“Optimizing firm performance through contingency factors, enterprise risk management, and intellectual capital in Southeast Asian mining enterprises”

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OPTIMIZING FIRM PERFORMANCE THROUGH CONTINGENCY FACTORS, ENTERPRISE RISK MANAGEMENT, AND INTELLECTUAL CAPITAL IN SOUTHEAST ASIAN MINING ENTERPRISES

Abstract

Enterprise risk management (ERM) is a crucial aspect of corporate operations. This study examines the impact of environmental uncertainty, industry competition, and firm complexity on Enterprise Risk Management implementation and firm performance in the Southeast Asian mining industry. Utilizing data from 205 mining companies listed on Southeast Asian stock exchanges from 2016 to 2022, the analysis employs panel data regression methods. The findings reveal that environmental uncertainty does not significantly affect ERM, while industry competition positively influences ERM but negatively impacts firm performance. Firm complexity positively affects both ERM and performance. ERM mediates the relationships between industry competition, firm complexity, and performance, while intellectual capital moderates the effect of ERM on performance. These results underscore the strategic importance of integrating ERM practices and developing intellectual capital to enhance firm performance amidst competitive and complex business environments. The study contributes to the literature by providing empirical evidence on the nuanced relationships between these variables in the context of the Southeast Asian mining sector and offers practical insights for policymakers and industry leaders.

Keywords contingency, enterprise risk management, firm performance, intellectual capital

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INTRODUCTION

The mining industry plays a crucial role in driving regional economic growth in Southeast Asia, positioning the region as a hub for global expansion. In recent years, the mining industry in Southeast Asia has experienced significant growth, accompanied by increased regulations, reforms, and policy changes (Hysa et al., 2020). Its prevalence is essential to achieving the goals of the ASEAN Economic Community 2025, particularly in terms of regional sustainability and providing basic resources to industries and society (Cu et al., 2017). However, the region's high vulnerability to commodity price fluctuations and stakeholder pressures sets it apart (Pangestuti et al., 2023). Mining operations inherently expose various risks, such as geological uncertainties, commodity price volatility, regulatory compliance challenges, community relations, and environmental sustainability (Hoque, 2004; Nguyen et al., 2020). To address this uniqueness, a customized risk management strategy is required that considers the dynamics of the distinct regional business environment. Enterprise risk management

(ERM) is a comprehensive approach to risk management that integrates across an organization (Ai & Brockett, 2008). Previous studies have shown that implementing ERM can lead to significant performance improvements. Implementing ERM in developing countries, such as those in the Southeast Asian region, provides valuable insights into the challenges faced.

The regulatory environment of Southeast Asia presents numerous challenges for mining companies, including the necessity of obtaining environmental permits, land acquisition, and the implementation of health and safety standards. In response to these challenges, recent reforms aim to enhance sustainability, transparency, and governance in the mining sector (Erin et al., 2019). Effective ERM practices and strategic leveraging of intellectual capital are crucial for achieving sustainable performance.

The interconnection between contingency factors, ERM, and intellectual capital is significant, and understanding these factors can enhance company performance. A robust ERM framework enables companies to identify and mitigate risks that impact intellectual capital development and performance outcomes (Azman et al., 2022). Effective risk management practices can minimize operational disruptions, preserve the environment, and ensure compliance with changing regulatory requirements. Moreover, intellectual capital is a vital enabler of ERM, providing the knowledge, expertise, and innovative capabilities needed to anticipate and respond to risks effectively (Hitt et al., 2001). The integration of ERM and intellectual capital management enhances overall mining company performance by fostering a culture of risk awareness, learning, and continuous improvement (Adeleke et al., 2017). This study reviews the contingency factors influencing ERM implementation, intellectual capital, and company performance in the Southeast Asian mining industry. It emphasizes the importance of a holistic approach to risk management, intellectual capital development, and performance optimization.

1. LITERATURE REVIEW

The contingency perspective theory proposes that the link between Enterprise Risk Management and business performance depends on variables such as environmental uncertainty, industry competition, firm complexity, and other firm-related factors (Sagawa & Nagano, 2013). Aligning ERM with these variables is crucial for optimizing firm performance. ERM plays a significant role in enhancing a company's adaptability and resilience in response to environmental uncertainties. Moreover, intellectual capital (IC) serves as a mediator between ERM and firm performance, strengthening their correlation by moderating the influence of environmental uncertainties on ERM effectiveness. Companies with robust intellectual capital frameworks are more capable of implementing ERM practices proficiently, thereby impacting overall firm performance positively. This interaction highlights the intricate interplay among contingency factors, ERM, intellectual capital, and firm performance.

In highly uncertain environments, firms are exposed to various risks, making ERM a crucial strategic framework for systematically identifying, evaluating, and mitigating these risks (Lam, 2014). ERM provides flexibility and adaptability to manage dynamic risks (Barton & MacArthur, 2015). Effective ERM systems enable organizations to anticipate, assess, and respond to evolving risks, thereby enhancing resilience and agility (COSO, 2017; Ai & Brockett, 2008). However, the effectiveness of ERM depends on factors such as its integration with strategic decision-making and the organization's risk culture (Liu, 2019). It is crucial to align ERM with broader strategic goals (Simsek et al., 2009). Research indicates that high environmental uncertainty can increase risks, which can negatively impact performance (Singh, 2020). On the other hand, organizations that successfully adapt to uncertain environments tend to achieve higher levels of performance (Godwin & Sorbarikor, 2022). Therefore, adaptability, learning capability, and agile responses to external changes are crucial for thriving in uncertain environments (Eisenhardt & Martin, 2000). In fast-paced and unstable business environments, businesses that can effectively adapt can turn challenges into growth opportunities and improved performance despite heightened uncertainty. It is crucial to understand this relationship to navigate and excel.

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Environmental uncertainty impacts ERM and firm performance by increasing the complexity of risk management processes, challenging strategic decision-making, and necessitating enhanced flexibility, adaptability, and integration with strategic planning. Organizations must enhance their risk management practices to be more proactive, flexible, and integrated with strategic planning. They must also leverage technology and maintain transparent communication with stakeholders to navigate the challenges posed by environmental uncertainty effectively.

In highly competitive industries such as Southeast Asia's mining sector, organizations face significant risks due to commodity price fluctuations and stakeholder pressures (Maraboutis et al., 2022). Therefore, a proactive and comprehensive approach to risk management is necessary, which distinguishes the region globally. The level of competition directly impacts risk exposure, requiring robust ERM frameworks. Intense competition can pose risks related to pricing, market share, and product differentiation (Chen et al., 2020; Gordon et al., 2009). In dynamic environments, firms may need to take calculated risks to foster innovation and maintain competitiveness, which requires flexible ERM practices. The relationship between industry competition and ERM significantly influences organizational resilience and performance, as highlighted by Chen et al. (2020) and Gordon et al. (2009). Integrating ERM into strategic decision-making processes is crucial in competitive industries. This approach ensures that risk management aligns with the overall business strategy. Moreover, Ganguly et al. (2017) and Sienou et al. (2006) emphasize ERM's role in enhancing organizational agility and adaptability in competitive environments. Strategic risk management enables organizations to seize opportunities and navigate competitive markets effectively. The effect of industry competition on business performance is complex and varies depending on factors such as differentiation and cost leadership tactics (Bayraktar & Hancerliogullari, 2017; Mikhailov, 2019). Although competition can drive innovation and growth, firms must balance competitiveness with the strategic focus for long-term performance (Muenjohn et al., 2020). It is crucial to understand this relationship for success in competitive market environments. Industry competition has an impact on both ERM and firm performance. While increased competition can drive innovation and productivity, leading to improved performance, it also necessitates a more robust and strategically aligned ERM system. Effective ERM can help firms navigate the risks associated with competitive pressures, thereby supporting better performance and providing a competitive advantage.

ERM is crucial for navigating the operational intricacies of highly complex organizations with agility and foresight. The correlation between organizational complexity and ERM significantly influences organizational resilience and performance. Mishra et al. (2019) and Abkowitz and Camp (2017) show that in intricate organizational structures, risk identification and management become convoluted. ERM provides a structured framework for comprehensively assessing and navigating numerous risks in complex organizations. It integrates risk considerations into the overall strategic framework (Abkowitz & Camp, 2017). Implementing ERM enhances organizations' ability to align risk management with broader business objectives (Stanton, 2015). In complex organizations, ERM promotes a culture of risk awareness and accountability, which is crucial for ingraining risk management within the organizational framework. The complexity of a firm, including its organizational structure and operational intricacies, significantly affects its performance (Nagy et al., 2017). Molchanov et al. (2019) and Li and Xu (2020) suggest that excessive complexity can hinder decision-making and resource allocation, leading to poor performance. However, Jacobs (2013) and Campos et al. (2019) note that some complexity can be beneficial, particularly for diversified companies. Balancing complexity with adaptability is crucial for sustainable performance, requiring prudent management aligned with operational capacities and strategic objectives (Filzen & Schutte, 2017). Understanding this complex relationship is crucial for companies looking to gain sustainable competitive advantages in uncertain business environments. Firm complexity has a profound impact on both ERM and firm performance. While complexity introduces additional risks and management challenges, it can also drive innovation and strategic advantages. The key to harnessing the benefits of complexity while mitigating its risks lies in the implementation of

an ERM system that is well-aligned with the firm's specific complexity. Such an ERM system can help firms navigate the intricate risk landscape and support improved performance outcomes.

The dynamics of ERM in the business landscape are influenced by environmental uncertainty, industry competition, and firm complexity, ultimately shaping company performance (Arena et al., 2010). Environmental uncertainty, characterized by unpredictability and volatility, challenges organizations to adopt agile risk management strategies to effectively navigate unforeseen challenges. The competitive industry landscape highlights the importance of ERM practices that not only mitigate risks but also provide a competitive edge. The effectiveness of ERM implementation depends on the complexity of a firm, including its structure and operational intricacies. Firms that comprehend these interrelated factors can adjust their risk management approaches, fostering resilience and enhancing overall company performance. In uncertain and highly competitive environments, effective ERM strategies are crucial for sustained success, as they ensure adaptability and strategic advantage (Gordon et al., 2009). Some studies indicated a favorable association between ERM adoption and firm performance, while others generated equivocal findings on firm performance, others have produced inconclusive results. The link between ERM and company performance is complex yet crucial. ERM systematically identifies, assesses, and manages risks across an organization, resulting in reduced disruptions, optimized resource allocation, and safeguarded reputation and value (Pangestuti et al., 2023). This integration can lead to increased operational efficiency, improved decision-making, and a more robust business model. ERM also enables companies to take advantage of opportunities in volatile markets, promoting growth and profitability.

ERM is a crucial aspect of corporate operations, particularly in the face of environmental uncertainty, industrial competition, and firm complexity (Marquez-Tejon et al., 2021). To ensure adaptability and resilience in the face of unpredictable external factors, companies must strengthen their ERM frameworks (Oliveira et al., 2019). Robust risk management practices are required to mitigate risks and gain a competitive edge in today's business environment. Intellectual capital plays a crucial role in enhancing the effectiveness of ERM strategies and boosting company performance. Companies that are skilled at navigating these dynamics and leveraging intellectual capital are well-positioned to thrive in the modern business landscape. Intellectual capital innovation can help companies maximize profits, promote economic growth, and foster prosperity. It can also aid companies in exploring new domains and gaining a competitive edge while maintaining sustainable growth (Xu & Zhang, 2021; Naumova & Voropai, 2020). Companies with sustainable competitive advantages possess unique resources that allow them to strategize in ways that their competitors cannot replicate, optimizing their resources and establishing an effective business environment (Subaida et al., 2018). Intellectual capital drives productivity improvements, fostering greater efficiency and profitability (Alekseieva et al., 2020). Previous research has shown that intellectual capital can improve ERM and overall firm performance (Nocco & Stulz, 2006; Khan & Ali, 2017). Integrating ERM with intellectual capital enables companies to achieve superior performance. Overall, intellectual capital refers to information used by companies to create value and improve performance.

2. AIMS AND HYPOTHESES

The study aims to analyze the correlation between contingency factors, ERM, intellectual capital, and firm performance in 205 mining companies operating in Southeast Asia in 2016–2022. In accordance with the objectives and presented literature, the hypotheses of this study are as follows:

H1: Environmental uncertainty impacts ERM.

H2: Environmental uncertainty impacts firm performance.

H3: Industry competition impacts ERM.

H4: Industry competition impacts firm performance.

H5: Firm complexity impacts ERM.

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H6: Firm complexity impacts firm performance.

H7: ERM mediates the effect of environmental uncertainty on firm performance.

H8: ERM mediates the effect of industry competition on firm performance.

H9: ERM mediates the effect of firm complexity on firm performance.

H10: Intellectual capital moderates ERM on firm performance.

3. METHODS

The study examines mining firms listed on Southeast Asian stock exchanges, including Thailand, Malaysia, Philippines, Indonesia, Singapore, and Vietnam, due to their significant economic impact and risk. The focus on Southeast Asian nations is because of their exposure to increased uncertainty, necessitating enhanced ERM practices. Sample selection utilized purposive sampling techniques. The study examines mining companies listed on Southeast Asian stock exchanges from 2016 to 2022, covering 227 companies, 22 of which lacked complete financial statements, with a total of 205 research samples over a seven-year period, totaling 1.435 data points.

Table 1 provides a comprehensive overview of the variables used in the study, including their measurements, data sources, and references supporting their selection and application.

The research utilized the panel data regression method to test the estimation model.

Model 1.

$$ERM = \alpha + \beta_1 EU + \beta_2 IndCom + \beta_3 FC + \beta_4 FZ + \beta_5 FL + \mu_{it}. \quad (1)$$

Model 2.

$$P = \alpha + \beta_1 ERM + \beta_2 EU + \beta_3 IndCom + \beta_4 FC + \beta_5 FZ + \beta_6 FL + \beta_7 ERM \cdot IC + \mu_{it}. \quad (2)$$

where *ERM* – Enterprise Risk Management, *P* – Firm Performance, *EU* – Environmental Uncertainty, *IndCom* – Industry Competition, *FC* – Firm Complexity, *FZ* – Firm Size, *FL* – Financial Leverage, *IC* – Intellectual Capital

4. RESULT

Table 2 presents a summary of the descriptive statistics. The collected data indicate a moderate level of environmental uncertainty, with a range between 10.31 and 46.66. The analysis indicates that industry competition is relatively low, as shown by the low mean and median values. The majority of companies cluster around a complexity level of 3, indicating moderate variability in firm complexity. ERM implementation shows a narrow range, with generally low means and medians. Intellectual capital scores display significant variation, ranging from 5.13 to 23.84. The data show that there is variation in performance among companies, with

Table 1. Description and explanation of variables

Variable	Measurement	Source	Reference
Performance (P)	Tobin's Q	Bloomberg	Gordon (2009), Hoyt and Liebenberg (2011), Farrell and Gallagher (2015)
Enterprise Risk Management (ERM)	2 = quantitative ERM 1 = qualitative ERM 0 = otherwise	Company annual report	Pangestuti et al. (2023), Hoyt and Liebenberg (2011), Pagach and Warr (2010), Golshan and Rasid (2012)
Intellectual Capital (IC)	MVAIC = HCE + SCE + CEE	Bloomberg	Ulum (2017), Subaida et al., (2018), Cheng (2020)
Environmental Uncertainty (EU)	Log CV (Xk)	Bloomberg	Gordon et al. (2009), Ilmy et al. (2021)
Industry Competition (IndComp)	Herfindahl Hirschman Index (HHI)	Bloomberg	Shepherd (1990), Krishnan (2005), Gordon (2009)
Firm Complexity (FC)	Number of business segments in an enterprise	Bloomberg	McVay Ge (2005), Gordon (2009)
Control Variables a. Firm Size (FZ)	Natural logarithm of book value of total assets	Bloomberg	Beasley et al. (2005), Hoyt and Liebenberg (2011), Golshan and Rasid (2012)
b. Financial Leverage (FL)	Book value of liabilities / Market value of equity	Bloomberg	Pagach, and Warr (2010), Hoyt and Liebenberg (2011), Farrell and Gallagher (2015)

Table 2. Descriptive statistics

Variable	Mean	Median	Max	Min	Std. Dev	N
Environment Uncertainty	30.47683	28.74362	46.66140	10.30889	7.926390	1435
Industry Competition	0.015813	0.004204	0.182923	0.000052	0.026769	1435
Firm Complexity	2.937979	3.000000	10.00000	1.000000	1.211141	1435
Firm Size	17.12995	16.83968	25.60336	1.609438	4.117361	1435
Financial Leverage	1.715193	0.860262	22.74331	0.000650	2.648160	1435
ERM	0.019919	0.020000	0.031250	0.003750	0.003252	1435
Intellectual Capital	15.62967	15.91114	23.83971	5.129380	3.465822	1435
Firm Performance	1.218930	1.018572	5.331107	0.204720	0.742213	1435

means and medians around 1.22 and 1.02, respectively. Additionally, the data indicate moderate environmental uncertainty, low industry competition, moderate firm complexity, limited implementation of ERM, varying levels of intellectual capital, and varying firm performance.

The analysis began by computing correlations among the variables listed in Table 3. Correlations were considered significant if the p-value was less than 0.05, indicating a relationship between the variables. Conversely, a p-value greater than 0.05 indicates no correlation, as indicated by the Pearson correlation coefficient. The relationship between environment uncertainty and industry competition, ERM, IC, and performance is strongly positive, while there is a significant negative correlation with firm complexity. Industry competition has a positive correlation with environmental uncertainty and IC and a significant negative correlation with firm complexity. Additionally, there is a significant negative correlation between industry competition and firm complexity and ERM. Conversely, the study found that ERM is positively correlated with environmental uncertainty, IC, and performance. Additionally, IC exhibits strong positive correlations with environmental uncertainty, industry competition, ERM, and performance. Performance has positive correlations with environmental uncertainty, industry competition, ERM, and IC. These results suggest complex interrelationships, emphasizing the multifaceted nature of organizational dynamics. Intellectual capital appears to be particularly influential across various aspects.

The Chow test aims to differentiate between the Common Effect Model approach and the Fixed Effect Model. According to this hypothesis, H_0 will be rejected if the probability value of Cross Section Chi-Square is < 0.05. Conversely, if H_1 has a probability value of Cross Section Chi-Square > 0.05, it will be accepted. The Chow test yielded in

Table 3. Pearson correlation

Variable	EU	IndCom	FC	FZ	FL	ERM	IC	P
Environment Uncertainty (EU)	1.000	0.159**	–0.102**	0.426**	0.150**	0.073**	0.261**	0.115**
	–	0.000	0.000	0.000	0.000	0.006	0.000	0.000
Industry Competition (IndCom)	0.159**	1.000	–0.027	0.110**	0.055*	0.022	0.079**	–0.026
	0.000	–	0.313	0.000	0.036	0.409	0.003	0.320
Firm Complexity (FC)	–0.102**	–0.027	1.000	–0.008	0.017	0.278**	–0.076**	–0.067*
	0.000	0.313	–	0756	0.524	0.000	0.004	0.012
Firm Size (FZ)	0.426**	0.110**	–0.008	1.000	0.114**	0.064*	0.431**	0.88**
	0.000	0.000	0.765	–	0.000	0.016	0.000	0.001
Financial Leverage (FL)	0.150**	0.055**	0.017	0.114**	1.000	0.103**	0.000	–0.001
	0.000	0.036	0.524	0.000	–	0.000	0.994	0.976
ERM	0.073**	0.022	0.278**	0.064*	0.103**	1.000	0.071**	0.126**
	0.006	0.409	0.000	0.016	0.000	–	0.007	0.000
Intellectual Capital (IC)	0.261**	0.079**	–0.076**	0.431**	0.000	0.071**	1.000	0.267**
	0.000	0.003	0.004	0.000	0.994	0.007	–	0.000
Firm Performance (P)	0.115**	–0.026	–0.067*	0.088**	–0.001	0.126**	0.267**	1.000
	0.000	0.320	0.012	0.001	0.976	0.000	0.000	0.000

Note: * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

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Table 4. The Chow test results show a probability value of 0.0000. Based on the test, if the p-value is less than the 0.05 significance level, then the Fixed Effect Model is preferred, and the Lagrange Multiplier (LM) test is not needed.

Table 4. Chow test results

Effect Test	Statistics	d.f.	Prob.
Cross-section F	9.435535	(204.1221)	0.0000
Cross-section Chi-square	1358.103564	204	0.0000

Table 5. Hausman test result

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	31.694569	(204.1221)	0.0062

Hausman test can further distinguish between the Fixed Effect Model approach and the Random Effect Model. Based on the hypothesis, H_1 is rejected if the probability value of the Cross Section Chi-Square is less than 0.05. Conversely, if H_0 has a probability value of Cross Section Chi-Square greater than 0.05, it is accepted. The Hausman test results in Table 5 show a probability value of 0.0002. In the Hausman test, if the p-value is less than the 0.05 significance level, the estimation model chosen is the Fixed Effect Model. It can be concluded that the best regression estimation model is the fixed effect model.

This regression analysis is divided into two subparts: (1) determining the impact of contingency variables (environmental uncertainty, industry competition, and firm complexity) on ERM and (2) analyzing the impact of contingency variables and ERM on firm performance variables.

Table 6 presents the findings of the hypotheses. The results of the hypothesis testing indicate that there are significant relationships between several variables and the outcome variables of ERM and firm performance. In Model 1, which examines the determinants of ERM, the constant term is significant (p = 0.0370), suggesting that it exerts a baseline influence on ERM. However, Environment Uncertainty (EU) does not significantly affect ERM (p = 0.2974). However, industry competition (IndCom) and Firm Complexity (FC) positively impact ERM, with IndCom showing significance at the 5% level (p = 0.0423) and FC at the 1% level (p = 0.0054). Control variables, namely Firm Size (FZ) and Financial Leverage (FL), also demonstrate significant positive effects on ERM, with both reaching statistical significance at the 1% level (p = 0.0069 and p = 0.0000, respectively). The adjusted R-squared for Model 1 is 0.651439, indicating that approximately 65.14% of the variance in ERM is explained by the included variables.

Table 6. Hypotheses evaluation

Variable	Model 1 Outcome Variable ERM			Model 2 Outcome Variable Firm Performance		
	Coeff.	t	Prob.	Coeff	t	Prob
Direct Effect Main Effect						
C	0.00560	1.231488	0.0370	0.656560	2.845343	0.0045
EU	2.02E–05	1.042396	0.2974	–0.005223	–2.830400	0.0047***
IndCom	0.029075	1.983452	0.0423**	–1.053884	–1.737263	0.0411***
FC	0.000676	3.282898	0.0054***	0.030138	3.528514	0.0011***
ERM				17,58695	6.441722	0.0000***
Control Variable						
FZ	0.000100	2.695475	0.0069***	0.023854	1.730950	0.0378***
FL	0.000152	4.289178	0.0000***	–0.003716	–2.33567	0.0057***
Indirect Effect						
EU – ERM – P				1.33085		
IndCom – ERM – P				6.22457		
FC – ERM – P				2.92240		
Moderating effect						
ERM*IC				–0.777802	–3.875361	0.0008
Adjusted R-Squared	0.651439			0.538919		

Note: * Significant at α = 0,1. ** Significant at α = 0,05. *** Significant at α = 0,01.

In Model 2, which focuses on firm performance, ERM demonstrates a highly significant positive effect (p = 0.0000). The constant term is also significant (p = 0.0045), underscoring a fundamental positive influence on firm performance. EU negatively impacts firm performance significantly at the 1% level (p = 0.0047). IndCom demonstrates a significant negative effect at the 5% level (p = 0.0411), while FC exerts a positive influence on firm performance significantly at the 1% level (p = 0.0011). Control variables also exhibit significance, with FZ exerting a positive effect on firm performance at the 5% level (p = 0.0378) and FL exerting a negative effect at the 1% level (p = 0.0057). The moderating effect of the interaction between ERM and Intellectual Capital (ERM*IC) is significantly negative (p = 0.0008), indicating that high industry competition diminishes the positive impact of ERM on firm performance. The adjusted R-squared for Model 2 is 0.538919, suggesting that 53.89% of the variance in firm performance is accounted for by the model's variables. These results emphasize the complex interplay between ERM, economic factors, and industry dynamics in shaping firm performance.

5. DISCUSSION

The study did not validate H_1, which suggests that environmental uncertainty impacts ERM, as the probability value exceeds the 0.05 significance level. These findings contradict earlier research, specifically the affirmation by Gordon et al. (2009) of a significant and positive correlation between environmental uncertainty and ERM. This discrepancy may be attributed to the unique regulatory and environmental conditions in Southeast Asia, which differ from the contexts studied by Gordon and colleagues. Several factors in Southeast Asia's mining industry may affect the relationship between environmental uncertainty and ERM. Government regulations related to sustainability, business permits, and environmental concerns can create a more stable and reliable business environment, reducing uncertainty and impacting companies' ERM practices (Sarfraz et al., 2023 ; Zhong & Peng, 2022). Implementing ERM allows firms to be proactive in anticipating market shifts, despite fluctuations in market demand and commodity prices (Onu & Mbohwa, 2019). Establishing strong connections with local communities, relevant organizations, and stakeholders can help mitigate environmental hazards and improve social stability. However, the mining sector in Southeast Asia is vulnerable to various environmental uncertainties, such as fluctuations in commodity prices, regulatory modifications, and governmental policies (Nguyen, 2020). Mining corporations in the area should prioritize efficient risk management in their ERM strategy.

The study confirmed the hypothesis that environmental uncertainty has a negative impact on performance. The study found that there is a significant correlation between firm performance and environmental uncertainty, with a probability value of 0.0047 < 0.05. Environmental uncertainty introduces unpredictable risks and challenges, which can impede a company's operational efficiency and effectiveness. In the mining industry, environmental uncertainty is affected by various factors, including government regulations, community concerns, and natural disasters. Government regulations play a crucial role in managing environmental uncertainty in mining. Strict regulations can help mitigate the environmental impact of mining, while lenient regulations can lead to degradation and legal issues. Southeast Asian governments are currently implementing policies to enhance environmental governance in mining. Community concerns contribute to environmental uncertainty, particularly regarding the environmental and social effects of mining. In Southeast Asia, such concerns can lead to conflicts that negatively affect company performance. Natural disasters can cause significant uncertainty, disrupt mining operations, and lead to environmental harm. Mining companies operating in Southeast Asia face increased risk due to the region's susceptibility to such disasters (García-Amate et al., 2023; Craik, 2020). While some studies suggest that uncertainty has a positive effect on innovation and corporate adaptation (Prihatningtyas, 2018), the findings of this study are consistent with previous research showing a negative correlation between environmental uncertainty and firm performance (Gerloff et al., 1991).

The study's results support H_3 and demonstrate a significant impact of industry competition on ERM at the 0.05 level of significance. The find-

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ings suggest that ERM practices in Southeast Asian mining companies could be affected by industry competition. Competitive pressures may lower prices and profit margins, as well as limit resources available for ERM, which can influence this relationship. Additionally, competition fosters innovation and the implementation of new technologies, which in turn introduces new risks and affects the company's ERM priorities. Furthermore, industrial competition can prompt alterations in policies and regulations, particularly in the mining sector, where inherent high risks exist (Golshan & Rasid, 2012). Companies that can anticipate and adapt to such changes possess a competitive edge in risk management (Pagach & Warr, 2010). Other studies, such as Gordon et al. (2009), Pagach and Warr (2010), and Manobi and Umar (2021), emphasize the importance of implementing ERM in competitive sectors. However, Golshan and Rasid (2012) hold a different perspective, arguing that industry competition is not the primary driver of ERM adoption.

The study confirms H_4, indicating that industry competition has a significant negative impact on firm performance (prob = 0.0411 < 0.05). This competition poses significant risks that can reduce performance. According to Joshi et al. (2013), analysts and investors use firm performance to compare firms in similar industries. Tight market conditions can limit business concentration, influence investments, and demand effective strategies from companies In Southeast Asia's competitive mining industry, environmental and social risk management and the adoption of advanced technologies are key. Intense industry competition can cause fluctuations in prices, cost pressures, regulatory and social pressures, depletion of resources, and the need for constant innovation and investment. All these factors have the potential to impact the performance of mining companies. Thus, intense competition may weaken firm performance, as noted by Krishnan (2005) and Al-rfou (2012). The effectiveness of implemented strategies affects the relationship between industry competition and firm performance (Wu & Pangarkar, 2010). To enhance competitiveness and performance, it is necessary to develop appropriate strategies that create a competitive advantage (Manijeh et al., 2013).

The study confirms the validity of H_5 and demonstrates that firm complexity has a significant and positive impact on ERM, with a probability value of 0.0054. This suggests that companies with more complex businesses should prioritize ERM implementation. Previous research has also emphasized the significance of business complexity in risk management (Lam, 2014; Beasley et al., 2005; Chernobai et al., 2021). In this context, firm complexity is linked to the number of business segments. This indicates that companies with more segments face greater complexity and intricate risks (Golshan & Rasid, 2012). Furthermore, firm complexity is related to agency theory. The more complex a company is, the more difficult it is to control and supervise, resulting in exploitable information gaps. Therefore, companies adopt ERM as a solution to address these risks and complexities. ERM serves as a framework that coordinates a company's risk management, fosters collaboration among business units, and facilitates effective risk management. Studies by Gordon et al. (2009), Jurdi and AlGhnaimat (2021), suggest that companies with greater complexity are more likely to adopt ERM to manage risks. However, Golshan and Rasid (2012) did not identify a significant relationship between firm complexity and ERM, contradicting this claim.

The study confirms H_6, indicating that the firm complexity of mining firms in Southeast Asia has a significant impact on firm performance (probability 0.0011 < 0.05). The study suggests that company size and complexity, as well as ERM and industry competition, have a positive impact on firm performance (Pangestuti et al., 2022). This implies that the performance of mining companies in Southeast Asia is linked to the complexity of a firm, which can be assessed through factors such as size and business segments. The total number of business sectors can indicate a company's diversification and size, which can help avoid dependence on a single market or product. However, managing complexity requires prudence, as too many segments can increase management burdens. While managing complexity can foster synergy and efficiency, it is crucial to take industry-specific strategies into account.

The study did not support H_7. The results of the Sobel test demonstrate that ERM does not me-

diate the correlation between environmental uncertainty and firm performance (Z = 1.33085 < 1.96). The mining sector experiences substantial levels of uncertainty due to the variation in countries, cultures, and regulations. Although ERM can aid in managing risks, this approach does not address all aspects of environmental uncertainty. Anticipating external factors, such as political changes and commodity price fluctuations, can be challenging. Moreover, relying solely on ERM is not a comprehensive solution for increasing company performance. Therefore, mining companies operating in the complex business environment of Southeast Asia must adopt holistic and adaptive strategies that cover risk management and other aspects. This way, they can address uncertainty and leverage existing opportunities. This finding aligns with contingency theory, which emphasizes that a company's performance depends on environmental conditions. Studies by Gordon et al. (2009) and Kuznik (2016) support the idea that uncertainty requires the implementation of risk management. Therefore, in environments with high uncertainty, companies can effectively enhance their performance.

The study confirms the validity of H_8. The data suggest that ERM serves as a mediator between industry competition and firm performance (Z = 6.22457 > 1.96). In a highly competitive and intricate business environment, effective ERM may promote a company's resilience and sustainability. Mining companies in Southeast Asia experience changes in commodity prices, regulations, and geopolitical circumstances. Therefore, effective strategies to manage such risks and capitalize on opportunities are necessary. ERM helps companies identify, assess, and manage risks, allowing them to focus on growth and strategic initiatives. By aligning ERM with strategic objectives, companies can optimize performance, allocate resources efficiently, and build a competitive advantage. ERM promotes a long-term perspective, which is particularly valuable during times of uncertainty, and instills confidence among stakeholders. Pagach and Warr (2010), Gordon et al. (2009), and Manobi and Umar (2021) suggest that increased competition amplifies risk exposure, and adopting ERM can improve corporate performance.

The study confirms H_9 with statistical significance (Z = 2.92240 > 1.96) and suggests that ERM mediates the relationship between a firm's complexity, which includes its operations, structure, and processes, and its performance in the mining industry. ERM acts as a vital risk management mechanism that enables resource optimization, adaptation to market changes, and maintenance of stakeholder confidence. In a constantly evolving and complex business environment, ERM enables mining companies to make well-informed decisions, strengthen organizational coherence, and gain a competitive advantage in Southeast Asia. Gordon et al. (2009), Jurdi and AlGhnaimat (2021), support the idea that ERM plays a strategic role in enhancing business resilience and achieving sustainable performance in the mining industry.

The study confirms the validity of H_{10}. This is supported by the moderated regression analysis (MRA) results, which reveal a negative t-statistic and a probability value below the significance threshold of 0.05. The study confirms the negative relationship between firm performance and the moderator variable Intellectual Capital, which interacts with the independent variable ERM. The IC variable functions as a quasi-moderator that can serve as both a moderator and an independent variable. In the mining industry context, IC plays a critical role in identifying risks, improving operational efficiency, and establishing relationships with stakeholders. IC helps accurately identify risks, structural capital enables ERM implementation with technology, and relational capital minimizes reputation risks. The impact of IC on innovation, operational efficiency, and competitive advantage aligns with resource-based theory. It can be inferred that the presence of IC optimally helps companies implement ERM, thereby creating superior performance. This is consistent with the findings of previous studies (Nocco & Stulz, 2006; Oktari, 2016; Khan & Ali, 2017; Khan et al., 2019). However, Aryanti et al. (2021) and Widarjo (2011) reported differing results. They found that IC is unable to moderate ERM and firm performance. This suggests that investors may not necessarily assign higher valuations to companies with high IC, indicating that IC is not always a determining factor in company

http://dx.doi.org/10.21511/imfi.21(2).2024.29

performance according to investor perceptions. The absence of standardized IC measurements makes it difficult for investors to accurately assess performance. As a result, companies prioritize the efficiency of physical and financial assets, which are more highly valued by investors.

CONCLUSION

The results of this study show a significant and optimistic correlation between industry competition, firm complexity, and the application of ERM in mining companies in Southeast Asia. Nevertheless, environmental uncertainty does not possess a noteworthy effect. Concerning firm performance, the firm complexity variable exerts a favorable and noteworthy impact. Environmental uncertainty and industry competition have negative and significant impacts on firm performance, while ERM has been identified as a mediator between industry competition and firm complexity toward performance. On the other hand, the association between environmental uncertainty and firm performance is not substantial. Additionally, intellectual capital moderates the influence of ERM on company performance and acts as a quasi-moderator. Overall, this study offers valuable insights into the correlation between contingency factors including environmental uncertainty, industry competition, firm complexity, ERM, intellectual capital, and firm performance in the mining sector in Southeast Asia. The results can guide mining firms in creating effective risk management strategies to enhance their performance.

However, it is important to note that the findings are limited to the mining industry in Southeast Asia and may not be immediately applicable elsewhere due to the unique characteristics of the sector. Factors such as resource availability, environmental policies, and community interactions could limit the generalizability of the results. Furthermore, the study failed to consider all possible variables that may impact the link between contingency factors, ERM, intellectual capital, and firm performance. To conduct a more comprehensive analysis, future research should encompass a wider range of factors. Additionally, the study's use of keyword searches to evaluate ERM implementation may introduce subjective evaluations. To provide more objective insights into ERM practices, it is recommended to employ methods such as surveys, interviews, and case studies.

AUTHOR CONTRIBUTIONS

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