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Eco-Innovation Adoption in Emerging Markets: Analyzing Managerial and Environmental Factors in Indonesian SMEs

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ABSTRACT

Purpose — *This study examines the influence of managerial and environmental factors on the adoption of eco-innovation practices to improve business sustainability in small manufacturing firms.*

Method — *The research employs a quantitative approach, gathering primary data from 110 owners and managers of small manufacturing firms in Bandung, Indonesia. Structural Equation Modeling (SEM) is utilized to analyze the relationships between managerial and environmental drivers, eco-innovation practices, and business sustainability. The data was analyzed using the Partial Least Squares (PLS) method via SmartPLS 3.0 software.*

Result — *The study's findings demonstrate that both managerial drivers (such as eco-commitment, eco-efficiency, and eco-capability) and environmental drivers (including eco-consumer demand, eco-regulation, and eco-competition) have a significant positive impact on the adoption of eco-innovation practices. These eco-innovation practices, in turn, significantly contribute to enhancing business sustainability. This underscores the importance of integrating sustainable practices into business operations and proactively responding to environmental pressures to achieve long-term competitive advantage.*

Novelty — *This research offers new insights by focusing on small manufacturing firms in an emerging market—a context that has been relatively underexplored in existing literature. Unlike previous studies that mainly target large enterprises or developed markets, this study highlights the critical role of eco-innovation in promoting sustainability within small firms in Indonesia. Moreover, it distinguishes the unique impacts of both managerial and environmental drivers, providing a more comprehensive understanding of the factors that motivate the adoption of eco-innovation practices in small enterprises.*

Keywords: *managerial drivers, environmental drivers, eco-innovation practice, business sustainability*

INTRODUCTION

In recent years, there has been a significant global increase in awareness and discourse surrounding environmental concerns (Almeida & Wasim, 2023). However, despite this heightened focus, the world continues to suffer the detrimental effects of human actions. A United Nations report emphasizes the severe impact of these actions, including biodiversity loss, escalating desertification, and climate change, all of which pose significant risks to human life (UN, 2023). These issues are particularly evident in the rising incidence of

respiratory illnesses linked to waste and water pollution, the deterioration of urban living conditions, and the growing frequency of floods. The challenges are even more pronounced in vulnerable regions where living conditions are already precarious.

It is crucial that societal progress does not come at the expense of the environment. A fundamental principle in this context is that development should meet present needs without compromising the ability of future generations to meet their own (Emina, 2021). This principle underpins sustainable development, which seeks to balance current and future demands for a sustainable and inclusive future for both the planet and its inhabitants. Guo, Chen, Sun, Wang, and Xue (2021) support this view, advocating for the integration of environmental policies and innovation to address the challenges of sustainable growth. Sustainable development is built on three pillars: environmental integrity, economic viability, and social equity (Mensah, 2019). Achieving sustainability relies on maintaining a proper balance among these pillars.

The growing emphasis on environmental sustainability has prompted businesses of all sizes, from small enterprises to large corporations, to embrace eco-friendly practices. In today's era of environmental consciousness, eco-innovation, including practices such as reuse, recycling, and reduction, has become essential for minimizing environmental impact (Aboelmaged & Hashem, 2019). It is crucial for companies to comply with environmental regulations. Despite the significant attention given to business sustainability and innovation in both academic literature and practical applications, the specific actions and strategies that companies employ to realize these concepts remain unclear (Bossle, Dutra De Barcellos, Vieira, & Sauvée, 2016). The key question is what drives eco-innovation within the context of business sustainability (Han & Chen, 2021; Hasan & Rahman, 2023). Therefore, it is essential for researchers to investigate the factors that motivate the adoption of eco-innovation in corporate settings.

Prior research on the application of eco-innovation practices for business sustainability, particularly in emerging markets, has been relatively underexplored. Furthermore, key driving factors such as eco-commitment, eco-efficiency, eco-capability, eco-consumer demand, eco-competition, and eco-regulation have not been thoroughly investigated. Notably, there are subtle distinctions among these drivers of eco-innovation, and much of the existing research has been conducted outside Indonesia. For instance, Kiefer, González, and Carrillo-Hermosilla (2018) focus on dynamic capability, competence, and resources as drivers of eco-innovation, while Jové-Llopis and Segarra-Blasco (2018) explore technology push, market pull, and public policy as influencing factors in large companies in Spain. Therefore, the novelty of this study lies in its focus on the underexplored context of small manufacturing firms in an emerging market, specifically Indonesia. It comprehensively examines both managerial and environmental drivers, including eco-commitment, eco-efficiency, eco-capability, eco-consumer demand, eco-regulation, and eco-competition, to understand what motivates these firms to adopt eco-innovation practices. By providing empirical evidence from SMEs, the study contributes a new perspective to the literature, which often centers on developed markets, thereby enhancing our understanding of eco-innovation's role in business sustainability in developing economies.

The purpose of this research is to investigate the impact of management drivers, such as eco-commitment, eco-efficiency, and eco-capability, as well as environmental drivers, including eco-consumer demand, eco-regulation, and eco-competition, on the adoption of eco-innovation practices in small manufacturing firms. The goal is to determine the potential positive impact of these drivers on the implementation of eco-innovations and assess whether these practices contribute to business sustainability. The study focuses on understanding how internal management commitments and external environmental pressures can promote sustainable innovation, thereby improving the long-term economic viability and environmental responsibility of small manufacturing enterprises.

METHOD

This study used primary data collected from respondents who answered a series of questions in the research instrument. The data came from owners or managers of small manufacturing firms in the food and beverage, shoe & bags, handicrafts, textile, and other sectors. The target population was located in Bandung and its surrounding areas because this region is a hub for small manufacturing enterprises in West Java. The sample size was determined following the guidelines suggested by Ghozali (2011), which recommend multiplying the number of parameters by a factor of 5 to 10. Since this research involved one exogenous variable and two endogenous variables, totaling 22 parameters, the minimum sample size needed for this study was calculated as 110 (22 x 5).

The data analysis used Structural Equation Modeling (SEM) with Partial Least Squares (PLS) methodology via SmartPLS 3.0. The research instrument was a four-part questionnaire adapted from various sources to collect demographic information, business characteristics, and respondent biodata. The questionnaire also included items on managerial drivers, environmental drivers, eco-innovation practices, and business sustainability, as shown in Table 1. The constructs were measured using a five-point Likert scale ranging from strongly disagree to strongly agree (1 = strongly disagree, 5 = strongly agree). Additionally, the validity and reliability of the constructs were tested using factor loading, Average Variance Extracted (AVE), discriminant validity, and composite reliability.

Table 1. Variables, Indicators, and Sources

Variables	Indicators	Sources
Managerial Drivers	- Eco-commitment - Eco-efficiency - Eco-capability	Bossle et al. (2016) Peng & Liu (2016) Souza et. al. (2017) Cai & Zhou (2014)
Environmental Drivers	- Eco-consumer - Eco-regulation - Eco-competition	Cai & Zhou (2014) Das (2019) Chygryn & Miskiewicz (2022)
Eco-Innovation Practice	- Innovation of environmentally friendly products - New methods/technologies - Development of eco-friendly processes - Seeking and developing new markets for eco-friendly products	Pacheco et al. (2017) Zhang & Walton (2017) Kuo & Smith (2018)
Business Sustainability	- Success rate in product sales - Success rate of new products - Success rate for the return on investment of new products - Consumer acceptance rate of environmentally friendly products	Cai & Li (2018) Lee & Min (2015) Figueiredo, Patrício, & Reis (2024)

Source: Authors' compilation (2024)

Hypotheses Development

Eco-innovation involves the creation, utilization, or exploration of goods, services, production processes, business models, or management approaches that are new to the organization or consumer. The primary objective is to reduce environmental risks, decrease air pollution, and

mitigate the negative impacts of resource usage compared to other alternatives. The adoption of eco-innovation is driven by two key factors: managerial drivers and environmental drivers.

Managerial Drivers and Eco-Innovation Practices

The ability to develop eco-innovations relies on managerial factors that promote environmental innovation and business progress. Managerial drivers push businesses to evaluate the costs, benefits, and risks associated with adopting eco-innovations. Essentially, companies strive to enhance efficiency, resulting in reduced environmental impact. This is driven by eco-commitment, eco-efficiency, and eco-capability.

Eco-commitment refers to an organization's dedication to achieving environmental objectives by investing time, effort, and resources into sustainability initiatives (Chukwuka & Nwakoby, 2018). It makes environmental goals a core aspect of the organization's mission. The literature suggests that eco-commitment is likely the most influential factor in driving eco-innovation practices. According to a study (Bossle et al., 2016), key internal sources of eco-innovation include environmental capability, environmental leadership, and environmental culture. Eco-commitment is closely linked to a company's successful adoption of eco-innovation practices (Peng & Liu, 2016).

Eco-efficiency is the concept of providing goods and services that meet human needs, improve the quality of life, and minimize environmental impacts and resource consumption throughout a product's entire life cycle. This reduction is crucial to ensure that we stay within the Earth's sustainable capacity (Caiado, Dias, Mattos, Quelhas, & Filho, 2017). Efficiency, including cost savings, was identified as the most significant driving factor, along with the development of improved organizational capabilities, support, and system practices (Bossle et al., 2016). Eco-efficiency drives eco-innovation practices by creating a need for more sustainable and resource-efficient practices within industries (Patra & Hota, 2024). As firms strive to improve their eco-efficiency, they are incentivized to innovate and develop greener processes.

Eco-capability refers to the organizational capabilities that support business sustainability. It encompasses three essential elements: a shared understanding among members regarding the advantages of sustainable practices, clear communication of sustainability initiatives to employees, and the practice of comparing internal strategies with those of competitors (Souza et. al., 2017). Environmental management practices assist companies in developing eco-capabilities and implementing strategies, such as resource reduction, recycling, pollution prevention, and green product design. These practices aim to promote the adoption of eco-innovations, resulting in enhanced environmental quality and reduced costs (Cai & Zhou, 2014). Based on this explanation, we hypothesize that:

H1: Managerial drivers have a positive impact on eco-innovation practices

Environmental Drivers and Eco-Innovation Practices

Eco-innovation relies on both managerial factors and environmental drivers, including eco-consumer preferences, eco-regulations, and eco-competition. Eco-consumers prioritize environmentally friendly products and practices, aiming to reduce their ecological impact and support sustainable development (Reddy et al., 2023). Meeting these demands may require suppliers to improve their sustainability performance and adopt eco-innovative practices. Companies may also expect their vendors to comply with environmental quality standards, illustrating the positive influence of customer-driven needs on eco-innovation (Cai & Zhou, 2014).

Eco-competition refers to a business's ability to develop and utilize green competitive advantages for sustainable growth (Chygryn & Miskiewicz, 2022). This environmental driver arises from competitors who push firms to enhance their innovation capabilities through advancements in resources, technology, and equipment. In response to intense competitive

pressure, other companies may imitate a firm's eco-innovation strategies to strengthen their market presence and increase their market share. Therefore, external competitive forces demanding improved sustainability performance and product quality contribute to the growing necessity for eco-innovation (Cai & Li, 2018).

Eco-regulation encompasses the rules and practices governing environmental management, including policies, institutions, and norms for protecting natural resources (Das, 2019). Unlike other types of innovation, eco-innovation is less driven by firms due to the adverse external impacts associated with environmental issues. As a result, environmental regulations become a key driver of eco-innovation (You, Zhang, & Yuan, 2019). These guidelines can provide additional benefits to regulated companies, potentially leading to increased profits over time. Empirical studies show that stricter environmental regulations encourage eco-innovation practices as a reactive strategy to reduce costs associated with environmental compliance (Wang et al., 2021). Based on this explanation, we hypothesize that:

H2: Environmental drivers have a positive impact on eco-innovation practices

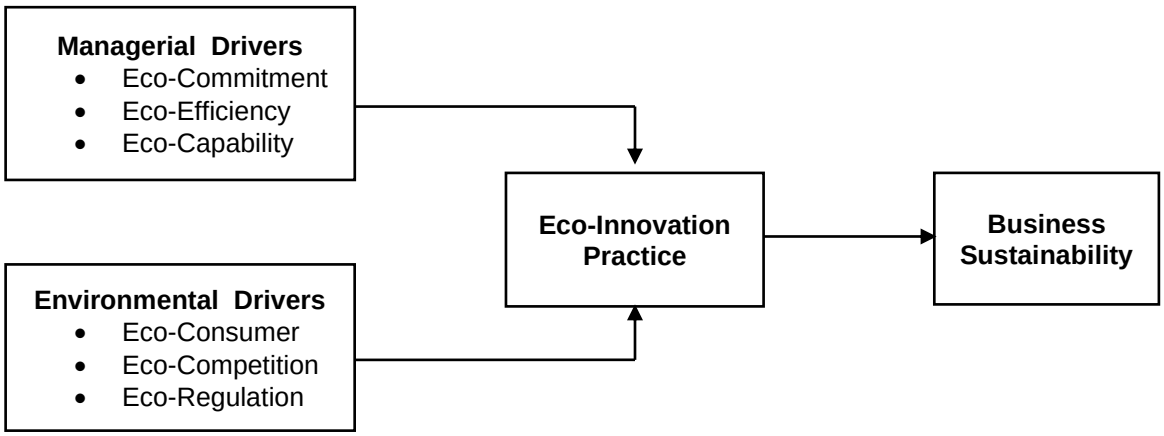
Eco-Innovation Practices and Business Sustainability

Eco-innovation refers to the development of advancements that reduce the environmental impact of production and consumption activities. It plays a crucial role in creating more affordable, eco-friendly, and sustainable societies (Kiefer et al., 2018). Eco-innovation involves identifying innovations that not only generate green profits in the market but also minimize environmental impacts while delivering value to firms (Cai & Li, 2018). This includes developing new market segments, products, services, or processes driven by environmental, social, or sustainability concerns.

By discovering new eco-technologies and introducing green solutions to the marketplace, eco-innovation fosters business sustainability (Kuo & Smith, 2018). It also helps green-oriented firms gain advantages by efficiently utilizing resources and energy, thereby reducing negative impacts on the ecosystem. The ambidextrous nature of eco-innovation provides a framework for balancing business-related and environmental activities that both respond to and shape environmental opportunities (Zhang & Walton, 2017). Eco-innovation also enables green-oriented firms to achieve greater synergies and integration of various resources and capabilities (Ghisetti, Marzucchi, & Montresor, 2015). These synergies suggest that eco-innovation can significantly contribute to the business sustainability of green-oriented firms (Zhang & Walton, 2017). Therefore, eco-innovation is a key driver in the pursuit of sustainable and environmentally conscious business practices. Thus. We hypothesize that:

H3: Eco-innovation practices have a positive impact on business sustainability

Figure 1. Research Model



Source: Compiled by the authors (2024)

RESULT AND DISCUSSION

Descriptive Analysis

According to the distribution data, 80% (88 participants) are male, while 20% (22 participants) are female. The age distribution shows that most participants are between 30 and 50 years old, with 35.5% in the 40–50-year range and 31.8% in the 30–40-year range. Participants over 50 years old make up 21.8% of the population, while the 20–30-year age group accounts for 14.5%. In terms of work experience, 37.3% have been employed for 5-10 years, and 22.7% have 10-15 years of experience. Smaller proportions have worked for shorter or longer periods, with 11.8% having 2-5 years of experience, and 10% each for 20-25 years and 15-20 years.

The business duration data reveals that 34.5% of businesses have been in operation for 11-19 years, with an equal percentage operating for 5-10 years. Fewer businesses have been established for longer periods, with 15.5% operating for 21-30 years and 6.4% for over 30 years. The employee count distribution shows that half of the businesses employ fewer than five people, and 33.6% have 5-10 employees. Only a small percentage have larger workforces, with 11.8% employing 11-20 people, 2.7% employing 21-30 people, and just 1.8% employing more than 30 people. This data suggests that most businesses are small to medium enterprises (SMEs), which is typical of the industry or region.

Lastly, regarding business categories, 40% of businesses are in the Crafts sector, followed by 23.6% in Shoes & Bags, and 20% in the Others category. The Food and Beverage sector comprises 13.6%, and Textiles only 2.7%.

Validity and Reliability Test

The validity test was conducted to determine the accuracy of the data, using the SmartPLS 3.0 application to assess convergent validity (see Table 2). The study included managerial and environmental drivers as independent variables and treated eco-innovation practice and business sustainability as dependent variables. All constructs showed satisfactory validity, as evidenced by Average Variance Extracted (AVE) values exceeding 0.5. Most items had factor loadings greater than 0.7, confirming that they accurately represent the concepts being measured. Specifically, the Managerial Drivers construct had an AVE of 0.652, with factor loadings ranging from 0.758 to 0.864, validating its accuracy. Similarly, the Environmental Drivers and Eco-Innovation Practice constructs demonstrated validity with AVE values of 0.557 and 0.529, respectively, indicating that all variables are valid and suitable for further analysis.

Table 2. Evaluation of Validity and Reliability

Construct	Factor Loading	Standard Deviation	t-statistics (t-table=1.97)
Managerial Drivers (AVE=0.652, CA=0.913)			
Eco-commitment			
We are committed to developing environmentally friendly products	0.864	0.104	8.283
We are continuously improving our production methods to ensure environmental sustainability	0.758	0.139	5.440
Our leadership and management team supports environmentally friendly production processes	0.826	0.103	7.979
Eco-capability			
We have the necessary resources to create products that are environmentally friendly	0.788	0.101	7.837
We prioritize producing products that are free from pollution and waste	0.758	0.088	8.617

Eco-efficiency			
We consistently work toward optimizing production efficiency to produce environmentally friendly products	0.835	0.068	12.355
Producing environmentally friendly products also allow us to save costs	0.819	0.073	11.217
Environmental Drivers (AVE=0.557, CA=0.868)			
Eco-consumer			
Our consumers consistently prioritize environmentally friendly products	0.702	0.178	3.936
We develop environmentally friendly products in response to consumer demand	0.715	0.246	2.903
We develop environmentally friendly products in response to encouragement from the community	0.745	0.203	3.678
Eco-regulation			
We create environmentally friendly products in response to government encouragements	0.756	0.228	3.315
We create environmentally friendly products due to regulatory requirements for eco-friendly production	0.718	0.177	4.061
Eco-competition			
We create environmentally friendly products to compete with both domestic and international products	0.823	0.251	3.274
We create environmentally friendly products because our competitors are also doing so	0.757	0.182	4.148
Eco-Innovation Practice (AVE=0.529, CA=0.704)			
We are always innovating new environmentally friendly products	0.752	0.06	12.586
We continuously strive to find new methods or technologies that are environmentally friendly	0.736	0.052	14.08
We consistently develop environmentally friendly production processes from the beginning to the end	0.708	0.086	8.26
We actively seek and develop new markets for our environmentally friendly products	0.714	0.07	10.123
Business Sustainability (AVE=0.588, CA=0.770)			
Success rate in product sales	0.842	0.031	27.237
Success rate of new products	0.841	0.042	20.246
Success rate for the return on investment of new products	0.693	0.093	7.44
Consumer acceptance rate of environmentally friendly products	0.676	0.09	7.472

Note:
AVE= Average Variance Extracted, CA=Cronbach's Alpha

Source: Processed data (2024)

Table 2 also presents the results of the reliability test, which evaluates the consistency of each variable. With a minimum acceptable value above 0.4, it was determined that all constructs passed the reliability test. A composite reliability value between 0.6 and 0.7 is considered acceptable, while values between 0.7 and 0.9 indicate a higher level of satisfaction (Hair et al., 2014). As shown in Table 2, all constructs demonstrated strong reliability, as evidenced by composite reliability values exceeding 0.7. Specifically, the Managerial Drivers construct achieved a composite reliability of 0.913, indicating high internal consistency among the items within the construct. The Environmental Drivers and Eco-Innovation Practice

constructs also exhibited reliability, with composite reliability values of 0.868 and 0.704, respectively.

Structural Model Testing

The structural model test examines the correlation between variables, significance levels, and R-square values for the relationships between constructs. The PLS research model initially assesses the R-square values of all dependent variables to determine the impact of exogenous latent variables on endogenous latent variables. A higher R-square value indicates a stronger effect on the endogenous variables. As shown in Table 3, the estimated R-square values obtained using PLS reveal that eco-innovation practice has an R-square value of 0.168, and business sustainability has an R-square value of 0.269. This suggests that managerial and environmental drivers account for 16.8% of the variance in eco-innovation practices, while the remaining 83.2% is influenced by variables not included in this model. Additionally, eco-innovation practice explains 26.9% of the variance in business sustainability, with the remaining 73.1% attributed to factors outside the scope of this research model.

Table 3. R-Square

Variables	R-Square
Eco-Innovation Practice	0.168
Sustainable Performance	0.269

Source: Processed data (2024)

Hypotheses Testing

The results presented in Table 4 support all three hypotheses tested in this study. The first hypothesis (H1) posits that Managerial Drivers positively influence Eco-Innovation Practice. This is confirmed by a construct coefficient of 0.328, a standard deviation of 0.065, and a t-statistic of 5.059, which significantly exceeds the critical value of 1.97. This result, significant at the 0.01 level, highlights the essential role of managerial commitment and capabilities in fostering eco-innovation within an organization.

Similarly, the second hypothesis (H2), which asserts that Environmental Drivers positively impact Eco-Innovation Practice, is supported by a construct coefficient of 0.261, a standard deviation of 0.075, and a t-statistic of 3.469, also significant at the 0.01 level. This finding underscores the importance of external environmental factors, such as eco-consumer demand, eco-regulation, and eco-competition, in driving eco-innovation.

Lastly, the third hypothesis (H3) identifies a significant positive relationship between Eco-Innovation Practice and Business Sustainability, evidenced by a construct coefficient of 0.519, a standard deviation of 0.083, and a t-statistic of 6.223.

The results obtained using SmartPLS confirm that the structural equation model effectively captures the correlations between constructs, as assessed through bootstrapping. These findings present an empirical research model that incorporates managerial drivers, environmental drivers, eco-innovation practices, and business sustainability (see Figure 2).

Table 4. Hypothesis Testing Result

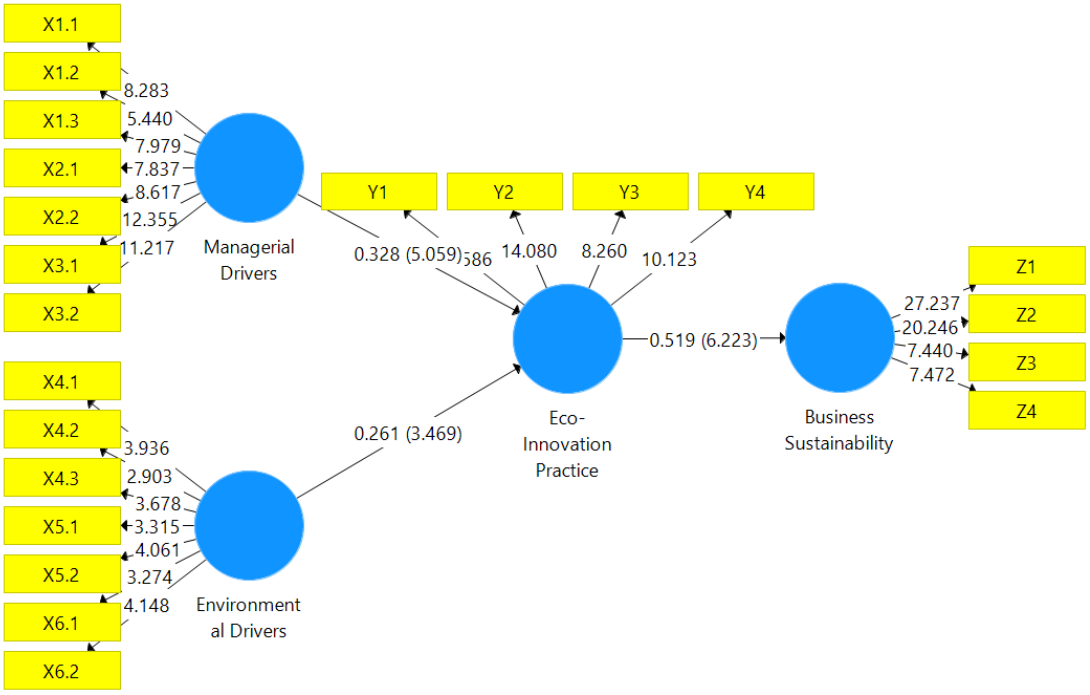
Hypotheses	Construct Coefficient	Standard Devistion	t-statistic (t-table=1.97)	Description
H1: Managerial Drivers → Eco-Innovation Practice	0.328	0.065	5.059	Supported**

H2: Environmental Drivers → Eco-Innovation Practice	0.261	0.075	3.469	Supported**
H3: Eco-Innovation Practice → Business Sustainability	0.519	0.083	6.223	Supported**

Note:
***Sig. < 0.01*

Source: Processed data (2024)

Figure 2. Structural Model Test



Source: Processed data (2024)

Discussion

Managerial Drivers on Eco-Innovation Practice

The path analysis results, with an estimate of 0.328 and a positive coefficient, indicate that an increase in the implementation of managerial drivers leads to a corresponding increase in the adoption of eco-innovation practices. This finding is reinforced by the hypothesis testing results, which show a significance level of less than 0.01 (t-statistic = 5.059). Therefore, it can be concluded that managerial drivers have a significant and positive impact on eco-innovation practices. This conclusion aligns with the work of Cai and Zhou (2014), which emphasizes the critical role of managerial drivers in enhancing eco-innovation practices. Internal drivers are crucial as they motivate companies to achieve benefits, mitigate risks, and reduce costs associated with eco-innovation (Bossle et al., 2016).

Managerial drivers play a pivotal role in the adoption and implementation of eco-innovation practices within organizations. Research indicates that managerial environmental awareness, including an understanding of risks and cost-benefit analysis, significantly influences corporate eco-innovation activities such as eco-management, eco-processes, and eco-product innovations (Peng & Liu, 2016). Managers who prioritize environmental concerns and

recognize the economic benefits of eco-innovation are more likely to steer their firms towards sustainable practices. Additionally, competitive pressure and customer demand are identified as strong motivators for managers to adopt eco-innovative solutions, as these factors directly influence company performance and market positioning (Cai & Li, 2018). Moreover, managerial commitment, along with the integration of human resource practices, is essential in overcoming technological challenges and enhancing the firm's competitive advantage through green innovation (El-Kassar & Singh, 2019). The role of managers is also significant in the context of regulatory compliance, where their environmental concerns can moderate the relationship between government regulations and sustainable business growth (Ben Amara & Chen, 2020).

Environmental Drivers on Eco-Innovation Practice

The path analysis results, with an estimate of 0.261 and a positive coefficient, indicate that an increase in the implementation of environmental drivers leads to a corresponding increase in the adoption of eco-innovation practices. This conclusion is supported by hypothesis testing results, which show a significance level of less than 0.01 (t-statistic = 3.469). Therefore, it can be concluded that environmental drivers have a significant and positive impact on eco-innovation practices. This finding is corroborated by Pham, Nguyen, Nguyen, and Nguyen (2024), who highlight that government regulation and incentives can stimulate firms to adopt eco-innovation practices, thereby enhancing their sustainability in the market. Similarly, Orjuela-Ramirez, Zuluaga-Jimenez, and Urbano (2024) emphasize the influence of consumer preferences for environmentally friendly products, which compel companies to innovate in response to market trends.

Environmental drivers are crucial in the adoption and implementation of eco-innovation within firms. Compliance with environmental regulations is a strong predictor of eco-innovation, particularly in the Malaysian green technology sector, where regulatory adherence significantly enhances environmental performance (Fernando & Wah, 2017). In China, competitive pressures and market-based instruments also play a key role in driving eco-innovation, which subsequently improves both environmental and economic sustainability (W. Cai & Li, 2018). Furthermore, anticipated eco-regulations and self-regulation positively impact eco-process and eco-product innovations, as demonstrated by a study on Korean manufacturing firms (Yu, Park, & Hwang, 2019).

Eco-Innovation Practice on Business Sustainability

The findings indicate that the adoption of eco-innovation practices positively impacts business sustainability, as evidenced by a t-statistic of 6.223 and a significance level of less than 0.01. The path analysis estimate of 0.519 suggests that more effective implementation of eco-innovation practices leads to improved business sustainability. Therefore, it can be concluded that there is a positive and significant effect of eco-innovation adoption on sustainable performance. This conclusion is consistent with the work of Ayandibu and Ayandibu (2024), who highlight that companies adopting eco-innovative practices can achieve significant cost savings and enhanced brand reputation, both of which are essential for long-term sustainability.

Additionally, Lee and Min (2015) argue that implementing eco-innovation practices improves a firm's business sustainability. Companies that adopt eco-innovation focus on reducing the negative environmental impacts of their activities, including production, processes, and product development. To further enhance sustainable performance through eco-innovation, firms should invest in environmental resources and technologies that reduce pollution, carbon emissions, and other environmental pollutants. Green innovation can help identify inefficiencies in existing production processes and technologies, leading to increased efficiency and, consequently, improved performance (Lee & Min, 2015). Moreover, Figueiredo, Patrício, and Reis (2024) emphasize the importance of organizational culture in

facilitating eco-innovation, suggesting that a supportive environment encourages creativity and the implementation of sustainable practices.

CONCLUSION

The aim of this study was to examine the influence of managerial drivers—such as eco-commitment, eco-efficiency, and eco-capability—and environmental drivers—including eco-consumer preferences, eco-regulation, and eco-competition—on the adoption of eco-innovation practices within small manufacturing firms. The results demonstrate that managerial drivers significantly influence the adoption of eco-innovation practices within these firms. Additionally, environmental drivers also play a crucial role in promoting eco-innovation. The research emphasizes that a combination of both managerial and environmental drivers fosters the implementation of eco-innovation practices. Furthermore, the study highlights the positive relationship between eco-innovation practices and business sustainability, underscoring their importance in enhancing the long-term viability and environmental responsibility of businesses. Notably, the study finds that managerial drivers have a stronger influence on eco-innovation practices compared to environmental drivers.

The practical implications of this research suggest that managers should prioritize eco-commitment, eco-efficiency, and eco-capability as strategic components to align operations with environmental goals, thereby improving overall business performance. The study also underscores the importance of responding to external drivers such as consumer demand, competitive pressures, and regulatory requirements, which can further incentivize eco-innovation. For policymakers, these insights highlight the need for supportive environmental regulations and incentives to encourage sustainable practices within small enterprises.

For future research, it is recommended to explore the role of specific industry sectors in shaping the impact of managerial and environmental drivers on eco-innovation practices. Additionally, expanding the study to include larger sample sizes and other emerging markets could provide a broader understanding of the factors that influence eco-innovation across different contexts. Investigating the long-term effects of eco-innovation practices on business sustainability, particularly in terms of financial performance and competitive advantage, would also be valuable. Future studies should also consider the influence of digital technologies and innovation ecosystems in facilitating eco-innovation among Small and Medium-sized Enterprises (SMEs).

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