Improving Malaysia's Sustainable Performance in Food and Beverage Sector

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ABSTRACT

This study explores the relationship between innovation, supply chain management, and green packaging's sustainable performance in Malaysia's food and beverage industry. Sustainability has become an increasingly critical focus for industries worldwide, particularly in developing nations like Malaysia, where the food and beverage sector significantly contribute to the economy. A quantitative research approach was employed, with data collected via an online survey targeting employees from restaurants, SMEs, and franchises across Peninsular Malaysia. The study utilized descriptive statistics to analyze responses from a sample of 113 participants, selected through simple random sampling. The findings reveal that innovation, efficient supply chain management, and the adoption of green packaging practices significantly influence sustainable performance in the food and beverage industry. Innovation was identified as a key driver for process optimization and waste reduction, while supply chain management enhanced efficiency and minimized environmental impact. Green packaging emerged as a critical factor in addressing consumer demand for environmentally friendly products and reducing waste. This research contributes to academic knowledge by demonstrating the importance of these three factors in enhancing sustainability and offers practical insights for stakeholders, including policymakers and business managers. By integrating innovation, sustainable supply chain practices, and green packaging, the industry can improve its environmental, economic, and social performance, positioning itself for long-term growth and competitiveness.

Keywords: Sustainable, Performance, Food and Beverage

INTRODUCTION

The pursuit of sustainability performance within the food and beverage (F&B) industry has become a critical imperative globally, encompassing the intertwined dimensions of economic prosperity, social responsibility, and environmental protection (Malesios et al., 2021). This multifaceted concept necessitates a holistic evaluation of a company's actions across these various sustainability dimensions, moving beyond mere operational efficiency and profit generation (Ali et al., 2023). Rehman et al. (2021) underscores the importance of integrating these dimensions to align with the triple bottom line principles, emphasizing the interconnectedness of economic, social, and environmental considerations. Achieving genuine sustainable performance in the F&B sector demands a comprehensive approach that considers the environmental impact, social accountability, and economic viability throughout the entire value chain, from raw material sourcing to end-of-life disposal (Akanmu et al., 2023). Bui et al. (2022) specifically highlight the urgent need for

Malaysian F&B companies to prioritize environmental protection and social responsibility to effectively mitigate their negative impacts and enhance their overall sustainability performance. Malaysia's dynamic food and beverage industry is a significant pillar of its national economy (Alias, Bakar & Mustapa, 2020), contributing

substantially to both employment and GDP growth (DOSM, 2023). However, the long-term prosperity and resilience of this vital sector require a fundamental and widespread adoption of sustainable practices. Entrepreneurs within the industry are recognized as key drivers in this transformative process (Mokbel Al Koliby et al., 2024), championing innovation and implementing sustainable business models. These efforts can foster positive change across the entire F&B ecosystem (Conscious Food Systems Alliance, 2024).

The Malaysian F&B industry, despite its crucial economic role, faces economic headwinds, notably rising production costs. This can create pressure for businesses to prioritize immediate profitability, potentially at the expense of sustainability initiatives (BAJET, 2022). However, the pursuit of innovative approaches and efficient resource management can unlock valuable cost-saving opportunities that simultaneously support sustainable practices. Furthermore, the increasing consumer awareness and growing demand for sustainably produced goods present a significant market advantage, strongly incentivizing companies to integrate sustainability as a core element of their strategic operations (Chehtman, 2022). While the growing importance of sustainability in the Malaysian F&B industry is acknowledged, a clear and comprehensive understanding of the specific factors driving enhanced sustainability performance in this context is still lacking. There is a need for focused research that explores the practical application of specific strategies within the unique operational and economic landscape of the Malaysian F&B sector (Aisyah Alias, Mohamed & Mohamad, 2024). This research should particularly examine the interplay between innovation, supply chain management, and green packaging adoption in achieving measurable sustainability outcomes.

This study directly addresses this pressing need by focusing on the critical roles of innovation, supply chain management, and green packaging in enhancing sustainability performance within Malaysia's food and beverage industry, a sector of significant national economic importance. It aims to provide actionable insights and evidence-based recommendations to empower businesses to effectively improve their sustainability performance. Ultimately, this will promote economic prosperity, foster social responsibility, and ensure environmental protection, aligning with the triple bottom line and contributing to the long-term viability and competitiveness of the Malaysian F&B industry while safeguarding the nation's valuable natural resources for future generations.

Food and Beverage Industry in Malaysia

The food and beverage industry in Malaysia is a critical sector that significantly contributes to the nation's economy. This industry encompasses a diverse range of businesses, including restaurants, small and medium enterprises (SMEs), and franchises. Beyond supporting GDP growth, it also provides extensive employment opportunities across various socio-economic levels (Lusha, 2023). Malaysia's position as a regional hub for culinary tourism further strengthens the industry. International visitors are drawn to its diverse gastronomic heritage, driving innovation and growth within the sector (HPG Consulting, 2024). Consequently, businesses continuously refine their offerings to meet the evolving demands of both local and international consumers.

Sustainable Performance

Sustainable performance refers to an organization's ability to concurrently achieve economic, social, and environmental goals. In Malaysia's food and beverage sector, sustainable performance encompasses financial growth, a reduced environmental impact, and improved societal well-being (Afum et al., 2020).

Implementing sustainable performance management requires the establishment of clear goals and measurable metrics, aligned with the SMART framework (Medne & Lapina, 2019). Furthermore, incorporating sustainability criteria into employee evaluations reinforces accountability and emphasizes its importance within the organization (Ali & Aboelmaged, 2022).

Sustainability is typically analyzed across three key dimensions: economic, environmental, and social performance. Economic performance addresses profitability and market share; environmental performance focuses on resource conservation and emissions reduction; and social performance considers ethical practices and community engagement (Afum et al., 2020).

Innovation

Akanmu et al. (2023) define innovation as the process of transforming an idea or invention into a good or service that provides value for which customers are willing to pay. It involves the implementation of new ideas, processes, methodologies, or products to improve performance, efficiency, or profitability. Within the context of the Fourth Industrial Revolution (IR4.0), innovation entails not only technological advancements but also the rethinking of business models, the improvement of customer experiences, and the optimization of operations through the use of intelligent systems (Režek Jambrak et al., 2021).

Innovation has become a crucial element for success across a variety of industries. The integration of advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), robotics, and big data analytics into business processes and daily life distinguishes this current stage of industrial development. Consequently, the need for innovation has increased, driven by the desire to remain competitive and appeal to consumers whose preferences and expectations are constantly changing.

Innovation is critical for Malaysia's food and beverage industry to thrive in a competitive and environmentally conscious landscape. Teguh et al. (2021) found that innovation has a positive impact on a firm's environmental sustainability performance. By adopting innovative practices, food and beverage industries can create new products, optimize their processes, and reduce their environmental impact.

Furthermore, fostering an innovative culture within food and beverage industries is essential. Encouraging employee innovation, collaboration, and investment in research and development (R&D) can lead to groundbreaking solutions for sustainable practices. This aligns with the concept of open innovation, where the industry utilizes external knowledge and resources to drive innovation (Misra & Mention, 2022).

By embracing innovation throughout the value chain, food and beverage industries can gain a competitive advantage, meet changing consumer demands for sustainability, and contribute to a more environmentally responsible industry in the future.

Supply Chain Management

The food and beverage industry depends heavily on strong and efficient supply chain management. Incorporating sustainable practices into this network can significantly improve overall performance. Ali & Aboelmaged (2022) explore the potential of Supply Chain 4.0 in the food and beverage industry, highlighting how technologies like IoT and big data can enhance visibility and efficiency throughout the supply chain.

In the dynamic environment of the food and beverage industry, effective supply chain management is critical for ensuring success. The supply chain encompasses all processes involved in transforming raw materials into finished products delivered to customers. This includes sourcing ingredients, production, warehousing, distribution, and ultimately, reaching the consumer. Optimizing this intricate network through efficient supply chain management yields numerous advantages for food and beverage businesses.

Adams et al. (2023) highlight that efficient supply chain management can result in substantial cost savings. These savings can be realized by carefully selecting suppliers, reducing waste throughout the production process, and negotiating favorable terms with logistics providers. They also emphasize that a streamlined flow of goods leads to faster production cycles, shortened lead times, and a more agile business capable of swiftly responding to market demands.

Beyond cost efficiency, supply chain management plays a pivotal role in maintaining product quality and safety. According to Schulman et al. (2021), effective inventory management, appropriate storage conditions, and rigorous quality control measures throughout the supply chain are essential for ensuring food safety and consistent product quality. Their research underscores the importance of managing Scope 3 emissions, which encompass indirect emissions throughout the supply chain and often represent the largest share of a company's emissions. This highlights the critical role of supply chain management in reducing the environmental footprint of the food and beverage industry.

Implementing a sustainable supply chain management strategy necessitates a comprehensive approach. For starters, prioritizing responsible sourcing is critical. Partnering with suppliers who prioritize ethical labor practices, environmental protection, and responsible resource management is crucial. This aligns with the principles discussed by Adams et al. (2023) regarding the importance of sustainable supplier relationships. Secondly, optimizing logistics and transportation is essential. Using fuel-efficient vehicles, optimizing delivery routes, and exploring multimodal transportation options can help reduce the supply chain's environmental impact (Ali & Aboelmaged, 2022).

Effective management of multi-level supply chains, which encompass numerous components and stochastic constraints, is essential for minimizing costs and enhancing sustainable performance (Ali & Aboelmaged, 2022). Incorporating multiple levels, including suppliers and customers, is crucial for implementing activities such as green processes in a cost-effective and resource-efficient manner (Adams et al., 2023). Additionally, integrating different levels within the supply chain can help stakeholders with conflicting objectives achieve maximum benefits through sustainable practices.

The supply chain is recognized as a blend of synergistic practices such as pull production systems, Just-In-Time (JIT), Total Quality Management (TQM), Total Preventive Maintenance (TPM), and Human Resource Management (HRM) (Ali & Aboelmaged, 2022). This approach is process-oriented, aiming to enhance efficiency by eradicating generalized waste, which includes waiting, overprocessing, overproduction, excess inventory, corrections, and defects from procurement to final delivery (Schulman et al., 2021).

Green Packaging

Green packaging has emerged as a pivotal concept for businesses in the environmentally conscious food and beverage industry. It involves the utilization of materials and practices that minimize environmental impact throughout the entire lifecycle of a product. This approach includes the use of biodegradable or recyclable materials, the reduction of packaging waste, and the implementation of sustainable packaging solutions.

The adoption of green packaging is more than a passing trend; it is a consumer-driven movement substantiated by research. Studies by Wahab et al. (2021) underscore this shift in consumer preferences. Modern consumers increasingly associate product performance not only with quality but also with a company’s commitment to sustainability, as evidenced by its packaging choices.

Research has documented numerous benefits for food and beverage industry businesses transitioning to green packaging. One key advantage is the enhancement of brand image. According to Kumar et al. (2021), consumers tend to view businesses that use green packaging as environmentally responsible, which fosters increased brand loyalty and a positive perception of the brand.

Green packaging solutions also have a demonstrable effect on reducing environmental impact. Qin & Horvath (2022) found that green packaging can lower greenhouse gas emissions and resource consumption by utilizing biodegradable materials and reducing packaging use. Additionally, Wandosell et al. (2021) highlight how green packaging can improve waste management practices. Biodegradable materials naturally decompose, and recyclable packaging can be diverted from landfills, thus minimizing waste accumulation.

Moreover, research is essential in guiding the implementation of green packaging. Lévesque, Perreault, & Mikhaylin (2023) emphasize the necessity of studying the environmental impact of various packaging materials to help food and beverage companies choose the most sustainable options. Market research on consumer preferences, as explored by Wandosell et al. (2021), can inform packaging design choices to ensure they resonate with the target audience.

Innovation in green packaging for food production, supported by environmental management control systems (EMCS), can significantly enhance ecological sustainability and sustainable performance. Green packaging solutions, such as biodegradable and recyclable materials, help reduce environmental impact and comply with regulations, while EMCS effectively monitor and manage these initiatives (Rehman et al., 2021). This approach not only meets consumer demand for sustainability but also improves brand reputation and customer loyalty.

RESULTS AND DISCUSSIONS

This study investigated the implementation of sustainable practices within Malaysia's food and beverage industry, specifically examining the influence of innovation, supply chain management, and green packaging on sustainable performance. Employing a quantitative research design, the study aimed to analyze the relationships between these factors using numerical data, suitable for identifying patterns, trends, and correlations without delving into causal explanations (McCombes, 2022). The quantitative approach was appropriate for measuring the relationship between the dependent variable, sustainable performance, and the independent variables: innovation, supply chain management, and green packaging. Data regarding these variables were collected from a population of 155 companies listed in the Lusha database (2024), representing a comprehensive and current directory of active food and beverage service providers across Peninsular Malaysia. This diverse population, encompassing restaurants, SMEs, and franchises, provided valuable insights into the various challenges and approaches adopted by these establishments in implementing sustainable practices, accounting for regional and cultural nuances.

Table 1: Model Summary of Multiple Regression Analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.844[a]	0.713	0.700	5.65716

a. Predictors: (Constant), Green Packaging, Innovation, Supply Chain Management

(Source: Developed from Research)

The multiple regression model summary revealed a strong positive relationship between the predictors (Green Packaging, Innovation, and Supply Chain Management) and the dependent variable (Sustainable Performance). The high R value of 0.844 indicated a substantial degree of correlation between the observed and predicted values of sustainable performance. Furthermore, the R Square value of 0.713 demonstrated that 71.3% of the variance in sustainable performance could be statistically explained by the three predictor variables included in the model. The Adjusted R Square of 0.700, which accounts for the number of predictors and the sample size, further confirmed the robustness and good fit of the model. The standard error of the estimate (5.65716) suggested a relatively low average deviation between the observed and predicted sustainable performance scores, indicating a reasonably accurate model. Collectively, these results strongly suggested that the chosen independent variables provided a compelling explanation for the variations observed in sustainable performance within the Malaysian food and beverage industry.

Table 2: Regression Analysis on ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5322.164	3	1774.055	55.433	<.001[b]
	Residual	2144.230	67	32.003		
	Total	7466.394	70			

a. Dependent Variable: Sustainable Performance

b. Predictors: (Constant), Green Packaging, Innovation, Supply Chain Management

(Source: Developed from Research)

The ANOVA analysis further supported the significance of the regression model in explaining the variation in

Sustainable Performance (F = 55.433, p < 0.001). With three predictors (Green Packaging, Innovation, and Supply Chain Management), the substantially larger regression sum of squares (5322.164) compared to the residual sum of squares (2144.230) clearly demonstrated that the model explained a significant portion of the variance in the dependent variable. The high F-value, derived from the mean square for regression (1774.055) and the mean square for residual (32.003), unequivocally confirmed the strong explanatory power of the model. This statistical significance underscored the crucial role of green packaging, innovation, and supply chain management in influencing sustainable performance within the Malaysian food and beverage sector.

Table 3: Regression Analysis on Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.169	4.261		1.213	.229
	Innovation	1.085	.228	.453	4.759	<.001
	Supply Chain Management	.556	.230	.243	2.423	.018
	Green Packaging	.922	.378	.250	2.441	.017

a. Dependent Variable: Sustainable Performance

(Source: Developed from Research)

The coefficients for the regression analysis, presented in Table 3, indicated the individual contribution of each predictor variable to sustainable performance. Green Packaging exhibited the highest positive beta value (β = 0.453, p < 0.001), signifying that it had the most substantial positive effect on sustainable performance compared to the other two variables. Supply Chain Management (β = 0.250, p < 0.001) and Innovation (β = 0.243, p < 0.001) also demonstrated significant positive beta values, indicating their important contributions to the dependent variable. These results suggested that while all three independent variables were significant predictors of sustainable performance, the adoption and implementation of green packaging practices had the most pronounced positive influence within the Malaysian food and beverage industry.

The p-values for all hypothesized relationships were below the critical threshold of 0.05, leading to the statistical significance and subsequent acceptance of all hypotheses. The findings strongly indicated that innovation, effective supply chain management practices, and the implementation of green packaging strategies each demonstrated a significant positive relationship with sustainable performance in Malaysia's food and beverage industry. These results suggest that these three factors are indeed valid and impactful contributors to enhancing sustainability within the sector.

CONCLUSION

The findings of this study corroborate the growing global understanding of the interconnectedness between operational strategies and sustainability outcomes, particularly within the Malaysian food and beverage industry. The multiple regression analysis unequivocally demonstrated that innovation is a significant positive predictor of sustainable performance (β = 0.453, t = 4.759, p < 0.001), indicating that a one-unit increase in innovation efforts is associated with a 1.085-unit improvement in sustainable performance. This is further supported by descriptive statistics, where respondents expressed positive perceptions regarding their firms' propensity for trying new ideas (mean = 4.15) and actively seeking process improvements (mean = 4.07). This aligns with the notion that a culture of innovation fosters the development and adoption of more sustainable practices, leading to enhanced overall performance.

Similarly, the regression analysis confirmed the significant positive impact of supply chain management on sustainable performance (β = 0.243, t = 2.423, p = 0.018), with a one-unit increase in effective supply chain management leading to a 0.556-unit improvement in sustainability. Descriptive analysis echoed these findings,

highlighting the perceived value of continuous improvement initiatives (mean = 4.15) and the implementation of pull production systems for waste reduction (mean = 4.01). However, the observed variability in the implementation of resource sharing with trade partners and delaying final manufacturing activities (mean = 3.82) suggests potential areas for further development and standardization within the industry. This underscores the complexity of implementing comprehensive sustainable supply chain practices across diverse organizational structures.

Furthermore, the study established that green packaging has a positive and significant effect on sustainable performance ($\beta = 0.250$, $t = 2.441$, $p = 0.017$), with a one-unit increase in green packaging adoption correlating with a 0.922-unit improvement in sustainability. This was reinforced by descriptive statistics indicating strong agreement among respondents that recyclable materials enhance product quality (mean = 4.11) and that green labels effectively promote environmental awareness (mean = 4.10). This finding highlights the growing consumer demand for environmentally conscious packaging and the potential for green packaging to contribute to both environmental sustainability and positive brand perception.

Collectively, this study effectively investigated the influence of innovation, supply chain management, and green packaging on the sustainable performance of Malaysia's food and beverage industry through a robust quantitative approach. The identified significant positive correlations between these variables and sustainability outcomes provide valuable empirical evidence for businesses seeking to enhance their environmental, economic, and social performance. Innovation emerges as a critical enabler of sustainability by driving process optimization, improving product quality, and minimizing waste generation. Effective supply chain management is crucial for ensuring operational efficiency and minimizing environmental impact through responsible sourcing, optimized logistics, and waste reduction strategies. The adoption of green packaging directly addresses consumer demand for environmentally friendly products and significantly reduces packaging-related waste.

While this study provides valuable insights, it is important to acknowledge potential limitations. The quantitative nature of the research, while allowing for the identification of significant relationships, does not provide in-depth qualitative understanding of the nuances and challenges associated with implementing these sustainable practices within the specific cultural and economic context of Malaysia. Future research employing mixed-methods approaches could offer a more comprehensive understanding. Furthermore, the cross-sectional design limits the ability to infer causality and track the long-term impact of these practices. Longitudinal studies could provide valuable insights into the dynamic evolution of these relationships over time.

Comparing these findings with existing literature, this study aligns with the broader global consensus on the importance of innovation (e.g., Dangelico, 2016), sustainable supply chain management (e.g., Seuring & Müller, 2008), and green packaging (e.g., Chen & Chai, 2010) as key drivers of sustainability across various industries. Specifically within the food and beverage sector, recent studies continue to emphasize the role of technological innovation in reducing food waste (e.g., Galanakis, 2020), the importance of collaborative supply chain initiatives for environmental performance (e.g., Andalib Ardakani, Soltanmohammadi & Seuring, 2023), and the growing market for sustainable packaging solutions (e.g.,Eissenberger et al., 2023). This study contributes to this body of knowledge by providing empirical evidence within the specific context of the Malaysian food and beverage industry, highlighting the significant and relatively strong influence of green packaging on sustainable performance in this region.

Practical Applications and Future Research Directions:

The findings of this research offer several actionable recommendations. Business managers in the Malaysian food and beverage industry should prioritize fostering a culture of innovation that encourages the development and adoption of sustainable solutions across their operations. Investing in training and infrastructure to optimize supply chain management practices, with a focus on ethical sourcing and waste reduction, is also crucial. Furthermore, actively exploring and implementing green packaging solutions that resonate with consumer preferences can significantly enhance both environmental performance and brand image. Policymakers can leverage these findings to develop targeted regulations and incentives that promote the adoption of innovation, sustainable supply chain practices, and green packaging within the food and beverage sector. This could include providing financial support for sustainable technology adoption, establishing clear guidelines for green

packaging standards, and promoting collaboration within supply chains to enhance overall sustainability.

Future research could delve deeper into the specific types of innovations, supply chain management strategies, and green packaging materials that yield the most significant impact on sustainable performance within the Malaysian context. Investigating the role of digital technologies and Industry 4.0 advancements in enabling sustainable practices within the industry would also be a valuable avenue for exploration. Furthermore, examining consumer behavior and willingness to pay for sustainably produced and packaged food and beverage products could provide crucial insights for businesses. Finally, comparative studies across different regions within Malaysia or with neighboring countries could help to further understand the influence of regional and cultural factors on the adoption and effectiveness of sustainable practices in the food and beverage industry. This research provides a robust foundation for ongoing efforts to promote continuous improvement and innovation in sustainable performance across this vital sector of the Malaysian economy.

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