

## **Driving Sustainability and Profitability: The Role of Green Entrepreneurial Orientation, Green Technology Adoption, and Green Transformational Leadership in Indonesian MSMEs**



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### **ABSTRACT**

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*environmental performance (EP), financial performance (FP), Green Entrepreneurial Orientation (GEO), Green Technology Adoption (GTA), Green Transformational Leadership (GTL), sustainable development goals (SDG)*

The purpose of this study is to analyze the effect of Green Entrepreneurial Orientation (GEO), Green Technology Adoption (GTA), and Green Transformational Leadership (GTL) on environmental performance (EP) and financial performance (FP). The study uses a quantitative approach, with primary data gathered using questionnaires. A total of 211 responses were gathered from micro, small, and medium enterprise (MSME) actors located in Jakarta and Tangerang. The respondents hold various positions, including staff, supervisors, managers, and owners, from different business sectors such as food and beverages, fashion, automotive, and handicrafts. The previously collected data were processed using SmartPLS4 and SPSS27. The results reflect that GTA and GTL have a significant positive effect on both EP and FP. Meanwhile, GEO has no significant effect on either performance. These results prove that MSME that adopt green technology or have green transformational leadership behavior may contribute to sustainable development goals (SDG), namely SDG 8, 12, and 13. Utilizing green technology enables MSME to reduce environmental burdens from operations and increase business efficiency, which leads to better EP and FP. In addition, MSME actors who possess GTL behavior would motivate co-workers to be more environmentally friendly, but also contribute positively to FP.

## **1. INTRODUCTION**

Global economic uncertainty, followed by worsening environmental degradation, has left enterprises caught between survival and collapse. Recently, the United States (U.S.) announced an increase in reciprocal import tariffs on goods for approximately 90 countries [1]. The baseline tariff planned by the U.S. is 10% for most countries including Indonesia. However, after several meetings and negotiations, Indonesia received a final tariff rate of 19%, a reduction from the initially proposed 32% [2]. The application of the tariffs creates a global depressing business sentiment [3], generating a ripple effect that eventually impacts global micro, small, and medium enterprises (MSMEs), including those in Indonesia. An increase in the import tariff would only contribute to higher inflation in Indonesia [4] and erode consumer purchasing power [5]. In a short time, MSMEs would potentially face obstacles, including fluctuating prices of raw materials and logistics fees. Moreover, the tariff update negatively impacts the Indonesian Rupiah, which may lead to a decline in consumers' purchasing behavior [6]. Additionally, the implementation of the tariffs reduces the demand for Indonesian products, specifically products from the textile, furniture, and footwear sectors [7]. Given that Indonesian MSMEs contribute 61% to the country's GDP [8], the combined effects of inflation, tariffs, and uncertainty pose a

serious threat to the Indonesian economy.

On the other hand, environmental concerns are also arising. Immediate actions are required to prevent the global temperature from increasing to 1.5°C. Efforts made in mitigating greenhouse gases are still deemed ineffective and inadequate to achieve the goals that were set at the Paris Climate Agreement [9]. In the context of Indonesia, according to the Institute for Essential Services Reform (IESR), energy-related emissions generated from MSMEs' operations are estimated to be equivalent to half of the emissions produced by the national industry sector [10]. Regardless of the contributions of MSMEs to the Indonesian economy, the increase in greenhouse gas emissions may only lead to extreme climate change [11]. Moreover, the global consumption of single-use plastic continues to increase, negatively impacting environmental sustainability, with the food and beverage sector being one of the largest contributors [12]. The increase in greenhouse gas emissions, followed by severe plastic pollution, underscores the urgent need for green solutions.

Due to the rapidly changing environment, all types of businesses are gradually being forced to implement green practices to ensure their long-term sustainability [13, 14]. Material waste, product, and packaging waste from MSMEs' activity may reduce consumers' attraction, leading to a decrease in employee welfare and operating profit [15]. Responding to the situation, MSMEs actors should explore

green practices including seeking new eco-friendly technologies and green innovative business practices [16]. The adoption of green orientation by MSMEs to overcome the obstacles from environmental and financial concerns aligns with the achievement of sustainable development goals (SDG). Decent Work and Economic Growth (SDG 8), Responsible Consumption and Production (SDG 12), and Climate Action (SDG 13) are three SDGs that this research can contribute to. As mentioned previously, MSMEs make many contributions to the Indonesian economy including to GDP, which is associated with SDG number 8 [17]. On the other hand, environmental and financial concerns faced by MSMEs require the adoption of eco-friendly technologies, renewable energy sources, and efficient resource utilization which is in line with SDG number 12 [18]. SDG 13, which focuses on climate action, is associated with MSMEs who switch to renewable energy sources or implement mitigation activities such as enhancing energy efficiency in lighting, refrigeration, and building systems [17]. Considering the phenomena and the opportunities for improvement that MSMEs have, this study aims to identify internal factors that may enhance enterprises' EP and FP [19], specifically through Green Entrepreneurial Orientation (GEO) [20], Green Technology Adoption (GTA) [21], and Green Transformational Leadership (GTL) [22].

GEO refers to the tendency of an entity to pursue green opportunities to gain financial outcomes while maintaining environmental impact [23]. It has the characteristics of green innovation, pro-activeness towards green practice, and risk-taking behavior [24]. A number of prior studies found that GEO has a positive influence on both environmental and financial performance [19, 23, 25, 26]. GEO plays a dynamic capability role that enables businesses to create, find, and take advantage of new green-themed possibilities while gaining profit from doing it [19]. According to Coelho et al. [23], GEO can mitigate the adverse effects of enterprises' activities which ultimately create a positive influence on SMEs' environmental and financial aspects. Although the majority of researchers agree that GEO has a positive impact on financial performance, some researchers including Anin et al. [16], Afum et al. [27], and Zhang and Li. [28] still found GEO to have a negative impact on financial performance. The researchers emphasize that it may be caused by the fact that investing in sustainable practice is high-risk and has uncertain return, especially in the short-term [27]. Meanwhile, according to Anin et al. [16], it is required a firm-level green intervention to translate GEO into economic benefits. On the other hand, a study by Shafique et al. [29] shows that GEO may boost environmental performance when there is strong organizational ambidexterity and corporate social responsibility activities.

Green technology is an umbrella term that covers a broad group of methods and materials that help address emerging sustainability issues through the advancement of science and technology [30]. According to Li et al. [21], GTA is the usage of eco-friendly technologies in business operations to reduce excessive resource consumption. A study by Khan et al. [31] found that GTA has a significant and positive direct relationship in improving sustainable performance. When GTA is implemented efficiently, it leads to lower resource waste and improves operational efficiencies which enhance overall sustainability performance. Another prior study by Maghfuriyah et al. [32] found that green technology innovations through green process and product innovation positively impact financial performance. Furthermore, several researchers found that GTA has a positive impact on

environmental performance [33, 34]. Opazo-Basáez et al. [34] argue that the utilization of green technology on medium-sized enterprises has a positive impact on environmental performance and states that enterprises that fail to adopt green technology tend to generate more negative environmental externalities. A study by Kuosuwan et al. [35] shows that the implementation of e-payments is able to increase environmental performance by reducing carbon footprint, paper usage, and energy to print or store financial records. The amount of existing literature on GT is still scarce, especially in the setting of Indonesia.

Another variable employed in this research was Green Transformational Leadership (GTL). By definition, GTL can be pictured as a leadership style that motivates, influences, and inspires followers to achieve environmental goals [36]. Xu et al. [36] conducted research and found that GTL has a positive effect on both EP and FP. The role of GTL influences and inspires co-workers to engage in green initiatives leading to positive outcomes for both EP and FP. Other former research by Ismail [18], Tian et al. [37], and Sun et al. [22] also discovered that GTL has a positive effect on EP. Furthermore, the research conducted by Asad et al. [24] shows that GTL has a positive impact on the financial performance of entrepreneurial firms. On the other hand, Rustiarini et al. [38] revealed that GTL does not affect EP. They believe that leaders are still focusing on economic performance and ignore the potential benefits of environmental performance and competitive advantage. Moreover, GTL was also proven to have a negative and insignificant effect on building environmental behavior [39].

In light of the inconsistent findings and gaps from prior research, this study aims to fill it by analyzing the influence of GEO, GTA, and GTD on MSMEs' EP and FP. The success of this study may also contribute to the achievement of SDGs 8, 12, and 13. The study was done in the setting of Indonesia, specifically across all regions of Jakarta, the main capital city, and all regions of Tangerang, its satellite city. These two locations were chosen due to their high economic activity and a combined total of over one million operating MSMEs. From the environmental perspectives, both location PM<sub>2.5</sub> levels exceed World Health Organization guidelines by 7 to over 10 times [40, 41]. The substantial amount of operating MSMEs in both areas plays a considerable role in contributing to the local air quality. Subjects of this study are MSMEs from various sectors that have the potential to negatively impact the environment such as food and beverages [26], fashion [19, 42], handicrafts, and otomotif. Further discussion towards the research will be divided on various parts in the following manner: Part 2 discusses about grand theory and prior research, Part 3 consists of methodology, measures, and techniques used in this research, Part 4 presents the result of the processed data supported by deep explanation, Part 5 is the conclusion of this research followed by suggestions for further research.

## 2. LITERATURE REVIEW

As a response to the rapidly changing environments, MSMEs are forced to be more innovative in what they are doing. This study is supported by the Dynamic Capability Theory (DCT) which was introduced by Teece et al. [43] in 1998. DCT is defined as the ability of an enterprise to integrate, build, and reconfigure internal and external competencies when facing rapidly changing environments [43]. The theory

has three fundamentals including sensing, seizing, and transforming. In short, sensing is the ability to seek and identify new opportunities, seizing refers to the action taken to reach the opportunities, and transforming means the ability to continuously adapt and reconfigure [44]. The implementation of dynamic capabilities would sharpen the business's flexibility, responsiveness, and learning capabilities [45]. Based on the discussion in part 1, environmental and financial issues are pushing MSMEs to adopt innovative green practices to ensure their survival in this uncertain condition. However, implementing green practices in operation is still deemed to be a risky move; it may contribute to a better environment, but on the other hand, financial performance may suffer. Therefore, MSMEs should have dynamic capabilities to counter any challenges and survive in the rapidly changing environment [19]. With the help of dynamic capability, it may support MSMEs to address sustainability performance at a lower cost and increase market success [46].

Moreover, this study is also supported by the Resource Based View (RBV) theory. The theory was initially introduced in 1984; it concluded that the competitive advantage of an enterprise stems from the uniqueness of its internal resources [47]. Resources can be in a variety of forms including assets, capabilities, information, or knowledge. Enterprise resources can be a competitive advantage when they are valuable; they have the characteristics of: imperfectly imitable, rare among competitors, having no equivalent substitutes, and must be valuable in exploiting opportunities and neutralizing threats [48]. As environmental and financial concerns are escalating, MSME should have unique and difficult-to-imitate internal resources to gain a competitive advantage in the competitive market which ultimately ensures their survival.

### **2.1 The effect of Green Entrepreneurial Orientation on environmental performance and financial performance**

The term Green Entrepreneurial Orientation (GEO) derives from Entrepreneurial Orientation (EO), a concept that was introduced by Miller in 1983. According to Miller [49], an enterprise can be identified as an entrepreneur through a three-dimensional framework including the risk-taking behavior, introduction of innovative features, and the pro-activeness in developing strategies. Over time, due to the escalating environmental concerns, many researchers modified and developed the term EO into GEO. GEO can be characterized by green innovation, green activity pro-activeness, and risk-taking in adopting green practices which would lead to superior entrepreneurial firms' performance [24]. The characteristics of GEO align well with the fundamentals of Dynamic Capability Theory, the risk-taking behavior and pro-activeness in introducing green innovation show the ability of an enterprise to sense, seize, and transform opportunities, especially in this rapidly changing environment. Moreover, the innovative nature of GEO itself helps entrepreneurial firms in efficient utilization of resources to reduce costs [16] and acts as a driver to reduce ecological consequences [50].

Existing studies have examined and elaborated on the impact of implementing GEO in affecting entrepreneurial firms' environmental and financial performance. For instance, a study conducted by Coelho et al. [23] states that strong implementation of GEO may increase an entrepreneurial firm's environmental and financial performance. According to San et al. [26], the tendency that comes from GEO may help enterprises in developing eco-design practice to reduce toxic

and hazardous material which ultimately increase the enterprise's environmental performance. Another study conducted by Asad et al. [19] has similar results to San et al. [26], where the researchers found that GEO acts as a dynamic capability role that motivates enterprises to adopt green-themed practices to reduce environmental impact while still gaining profits. Ultimately, Asad et al. [24] found a positive influence of GEO on the performance of entrepreneurial firms due to the shift of consumer preference towards green products. Many studies have shown the positive influence of GEO on EP and FP; however, different contexts, methodological, and theoretical applied may contribute to diverse results [50]. Considering the discussion, the researchers hypothesized:

**H1:** GEO has a positive effect on EP.

**H2:** GEO has a positive effect on FP.

### **2.2 The effect of Green Technology Adoption on environmental performance and financial performance**

According to the European Commission [51], eco-innovation can be defined as any form of innovation resulting in or aiming at achieving the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources. The concept of green technology is a subset of the term eco-innovation; it can be characterized by the ability to reduce environmental burdens [52]. Green technology is hard to define since it covers a lot of areas; it can be safely defined as technology that helps address emerging issues of sustainability because of the advancement of science and technology [30]. Moreover, according to Opazo-Basáez et al. [34], it may be in the form of process, product, or service innovation. For instance, research by Hamdani et al. [33] shows the usage of natural dyes in batik products to reduce pollution and other environmental impacts. Adopting green technology offers several benefits including an increase in organizational productivity and helps in reducing material waste [31]. In addition to eco-friendly raw materials and energy-efficient equipment, this study considers fintech as a branch of green technology. According to Kuosuwani et al. [35], e-payments have the ability to reduce carbon emissions, energy consumption, and material waste (e.g., paper and ink) and have been proven to have less environmental impact compared to cash payments [53]. Moreover, the implementation of fintech may help in increasing environmental performance and help small businesses in transitioning towards a more sustainable business model [54]. The initiative of adopting green technology aligns with RBV theory, where the implementation of it may lower environmental impact and lower operational costs which directly generate competitive advantage and uniqueness compared to competitors.

According to a prior study by Khan et al. [31], the implementation of green technology may increase enterprise operational efficiencies and reduce resource waste which leads to increased overall sustainable performance. Moreover, Hamdani et al. [33] found that the implementation of green technology positively impacts environmental performance due to the ability to reduce environmental impact such as pollution. A study by Maghfuriyah et al. [32] shows a positive influence of green technology innovation on the financial performance of entrepreneurial firms through the utilization of green product innovation and process. Li et al. [21] conducted a study on manufacturing firms and found that the adoption of

green technology positively influences both EP and FP because of the ability of GTA to increase operational efficiencies and foster the firm’s innovative process. In addition, performing R&D for technology innovation helps enterprises to use more environmentally friendly materials and cleaner technology to make more savings [55]. The utilization of green technology innovation can create competitive advantages and enhance consumers’ trust in society [56]. The amount of literature on green technology usage in MSMEs is still scarce; hence, the researchers aim to fill the gap. Based on the discussion, the researchers hypothesized:

**H3:** GTA has a positive effect on EP.

**H4:** GTA has a positive effect on FP.

### 2.3 The effect of Green Transformational Leadership on environmental performance and financial performance

GTL can be defined as a leadership style of an individual who is able to influence followers to engage in pro-environmental behaviours [57]. GTL plays an important role in entrepreneurial firms; it may enhance the followers’ capabilities and help them in taking risky innovations [24]. By demonstrating and advocating eco-friendly conscious practice, followers would be inspired and motivated to adopt similar green behavior [18]. The growing emphasis on environmental and sustainable practices leads to the emergence of Green Transformational Leadership as a significant concept. The characteristics of Green Transformational Leadership align with the RBV theory; GTL represents a unique internal human capital resource, particularly in the form of knowledge and intelligence [48]. Furthermore, the implementation of GTL behavior offers benefits including a reduction in negative environmental impact and an increase in green practice adoption [58].

GTL has gained considerable attention from researchers, especially its utilization in the context of entrepreneurial firms. According to the research by Le et al. [13], GTL plays an important role in inspiring and pursuing followers in implementing green practices, which would lead to better environmental and financial performance. Another study conducted by Asad et al. [24] also shows similar output where GTL positively impacts the performance of entrepreneurial firms. Moreover, Tian et al. [37] found that GTL has a positive and significant impact on environmental performance, it was because GTL enhances businesses’ green capacity, dedication, and potential which leads to an increase in EP. Additionally, Sun et al. [22] found that the implementation of GTL has a positive influence on increasing environmental performance. Therefore, based on the discussion, the researchers hypothesized:

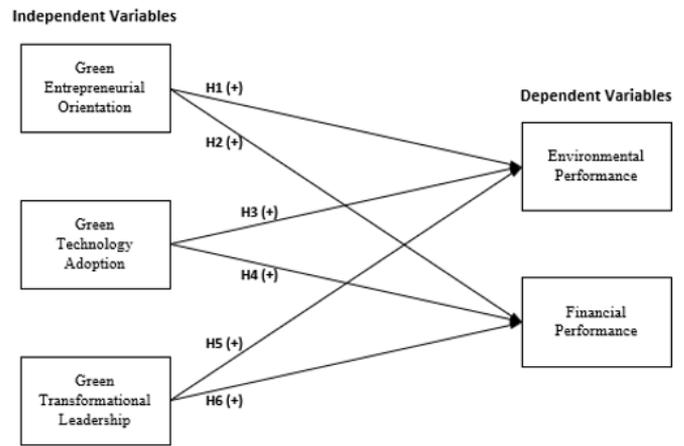
**H5:** GTL has a positive effect on EP.

**H6:** GTL has a positive effect on FP.

### 3. METHODOLOGY

This study employs a quantitative approach using primary data. Figure 1 illustrates the research model of this study. A Google Form was used as an instrument to collect data from participants. The questionnaires were mostly shared by approaching the participants in person, while the rest were collected by utilizing social media such as Whatsapp, Telegram and Instagram Direct Message. A minimum target of 99 respondents (100%) was calculated using G\*Power

3.1.9.7 [59]. The total collected data is 215 respondents, 117% higher than required; however, only 211 (98%) respondents fit the criteria. Data used in this study were gathered from micro, small, and medium enterprises (MSMEs) operating in all regions of Jakarta and all regions in Tangerang. These two cities reflect diverse levels of economic growth and geographical location.



**Figure 1.** Research model

The criteria of MSMEs refer to the Government Regulation Number 7 of 2021. A Convenience sampling technique is implemented to ease the researchers in collecting data [60]. Owners, Managers, Supervisors, and Staff from several different business sectors including food and beverage, fashion, handicraft, and otomotif are identified as informants in this study. Staff are included on the basis that transformational leadership may be exhibited by anyone regardless of their formal position [61]. The criteria of the subject are as follows: MSMEs that evaluate both environmental and financial performance, utilize green technology, and are managed by more than one individual. Data gathered from participants were analysed using partial least squares structural equation modeling (PLS-SEM), which suits this study which has a large number of items and a small amount of sample size [59]. Statistic softwares namely SmartPLS 4 and SPSS 27 were utilized to evaluate the research hypothesis.

A six-point likert scale was used as a measure of each item, ranging from 1 (strongly disagree) to 6 (strongly agree). The scale of EP was measured using six items adopted from the studies [19, 50]. FP had five items adopted from the study [19]. Six items were used to measure Green Transformational Leadership (GTL) adopted from the study [22]. Green Technology Adoption (GTA) measure had five items adopted from this research [21]. The measurement of Green Entrepreneurial Orientation (GEO) was measured using five items adopted from researches [20, 62].

The items were modified after conducting a consultation session using Zoom Meeting with a sustainability expert. Initially, the researchers gathered several indicators used from prior studies. During the session, a selection and elimination of indicators was performed to ensure which items suit best. With the assistance and guidance from the expert, the selected items were added further elaboration and given samples. Some examples of modifications are as follows: an item from EP was modified from “Our firm focused on reduced emission” to “Our firm aims to reduce emissions generated by operational vehicles, operational equipment and machinery, business

travel, and product delivery”, the modification was done to add more details and reflect the three scopes of emission (scope 1-3). An item from FP, “Our firm has experienced a reduction in costs,” was changed to “Our firm experienced a reduction in costs (e.g., raw material, freight, administrative, or operational costs)” to add more clarity to the item. As for other items, the wordings were mostly modified to ease the participant’s understanding and added with more emphasis on the sustainability-related terms.

In addition, before the questionnaire was distributed, a pre-test was performed among the MSME actors. The researchers approached 10 MSME actors including the owner, manager, supervisor, and staff from different business backgrounds, to discuss the modified items. The process started with showing the pre-modified indicators, followed by a discussion for items that are still deemed to be unclear. Turns out most of the indicators were easily understood by MSME actors, though some minor modifications are still required. The following are some examples of the modifications suggested and implemented: an item from EP, “Our firm focused on reduced air pollution” was modified into “Our firm focused on reduced air/water/land pollution” to broaden the scope of the item measured, then the phrase “a responsive” was shifted to “fast” for the item “When facing uncertainty, we usually take a responsive action to seize potential green opportunities” in GEO, as a response to the preferred terminology used by local business actors. Moreover, all items in FP were previously measured within six months, but after conducting further investigations and discussion, MSMEs evaluated FP monthly; therefore, FP items were measured in the range of one month.

## 4. RESULT

### 4.1 Statistical descriptive test

According to Table 1, EP showed a minimum value of 2.00 and a maximum value of 6.00, with a mean of 4.59 and a standard deviation of 0.85. The descriptive statistical values of EP reflect a strong agreement majority trend with a moderate spread of responses. This shows that respondents tend to agree on reducing pollution and emissions. However, their response shows a slight disagreement when it comes to utilizing 3R (reduce, reuse, recycle) items in daily operation.

**Table 1.** Descriptive statistic result

Variables	Minimum	Maximum	Mean	Standard Deviation
EP	2.00	6.00	4.59	0.85
FP	1.00	6.00	4.09	0.95
GEO	1.60	6.00	3.94	0.85
GTA	1.80	6.00	4.12	0.84
GTL	2.17	6.00	4.46	0.84

Note: EP = Environmental Performance, FP = Financial Performance, GEO = Green Entrepreneurial Orientation, GTA = Green Technology Adoption, GTL = Green Transformational Leadership.

Furthermore, FP recorded a minimum value of 1.00 and maximum value of 6.00, with mean of 4.09 and a standard deviation of 0.95. The result suggests that while some respondents showed strong disagreement, the overall trend leaned toward agreement. According to the response, the majority of respondents agreed that they experienced an increase in revenue and net profit. However, they expressed a

huge amount of disagreement on the increase in assets and employees.

As for GEO, the descriptive statistics showed a minimum value of 1.60 and a maximum value of 6.00, with a mean of 3.94 and a standard deviation of 0.85. The output for the minimum value and the maximum value is similar to other variables. But GEO had the lowest mean score, suggesting that respondents have different opinions on GEO. According to the response, respondents show agreement on the importance of ethics in business operations. However, they show inconsistent answers when it comes to more proactive aspects of GEO, such as performing green-oriented R&D, becoming a market leader in introducing green products or services, and using environmentally friendly business ideas as an aggressive strategy in uncertain market conditions.

GTA recorded a minimum value of 1.80 and a maximum value of 6.00, with a mean of 4.12 and a standard deviation of 0.84. It can be concluded that the responses are leaning toward agreement. Respondents agree that they are fast at adopting green technology; however, they were uncertain whether the adoption of technology was initially intended as an effort to create business opportunities. This indicates that the adoption may be triggered by other factors including following a market trend.

Finally, GTL showed a minimum value of 2.17 and a maximum value of 6.00, with a mean value of 4.46 and a standard deviation of 0.84. GTL’s mean value reflects a positive tendency towards agreement, with relatively consistent responses. According to the data, respondents agree that they motivate, inspire, and push their co-workers to engage in environmentally friendly practices. They also participate in building green-oriented vision, mission, and goals for the business. This suggests that respondents possess the GTL behaviors.

### 4.2 Reliability and validity analysis

Additionally, researchers conducted further analysis using SmartPLS. The outer loadings of all indicators have surpassed the recommended value  $< 0.70$  [63], except for GEO4 (0.618). According to Hair et al. [59], an outer loading between 0.40 – 0.70 should be considered for removal only if removal results in increased internal consistency reliability above the threshold. In this case, Cronbach’s alpha/Composite Reliability/Average Variance Extracted has already passed the minimum threshold; therefore, removal of the indicator is unnecessary. Furthermore, the researchers analyzed the calculated values of Cronbach’s alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) to ensure the model’s reliability and validity.

According to the SmartPLS output, the cronbach’s alpha value lies between the range of 0.837 – 0.892, suggesting that all constructs have passed the minimum cronbach’s alpha threshold at 0.70 [59]. The CR has also passed the minimum threshold of 0.70, where its value lies between (0.885 – 0.918) [64]. Moreover, the AVE output lies between 0.603 – 0.661, suggesting it has passed the minimum threshold of  $> 0.50$  [59]. It can be concluded that all indicators have met the minimum reliability and validity thresholds; therefore, no removals are required. In addition, researchers performed a discriminant validity test using the Heterotrait–Monotrait ratio (HTMT) due to its accuracy and sensitivity compared to Fornell–Larcker [65]. The HTMT in Table 2 shows that every construct has passed the minimum threshold  $< 0.85$  [65].

### 4.3 Discussion

The researchers initially proposed six research hypotheses; according to Table 3, only four of the hypotheses were accepted. The total final respondents used in this research was 211 out of 215. The adjusted R<sup>2</sup> value for both dependent variables was below 50% with EP at 0.494 (49.4%) and FP at 0.437 (43.7%). These values indicate that GEO, GTA, and GTL account for only a part of the variation in EP and FP, suggesting that a substantial portion of the outcome was influenced by other factors that are not included in the current research model.

**Table 2.** Heterotrait–Monotrait ratio (HTMT)

Variables	EP	FP	GEO	GTA	GTL
EP					
FP	0.557				
GEO	0.445	0.464			
GTA	0.698	0.685	0.563		
GTL	0.744	0.595	0.502	0.709	

Note: EP = Environmental Performance, FP = Financial Performance, GEO = Green Entrepreneurial Orientation, GTA = Green Technology Adoption, GTL = Green Transformational Leadership.

**Table 3.** Results of hypothesis testing

Variables	Pred. Sign	Model 1: EP			Result	Variables	Pred. Sign	Model 2: FP			Result
		O	t-value	p-value				O	t-value	p-value	
GEO (H1)	(+)	0.025	0.424	0.336	Rejected	GEO (H2)	(+)	0.071	0.926	0.177	Rejected
GTA (H3)	(+)	0.317	5.324	0.000***	Supported	GTA (H4)	(+)	0.322	4.109	0.000***	Supported
GTL (H5)	(+)	0.451	7.198	0.000***	Supported	GTL (H6)	(+)	0.373	3.960	0.000***	Supported
Adjusted R <sup>2</sup>			0.494			Adjusted R <sup>2</sup>		0.437			
N			211			N		211			

Notes: 1. \*\*\**p* < 0.005. 2. O = Original sample, N = Number of data. 3. Notes: EP = Environmental Performance, FP = Financial Performance, GEO = Green Entrepreneurial Orientation, GTA = Green Technology Adoption, GTL = Green Transformational Leadership.

Table 3 shows that H1 (O = 0.025, t-value = 0.424) and H2 (O = 0.071, t-value = 0.926) were rejected, indicating there is insufficient statistical evidence regarding the relationship between GEO and both EP and FP. According to the conversation with respondents, a possible explanation towards this phenomenon may stem from the presence of GEO that is still uneven among MSMEs. This explanation is supported by GEO's descriptive statistics (mean = 3.94; standard deviation = 0.85) and its positive effects (O = 0.025 and O = 0.071, respectively) which suggest a general trend toward agreement. However, a considerable portion of respondents still expressed disagreement, which may contribute to the insignificance of the relationships. The researchers believe the insignificance of the relationship may also stem from the fact that MSMEs have no formal obligations to implement sustainability practices, as there are no specific regulations that apply to them and that GEO has not yet functioned as a fully proactive strategic orientation. From the dynamic capability lens, MSMEs may lack the ability to sense, seize, and transform opportunities, ultimately limiting the impact of GEO on both EP and FP. The findings of this study contrast with prior studies [19, 23, 25, 26] which reported that GEO has a positive and significant influence on both EP and FP. This discrepancy may stem from substantial differences in sample characteristics, as previous studies examined enterprises that differed in scale, sector, and national context compared with the MSME analyzed in this research. However, several studies [16, 27, 28] align with this study where GEO was reported not to be significant towards financial performance. According to Afum et al. [27] and Zhang and Li [28], the benefit of GEO may only be seen over a longer time horizon, whereas in this research financial performance was measured over a short period. Additionally, according to Anin et al. [16], it is required a firm-level green intervention to translate GEO into economic gains, whereas most MSMEs are relatively small and lack the capacity to implement such an intervention. Meanwhile, the insignificant relationship between GEO and EP, which contrasts with prior studies, may stem from the lack of capacity or awareness among MSME actors, as well as their focus on short-term

output rather than long-term environmental goals.

Moving on to H3 (O = 0.317, t-value = 5.324) and H4 (O = 0.322, t-value = 4.109), the t-test result reflects that both hypotheses were accepted. The significant relationship suggests that the adoption of green technologies supports both environmental and financial performance. Practices such as adopting energy-efficient equipment and using raw materials that are reducible, reuseable and recyclable help lower energy usage, decrease resource consumption, and improve both overall financial and environmental outcomes. In addition, electronic-based payments minimize the reliance on paper and physical transactions, contributing to lower environmental burden and enhancing transaction efficiency which leads to better financial gains. The finding aligns with RBV theory, which posits that exploiting internal resources, such as green technology, successfully enhances MSMEs' environmental and financial performance. The findings align with previous studies [31-34] which reported the positive influence of GTA towards EP or FP. According to Khan et al. [31], the implementation of green technology leads to lower resource consumption which is beneficial to the environment and the business itself. The adoption of green technology is crucial; enterprises that fail to adopt green technologies tend to produce higher environmental externalities [34]. In addition, referring to the study conducted by Hamdani et al. [33], green technology should be implemented to prevent, measure, limit, minimize, or repair environmental damages. The insignificant output of H1 and H2 suggests that GTA may be driven by various factors other than green orientation, including customer preferences, perceived effectiveness, or the tendency of enterprises to follow the trend regardless of the actual usefulness of the technology itself.

Lastly, the t-test result indicates that H5 (O = 0.451, t-value = 7.198) and H6 (O = 0.373, t-value = 3.960) were accepted. The presence of Green Transformational Leadership on MSMEs brings positive benefits towards environmental and financial performance. MSMEs who inspire, motivate, and provide eco-friendly behaviors towards their co-workers tend to cause fewer environmental casualties and increase business

efficiency which ultimately eliminates high operational costs. From the RBV perspective, GTL can be considered as an internal resource in the form of knowledge and information that may create a competitive advantage leading to business success. The findings are aligned with previous studies conducted by Le et al. [13], Ismail [18], Tian et al. [37], Asad et al. [24]. According to Le et al. [13], the implementation of GTL on enterprise influences and inspires co-workers to actively engage in environmentally friendly practices which lead to positive outcomes for EP and FP. Enterprises with GTL tend to involve employees in performing innovative environmentally friendly practices which lead to higher entrepreneurial performance [24]. Strong GTL behavior in small businesses demonstrated by individuals in small businesses may influence their co-workers through advocating eco-friendly conscious practices [18]. Therefore, the implementation of GTL in MSMEs is crucial as it can enhance both environmental and financial outcomes.

## 5. CONCLUSIONS

This study examined how Green Entrepreneurial Orientation (GEO), Green Technology Adoption (GTA), and Green Transformational Leadership (GTL) influence MSME's environmental performance (EP) and financial performance (FP). The findings suggest that GEO is insignificant towards both EP and FP, whereas both GTA and GTL show a positive and significant effect towards EP and FP. Additionally, the result contributes to sustainable development goals (SDG), particularly SDG 8 (Decent Work and Economic Growth) by offering insights for MSMEs as national economic movers, SDG 12 (Responsible Consumption and Production) by promoting adoptable green practices, and SDG 13 (Climate Action) by encouraging efficient resource use. The result implies that the implementation of GEO is still inconsistent among MSMEs and that MSME actors are still unaware of green practices. As a result, its impact on EP and FP may only be seen in a longer time horizon. Moreover, the adoption of green technology may reduce environmental burdens and increase operational efficiency, ultimately contributing to better financial performance. Lastly, MSMEs with a strong presence of GTL behaviors may enhance the enterprise's sustainability and profitability by inspiring and motivating co-workers. The result of this research provides several implications: For MSME actors, they should consider implementing GTA or GTL to leverage their business's environmental and financial performance. For regulators, the insignificance of GEO may be a suggestion for regulators to encourage MSME actors to be more green oriented entrepreneurs by providing programs, training, or financial incentives.

### 5.1 Limitations and suggestions

Regardless of the insights provided by this study, several limitations should be acknowledged. First, during the data collection period, researchers encountered challenges in the North and East Jakarta regions, where a considerable number of respondents showed hesitant behavior in participating in the survey. This behavior reflects a lack of information transparency and ultimately contributed to a lower response rate. Second, respondents' understanding of the questionnaire was influenced by their subjective perception, as they all had

varied educational backgrounds. Third, the adjusted  $R^2$  values obtained for both dependent variables were below 50%, indicating that the remaining variance was influenced by other factors that were not included in this research model. For future research, to address the hesitant behavior of respondents, the researchers suggest using a more friendly approach when asking for responses. In addition, the researchers also suggest that regulatory bodies help enlighten and encourage MSME actors to be more cooperative in participating in surveys by providing programs related to sustainability and financial literacy. Moreover, future research may target respondents with similar backgrounds. Lastly, future research should consider other predictors to achieve better adjusted  $R^2$  results. The researchers suggest employing other variables such as environmental commitment and financial stability which may increase the environmental and financial performance of MSME.

## AUTHOR CONTRIBUTIONS

Russel Syaidina Ouwrihan: Methodology, Software, Formal Analysis, Resources, Data Curation, Writing Original Draft, Visualization, Project Administration. Tommy Andrian: Conceptualization, Methodology, Validation, Formal Analysis, Resources, Writing Original Draft, Writing Review & Editing, Visualization, Supervision, Project Administration.

## DATA AVAILABILITY

Data supporting this study are openly available from Mendeley Data (<https://doi.org/10.17632/45ch9tbt2w.1>).

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