

Factors Influencing Eco-innovation in Halal Food SMEs in Malaysia: A Study from an Islamic Perspective

Samer Al-shami

Universiti Teknikal Malaysia Melaka

MELAKA, Malaysia

samshami79@gmail.com

Abstract

Halal food SMEs play a significant role in Malaysia's economic development, as the halal food industry is a major contributor to the country's GDP and employment. However, the industry faces a challenge in meeting the growing demand for eco-innovation while also complying with government regulations. This study aimed to investigate the implementation of eco-innovation practices among SMEs in the Malaysian food industry. The study included four independent variables: technological, organizational, environmental, and individual factors, to measure their relationship towards eco-innovation performance. A questionnaire was used to collect data from 150 employees in the food SME sector who implemented eco-innovation practices. The study's findings revealed that technological, organizational, environmental, and individual factors have a significant positive relationship with eco-innovation in Malaysian food industry SMEs. This study contributes to the literature by providing new insights into how teleology ethics guide Muslims to consume halal food purposefully, intentionally, mindfully, compassionately, and conscientiously. Furthermore, it enhances the knowledge on eco-innovation practices among SMEs in the Malaysian food industry, which has been lacking in research. However, this study has some limitations. Firstly, the study only focused on the Malaysian halal food industry, which limits the generalization of the findings to other industries or countries. Secondly, the sample size was relatively small, and the data was collected from a single source. Therefore, future research should consider a larger sample size from multiple sources to improve the generalizability of the findings. Additionally, future studies could explore the impact of different eco-innovation practices on the performance of SMEs in the halal food industry.

Keywords

Eco-Innovation; Halal; Food; Muslims; SMEs; Malaysia

1. Introduction

Malaysia is recognized as a prominent player in the Halal food industry, largely driven by small-medium enterprises (SMEs) (Marmaya et al., 2019). The food processing sector in Malaysia is dominated by SMEs and international investors, making it a hub for multinational corporations (Talib & Ali, 2009). The creation of opportunities for SMEs to enter the Halal market is a critical step in this regard, as SMEs account for over 80% of the total number of companies in the food processing industry, according to IMP3 (2006). The food and beverage industry is a crucial sector for Malaysia's economic development, as highlighted by Ahmad, Ungku Zainal et al., (2018). It plays a vital role in national economic growth, generating income and employment. Moreover, Malaysia is poised to become a significant player in the provision of Halal goods and services, which is a crucial aspect of Islamic practices.

During the COVID-19 pandemic, many people have looked for new businesses to generate additional income. Governments, NGOs, and the general public have put pressure on major corporations to prioritize environmental protection (Jayakrishnan et al., 2018). However, research on eco-innovation in the food sector is limited, making it an area for further research (Bossle, 2015). SMEs are a critical sector for Malaysia's economic development, as highlighted in Marmaya, et al., (2019). The Malaysian government has introduced several programs to support local SMEs and help them achieve their goal of becoming a high-income country with an established status by 2020. Despite this, Malaysian SMEs continue to struggle with low productivity and poor outcomes, resulting in a lack of competitiveness in the global business climate. Additionally, neighboring countries like Japan, South Korea, and Singapore have SMEs that contribute more to their GDP and exports than Malaysian SMEs.

Eco-innovation is widely supported by academics, businesses, and policymakers as a cost-effective approach to achieving environmental sustainability. This is because eco-innovation principles align with the circular economy's social ideals and broader sustainability agenda, emphasizing efficient and effective product, energy, and human capital usage (Lopes et al., 2019). However, the process of eco-innovation can be challenging,

especially for SMEs lacking the necessary skills. Thus, this study aims to propose a model that explains the factors influencing green innovation among Halal food enterprises in Malaysia, taking into account Islamic principles that emphasize the importance of environmental conservation and sustainability.

2. Literature Review

2.1 Eco-innovation

Eco-innovation is defined as the development of goods and services that create ecological changes and lead to a sustainable world, with a focus on reducing environmental impact (Ceptureanu, Ceptureanu, Popescu, & Orzan, 2020). There are various forms and levels of maturity in eco-innovation, and it can be seen as a symbol of the technical frontier, where businesses are still learning and grappling with uncertainty to achieve better results (Bossle, 2015). In the context of religion, eco-innovation can be viewed as a way to fulfill the ethical responsibility of protecting the environment and preserving God's creation. Islam, for example, has a strong tradition of environmental stewardship, known as "hima," which refers to the protection and preservation of natural resources (Elkington and Hailes, 2013). According to Hazarika and Zhang (2019), eco-innovation has been defined in scholarly works with different limits and degrees of possibilities. The OECD (2009), for instance, defines eco-innovation as any innovation that reduces the impact on the environment, even if this was not the primary intention. While such definitions are useful, eco-innovation should not be viewed merely as a side effect but rather as an alternative to business as usual, with a primary focus on environmental performance.

2.2 Factor implementation of Eco-Innovation

2.2.1 Technological Factors

Technological factors are one of the driving forces behind the implementation of eco-innovation practices. Enterprises with greater technical know-how can boost economic growth. According to Rashid et al. (2014), strategic capabilities, both internal and external, are considered future technology capabilities for competitive advantages. Compatibility refers to the degree to which an innovation aligns with a company's current principles, experiences, and needs. The integration of the latest technology with an organization's accumulated expertise is crucial in determining technological progress. Companies are more likely to adopt a new technology that is compatible with their existing technologies to minimize potential opposition to its diffusion (Al-Shami et al., 2021). Compatibility is also essential for the adoption of eco-innovation since many eco-innovations are improvements to existing business technologies. The adoption of eco-innovation is a process of accumulation and incorporation of information, rather than a single event. Eco-innovation that is more consistent with a business's existing technologies can be more readily disseminated within the enterprise. A fit between past experience and environmental behavior can lead to greater environmental impact (Portia Oliver, 2011). Consequently, the acceptance of green technology for SMEs is expected to be positively linked to the perceived compatibility of innovations.

H1: Technological innovation positively affects eco-innovation practices by Malaysian food industry SMEs.

2.2.3 Organizational Factor

The organizational context encompasses the processes that either hinder or facilitate technological innovation. Several studies have examined the impact of various organizational characteristics on technological growth and environmental policies, such as human resource efficiency, senior management expertise, organizational support, and organizational culture. According to Portia Oliver (2011), adequate organizational capital and skilled organizational skills are two crucial organizational characteristics that promote technological innovation and environmental efficiency. The availability of funding, support for management, organizational learning, and human resources all influence the adoption of eco-technologies. The focus of this analysis is on the quality of human capital, organizational support, and company size as variables linked to organizational resources that have been widely studied in technical innovation and environmental management research.

H3: Environmental factors positively influence eco-innovation practices by SMEs in Malaysia's food industry.

2.2.4 Individual factor

Manufacturers play a crucial role in the supply chain when it comes to smooth operations policy. According to Geng et al. (2021), in order to successfully adopt eco-innovation, businesses need to monitor, assess, and audit suppliers in value chain management to implement eco-innovation activities. Companies that partner with suppliers and prioritize environmental issues enjoy environmental and efficiency gains. Environmental management depends on the attitude of executives towards managing their business, which can be influenced by their faith and values. For instance, in the context of Halal Islam, which emphasizes ethical and sustainable practices, eco-innovation aligned with Halal values can be viewed as a religious obligation. The opportunities for implementing eco-innovation in a company are driven by the role of managers who invest time, energy, and support to improve the company's efficiency.

H4: Individual factors have a positive effect on eco-innovation practices by SMEs in Malaysia's food industry.

2. Methodology

A quantitative research design was utilized in this study, which involved distributing a questionnaire to food SMEs that have implemented eco-innovation practices in Malaysia. The researcher selected ten companies from various sectors within the food industry and others that have implemented eco-innovation practices. The sample population for this research included employees holding managerial, supervisory, and line worker positions within Malaysian food industry SMEs. A total of 150 questionnaires were distributed to these employees. The data collected was then analyzed using SPSS. Multiple linear regression was used to establish the relationship between two or more independent variables and one dependent variable. The dependent variable is also referred to as the outcome variable, while the predictor variables are considered to be the independent variables. The results of the multiple regression analysis were used to predict the output of the independent variables. The general form of the multiple regression equation is as follows: -

$$Y = a + bX_1 + cX_2 + dX_3 + eX_4$$

Where,

Y = Dependent variable (Eco-Innovation)

a = Constant term

b, c, d, e = Coefficient

X_1 = IV (Technological)

X_2 = IV (Organizational)

X_3 = IV (Environmental)

X_4 = IV (Individual)

Table 1. Term definition

Label	Items	Sources
Eco-Innovation		
EC1	Implementation of green supply chain management practices	(Wu & Huang, 2018) (Tseng, Tan, Geng, & Govindan, 2016)
EC 2	Use of renewable energy sources in production processes to reduce carbon footprint	
EC3	Adoption of eco-design principles in product development to ensure halal compliance and eco-friendliness	
EC4	Implementation of a waste management system to reduce food waste and ensure halal compliance	
EC5	Development of a green culture within the organization	
EC6	Use of eco-labels to indicate eco-friendliness and halal compliance of products	
Technological Factor		
TF 1	Green technology can improve employee skills and knowledge related to halal practices	(Chege & Wang, 2020), (Fernando, Wahyuni-TD, Zainul Abideen, & Mergeresa, 2023)
TF 2	It can provide new technologies, materials, processes, and innovative skills for halal food production	
TF 3	It can provide a new and easier solution to solve the halal compliance problems in my work	
TF 4	Employees can easily use new technologies to ensure halal compliance in food production	
TF 5	Green technology can have a positive impact by raising awareness about sustainability in halal practices	
TF 6	The existence of eco-friendly technology can also improve the health and hygiene standards in halal food production	
Organizational Factor		
OF 1	Management can provide support when I face halal compliance issues	

OF 2	It can provide new ideas related to halal practices and programs to me	(Chege & Wang, 2020)
OF 3	It can improve my understanding of halal practices and sustainability in halal food production	
OF 4	Working in a better organization could improve morale, which leads to greater productivity in halal food production	
OF 5	It can improve my skills, capabilities, and expertise in halal practices and compliance	
OF 6	Management can become more efficient in halal food production processes	
Environmental Factor		
EF 1	It also helps to train me in green skills, in accordance with halal values of <u>striving for excellence and continuous learning.</u>	(Wijekoon & Sabri, 2021)
EF 2	Halal environmental practices can make my health more secure by <u>working in suitable environmental conditions.</u>	
EF 3	It can encourage and give me awareness about better environmental improvement, in line with the Islamic principles of preserving and protecting the environment.	
EF 4	Halal environmental practices can improve my compliance with environmental standards and regulations, as well as Islamic values of sustainability and responsible resource management.	
EF 5	A better environment, in accordance with halal principles, can provide a comfortable working area for me.	
EF 6	It can give me a chance to involve in recycling activities to help our environment and contribute to the Islamic concept of khilafah, or stewardship of the Earth.	
Individual Factors		
IF 1	Our organization improve our ability to generate novel and unique ideas that are <u>environmentally friendly.</u>	Developed by the authors
IF 2	Our organization improve our expertise in environmental science, engineering, and sustainability are more likely to engage in green innovation.	
IF 3	Our organization improve our ability to take risks and embrace new and unconventional approaches to solving environmental challenges	
IF 4	Our organization improve our intrinsic motivation and the drive to make a positive impact on the environment can lead individuals to pursue green innovation	
IF 5	Our organization improve employees' leaning capacity through creating social community	
IF 6	It can give me pride for successfully providing the best to the company on eco-innovation and halal compliance.	

4. Analysis

4.1 Reliability and Validity Analysis.

The Table 1 above, Table 2, displays Cronbach's Alpha values for all variables (both independent and dependent) to test the reliability of the research conducted. The reliability analysis was performed among the four independent variables, namely Technological Factor, Organizational Factor, Environment Factor, and Individual Factor, and one dependent variable, Eco-Innovation Performance, among SMEs in the Malaysian Food Industry. The research

measured a total of 30 items from 150 respondents. The rule of thumb for the reliability test is that 0.7 or higher indicates good reliability. As shown by the test result, the reliability value was 0.994, indicating very good reliability.

Table 2. Reliability Analysis

	Variables	Cronbach's Alpha	No. of Items
Dependent variable	Eco Innovation Performance	0.978	6
Independent variable	Technological Factor	0.982	6
	Organizational Factor	0.985	6
	Environmental Factor	0.984	6
	Individual factor	0.989	6

Table 2 displays the results of the reliability analysis of the Cronbach's Alpha for both independent and dependent variables in this study. The purpose of this research was to ensure the accuracy of the collected data for analysis. The table includes the items for each independent variable (technological, organizational, environmental, and individual factors) and dependent variable (eco-innovation performance), with six items for each. The high reliability level of this test is reflected in the results, which demonstrate excellent reliability with a score of 0.994. Table 3 presents the results of the Pearson correlation coefficient analysis, which was conducted to test the validity of the data and determine the relationship between independent and dependent variables. The table also indicates the direction, strength, and significance of the correlation for all variables. The Pearson's ratio ranges from 0.00 to 1.00, with a higher value indicating a stronger correlation. The following table provides the Pearson Correlation Coefficient results.

Table 3. Pearson Correlation Coefficient

		Technological Factor (TF)	Organizational Factor (OF)	Environmental Factor (EF)	Individual Factor (IF)	Eco-innovation Performance (EIC)
TF		1				
OF		0.922	1			
EF		0.885	0.900	1		
IF		0.884	0.899	0.905	1	
EIC		0.888	0.872	0.880	0.903	1

4.3 Regression Results

Table 4 displays the Beta values, which indicate how much the independent variables influence the dependent variable. The results indicate that $B_1 = 0.311$, $B_2 = 0.011$, $B_3 = 0.189$, and $B_4 = 0.437$ for the independent variables of Technological Factor, Organizational Factor, Environmental Factor, and Individual Factor, respectively. The Individual Factor has the highest B value, indicating that it strongly influences the implementation of eco-innovation practices, with a B value of 0.437. This suggests that 43.7% ($t=5.123$, $p < 0.001$) of the variation in eco-innovation performance is due to the individual factor. The Technological Factor has the second-highest B value, with a variation of 31.1% ($t=3.778$, $p < 0.001$). The Environmental Factor exhibited a B value of 0.189 with a variation of 18.9% ($t=2.188$, $p > 0.001$). Finally, the Organizational Factor had the lowest B value, with a variation of 1.1% ($t=0.118$, $p > 0.001$). The unstandardized coefficient (B), standardized coefficient (Beta), and significant level were determined by t-test. After examining the B value, the independent variables of Individual Factors and Technological Factors significantly contributed to the prediction model. These four independent variables are the factors that influence the implementation of eco-innovation practices among SMEs in the Malaysian Food Industry. From the linear equation, a positive relationship can be seen between Technological Factor, Organizational Factor, Environmental Factor, and Individual Factor with eco-innovation performance.

Table 4. Coefficient

Hypotheses	Unstandardized Coefficients		Standardized Coefficients	t	P. Value
	B	Std. Error	Beta		
Relationship between Technological Factor and Eco Innovation Performance	0.311	0.082	0.331	3.778	0
Relationship between Organizational Factor and Eco Innovation Performance	0.011	0.091	0.011	0.118	0.906
Relationship between Environmental Factor and Eco Innovation Performance	0.189	0.087	0.186	2.188	0.03
Relationship between Individual Factor and Eco Innovation Performance	0.437	0.085	0.433	5.123	0

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4$$

Where:

Y = Eco Innovation Performance

b₀ = Regression Constant

X₁ = Technological Factor

X₂ = Organizational Factor

X₃ = Environmental Factor

X₄ = Individual Factor

b₁ b₂ b₃ b₄ = Regression Coefficient

$$\text{Eco Innovation Performance} = 0.261 + 0.311 (\text{technological factor}) + 0.011 (\text{Organizational Factor}) + 0.189 (\text{Environmental Factor}) + 0.437 (\text{Individual Factor})$$

5. Discussion

The sample of 150 respondents in this study was selected from small and medium-sized enterprises (SMEs) in the Malaysian Food Industry, comprising executives, managers, supervisors, and line workers. Of the 150 respondents, 61 (40.7%) held line worker positions, 46 (30.7%) were supervisors, 30 (20%) were managers, and 13 (8.7%) held executive positions. Moreover, 62 (41.3%) of respondents were from the operation department, 41 (27.3%) were from marketing, 35 (23.3%) were from quality department, and 12 (8%) were from the research and development department. The organizations were categorized based on the number of current employees. Of the 150 respondents, 83 (55.3%) of organizations have between 5 to 75 employees, 37 (24.7%) have less than 5 employees, and 30 (20%) have between 75 to less than 200 employees. In terms of business age, 66 (44%) of respondents were from companies that had been in operation for 5 to 10 years, followed by 60 (40%) from companies that operated for less than 5 years, and 24 (16%) from companies that have been in business for more than 10 years.

In terms of revenue, 77 (51.3%) of respondents were from companies with annual revenue between RM 300,000 to less than RM 15 million, while 42 (28%) were from companies with revenue less than RM 300,000 per year. Additionally, 31 (20.7%) of respondents were from companies with high revenue between RM 15 million to not exceeding RM 50 million per year.

5.1 Relationship between Technological factor and Eco-Innovation Performance

The results in Table 4 demonstrate that technological factors have a strong positive correlation with eco-innovation performance among SMEs in the Malaysian Food Industry, with a correlation coefficient value of 0.888. This suggests that technological factors play a crucial role in driving eco-innovation practices among SMEs in this industry. The first set of hypotheses also supports this finding, as H1 was accepted, indicating that technological factors significantly contribute to the implementation of eco-innovation practices among SMEs in the Malaysian Food Industry. The statistical analysis further confirms this positive relationship, with a significant direct effect of technological factors on eco-innovation performance ($\beta = 0.311$, $p = 0.001$).

The importance of technological capabilities in eco-innovation is well-supported by existing literature, as noted by Cai and Li (2018). These capabilities include tangible technologies, intangible experiences, and specific knowledge of developing environmentally friendly products and processes. Firms that possess robust eco-innovation capabilities can leverage knowledge spillover in their cluster networks, learn from others, and enhance

their eco-innovation capabilities over time. This highlights the importance of technological factors in driving eco-innovation practices in the Malaysian Food Industry among SMEs.

5.2 Relationship between Organizational Factor and eco-Innovation performance

The literature suggests that the organizational factor has a positive correlation with eco-innovation practices among SMEs in the Malaysian Food Industry. However, the finding of this paper shows that the organizational factor did not have a significant impact on the implementation of eco-innovation practices in the industry. Hence, the hypothesis was rejected as the coefficient analysis showed that the relationship between the organizational factor and eco-innovation performance was not statistically significant ($\beta = 0.011$, $p = 0.906$).

It is worth noting that organizational factors such as leadership, management support, and employee involvement are crucial in fostering an environment that encourages eco-innovation practices. In the halal food industry, these factors are even more critical as companies need to adhere to strict halal certification requirements. Therefore, further research is necessary to explore why the organizational factor did not have a significant impact on eco-innovation practices in the halal food industry and to identify ways to improve this factor to enhance eco-innovation practices among SMEs in the Malaysian Food Industry.

5.3 Relationship between Environmental Factors and eco-Innovation performance

The analysis revealed that there is a statistically significant positive direct relationship between the Environmental factor and eco-innovation performance, with a β value of 0.189 and p-value of 0.030. This suggests that the Environmental factor plays a significant role in the implementation of eco-innovation practices among SMEs in the Malaysian Food Industry, as perceived by most respondents. It is important to note that in this study, the term Environmental factor corresponds to the definition of "external environment" in the literature on organizational behavior. External factors such as environmental uncertainty, governmental support, industry type, competition, and network relations are considered key determinants of innovative and green behavior in organizations. Two significant environmental factors influencing technical innovation and environmental strategy are environmental uncertainty and external resource availability. The government also plays a crucial role in providing resources to encourage the adoption of new technologies. Based on the model proposed by Lin and Ho (2011), this study focuses on the effects of environmental uncertainty, government support, and stakeholder pressures on eco-innovation practices among SMEs in the Malaysian Food Industry. The findings highlight the importance of considering the external environment when examining the implementation of eco-innovation practices in organizations.

5.4 Relationship between Individual Factors and eco-Innovation performance

Table 4 shows that there is a positive correlation between the Individual Factors and eco-innovation performance among SMEs in the Malaysian Food Industry. The correlation coefficient value is 0.903, indicating a strong relationship between the individual factor and eco-innovation performance. Additionally, the fourth set of hypotheses supports the hypothesis that individual factors have a significant relationship with the implementation of eco-innovation practices, and thus was accepted. Further analysis in Chapter 4 reveals that the coefficient analysis between the individual factor and eco-innovation performance ($\beta = 0.437$, $p = 0.000$) indicates a statistically significant relationship between the two variables. The p-value being less than 0.05 indicates that the individual factor has significantly influenced the implementation of eco-innovation practices. It is important to note that the individual factor encompasses a range of individual-level variables, including knowledge, skills, attitudes, and behavior. These individual-level factors are critical in driving innovation and change within an organization.

6. Conclusion

6.1 Implication of the research

The halal food industry in Malaysia is an emerging sector that requires a focus on environmental sustainability. Eco-innovation is critical to achieving this goal, and understanding the factors that significantly influence it can help improve the industry's environmental performance. This study contributes to the literature on eco-innovation by examining the individual, environmental, and organizational factors that significantly influence eco-innovation in the halal food industry in Malaysia. Firstly, individual factors such as personal values, environmental awareness, and willingness to innovate significantly influence eco-innovation in the halal food industry. Employees who are environmentally conscious and willing to adopt eco-friendly practices can positively impact the industry's overall eco-innovation performance. Secondly, environmental factors such as government support, environmental regulations, and stakeholder pressure are critical to the implementation of eco-innovation practices in the halal food industry. The Malaysian government has shown support for environmental sustainability initiatives, and stakeholders are increasingly pushing for eco-friendly practices in the industry. Finally,

organizational factors such as organizational culture, resource availability, and management support are also critical to the implementation of eco-innovation practices in the halal food industry.

6.2 Managerial Implication

The findings of this study have several managerial implications for SMEs in the Halal food industry in Malaysia. First, SMEs should prioritize the adoption of eco-innovation practices as they not only contribute to environmental sustainability but also positively impact their performance. SMEs should focus on developing innovative products and processes that reduce their environmental footprint, such as using renewable energy sources, reducing waste generation, and improving packaging materials. Secondly, SMEs should take into account the individual, environmental, and organizational factors that significantly influence the implementation of eco-innovation practices. SMEs should ensure that their employees are aware of the importance of eco-innovation practices and provide training to improve their knowledge and skills. They should also consider the external environment, such as government policies and support, to facilitate the adoption of eco-innovation practices. Thirdly, SMEs should focus on developing a supportive organizational culture that encourages and rewards the adoption of eco-innovation practices. This can be achieved by providing incentives and recognition to employees who come up with innovative ideas that reduce the environmental impact of their products or processes.

6.3 Implication of the Policy Makers

The findings of this study highlight the significant influence of individual, environmental, and organizational factors on eco-innovation in the halal food industry in Malaysia. Policy makers can use this information to design policies and regulations that support the implementation of eco-innovation practices in SMEs operating in the halal food industry. For instance, policy makers can provide incentives and support for technological innovation, promote environmental regulations, and encourage organizational practices that support eco-innovation. By doing so, policy makers can create an enabling environment for SMEs to adopt eco-innovation practices that reduce environmental impact while enhancing their competitiveness.

6.4 Limitation and contribution

One of the limitations of this study is that it focuses only on SMEs in the Malaysian Halal food industry. Therefore, the results may not be applicable to other industries or larger companies. Additionally, the study relies on self-reported data, which may lead to response bias. Furthermore, this study does not consider cultural or societal factors that may affect the implementation of eco-innovation practices. Future research could expand the scope of the study to include larger companies and other industries. Additionally, researchers could consider using objective measures of eco-innovation practices instead of relying on self-reported data.

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