



(Green) Strategic Orientation, Innovation Capabilities, and (Green) Competitive Advantage in the Coal Mining Industry

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Received : August 28, 2024

Revised : August 29, 2024

Accepted : August 29, 2024

Online : September 11, 2024

Abstract

Despite its economic importance, the coal mining industry confronts significant environmental challenges. Indonesia prefers coal to renewables because of its lower cost. This study investigates the influence of green strategic orientation in promoting business model innovation and a green competitive advantage in the coal mining industry. The findings indicate that a green strategy orientation enhances green competitive advantage through innovation capability. Environmental and innovation capabilities are critical for successfully implementing business model innovation. This study identifies significant aspects that contribute to green competitive advantage and business model innovation. While the study offers useful insights, it has practical and managerial consequences for business sustainability in the coal mining industry.

Keywords *Strategic Orientation; Innovation Capability, Business Model Innovation, Competitive Advantage, Coal Mining Industry, Sustainability*

INTRODUCTION

Coal mining has made a considerable contribution to global economic growth, with coal-fired power plants producing more than 26.8% of total energy and 39% of electricity. However, the worldwide coal market has recently fallen, with the power industry accounting for more than 40% of the reduced demand in 2020. Despite efforts to diversify energy sources, Indonesia, a major coal producer and exporter, remains dependent on coal due to its low cost and importance in generating foreign income. The government is expected to continue relying on coal exports to address trade imbalances in the near future.

Global Environmental Challenge: Energy Transition

Global warming, pollution, and ozone layer depletion are now serious global concerns (Ferreira et al., 2020; Adams et al., 2019). The energy transition favours renewable energy over coal in the electrical mix. Despite coal's significance in driving economic growth, particularly in emerging markets, its high greenhouse gas emissions generate serious environmental issues. The move to renewable energy is accelerating as it becomes more economical and sustainable, but coal's negative impact on local resources hinders the process. "Clean coal" technologies such as wet scrubbers and Carbon Capture and Storage (CCS) seek to minimize emissions. However, CCS is costly and difficult to install, with development expenditures possibly exceeding \$100 billion annually. Under the Paris Agreement, Indonesia has pledged to decrease greenhouse gas emissions by 29% by 2030. However, fulfilling its renewable energy targets is proving tough.

Coal, which accounted for 61.9% of Indonesia's energy mix in 2018, remains a significant barrier to meeting the goals established in the National Energy Security Plan. The Indonesian government intends to enhance the mix of coal and renewable energy, with a preference for coal because of its low cost despite societal consequences. Coal receives subsidies, but coal facilities risk

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becoming stranded assets as renewables such as wind and solar become more cost-effective. A green strategic approach is critical for firm innovation and competitiveness.

LITERATURE REVIEW

As firms increasingly prioritize sustainability, the business case for this shift remains debated (Mihalache & Volberda, 2021). Research on strategic orientation towards sustainability yields mixed results, though some studies, like Adams et al. (2019), suggest it enhances firm performance and competitive differentiation. Strategic orientation, a concept integral to business performance, refers to a firm's strategic direction to maintain superior performance and achieve a competitive edge. It is measured through entrepreneurial orientation (Klein et al., 2021; Purity et al., 2020), market orientation (Klein et al., 2021; Purity et al., 2020), technology orientation (Klein et al., 2021), and internal environmental orientation (Fatoki, 2021).

Environmental capability, defined by Hart and Dowell (2011) as a firm's ability to minimize environmental harm while conducting business, is crucial for sustainability. Key environmental capabilities include organizational learning (Henri & Journeault, 2006; Lankoski, 2008), managerial competencies (Orlitzky et al., 2003), and shared vision (Aragon-Correa & Sharma, 2003; María et al., 2010). The resource orchestration view addresses how managers transform resources into capabilities and is vital for enhancing competitive performance (Carnes et al., 2017). It focuses on structuring, bundling, and leveraging resources (Kristoffersen et al., 2021).

Sustainability-oriented strategies promote innovation by integrating inventive behaviours and processes (Foss & Saebi, 2015). Innovation capability, which includes marketing and process innovation capabilities as well as innovation culture (Calik et al., 2017), is essential for developing new products, processes, and business models (Jan & Maulida, 2022). Business model innovation (BMI) involves redesigning value propositions or constellations to secure a sustainable competitive advantage (Wirtz & Daiser, 2017). Sustainable BMI aims to positively impact the environment and society while delivering economic value (Baldassarre et al., 2017). Klein et al. (2021) measure (sustainable) BMI by value offering innovation, value architecture innovation, revenue model innovation, and environmental turbulence. It found that a firm's competence and strategic orientation influence BMI's ability to produce value and discover innovative approaches.

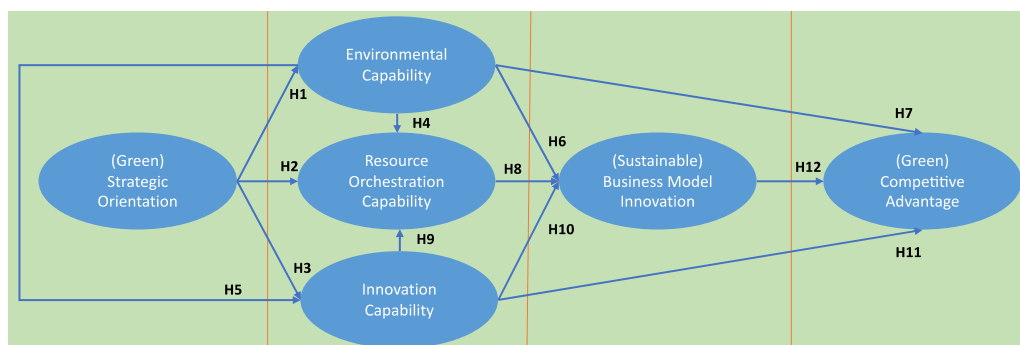


Figure 1. Conceptual Model

Firms can achieve a competitive advantage through innovation in their business models, as highlighted by Wei et al. (2014) and Amit and Zott (2010). This study measures competitive advantage through product uniqueness (Gleißner et al., 2013), product adaptation, and green competitive advantage (Fatoki, 2021). For the coal industry, focusing on green strategic orientation is essential for driving business model innovation and achieving green competitive advantage. This requires leveraging environmental, resource orchestration, and innovation capabilities to adapt to the increasing demand for sustainable practices and maintain a competitive edge in a shifting global

market.

(Green) Competitive Advantage of the Indonesian Coal Industry

Competitive advantage refers to a company's superior market position, which allows it to outperform its competitors (Porter et al., 1985). To do this, coal plants must incorporate environmental issues into their operations (Ghosh, 2023), such as ISO 14001:2004 certification. This strategy, known as Green Competitive Advantage (GCA), helps to reduce the tension between environmental management and corporate performance (Astuti & Datrini, 2021; Chen & Tian, 2022). While the definition of GCA varies, all emphasize the significance of maintaining environmental management positions that competitors find difficult to replicate (Astuti & Datrini, 2021; Chen & Tian, 2022) for long-term advantage.

Research Gap

Research on the link between strategic orientation to sustainability, business model innovation (BMI), and sustainability is limited, particularly in coal plants. This study explores the relationship between green strategic orientation, internal resources, and BMI in the coal industry, highlighting how sustainability impacts firm strategy and competitive advantage amid global environmental challenges. It contributes to the literature on strategic management by combining a firm's internal strategies and capabilities to gain a competitive advantage while considering sustainability.

RESEARCH METHOD

The population in this study was drawn from the coal mining industry sector throughout Indonesia from May to June 2022. The data was collected as a sample, and the questionnaire was given to coal mining firms and their contractors using a Google Form link. This study incorporates quantitative methods. The study was done using cross-sectional data; therefore, it only depicts the industry's conditions at a certain point in time, and the study's findings primarily focus on coal mining.

This study evaluates respondent survey data using the Structural Equation Modeling (SEM) application LISREL. Hair et al. (2018) defined SEM as a statistical model that explains correlations between several variables and outperforms other regression or multivariate processes. The data is evaluated using the "two-stage approach" of the SEM (Wijayanto, 2008). Confirmatory Factor Analysis (CFA) was performed to determine whether specific observed components could be classed as latent variables. In factor analysis, we assume that the latent variables "cause" the observed variables, as represented by the single-headed arrows that point away from the circles and toward the manifest variables (Albright & Vanek, 2008), and then we evaluate how well the model matches the observed data. Second, the structural model is analyzed.

FINDINGS AND DISCUSSION

Measurement Model Analysis

A model's Goodness of Fit Index (GOFI) is determined by comparing its calculated and standard values. In this work, we employ normed chi-square (NCS), p-value, RMSEA, standardized RMR (SRMR), goodness of fit (GFI), normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), incremental fit index (IFI), and relative fit index. Overall Measurement Model's goodness-of-fit indices are good. All latent variables (SO, EC, IC, ROC, BMI, CA) are valid and reliable in the model (refer to Table 1). It shows that all dimensions are valid and all latent variables are dependable (Hair et al., 2018).

Table 1. Overall Measurement Model Analysis

Latent Variables	Construct Reliability	Variable Extracted	Conclusion
SO	0.99	0.93	Reliable
EC	0.96	0.88	Reliable
ROC	0.95	0.86	Reliable
IC	0.98	0.94	Reliable
BMI	0.94	0.79	Reliable
CA	1.00	1.00	Reliable

¹Standard Loading Factor

Structural Equation Model (SEM) Analysis

Table 2 reveals that almost all of the overall measurement model's goodness of fit indices produce positive results, with the exception of GFI (0.88) as a marginal fit. Nonetheless, the SEM has high goodness of fit indices.

Table 2. Goodness of Fit Indices of Structural Equation Model

GOFI	Criteria	Value	Result
NCS	≤ 2	0.9366	Good Fit
p-value	>0.05	0.7000	Good Fit
RMSEA	≤ 0.08	0.0000	Perfect Fit
SRMR	≤ 0.05	0.0140	Good Fit
GFI	≥ 0.90	0.8800	Marginal Fit
NFI	≥ 0.90	0.9900	Good Fit
NNFI	≥ 0.90	1.0000	Perfect Fit
CFI	≥ 0.90	1.0000	Perfect Fit
IFI	≥ 0.90	1.0000	Perfect Fit
RFI	≥ 0.90	0.9900	Good Fit

Table 3 indicates that all latent variables (SO, EC, IC, ROC, BMI, and CA) are valid and reliable. All dimensions are valid, and all variables are dependable (Hair et al., 2018).

Table 3. Structural Equation Model (SEM) Analysis

Latent Variables	Dimensions	SLF ¹	Error	Construct Reliability	Variable Extracted	Conclusion
SO				0.99	0.93	Reliable
	SO.MO	1.00	-0.0042			Valid
	SO.EO	0.96	0.094			Valid
	SO.TI	0.96	0.077			Valid
	SO.IEO	0.98	0.043			Valid
EC				0.96	0.83	Reliable
	EC.MC	0.93	0.150			Valid
	EC.OL	0.95	0.120			Valid
	EC.SV	0.96	0.083			Valid
ROC				0.95	0.86	Reliable
	ROC.S	0.90	0.260			Valid
	ROC.B	0.95	0.093			Valid
	ROC.L	0.97	0.069			Valid
IC				0.98	0.94	Reliable
	IC.MIC	0.97	0.059			Valid
	IC.PIC	0.97	0.064			Valid

Latent Variables	Dimensions	SLF ¹	Error	Construct Reliability	Variable Extracted	Conclusion
BMI	IC.IC	0.97	0.062	0.98	0.92	Valid
	BMI.VOI	0.96	0.082			Reliable
	BMI.VAI	0.97	0.063			Valid
	BMI.RMI	0.96	0.080			Valid
	BMI.ET	0.96	0.077			Valid
CA				1.00	1.00	Reliable
	CA.UP	1.00	0.000			Valid
	CA.CR	1.00	0.000			Valid
	CA.GCA	1.00	0.001			Valid

¹Standard Loading Factor

Hypothesis Test

Table 4 summarizes the research SEM hypotheses tests. Six hypotheses (H2, H4, H5, H7, H8, H12) were rejected, while others (H1, H3, H6, H9, H10, H11) were accepted.

Table 4. Hypothesis Test

Hypothesis	Paths	β	t-value	Conclusion
H1	SO → EC	0.95	16.62	H1 Accepted
H2	SO → ROC	0.26	1.70	H2 Rejected
H3	SO → IC	0.69	2.56	H3 Accepted
H4	EC → ROC	0.01	0.03	H4 Rejected
H5	EC → IC	0.26	0.96	H5 Rejected
H6	EC → BMI	0.19	2.02	H6 Accepted
H7	EC → CA	0.10	0.60	H7 Rejected
H8	ROC → BMI	-0.11	-0.99	H8 Rejected
H9	IC → ROC	0.69	4.03	H9 Accepted
H10	IC → BMI	0.89	6.06	H10 Accepted
H11	IC → CA	0.63	2.88	H11 Accepted
H12	BMI → CA	0.19	1.33	H12 Rejected

¹Standard Loading Factor

The highest standard coefficient for all hypotheses is β_1 (0.95). It demonstrates how strategic orientation (SO) has a positive impact on environmental capabilities. The hypotheses with the lowest standard coefficient, β_4 , have a value of 0.01. It reveals that environmental capability (EC) is considerably less important in country-level organizations than resource orchestration capability (ROC). Table 6 indicates that the SO to EC pathway has the highest total standard coefficient ($\beta=0.95$), followed by the IC to BMI ($\beta=0.89$), SO to IC ($\beta=0.69$), and IC to ROC ($\beta=0.69$).

Table 5 identifies two routes connecting SO to ROC: ($\beta_2=0.26$), ($\beta_1-\beta_4=0.0095$), and ($\beta_3-\beta_9=0.4761$), resulting in a total standard coefficient of SO to ROC ($\beta_{Total} = 0.7456$). The association between variable SO and IC follows two paths: $\beta_1-\beta_5$ (0.247) and β_3 (0.69). Additionally, two routes connect EC and CA: $\beta_6-\beta_{12}$ (0.0361) and β_7 (0.10). The association between variable IC and CA follows two paths: $\beta_{10}-\beta_{12}$ (0.1691) and β_{11} (0.63). There are two paths in the association between EC and BMI: $\beta_4-\beta_8$ (-0.10) and β_6 (0.19). Two paths connect IC and BMI: $\beta_9-\beta_8$ (0.58) and β_{10} (0.89). The table above also describes two indirect effect routes in which variables are related to one another rather than directly.

Based on six hypotheses that were not supported by the study: 1) Strategic orientation has no effect on resource orchestration capability; 2) Environmental capability has no effect on

resource orchestration capability, innovation capability, or competitive advantage; and 3) Resource orchestration capability has no effect on business model innovation. Nevertheless, we find that a firm can only acquire a competitive advantage from strategic orientation through innovation capabilities (β_3 - β_{11}).

Table 5. Structural Model Decomposition

Relationship between Variables	β Calculation	β Total
SO \rightarrow IC \rightarrow CA	$\beta_3 * \beta_{11}$	0,69 * 0,63 = 0,43
SO \rightarrow EC \rightarrow BMI	$\beta_1 * \beta_6$	0,95 * 0,19 = 0,18
SO \rightarrow IC \rightarrow BMI	$\beta_3 * \beta_{10}$	0,69 * 0,89 = 0,62

Discussion

The COVID-19 pandemic has prompted substantial adjustments in firm operations, including measures to maintain a competitive advantage. Firms must better grasp the global issue of environmental effects, as well as the needs of global customers and business partners in the coal sector, in order to foster a symbiotic mutualism in healthy and sustainable business practices.

The study investigates how strategic orientation improves environmental, resource orchestration, and innovation capabilities when developing business models in Indonesia's coal sector. The findings indicate that green strategic orientation improves environmental and innovation capabilities but has no effect on resource orchestration capabilities. In addition, environmental capabilities have no direct impact on green competitive advantage. It suggests that green strategic orientation enhances green competitive advantage through innovation capabilities. The report links these findings to rigorous government rules (Indonesian Ministry of Energy and Mineral Resources RUPTL 2018-2027) aimed at preventing environmental damage and global pressure to provide green coal products to the international market. As a result, competitors with environmental capabilities can compete in the global market with green products.

Strategic orientation is critical to attaining a competitive advantage because it creates a normative framework for conducting competitive business and choosing acceptable strategies (Purity et al., 2020). It entails dealing with government rules, worldwide market demand, industry standards, and customer behaviour. Strategic orientation is strongly related to firm innovation behaviour, although environmental capability has a limited beneficial impact on innovation capability. However, organizational learning improves both environmental and innovative capability (Henri & Journeault, 2010). Thus, innovation capabilities serve as a link between strategic orientation and other critical aspects such as resource management capability, business model innovation, and competitive advantage.

Environmental capability is critical for protecting the natural environment while meeting government and customer expectations (DeLuca et al., 2016). While it has no direct impact on resource orchestration, innovative capability, or competitive advantage, it promotes business model innovation by addressing shifting environmental challenges (Schulze et al., 2017). To produce or secure long-term competitive advantage, firms must seek out new market business models with altered value propositions or constellations (Wirtz & Daiser, 2017).

Furthermore, because firms are constantly focused on complying with environmental rules in the face of rapidly changing environmental concerns, business model innovation has had no significant influence on (green) competitive advantage (Schulze et al., 2017). According to Zehir and Ozgul (2020), business model innovation driven by new technology has had minimal impact on (green) competitive advantage, owing to government rules and regulations, international environmental treaties, and market pro-environmental behaviour. Thus, the firm should establish innovation capability in the Indonesian coal sector to preserve a (green) competitive edge.

Additionally, strategic orientation and environmental capabilities influence innovation capability significantly. This study emphasizes the importance of innovation for firms in the coal industry to gain market share in the future. As a result, firms should reconsider the role of strategic orientation, environmental capability, resource orchestration capability, and innovation capability in business model innovation to embrace business sustainability.

Theoretical Contribution

Previous research highlights that environmental capability significantly impacts long-term intellectual capital in advanced countries through managerial skills, innovation, and stakeholder integration, influencing economic and environmental performance. It also explored the role of proactive environmental strategy in enhancing competitive advantage. However, findings revealed that strategic orientation does not significantly affect resource orchestration capability, though it is crucial for maintaining competitive advantage. During the pandemic, business model innovation had a limited impact on Indonesia's coal industry, as survival was prioritized over strategy development. Government regulations further restricted new business model opportunities in this sector.

Managerial Contribution

The study's findings are critical for the coal industry, particularly in Indonesia, because they provide practical applications of strategic orientation, business model innovation, and environmental skills to generate a green competitive advantage. The study focuses on changes in industry behaviour during the COVID-19 pandemic and offers many viewpoints on the linkages between strategic orientation, environmental capability, resource orchestration capability, and innovation capability in developing economies.

CONCLUSIONS

The study examines the coal mining industry in Indonesia, focusing on how green strategic orientation contributes to business model innovation and competitive advantage. It finds that green strategic orientation improves competitive advantage through innovation capability. The study explores key factors like environmental knowledge, resource orchestration, and innovation capabilities that contribute to green competitive advantage and business model innovation. While the study provides valuable insights, it has limitations, and future research can use the research model to study coal mining industries in other countries and examine geographical factors.

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