

# The Role of Entrepreneurs' Self-Efficacy and Alertness in Green Logistics Management for Sustainability in SMEs

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## Abstract

*This research aims to check the consistency and develop a model. It also explores the role of mediating variables and moderating variables that affects Sustainability Performance. The population used in this study was a group of small and medium-sized enterprises (SMEs), a sample of 250 (Wiratchai, 1999). Using the Smart PLS model, a two-stage approach was used for direct path, mediation and mediation effect analysis with high-dimensional latent variables. The results of the study found that GLM, EA, and ESE has a direct positive effect on SP. EA and ESE has a direct positive effect on GLM. The results of the mediation influence test found that, EA impact GLM through the mediation of ESE, EA impact SP through the mediation of ESE. But, no mediating role was discovered between GLM impact SP through the mediation of ESE. The results of mediation influence test found that, EA impact SP through the moderator of ESE, EA impact GLM through the moderator of ESE.*

**Keywords:** *Green Logistics Management, Sustainability Performance, Entrepreneurs' Alertness, Entrepreneurs' Self-Efficacy*

## Introduction

In an era where sustainability has become a crucial factor in business operations, adopting green logistics as a strategy can significantly reduce environmental impact while improving organizational efficiency. Green logistics management, which emphasizes environmentally friendly practices, has become increasingly important (Wu & Dunn, 1995). Green logistics not only reduces energy consumption and pollution but also enhances long-term business competitiveness. For SMEs in Thailand, implementing green logistics remains a challenge due to limited resources and knowledge. However, research shows that the ability to manage green logistics impacts stakeholder satisfaction and business performance (Siriporn Lertyinyos et al., 2015). Additionally, entrepreneurial traits like self-confidence and alertness play a vital role in adopting green logistics. Entrepreneurs with higher confidence and alertness are better equipped to implement green logistics strategies effectively, fostering greater business sustainability (Wongchaiya, 2017). Sustainability has become a pressing issue for businesses today, particularly for SMEs facing challenges in resource management and environmental responsibility. Green logistics management (GLM) plays a key role in minimizing environmental impact, enhancing economic efficiency, and promoting a positive social image. The growing focus on sustainable practices has highlighted the importance of green logistics (GL), which aims to balance economic, environmental, and social concerns in managing logistics activities. From such importance therefore, the researcher wanted to study “The Role of Entrepreneurs' Self-Efficacy and Alertness in Green Logistics Management for Sustainability in SMEs”. The objective is to check the consistency and develop a model. It also explores the role of mediating variables and moderating variables that affects Sustainability Performance.

## Literature Review and Hypothesis

### *Green Logistics Management (GLM)*

Green logistics refers to managing the entire process of moving goods, storing, and transporting raw materials or products in an environmentally friendly manner. This encompasses upstream and downstream supply chain

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activities while minimizing energy and natural resource consumption and reducing greenhouse gas emissions. Key activities include transportation, inventory management, warehousing, material handling, packaging, logistics communication, order fulfillment, customer service, and reverse logistics. For SMEs, integrating green logistics is essential, as these businesses form a significant part of many economies. Improving logistics processes to be eco-friendly can reduce costs and significantly enhance market competitiveness. Practical green logistics strategies for SMEs may include: 1) Efficient transportation management 2) Sustainable material and packaging management 3) Waste management 4) Adoption of green technologies. Green logistics practices involve integrating environmentally friendly policies and strategies into logistics operations to reduce waste, conserve energy and resources, and minimize the environmental impact of logistics activities while improving operational efficiency (Agyabeng-Mensah et al., 2020a).

### *Entrepreneurs' Alertness (EA)*

The concept of entrepreneurship and the necessity of maintaining alertness toward both internal and external organizational environments have garnered significant attention from researchers over the past decades. Specialized literature highlights the pivotal role of Entrepreneurial Alertness (EA) in recognizing and identifying opportunities throughout the entrepreneurial process (Pirhadi et al., 2023). Kirzner (1979), suggests that individuals with heightened alertness possess a metaphorical "antenna" that allows them to detect market gaps based on limited clues. Furthermore, Kirzner (1997) argued that alertness involves creative and imaginative actions, which can influence the types of future transactions. Kirzner expanded the definition of alertness by emphasizing the roles of time and uncertainty, a unique perspective that enables entrepreneurs to assess opportunities more effectively and take calculated risks (Norton & Moore, 2002). Chavoushi et al. (2021) cite various researchers who define entrepreneurial alertness as a cognitive ability and a process shaped by experience, information processing capabilities, social interactions, and pattern recognition. Scholars such as Ardichvili, Cardozo, and Ray, along with Gaglio and Katz, have also contributed to these definitions. The term "alert" in the business context signifies "being watchful without deliberate intent"—a set of cognitive abilities for perceiving and processing information that allows entrepreneurs to uncover opportunities.

### *Entrepreneurs' Self-Efficacy (ESE)*

Entrepreneurs' self-efficacy refers to their confidence in their ability to handle challenges and achieve goals. This confidence significantly influences organizational decision-making and operations (Bandura, 1997). In the context of green logistics, ESE is critical for adopting eco-friendly practices and efficiently managing resources, such as investing in green technologies or refining processes to reduce emissions. Research shows that ESE enhances sustainability by boosting entrepreneurs' confidence in solving innovation-related challenges, such as implementing green logistics systems and achieving sustainability goals (Urban, 2019; Zhou et al., 2023).

### *Sustainability Performance (SP)*

Sustainability performance reflects an organization's ability to achieve balanced goals in economic, social, and environmental dimensions. This concept goes beyond profitability to include reducing negative environmental impacts, supporting community development, and meeting stakeholder expectations (Elkington, 1998). Strong sustainability performance not only enhances long-term competitiveness but also aligns with global sustainable development goals (UNISDR, 2015). It is typically assessed through environmental, economic, and social components (Ahmad et al., 2022).

### *Relationship between Green Logistics Management (GLM) and Sustainability Performance (SP)*

Ye (2024) studied the impact of Green Logistics on the Sustainable Development of Enterprises. *Advances in Economics*. The study indicates that green logistics significantly influences the sustainable development

performance of enterprises. It highlights the importance of green logistics in enhancing corporate sustainability performance indicators. As well as Reynolds (2024) has studied Sustainable Supply Chain Practices- A Qualitative Investigation of Green Logistics Strategies. The study indicates that green logistics management significantly enhances sustainability performance by aligning logistics strategies with corporate sustainability goals. Implementing eco-friendly vehicles, energy-efficient warehouse operations, and reverse logistics contributes to reducing carbon footprints and environmental impacts. Khoa et al. (2024) has studied Impact of Green Logistics Practices on Sustainable Performance: A Comprehensive Analysis. The study indicates that green logistics practices, encompassing both inbound and outbound logistics, have a positive influence on sustainable performance, which includes environmental, social, and economic dimensions. This suggests that implementing green logistics management can enhance sustainability performance in small and medium-sized enterprises (SMEs). The research provides empirical evidence supporting the notion that effective green logistics practices contribute significantly to improving overall business performance, particularly in the context of developing countries. This synthesis of literature leads to Hypothesis H1.

*Hypothesis H1: Green Logistics Management has a direct positive effect on Sustainability Performance*

*Relationship Entrepreneurs' Alertness (EA) and Sustainability Performance (SP)*

Umapathy & Ramamoorthy (2024) studied Analyzing the Impact of Entrepreneurial Orientation on Sustainable Business Performance using Hierarchical Linear Regression. This study examines the relationship between Entrepreneurial Orientation (EO) and Sustainable Business Performance (SBP) using hierarchical linear regression, finding that EO dimensions positively influence SBP across various industries, particularly in manufacturing and service sectors. Corresponds to Choongo (2018) studied Sustainable Entrepreneurship in Zambia: The engagement in and effect of sustainable practices in small and medium-sized enterprises. The research indicates that entrepreneurs' alertness, particularly in identifying sustainable opportunities, significantly influences their engagement in sustainable practices. This alertness is linked to personal values such as altruism, self-transcendence, and openness to change. Parhankangas et al. (2014) that states entrepreneurs' alertness significantly enhances sustainability performance by enabling them to identify and capitalize on opportunities for disruptive technologies and innovative business models. This synthesis of literature leads to Hypothesis H2.

*Hypothesis H2: Entrepreneurs' Alertness has a direct positive effect on Sustainability Performance*

*Relationship Entrepreneurs' Alertness (EA) and Green Logistics Management (GLM)*

Mach & Furtak (2020) studied green supply chain. developing logistics with care for the environment. Found that entrepreneurs' alertness significantly impacts green logistics management by fostering awareness of environmental performance and motivating the adoption of sustainable practices. This heightened consciousness leads to the implementation of green supply chains, which focus on reducing waste and optimizing resource use. Governmental support, such as grants, further encourages entrepreneurs to innovate their business models, enhancing their commitment to ecological initiatives. Consequently, this proactive approach not only benefits the environment but also aligns with evolving consumer expectations and market demands for sustainability. Corresponds to Kanwal et al. (2024) specify that Entrepreneurs' alertness, a key aspect of Entrepreneurial Orientation (EO), fosters innovative thinking and proactiveness, which are essential for effective Green Logistics Management (GLM). By being alert to environmental challenges and opportunities, entrepreneurs can implement sustainable practices within their logistics operations. This integration enhances supply chain sustainability, addressing economic, environmental, and social outcomes. The chapter emphasizes that leveraging EO can lead to competitive differentiation and improved cost efficiency in GLM, ultimately driving long-term success in sustainability initiatives. This synthesis of literature leads to Hypothesis 3.

*Hypothesis H3: Entrepreneurs' Alertness has a direct positive effect on Green Logistics Management*

### *Relationship between Entrepreneurs' Self-Efficacy (ESE) and Sustainability Performance (SP)*

j (2023) studied Green Entrepreneurial Self-efficacy and Environmental Performance of SMEs: Mediating and Moderating Role of Green Innovation and Green Purchase Behaviour. The study finds a significant positive relationship between green entrepreneurial self-efficacy (GESE) and the environmental performance (EP) of SMEs. It indicates that GESE influences EP, with green innovation (GI) partially mediating this relationship and green purchase behaviour (GPB) moderating it. This suggests that higher levels of GESE can enhance sustainability performance in SMEs, particularly when supported by innovative green practices and consumer purchasing decisions that prioritize environmental considerations. Corresponds to Sanaji (2023) studied the Role of Performance to Continue the Business for Nascent Entrepreneurs: The Effect of Entrepreneurial Self-Efficacy. Found that entrepreneurial self-efficacy (ESE) positively influences business performance, which is crucial for the sustainability of nascent entrepreneurs. Higher ESE enhances their ability to manage and grow their businesses, leading to better performance outcomes. This improved performance, in turn, reduces the intention to switch careers, thereby supporting business continuity. The study indicates that ESE plays a significant role in reinforcing the commitment of nascent entrepreneurs to sustain their businesses, highlighting its importance in entrepreneurial success and sustainability. In addition, research has found that ESE helps to enhance business sustainability by increasing confidence in entrepreneurs' ability to solve problems related to innovative operations, such as the adoption of green logistics management systems and the development of strategies to achieve sustainability goals. (Urban, 2019; Zhou et al., 2023). This synthesis of literature leads to Hypothesis 4.

*Hypothesis H4: Entrepreneurs' Self-Efficacy has a direct positive effect on Sustainability Performance*

### *Relationship between Entrepreneurs' Self-Efficacy (ESE) and Green Logistics Management (GLM)*

Entrepreneurs' self-efficacy, particularly green entrepreneurial self-efficacy (GESE), plays a crucial role in fostering green logistics management. GESE is the belief in one's ability to successfully implement environmentally sustainable practices, which can drive innovation and adaptation in business models. GESE significantly impacts the environmental performance of small and medium enterprises (SMEs) by fostering green innovation and purchase behavior, which are essential components of green logistics management (j, 2023). Entrepreneurs with high GESE are more likely to adopt green logistics practices, such as localized sourcing and greener transport options, which are crucial for reducing environmental impacts in logistics processes (Hernandez et al., 2022). In addition, research has found that ESE helps to enhance business sustainability by increasing confidence in entrepreneurs' ability to solve problems related to innovative operations, such as the adoption of green logistics management systems and the development of strategies to achieve sustainability goals. (Urban, 2019; Zhou et al., 2023). This synthesis of literature leads to Hypothesis 5.

*Hypothesis H5: Entrepreneurs' Self-Efficacy has a direct positive effect on Green Logistics Management*

### *Entrepreneurs' Self-Efficacy (ESE) has influence on the relationship between Entrepreneurs' Alertness (EA) and Green Logistics Management (GLM)*

ESE is a significant factor in driving sustainable business models by enhancing innovation and adaptation capabilities. It mediates the relationship between dynamic capabilities and green entrepreneurial intentions, suggesting that self-efficacy is crucial for reconfiguring business models towards sustainability (Sanchez-García et al., 2020). ESE can moderate the relationship between entrepreneurial alertness and green logistics management by enhancing the confidence and capability of entrepreneurs to implement sustainable practices. This is supported by the role of self-efficacy in mediating green entrepreneurial intentions and education (Rahmanto et al., 2020). The presence of GESE can amplify the effects of entrepreneurial alertness on green

logistics by fostering a proactive approach to environmental challenges and opportunities (j, 2023). This synthesis of literature leads to Hypothesis 6.

*Hypothesis H6: Entrepreneurs' Alertness impact Green Logistics Management through the mediation of Entrepreneurs' Self-Efficacy.*

*Entrepreneurs' Self-Efficacy (ESE) has influence on the relationship between Entrepreneurs' Alertness (EA) and Sustainability Performance (SP)*

The success of entrepreneurial firms, which is linked to sustainability, is enhanced by entrepreneurial alertness, especially when supported by networking and other moderating factors (Satar et al., 2024). ESE influences both financial and non-financial performance of SMEs by enhancing entrepreneurs' confidence in identifying and commercializing new opportunities (Ndibalema et al., 2024). The dynamic capabilities associated with GESE further support the creation of sustainable business models, indicating that self-efficacy can mediate the relationship between alertness and sustainability performance (Sanchez-Garcia et al., 2024). In line with the research of Rasyid & Stepanus (2024). Has studied the Influence of Green Leadership and Entrepreneurship on the Sustainability of Manufacturing Companies: Mediation of Green Innovation and Knowledge Management. The research indicates that green entrepreneurial orientation positively influences corporate sustainability performance, with knowledge management processes acting as a mediator. This mediation enhances the relationship between green transformational leadership, knowledge-oriented leadership, and sustainability performance. Thus, entrepreneurs' alertness, as part of green entrepreneurial orientation, significantly impacts sustainability performance through the mediation of green innovation and knowledge management, highlighting the importance of these factors in improving the sustainability of manufacturing companies in Indonesia. This synthesis of literature leads to Hypothesis 7.

*Hypothesis H7: Entrepreneurs' Alertness impact Sustainability Performance through the mediation of Entrepreneurs' Self-Efficacy*

*Entrepreneurs' Self-Efficacy (ESE) has influence on the relationship between Green Logistics Management (GLM) and Sustainability Performance (SP)*

Sanchez-Garcia et al. (2024) studied The Green Entrepreneurial Self-Efficacy as an Innovation Factor That Enables the Creation of New Sustainable Business. This study examines the role of green entrepreneurial self-efficacy in innovation and adaptation, finding a significant positive effect of dynamic capabilities on sustainable entrepreneurial intentions, mediated by self-efficacy, in the Iberian Peninsula. Entrepreneurial self-efficacy acts as a mediator in the relationship between green entrepreneurial intention and entrepreneurship education, suggesting its potential role in mediating the impact of green logistics on sustainability performance (Rahmanto et al., 2024). Entrepreneurs' Self-Efficacy (ESE) helps promote confidence among entrepreneurs in implementing Green Logistics Management (GLM) in their organizations. Having a high ESE will allow entrepreneurs to see long-term benefits (Bandura, 1997; Zhou et al., 2023). This synthesis of literature leads to Hypothesis 8.

*Hypothesis H8: Green Logistics Management impact Sustainability Performance through the mediation Entrepreneurs' Self-Efficacy.*

*Green Logistics Management (GLM) as mediation Variable Affecting Sustainability Performance (SP)*

Kurniawan et al. (2024) studied the Effect of Green Innovation on Business Sustainability Through Green Supply Chain Management as a Mediating Variable in Furniture SMEs in Yogyakarta Special Region. This study examines the effect of Green Innovation on Business Sustainability in Yogyakarta's furniture SMEs, finding



that Green Supply Chain Management mediates the relationship, with Green Innovation positively influencing both Business Sustainability and Green Supply Chain Management. Corresponds to Verma (2024) studied Green Logistics Practices toward a Circular Economy: A Way to Sustainable Development. Found that green logistics management significantly enhances an organization’s sustainability performance, acting as a crucial mediator in the relationship with circular economy practices. The research indicates that implementing green logistics practices in manufacturing enterprises leads to improved sustainability outcomes. However, while supply chain trackability influences circular economy practices, it does not moderate the relationship between sustainable performance and green logistics. This highlights the importance of green logistics in supporting sustainable development within the manufacturing sector. Wang et al. (2024) studied How to Convert Entrepreneurial Alertness into the Performance of New Ventures via Entrepreneurial Bricolage: The Moderating Effect of Environmental Dynamism. The paper does not address the relationship between Entrepreneurs' Alertness (EA) and Sustainability Performance (SP) with Green Logistics Management (GLM) as mediation. This synthesis of literature leads to Hypothesis 9 and Hypothesis 10.

*Hypothesis H9: Entrepreneurs' Alertness (EA) has a direct positive effect on Sustainability Performance (SP) through the mediation of Green Logistics Management (GLM)*

*Hypothesis H10: Entrepreneurs' Self-Efficacy (ESE) has a direct positive effect on Sustainability Performance (SP) through the mediation of Green Logistics Management (GLM)*

From the study of these theories, the researcher developed a conceptual framework to illustrate the relationships between all variables and links them to hypotheses, as shown in the figure.1

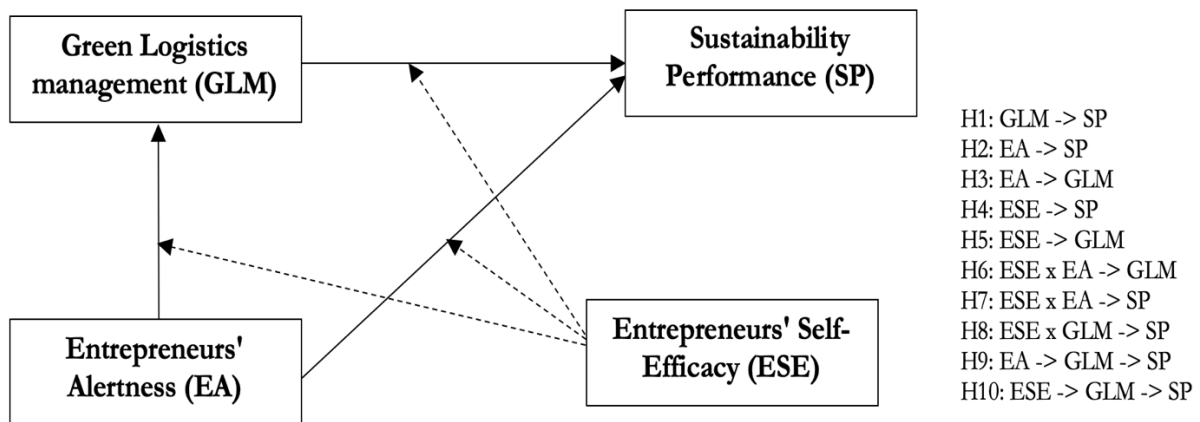


Figure 1 Conceptual Framework Showing Proposed Hypothesis

## Research Methodology

### Data Collection and Sampling

The population used in this study was a group of 327 manufacturing small and medium-sized enterprises (SMEs) in Chumphon Province, Thailand. (Report from the Office of Small and Medium Enterprises Promotion, 2022). The unit of analysis of this research was at the organization level is the president or vice president of the small and medium-sized enterprises (SMEs). This research used a postal data collection questionnaire, which has a response rate constraint to provide a good representation of information (Panayides,

2007). The researcher therefore studied the entire population. Determination of samples using G\*Power software, a program created with Cohen (1977) found that total sample size was 166 sample. And has been inspected and certified for accurate and up-to-date sample size by several researchers (Howell, 2010). The model has 20 observable variables,  $Df = 20(20+1)/2 = 210$ , Effect Size = 0.5 (Faul et al., 2007), power of test = 0.80 (Hair et al, 2010) and large effect size = 0.5. By defining the sample of the analysis causal structural models with latent variable. Wiratchai (1999) suggested that the appropriate sample size should be 1 observed variable per 10 - 20 times or the least acceptable sample can be determined by the Holster statistic, in this study, there were 20 observable variables, which if using a sample size of 10 times the observed variables. A sample of 200 was required. In addition must be greater than 200 (Hoelter, 1983). Therefore, it is considered that the causal relationship model is consistent with the empirical data. Samples in this study is 250 and use probability theory in simple random sampling.

### *Measure of Constructs*

The development and validation of instruments involved the use of a questionnaire designed based on the intended conceptual framework and operational definitions. The questionnaire is divided into 6 sections: Section 1 Consists of questions related to general information about SMEs, utilizing checklist formats. Section 2 Green logistics management, including (1) logistics planning (2) using environmentally friendly technologies (3) reducing carbon dioxide emissions (4) use energy-efficient vehicles (5) using environmentally friendly packaging (6) give importance to reducing energy use (7) staff training on green logistics management (8) cost reduction using green logistics strategies (9) there is continuous improvement in logistics processes. Section 3 Entrepreneurs' Alertness, including (1) scanning and searching (2) association and connection (3) evaluation and judgment. Section 4 Entrepreneurs' Self-Efficacy, including (1) opportunity Identification), (2) riskmanagement (3) planning and execution (4) resource and people management (5) innovation and adaptability. Section 5 Sustainability Performance, including (1) economic (2) social (3) environment. Variables of section 2 – 5 using a 5-point Likert-type scale (1 = not at all, 5 = very much), and validated questionnaires from previous studies were modified and adapted to fit the context of this study .

### *Data Analysis*

To validate the proposed research model, we used partial least squares structural equation modeling (PLS-SEM, also referred to as composite-based structural equation modeling). Generally, PLS is frequently utilized in exploratory studies as it necessitates a more conservative interpretation of results compared to traditional PLS-SEM (Hair et al. 2017). A PLS path model analysis was conducted using SmartPLS (V.4, Smart PLS GmbH, Bönningstedt, Germany). First, confirmatory factor analysis was performed to eliminate all items with a value below the 0.7 threshold. Next, the internal consistency, reliability, and validity of the theoretical model were assessed with the remaining items. Finally, the structural model was estimated, and the proposed model was verified. To evaluate reliability, Cronbach's alpha and composite reliability were utilized, while convergent validity was assessed. The average variance extracted (AVE) was examined to ensure it exceeded the 0.5 threshold. Additionally, discriminant validity was analyzed by comparing the correlation value and the square root of AVE to determine if the square root of AVE was greater than the correlation value between the latent variables. The comprehensive research hypothesis test was conducted using bootstrapping (5,000 iterations, 95% significance level) with the PLS algorithm.

## **Results**

### *Evaluation of the Measurement Model*

Analysis results descriptive statistic, normality assessment, and validity variables as shown in the table 1 shows that data from all observed variables have a normal distribution. This is because the values of skewness (Skewness) and kurtosis (Kurtosis) are close to 0, which if considered from the criteria of Schumocker saw that

both values were not more than  $\pm 1.00$  and  $\pm 1.50$  respectively, indicating that the data collected were suitable data for analysis with parametric statistics. For the convergent validity of the latent variables based on the average of the extracted variables (AVE), it was found that every latent variable had a value higher than 0.50 (Henseler et al, 2015). Therefore, it can be concluded that Every scalable variable of the variable model is valid in its own use as a latent variable. And when considering confidence (reliability) by considering the Cronbach's alpha coefficient ( $\alpha$ ), component reliabilities (Composite reliability), both  $P_A$  and  $P_C$ , all latent variables have all reliabilities higher than 0.70 (Henseler et al. 2015). Therefore it can be concluded that The observed variables used to measure each latent variable have high internal relationships and are suitable for explaining the latent variable well.

**Table 1 Descriptive statistic, Normality assessment, and Validity of variables**

Validity	Mean	SD.	Skewness	kurtosis	Loading	R-sq	Conbach's alpha	$P_A$	$P_C$	AVE
<b>Entrepreneurs' Alertness (EA)</b>							0.891	0.892	0.932	0.821
EA1	3.834	0.413	0.413	0.884	0.920	0.846				
EA2	3.724	0.431	0.431	-0.185	0.905	0.819				
EA3	3.877	0.378	0.378	2.330	0.893	0.797				
<b>Green Logistics management (GLM)</b>							0.960	0.960	0.966	0.758
GLM1	3.834	0.402	-1.233	1.191	0.876	0.767				
GLM2	3.858	0.401	-1.078	1.741	0.829	0.687				
GLM3	3.820	0.426	-0.989	0.718	0.898	0.806				
GLM4	3.854	0.395	-1.199	1.726	0.863	0.745				
GLM5	3.840	0.395	-1.266	1.385	0.830	0.689				
GLM6	3.822	0.414	-1.126	0.811	0.894	0.799				
GLM7	3.798	0.438	-1.156	1.116	0.863	0.745				
GLM8	3.832	0.374	-1.787	1.202	0.867	0.752				
GLM9	3.820	0.404	-1.259	0.795	0.910	0.828				
<b>Entrepreneurs' Self-Efficacy (ESE)</b>							0.899	0.916	0.924	0.710
ESE1	3.755	0.464	-0.628	-0.265	0.887	0.787				
ESE2	3.781	0.501	-0.345	-0.163	0.871	0.759				
ESE3	3.757	0.462	-0.598	-0.241	0.877	0.769				
ESE4	3.828	0.377	-1.075	1.407	0.800	0.640				
ESE5	3.843	0.363	-1.897	1.622	0.774	0.599				
<b>Sustainability Performance (SP)</b>							0.899	0.938	0.938	0.836
SP1	3.826	0.344	-1.321	0.949	0.975	0.975				
SP2	3.823	0.353	-1.223	1.161	0.970	0.970				
SP3	3.850	0.332	-1.956	2.143	0.785	0.785				

**Note.** AVE, average variance extracted; CR, composite reliability; CA, Cronbach's alpha.  $p < .001$ .

From the analysis to assess discriminant validity between latent variables by Fronell-Larcke method. The results of the analysis appear in table 2. Shows that Relationships between latent variables (Cross-latent variables) have values no higher than the diagonal values. (The square root of the AVE of the latent variable). Therefore, it can be concluded that all latent variables have discriminant validity.

**Table 2 Discriminant validity**

<b>Fronell-Larcker criterion</b>				
Variables	EA	ESE	GLM	SP



EA	0.906			
ESE	0.727	0.843		
GLM	0.749	0.735	0.870	
SP	0.801	0.812	0.931	0.914

### *Evaluation of the Structural Model*

Analysis results to assess the predictive relevance. A Q-sq -value greater than 0 for a specific endogenous latent variable indicates that the Smart PLS path model possesses strong predictive relevance for that latent variable. As demonstrated in Table 3, the cross-validated redundancy of the latent variables indirectly forecasts the endogenous item based on the prediction of the corresponding latent variable utilized in the structural model. The predictive relevance for the resistance latent variables GLM and SP was all classified as 'high' ( $Q^2 > 0.35$ ). The cross-validated commonality of latent variables evaluates the path model directly from the latent variables, by latent variables EA, ESE, GLM and SP exhibited 'high' ( $Q^2 > 0.35$ ), predictive power, verifying that the model had substantial predictive power. In this study, the overall goodness-of-fit (GOF) of the structural model is assessed by calculating the square root of the product of the mean coefficient of determination ( $R^2$ ) and the mean communality (AVE value). A GOF value of 0.785 was obtained. In PLS-PM analysis, the GOF is typically employed to evaluate the overall model fit. A higher GOF value indicates a better model fit; a GOF between 0.1 and 0.25 signifies a low model fit, a GOF between 0.25 and 0.36 indicates a medium model fit, and a GOF of 0.36 or higher represents a high model fit (Tenenhaus et al. 2005). As shown in Table 4, all GOF indices exceeded the threshold, leading to the conclusion that the structural fit of this research model was excellent.

**Table 3 Predictive relevance (Q-sq)**

	Cross-validated redundancy Q-sq	Cross-validated commonality Q-sq
EA		0.659
ESE		0.659
GLM	0.640	0.871
SP	0.769	0.906

**Note.** Low ( $Q^2 > 0$ ), medium ( $Q^2 > 0.15$ ) and high ( $Q^2 > 0.35$ ).

**Table 4 Goodness-of-Fit (GO) results**

Variables	AVE	R-sq
EA	0.821	
ESE	0.710	
GLM	0.758	0.660
SP	0.836	0.920
Mean value	0.781	0.790
Multiply of mean value	0.617	
<b>GOF</b>	<b>0.785</b>	

**Note.** AVE, average variance extracted. GOF = low (0.10 - 0.02), medium (0.25 - 0.36) and high ( $> 0.36$ ).

### *Path Analysis and Hypothesis Testing*

Examining the significance of path coefficients between the latent variables in the structural model. To determine significance, we generated a bootstrap subsample (5,000) in Smart PLS and utilized the t-value, p-value to test if the path coefficient  $\beta$  is statistically significant at a 5% error probability. As displayed in figure 2 and table 5, it was found that GLM, EA, and ESE has direct positive effect on SP. EA and ESE has direct

positive effect on GLM. Indicating hypothesis H1, H2, H3, H4, H5 were deemed statistically significant, the hypothesis is supported. The results of the mediation influence test found that, *EA* impact *GLM* through the mediation of *ESE*, *EA* impact *SP* through the mediation of *ESE*. Indicating hypothesis H6, H7 were deemed statistically significant, the hypothesis is supported. However, no mediating role was discovered between *GLM* impact *SP* through the mediation of *ESE*, the hypothesis H8 is not supported. The results of mediation influence test found that, *EA* impact *SP* through the moderator of *ESE*, *EA* impact *GLM* through the moderator of *ESE*. Indicating hypothesis H9, H10 were deemed statistically significant, the hypothesis is supported. Moreover, when considering the *f-sq* that reflects the magnitude of influence that the causal variable has on the dependent variable, it can be seen that (1) the *SP* variable is affected by a high magnitude from the *GLM* variable. (2) The *GLM* variable was affected by a medium magnitude from the *EA* variable. (3) The *EA*, *ESE*, and *ESE x EA* variable were affected by a small magnitude from the *SP* variable. The *EA*, *ESE*, and *ESE x EA* variable were affected by a small magnitude from the *GLM* variable (Cohen, 1977).

**Table 5 Results of path analysis and hypothesis testing**

H	Path	B	STDEV	t-test	P value	f-sq	Supported
H1	GLM -> SP	0.625	0.046	13.500	0.000	1.517	Yes
H2	EA -> SP	0.124	0.038	3.219	0.001	0.068	Yes
H3	EA -> GLM	0.391	0.061	6.418	0.000	0.195	Yes
H4	ESE -> SP	0.171	0.041	4.169	0.000	0.126	Yes
H5	ESE -> GLM	0.299	0.058	5.196	0.000	0.102	Yes
H6	ESE x EA -> GLM	-0.142	0.044	3.246	0.001	0.066	Yes
H7	ESE x EA -> SP	-0.107	0.049	2.204	0.028	0.065	Yes
H8	ESE x GLM -> SP	0.020	0.054	0.378	0.705	0.002	No
H9	EA -> GLM -> SP	0.245	0.040	6.095	0.000		Yes
H10	ESE -> GLM -> SP	0.187	0.042	4.500	0.000		Yes

Analysis of the type of influence of causal variables on the dependent variable as shown in the table 6 and Figure 2. It was found that *SP* received the highest total influence from the *GLM* variable (*TE* = 0.625), followed by *EA* (*TE* = 0.368, *DE* = 0.124, *IE* = 0.245), and *ESE* (*TE* = 0.358, *DE* = 0.171, *IE* = 0.187), respectively. It was found that the *GLM* variable received the highest total influence from *EA* (*TE* = 0.391), followed by the *ESE* variable (*TE* = 0.391). This result reflects the important role of Green Logistics Management (*GLM*), Entrepreneurs' Alertness (*EA*), and Entrepreneurs' Self-Efficacy (*ESE*) were factor that affects Sustainability Performance Sustainability Performance (*SP*). In addition, Entrepreneurs' Alertness (*EA*), and Entrepreneurs' Self-Efficacy (*ESE*) were factor that affects Green Logistics Management (*GLM*). Considering the variance of internal variables that are explained by cause variables (*R-sq*), it is found that *GLM* variables have 66.0 percent of the variance, *SP* variables have 92.0 percent of the variance.

**Table 6 Direct, Indirect, and Total effect**

Variables	GLM			SP		
	DE	IE	TE	DE	IE	TE
EA	0.391		0.391	0.124	0.245	0.368
ESE	0.299		0.299	0.171	0.187	0.358
GLM				0.625		0.625
ESE x EA	-0.142		-0.142	-0.107	-0.089	-0.196
ESE x GLM				0.020		0.020

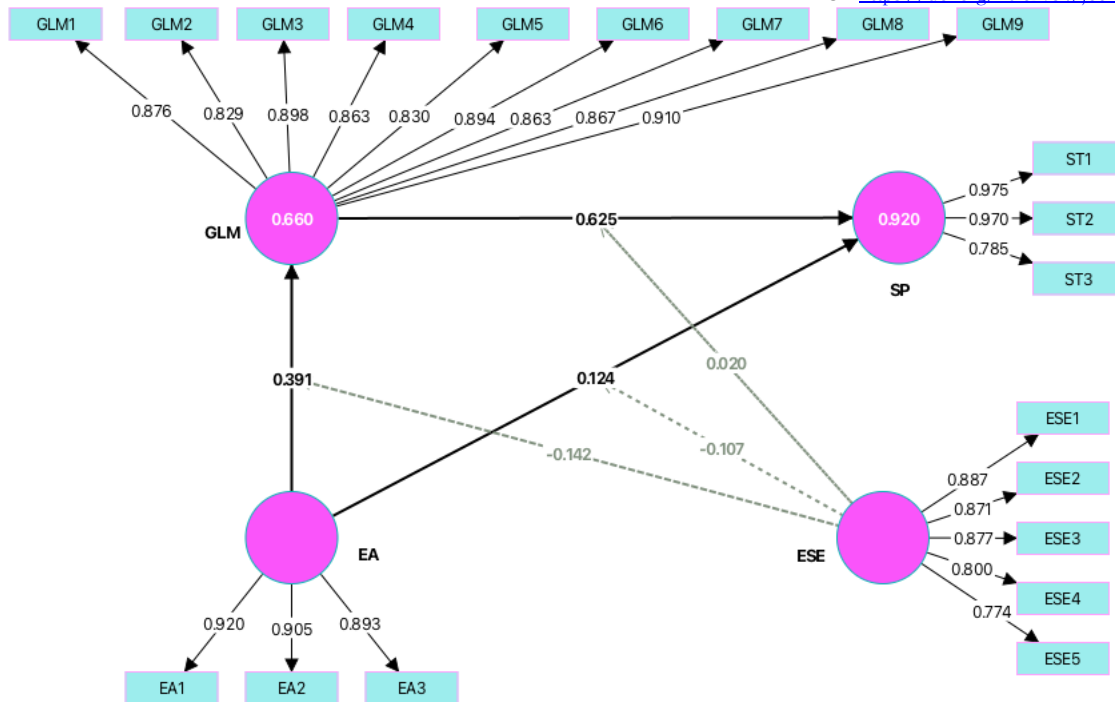


Figure 2 Measurement Model

To gain deeper insights beyond traditional path analysis, we employed Importance-Performance Map Analysis (IPMA), which considers both the relative importance (path coefficient) and absolute performance (mean value) of constructs and indicators (Ringle & Sarsted, 2016). Figure 3 visualizes our IPMA results categorized into four quadrants based on combined importance-performance values: high-high (Q1), low-high (Q2), low-low (Q3), and high-low (Q4). Notably, By Entrepreneurs' Self-Efficacy (ESE) construct reside in Q2, indicating Entrepreneurs' Self-Efficacy signifying high performance but limited contribution to the target variable. This means that entrepreneurs' self-Efficacy is a driver of Sustainability Performance (SP) but further improvements are needed to significantly impact Sustainability Performance.

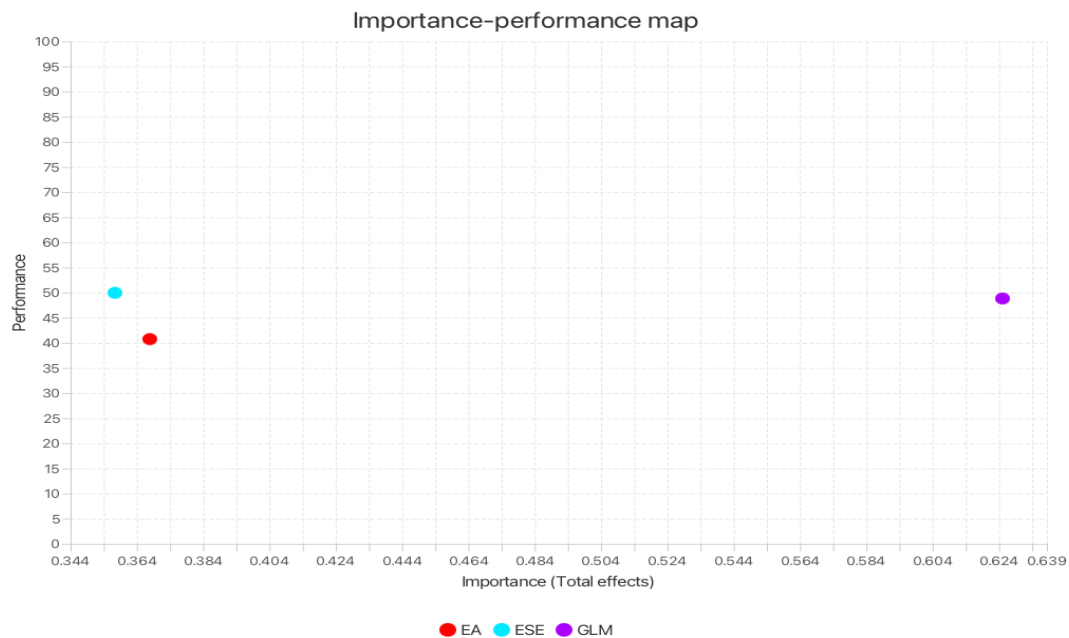


Figure 3 Results of Importance-performance Map Analysis (IPMA)

## Discussion

### *Discussion of the Findings*

The analysis “The Role of Entrepreneurs' Self-Efficacy and Alertness in Green Logistics Management for Sustainability in SMEs”. The results of the study are as follows.

Green Logistics Management (GLM) impact Sustainability Performance (SP) of SMEs. Consistent to Ye (2024) found that green logistics significantly influences the sustainable development performance of enterprises. Reynolds (2024) indicates that green logistics management significantly enhances sustainability performance. Khoa et al. (2024) indicates that green logistics practices, encompassing both inbound and outbound logistics, have a positive influence on sustainable performance, which includes environmental, social, and economic dimensions. Parhankangas et al. (2014) that states entrepreneurs' alertness significantly enhances sustainability performance by enabling them to identify and capitalize on opportunities for disruptive technologies and innovative business models

Entrepreneurs' Alertness (EA) impact Sustainability Performance (SP) of SMEs. Consistent to Umapathy & Ramamoorthy (2024) found that Entrepreneurs' Alertness dimensions positively influence Sustainability Performance across various industries, particularly in manufacturing and service sector. Choongo (2018) indicates that entrepreneurs' alertness, particularly in identifying sustainable opportunities, significantly influences their engagement in sustainable practices. Kanwal et al. (2024) specify that Entrepreneurs' alertness, a key aspect of Entrepreneurial Orientation (EO), fosters innovative thinking and proactiveness, which are essential for effective Green Logistics Management (GLM).

Entrepreneurs' Self-Efficacy (ESE) impact Green Logistics Management (GLM) of SMEs. Consistent to Mach & Furtak (2020) found that entrepreneurs' alertness significantly impacts green logistics management by fostering awareness of environmental performance and motivating the adoption of sustainable practices.

Entrepreneurs' Alertness (EA) impact Green Logistics Management (GLM) of SMEs. Consistent to j (2023) finds a significant positive relationship between green entrepreneurial self-efficacy (GESE) and the environmental performance (EP) of SMEs. Sanaji (2023) Found that entrepreneurial self-efficacy (ESE) positively influences business performance, which is crucial for the sustainability of nascent entrepreneurs.

Entrepreneurs' Self-Efficacy (ESE) impact Sustainability Performance (SP) of SMEs. Consistent to j (2023) found that Entrepreneurs' self-efficacy, particularly green entrepreneurial self-efficacy (GESE), plays a crucial role in fostering green logistics management. GESE is the belief in one's ability to successfully implement environmentally sustainable practices, which can drive innovation and adaptation in business models. GESE significantly impacts the environmental performance of small and medium enterprises (SMEs) by fostering green innovation and purchase behavior, which are essential components of green logistics management. Entrepreneurs with high GESE are more likely to adopt green logistics practices (Hernandez et al., 2022).

Entrepreneurs' Alertness (EA) impact Green Logistics Management (GLM) through the mediation of Entrepreneurs' Self-Efficacy (ESE). Consistent to Sanchez-Garcia et al. (2020) found that ESE is a significant factor in driving sustainable business models by enhancing innovation and adaptation capabilities. It mediates the relationship between dynamic capabilities and green entrepreneurial intentions, suggesting that self-efficacy is crucial for reconfiguring business models towards sustainability. ESE can moderate the relationship between entrepreneurial alertness and green logistics management by enhancing the confidence and capability of entrepreneurs to implement sustainable practices. This is supported by the role of self-efficacy in mediating green entrepreneurial intentions and education (Rahmanto et al., 2020).

Entrepreneurs' Alertness (EA) impact Sustainability Performance (SP) through the mediation of Entrepreneurs' Self-Efficacy (ESE). Consistent to Satar et al. (2024) found that the success of entrepreneurial firms, which is linked to sustainability, is enhanced by entrepreneurial alertness, especially when supported by networking and other moderating factors. ESE influences both financial and non-financial performance of SMEs by enhancing entrepreneurs' confidence in identifying and commercializing new opportunities (Ndibalema et al., 2024). Rasyid & Stepanus (2024) indicates that green entrepreneurial orientation positively influences corporate sustainability performance, with knowledge management processes acting as a mediator. This mediation enhances the relationship between green transformational leadership, knowledge-oriented leadership, and sustainability performance.

Green Logistics Management (GLM) no impact Sustainability Performance (SP) through the mediation of Entrepreneurs' Self-Efficacy (ESE). inconsistent with Sanchez-Garcia et al. (2024) finding a significant positive effect of dynamic capabilities on sustainable entrepreneurial intentions, mediated by self-efficacy, in the Iberian Peninsula. Entrepreneurial self-efficacy acts as a mediator in the relationship between green entrepreneurial intention and entrepreneurship education, suggesting its potential role in mediating the impact of green logistics on sustainability performance (Rahmanto et al., 2024).

Entrepreneurs' Alertness (EA) impact Sustainability Performance (SP) through the moderator of ESE. Consistent to Kurniawan et al. (2024) examines the effect of Green Innovation on Business Sustainability in Yogyakarta's furniture SMEs, finding that Green Supply Chain Management mediates the relationship, with Green Innovation positively influencing both Business Sustainability and Green Supply Chain Management. Verma (2024) found that green logistics management significantly enhances an organization's sustainability performance, acting as a crucial mediator in the relationship with circular economy practices.

Entrepreneurs' Alertness (EA) impact Green Logistics Management (GLM) through the moderator of ESE. Consistent to Wang et al. (2024) studied How to Convert Entrepreneurial Alertness into the Performance of New Ventures via Entrepreneurial Bricolage: The Moderating Effect of Environmental Dynamism. The paper does not address the relationship between Entrepreneurs' Alertness (EA) and Sustainability Performance (SP) with Green Logistics Management (GLM) as mediation. Verma (2024) found that green logistics management



significantly enhances an organization's sustainability performance, acting as a crucial mediator in the relationship with circular economy practices.

## Implications of the Research

The implications of this research can be divided into theoretical and managerial perspectives. The overall discussion can be as follows.

First, research results provide empirical data about “the role of Entrepreneurs' Self-Efficacy and alertness in Green Logistics Management for Sustainability in SME.” Expands the scope of Green Logistics Management, Entrepreneurs' Alertness, and Entrepreneurs' Self-Efficacy are all variables that affect sustainable performance. Consistent with relevant concepts, theories and research that state that green logistics management involve integrating environmentally friendly policies and strategies into logistics operations to reduce waste, conserve energy and resources, and minimize the environmental impact of logistics activities while improving operational efficiency (Agyabeng-Mensah et al., 2020a, b). Entrepreneurial Alertness (EA) in recognizing and identifying opportunities throughout the entrepreneurial process (Pirhadi et al., 2023). This alertness enables SMEs to adapt to changing demands in areas such as sustainable operations and green logistics management. In the context of SMEs, entrepreneurial alertness plays a crucial role in identifying cost-reduction opportunities, such as transitioning to clean energy, adopting transportation technologies that minimize emissions, or forming partnerships within supply chains that prioritize sustainability (Tang et al., 2021). Entrepreneurs' Self-Efficacy enhances sustainability in business by boosting entrepreneurs' confidence in solving problems related to innovative operations. This includes implementing green logistics systems and developing strategies to meet sustainability goals (Urban, 2019; Zhou et al., 2023).

In addition, the research found the importance of mediation of Entrepreneurs' Self-Efficacy. By Entrepreneurs' Self-Efficacy has influence on the relationship between Entrepreneurs' Alertness and Green Logistics Management., Entrepreneurs' Self-Efficacy has influence on the relationship between Entrepreneurs' Alertness and Sustainability Performance. This is consistent with many researchers who found that Entrepreneurs' Self-Efficacy is a mediating variable that influences Sustainability Performance. (Sanchez-Garcia et al., 2020; Rahmanto et al., 2020; j, 2023) (Satar et al., 2024; Ndibalema et al., 2024; Rasyid & Stepanus, 2024).

Second, research results of managerial perspectives. From the finding that Green Logistics Management impact sustainable performance. SMEs should focus on Green Logistics Practices, viz logistics planning, using environmentally friendly technologies, reducing carbon dioxide emissions, use energy-efficient vehicles, using environmentally friendly packaging, give importance to reducing energy use, staff training on green logistics management, cost reduction using green logistics strategies, there is continuous improvement in logistics processes.

From the finding that Entrepreneurs' Alertness impact sustainable performance. SMEs should focus on entrepreneurs' Alertness, viz scanning and searching, association and connection, evaluation and judgment.

From the finding that Entrepreneurs' Self-Efficacy impact sustainable performance. SMEs should focus on Self-Efficacy, viz opportunity Identification, riskmanagement, planning and execution, resource and people management, innovation and adaptability.

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