Factors Influencing Green Entrepreneurship Implementation Among Malaysian Oil and Gas Small and Medium Enterprises

[1] Ariff Aiman Azmin Mustam, [2]Mohd Najib Saad, [3] Arnis Asmat
[1 2 3] Faculty of Business and Management, Universiti Teknologi MARA, Malaysia
Corresponding Author: Email: najibsaad@uitm.edu.my

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Abstract

Scholars have recently concluded that green entrepreneurship is crucial to creating new economic prospects for sustainable development. Although there have been many recent studies in this area, little is known about how green entrepreneurship drivers help companies in the oil and gas industry move toward sustainable green practices. This study aims to fill the current research vacuum by clarifying the elements impacting green entrepreneurship in Malaysian oil and gas small and medium-sized businesses (OGSMEs). 3834 OGSMEs in Malaysia will have their data gathered using stratified random sampling. The study will use a cross-sectional survey approach, and SPSS version 29.0 and PLS-SEM version 4.0 will be used for data analysis. This study gives policymakers, government agencies, and business experts a better understanding of the variables affecting green entrepreneurship in the oil and gas industries. The results make it easier to create rules and policies that will improve the oil and gas sector's sustainability.

1.0 Introduction

Due to evidence that entrepreneurship contributes to economic growth, increased productivity, and the revitalization of social and productive networks, governments and scholars have become more interested in entrepreneurship over the past 20 years, particularly in relation to the emergence of new entrepreneurs and businesses (Goines et al., 2020; Cohen & Winn, 2021). According to Shirokova et al. (2018), entrepreneurship revitalizes local identities, accelerates innovation processes, and creates new job prospects. It is recognized that entrepreneurship can propel the shift towards a more sustainable society in the modern period, where sustainability is of utmost importance (Gasbarro et al., 2021; Martí & Santos, 2022). The relationship between business and the environment, in particular the role that entrepreneurs and Small and Medium Enterprises (SMEs) play in promoting a sustainable economic system, has drawn more and more attention from researchers (Nikolaou & Evangelinos, 2022). According to Smith et al. (2022), entrepreneurship is crucial to creating a more sustainable society, and sustainability has become commonplace in business. While Martinez-Canas (2020) notes that sustainable entrepreneurship has gained traction as a worldwide movement emphasizing social and environmental effect, Levinsohn (2019) argues that SMEs play a crucial, if under-researched, role in fostering local sustainability.

Green entrepreneurship is the term for business ventures focused on environmental sustainability, however for a variety of reasons, it is still not well studied in Malaysia and throughout the world. It is relatively new, having only been developed in the early 2000s, and lacks the deep historical research underpinnings of more traditional business methods (Yadlapalli, 2020). Research framework standardization is hampered by the lack of a common definition (Ratten, 2020; Urban, 2019). This emerging field covers a number of topics, including green markets (Zou et al., 2019), sustainable development (Gupta et al., 2021), and renewable energy (Demirel & Parris, 2017). Recent increases in knowledge of environmental deterioration and climate change have made green entrepreneurship more important (Kraus et al., 2020; Cohen & Winn, 2019). In ASEAN countries, particularly Malaysia, where studies show a discrepancy between the implementation of green entrepreneurial projects and their enablers, green entrepreneurship is not sufficiently studied (Rahman et al., 2025; Smith et al., 2023). Green entrepreneurship is still in its infancy, as evidenced by the uneven levels of green management practices among SMEs in Southeast Asia and the limited practical adoption of green entrepreneurship among Malaysian SMEs, despite growing interest (Tan & Liu, 2022).

The oil and gas industry is under growing pressure to reduce its environmental effect in the face of growing concerns about climate change and the global movement towards sustainable development (Ahmed et al., 2023). Small and medium-sized businesses in Malaysia's oil and gas industry play a critical role in supporting both upstream and downstream operations (SME Corp Malaysia, 2023). Despite their strategic importance, small and medium-sized businesses usually struggle to implement green entrepreneurship due to institutional barriers, knowledge gaps, and limited resources (Hair et al., 2018). Malaysian OGSMEs can achieve long-term competitiveness and support national and international sustainability goals by engaging in green entrepreneurship, which includes company operations that integrate environmental sustainability into entrepreneurial processes (Smith & Jones, 2022). However, in this high-impact industry, the implementation and use of green entrepreneurship strategies are uneven and understudied (Batty et al., 2020).

Numerous elements, such as organizational characteristics, environmental conditions, teamwork, and research and development, have been identified by previous studies as facilitators of green entrepreneurship (Xin & Gao, 2023). Nevertheless, little is known about how these factors impact the application of green entrepreneurship, which serves as an essential internal mechanism guiding resource allocation and decision-making (Zhang & Kim, 2024). There is a serious problem with this gap in the literature. Efforts to encourage sustainable practices in this sector may remain fragmented and ineffectual if the relationship between drivers and the implementation of green entrepreneurship is not understood (Kumar & Sinha, 2024). The creation of efficient organizational procedures and policies that are required to hasten the sector's sustainable transformation is hampered by this information gap.

Therefore, the purpose of this study is to evaluate the factors that influence Malaysian SMEs in the oil and gas industry to adopt green entrepreneurship. This study aims to identify the elements that increase the efficacy of organizational, environmental, collaborative, and research and development in promoting sustainable business practices by analysing how these practices interact (Gao & Li, 2020; Hair et al., 2018). By developing a thorough framework that includes key motivators and the application of green entrepreneurship, this study aims to bridge the gap between theory and practice. It offers OGSMEs workable ways to overcome challenges and take advantage of sustainability opportunities (Ahmed et al., 2023; Johnson & Lee, 2023). In line with national and international sustainability goals, our study contributes to the overall goal of building a resilient and sustainable economy in Malaysia (Broman & Robèrt, 2017; Hameed et al., 2021).

2.0 Literature Review

Malaysia's economy depends heavily on the oil and gas sector, which generates almost 20% of the country's income from exports, domestic energy supply, and industrial activities (Salleh et al., 2019). But there are also calls for a shift to sustainable methods because this industry contributes significantly to greenhouse gas emissions and environmental deterioration (Ahmad et al., 2020; Khan et al., 2021). Entrepreneurship, especially green entrepreneurship, is being adopted in this sector as a way to reconcile environmental stewardship with economic growth (Gast et al., 2017; Lüdeke-Freund et al., 2018). Incorporating green entrepreneurship into Malaysia's oil and gas sector is not just a tactical necessity to meet global sustainability targets, but also a solution to environmental issues. This strategy is especially pertinent in resource-intensive industries with significant environmental impact and significant innovation potential, such as oil and gas (Zeng et al., 2023; Hall et al., 2020). Although Malaysia's economy depends heavily on the oil and gas sector, its activities have long been linked to environmental problems such carbon emissions, habitat damage, and resource depletion (Khan et al., 2021).

Green entrepreneurship, sometimes referred to as eco-entrepreneurship, addresses pressing ecological issues through creative activities, goods, and services by fusing economic goals with environmental stewardship (Lüdeke-Freund et al., 2018; Demirel et al., 2019). This strategy integrates company strategies with broader societal shifts toward sustainable economies and prioritizes sustainability over short-term earnings (Horne & Bilec, 2020; Zeng et al., 2023). Green entrepreneurship, a crucial idea that arose from the larger environmental movements of the 20th century, is now essential to addressing environmental issues including resource depletion and climate change (Rockström et al., 2021). This study only looked at four of the many factors that influence green entrepreneurship: research and development, the environment, collaboration, and organizations (Rahman & Wong, 2022; Abdullah et al., 2021). For Malaysian SMEs operating in the oil and gas (O&G) sector, the incorporation of environmental and research and development as catalysts for green entrepreneurship is especially pertinent. By encouraging innovation and creating new markets, green entrepreneurship makes a substantial

contribution to economic growth, job creation, and environmental sustainability (Gast et al., 2017; Hall et al., 2020).

In green entrepreneurship, collaboration refers to the concerted efforts of stakeholders, such as cross-functional cooperation, green teams, and top management support, to accomplish common environmental and financial objectives. (Bocken and colleagues, 2018; Baldassarre and colleagues, 2018). By combining resources, knowledge, and experience, this partnership tackles challenging sustainability issues and promotes eco-innovation, removes obstacles, and aids in the adoption of sustainable practices. Support from senior management, green teams, and cross-functional cooperation are important aspects of collaboration that are essential to integrating sustainability into organizational operations and strategies (Demirel et al., 2019; Montiel et al., 2020). Collaboration promotes resource pooling, information sharing, and eco-innovation, all of which have a substantial impact on green entrepreneurship. By encouraging collaborations with external stakeholders and encouraging staff to embrace green practices, top management support guarantees that sustainability is ingrained in organizational strategies (Goh et al., 2019; Zhang et al., 2019). By encouraging creativity and coordinating sustainability initiatives with strategic objectives, green teams propel the creation of environmentally friendly solutions (Chen et al., 2020; Lüdeke-Freund et al., 2018).

In order to lessen environmental harm and promote the preservation of natural resources, the environmental component of green entrepreneurship includes external ecological and regulatory issues that influence the adoption and implementation of sustainable business practices. (Gast and others, 2017). The objective is to ensure long-term sustainability and competitive advantage by coordinating corporate operations with economic viability and environmental stewardship (Kirkwood & Walton, 2020). Through their impact on investment priorities, sustainability initiatives, and decision-making, environmental factors in particular, market orientation, inflation, and government policies are vital in determining the strategic direction of green entrepreneurship (Lyu et al., 2020).

By empowering SMEs to create eco-innovations that tackle environmental issues and satisfy sustainability requirements, research and development propels green entrepreneurship (Ghisetti & Rennings, 2020). While tactical positioning guarantees that cutting-edge technologies are in line with market demands and regulatory norms, scientific capability serves as the foundation for their development (Belin et al., 2018). These initiatives are organized through intervention planning, which maximizes resource allocation and guarantees quantifiable results (Barbieri et al., 2019). SMEs can establish themselves as leaders in the green economy by utilizing research and development to create sustainable business models that strike a balance between environmental responsibility and profitability (Schiederig et al., 2020). In line with market trends and sustainability frameworks, renewable energy SMEs, for example, employ research and development to produce novel solutions such energy-efficient technologies (Triguero et al., 2021). By fostering innovation, flexibility, and competitive advantage, research and development supports company strategy and helps SMEs succeed in ever-changing markets (Zhong et al., 2021).

Organizational drivers in green entrepreneurship are internal procedures, cultural norms, and structural arrangements that make it easier for a company to smoothly incorporate sustainability efforts. These factors are crucial in determining how well a business can create and apply environmentally friendly solutions, which will eventually support environmental sustainability (Garcés-Ayerbe et al., 2021). By offering the strategic and structural underpinnings required for eco-innovation, organizational factors like corporate social responsibility, circular supply chain management, and total quality management have a big impact on the uptake and success of green entrepreneurship. In order to achieve the goals of green entrepreneurship, circular supply chain management promotes resource efficiency and lowers environmental footprints by bringing supply chain operations into line with sustainability principles (Kirchherr et al., 2020). In a similar vein, corporate social responsibility incorporates environmental and social responsibility into organizational strategy, allowing companies to strike a balance between sustainability and profitability—a crucial component of green business endeavors (Zhao et al., 2019). By integrating innovation and continual improvement into operations, total quality management supports these initiatives and guarantees that environmental objectives are fulfilled while upholding high standards of quality (Jabbour et al., 2021). These factors combine together to form a coherent framework for green entrepreneurship that promotes long-term company resilience and sustainable value creation (Khalid et al., 2021).

2.1 Underpinning Theory

A variety of theories that highlight the importance of environmental, social, and economic factors in corporate

operations can be used to gain a thorough understanding of green entrepreneurship in the Malaysian oil and gas (O&G) industry. According to the sustainability theory, which is backed by the Triple Bottom Line framework, profitable companies must strike a balance between social justice, environmental responsibility, and environmental responsibility (Schaltegger et al., 2017). This viewpoint offers long-term advantages like improved reputation and regulatory compliance, guiding Malaysian SMEs in O&G to choose sustainable practices despite obstacles like high initial expenses (Savitz & Weber, 2016).

2.1.1 Critical Success Factors Theory

The notion of critical success factors outlines the key components that an organization needs to accomplish its goals, especially in dynamic and complicated industries like the oil and gas sector. Critical success factors theory, as it relates to green entrepreneurship, highlights elements like stakeholder engagement, technological innovation, and environmental compliance that are essential for Malaysian SMEs to successfully shift to sustainable practices (Amran et al., 2018; Mohamed & Alsharif, 2021).

By highlighting industry-specific elements like government incentives, access to green technology, and the demand for qualified workers, this theory emphasizes the significance of coordinating business strategy with green initiatives (Ahmad et al., 2020). Integrating important success factors into strategic planning guarantees that Malaysian SMEs in the O&G industry may successfully negotiate the intricacies of regulatory frameworks and gain a competitive edge through sustainable practices (Rahman et al., 2022).

2.1.2 Dynamic Capabilities Theory

The ability of an organization to integrate, develop, and reorganize internal and external resources in order to adjust to quickly changing surroundings is the main focus of dynamic capabilities theory. This theory emphasizes the need for agility and innovation in executing green entrepreneurship activities, making it especially pertinent to Malaysian SMEs in the O&G sector (Bocken et al., 2018).

Three essential skills for green entrepreneurship are identified by the dynamic capability framework: recognizing opportunities, grasping them, and rearranging resources (Ambrosini & Bowman, 2018; Lim et al., 2022). For example, identifying new trends in renewable energy is part of sensing possibilities, but investing in green technology and forming alliances with stakeholders are necessary to seize them (Lee et al., 2023). Long-term competitiveness and resilience are ensured by resource reconfiguration, such as switching from fossil fuels to sustainable energy sources (Zahra et al., 2020).

2.1.3 Resource-Based View Theory

Furthermore, the resource-based view theory emphasizes how crucial it is to use internal resources like skilled workers and renewable energy systems to generate competitive advantages and carry out green plans successfully (Khan et al., 2021). As demonstrated by Malaysia's National Green Technology Policy and the Green Technology Financing Scheme, institutional theory highlights the important role that social pressures and governmental policies play in promoting sustainable practices (Eshun & Kafui, 2021; DiMaggio & Powell, 2022). Additionally, in line with global sustainability trends, the Environmental Innovation theory promotes the adoption of green technologies by highlighting how eco-innovations can result in cost savings and increased competitiveness (Albort-Morant et al., 2016).

2.2 Proposed Conceptual Framework

The study's suggested framework offers an organized method for comprehending the connection between green entrepreneurship implementation and drivers. The framework adds new components to broaden its explanatory breadth while building on findings from earlier studies and related theories, particularly addressing the factors that influence the adoption of green entrepreneurship.

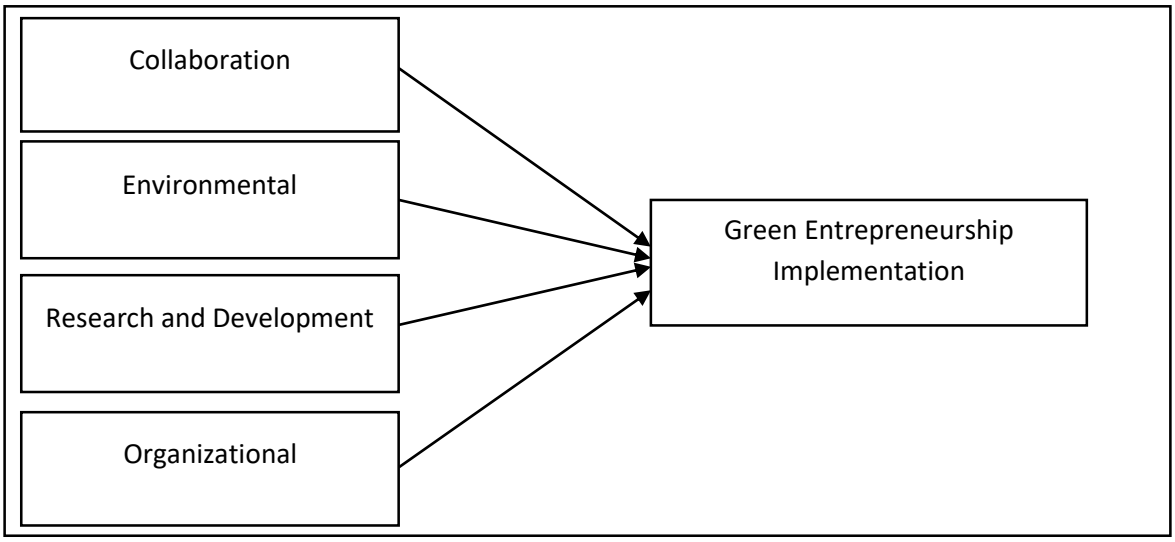
The main outcome of interest is the implementation of green entrepreneurship, which is positioned as the dependent variable in the research framework. The process of developing novel goods and services that strike a

balance between environmental stewardship and profit, integrating sustainability into fundamental company plans, and meeting consumer expectations for eco-friendly solutions is known as "green entrepreneurship." The elements that propel or support the adoption of green entrepreneurship are known as drivers of green entrepreneurship, and they function as independent variables. Research and development, organizational, environmental, and collaborative factors are some of these drives.

This framework takes a broad view, looking at a variety of organizational, environmental, collaborative, and research-based elements, in contrast to fragmented methods that concentrate on particular drivers. A more thorough comprehension of the complex nature of green entrepreneurship is ensured by this integrative approach.

The framework highlights the dynamic interaction between drivers and the implementation of green entrepreneurship. It provides practical insights for practitioners and policymakers by demonstrating how operational considerations and strategic alignment combine to accomplish sustainability goals. The framework is a useful tool for investigating green entrepreneurship in a variety of businesses due to its adaptability to different sectors and circumstances. Its application to cutting-edge fields, like the nexus of sustainability and technology, presents opportunities for additional innovation in practice and research.

Figure 1: Proposed Conceptual Framework



2.3 Hypotheses Development

Collaboration, the environment, knowledge management techniques, and organizational characteristics all have a big impact on how green entrepreneurship is implemented among OGSMEs in Malaysia. Collaboration promotes group innovation and resource-sharing mechanisms that greatly improve the execution of green entrepreneurship initiatives. This includes stakeholder partnerships, inter-organizational networks, and cross-sector engagement (Zheng et al., 2023; Upward & Jones, 2016). Consequently, the following hypothesis is developed:

H1: There is a significant relationship between collaboration and green entrepreneurship implementation.

Since encouraging government policies encourage eco-innovation among SMEs, there is a strong correlation between environmental factors and the adoption of green entrepreneurship (Hassan et al., 2021). Businesses are driven to implement green practices by consumer demand for sustainable products (Ismail & Daud, 2020; Nor & Said, 2019). Entrepreneurial dedication to sustainability is strengthened by regulatory frameworks and environmental awareness initiatives (Omar & Azmi, 2020; Mahadi & Yusof, 2021). Additionally, eco-friendly company models are promoted by having access to green funding and tax benefits (Abdullah & Ramli, 2021; Rahman & Ibrahim, 2022). Thus, the following hypothesis is developed:

H2: There is a significant relationship between environmental and green entrepreneurship implementation.

Furthermore, research and development plays a crucial role in green entrepreneurship by advancing technology and encouraging the creation of environmentally friendly goods and services, which helps businesses stay competitive in markets that prioritize sustainability (Zhang et al., 2023; Schaltegger et al., 2024). Consequently, the following hypothesis is developed:

H3: There is a significant relationship between research and development and green entrepreneurship implementation.

Since eco-innovation strategies are driven by strong internal structures, there is a considerable correlation between the implementation of green entrepreneurship and organizational competencies (Abdullah & Ramli, 2021; Ismail & Daud, 2020). For SMEs to adopt sustainable practices, corporate culture and leadership commitment are essential (Hassan et al., 2021; Nor & Said, 2019). Green entrepreneurship results are improved by efficient resource management in firms (Omar & Azmi, 2020; Rahman & Ibrahim, 2022). Businesses are able to conform to market demands and environmental requirements through organizational learning and flexibility (Zainal & Hashim, 2020; Ahmad et al., 2021). Consequently, the following hypothesis is developed:

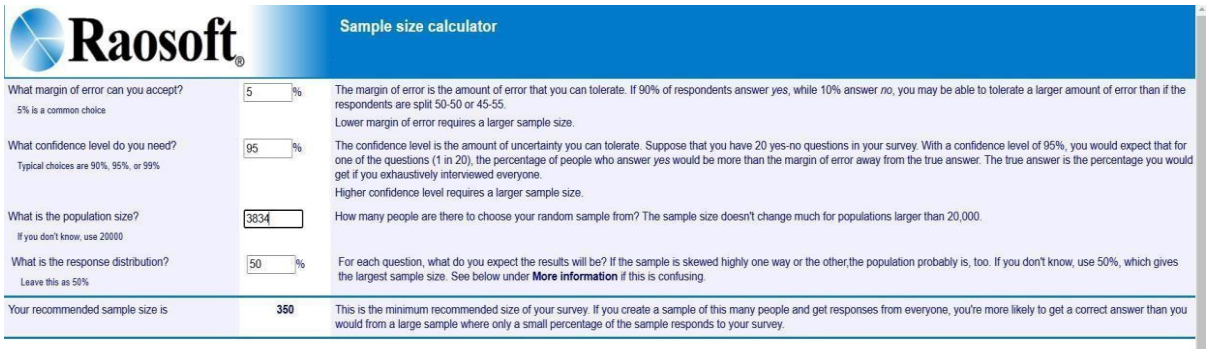
H4: There is a significant relationship between organizational and green entrepreneurship implementation.

3.0 Research Methodology

The quantitative technique of this study will employ self-administered survey questionnaires to collect data from a sample of oil and gas-related Malaysian SMEs. Simple random sampling is used as a sample approach. The Petroleum Regulatory Division, Ministry of Domestic Trade and Costs of Living (KPDN), and SME Corporation (SME Corp) directories as of October 2024, which represent Malaysian oil and gas SMEs, will serve as the basis for the sample frame for this study. Specific information such firm names, office addresses, phone and fax numbers, business categories, and contact names will all be included in the sampling period.

To find the minimum sample size for the specified total population, this study will use the Raosoft sample size calculator (Raosoft, 2010). Memon et al. (2020) claim that the Raosoft software will work especially well for this. The suggested sample size is 350 respondents, as seen in Figure 2. The researcher will determine the bare minimum of participants needed for a suitable sample size by using these methods. As a result, at least 350 participants will be included in the data collection. This sample size will be adequate for extrapolating the results given the target population of roughly 3,834 business establishments. The Raosoft Sample Size Calculator will be the most effective tool for figuring out the minimal sample size when all aspects are considered.

Figure 2: Raosoft Sample Size Calculator



To reach the minimal sample size of 350, 1500 questionnaires will be sent to respondents from SMEs in the oil and gas sector, according to the Raosoft Sample Size Calculator. The link between the variables is investigated using Partial Least Squares-Structural Equation Modeling (PLS-SEM). Collaboration, organizational, environmental, and research and development are the exogenous latent variables in this study, whereas the implementation of green entrepreneurship is the endogenous latent variable.

4.0 Conclusion

This conceptual study has examined the primary motivators for the implementation of green entrepreneurship in Malaysian oil and gas SMEs. By combining insights from current literature and industrial realities, the research identifies four key drivers that are collaboration, environmental, research and development, and organizational as basic drivers of the implementation of green entrepreneurship. These factors provide a fundamental foundation for understanding how SMEs in the oil and gas industry can assist Malaysia's broader environmental and economic sustainability goals and successfully adopt green practices.

This study is important because it fills important research gaps on green entrepreneurship, especially when considering Malaysian SMEs in the oil and gas industry. Although earlier research has concentrated on technology developments, this study highlights factors and how they relate to the application of green entrepreneurship, providing a novel framework to improve green practices. It emphasizes utilizing resources and accomplishing crucial objectives for sustainability and competitiveness by utilizing the resource-based view, dynamic capability theory, and critical success factors theory. Beyond its scholarly significance, it offers practical advice on how SMEs might embrace green practices, helping legislators create incentives and legislation that promote national sustainability objectives. The study has wider ramifications for Malaysia as well, addressing sustainability in a crucial sector and promoting green entrepreneurship to meet both financial and environmental goals. In emerging economies, this all-encompassing strategy promotes sustainability and environmental responsibility.

This study is important because it fills important gaps in the literature on green entrepreneurship, especially when it comes to SMEs in Malaysia's oil and gas sector. Although the majority of earlier study has focused on technological developments in green entrepreneurship, less focus has been placed on the factors that encourage its uptake. The study offers a thorough and creative framework to comprehend and improve green entrepreneurship practices by concentrating on these factors. In a sector that has historically been linked to environmental issues and inadequate sustainability measures, this contribution is extremely valuable. By creating a thorough framework that incorporates important drivers and the application of green entrepreneurship, this study ultimately seeks to close the gap between theory and reality by providing OGSMEs with workable ways to get over obstacles and seize sustainability opportunities. In line with national and international sustainability objectives, this research advances the larger objective of creating a resilient and sustainable economy in Malaysia.

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