



Green Intellectual Capital and Sustainability Performance: Does Environmental Leadership Matter?

Amrie Firmansyah^{1*}, Resi Ariyasa Qadri², Paulina Permatasari³, Arifah Fibri Andriani⁴, Sylvia Fetri Elvira Maratno⁵

¹ Faculty of Economics and Business, Universitas Pembangunan Nasional Veteran Jakarta

^{2,4} Department of Accounting, Polytechnic of State Finance STAN

^{3,5} Department of Accounting, Faculty of Economics and Businesses, Parahyangan Catholic University

*Corresponding Author: amriefirmansyah@upnvj.ac.id

Abstract

Objective –This study investigates the impact of green human capital, green structural capital, and green relational capital, all components of green intellectual capital, on sustainability performance. Furthermore, this study considers environmental leadership a moderating component in this test.

Design/Methodology –This study employs primary data in the form of a questionnaire survey to research respondents, namely the top-level managers of a company. The final questionnaire used in the research was derived from 141 respondents. The data analysis test in this study uses a structural equation model.

Results –This study concludes that green human capital and green structural capital positively affect sustainability performance, while green relational capital does not affect sustainability performance. Environmental leadership does not strengthen the positive influence of green human capital on sustainability performance and the positive impact of green relational capital on sustainability performance. However, the interaction of environmental leadership and green relational capital has a negative effect on sustainability performance. Furthermore, environmental leadership strengthens the positive effect of green structural capital on sustainability performance.

Research limitations/implications –One disadvantage of this study is that most respondents came from the banking industry. As a result, the results remain narrowly focused on that industry and do not adequately reflect the organization's state. To provide more precise research results, future studies can assess sustainability performance utilizing respondents from various industries.

Novelty/Originality –This work in sustainable accounting has developed a rarely explored literature on utilizing green intellectual capital. Furthermore, by gathering data from a growing economy, our analysis adds to the body of information on references on long-term company performance. Furthermore, by evaluating the features of Indonesian firms, our research can be used to help design government policies governing the implementation of sustainability in the business sector.

Keywords: Environmental leadership, green human capital, green structural capital, green relational capital, sustainability

1. Introduction

Environmental harm results from businesses' extensive consumption of natural resources, contributing to pollution and resource depletion (Mishal et al., 2017; Yuzliza et al., 2020). Industries expanding without environmental awareness are major contributors to ecological issues, including water pollution, acid rain, and global

warming (Chang & Chen, 2012). Consequently, environmental management is essential and should be prioritized by all parties involved (Chang & Chen, 2012). From a corporate perspective, environmental management encourages businesses to minimize the negative impact of their operations on the environment (Hejazi et al., 2023). The increasing environmental challenges necessitate stringent regulations to address industrial pollution worldwide (Wang et al., 2021). This situation compels companies to meet environmental preservation obligations while pursuing financial returns (Bombiak & Marciniuk-Kluska, 2018). Modern businesses must integrate social and environmental goals into their operations (Jabbour & Santos, 2008).

As global industries increasingly affect the environment, there is a growing demand for sustainable practices, especially among manufacturing firms that produce waste and pollution (Zailani et al., 2012). To address these challenges, businesses must adopt sustainable performance, which includes economic, social, and environmental considerations in achieving business goals (Yong et al., 2019; Yusliza et al., 2020). Profitability is no longer the sole measure of success; sustainability is now a crucial factor. Sustainability performance has been explored in various studies, including those on green supply chain management (Çankaya & Sezen, 2019; Firmansyah et al., 2021), organizational creativity (Souto, 2021), and green intellectual capital (Antwi-Boateng et al., 2023; Hina et al., 2024; Yadiati et al., 2019; Yusliza et al., 2020; Yusoff et al., 2019; Zalfa & Novita, 2021). and organizational reputation (Yadiati et al., 2019). Other tests include economic performance (Agyabeng-Mensah et al., 2020), environmental performance (Carlos Maria Jardon & Dasilva, 2017; Salehi & Arianpoor, 2021; Severo et al., 2015; Yadiati et al., 2019), or social performance (Salehi & Arianpoor, 2021). Companies must redesign business models to improve sustainable performance and create and organize new capabilities and organizational innovation (Chen, 2008). According to numerous stakeholders' demands, the trend of consumer environmental awareness, and the tightening of international environmental protection rules, businesses must respond to sustainability challenges (Chen, 2008).

Green intellectual capital, which focuses on sustainability, has gained attention for helping companies pursue sustainability goals (Chen, 2008). By leveraging green intellectual capital, businesses can gain a competitive advantage and integrate sustainability into their operations (Cavicchi & Vagnoni, 2017). Research indicates that green intellectual capital is linked to improved social, environmental, and economic outcomes (Yusliza et al., 2020; Yusoff et al., 2019). However, findings have been mixed, with some studies showing a negative impact of green human capital on sustainability performance (Zalfa & Novita, 2021). The relationship between green intellectual capital and sustainability performance remains underexplored, with inconsistent results across studies. Further research is needed to confirm this relationship and advance the understanding of sustainability performance in the context of green intellectual capital. This area remains critical for future academic exploration, as it holds the potential to drive significant advancements in sustainable business practices.

This study aims to investigate how green intellectual capital affects sustainability performance. In this study, "green intellectual" is divided into three main parts: "green human capital," "green structural capital," and "green relational capital," following Yusliza et al. (2020). To more clearly portray sustainability performance, economic, environmental, and social performance are combined into one unit. This study employs corporate data, which is more complicated than MSMEs, in contrast to earlier assessments by Yusoff et al. (2019) and Zalfa & Novita (2021), to produce a more tangible application of green intellectual capital and sustainability performance.

The component of green intellectual capital on sustainability performance is further examined in this research using environmental leadership, a moderating variable that has yet to be utilized in previous studies. Regarding the environmental concerns businesses must address, environmental leadership can be seen as a sign of organizational identity (Chen, 2011). Stakeholders anticipate that firm executives will

need to assist in adopting sustainability performance. To achieve sustainable performance, traditional leadership must shift to environmental-based leadership, maximizing economic benefits while addressing environmental concerns. Leaders committed to environmental protection drive their companies to enhance sustainability performance. When leaders influence the interpretation of environmental issues, internalizing these concerns becomes dynamic and impactful.

Environmental leadership is also tied to a company's competitive edge, encouraging better environmental management and the development of eco-friendly products (Chen, 2011). Leaders can optimize green intellectual capital by adapting existing knowledge and enhancing competitiveness. Thus, environmental leadership is crucial in leveraging green intellectual capital to achieve corporate sustainability. Numerous contributions are envisaged from this study. The literature on the use of green intellectual capital, which is rarely examined, is developed due to this work in sustainability accounting. Additionally, by collecting data from an emerging economy, our investigation adds to the knowledge of references on sustainable business performance. Further, by examining the characteristics of Indonesian enterprises, our research can be utilized as a guide in developing government regulations relating to the implementation of sustainability in the business sector.

This paper is structured into five sections: Introduction, Theoretical Review and Hypothesis Development, Research Methodology, Results, and Conclusions, along with Limitations and Implications. The Introduction highlights the importance of green intellectual capital, sustainability performance, the role of environmental leadership, and the study's purpose and significance. The Theoretical Review lays the groundwork by defining key concepts such as green intellectual capital, sustainability performance, and environmental leadership. It develops hypotheses based on these insights, aiming to examine the relationships and moderating effects of environmental leadership empirically. The Research Methodology outlines the study's design, sample selection, data collection methods, variable measurement, and data analysis techniques. The Results section presents the sample's descriptive statistics, data analysis outcomes, hypothesis testing, and related discussions. The Conclusions section addresses the research objectives, summarizing the key findings. The Limitations discuss challenges encountered during the study, particularly in data collection. Finally, the Implications section offers theoretical insights for future research and practical recommendations for improving government regulations.

2. Theoretical Review and Hypothesis Development

Chen (2008) argued that green intellectual capital can enhance a company's competitive advantage, challenging the belief that environmental protection diminishes economic performance. The commitment of each individual within an organization is crucial, as green human capital directly contributes to the competitive edge companies can achieve (Nurdiana, 2022). Chen (2008) further asserted that green innovation, driven by environmentally conscious employees, enables companies to diversify their products and develop new markets, ultimately positioning them as future market leaders (Nuryakin & Maryati, 2022). Green intellectual capital plays a vital role in organizations prioritizing sustainability, necessitating the integration of economic, environmental, and social dimensions (Banerjee, 2011). Effective human resource practices enhance a company's triple-bottom-line performance by fostering environmental awareness and encouraging eco-friendly behavior among employees (Rayner & Morgan, 2018; Westerman et al., 2020). Critical capabilities for sustainability include individual knowledge, awareness of environmental values, systems thinking, and collaborative skills (Nair & Bhattacharyya, 2022). Employees in environmentally oriented organizations can significantly improve environmental innovation performance (Chen & Chang, 2013).

Companies with environment-focused employees can develop new markets, increase productivity, enhance their corporate image, and sustain their competitive

advantage. Green human capital is a strategic corporate investment demonstrating an organization's commitment to economic, environmental, and social goals (Golicic & Smith, 2013). This approach aligns with sustainability-oriented management practices and reinforces the importance of intellectual capital management in achieving sustainable operations (Cavicchi & Vagnoni, 2017; Toniai et al., 2018). According to Yong et al. (2019), leveraging environmentally friendly intellectual capital based on the resource-based view theory offers firms a competitive advantage. Superior performance is closely tied to this competitive edge (Khan et al., 2019).

Therefore, companies that develop green human capital are better positioned to excel in sustainability performance, distinguishing themselves from competitors and gaining a lasting competitive advantage. This investment in green human capital drives superior sustainability outcomes and underscores the critical role of human capital in advancing environmental, social, and economic effectiveness, leading to long-term sustainable success.

H1: Green human capital is positively associated with sustainability performance.

Green structural capital, encompassing the specification, enhancement, and infrastructure support for environmental protection and management systems, is crucial for businesses aiming to prevent environmental damage and minimize penalties. Investing in green structural capital safeguards the environment, enhances a company's productivity, opens new markets, improves its image, and strengthens its competitive edge (Bombiak, 2023). Even when companies prioritize long-term environmental goals, they cannot ignore the escalating environmental challenges (Yong et al., 2019). Despite the growing recognition of sustainability in business, there remains a need to integrate the three pillars of sustainability: economic, environmental, and social (Banerjee, 2011). Research highlights the importance of strategic management aspects, such as implementation and the role of human resources in shaping routines, capabilities, and value creation (Akhtar et al., 2018; Schoenherr et al., 2015). Effective human resource policies can enhance a company's triple bottom line—economic, social, and environmental performance—by fostering environmental awareness and promoting eco-friendly behavior among employees (Rayner & Morgan, 2018; Westerman et al., 2020). Key characteristics contributing to sustainability include self-awareness, value-driven decision-making, systems thinking, collaboration, and reflection (Ehnert, 2009).

Business policies and structures are critical in achieving sustainability across economic, environmental, and social dimensions (Drago & Gatto, 2022). Organizational culture significantly influences performance outcomes, including process innovation, product quality, and innovation (Prajogo & McDermott, 2011). Strong organizational structures or green structural capital also help businesses reduce environmental violations and associated costs while fostering new market development, productivity, corporate image, and competitive advantage (Huang & Kung, 2011). Furthermore, a positive relationship exists between customer loyalty, satisfaction, and overall corporate performance (Huang & Kung, 2011).

Investing in sustainability allows companies to demonstrate their commitment to environmental and social goals, which positively correlates with improved company performance and sound management practices (Cavicchi & Vagnoni, 2017; Golicic & Smith, 2013; Toniai et al., 2018). Green intellectual capital also provides a competitive advantage, improving overall performance (Khan et al., 2019; Yong et al., 2019). Companies that implement eco-friendly systems, processes, and policies are more likely to achieve higher levels of sustainability. These connections underscore the importance of embedding green practices within organizational structures to enhance social, economic, and environmental outcomes and drive sustainable long-term growth.

H2: Green structural capital is positively associated with sustainability performance

Shafiee et al. (2023) suggested that organizations can enhance their competitive advantage through relational capital. To stay ahead, companies should proactively implement environmentally friendly management practices and innovations in response to consumer awareness and growing international environmental protection standards. These initiatives aim to reduce waste, improve productivity, lower manufacturing costs, and develop eco-friendly products, all of which contribute to a competitive edge (Haleem et al., 2023). The synergy between a company's environmental management efforts and green innovation is pivotal in building and sustaining competitive advantages.

Organizations prioritizing sustainability cannot ignore emerging environmental challenges (Yong et al., 2019). Engaging with new ideas from upstream and downstream partners can further strengthen an organization's sustainability initiatives (McKinsey & Company, 2008). Investing in sustainability sends a clear message to stakeholders about the organization's commitment to environmental and social goals, which is positively correlated with enhanced company performance (Golicic & Smith, 2013; Podsakoff & MacKenzie, 1997) and sustainability-management practices (Cavicchi & Vagnoni, 2017; Todericiu & Stăniț, 2015; Tonial et al., 2018). Moreover, managing intellectual capital effectively can bolster sustainable efforts (Tonial et al., 2018), while green intellectual capital provides firms with a competitive advantage that drives higher performance (Yong et al., 2019). Strong relationships with environmentally conscious stakeholders, suppliers, customers, and the community are linked to improved organizational sustainability performance. It highlights the critical role of stakeholder engagement and external partnerships in advancing sustainable practices and achieving sustainability goals.

H3: Green relational capital is positively associated with sustainability performance

Organizational leaders must effectively navigate challenges by identifying threats, crafting strategies, engaging internal teams, and resolving conflicts (Schaedler et al., 2022). The beliefs and interpretations of top management shape organizational identity and guide action (Schaedler et al., 2022). Leadership is instrumental in creating and reinforcing an organizational identity that members understand and embrace (Freeman & Koçak, 2023). It is a process where leaders influence how events are interpreted, goals are set, and individuals are motivated to achieve those goals (Tipuric, 2022). As leadership impacts employees' perceptions, feelings, and thoughts, it is a critical indicator of corporate identity (Cakir & Adiguzel, 2020).

In environmental leadership, top management must guide employees to participate actively in environmental initiatives, aligning leadership's ecological concerns with environmental performance (Su et al., 2020). Environmental leadership is a dynamic process where leaders inspire others to contribute to environmental management and protection (Su et al., 2020). Leaders can shape organizational values, commitments, and aspirations to achieve environmental preservation goals (Felipe et al., 2017). Leaders can elicit positive stakeholder responses through strong interpersonal and communication skills (Osobajo et al., 2023). Achieving peak performance in creating environmental awareness is crucial, as a strong environmental vision can become an integral part of the organizational identity (Felipe et al., 2017).

Environmental leadership provides a competitive advantage by meeting market demand for eco-friendly products and superior customer service, which results in economic benefits through energy and resource conservation (He et al., 2023). It fulfills corporate stakeholders' environmental expectations and motivates employees to pursue organizational changes that enhance environmental performance. By driving organizational change for competitive advantage, environmental leadership can be both altruistic and a means to boost competitiveness (He et al., 2023).

Environmental leaders aim to inspire a shared environmental vision, implement effective environmental management strategies, collaborate with stakeholders to address environmental challenges, and promote environmental education among

employees (Freeman & Koçak, 2023). Leadership is vital in managing environmental challenges, ultimately improving the company's environmental performance (Freeman & Koçak, 2023). Leaders are crucial in cultivating a business culture that supports long-term competitive advantage (He et al., 2023).

Environmental leadership enhances business sustainability performance by leveraging green intellectual capital. Environmentally conscious top management aligns the company's resource utilization with competitive advantage goals. With strong senior management support, the effectiveness of green intellectual capital in operations is maximized. Leaders prioritizing environmental sustainability enhance their workforce's eco-friendly knowledge and skills, driving superior sustainability outcomes. Additionally, leaders who foster strong relationships with environmentally conscious stakeholders push the company toward exceptional sustainability performance through collaborative and supportive external interactions.

H4: Environmental leadership strengthens the positive influence of green human capital on sustainability performance.

H5: Environmental leadership strengthens the positive effect of green structural capital on sustainability performance.

H6: Environmental leadership strengthens the positive effect of green relational capital on sustainability performance

3. Research Method

The primary data for this study was collected directly from the study subjects through a survey of corporate managers and above. These respondents are actively involved in strategic decision-making, possess extensive knowledge of green intellectual capital and sustainability initiatives, play a pivotal role in environmental leadership, and are responsible for implementing and assessing sustainability practices. Their insights are crucial for gaining a detailed understanding of the relationships explored in this research. The data was gathered via a questionnaire distributed to respondents between September 12, 2022, and October 13, 2022. The survey was conducted online, and respondents accessed the questionnaire through the link <https://bit.ly/RisetGreenIntellectualCapital>. A total of 141 completed questionnaires were used in the study, exceeding the minimum sample size requirement of 30 or five times the number of variables, thus ensuring the adequacy of the sample size.

The dependent variable used in this research is sustainability performance. This variable follows the dimensions and indicators used by Yusliza et al. (2020) and Yusoff et al. (2019), which consist of three main parts: environmental performance, economic performance, and social performance. **Environmental performance** refers to an organization's capacity to reduce air emissions, the energy consumption of hazardous materials, material use, and compliance with environmental standards, which includes enhancing company compliance with environmental standards, lowering company air emissions, reducing company energy consumption, lessening company material use, and bringing down company consumption of hazardous materials. **Economic performance** is an organization's capacity to lower expenses associated with material procurement, energy use, waste treatment, disposal, and fines for environmental mishaps. The indicators for measuring this dimension are decreased costs for material purchases by businesses, reduced costs for energy consumption by organizations, improved efficiency for handling organizational waste by corporates, decreased costs for waste disposal by enterprises, and lessened fines imposed by companies related to the reduced environmental accident. **Social performance** refers to an organization's capacity to advance welfare and social advancement, public health and safety, dangers to the general public, occupational health, and employee safety. The indicators used to measure this dimension include raising stakeholder welfare as a whole, enhancing health and safety within the company/organization community, lowering environmental impacts and risks to the general public, increasing employee health and

safety insurance, and enhancing awareness of the rights of individuals within the community the company/organization serves.

The independent variables utilized in this research to measure sustainability performance are green human capital, green structural capital, and green structural capital. Employee involvement in environmental protection, employee competence in environmental protection, the quality of employee services and products related to environmental protection, the extent to which environmental protection is carried out in collaboration within work teams, and leadership support for employees in environmental protection are indicators to determine **green human capital** (Chang & Chen, 2012; Huang & Kung, 2011). In the meantime, **green structural capital** can be measured by the presence of company management systems for environmental protection, the existence of committees within the company to advance environmental protection issues, the availability of detailed rules within the company related to environmental protection, the emergence of the company's investment in realizing environmental protection facilities, and the high ratio of environmentally conscious employees (Chang & Chen, 2012; Huang & Kung, 2011). Moreover, indicators we adopted to measure **green relational capital** are products designed to be environmentally friendly according to consumer expectations, consumer satisfaction with the company's efforts in environmental protection, companies and suppliers who have concern for environmental protection, the existence of environmental protection cooperation between companies and clients, and the occurrence of environmental protection activities between companies and their strategic partners (Chang & Chen, 2012; Huang & Kung, 2011).

We put environmental leadership as the moderating variable to boost the causality between green intellectual capital and sustainability performance. **Environmental leadership** is measured by several indicators, including corporate leaders who inspire organizational vision into environmental sustainability, create or maintain environmental values in all aspects of the organization, use a well-developed environmental management approach that is typically centered around programs that are specific to the company's business and market, and create part of the environmental management process (Chang & Chen, 2012; Huang & Kung, 2011).

A questionnaire survey was employed in this study. To lessen respondents' propensity to select the median response to each questionnaire statement, a 6-point Likert scale was used. The descriptive-analytic method and the structural equation model (SEM), a multivariate analysis used to examine complex interactions between variables, were used in this study's data analysis.

4. Results and Discussion

Table 1 shows the validity test of the questionnaire items. Some questionnaire items are considered invalid because the loading factor is below 0.7.

	EL	GHC	GRC	GSC	SP
EL1	0.809				
EL2	0.852				
EL3	0.724				
EL4	0.817				
GHC1		0.876			
GHC2		0.79			
GHC3		0.737			
GHC4		0.768			
GHC5		0.756			
GRC1			0.734		
GRC2			0.866		
GRC3			0.814		

Table 1.
Summary of
Validity Test

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GRC4	0.856	
GRC5	0.734	
GSC1		0.8
GSC2		0.811
GSC3		0.72
GSC4		0.753
GSC5		0.745
GSC6		0.844
GSC7		0.742
SP6		
SP11		0.723
SP12		0.761
SP14		0.873
SP15		0.775
SP18		0.738
SP20		0.768

Where:

EL = environmental leadership
 GHC = green human capital
 GRC = green relational capital
 GSC = green structural capital
 SP = sustainability performance

The reliability test is summarized in Table 2. All latent variables employed in this study are trustworthy because the Cronbach alpha and composite reliability values are greater than 0.7 or the AVE value is greater than 0.5.

Table 2.
Summary of the
Main Model
Reliability Test

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
EL	0.814	0.824	0.878	0.644
GHC	0.845	0.851	0.89	0.619
GRC	0.862	0.884	0.9	0.644
GSC	0.889	0.893	0.913	0.6
SP	0.895	0.9	0.918	0.616

Where:

EL = environmental leadership
 GHC = green human capital
 GRC = green relational capital
 GSC = green structural capital
 SP = sustainability performance

Descriptive statistics for environmental leadership are shown in Table 3 below.

Table 3.
Descriptive
Statistics of
Environmental
Leadership

	Mean	Median	Mode	Std. Dev.	Min	Max	Resp.
EL1	4.950	5	5	0.6015	2	6	141
EL2	4.865	5	5	0.6678	2	6	141
EL3	4.829	5	5	0.7742	2	6	141
EL4	4.843	5	5	0.6685	2	6	141

Descriptive statistics for green human capital are in Table 4 below.

	Mean	Median	Mode	Std. Dev.	Min	Max	Resp.
GHC1	4.751	5	5	0.8207	1	6	141
GHC2	4.687	5	5	0.7665	2	6	141
GHC3	4.680	5	5	0.9435	1	6	141
GHC4	4.794	5	5	0.8325	2	6	141
GHC5	4.851	5	5	0.7458	2	6	141

Table 4.
Descriptive
Statistics of Green
Human Capital

Descriptive statistics for green relational capital are shown in Table 5 below.

	Mean	Median	Mode	Std. Dev.	Min	Max	Resp.
GRC1	4.837	5	5	0.6505	1	6	141
GRC2	4.780	5	5	0.7568	1	6	141
GRC3	4.844	5	5	0.7586	1	6	141
GRC4	4.829	5	5	0.8014	1	6	141
GRC5	4.730	5	5	0.8854	1	6	141

Table 5.
Descriptive
Statistics of Green
Relational Capital

Descriptive statistics for green structural capital are shown in Table 6 below.

	Mean	Median	Mode	Std. Dev.	Min	Max	Resp.
GSC1	4.794	5	5	0.7418	2	6	141
GSC2	4.688	5	5	0.8874	2	6	141
GSC3	4.794	5	5	0.8985	1	6	141
GSC4	4.667	5	5	0.8997	1	6	141
GSC5	4.766	5	5	0.7712	1	6	141
GSC6	4.773	5	5	0.7961	2	6	141
GSC7	4.808	5	5	0.6961	2	6	141

Table 6.
Descriptive
Statistics of Green
Structural Capital

Descriptive statistics for sustainability performance are shown in Table 7 below.

	Mean	Median	Mode	Std. Dev.	Min	Max	Resp.
SP6	4.745	5	5	0.7502	2	6	141
SP11	4.752	5	5	0.8465	1	6	141
SP12	4.745	5	5	0.7874	1	6	141
SP14	4.822	5	5	0.7395	1	6	141
SP15	4.851	5	5	0.7553	2	6	141
SP18	4.667	5	5	0.8837	1	6	141
SP20	4.730	5	5	0.8356	2	6	141

Table 7.
Descriptive
Statistics of
Sustainability
Performance

Furthermore, a summary of the hypothesis testing is in Table 8 below.

	Coeff	T Stat.	Prob	
GHC	0.198	1.487	0.069	*
GRC	0.039	0.202	0.42	
GSC	0.391	2.264	0.012	**
EL	0.378	2.661	0.004	***
EL*GHC	-0.057	0.629	0.265	
EL*GRC	-0.235	1.611	0.054	*
EL*GSC	0.313	2.332	0.01	**
R ²	0.758			
Adj. R ²	0.745			

Table 8.
Hypothesis
Testing Summary

Where:

EL is environmental leadership; GHC is green human capital; GRC is green relational capital; GSC is green structural capital; SP is sustainability performance.

4.1 *The association between green human capital and sustainability performance.*

According to the findings of hypothesis testing, sustainability performance is positively impacted by green human capital. The findings of this study align more comprehensively with the results of Yusliza et al. (2020) and Yadiati et al. (2019) but contrast with those of Yusoff et al., 2019 and Zalfa and Novita (2021). Businesses that leverage environmental-based resource competencies can enhance their sustainability performance. A solid environmental foundation enables companies to foster innovative, eco-friendly ideas, which positively impact their sustainability outcomes. This improved sustainability performance can help differentiate a company from its competitors and sustain its competitive edge. Green human capital within an organization promotes better social, environmental, and economic performance—the three pillars of sustainability. It can drive sales growth, strengthen relationships with community stakeholders, raise awareness about community rights, improve employee safety, and enhance stakeholder welfare. Additionally, green human capital reduces air emissions and minimizes environmental accidents within the company.

This study has optimized the application of green human capital. It identifies green human capital in organizations by examining employee involvement in environmental protection, competence in ecological conservation, contribution to high-quality eco-friendly products, and teamwork that supports environmental protection. The company's green human capital is linked to employees' knowledge, skills, abilities, experience, behavior, wisdom, creativity, and commitment to environmental protection (Chen, 2008). Since green intellectual capital is tied to human resources, it departs with employees when they leave the company (Chang & Chen, 2012). Human resources are a critical intangible asset that enhances employee satisfaction and business performance. Companies with environmentally conscious personnel are better positioned to explore new markets, boost productivity, enhance their corporate image, and maintain a competitive advantage. It supports the resource-based view, which suggests that unique, valuable competencies, such as those related to environmental awareness, provide a competitive advantage (Barney, 2001; Khan et al., 2019; Yong et al., 2019).

Investing in employee training on environmental issues can further enhance sustainability performance. This investment signals the company's commitment to environmental and social goals beyond financial success to stakeholders. Companies prioritizing building a skilled, environmentally conscious workforce tend to contribute more effectively to developing eco-friendly practices (Yong et al., 2019).

4.2 *The association between green relational capital and sustainability performance.*

According to the findings of the hypothesis test, green relational capital has no impact on sustainability performance. The finding of this study contrasts with that of Zalfa & Novita (2021). According to Chen (2008), "green relational capital" refers to the value derived from a company's interactions with clients, suppliers, network members, and partners, which supports environmental management and innovation. This intangible asset, "green relational capital," is built on the company's commitment to environmental sustainability through stakeholder relationships. Green intellectual capital should enhance sustainability performance and strengthen the company's competitive advantage. Moreover, effective use of green relational capital should align with stakeholder expectations to maximize long-term value. However, this study found that green relational capital does not significantly impact sustainability performance as expected.

Green relational capital is evidenced by a company's efforts to design eco-friendly products and services that meet consumer demand, the satisfaction of customers with the company's environmental initiatives, stable cooperative

relationships with suppliers for environmental protection, and strong partnerships related to environmental activities. Despite these indicators, this study found no substantial impact of green relational capital on economic performance, including sales growth. Additionally, green relational capital did not enhance relationships with local stakeholders, such as NGOs and activists, or improve employee safety, well-being, or corporate awareness of reducing air emissions and environmental accidents.

The lack of a significant relationship between green relational capital and sustainability performance may be attributed to 78% of respondents being from the banking sector. This sector's competitive landscape has shifted focus from product-oriented to customer-oriented strategies, which might explain why the findings diverge from Tonial et al. (2018), who emphasized customer relationships as crucial in relational capital. Consequently, in this study, the development of environmental relationships with clients did not correlate with enhanced sustainability performance.

4.3 The association between green structural capital and sustainability performance.

According to the result of hypothesis testing, green structural capital enhances sustainability performance. The results of this study align with the findings of Yong et al., 2019, and Yusoff et al. (2019) and corroborate the conclusions of Yadiati et al. (2019), but they differ from those of Zalfa & Novita (2021). Structural capital encompasses intangible assets such as patents, trademarks, hardware, software, databases, organizational culture, and competencies (Bontis et al., 2000). It represents an organization's non-human resources, including organizational charts, databases, technological components, process instructions, and strategies (Jardon & Martos, 2012). Human resources alone cannot address environmental issues effectively without the support of organizational culture and structures, which are crucial for strategic decision-making (Jardon & Dasilva, 2017).

The application of green structural capital within a company indicates a well-established management system for environmental protection, including dedicated committees or departments focused on environmental issues and established protection standards. Companies that invest in green structural capital often have a high proportion of staff knowledgeable in environmental management and an efficient operational process for environmental protection. Ongoing knowledge sharing about environmental management within these companies contributes to their effective use of green structural capital. This type of capital enhances the company's ability to manage processes and systems, acquire technological expertise, and advance environmental sustainability. Consequently, a company's potential for achieving optimal sustainable performance is supported by its environmental management capabilities (Jardon & Dasilva, 2017). An eco-friendly corporate structure can lead to increased sales, improved community stakeholder relationships, heightened awareness of community rights, enhanced employee safety, and overall stakeholder welfare.

4.4 The moderating role of environmental leadership in the relationship between green human capital and sustainability performance.

The hypothesis test result indicates that environmental leadership does not enhance the positive impact of green human capital on sustainability performance. In other words, the influence of green human capital—employees' knowledge, skills, and abilities geared toward environmental management—on a company's sustainability performance is not necessarily amplified by the presence of environmentally focused leadership. This finding challenges the assumption that leadership with a strong environmental orientation would naturally strengthen the effectiveness of green human capital in promoting sustainable practices. The result suggests that, even with leaders who integrate an environmental vision and mission into the organization and work to instill environmental values across all levels, the full potential of green human capital may remain unrealized. Employees' contributions to sustainability may not be directly

linked to the actions or support of top-level executives focused on environmental concerns.

Leadership in these organizations may still engage in environmentally conscious activities, such as forming partnerships with external stakeholders—like government agencies, NGOs, and local communities—to tackle environmental challenges and align with the organization's sustainability goals. Moreover, executives may invest in providing environmental education and training to employees to encourage their active participation in environmental management practices. However, these actions alone do not appear to significantly boost the direct impact of green human capital on sustainability performance.

The result implies that while environmental leadership shapes the organization's overall approach to sustainability, it does not necessarily serve as a catalyst that maximizes the contributions of green human capital. It may indicate a need for more effective integration strategies, where the capabilities of green human capital are better leveraged in alignment with the organization's sustainability objectives. It also suggests that other factors, such as organizational culture, operational practices, or employee engagement mechanisms, might play a more critical role in harnessing the potential of green human capital for achieving corporate sustainability performance.

4.5 *The moderating role of environmental leadership concerning green relational capital and sustainability performance.*

The hypothesis testing result reveals a negative association between environmental leadership, green relational capital, and sustainability performance. This finding indicates that the role of environmental leadership in fostering a firm's green relational capital—the value derived from relationships with external stakeholders, such as customers, suppliers, and regulatory bodies—may not be well understood or effectively implemented within organizations. Consequently, this lack of clarity and misalignment could adversely affect sustainability performance.

This outcome may reflect a novel perspective on environmental leadership's interaction with green relational capital. It suggests that, while leadership may recognize the importance of environmental issues, their efforts to engage stakeholders and build environmentally focused relationships are not necessarily translating into improved sustainability outcomes. The misapplication or inconsistent implementation of environmental leadership principles may weaken the firm's overall environmental strategy rather than strengthen it.

Indonesian organizations, in particular, face challenges in effectively implementing environmental leadership in conjunction with green relational capital. This inadequacy may stem from conflicting viewpoints and practices within organizations. While business leaders may theoretically understand the necessity of addressing environmental challenges, they may struggle to apply these principles effectively in a way that enhances green relational capital. Instead of fostering stronger stakeholder relationships and collaboration around sustainability goals, these efforts could inadvertently undermine sustainability performance by failing to align with the organization's broader strategic objectives.

Furthermore, environmental leadership initiatives might also exacerbate the suboptimal use of green structural capital—the internal policies, processes, and intellectual assets that support environmental management. The lack of synergy between leadership and these structural elements could further hinder the organization's ability to achieve its sustainability goals. This issue is particularly significant given that 78% of the study's respondents were from financial corporations, which historically have been less engaged with environmental concerns than other sectors. These organizations may not fully appreciate or prioritize integrating environmental leadership practices to enhance the long-term effectiveness of green structural capital.

4.6 *The moderating role of environmental leadership in the relationship between green structural capital and sustainability performance.*

The hypothesis test results suggest that environmental leadership enhances the positive impact of green structural capital on sustainability performance. This finding implies that business executives are effectively integrating their environmental vision within the framework of green structural capital. Company leaders who have developed or reinforced environmental values and implemented advanced environmental management strategies tailored to their industry can significantly improve sustainability performance.

Environmental leadership encourages stakeholder collaboration to address environmental challenges and achieve sustainability goals. Leaders committed to environmental protection can also provide valuable education to employees, fostering a culture of environmental management. This leadership emphasis is likely to support the development of green relational capital, thereby enhancing the overall effectiveness of green structural capital.

In Indonesian businesses, the potential of environmental leadership is being effectively harnessed to complement green structural capital, contributing positively to sustainability performance. While environmental leadership is essential for promoting sustainability, it should be integrated with existing structural principles to maximize its impact. A balanced approach that harmonizes leadership initiatives with established structural frameworks will optimize sustainability performance.

5. Conclusion

The results of this study indicate that green human capital positively influences sustainability performance. Sustainability performance improves when employees are actively involved in environmental protection, possess adequate ecological competence, contribute to producing high-quality, environmentally friendly products, and exhibit strong teamwork in these efforts. However, green relational capital does not appear to impact sustainability performance. Factors such as consumer satisfaction with environmental practices, stable partnerships with suppliers, and harmonious relationships with consumers and other partners are not significantly related to sustainability outcomes.

Conversely, green structural capital has been shown to enhance sustainability performance. A company with a well-established environmental management system, including dedicated teams or departments for environmental protection and clear environmental policies, is more likely to achieve sustainable performance. Companies that invest in environmental protection facilities and have knowledgeable staff in environmental management tend to perform better in sustainability. Regularly disseminating environmental management knowledge to employees also improves sustainability performance.

Environmental leadership does not appear to strengthen the positive effects of green human capital on sustainability performance. Environmental leadership is not fully utilized even in companies that have invested in green human capital. The interaction between environmental leadership and green relational capital negatively affects sustainability performance. Furthermore, environmental leadership enhances the positive impact of green structural capital on sustainability performance. Business executives are effectively integrating their environmental vision into green structural capital, with company leaders enhancing sustainability performance through developed environmental values and advanced industry-specific management strategies.

This study has limitations, primarily because most respondents are from the financial sector. As a result, the findings may not fully represent other industries. Future research should include respondents from broader sectors to provide a more comprehensive view of sustainability performance. Additionally, the government should establish regulations and guidelines for sustainability practices across all industries, not just those in the natural resources sector. The focus on sustainability

should extend to economic, environmental, and social contexts to ensure comprehensive application across all fields.

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