GREEN INTELLECTUAL CAPITAL AND SUSTAINABILITY: THE MODERATING ROLE OF TOP MANAGEMENT SUPPORT

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Abstract: The purpose of the present study is to examine the relationship between green intellectual capital (green human capital, green structural capital, and green rational capital) and sustainability. Moreover, it examines the moderating role of top management support for these relationships. The study is empirical in nature. Responses from 253 oil and gas companies in Indonesia were otained from the period of July until December 2022 through self-administered questionnaire using convenience sampling. An advanced Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis was conducted to reveal the study results. The study findings confirmed the positive effect of green human capital and green structural capital on sustainability. Moreover, study shows no positive relationship between green relational capital and sustainability. Furthermore, results reveals that top management does not moderate these relationships. This study provides important implications for sustainable performance by improving green human capital and green structural capital; particularly for its unique context, the oil and gas sector. This study is considered original since it is one of the few to provide empirical evidence for the link of green intellectual capital with sustainability and moderating role of top management support.

Key words: green human capital, green relational capital, green structural capital, top management support, sustainability

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Introduction

The issue of sustainability has emerged as a central focus in the current corporate climate, as there is growing acknowledgment of its significant influence on economic, environmental, and social consequences (Eccles and Serafeim, 2013). The complex nature of this term highlights the necessity of adopting a comprehensive strategy for sustainability, wherein firms are required to not only prioritize profit generating but also actively engage with environmental and social responsibilities (Dyllick and Hockerts, 2002).

The concept of intellectual capital, which is commonly referred to as green intellectual capital, exhibits a close association with the domain of natural security. The objective was to analyze the impact of environmentally conscious human resources and financial resources on the long-term sustainability of the organization. Through the implementation of environmentally conscious policies and practices, such as those advocated by Yusoff et al. (2019), the concept of green natural administration is promoted.

The concept of green human capital pertains to the intellectual, practical, and aptitude-based attributes possessed by the workforce of an organization, with a specific focus on sustainability. According to Delmas and Pekovic (2013), this particular type of capital recognizes the significant contribution of employees in promoting and implementing sustainable practices within organizations. According to Epstein and Buhovac (2014), the successful attainment of economic, environmental, and social sustainability objectives heavily relies on the competencies and dedication of the workforce towards sustainability projects.

Green structural capital refers to the infrastructure, processes, and systems inside an organization that is designed to support and facilitate sustainability initiatives. Sánchez et al. (2007) acknowledge the significance of establishing comprehensive frameworks that enable the implementation of sustainable practices, encompassing several aspects such as supply chain management and the adoption of green technologies. Capital is referred to in this context as one that emphasizes the structural components that enable an organization to embark on a sustainable trajectory (Gupta and Sharma, 2018).

Green rational capital is a concept that pertains to the strategic decision-making procedures employed by organizations, with a specific emphasis on sustainability. The literature (e.g., see Hahn et al., 2015) emphasizes the importance of integrating sustainability considerations into fundamental aspects of organizational decision-making, such as resource allocation and long-term planning. The concept of capital in question emphasizes the logical and strategic elements of incorporating Sustainability (Eccles and Serafeim, 2013).

Nevertheless, it is critical to acknowledge that external influences can alter the efficacy of these green intellectual capital forms in promoting sustainability outcomes. An example of a significant external element is the support of top management (Alkaf et al., 2023). Hence, this research study also aims to examine the moderating influence of top management support on the association between

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various types of green intellectual capital (namely, green human capital, green structural capital, and green rational capital) and sustainability. The presence of strong support from top management is widely recognized as a critical factor in determining the effectiveness and ultimate success of sustainability efforts implemented within organizations.

Hypotheses Development

Green human capital stands as a vital strategic asset for achieving organizational success in the dynamic and rapidly evolving contemporary landscape as their knowledge and competencies play a crucial role in upholding and perpetuating a business in today's ever-changing environment (Huang et al., 2022).

From the perspective of the Resource-Based View (RBV), it is suggested that valuable resources should have specific characteristics such as being unique, rare, and not easily comparable or substitutable. This uniqueness and rarity are what enable organizations to gain a competitive advantage over their rivals. Since green human capital is essentially embedded in the knowledge and expertise of employees, it is at risk of being lost when an employee leaves the organization. As a result, organizations should make efforts to retain this form of capital (Williams et al., 2014).

Organization is characterized by robust structural capital that fosters a helpful setting to encourage staffs to acquire novel information (Florin et al., 2003). Various scholars globally (e.g., Mention and Bontis, 2013; Sharabati et al., 2010; Wang et al., 2014) have approved the relevance of green structural capital for better functioning of business.

Green relational capital is defined as "intangible assets of the company that are based on the relationship between organization and supplier, customers, green innovation, network members, and partners about corporate environmental management with the aim to obtain competitive advantages" (Chen, 2008, p. 278). Green relational capital facilitates the flow of continuous information in organisation. Through these interactions, organizations can benefit from the expertise of their partners, gain market intelligence, mitigate risks, foster green innovation, enhance their reputation and facilitate strategic decision-making processes (Long and Liao, 2023). Rooted in the social exchange theory (SET), green relational capital is regarded as a founding stone of trust between organisation and its partners (Zhao and Detlor, 2023).

Many researchers (for instance, Al Issa et al., 2023; Asiaei et al., 2022; Malik et al., 2020; Yusoff et al., 2019) highlighted the significance of sustainability and various dimensions of green intellectual capital. Thus, this study hypothesises that:

H1. There is a positive relationship between green human capital and sustainability.

H2. There is a positive relationship between green structural capital and sustainability.

H3. There is a positive relationship between green relational capital and sustainability.

Support from the top management in organisation is considered to be a significant factor in ensuring sustainability in business (Men et al., 2023). Top management

comprises the highest-ranking leaders within a company, such as the chairman, CEOs, and directors, who are responsible for strategic decisions and guiding the organization. Top management's support is crucial in ensuring green intellectual capital performing business activities in an economically, environmentally, and socially sustainable way as it involves selecting and investing in projects that aligns well with the business sustainability (Wijethilake and Lama, 2019).

Literature suggests that the commitment of top management to sustainability is more likely to promote executing sustainability practices (Colwell and Joshi, 2013). As an application of SET to the company–employee association, the organizational support theory (OST) asserts that when employees believe that their work is being valued in organization and cares about their wellbeing they tend to reciprocate (Eisenberger et al. 1986). Thus, it can be assumed that the presence of top management support strengthens the relationship between green intellectual capital dimensions and sustainability while the absence of top management support weakens their relationship. Hence,

H4. Top management support significantly moderates between green human capital and sustainability.

H5. Top management support significantly moderates between green relational capital and sustainability.

H6. Top management support significantly moderates between green structural capital and sustainability.

Research Methodology

Participants and Procedures

The population targeted for the purpose of the study is that of oil and gas companies in Indonesia. The rationale behind this selection is the limited attention given to this sector, previous studies were more focused on in the fields of hospitality (Darban et al., 2022) , finance (Cheng et al., 2022), and education (Anwar et al., 2020), when investigating the impact of environmentally friendly practices on overall performance. Studies on green practices predominantly focus on the manufacturing sector (Fachada et al., 2022). However, in response to previous calls for more extensive research within the oil and gas sector, notably from Murillo-Ramos et al (2022), our present study centers on the oil and gas sector in Indonesia. This sector in Indonesia is experiencing significant growth, as the country is actively targeting the sustainability as part of its efforts to diversify the economy. The selection of this sample is underpinned by three key rationales. First, Indonesia was chosen as the focal point not only due to the abundant distribution of oil, condensate reserves, and natural gas throughout the country, which hold substantial value, but also because the research data and information are of broader significance to Indonesia as a whole, in line with Indonesian Ministy of Energy and Mineral Resoices (2021). Second, the inclusion of oil and gas companies in the study is motivated by their sustainability concerns, particularly regarding the environmental, economic, and social impacts associated with the processing of oil into various products, as highlighted by Heim

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et al. (2023) and Shahbaz et al. (2023). Lastly, human resource managers were specifically chosen as informants for their ability to provide the necessary insights. According to Obeidat et al. (2020), human resource managers play a pivotal role in driving sustainability practices within organizations.

The analysis focused on the organizational level. These companies were chosen based on information available on the official website of the Indonesian Ministry of Energy and Mineral Resource. The sample for this study was specifically drawn from oil and gas companies with a focus on sustainability issues and various aspects of their business operations. To determine the sample size, non-probability convenience sampling techniques were employed. This method of convenience sampling was chosen to effectively manage available resources, as emphasized by Ali et al. (2020). Furthermore, it was adopted due to the willingness of participants to provide the necessary information, thereby reducing the time required for data collection, aligning with the insights from Amoah et al. (2023) and Hair et al., (2017) recommended the G*Power to calculate minimum sample size for social sciences research. Through G*Power analysis, it was determined that a minimum sample size of 119 was sufficient for this study. Consequently, the targeted sample size was set at a minimum of 119. The sample consisted of 253 oil and gas companies in Indonesia. Thus, the sample reaches the minimum threshold number required for G*Power analysis.

Data Collection

The data for this study were gathered using a close-ended questionnaire, which offers respondents a fixed set of possibilities. Self-administered surveys can reduce the impact of social desirability bias by allowing respondents to provide honest answers without fear of judgment or retribution (Tourangeau et al., 2000). Furthermore, it delivers exact results on the sample and allows researchers to draw conclusions based on the findings (Juschten et al., 2019).

The questionnaires were distributed among the HR managers. Additionally, this study used Drop-Off and Pick-Up (DOPU), based on Kott (2021). This data collection method enables a researcher to hand-deliver survey questionnaires to respondents. According to Marsden and Campbell (2021), the DOPU method allows respondents to complete a survey at their convenience and return it at a later time or date, which can increase response rates and reduce non-response bias. The cover letter explained the nature and objectives of the study and highlighted the strict confidentiality of respondent information. Data were collected from July 1 to December 31, 2022.

Measures

The questionnaire was pretested to ensure content validity and clarity. The questionnaire was developed based on already used scales in previous literature. Top management support, green intellectual capital, and sustainability was adapted from Obeidat et al. (2020) with four items, Chen (2008) with 19 items, and Yong et al. (2020) with 15 items respectively. All items were measured using a 7-point Likert

scale with responses to statements ranging from (1) strongly disagree to (7) strongly agree.

Research Results

Using a single data source in questionnaire-based studies is common but can introduce problems like artificial associations between variables, compromising result reliability due to common method bias (CMB). In this study, researchers tackled CMB through procedural and statistical means. Procedurally, they assured respondents of confidentiality and emphasized that there were no right or wrong answers. Statistically, they followed Kock (2015) recommendations for full-collinearity testing. As shown in Table 1, all variance inflated factor (VIF) values were below 2, indicating the absence of significant common method bias. Consequently, the study's data is considered reliable, free from undue influences linked to using a single data source.

Table 1. Full Collinearity Testing

Construct	VIF
Green Human Capital	2.675
Green Relational Capital	3.692
Green Structural Capital	2.615
Sustainability	2.510
Top Management Support	2.854

To assess the research model developed for this study, we employed partial least squares (PLS) analysis using SmartPLS 4 software (Ringle et al., 2022). SmartPLS is a second-generation statistical software designed for analyzing data sets, particularly those that do not follow a normal distribution. Given that survey research data typically deviates from normality, this technique was the most suitable choice for our analysis. Our analysis involved two stages: evaluating the measurement model and examining the structural model, following established literature guidelines (Hair et al., 2017).

The model we constructed included a second-order factor related to sustainability. Therefore, we initially assessed the first-order factors and subsequently examined the validity and reliability of the second-order factor. Consistent with recommendations from Hair et al. (2017) we employed factor loadings, average variance extracted (AVE), and composite reliability (CR) to evaluate convergent validity, followed by an examination of discriminant validity.

As presented in Table 2, all the first-order factors exhibited loadings exceeding 0.6, AVE values greater than 0.5, and CR values exceeding 0.7, indicating that the measures are both valid and reliable. Likewise, the variables met these three criteria, confirming the validity and reliability of both the first and second-order factors (Ramayah et al., 2018).

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Table 2. Measurement Model for the First Order Constructs

Construct	Items	Loadings	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Sustainability	ECP1	0.677	0.932	0.939	0.518
	ECP2	0.790			
	ECP3	0.724			
	ECP4	0.784			
	ECP5	0.814			
	ENP1	0.806			
	ENP2	0.873			
	ENP3	0.609			
	ENP4	0.629			
	ENP5	0.807			
	SP1	0.620			
	SP2	0.638			
	SP3	0.678			
	SP4	0.629			
	SP5	0.641			
Green Human Capital	GHC2	0.786	0.801	0.822	0.629
	GHC3	0.875			
	GHC4	0.824			
	GHC5	0.672			
Green Relational Capital	GRC2	0.813	0.869	0.87	0.719
	GRC3	0.877			
	GRC4	0.825			

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	GRC5	0.875			
Green Structural Capital	GSC2	0.870	0.92	0.928	0.645
	GSC3	0.712			
	GSC4	0.722			
	GSC5	0.868			
	GSC6	0.754			
	GSC7	0.737			
	GSC8	0.864			
	GSC9	0.875			
Top Management support	TMS1	0.705	0.767	0.791	0.585
	TMS2	0.801			
	TMS3	0.760			
	TMS4	0.790			
Sustainability	ECP	0.935	0.916	0.947	0.856
	ENP	0.935			
	SP	0.906			

Note: GSC = Green Structural Capital; GHC = Green Human Capital; GRC = Green Relational Capital; TMS = Top Management Support
GSC1, GHC1 and GRC1 removed due to low loadings

Henseler et al. (2015) and Franke and Sarstedt (2019) recommended the HTMT criterion to establish discriminant validity. The results in Table 4 show that all HTMT values were less than the threshold values of ≤ 0.85. This result represents that respondents clearly understood that each construct was distinct.

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Table 3. Discriminant Validity Fornell-Larcker Scale

	GHC	GRC	GSC	SUST	TMS
GHC	**0.793**				
GRC	0.736	**0.848**			
GSC	0.625	0.764	**0.803**		
Sustainability	0.635	0.605	0.546	**0.720**	
TMS	0.673	0.659	0.471	0.736	**0.765**

Note: GSC = Green Structural Capital; GHC = Green Human Capital; GRC = Green Relational Capital; TMS = Top Management Support

Table 4. Discriminant Validity (HTMT)

	1	2	3	4	5	6	7	8
1-GHC								
2-GRC	**0.879**							
3-GSC	0.710	**0.848**						
4-Sustainability	0.721	0.662	**0.583**					
5-TMS	0.848	0.810	0.567	**0.835**				
6-TMS x GHC	0.252	0.302	0.171	0.247	**0.299**			
7-TMS x GSC	0.183	0.150	0.152	0.172	0.229	**0.791**		
8-TMS x GRC	0.300	0.271	0.143	0.243	0.340	0.854	**0.852**	

Note: GSC = Green Structural Capital; GHC = Green Human Capital; GRC = Green Relational Capital; TMS = Top Management Support

Structural Model

Hair et al. (2019) recommended the use of a resampling bootstrapping technique involving 5,000 samples to generate structural model path coefficients, p-values, standard errors, and t-values. Meanwhile, Hahn and Ang (2017) asserted that p-values alone are not dependable indicators of hypothesis significance and advocated for a combination of criteria, such as confidence intervals, to assess hypotheses. The criteria used for hypothesis testing are detailed in Table 5.

Table 5. Path coefficients and significance

	Relationship	Std. Beta	Std. Dev	T Statistics	P values	BCI LL	BCI UL	Decision
H1	GHC -> Sustainability	0.165	0.08	2.072	0.019	0.032	0.294	Accepted
H2	GRC -> Sustainability	-0.074	0.079	0.937	0.174	-0.208	0.053	Not Accepted
H3	GSC -> Sustainability	0.226	0.067	3.386	0.000	0.123	0.345	Accepted

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H4	TMS x GHC -> Sustainabilit y	- 0.104	0.067	1.551	0.060	- 0.215	0.007	Not Accepted
H5	TMS x GSC -> Sustainabilit y	0.037	0.061	0.614	0.269	- 0.056	0.140	Not Accepted
H6	TMS x GRC -> Sustainabilit y	0.046	0.075	0.612	0.270	- 0.084	0.164	Not Accepted

Note: A 95% confidence interval with a bootstrapping of 5,000 was employed.
First hypothesis H1 and H3 shows the significant and positive relationship with sustainability.
GSC = Green Structural Capital; GHC = Green Human Capital; GRC = Green Relational Capital; Note: TMS = Top Management Support

The values for the H1 relationship with sustainability ($\beta = 0.165$, $p = 0.019$), and for H3 shows the ($\beta = 0.226$, $p< 0.01$), Meanwhile other hypotheses are not accepted due to not meeting the threshold values for H2 ($\beta = -0.077$, $p = 0.168$) that show the inverse relationship in the study. Similarly, H5 ($\beta = 0.037$, $p = 0.269$) and for H6 ($\beta = 0.046$, $p = 0.270$). The R^2 was 0.605, showing that all three predictors explained 60% of the variance in EEB, while adjusted-R^2 was 0.593.

In this study, we used PLS Predict to predict the model assessment's strength, following the guidelines (Shmueli et al., 2019). We assessed the Q2 predictive power of the measurement variables, and all values were found to be greater than zero (Q2predict > 0). Subsequently, we examined the differences in PLS-LM values. As presented in Table 6, PLS-LM values were lower and negative, signifying that the model possesses good predictive power. This enhances the reliability of the study's overall findings, leading to the conclusion that the model demonstrates robust predictive capabilities.

Table 6. PLS-Predict

Items	Q²predict	PLS RMSE	LM RMSE	PLS-LM
ECP1	0.349	1.191	0.98	0.211
ECP2	0.372	1.167	1.225	-0.058
ECP3	0.267	1.246	1.208	0.038
ECP4	0.407	1.083	1.095	-0.012
ECP5	0.417	1.110	1.018	0.092
ENP1	0.325	1.148	1.132	0.016
ENP2	0.453	1.023	1.003	0.02

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ENP3	0.107	1.422	1.354	0.068
ENP4	0.218	1.410	1.413	-0.003
ENP5	0.326	1.134	1.151	-0.017
SP1	0.176	1.461	1.507	-0.046
SP2	0.230	1.370	1.403	-0.033
SP3	0.296	1.324	1.309	0.015
SP4	0.247	1.389	1.393	-0.004
SP5	0.220	1.400	1.439	-0.039

Discussion

Hypothesis 1 posits that there exists a positive relationship between green human capital and sustainability. The significance of green human capital has been supported by previous research (Delmas and Pekovic, 2013; Epstein and Buhovac, 2014). Green human capital give distintiveness, which provides companies an edge over competitors. Green human capital is rooted in employees' knowledge and expertise, thus it can be lost when they depart. Thus, organisations should preserve this capital. Organizations that allocate resources towards enhancing the knowledge and skills of their workforce in relation to sustainability tend to exhibit superior performance in terms of economic, environmental, and social sustainability aspects. The aforementioned outcome is supported by theoretical justification, as employees who possess knowledge and skills related to sustainability are more inclined to participate in sustainable behaviours and make contributions towards the attainment of sustainability objectives.

Additionally, H2 proposed a positive linkage between green relational capital and sustainability. In contrast to the initial premise, the empirical investigation shows no significant evidence to substantiate the notion that green relational capital exhibits a direct positive relationship with sustainability. The finding is unexpected, given that previous studies have consistently highlighted the significance of robust relationships and collaborations in promoting sustainability objectives (Hahn et al., 2015; Long and Liao, 2023). This indicates that the association between relational capital and sustainability outcomes can exhibit variations in different situations. One plausible argument for these results could be that the impact of green relational capital on sustainability outcomes is contingent upon industry dynamics, organizational tactics, or other contextual factors. The lack of a direct relation does not diminish the potential significance of green relational capital in facilitating sustainability through indirect channels.

Furthermore, H3 posited that there exists a positive relationship between green structural capital and sustainability. The empirical analysis provides evidence in favor of the hypothesis. This finding is consistent with the concept that the presence of efficient structures, processes, and systems to support sustainability activities is essential for attaining sustainability objectives (Sánchez et al., 2007). In alignment

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with our research findings, prior studies conducted by Mention and Bontis (2013) have also documented positive relation between structural capital and sustainability outcomes. The outcome, as mentioned above, can be theoretically substantiated since organizations with a well-structured stock of capital are more proficient in executing sustainable practices and effectively managing the intricacies associated with sustainability issues.

Regarding interaction terms, in H4, it is hypothesized that there is a positive moderating effect of top management support on the association between green human capital and sustainability. In contrast to the proposed hypothesis, the empirical investigation yielded inconclusive results, as the analysis did not provide substantial evidence to support the hypothesis. The findings shown in this study are in opposition to the conclusions drawn in previous scholarly argument (Alkaf et al., 2023), which propose that the endorsement of top management support can amplify the efficacy of green intellectual capital in promoting sustainability endeavors. The findings of this study indicate that the influence of top management support on the association between green human capital and sustainability is contingent upon contextual factors and other organizational variables. Additionally, the level of top management engagement may vary across various organizations.

Similarly, H5 is also rejected. The results suggested that there is no substantial moderation effect of top management support. The observed result is contrary to expectations, considering the recognized significance of top management support in influencing green intellectual capital to sustainability (Alkaf et al, 2023). The findings of this study indicate that the influence of top management support on the connection between green relational capital and sustainability could be affected by contextual circumstances or that the degree of top management engagement may differ among organizations. The role of top management assistance may have been altered by contextual circumstances that were specific to the organizations under study. Various organizations exhibit distinct structures, cultures, and tactics that influence the manner in which top management support is implemented within the framework of sustainability. This variation may result in diverse consequences with regard to its moderating impact. Moreover, there is considerable variation in the extent to which top management is engaged in sustainability projects across different organizations. Certain organizations may exhibit a high level of engagement from their top leadership, whereas others may have a lower degree of involvement. This observed heterogeneity may explain the lack of statistical significance in the moderating effect of top management support within the context of this investigation.

Finally, Hypothesis 6 posited that top management support plays a positive moderating function in enhancing the association between green structural capital and sustainability. The empirical study did not reach statistical significance. The observed effect is unexpected, considering the well-documented significance of executive leadership in promoting sustainable practices within organizational contexts (Colwell and Joshi, 2013). Diverse cultures and values can be observed

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among organizations, even those operating within the same industry. Specific organizations may possess deeply rooted sustainability principles that permeate throughout all levels of the company, hence reducing their reliance on upper management endorsement to propel sustainability initiatives. In instances of this nature, the mitigating influence of top management support may exhibit diminished prominence.

Research Implications

In terms of theoretical implications, the findings highlight the intricate nature of the connections between various manifestations of green intellectual capital, endorsement from top-level executives, and the consequences pertaining to sustainability. In particular, green human capital and green structural capital are the significant drivers of sustainability. A single component does not exclusively determine the concept of sustainability but is somewhat shaped by a complex interaction of various organizational, contextual, and external variables. Scholars must persist in their exploration of these complex relationships in order to cultivate a more thorough comprehension of the dynamics of sustainability.

The results indicate a requirement for more sophisticated theoretical frameworks that take into account the variable nature of top management support in the field of sustainability research. The inclusion of variables pertaining to organizational culture, resource allocation, sustainability maturity, and other contextual factors is crucial in theoretical models in order to capture the potential moderating impact of top management assistance adequately.

The practical implications of this findings is organizations must acknowledge that the implementation of uniform sustainability policies may not yield the desired outcomes. However, individuals or organizations should customize their sustainability strategies in order to harmonize with their circumstances. In such customization, the role of green human capital and green structural capital should be deeply considered. Moreover, implementing a culture that prioritizes sustainability across the entire organization can prove to be a highly advantageous approach.

Organizations need to deploy resources in order to effectively support sustainability initiatives judiciously. The alignment of resources with sustainability goals and practices has the potential to improve sustainability outcomes, hence potentially decreasing the necessity for top management intervention in resource allocation choices. During the initial phases, the backing of top-level management becomes more significant. However, as organizations progress and develop, sustainability practices have the potential to become self-perpetuating. The process of monitoring and responding to these stages can provide valuable insights for making strategic decisions.

Moreover, organizations must maintain their responsiveness towards external market and regulatory constraints. This can occur even in the absence of support from top management. The integration of sustainability initiatives should encompass multiple dimensions of green intellectual capital, encompassing human, structural,

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and relational aspects. The use of an integrated strategy enables organizations to effectively harness the synergistic effects of dirrent forms of green intellectual capital, hence facilitating a comprehensive promotion of sustainability.

Limitation of the Study and Future Research Directions

This study has the following limitations. First, the use of convenience sampling may induce biases, hence restricting the extent to which findings may be generalized. Subsequent research may derive advantages from employing sample approaches that are more diverse and representative, hence augmenting the study's external validity. Moreover, the utilization of self-administered surveys introduces potential answer biases, necessitating prudence in the analysis and understanding of findings. Second, the narrow emphasis on the oil and gas sector in Indonesia limits the applicability of the results to other sectors. Further investigation is warranted to examine other industries in order to determine the extent to which the found connections between green intellectual capital and sustainability hold true across different sectors. Third, the research did not yield any empirical support for the expected moderating influence of top management support. This statement raises the need for additional research on other moderating variables in the relationship between green intellectual capital and sustainability such as perceived organizational support (Yusliza et al., 2021), organizational culture, structure, and leadership styles.

Further, the inclusion of longitudinal studies would provide a deeper understanding of the theoretical channels. The examination of the dynamic relationship between green intellectual capital and sustainability can provide valuable insights for strategic decision-making and the implementation of sustainable practices. Also, to better comprehend the intricate dynamics pertaining to the relationship between green intellectual capital and sustainability, it is advisable to incorporate qualitative methodologies, such as interviews or case studies, as a complement to quantitative approaches. This has the potential to catch subtleties that may be overlooked by quantitative methods alone.

Conclusion

In summary, this research study has provided a comprehensive understanding of the complex interplay between green intellectual capital, top management support, and sustainability in the specific context of the oil and gas sector in Indonesia. The empirical evidence supports the notion that green human capital and green structural capital have a notable beneficial influence on sustainability, emphasizing their essential roles in promoting sustainable practices. Nevertheless, the findings of the study deviate from anticipated outcomes since they fail to show a clear and direct correlation between green relational capital and sustainability. Additionally, the expected moderating influence of top management support on the relationship between green human and structural capital, as hypothesised, did not manifest as anticipated. The aforementioned outcomes enhance the overall comprehension of sustainability dynamics within the oil and gas industry, highlighting the necessity for intricate and situation-specific approaches. The originality of this work is rooted in

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its provision of empirical evidence that establishes a connection between green intellectual capital, top management support, and sustainability. Furthermore, it offers insights into the intricate nature of these interactions specifically within the oil and gas business.

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ZIELONY KAPITAŁ INTELEKTUALNY I ZRÓWNOWAŻONY ROZWÓJ: MODERUJĄCA ROLA WSPARCIA NAJWYŻSZEGO KIEROWNICTWA

Streszczenie: Celem niniejszego badania jest określenie związku między zielonym kapitałem intelektualnym (zielonym kapitałem ludzkim, zielonym kapitałem strukturalnym i zielonym kapitałem racjonalnym) a zrównoważonym rozwojem. Ponadto badanie analizuje moderującą rolę wsparcia najwyższego kierownictwa w tych relacjach. Badanie ma charakter empiryczny. Odpowiedzi od 253 firm naftowych i gazowych w Indonezji zostały zebrane w okresie od lipca do grudnia 2022 roku za pomocą kwestionariusza samooceny przy użyciu nielosowej metody doboru próby. Przeprowadzono zaawansowaną analizę modelowania strukturalnego Partial Least Squares (PLS-SEM). Wyniki badania potwierdziły pozytywny wpływ zielonego kapitału ludzkiego i zielonego kapitału strukturalnego na zrównoważony rozwój. Ponadto badanie nie wykazało pozytywnego związku między zielonym kapitałem relacyjnym a zrównoważonym rozwojem. Co więcej wyniki ukazują, że najwyższe kierownictwo nie moderuje tych relacji. Badanie to przynosi istotne implikacje dla zrównoważonych wyników poprzez poprawę zielonego kapitału ludzkiego i zielonego kapitału strukturalnego, zwłaszcza ze względu na swój unikalny kontekst jakim jest sam sektor naftowy i gazowy. Badanie to uważa się za oryginalne, ponieważ jest jednym z niewielu, które dostarcza dowodów empirycznych na temat związku zielonego kapitału intelektualnego ze zrównoważonym rozwojem i moderującą rolą wsparcia najwyższego kierownictwo.

Słowa kluczowe: zielony kapitał ludzki, zielony kapitał relacyjny, zielony kapitał strukturalny, wsparcie najwyższego kierownictwa, zrównoważony rozwój