate green accounting data enables

organizations to more effectively recognize environmental risks and opportunities, helping them integrate sustainability into long-term planning and build more resilient, future-oriented strategies.

By assigning financial value to environmental factors, green accounting enhances the precision of cost-benefit analyses, especially for projects related to regulatory compliance, sustainability targets, or ecological compromises. Reliable environmental data supports compliance with regulations and readiness for upcoming environmental policies, reducing legal and reputational risks while promoting more informed, risk-conscious decisions. Additionally, transparent green reporting builds stakeholder trust—particularly among investors, regulators, and customers—and helps define a brand's reputation, market strategy, and strategic partnerships.

H4: Green accounting information has a positive relationship with the quality of decision-making.

3 METHOD

By applying a positivist approach, this research focuses on analysing the relationship between social phenomena, specifically the practices of green intellectual capital, green accounting information, and decision-making quality, in developing countries, particularly Indonesia. Thus, it is hoped that a general law of causality can be produced, which allows an event to be controlled and predicted. According to data from the BPS-Statistics of Bali Province (2024), there are 413 manufacturing companies in Bali. The sample size of 185 was determined using the formula by Yamane (1973), employing a simple random sampling technique for selection.

$$n = \frac{N}{1+N(e)^2} = \frac{413}{1+413(0.05)^2} \approx 185 \qquad (1)$$

n shows the number of samples, N shows the population total, and e signifies the acceptable errors.

The data in this study were obtained through questionnaires sent to the CEOs of the sample companies. Assuming a response rate of 80% of the questionnaires distributed, as many as 231. The questionnaire started receiving responses three weeks after it was sent. A total of 231 questionnaires were sent, and 171 were successfully returned and

processed, resulting in a usable response rate of 74.03%. Most respondents in this study were men (70.76%), holding a bachelor's degree (80.70%), and having more than 5 years of work experience (83.04%).

The three elements used to measure green intellectual capital are green human, green relational, and green structural capital, which are assessed using instruments adapted from Ullah *et al*. (2021), each comprising three measurement items. Green accounting information is measured by six items adopted from instruments developed by Ahmed *et al*. (2021). Meanwhile, decision-making quality is measured using instruments adopted from Lutfi *et al*. (2022), which contain four items. The measurement uses a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Structural equation modeling software with partial least squares (SEM-PLS) version 8.0 was used to analyze the data. The study includes testing the outer model and the inner model. Testing the outer model in SEM is a crucial step to confirm that the indicators can accurately measure the latent variable validly and reliably. This test is carried out before analysing the relationship between variables (inner model). The inner model explains the relationship between the latent variables determined in the research model. This test aims to assess the level of strength and significance of the relationship between variables. It relates to hypothesis testing in the developed model.

4 RESULTS AND DISCUSSION

4.1 Results

Composite reliability and Cronbach's alpha are used to measure the reliability of a construct. The minimum acceptable reliability limit is above 0.70 (Fornell & Larcker, 1981; Nunnally, 1978). The composite reliability and Cronbach's alpha values of all constructs in the study meet the established criteria (Table 1).

Table 1

Reliability and Convergent Validity

	GHC	GRC	GSC	GAI	DMQ
Composite Reliability	0.911	0.858	0.913	0.922	0.938
Cronbach's Alpha	0.853	0.750	0.856	0.898	0.913
Average Variance Extracted	0.773	0.670	0.777	0.663	0.792

Evaluation of construct validity is carried out through convergent validity and discriminant validity. Convergent validity is considered fulfilled if the average variance extracted (AVE) and loading values of each indicator are within the required limits. The AVE values listed in Table 1 are above 0.50, indicating that the criteria set by Fornell and Larcker (1981) have been met.

The total loading value for each indicator indicates that it exceeds 0.60 and is statistically significant (Table 2). The lowest loading value of 0.60 is considered vital because it demonstrates that the measure contributes at least 60% to the variance of the underlying latent variable (Chin, 1998). Table 2 also shows the cross-loading results that are lower than the loading value of the construct itself. For example, the GHC1 indicator shows a greater value in the GHC construct (0.857) compared to the cross-loading in the other constructs (GRC, GSC, GAI, DMQ), which have lower values than the GHC construct. Based on this, the convergent validity for the reflective construct in this study has been met. Similar provisions also apply to the loading values of other indicators (written in bold and in brackets) on different constructs.

Table 2

Combined Loading and Cross-Loading Results

	GHC	GRC	GSC	GAI	DMQ	P value
GHC1	**0.857**	-0.065	-0.075	0.063	0.080	<0.001
GHC2	**0.906**	-0.002	-0.050	-0.050	-0.033	<0.001
GHC3	**0.874**	0.066	0.126	-0.010	-0.044	<0.001
GRC1	0.138	**0.872**	0.081	-0.130	0.072	<0.001
GRC2	0.013	**0.850**	-0.094	-0.059	0.033	<0.001
GRC3	-0.181	**0.725**	0.012	0.226	-0.126	<0.001
GSC1	0.021	0.069	**0.909**	-0.004	-0.046	<0.001
GSC2	-0.106	0.051	**0.909**	-0.011	-0.008	<0.001
GSC3	0.093	-0.132	**0.824**	0.017	0.060	<0.001
GAI1	-0.043	0.103	-0.092	**0.838**	0.072	<0.001
GAI2	0.007	-0.005	-0.007	**0.834**	0.013	<0.001
GAI3	-0.012	-0.007	-0.066	**0.835**	0.134	<0.001
GAI4	0.038	-0.028	-0.227	**0.821**	0.001	<0.001

GAI5	-0.039	-0.008	0.206	**0.779**	-0.059	<0.001
GAI6	0.050	-0.060	0.210	**0.777**	-0.179	<0.001
DMQ1	-0.145	0.075	-0.110	0.038	**0.902**	<0.001
DMQ2	0.003	-0.107	-0.086	-0.072	**0.902**	<0.001
DMQ3	0.011	0.128	0.062	-0.039	**0.879**	<0.001
DMQ4	0.136	-0.095	0.139	0.073	**0.877**	<0.001

All hypotheses tested in this study showed confirmed results based on full model testing. There is a significant positive relationship between green human capital and green accounting information ($\beta = 0.166$; $p = 0.042$). The results of the study show a significant positive relationship between green relational capital and green accounting information ($\beta = 0.240$; $p = 0.003$). Similar findings are indicated by green structural capital, which shows a positive coefficient value ($\beta = 0.385$) and is significant at $p < 0.001$ in conjunction with green accounting information. Green accounting information has also been shown to have a positive and significant relationship with quality decision-making ($\beta = 0.460$; $p < 0.001$).

The R^2 value is used to measure the coefficient of determination. The R^2 value in Table 2 and Figure 1 for the green accounting information construct is 0.375. This suggests that variations in green intellectual capital, comprising green human capital, green relational capital, and green structural capital, can account for 37.5% of the variation in green accounting information. The R^2 value of decision-making quality is 0.212. In other words, 21.2% of the variation in decision-making quality can be attributed to variations in green intellectual capital, which encompasses green human capital, green relational capital, green structural capital, and green accounting information.

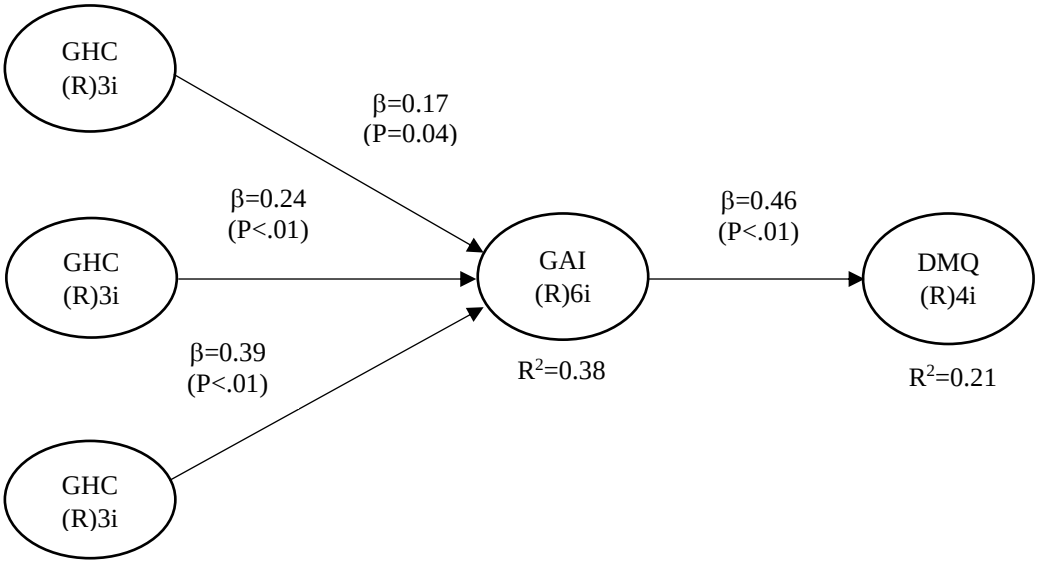
Table 3

PLS Results for Full Model

Variable	Path to	
	GAI	DMQ
GHC	0.166 (p = 0.042)	
GRC	0.240 (p = 0.003)	
GSC	0.385 (p < 0.001)	
GAI		0.460 (p < 0.001)
DMQ		
R-squared	0.375	0.212

Figure 1

PLS Results



This study conducted an effect size test to provide additional information about the significance of an outcome, not only in terms of statistics but also in terms of practical implications. Table 4 summarizes the effect size test value, which indicates green accounting information regarding decision-making quality (0.212). The effect size is categorized into three levels: weak (0.02), moderate (0.15), and strong (0.35) (Kock, 2014).

Table 4

Effect Size Test Results

	GHC	GRC	GSC	GIA
GIA	0.074	0.108	0.193	
DMQ				0.212

An effect of 0.212 can be categorized as a medium-sized effect (Kock, 2014). Therefore, in practical terms, green accounting information plays a significant role in improving the quality of decision-making.

5 DISCUSSION

The results of this study suggest that the utilization of environmentally friendly resources, particularly green intellectual capital and green accounting information, contributes to enhancing the quality of decision-making. The results of this study confirmed all hypotheses. Green human capital was found to be positively and significantly associated with green accounting information, indicating that environmentally aware human resources have a very significant role in enhancing green accounting information by integrating sustainability practices into organizational processes. Green human capital is a crucial component in green accounting information, as its existence encourages the implementation of sustainable practices, strengthens environmental management accounting, and contributes to increased green-oriented innovation and competitiveness (Asiaei, Bontis, *et al*., 2022; Jha *et al*., 2024).

Green human capital is essential for managing sustainable practices, which involves incorporating these practices into human resources processes. This integration enables the measurement and reporting of environmental consequences, including carbon waste and energy use, through green accounting (Jha *et al*., 2024; Nasir *et al*., 2024). Green human capital fosters green innovation, which is crucial for developing sustainable business practices. Green accounting information often reflects these innovations, demonstrating the environmental benefits and cost savings of sustainable initiatives (Mahlhal *et al*., 2025; Song *et al*., 2020). By encouraging green logistics practices, green human capacity helps improve social and financial results, a key metric in green accounting. Green human resources and their role in driving comprehensive sustainability reporting are the focus of the relationship.

This study demonstrates that employee skills and competencies have a significant influence on the sustainability of the manufacturing business environment in Bali. It encourages companies to create a green work ecosystem that considers human resources to improve business sustainability. Skilled and competent employees can present green accounting information that is useful in the decision-making mechanism. This information is one of the core pieces of data used to evaluate economic units based on the services they provide to protect the environment. Failure to disclose green accounting information results in users not receiving complete and accurate information for informed

decision-making. Full disclosure enables companies to meet regulatory requirements and fosters trust among stakeholders.

The results of this study indicate a positive and significant relationship between green relational capital and green accounting information. This finding confirms that efforts to build relationships that support environmental management and performance can strengthen the green relational capital of manufacturing companies in Bali Province and, in turn, improve the quality of their green accounting information. Green relational capital is crucial for developing robust green accounting information by enhancing environmental management practices, fostering green innovation, and integrating green practices throughout the supply system (Anser *et al*., 2024; S. Wang *et al*., 2024). Green relational capital supports green innovation, enhancing both economic and environmental performance. These innovations are often reflected in green accounting information, which demonstrates the company's commitment to continuity (Nawangsari *et al*., 2025; C. H. Wang & Juo, 2021).

Environmentally oriented relational capital contributes to better environmental performance by facilitating the integration of environmentally friendly practices into supply systems. This integration is essential for accurate and comprehensive green accounting information. The positive relationship between green relational capital and environmental accounting emphasizes its role in monitoring and improving environmental performance. This relationship helps organizations align their green resources effectively (Alnaim & Metwally, 2024; Asiaei, Bontis, *et al*., 2022). By building strong networks with external stakeholders, organizations can identify opportunities for collaboration in green innovation. Furthermore, green relational capital also strengthens communication and transparency, supporting sustainability-oriented decision-making.

In manufacturing companies in Bali, the absence of green relational networks will harm productivity. Therefore, owners support the implementation of green practices even though it involves additional costs, especially those related to the environmental and social consequences of business operations. Green accounting information is crucial for manufacturing companies in Bali when evaluating the ecological protection services they provide. With substantial green relational capital, companies can build effective partnerships with various stakeholders, including governments and local communities. It

not only strengthens the company's commitment to sustainability but also improves its reputation and public trust in its business.

The positive and significant relationship between green structural capital and green accounting information demonstrates the crucial role of green structural capital in supporting environmental sustainability initiatives. It is evident in the infrastructure and processes required to enhance the quality of green accounting information, as green structural capital is closely linked to environmental management accounting. Environmental management accounting enables organizations to track and report ecological costs and benefits, thereby improving their environmental performance (Asiaei, Bontis, *et al*., 2022; Asiaei, Jusoh, *et al*., 2022). This alignment ensures that green structural capital supports the implementation of accurate and effective green accounting practices.

For manufacturing companies in Bali, the company's sustainable actions are crucial in shaping the company's positive image. The adoption of green structural capital plays a role in shaping consumer perceptions. Therefore, the company's ability to manage green structural capital is crucial for business continuity, particularly in evaluating the management of economic units. Information related to green structural capital presented in accounting helps users make informed decisions. Furthermore, the implementation of this capital reflects the company's commitment to environmentally conscious operational efficiency. The existence of systems, procedures, and policies that support green practices also improves the company's accountability and competitive capabilities in the global marketplace.

Green accounting information significantly improves the quality of decision-making by providing a comprehensive view of environmental impacts, improving financial performance, supporting sustainable development, and enhancing corporate social responsibility activities (Dhar *et al*., 2022; Le *et al*., 2020; Ratmono *et al*., 2024). Green accounting information is crucial for environmentally informed decision-making, as it provides a comprehensive view of the economic, social, and ecological impacts of business activities (Dwianika *et al*., 2024; Nasir *et al*., 2024). Green accounting integrates environmental and social costs into financial decision-making, improving the quality of decisions by providing a comprehensive view of sustainability impacts.

Integrating green accounting information significantly impacts strategic policy determination by providing a thorough insight into environmental costs and benefits,

which in turn influence various aspects of the organization's strategy. Green accounting information plays a critical role in strategic decision-making by providing a comprehensive view of environmental impacts, improving financial performance, supporting sustainability strategies, ensuring regulatory compliance, and enabling proactive management (Jha *et al*., 2024; Orbaningsih, 2023; Pumiviset & Suttipun, 2024). With relevant and timely information, companies can identify environmental risks early and respond strategically. Furthermore, this integration promotes the development of green innovations that align with the organization's strategic objectives.

Green accounting information plays a crucial role in the decision-making process of manufacturing companies, considering that this sector is highly dependent on natural resources and has the potential to cause significant ecological impacts. Green accounting information enables precise results from economic, social, and environmental decisions made by CEOs in manufacturing companies in Bali, ensuring consistent outcomes every time they face the same problem. Decision-making based on a green information system also makes the decisions made by the CEO more reliable, resulting in fewer errors. Green accounting information enables manufacturing companies to design long-term strategies that are adaptable to global environmental changes and pressures, while addressing ESG aspects, with a focus on business continuity and long-term value creation. This approach drives a shift toward sustainable manufacturing practices.

6 CONCLUSION

The results of this study reveal that green intellectual capital, encompassing human, relational, and structural capital, is associated with green accounting information. This capital helps companies manage sustainability, while green accounting information measures and reports on the financial impact of environmental initiatives. Both encourage the creation of a balance between economic profit and environmental sustainability, while increasing the value and reputation of the company as a socially and ecologically responsible entity.

Green accounting information was found to be related to the quality of decision-making. This information provides relevant environmental data, helping companies make more accurate, innovative, and data-driven decisions. As a result, the quality of decisions has improved because they are more measurable and responsive to sustainability issues,

thereby optimizing company competencies in addressing economic challenges and environmental concerns.

The application of green accounting information in manufacturing companies can improve decision-making quality by providing comprehensive and accurate information on environmental impacts and related costs. In this way, decision-makers can recognize opportunities to increase efficiency and reduce costs, manage ecological risks more effectively, make more sustainable investment and innovation decisions, enhance stakeholder participation and satisfaction, and monitor and assess the company's sustainability performance more accurately.

The theoretical implication of this research is to expand the scope of NRBV into decision-making theory, emphasizing that natural resource-based sustainability strategies must be complemented by information systems that support wiser and more measured decisions. Integrating green intellectual capital and accounting in this study encourages NRBV to become a more interdisciplinary and adaptive framework for sustainability practices in the modern business world. Green intellectual capital can be a strategic capability in NRBV, enabling companies to implement sustainability initiatives more effectively and measurably. Green accounting is a crucial mechanism in NRBV that measures, monitors, and manages sustainability performance in a systematic and data-driven manner.

Compared to most previous studies on green intellectual capital, which primarily measure outcomes in terms of financial performance, firm value, or sustainability performance, this study adds a more strategic outcome, namely the quality of decision-making. It enriches the literature by demonstrating how green intellectual capital and green information accounting influence the decision-making process, not just financial results. Therefore, this research bridges the literature between the sustainability or intangible aspect—green intellectual capital, green accounting—and the element of organizational processes—decision-making.

This research provides practical implications for manufacturing companies to implement green practices by integrating green intellectual capital and green accounting information into business strategies. They must invest in employee training related to green practices, develop supporting systems and technologies such as green accounting, and establish transparent communication with stakeholders. Green accounting

information is used to record, analyse, and report on environmental impacts, evaluate risks, and design long-term sustainability strategies.

This study was conducted on a limited sample, so to generalize the results, further research can be performed on a larger sample. This research was conducted in only one developing country, namely Indonesia, which has limitations in its cultural context. Cultural values, environmental awareness levels, and accounting practices typical of Indonesia can influence respondents' perception of the concept of green intellectual capital and green information accounting. Therefore, generalization of the results of this study to other cultural contexts needs to be done carefully. The use of self-report data in this study has the potential to compromise external validity, thereby limiting the generalizability of findings and their interpretation. In addition, this study does not examine the components of the accounting information system, such as system quality, information quality and service quality. The contribution of information system components to decision-making can be the next research agenda.

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Authors' Contribution

Both authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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