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Intellectual Capital Efficiency, Innovation, Sensitive Industries and Environmental, Social and Governance Performance: Evidence from Malaysian Public Listed Companies

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Abstract: *There is growing awareness of the crucial role intangible assets play in corporate sustainability and to achieve the Sustainable Development Goals (SDGs). Intangible assets are recognized as key drivers influencing Environmental, Social and Governance (ESG) performance. This research examines how components of Intellectual Capital Efficiency (ICE) influence the ESG performance of Malaysian Public Listed Companies (PLCs) within the theoretical framework of the Resource-Based View (RBV) theory. It further investigates how innovation and sensitive industries moderate the relationship. Data from 161 Bursa Malaysia PLCs in 2022 were analyzed using STATA software to test the hypotheses developed. The findings revealed that Human Capital Efficiency (HCE) and Structural Capital Efficiency (SCE) influence ESG performance. Innovation positively moderates the relationship between HCE and ESG performance, while the influence of SCE on ESG performance is stronger in sensitive industries. Relational Capital Efficiency (RCE) and Capital Employed Efficiency (CEE) revealed no significant influence. These findings offer valuable insights for PLC managers to prioritize investments in HCE and SCE to improve ESG. Policymakers and regulators can also collaborate with Malaysian PLCs to develop regulatory frameworks that encourage intellectual capital investments for sustainable development.*

Keywords: Intellectual Capital Efficiency, Environmental, Social and Governance Performance, Innovation and Sensitive Industries

1. Introduction

Sustainability has become a priority in today's rapidly changing business environment, with ESG as an essential tool for more sustainable development (Boffo & Patalano, 2020). Despite global efforts, the COVID-19 pandemic disrupted progress towards the United Nations SDGs, negatively impacting economic and social dimensions. Only 20.12% of SDG targets were positively influenced, while 31.95% were adversely affected (Hannan et al., 2022). The role of Malaysian PLCs is important in progressing sustainability and achieving SDGs nationally. However, compliance with ESG regulations remains challenging for many PLCs, impeding their ESG performance. Malaysian PLCs face an urgent need to optimize resource allocation, particularly intellectual capital, to strengthen their sustainability efforts. Inefficient use of resources has been identified as a significant contributor to subpar firm performance (Handoyo et al., 2023). This challenge is intensified by a shortage of skilled sustainability professionals and insufficient investment in developing ESG capabilities, which hinders efficient implementation of sustainability practices (Krishnan, 2023). Moreover, the lack of

standardized ESG data collection and analytical frameworks complicates strategic decision-making and undermines comprehensive sustainability planning (Deloitte, 2022). Compounding these issues, many firms fail to adequately manage relational capital critical relationships with third parties, and supply chain risk, thereby limiting their ESG performance potential (Bursa Malaysia, 2022). Frequently, ESG are perceived as compliance costs rather than strategic investments, leading to minimal adoption of enabling technologies that could support sustainability goals. Addressing these gaps is essential for advancing both academic understanding and practical strategies that leverage intellectual capital to enhance ESG performance, especially within emerging markets such as Malaysia.

2. Literature Review

This study is grounded in RBV theory, which serves as the primary theoretical foundation of this study, originated from the work of Penrose (1959), Wernerfelt (1984), and Barney (1991). It emphasizes that firms achieve sustained competitive advantage by efficiently managing resources that are valuable, rare, difficult to imitate, and non-substitutable. Both tangible and intangible assets contribute to this advantage, and RBV provides a comprehensive framework for understanding how ICE components measured using the Modified Value-Added Intellectual Coefficient (MVAIC) model impact firm success. These ICE components which encompass employees' knowledge and skills, organizational processes, stakeholder relationships, and physical assets, respectively (Obeidat et al., 2021). An important aspect of RBV is its emphasis on innovation as a catalyst for competitive advantage. Innovation can enhance the outcome of ICE on firm performance by translating intangible assets into new products, services, or processes that improve outcomes (Mady et al., 2023). This reinforces the choice of RBV as a suitable theoretical framework for this study, which also considers sensitive industries as representing unique, strategic firm capabilities where efficient resource allocation is critical for sustaining competitive advantage (Hanifah et al., 2022).

3. Research Objectives

The first research objective of this study is to examine the relationship between ICE components (HCE, SCE, RCE, and CEE) and ESG performance. The second research objective is to examine the moderating role of innovation in the relationship between ICE components and ESG performance and the third objective is to examine the moderating role of sensitive industries in the relationship between ICE components and ESG performance in Malaysian PLCs.

4. Research Theoretical Framework

This study investigates the relationship between ICE and ESG performance, with a particular focus on the moderating influence of innovation and sensitive industries within Malaysian PLCs. ICE components comprising HCE, SCE, RCE, and CEE are posited as the independent variable, while ESG performance serves as the dependent variable. Innovation and sensitive industries are introduced as moderator variables influencing the ICE–ESG relationship. Firm size and firm age are included as control variables.

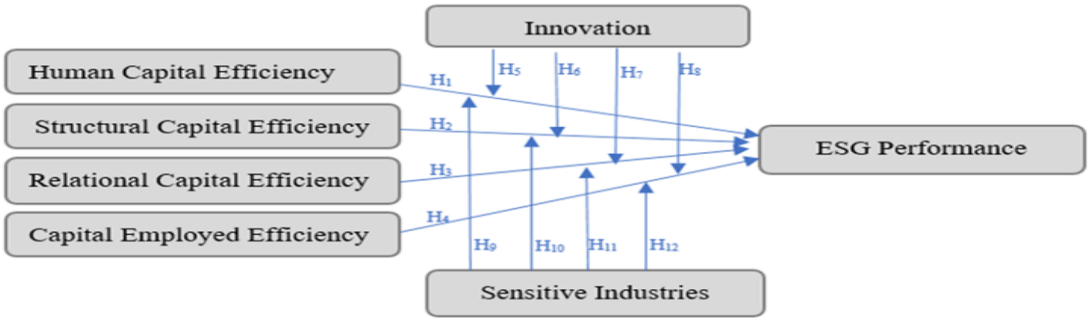

Figure 1: Theoretical Framework of Intellectual Capital Efficiency, Innovation, and Sensitive Industries and Environment, Social and Governance Performance

5. Research Methodology

This study analyzes secondary data from Malaysian PLCs on Bursa Malaysia's main market for the 2022 financial year. Secondary data was chosen for its validity, reliability, and cost-effectiveness, with data before 2022 excluded to avoid COVID-19 pandemic distortions. The unit of analysis is at the firm level, covering all 753 Malaysian PLCs across 13 sectors mandated to report financial and ESG information. These sectors include finance, plantations, property, construction, consumer and industrial products, technology, energy, healthcare, REITs, telecommunications, transportation, and utilities. Following research guidelines, a minimum sample size of 90 was required for valid analysis given the nine study variables. The final sample included 161 PLCs from 11 sectors, exceeding this minimum to improve statistical reliability. Firms were selected through a non-probability judgment sampling method based on data availability. Among the sampled firms, 119 belong to environmentally sensitive industries as classified by Malaysia's Department of Environment, following established criteria. This sample size and selection approach strengthen the study's ability to reliably investigate the impact of ICE, innovation, and sensitive industries on ESG performance in Malaysian PLCs.

6. Variable Measurement

The primary focus is on ESG Performance, which is assessed using the ESG scores from the LSEG FTSE ESG index. These scores range from 0 to 100 and reflect a company's commitment to sustainable and ethical practices. ESG performance is categorized into four levels: poor (0–25), satisfactory (26–50), good (51–75), and excellent (76–100). The scores are based on over 630 indicators spanning ESG factors, with weighting schemes that vary by industry for environmental and social aspects, while governance weights are consistent across all sectors. Next, the study measures ICE through the MVAIC model. This model is an extension of the original VAIC developed by Pulic, incorporating an additional component of RCE. Innovation is treated as a moderator variable, operationalized using R&D expenditure. Firms that invest in R&D are coded as 1; those without R&D spending are coded as 0. This binary coding approach aligns with prior research and reflects the role of R&D in fostering innovation and growth. The study also considers sensitive industries as a moderating factor, based on classifications from previous studies and the Malaysian Department of Environment. The eight sectors identified include industrial products, consumer products, property, plantations, trading and services, mining, construction, and infrastructure. Out of 161 Malaysian PLCs sampled, 119 belong to these sensitive sectors. This variable is coded as 1 for companies in sensitive industries and 0 for others. Lastly, firm size and firm age are included as control variables, given their influence

on firm performance. Firm size is measured by total assets, while firm age is calculated by the number of years since the company's commencement.

7. Data Analysis Techniques

Data were analyzed using STATA version 17, employing descriptive statistics to summarize data, Pearson correlation tests to identify preliminary relationships, and regression analyses to test hypothesized effects. Classical assumption tests covering multicollinearity (Variance Inflation Factor), heteroscedasticity (Breusch-Pagan/Cook-Weisberg test), normality (Kolmogorov-Smirnov test), and linearity (residual plots, histograms, quantile-quantile plots) were conducted to validate regression assumptions and ensure robustness. Regression results interpretation focused on coefficients, F-statistics for overall model significance, t-tests for individual variable effects, and the coefficient of determination (R^2) to assess explanatory power.

8. Results of Regression Models

The regression results are presented based on the three empirical models of the study.

Influence of ICE Components on ESG Performance: Model 1 examines the relationship between ICE components and ESG performance. The R-squared value of 0.392 indicates that approximately 39.2% of the variability in ESG performance is explained by the model. The F-test value is 16.540 with a p-value of 0.0000 which is significant at 1% indicates that the independent variables have a significant effect on the dependent variable, which is ESG performance. The equation developed for model 1 is: $ESG = \alpha + \beta1HCE + \beta2SCE + \beta3RCE + \beta4CEE + \beta5AGE + \beta6SIZEi + \varepsilon$

Influence of HCE on ESG Performance: HCE positively influenced ESG performance ($\beta = 5.0410$, $p = 0.0130$), supporting hypothesis H1 as presented in Table 1. From the regression model, the p-value of HCE is 0.0130 which is significant at 5%. This result suggests that an increase in HCE is associated with an improvement in ESG performance. Therefore, this study has found evidence to accept H1. Influence of SCE on ESG Performance. SCE positively influenced ESG performance ($\beta = 19.635$, $p = 0.0380$), supporting hypothesis H2 as presented in Table 1. The results of the regression model show that the p-value 0.0380 of SCE is significant at 5%. This result suggests that an increase in SCE is associated with an improvement in ESG performance.

Influence of RCE on ESG Performance: RCE was no influence on ESG performance ($\beta = -0.1600$, $p = 0.7050$) thus hypothesis H3 is not supported as presented in Table 1. This result indicates that there is no relationship between RCE and ESG performance in Malaysian PLCs. The results of relationship indicate that as the efficiency of relational capital increases, the ESG performance does not improve correspondingly. This study has found evidence not to accept H3**.**

Influence of CEE on ESG Performance: CEE was no influence on ESG performance ($\beta = 0.3540$, $p = 0.9410$) thus hypothesis H4 is not supported as presented in Table 1. This result indicates that there is no relationship between CEE and ESG performance in Malaysian PLCs. The results of the relationship indicate that as the efficiency of capital employed increases, the ESG performance does not improve correspondingly. This study has found evidence not to accept H4.

Table 1: Regression Results of Model 1

Regression Result				
ESG	**Coef.**	**St.Err.**	**t-value**	**p-value**
HCE	5.0410	1.9990	2.5200	0.0130**
SCE	19.635	9.4000	2.0900	0.0380**
RCE	-0.1600	0.4210	-0.3800	0.7050
CEE	0.3540	4.8000	0.0700	0.9410
FAGE	0.0540	0.0960	0.5700	0.5710
FSIZE	4.3790	0.9000	4.8700	0.0000***
R-squared			0.3920	
F-test			16.540	
P-value			0.0000***	

*** p<.01, ** p<.05, * p<.1*
Note: ESG (ESG performance), HCE (human capital efficiency), SCE (structural capital efficiency), RCE (relational capital efficiency), CEE (capital employed efficiency), FAGE (firm age), and FSIZE (firm size).

Influence of Innovation in the relationship between ICE Components and ESG Performance: Model 2 explains innovation as a moderator in the relationship between ICE components and ESG performance. The R-squared value of 0.4520 indicates that 45.2% of the variability in ESG performance is explained by this model, an improvement over Model 1. The F-test value is 11.153 with a p-value of 0.0000 which is significant at 1% indicates that the independent variables have a significant effect on the dependent variable, which is ESG performance. The equation develops for model 2 is $ESG = \alpha + \beta_1 HCE + \beta_2 SCE + \beta_3 RCE + \beta_4 CEE + \beta_5 INN + \beta_6 HCE * INN + \beta_7 SCE * INN + \beta_8 RCE * INN + \beta_9 CEE * INN + \beta_{10} AGE + \beta_{11} SIZE + \varepsilon$

Moderating effect of Innovation in the relationship between HCE and ESG Performance: Innovation moderates the relationship between HCE and ESG Performance (β = 7.0860, p = 0.0170) as presented in Table 2, indicating that innovation strengthens the positive relationship between HCE and ESG performance, supporting hypothesis H5. Findings demonstrate the key role of innovation in moderating the relationship between HCE and ESG performance. The result supports Hypothesis H5 that predicted innovation positively moderates the relationship between HCE and ESG performance.

Moderating effect of Innovation in the relationship between SCE and ESG Performance: Innovation not moderate the relationship between SCE and ESG Performance (β = -7.1970, p = 0.6910) as presented in Table 2 indicates that innovation not strengthens the relationship between SCE and ESG performance. As a result, hypothesis H6, which proposed that innovation moderate SCE on ESG performance, is not supported by the findings. The results suggest that the presence of innovation does not enhance the relationship between SCE and ESG performance.

Moderating effect of Innovation in the relationship between RCE and ESG Performance: Innovation does not moderate the relationship between RCE and ESG Performance (β = 0.0910, p = 0.9150) as presented in Table 2. The findings suggest that innovation does not influence the relationship between RCE and ESG performance. Therefore, hypothesis H7 is not supported.

Moderating effect of Innovation in the relationship between CEE and ESG Performance: Innovation does not moderate the relationship between CEE and ESG Performance (β = -

19.7110, p = 0.0410) as presented in Table 2. The findings suggest that the relationship between CEE and ESG performance is not moderated by a firm's innovation. Therefore, hypothesis H8, which proposed that innovation would strengthen the positive relationship between CEE and ESG performance, is not supported by the findings in this study.

Table 2: Regression Results of Model 2
Regression Results

ESG	Coef.	St.Err.	t-value	p-value
HCE	2.2530	2.1480	1.0500	0.2960
SCE	18.7270	10.4220	1.8000	0.0740*
RCE	0.0050	0.5170	0.0100	0.9920
CEE	9.6120	5.8250	1.6500	0.1010
Innovation	-2.3380	11.1950	-0.2100	0.8350
HCE_Inno	7.0860	2.9270	2.4200	0.0170**
SCE_Inno	-7.1970	18.0630	-0.4000	0.6910
RCE_Inno	0.0910	0.8570	0.1100	0.9150
CEE_Inno	-19.7110	9.5610	-2.0600	0.0410**
FAGE	0.0610	0.0930	0.6500	0.5140
FSIZE	3.8370	0.8870	4.3300	0.0000***
R-squared			0.4520	
F-test			11.153	
P-value			0.0000***	

*** p<.01, ** p<.05, * p<.1*
Note: ESG (ESG performance), HCE (human capital efficiency), SCE (structural capital efficiency), RCE (relational capital efficiency), CEE (capital employed efficiency), INNO (innovation), FAGE (firm age), and FSIZE (firm size)

Influence of Sensitive Industries in the relationship between ICE Components and ESG Performance: Model 3 investigates the relationship between ICE components and ESG performance, moderated by firms operate in sensitive industries. The R-squared value of 0.4900 indicates that 49.0% of the variability in ESG performance is explained by this model, showing an improvement over Models 1 and 2. The F-test value is 13.011 with a p-value of 0.0000 which is significant at 1% indicates that the independent variables have a significant effect on the dependent variable, which is ESG performance. The equation develops for model 3 is $ESG = \alpha + \beta_1 HCE + \beta_2 SCE + \beta_3 RCE + \beta_4 CEE + \beta_5 SI + \beta_6 HCE * SI + \beta_7 SCE * SI + \beta_8 RCE * SI + \beta_9 CEE * SI + \beta_{10} AGE + \beta_{11} SIZE + \varepsilon$

Moderating effect of Sensitive Industries in the relationship between HCE and ESG Performance: Sensitive industries not moderate the relationship between HCE and ESG Performance (β = -2.5530, p = 0.4260) as presented in Table 3. Hence, hypothesis 9 is not supported. This finding implies that the firms operating in sensitive industries do not appear to influence the relationship of HCE in achieving better ESG performance**.**

Moderating effect of Sensitive Industries in the relationship between SCE and ESG Performance: Sensitive industries moderate the relationship between SCE and ESG Performance (β = 62.799, p = 0.0000) as presented in Table 3, supporting hypothesis H10. The findings suggest that firms operating in sensitive industries benefit more from their SCE for better ESG performance.

Moderating effect of Sensitive Industries in the relationship between RCE and ESG Performance: Sensitive industries not moderate the relationship between RCE and ESG Performance (β = -0.4650, p < 0.6200) as presented in Table 3, indicating that the relationship between RCE and ESG performance is not moderated by sensitive industries. Therefore, hypothesis H11 is not supported.

Moderating effect of Sensitive Industries in the relationship between CEE and ESG Performance: Sensitive industries not moderate the relationship between CEE and ESG Performance (β = -9.0190, p = 0.3630) as presented in Table 3. This finding imply that sensitive industries do not appear to influence the relationship between CEE and ESG performance. Consequently, hypothesis H12 is not supported.

Table 3: Regression Results of Model 3
Regression Result

ESG	Coef.	St.Err.	t-value	p-value
HCE	2.8840	2.5740	1.1200	0.2640
SCE	8.1060	10.858	-0.7500	0.4570
RCE	0.3510	0.8230	0.4300	0.6700
CEE	8.5110	8.1430	1.0500	0.2980
SI	-33.286	9.2280	-3.6100	0.0000***
HCE*SI	-2.5530	3.1960	-0.8000	0.4260
SCE*SI	62.799	14.196	4.4200	0.0000***
RCE*SI	-0.4650	0.9360	-0.5000	0.6200
CEE*SI	-9.0190	9.8840	-0.9100	0.3630
FAGE	0.0880	0.0900	0.9800	0.3300
FSIZE	4.8090	0.8740	5.5000	0.0000***
R-squared			0.4900	
F-test			13.011	
P-value			0.0000***	

*** p<.01, ** p<.05, * p<.1*
Note: ESG (ESG performance), HCE (human capital efficiency), SCE (structural capital efficiency), RCE (relational capital efficiency), CEE (capital employed efficiency), SI (sensitive industries), FAGE (firm age), and FSIZE (firm size).

9. Hypotheses Statement and Findings

The results of the hypotheses tested in the study are summarized in Table 4. Based on the research objectives, 12 hypotheses are proposed to investigate the role of ICE components, innovation, and sensitive industries on ESG performance in Malaysian PLCs. The results indicated that 4 hypotheses were accepted, and 8 hypotheses were rejected.

Table 4: Summary of Hypotheses Statement and Results

Hypothesis	Hypothesis Statement	Findings
H1	There is a positive relationship between Human Capital Efficiency and ESG performance	Supported
H2	There is a positive relationship between Structural Capital Efficiency and ESG performance	Supported
H3	There is a positive relationship between Relational Capital Efficiency and ESG performance	Not Supported

H4	There is a positive relationship between Capital Employed Efficiency and ESG performance	Not Supported
H5	The positive relationship between HCE and ESG performance is strengthened in a highly innovative company	Supported
H6	The positive relationship between SCE and ESG performance is strengthened in a highly innovative company	Not Supported
H7	The positive relationship between RCE and ESG performance is strengthened in a highly innovative company	Not Supported
H8	The positive relationship between CEE and ESG performance is strengthened in a highly innovative company	Not Supported
H9	The positive relationship between HCE and ESG performance is strengthened in Sensitive Industries	Not Supported
H10	The positive relationship between SCE and ESG performance is strengthened in Sensitive Industries	Supported
H11	The positive relationship between RCE and ESG performance is strengthened in Sensitive Industries	Not Supported
H12	The positive relationship between CEE and ESG performance is strengthened in Sensitive Industries	Not Supported

10. Discussion of Research Findings

Influence of ICE Components on ESG Performance

The first research question asks whether the components of ICE are positively related to the ESG performance of Malaysian PLCs. The positive link between HCE and ESG aligns with the RBV theory, which views intangible resources as strategic assets that enhance competitive advantage. This supports previous studies by Bayraktaroglu et al. (2019) and Xu and Liu (2020), who reported that HCE improves corporate sustainability and social responsibility. The positive effect of HCE may be explained by the adaptability and competence development of human capital, which equips firms to better address ESG challenges. In Malaysia, national initiatives such as the National Training Index and partnerships to promote sustainable investment underscore the growing emphasis on human capital development to support ESG goals. Similarly, SCE positively influence ESG performance and is consistent with findings by Bayraktaroglu et al. (2019). SCE relates to how effectively a company uses its internal processes and systems to create value. Firms with high SCE optimize workflows and manage resources efficiently, which often leads to cost reductions, improved energy efficiency, and waste management practices that enhance sustainability. The study found no significant influence of RCE on ESG performance. This aligns with previous research by Rana and Hossain (2023). While Malaysian PLCs efficiently manage relational capital, challenges such as inadequate third-party risk management and transactional stakeholder relationships limit its impact on ESG. A more strategic and collaborative approach to relational capital, aligned with sustainability, is needed to enhance ESG outcomes. CEE showed no positive influence on ESG performance, consistent with earlier studies (Duho et al., 2022). Many Malaysian firms treat ESG as a compliance issue rather than integrating it into core operations.

Innovation as a Moderator between ICE and ESG Performance

The second research question examines whether innovation moderates the relationship between ICE components and ESG performance. The results indicate that innovation significantly strengthens the positive relationship between HCE and ESG performance but does not moderate the relationships involving SCE, RCE, or CEE. The positive moderating effect of innovation on HCE is consistent with Valaei et al. (2022). Skilled employees drive innovation

by generating new ideas and improving processes, thereby enhancing ESG outcomes. In Malaysia, companies investing in employee development and training enjoy greater ESG benefits through innovation. However, innovation did not moderate the other ICE components. This may be due to low investment in R&D, with 70% of PLCs not engaging in R&D activities. High innovation costs and a focus on short-term gains over sustainability also impede integration of innovation with ESG efforts. Lack of R&D limits firms' ability to adopt new technologies or collaborate externally, reducing their innovation capacity.

Sensitive Industries as a Moderator between ICE and ESG Performance

The third research question investigates whether operating in sensitive industries moderates the ICE–ESG relationship. The analysis shows that sensitive industries strengthen the positive relationship between SCE and ESG performance, but do not moderate relationships involving HCE, RCE, or CEE. Firms in sensitive industries face stricter regulations and higher scrutiny regarding environmental and social impacts. This drives them to optimize structural capital, aligning processes with compliance and sustainability standards. Such operational focus explains why SCE plays a more critical role in ESG success in these sectors. Examples include advanced waste management and cleaner technologies that reduce emissions and improve ESG scores. For other ICE components, the lack of moderation may stem from compliance-driven strategies that prioritize meeting regulations over broader resource integration. Sensitive industries often emphasize structural capital to ensure regulatory adherence, potentially neglecting the strategic use of human, relational, or physical capital to enhance sustainability. This narrow focus may limit opportunities to leverage the full spectrum of intellectual capital to achieve stronger ESG performance.

11. Theoretical and Practical Implications of the Study

This study advances academic knowledge by expanding the RBV theory on how HCE and SCE influence the ESG performance of Malaysian PLCs. It confirms that these resources are valuable for achieving competitive advantage through better ESG performance. Innovation strengthens the relationship between HCE and ESG, while SCE's influence on ESG is stronger in sensitive industries, demonstrating how external factors interact with internal resources. The research fills a gap by focusing on ICE's role in non-financial performance, ESG, which prior studies largely overlooked. Using the MVAIC model it provides a holistic view of ICE's components across diverse industries, enhancing understanding of sustainable business strategies. Managers of Malaysian PLCs should prioritize investments in HCE and SCE to enhance ESG performance, aligning resource allocation with strategic goals. Innovation is key, but only a minority of firms currently invest in R&D, indicating room for improvement. Firms in sensitive industries should emphasize SCE to improve operational efficiency and environmental outcomes. Policymakers, including Bursa Malaysia and the Department of Environment, can use these insights to shape regulations that support intellectual capital investment for sustainability. Bursa Malaysia can enhance director training and sustainability reporting, while the Department of Environment can update environmental policies based on research to address emerging challenges and stakeholder needs.

12. Limitations of the Study and Directions for Future Research

This study recognizes several key limitations that impact the validity and applicability of its findings. First, the limited sample size of 161 firms from the FTSE Russell ESG database restricts the generalizability of conclusions about the relationship between ICE and ESG performance. Future research should use larger, more diverse datasets like Refinitiv and

Sustainalytics to enhance robustness. Second, the cross-sectional design focusing on the year 2022 limits understanding of how ICE and ESG performance evolve. Longitudinal studies are recommended to capture trends, causality, and shifts in corporate sustainability practices. Third, concentrating solely on Malaysian PLCs limits the study's external validity within the ASEAN region, which has varied regulatory environments. Comparative analyses across countries such as Thailand, Singapore, Indonesia, and the Philippines are needed to explore how different institutional contexts influence the ICE-ESG relationship. Finally, relying exclusively on the MVAIC model to measure ICE may omit important aspects of intellectual capital affecting ESG performance. Future studies should employ multiple intellectual capital frameworks to gain a more comprehensive understanding.

13. Conclusion

The findings of this study highlight that the efficient management of intellectual capital can enhance ESG performance. The relationship between ICE and ESG recommends that firms prioritize HCE and SCE to meet global sustainability standards. In conclusion, Malaysian PLCs should implement focused strategies targeting these intellectual capital components to improve their ESG performance. The findings revealed deeper understandings for firm managers and policymakers of the development sustainability determinations and align with national development goals.

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Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this study.

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