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Prioritizing Sustainability Performance through Importance Performance Map Analysis in State Enterprises

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Abstract
Purpose: This study evaluates the sustainability performance of State-Owned Enterprises (SOEs) (SOEs) using Importance-Performance Matrix Analysis (IPMA), focusing on Green Intellectual Capital (GIC), Green Organizational Identity (GOI), and Green Innovation (GI).
Methodology: The study employs Structural Equation Modeling-Partial Least Squares (SEM-PLS) with data collected from 227 managerial respondents across Indonesian SOEs. SmartPLS version 4 was used for data analysis.
Results: The results show that GIC and GI significantly enhance sustainable performance. IPMA indicates that several Green Human Capital (GHC) and Green Structural Capital (GSC) indicators such as environmental competencies, training, leadership support, Research and Development (R&D) investment, and environmental management systems are highly important but underperforming. Meanwhile, GI demonstrates both high importance and strong performance in supporting sustainability outcomes.
Conclusions: GIC and GI are the main drivers of SOEs sustainability performance. Although the GOI has a relatively weaker direct effect, it remains important for supporting sustainability-oriented practices. The findings suggest that SOEs should prioritize environmental training, employee competency development, R&D investment, and environmental governance to improve sustainability performance.
Limitations: This study is limited by its cross-sectional design, reliance on self-reported questionnaire data, and focus on Indonesian SOEs, which may limit the generalizability of its findings.
Contributions: This study contributes to the sustainability literature by integrating SEM-PLS and IPMA to identify the importance of sustainability drivers and priority areas for managerial improvement. The findings provide practical guidance for SOEs managers and policymakers to allocate resources to enhance sustainability performance.

Keywords: *Green Intellectual Capital, Green Innovation, Green Organizational Identity, State-Owned Enterprises, Sustainability Performance*

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1. Introduction

Environmental issues have recently become interesting topics for discussion. This is in line with the various disasters that have recently emerged in various regions in Indonesia. Environmental damage is considered the main factor in the current disaster. In addition, other problems, such as depletion of

natural resources, carbon pollution, climate change, and declining biodiversity, lead to a decline in ecological balance (A. Firmansyah, 2017). Based on Ahdiat (2022), Indonesia's environmental protection efforts are ranked poorly on a global scale, even on an Asia-Pacific scale. Based on data from the Environmental Performance Index in 2024, environmental conservation efforts in Indonesia have increased from 2022 to 2024, from 164th to 163rd, with an environmental performance score growing from 28.2 to 33.6, as shown in Table 1.

Table 1. Environmental performance index

	EPI 2022	**EPI 2024**
Indonesia	164	163
Score	28.2	33.6

Environmental issues are not only national issues but also affect corporate performance negatively. These issues make corporate objectives not only measured by financial measures but have been increased by non-financial measures. These measures ensure that companies operate sustainably and provide benefits to society and the environment. These measures combine to become one of the goals that is currently continuing to develop, namely, Sustainable Performance (SP). Sustainable corporate performance is a combination of three harmonious corporate goals that a company wants to achieve (Rizki, Murwaningsari, & Sudibyo, 2022). These three goals follow the development of the triple bottom line concept, namely, financial, environmental, and social goals. These three goals are then implemented into the company's core business activities to maximize its value. This also applies to State-Owned Enterprises (SOEs) (SOEs). State-Owned Enterprises (SOEs) also have environmental preservation and social goals, in addition to financial goals. State-Owned Enterprises (SOEs) in Indonesia have assets worth IDR 9,000 trillion in 2021 or 53% of Gross Domestic Product (GDP) in 2021 (Rafie, 2022). This indicates that State-Owned Enterprises (SOEs) are one of the drivers of the national economy. However, State-Owned Enterprises (SOEs) are also one of the largest producers of carbon emissions (Fajrian, 2023). Therefore, a policy is required to reduce the rate of environmental damage while maintaining company productivity.

In addition to being the largest emitter, several issues involve State-Owned Enterprises (SOEs) (SOEs) related to environmental preservation (Setiawan, 2020). In 2020. there was an issue related to one of the state-owned enterprise banks contributing to environmental damage by funding a palm oil company that caused forest and land fires. In addition, the PT Timah case caused environmental damage estimated at IDR 271 trillion (A. Sidik, 2024). In terms of government assignments, many SOEs cannot accept reassignments. This can be seen from several cases of assignments in SOEs Karya, which burden the company. According to Koran (2024), many SOEs face financial difficulties because they are carrying out government assignments. Many State-Owned Enterprises (SOEs) suffered losses and were dissolved by the government. There are various reasons for this, but one certain thing is the failure of State-Owned Enterprises (SOEs) to continue to achieve sustainable performance. The failure of State-Owned Enterprises (SOEs) stems from their inefficiency and lack of professionalism (Nainggolan, 2020). This is directly related to the importance of the green intellectual capital. Based on the Central Government's financial report, it can be seen that in 2021, 27 State-Owned Enterprises (SOEs) experienced losses and in 2022, there were 23 State-Owned Enterprises (SOEs) that suffered losses according to the Central Government's Financial Report for 2021 and 2022. This indicates that sustainable performance has not yet been achieved.

The sustainable performance of State-Owned Enterprises (SOEs) can also be seen from the Environmental, Social, and Governance (ESG) score. Based on data from the Indonesia Stock Exchange, not all State-Owned Enterprises (SOEs) listed on the IDX have obtained an ESG score. According to the data on the idx.co.id page (September 3, 2023), only 12 State-Owned Enterprises (SOEs) have an ESG score. Table 2 shows the ESG scores of State-Owned Enterprises (SOEs).

Table 2. IDX ESG score

No	Code	PT Name	ESG	Information
1	WIKA	PT Wijaya Karya (Persero) Tbk	29,76	Medium risk
2	JSMR	PT Jasa Marga (Persero) Tbk	15,15	Low risk
3	TLKM	PT Telkom Indonesia (Persero) Tbk.	27,09	Medium risk
4	ANTM	PT Aneka Tambang Tbk	40	High risk
5	SMGR	PT Semen Indonesia (Persero) Tbk.	32,42	High risk
6	BBTN	PT Bank Tabungan Negara (Persero)Tbk	28,44	Medium risk
7	BBRI	PT Bank Rakyat Indonesia (Persero) Tbk	18,84	Low risk
8	BBNI	PT Bank Negara Indonesia (Persero) Tbk	25,7	Medium risk
9	BMRI	PT Bank Mandiri (Persero) Tbk	28,18	Medium risk
10	ELSA	PT Elnusa Tbk	30.83	High risk
11	PGAS	PT Perusahaan Gas Negara (Persero) Tbk	28,44	Medium risk
12	PTBA	PT Tambang Batubara Bukit Asam (Persero) Tbk	33,63	High risk

From these cases, it can be seen that several factors cause SOEs to be unable to achieve sustainable performance, one of which is from the intellectual capital side, including employee capacity and from the character or identity side, which is not optimal in supporting SOEs activities in achieving sustainable performance. In addition, innovation problems are a factor that causes SOEs to fail to compete. Based on previous research, Green intellectual capital, green organizational identity, and green innovation can help companies achieve sustainability goals. However, these conditions have not been achieved in the SOEs.

Minister of State-Owned Enterprises (SOEs), Erick Thohir, stated that he was concerned about sustainability leadership (Wareza, 2021). This proves that green intellectual capital is important for realizing a company's sustainability goals. The problems of SOEs are related to the identity of green companies, as evidenced by various corruption cases. The corruption case at PT Timah (Tbk), a SOEs Mining, shows that the company's identity is not implemented properly. This has an impact on environmental degradation. The corruption case at PT Timah shows that SOEs managers are unable to comply with the core values of Akhlak in SOEs (Indonesia Corruption, 2024). Apart from the PT Timah case, there are several other corruption cases. Indonesia (2024) reported that several SOEs officials were involved in corrupt cases. Corruption occurred in Jasamarga, Pertamina, Garuda Indonesia, Jasindo, Waskita Karya, Asabri, and PT Antam.

Furthermore, there are various problems related to green innovation in SOEs. An example of the problem of innovation failure that resulted in SOEs performance losses can be seen in the case of the dissolution of PT PANN, because PT PANN failed to adapt and innovate to keep up with industrial developments and increasingly tight competition (Salwa, 2024). The second example is PT Kimia Farma (Tbk). KAEF failed to carry out efficiency and innovation. This causes the company's utility to be low when its capacity is very large (Musa, 2024). According to Elzek, Gaafar, and Abdelsamie (2021), the term green innovation is often equated with the term's sustainable innovation, ecological innovation, and environmental innovation. Dias Angelo, Jose Chiappetta Jabbour, and Vasconcellos Galina (2012); Elzek et al. (2021); Halila and Rundquist (2011); Hojnik, Ruzzier, and Manolova (2018); Reid and Miedzinski (2008) state that green innovation is any solution offered at any stage of the product or service life cycle to include significant improvements in resources while reducing environmental impacts. Asadi et al. (2020) found that green innovation has a significant and positive effect on environmental and economic performance. This finding is also supported by Elzek et al. (2021), who found that green innovation has a significant positive effect on sustainability performance.

Sustainable performance is also inseparable from intellectual capital and organizational identity that focuses on the environment. Achieving innovation and company goals cannot be separated from the excellence of its employees, which is often reflected in the intellectual capital (A. Firmansyah, 2017). Through Green Intellectual Capital (GIC) and green innovation, companies can minimize environmental damage and still be able to preserve it, increase production capacity, and make costs

more efficient. This will improve the image of an environmentally friendly company (Berry & Rondinelli, 1998; Y.-S. Chen, Lai, & Wen, 2006; Porter & Linde, 1995). Rizvi (2021) examined the relationship between green intellectual capital and environmental sustainability performance and found that there was a relationship between green intellectual capital and environmental sustainability performance. This supports the findings of previous research conducted by (Yadiati, Nissa, Paulus, Suharman, & Meiryani, 2019). Yusliza et al. (2020) in their research also found that green intellectual capital has a positive effect on sustainability performance, both economic, environmental, and social performance. Erinos and Yurniwati (2018) found that green intellectual capital affected the financial performance of manufacturing companies in Indonesia.

Furthermore, in addition to green intellectual capital, an environmentally friendly corporate identity will also realize sustainable performance (Yu-Shan Chen, 2011). Several researchers have also studied the relationship between green organizational identity and sustainability performance. Zehir and Ozgul (2020) in their research found that green organizational identity positively affects a company's financial performance. Xing, Wang, and Tou (2019) found that green organizational identity affects corporate environmental performance. Suraporn and Chalermporn (2021), in their research in Thailand, found that green corporate identity or green organizational identity has a significant effect on green business performance. Green business performance in Suraporn and Chalermporn (2021) research refers to economic, social and environmental aspects. Green corporate identity has the same meaning as green organizational identity.

Based on prior studies and relevant theoretical frameworks, it can be concluded that Green Intellectual Capital (GIC), Green Innovation (GI), and Green Organizational Identity (GOI) are key variables influencing sustainability performance, including in State-Owned Enterprises (SOEs) (SOEs). Companies are expected to achieve sustainability in terms of financial, environmental, social, and economic performance when they effectively enhance GIC, GI, and GOI, this also applies to SOEs. Moreover, for SOEs, improvements in these variables should ideally support their ability to fulfill additional mandates assigned by the government to SOEs. However, in practice, these three variables have not been fully effective in enabling SOEs to achieve sustainable performance. This is evidenced by the fact that some SOEs are still involved in environmental and social issues, while others continue to experience financial losses or have been dissolved. This condition reflects a practical gap, indicating a discrepancy between what is suggested by theory and prior research and what occurs in practice within SOEs. Given this phenomenon, this study is important for examining the extent to which GIC, GI, and GOI are perceived as significant factors by companies, as well as how far these variables have been implemented in SOEs.

However, previous studies have aimed to examine the influence of green intellectual capital, green organizational identity, and green innovation on sustainability performance. No research has evaluated the importance and performance of each indicator of green intellectual capital, green organizational identity, and green innovation in influencing sustainability performance in companies. Therefore, this study aims to analyze each construct tested based on the performance value that will affect the achievement of sustainable performance. This is useful for determining the extent to which the value can be the basis for determining which dimensions or indicators are first evaluated, modified, and/or further developed by management based on the SEM model in State-Owned Enterprises (SOEs). Another objective is to analyze each construct based on the importance value according to the SEM path model for the variables Green Intellectual Capital, Green Organizational Identity, and Green Innovation in State-Owned Enterprises (SOEs) using the IPMA. The IPMA testing employed in this study represents a novel contribution, as no prior research in Indonesia has evaluated the factors influencing sustainability performance in State-Owned Enterprises (SOEs) (SOEs) using this approach.

This study is expected to provide practical implications for relevant stakeholders so that they can evaluate the importance of each measurement indicator of the GIC, GOI, and GI variables in influencing SP and the extent to which the performance impact of each measurement indicator has influenced sustainability performance. With the results of this evaluation, stakeholders such as SOEs can focus on indicators that need to be improved and maintain optimal performance by considering the important

factors for achieving sustainable performance. This study is also expected to provide additional knowledge in the field of sustainability accounting, especially related to sustainability performance in SOEs. This paper is organized as follows, the introduction is followed by a theoretical review, research methodology, and discussion. This research is closed with conclusions and suggestions, limitations, and implications of the research.

2. Literature Review

This study is grounded in the Resource-Based Theory (RBT), which posits that firms achieve sustainable competitive advantage through valuable, rare, inimitable, and non-substitutable resources (Kor & Mahoney, 2004). From this perspective, environmentally oriented intangible resources play a crucial role in creating long-term organizational value. Green Intellectual Capital (GIC) and Green Organizational Identity (GOI) represent strategic resources that enable firms to develop environmental capabilities, strengthen stakeholder relationships, and support sustainable business practices.

Green Intellectual Capital comprises green human, structural, and relational capital, which collectively provide the knowledge, organizational systems, and stakeholder networks necessary to support environmental initiatives (Yu Shan Chen, 2008). According to RBT, these resources enhance a firm's ability to develop Green Innovation (GI), which serves as an operational capability that transforms environmental knowledge into environmentally friendly products, services, and processes. Prior studies have shown that GIC positively influences both green innovation and sustainability performance (Singh et al., 2022; Yusliza et al., 2020).

In addition, Green Organizational Identity (GOI) reflects the extent to which environmental responsibility is embedded within an organization's values, culture, and self-definition (Albert & Whetten, 1985). A strong GOI encourages employees to adopt pro-environmental behaviors and supports the effective implementation of green innovation initiatives in organizations. Consequently, GOI is expected to strengthen sustainability-oriented practices and improve sustainability performance. The proposed relationships are further supported by Legitimacy Theory, which suggests that organizations must align their actions with societal expectations to maintain legitimacy and stakeholder support (Mousa, 2015). Green innovation and environmentally responsible organizational practices enhance stakeholder trust and contribute to the achievement of sustainability objectives legitimacy (Akhimien & Adekunle, 2023; Shahzad et al., 2020).

In the context of State-Owned Enterprises (SOEs), sustainability performance is conceptualized as a multidimensional construct encompassing economic, environmental, social, financial, and task performance dimensions. The inclusion of task performance reflects SOEs unique responsibility to fulfil government-assigned mandates in addition to commercial objectives. Based on resource-based and legitimacy theories, this study proposes that GIC serves as a strategic organizational resource, GOI as an organizational enabler, and GI as an operational capability that collectively enhances sustainability performance. Accordingly, the research model examines the direct and indirect relationships among GIC, GOI, GI and sustainability performance in Indonesian SOEs.

3. Methodology

This study is a quantitative study with a Structural Equation Model (SEM) approach. The research method uses non-probability sampling techniques and sampling techniques using purpose sampling. Data were collected through questionnaires submitted to low, middle, and top managers of SOEs. The selected SOEs that are going concerns and are not in the status of being/have been dissolved or have been self-managed to other SOEs.

The study employs the Structural Equation Modeling, Partial Least Squares (SEM-PLS) approach because this method is considered appropriate for analyzing complex relationships among latent variables simultaneously, particularly when the research model involves mediation relationships and multidimensional constructs. SEM-PLS is also suitable for exploratory and predictive research, does not require strict assumptions of normal data distribution, and can effectively handle relatively small

sample sizes compared with covariance-based SEM (Hair et al., 2022). Furthermore, SEM-PLS enables the simultaneous evaluation of both the measurement model (outer model) and the structural model (inner model), thereby allowing researchers to comprehensively assess the validity and reliability of constructs while examining the relationships among variables.

In addition, this study applies Importance Performance Map Analysis (IPMA) to complement the SEM-PLS analysis. While SEM-PLS primarily explains the significance and strength of the relationships among variables, IPMA extends the analysis by identifying which constructs have the highest importance and performance in influencing sustainability performance. Therefore, IPMA provides more practical and managerial insights by highlighting the priority areas that State-Owned Enterprises (SOEs) should improve to enhance sustainability performance. The use of IPMA also represents a novelty in this study, as previous studies in Indonesia have rarely evaluated the determinants of sustainability performance in SOEs using this analytical method.

Data were collected using a quantitative approach through a structured questionnaire distributed to managers of Indonesian State-Owned Enterprises (SOEs). The respondents were selected using purposive sampling techniques, with criteria including employees who have knowledge of and are involved in environmental management, sustainability practices, innovation activities, or strategic organizational processes within the company. This criterion was applied to ensure that respondents possessed a sufficient understanding of Green Intellectual Capital (GIC), Green Innovation (GI), Green Organizational Identity (GOI), and sustainability performance. The questionnaire was also distributed to State-Owned Enterprises (SOEs) under the authority of the Ministry of Finance, namely, PT. Sarana Multigriya Finansial (SMF), PT. Penjaminan Infrastruktur Indonesia (PII), PT. Geo Dipa Energi, and PT. Sarana Multi Infrastruktur (SMI). From the results of the selection of selected SOEs samples, there were 53 SOEs selected as research samples, as shown in Table 3.

Table 3. Results of SOEs sample calculations

Description	Total
Existing SOEs per 2024	71
SOEs in the process of dissolution	-1
SOEs that are specifically controlled by other State-Owned Enterprises (SOEs) (SKK)	-16
SOEs that are transferred to other State-Owned Enterprises (SOEs)	-1
Total sample of SOEs used	53

The questionnaire was distributed to all State-Owned Enterprises (SOEs) under the Ministry of Finance and the Ministry of State-Owned Enterprises (SOEs), and 247 responses were received. From these results, 20 respondents were excluded because they were not part of the company's management. Table 4 presents the number of respondents who completed the questionnaire.

Table 4. Number of questionnaire respondents

Description	Total
The number of respondents who answered	247
Respondents are not managers	20
Observation data	227

Table 4 shows the final sample comprised 227 managerial respondents representing Indonesian State-Owned Enterprises (SOEs). Only managerial-level employees were selected to ensure that respondents possessed adequate knowledge of sustainability practices and organizational strategies. The sample included respondents from both manufacturing (26.4%) and non-manufacturing sectors (73.6%), providing a cross-sectoral perspective on sustainability performance in SOEs. In addition, 60.4% of respondents occupied middle- and top-management positions, indicating that they were directly involved in sustainability, innovation, and organizational development decision-making processes. Given the diversity of SOES sectors represented in the sample, the findings are expected to reflect broader sustainability practices among Indonesian SOEs.

The variables used in this study consist of sustainability performance, which is a dependent variable measured using five dimensions taken from research by Amrie Firmansyah, Qadri, and Arfiansyah (2021); Paulraj (2011); Yildiz Çankaya and Sezen (2019); Zhu and Sarkis (2007) for the economic performance dimension; Amrie Firmansyah et al. (2021); Paulraj (2011); (Yildiz Çankaya & Sezen, 2019) for the social performance dimension; Antoni, Jie, and Abareshi (2020); Asiaei, Jusoh, Barani, and Asiaei (2022); Amrie Firmansyah et al. (2021); Gholami, Sands, and Shams (2022); Shahzad et al. (2020) for the environmental performance dimension; Ahmad, Omar, and Quoquab (2019); Ong and Chen (2013) for financial performance; and Herni Setiawan and Ariadi (2012); Kerzner (2009); Khan, Johl, and Akhtar (2022); Robbins (2005); Schermerhorn Jr (1984) for task performance. The measurement of the five dimensions was also developed by considering the indicators in the Sustainability Development Goals (SDGs) and regulations related to SOEs. The independent variables in this study are green intellectual capital, green organizational identity, and green innovation. Green intellectual capital is measured using three dimensions following Chang and Chen (2012); Yu Shan Chen (2008); A. Firmansyah (2017); Huang and Kung (2011); Yusliza et al. (2020) which consists of green human capital, green structural capital, and green relational capital.

Green organizational identity is measured using two dimensions, such as Green Internal Organizational Identity (GIOI) and Green External Organizational Identity (GEOI). The GIOI measurement indicator was developed by adopting (Banerjee, 2003; Chan, He, Chan, & Wang, 2012; Fraj-Andrés, Martinez-Salinas, & Matute-Vallejo, 2009) and the main indicator is AKHLAK, which is the core value of SOEs. While the GEOI measure was developed from research by (Banerjee, 2003; Chan et al., 2012; Salvador & Burciaga, 2020; Zehir & Ozgul, 2020). These indicators were also adjusted by considering the indicators in the Sustainability Development Goals (SDGs) and regulations related to SOEs. Green Innovation is measured using 10 indicators developed from (Y.-S. Chen et al., 2006; Soewarno, Tjahjadi, & Fithrianti, 2019). These indicators are also adjusted to regulations related to State-Owned Enterprises (SOEs). The data analysis technique uses a structural equation model test Structural Equation Modeling-Partial Least Square (SEM-PLS). The SEM-PLS model was used because, according to (Hair, Risher, Sarstedt, & Ringle, 2019), it can be used for the development of structural models/exploratory studies with complex models or second-order factors. The variables Green Organizational Identity, Green Intellectual Capital, and Sustainability Performance were measured by the second-order factor, while the first-order factor measured Green Innovation. In addition, the main data analysis will use Importance-Performance Map Analysis (IPMA).

The PLS-SEM evaluation process involves a structural equation model consisting of measurement (outer) and structural (inner) models. IPMA is used to identify gaps between the performance of a variable or variable measurement indicator and the importance that represents user expectations of the variable or variable measurement indicator (Martilla & James, 1977; Streukens, Leroi-Werelds, & Willems, 2017). The results of the IPMA analysis produce an IPMA image with certain quadrants. Quadrant I is the main priority that is considered very important (high importance) by the community, but the level of service provider performance is still not in accordance with the expectations of community needs (low performance) (Ariza-Montes, Leal-Rodríguez, Ramírez-Sobrino, & Molina-Sánchez, 2019). Quadrant II is an area that is considered very important (high importance) by the community, and the level of service provider performance is very good and in accordance with the expectations of community needs (high performance) (Ariza-Montes et al., 2019).

Quadrant III is an area that is considered less important (low importance) by the community, and the level of service provider performance is still low (low performance) (Ariza-Montes et al., 2019). Service providers must reconsider the indicators included in this quadrant, especially in terms of the influence of indicators on the overall service, to prevent the indicators in question from shifting to quadrant I (Martilla & James, 1977).

4. Results and Discussions

4.1 Results

The Model testing in this study uses the second-order PLS-SEM model so that testing will be carried out at a new dimension level and then continued with the variable level on the GIC and GOI variables.

The second-order model is shown in Figure 1. We analyzed the second-order structural model using the (extended) repeated indicators approach, following (Sarstedt, Hair, Cheah, Becker, & Ringle, 2019).

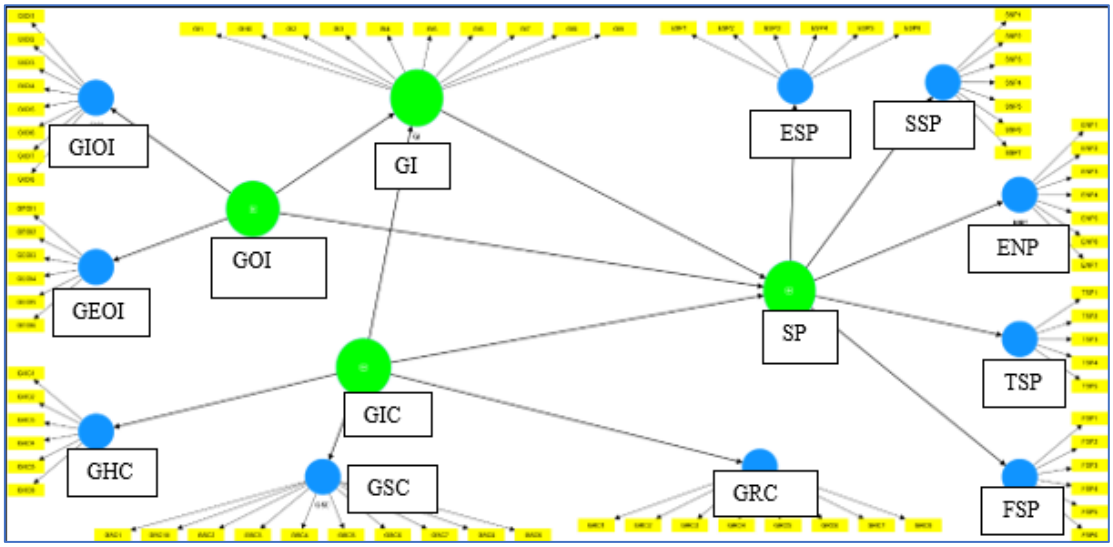

Figure 1. SEM Model

Information:

GI	: Green Innovation	GIOI	: Green Internal Organizational Identity
SP	: Sustainability Performance	GEOI	: Green External Organizational Identity
GIC	: Green Intellectual Capital	ESP	: Economic Performance
GOI	: Green Organizational Identity	SSP	: Social Performance
GHC	: Green Human Capital	ENP	: Enviromental Performance
GSC	: Green Structural Capital	FSP	: Financial Performance
GRC	: Green Relational Capital	TSP	: Task Performance

4.2 Outer Model Evaluation at the Dimensional Level

Prior to conducting the Importance Performance Matrix Analysis (IPMA), it is essential to ensure that the measurement and structural models meet the required validity and reliability criteria through outer model and inner model evaluations. Given that this study employs a second-order construct, the assessment was performed sequentially, beginning at the dimensional (first-order) level, followed by evaluation at the higher-order (second-order) variable level. The measurement model demonstrated satisfactory reliability and validity. All constructs exceeded the recommended thresholds for outer loading, composite reliability, and Average Variance Extracted (AVE), indicating that the measurement instruments were reliable and valid. The detailed results are presented in Table 5.

Table 5. Reliability level

Dimensions	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)	Description
Green Internal Organizational Identity (GIOI) Dimensions	0.718	0.718	0.842	0.640	Reliable and Valid
Dimensions of Green External Organizational Identity (GEOI)	0.887	0.888	0.912	0.597	Reliable and Valid
Dimensions of Green Human Capital (GHC)	0.888	0.889	0.915	0.642	Reliable and Valid

Dimensions of Green Relational Capital (GRC)	0.890	0.890	0.914	0.603	Reliable and Valid
Dimensions of Green Structural Capital (GSC)	0.924	0.924	0.937	0.622	Reliable and Valid
Dimensions of Economic Performance (ENP)	0.854	0.856	0.896	0.633	Reliable and Valid
Environmental Performance (ESP) Dimensions	0.837	0.842	0.885	0.606	Reliable and Valid
Financial Performance (FSP) Dimension	0.883	0.883	0.911	0.631	Reliable and Valid
Social Performance (SSP) Dimensions	0.875	0.876	0.909	0.667	Reliable and Valid
Task Performance Dimension (TSP)	0.828	0.829	0.886	0.660	Reliable and Valid

4.3 Evaluation of Outer Model Variable Levels

Following the evaluation at the dimensional level, the analysis proceeded to a variable-level assessment. Similar to the dimensional evaluation, the variable-level assessment involved outer model testing to examine both the validity and reliability. At this stage, the evaluation aims to assess the relationships between the higher-order constructs Green Organizational Identity, Green Innovation, Green Intellectual Capital, and Sustainability Performance and their respective dimensions, as well as the relationships between Green Innovation and its measurement indicators. The measurement model demonstrated satisfactory reliability and validity. All constructs exceeded the recommended thresholds for outer loading, composite reliability, and Average Variance Extracted (AVE), indicating that the measurement instruments were reliable and valid. The detailed results are presented in Table 6.

Table 6. Reliability test

Variables	**Cronbach's alpha**	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**	**Average variance extracted (AVE)**	**Description**
Green Intellectual Capital (GIC)	0.957	0.957	0.942	0.843	Reliable and Valid
Green Organizational Identity (GOI)	0.904	0.905	0.912	0.839	Reliable and Valid
Green Innovation (GI)	0.939	0.939	0.948	0.644	Reliable and Valid
Sustainability Performance (SP)	0.954	0.956	0.938	0.751	Reliable and Valid

After the outer model test was conducted, the next test was the significance test of each independent variable against the dependent variable. This test was conducted to ensure that the independent variables tested by IPMA affected the dependent variable. Table 7 shows that GIC, GOI, and GI have significant positive effects on Sustainability Performance (SP) in SOEs. Therefore, IPMA testing is useful because each measurement indicator has a significant effect on the sustainability performance of SOEs.

Table 7. Significancy testing

Influence Test	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Stat	P values	Description
GIC → SP	0.494	0.506	0.104	4.742	0.000	Significant
GOI → SP	0.135	0.140	0.059	2.286	0.022	Significant
GI → SP	0.337	0.321	0.119	2.825	0.005	Significant

In this study, IPMA was conducted for the indicator level to determine the importance and performance of each indicator. IPMA maps exogenous variable indicators (green intellectual capital, green organizational identity, and green innovation) and their influence on endogenous variables (sustainability performance) in a map divided into four quadrants. The X-axis represents the level of variable importance (Important) measured by the total effect, and the Y-axis describes the variable performance (Latent Variable Performance). The results of the IPMA processing are presented in Table 8.

Table 8. IPMA indicator level

Indicator	Importance	Performance	Quadrant
GHC6	0.045	72.394	II
GI1	0.042	77.093	II
GI10	0.040	74.302	II
GI2	0.042	73.275	II
GI3	0.045	78.084	II
GI4	0.043	72.834	II
GI5	0.041	71.659	II
GI6	0.043	72.540	II
GI7	0.042	73.128	II
GI8	0.041	73.862	II
GI9	0.041	71.806	II
GRC1	0.042	73.862	II
GRC2	0.044	73.568	II
GRC3	0.043	73.275	II
GRC4	0.042	72.981	II
GRC6	0.043	72.540	II
GRC7	0.045	71.366	II
GSC1	0.045	74.156	II
GSC2	0.044	73.421	II
GSC3	0.044	71.953	II
GSC8	0.043	71.953	II
GSC9	0.043	71..659	II
GIOI1	0.027	79.736	IV
GIOI2	0.029	78.267	IV
GIOI5	0.029	77.974	IV
GIOI6	0.027	75.918	IV
GEOI1	0.026	66.740	III
GEOI4	0.027	64.758	III
GEOI5	0.026	62.775	III
GIOI4	0.029	67.181	III
GIOI7	0.026	63.877	III
GIOI8	0.029	67.181	III
GHC1	0.044	64.537	I
GHC2	0.045	59.692	I
GHC3	0.045	67.988	I
GHC4	0.047	71.219	I

GHC5	0.043	63.877	I
GRC8	0.043	70.044	I
GSC10	0.044	70.191	I
GSC4	0.045	67.695	I
GSC6	0.042	69.750	I
GSC7	0.043	71.219	I

Quadrant II contains 22 indicators with an average performance value above 71.246 and a total effect above 0.40. All indicators of Green Innovation are in quadrant II. Furthermore, some indicators of the GRC and GSC dimensions are in quadrant II. Indicators that need improvement are in quadrant I, there are 10 indicators in the green intellectual capital variable, namely the GHC Indicator (GHC1, GHC2, GHC3, GHC4, GHC5) and GSC (GSC4, GSC6, GSC7 and GSC10). Furthermore, indicators that enter quadrant III are in the GEOI dimension (GEOI1, GEOI4, and GEOI5) and indicators in the GIOI dimension (GIOI4, GIOI7, and GIOI8). The indicators in quadrant IV are in the GIOI dimension (GIOI1, GIOI2, GIOI5, and GIOI6). The image showing the indicators in each quadrant is presented in Figure 2.

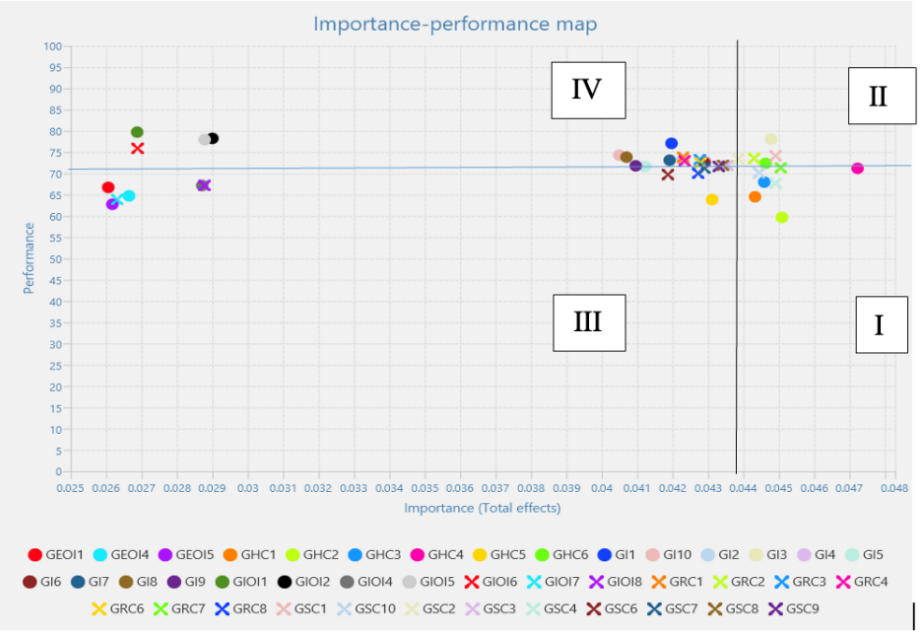

Figure 2. IPMA Indicator Level

4.4 Discussion

Furthermore, related to the IPMA results, it should be noted that quadrant I is an area to improve or the main quadrant area that must be considered by State-Owned Enterprises (SOEs) to achieve sustainability performance. Quadrant I is the main priority that State-Owned Enterprises (SOEs) consider very important (high importance). However, the level of performance of State-Owned Enterprises (SOEs) is still not in accordance with the set targets (low performance) (Ariza-Montes et al., 2019; Ormanovic et al., 2017). The measurement indicators for the variables included in quadrant I are as follows:

1. GHC1: Our company employees have sufficient competence in preserving the environment.
2. GHC2: Our company's employees provide high-quality services and related products that remain environmentally friendly.
3. GHC3: Our employees receive training and education related to competence and environmental protection.
4. GHC4: Employees in our company are engaged in productivity and contribute positively to environmental protection.
5. GHC5: Our company's leadership strongly supports employees in achieving goals in accordance with environmental protection.

6. GSC4: Our company's investment in environmental protection-related Research and Development (R&D) is greater than that of our competitors.
7. GSC6: Our company has a high ratio of employees who understand environmental management to total employees.
8. GSC7: Our company has established detailed rules regarding environmental protection.
9. GSC10: Our company has the best environmental protection management system compared with competitors.
10. GRC8: The cooperative relationship between our company and major clients or consumers for environmental protection is stable.

The IPMA analysis results show that green intellectual capital, especially the GHC and GSC dimensions, are believed to be very important. However, their performance has not been in accordance with the expected targets. GHC1, GHC3, and GHC5 indicate that the competencies possessed by State-Owned Enterprises (SOEs) are not in accordance with the expected target. This needs improvement. Management support is needed to improve employee competency. Related to GHC2 and GHC4, which are still not performing according to the target, this is likely due to the lack of competence in State-Owned Enterprise employees, so that quality and productivity are not in accordance with the targets expected by respondents. Therefore, employee self-development activities need to be carried out continuously and involve other parties to achieve better results. This can also be seen from the GRC8 indicator, which is considered important, but the results are still not as expected. To achieve sustainable performance and create innovation, collaboration with other parties is necessary.

In addition to GHC and GRC, the indicators in GSC are also considered very important but have not performed optimally. The indicator that has not been maximized is in the field of intellectual capital governance. Investment in research and development must continue because it produces knowledge and innovation that are useful for achieving sustainable performance. GSC4 indicates that State-Owned Enterprises (SOEs) have not yet maximized their investment in research and development activities. In addition, regulations and management systems must be implemented to support the creation of environmentally friendly intellectual capital. GSC6, GSC7, and GSC10 have not been maximized because there is a possibility that there are State-Owned Enterprises (SOEs) that have not made good intellectual capital management governance. Strengthening the results of the analysis in Table 8, green intellectual capital is the variable that has the greatest influence on sustainability performance. This indicates the importance of increasing intellectual capital to achieve sustainable performance. The Ministry of State-Owned Enterprises (SOEs) and the Ministry of Finance, as regulators of State-Owned Enterprises (SOEs), need to provide direction or policies to ensure that State-Owned Enterprises (SOEs) manage green intellectual capital sustainably.

Quadrant II is the keep up the good work area or the quadrant area that explains what things performance achievements must be maintained to achieve sustainable performance because they are in accordance with the expected targets. Quadrant II is an area that is considered very important (high importance) by State-Owned Enterprises (SOEs), and the level of performance is very good and in accordance with the expectations set (high performance) (Ariza-Montes et al., 2019; Ormanovic et al., 2017). The measurement indicators for the variables included in quadrant II are indicators in the GRC and GSC dimensions that are not included in quadrant I and all GI indicators. This shows that, according to the SOEs manager respondents, State-Owned Enterprises (SOEs) have made most of their efforts to maximize indicators of green intellectual capital and implement sustainable innovation. Regarding green innovation, respondents agreed that it is an important factor in achieving sustainable performance. In addition, respondents agree that State-Owned Enterprises (SOEs) have performed the best in developing green innovation and implementing it in producing products and services to achieve sustainability goals.

Respondents agree that green innovation increases when green intellectual capital increases. Cooperation and relationship-building with various stakeholders have been carried out to increase intellectual capital and green innovation. The level of performance and importance of green intellectual capital and green innovation indicators are also evident from the respondents' answers. Based on

respondents' answers about green intellectual capital to the green intellectual capital indicator, the range of values is 3.41 - 4.20 with an average of 4.164, which indicates that respondents agree that the implementation of Green Organizational Identity has been running very well in State-Owned Enterprises (SOEs). For the indicator of Green Innovation, respondents answered with an average value per Green Innovation indicator between 4.150 and 4.229, indicating that the implementation of green innovation has been running well or very well in the company. Based on these results, State-Owned Enterprises (SOEs) must maintain and continue to strive to increase green intellectual capital and green innovation to achieve sustainable performance.

Quadrant III is a low-priority area or non-main priority area or low priority for State-Owned Enterprises (SOEs). Quadrant III is an area that is considered less important (low importance) by respondents of State-Owned Enterprises (SOEs), and the level of performance is still low (low performance(Ariza-Montes et al., 2019; Ormanovic et al., 2017). Indicators included in this quadrant need to be reconsidered by State-Owned Enterprises (SOEs), especially in terms of the influence of indicators on sustainability performance, to prevent the indicators in question from shifting to quadrant I (Martilla & James, 1977).

In other words, the indicators included in quadrant III are not necessarily indicators that service providers should ignore. Several findings indicate that an indicator falls into quadrant III and becomes less important because the performance of State-Owned Enterprises (SOEs) has not improved, so manager respondents assess the expectation of performance improvement for the indicator as very low (Ormanovic et al., 2017; Tontini, Picolo, & Silveira, 2014). The measurement indicators for variables that fall into quadrant III are as follows:

1. GEIO1: Environmental preservation is crucial for the survival of our company.
2. GEOI4: Our company contributes to the surrounding environment through community empowerment while prioritizing environmental preservation.
3. GEOI5: Various external stakeholders expect our company to protect the environment.
4. GIOI4: In our company, employees prioritize the interests of the nation and state, the company is included in environmental preservation (Loyal)
5. GIOI7: Our company makes joint efforts to ensure that every employee understands the importance of environmental preservation.
6. GIOI8: Our company employees highly value environmental preservation.

Related to the results of the IPMA analysis, which placed the above indicators in low importance (Quadrant III), this may be due to the number of respondents who answered the questionnaire mostly coming from service companies. Service companies do not use materials that are largely dependent on environmental conservation practices. Community empowerment activities become unimportant, and their performance is low, possibly because not all State-Owned Enterprises (SOEs) generate profits, so community empowerment activities are not optimal in helping the community and the environment. Based on the Central Government's financial report, in 2021 and 2022, almost 50% of State-Owned Enterprises (SOEs) experienced losses (2021:48% and 2022:45%).

Regarding environmental and social performance, it can also be seen from the ESG score results presented in the introduction that the ESG score of existing State-Owned Enterprises (SOEs) indicates that no State-Owned Enterprises (SOEs) have managed ESG well. This shows that the performance of the indicators of green organizational identity has not been fully realized. In terms of its level of importance, even though it is in quadrant III, it cannot be ignored because it is very close to quadrant I. Quadrant IV is an area of possible waste of resources or excessive area, where there is potential for wasteful use of State-Owned Enterprises (SOEs)' resources. Quadrant IV is an area that is considered less important (low importance) by respondents of State-Owned Enterprises (SOEs), but the level of service provider performance is very good (high performance) (Ariza-Montes et al., 2019; Ormanovic et al., 2017). In other words, the current performance of service providers no longer needs to be improved and can be reduced, even the excess performance (overperformance) should be diverted to other areas that are still not optimal, for example, in quadrant I (Ormanovic et al., 2017; Tontini et al.,

2014) so that sustainability performance becomes more optimal overall. The measurement indicators for the variables included in quadrant IV are as follows:

1. GIOI1: In our company, employees hold fast to their beliefs regarding their duties, values, and ethics, including those related to environmental conservation (Amanah)
2. GIOI2: In our company, employees complete their duties with the best quality, including in environmental conservation (Competent)
3. GIOI5: In our company, employees are proactive and innovative and follow developments in environmentally friendly technology (Adaptive)
4. GIOI6: In our company, employees build synergistic collaboration by using natural resources that continue to preserve the environment (Collaborative)

Those included in quadrant IV all came from the GIOI dimension. The GIOI performance is very high, as seen from the respondents' answers, with an average GIOI answer of 4.313 compared to the average GEOI of 4.220. Based on these answers, it indicates that State-Owned Enterprises (SOEs) have implemented core values well. According to the Ministry of State-Owned Enterprises (SOEs), the core value of Akhlak has become an obligation and, without being asked, should be inherent in all employees of State-Owned Enterprises (SOEs). SOEs stated that core values have become basic principles and cultures that must be applied in running company operations. Monitoring and activities to develop the implementation of core values are always carried out. This is consistent with the IPMA results.

The importance of the indicator in quadrant IV is not immediately ignored. This can be seen from several indicators that are almost close to Quadrant II. In addition, the core value is an obligation that must be carried out by all employees of State-Owned Enterprises (SOEs). Based on the results of the data analysis, GIOI has a greater impact on green organizational identity, which shows that GIOI is also important in determining the sustainability performance of State-Owned Enterprises (SOEs). If the implementation of the GIOI is good, State-Owned Enterprises (SOEs) can focus more on indicators and other variables.

5. Conclusions

5.1 Conclusion

This study examined the influence of Green Intellectual Capital (GIC), Green Innovation (GI), and Green Organizational Identity (GOI) on the sustainability performance of Indonesian State-Owned Enterprises (SOEs) using SEM-PLS and Importance Performance Map Analysis (IPMA). The findings indicate that GIC, GI, and GOI contribute to sustainability performance, with GIC being the most influential determinant. These results highlight the importance of environmentally oriented knowledge, competencies, organizational systems, and stakeholder relationships in supporting environmental, social, economic, financial, and task-related performance in SOEs. This study contributes to the sustainability literature by extending the application of resource-based and legitimacy theories in the SOEs context. The findings demonstrate that green intangible resources, particularly GIC, serve as strategic assets that enhance sustainability performance directly and through innovation capabilities. The results also support the view that environmentally responsible organizational values and practices strengthen organizational legitimacy and contribute to sustainable outcomes. Furthermore, this study extends prior research by integrating IPMA with SEM-PLS to evaluate the significance, relative importance, and performance of sustainability drivers.

The IPMA results identified Green Human Capital (GHC) and Green Structural Capital (GSC) as the primary areas requiring managerial attention. Several indicators related to employee environmental competencies, environmental training and education, leadership support, research and development investment, and environmental management systems were classified as highly important but underperformed. Therefore, SOEs managers and policymakers should prioritize investments in employee capability development, environmental governance, and knowledge management practices. The findings also emphasize the importance of stakeholder collaboration and continuous green innovation for achieving sustainable performance.

5.2 Research Limitations

This study had several limitations. First, the use of cross-sectional data limits the ability to capture dynamic changes in sustainability performance over time. Second, the data were collected using self-reported questionnaires from managerial respondents, which may have introduced response bias and subjectivity. Third, the study focuses only on State-Owned Enterprises (SOEs) in Indonesia, which may limit the generalizability of the findings to private sector companies or other countries with different institutional environments. Finally, this study only examines three main variables: Green Intellectual Capital (GIC), Green Organizational Identity (GOI), and Green Innovation (GI), while other potentially relevant factors such as corporate governance, regulatory pressure, and market competition are not included. Although the sample includes respondents from both manufacturing and non-manufacturing SOEs, the findings are limited to the Indonesian State-Owned Enterprise context. Differences in institutional environments, ownership structures, and regulatory frameworks may limit the applicability of the results to private-sector organizations or SOEs in other countries. Therefore, future studies are encouraged to conduct comparative analyses across sectors and countries to enhance the generalizability of the findings.

5.3 Suggestions and Directions for Future Research

Future research is expected to address the limitations of this study and expand its scope. First, longitudinal studies are recommended to better capture the development and sustainability performance trends of companies over time. Second, future studies may incorporate additional variables, such as ESG disclosure quality, corporate governance mechanisms, digital transformation, and institutional pressures, to provide a more comprehensive model. Third, expanding the research sample to include private companies or conducting cross-country comparisons would enhance the generalizability of the findings of this study. Qualitative or mixed-method approaches could be used to gain deeper insights into managerial perspectives and organizational practices related to sustainability. Finally, future research can explore the mediating or moderating roles of financial performance or ESG ratings in the relationship between green practices and sustainability performance.

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Author Contributions

AD led the conceptualization and design of the study, developed the methodology, conducted the formal analysis using SEM-PLS and IPMA, performed data curation, and prepared the original draft of the manuscript, including the visualization of the results. SW contributed to the conceptual framework, validation of the research model, critical review, and supervision. DD, SS, and SD supported the development of the methodology, conducted validation and formal analysis, and contributed to the review and refinement of the manuscript.

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