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RESEARCH PAPER

Overcoming barriers: behavioral determinants of sustainable practices in MSME supply chain management

M. Azka Kesuma Wardana[1], Rudi Kurniawan[2], Nanda Andreas Octavini[1], Maulina Agustin[3]

[1]Institute of Technology and Business Diniyyah Lampung (INSTIDLA), Lampung, Indonesia.

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ABSTRACT

Goal: This study examines how cognitive evaluations and moral norms jointly shape Indonesian MSMEs' intentions to implement Sustainable Supply Chain Management (SSCM) by integrating the Theory of Planned Behavior (TPB) and the Norm Activation Model (NAM).

Design / Methodology / Approach: A quantitative explanatory design was applied using data from 219 MSME owners involved in supply chain decision-making. Structural Equation Modeling (SmartPLS 4.0) was used to assess reliability, validity, and predictive accuracy.

Results: Environmental Knowledge significantly enhanced Attitude, Subjective Norms, and Perceived Behavioral Control. Awareness of Consequences strongly influenced Ascription of Responsibility and Personal Norms, and Personal Norms were the most dominant predictor of Behavioral Intention. The link between Subjective Norms and Personal Norms was insignificant, indicating that social expectations do not easily translate into moral commitment within MSMEs.

Limitations of the Investigation: The model excludes macro-level and institutional variables, and the single-province sample restricts generalizability.

Practical Implications: Interventions should emphasize applied environmental knowledge, strengthened moral responsibility, and capacity building that supports MSMEs in operationalizing SSCM intentions.

Originality / Value: This study provides one of the first empirical applications of an integrated TPB–NAM framework in the MSME supply chain context. Unlike prior sustainability research, no existing study has tested this combined model specifically in MSME-based supply chains. The findings contribute theoretically by demonstrating that TPB–NAM interactions in small enterprises are not linear, particularly in the weak internalization of social norms.

Keywords: Sustainability; MSMEs; Sustainable Supply Chain Management; Theory of Planned Behavior; Norm Activation Model.

1 INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) remain central to Indonesia's economic structure, consistently contributing more than sixty percent to national output and serving as major sources of employment across the regions (Jee Sinha et al., 2024). Despite improvements in digital platforms that facilitate coordination with suppliers and access to market information, MSMEs continue to face operational fragility rooted in limited capital, unstable raw material supply, and gaps in operational capability (Yacob et al., 2021). The COVID-19 pandemic further exposed these vulnerabilities, as many firms were unable to absorb logistics and procurement shocks (Batubara & Aisyah, 2022; Brilliana et al., 2020).

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Although the adoption of Sustainable Supply Chain Management (SSCM) has gained prominence, existing MSME studies largely emphasize structural or external drivers such as regulatory requirements, financial schemes, and technological resources (Gonçalves et al., 2024). These perspectives offer useful insights yet provide an incomplete understanding of how MSME owners interpret sustainability demands or how such interpretations influence SSCM adoption. Since decision-making authority in MSMEs is typically concentrated in the owner–manager, explaining SSCM adoption requires examining the cognitive and moral reasoning underpinning their choices. Intention plays a critical role in this process because it reflects owners' evaluations of potential benefits, costs, and consequences associated with adopting sustainable practices.

To address this gap, the present study integrates the Theory of Planned Behavior (TPB) and the Norm Activation Model (NAM) to develop a more comprehensive explanation of sustainability-related intention. TPB highlights cognitive assessments through attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991), while NAM contributes a moral lens by emphasizing awareness of consequences, responsibility, and personal norms (Wahid et al., 2022). Previous studies indicate that combining these models enhances behavioral prediction by capturing both rational evaluation and moral commitment. However, integrated TPB–NAM applications remain rare within MSME supply chain research, particularly in emerging economies where resource constraints, high owner–manager autonomy, and volatile operating environments create distinct behavioral patterns.

By situating the TPB–NAM integration within the Indonesian MSME context, this study offers a theoretical contribution that extends behavioral explanations of SSCM adoption and provides a more nuanced understanding of how cognitive and moral mechanisms jointly shape intention.

2 LITERATURE REVIEW

2.1 Sustainable Supply Chain Management (SSCM) in MSMEs

SSCM in MSMEs refers to the integration of environmental, social, and economic considerations across procurement, production, and distribution activities. Recent evidence shows that sustainability initiatives can enhance operational efficiency and generate added value for small businesses (Gonçalves et al., 2024). Nevertheless, SSCM adoption among MSMEs remains uneven, reflecting the persistent influence of limited resources, capability gaps, and varying levels of managerial readiness.

Beyond structural and operational constraints, the literature emphasizes that SSCM adoption is shaped by how business owners perceive the relevance, benefits, and risks of sustainability initiatives. Uddin et al. (2023) demonstrate that perceived sustainability value, environmental concern, and beliefs about the social importance of sustainable practices play a critical role in determining MSME readiness to adopt SSCM. These findings indicate that cognitive and normative interpretations held by owner-managers substantially influence sustainability-related decisions, thereby underscoring the need for behavioral perspectives to complement structural explanations in SSCM research.

2.2 Theory of Planned Behaviour (TPB)

TPB posits that behavioral intention is shaped by attitude, subjective norm, and perceived behavioral control, each reflecting how individuals evaluate a behavior, perceive social expectations, and assess their capability to perform it. In the MSME context, TPB has been widely applied to explain sustainability-related decisions, with recent studies showing that positive evaluations of sustainable practices, perceived support from relevant stakeholders, and confidence in resource availability strengthen intention to adopt such practices (Durman & Nadlifatin, 2024; Karsana et al., 2024). These mechanisms are particularly salient in MSMEs where decision-making authority is concentrated in the owner-manager, making individual perceptions the primary basis for adopting sustainability initiatives.

Although TPB offers a robust structure for predicting intention, several scholars argue that its cognitive orientation may overlook moral obligations that often influence sustainability decisions. This limitation points to the need for complementary frameworks that incorporate moral and normative drivers, thereby providing a more complete understanding of the behavioral foundations of SSCM adoption among MSMEs.

2.3 Norm Activation Model (NAM)

NAM explains prosocial and pro-environmental behavior through three cognitive processes: awareness of consequences, ascription of responsibility, and the development of personal norms. When individuals recognize the environmental or social impacts of their actions and feel responsible for addressing them, they are more likely to internalize moral obligations that guide their behavioral choices (Wahid et al., 2022).

NAM has been widely applied to sustainability-related behaviors, including responsible consumption, waste reduction, and participation in environmental initiatives. Evidence consistently shows that personal norms strongly influence intention and actual behavior when decisions involve ethical or moral considerations (Helferich et al., 2023). This makes NAM particularly relevant for understanding sustainability decisions that extend beyond rational cost–benefit evaluations.

Despite its strengths, NAM provides limited attention to behavioral control or practical constraints, which are practical in MSMEs operating with restricted resources. Furthermore, external social expectations are not explicitly incorporated into the model, even though customer or partner expectations often influence sustainability decisions in supply chain contexts. These limitations indicate that NAM alone may be insufficient for capturing the full range of cognitive, social, and moral mechanisms underlying SSCM adoption, thereby supporting the integration of NAM with TPB to achieve a more comprehensive behavioral explanation.

2.4 Integration of the Theory of Planned Behavior (TPB) and the Norm Activation Model (NAM)

Integrating TPB and NAM offers a more comprehensive foundation for explaining sustainability behavior because each framework highlights distinct yet complementary mechanisms. While TPB captures cognitive evaluations and perceptions of behavioral control, NAM emphasizes moral obligations that arise from recognizing and taking responsibility for environmental or social consequences (Menatizadeh et al., 2025). Combining these perspectives enables researchers to account for how rational appraisals and internalized moral values jointly influence sustainability-related intention.

Empirical studies across various sustainability domains support the value of this integration. Liu et al. (2017) show that both TPB constructs and personal norms contribute to intentions to reduce car use, with personal norms mediating the influence of awareness of consequences. Similarly, Michael et al. (2024) and Wang et al. (2025) find that integrating TPB and NAM strengthens predictive accuracy in explaining waste reduction and e-waste recycling behavior by linking cognitive assessments with moral motivations. These findings demonstrate that merged TPB–NAM frameworks provide a robust structure for understanding sustainability behavior in settings where both feasibility considerations and ethical concerns shape decision-making.

Despite these advances, applications of the integrated TPB–NAM model in SSCM among MSMEs remain scarce. This gap is particularly important because MSME decision-making is often concentrated in the owner-manager, who evaluates sustainability practices through intertwined cognitive, social, and moral considerations under conditions of resource constraints. Extending TPB–NAM integration to the SSCM context of Indonesian MSMEs therefore represents a substantive theoretical contribution and serves as the foundation for constructing the research model and formulating the hypotheses that follow.

3 HYPOTHESIS DEVELOPMENT

3.1 Environmental Knowledge and Attitude

Environmental knowledge provides MSME owners with a clearer foundation for interpreting the environmental implications of their business activities. When owners understand how operational decisions relate to ecological outcomes, they are more inclined to view sustainability initiatives as relevant and beneficial for their enterprises. Previous studies also demonstrate that higher levels of environmental understanding are associated with stronger pro-environmental attitudes, reinforcing the expectation that knowledge contributes to more positive sustainability evaluations (Surahman et al., 2023; Chen et al., 2023).

H1: Environmental knowledge is expected to strengthen MSME owners' attitudes toward adopting sustainable practices.

3.2 Environmental Knowledge and Subjective Norm

MSME owners who possess broader environmental understanding are more capable of interpreting why stakeholders expect sustainable business conduct. This insight increases the extent to which owners acknowledge and respond to social expectations related to environmental responsibility. Prior evidence shows that environmental knowledge often strengthens individuals' sensitivity to sustainability-oriented social cues (Schlegelmilch et al., 2025; Ha, 2024).

H2: Higher levels of environmental knowledge are anticipated to increase owners' sensitivity to sustainability-related expectations from stakeholders.

3.3 Environmental Knowledge and Perceived Behavioral Control

A stronger grasp of environmental issues enables MSME owners to judge more accurately whether sustainable practices can be integrated into their operational routines. This understanding reduces uncertainty and contributes to higher confidence in their ability to carry out sustainability initiatives. Previous research also indicates that greater environmental knowledge is associated with stronger perceptions of behavioral control in pro-environmental contexts (Sendawula et al., 2024; Galván-Mendoza et al., 2022).

H3: Greater environmental knowledge is expected to enhance MSME owners' perceived capability to implement sustainable supply chain practices.

3.4 Attitude and Behavioral Intention

MSME owners' attitudes toward sustainability represent their evaluations of how beneficial and worthwhile SSCM practices are for their operations. When these evaluations are positive, owners are more inclined to commit to sustainability-oriented actions. Empirical evidence consistently shows that favorable attitudes support stronger intentions to adopt sustainable practices (Dombi et al., 2025; Wasiq et al., 2023).

H4: A more favorable attitude toward sustainability is expected to increase owners' intention to adopt sustainable supply chain practices.

3.5 Subjective Norm and Behavioral Intention

Subjective norms capture the extent to which MSME owners perceive encouragement or expectations from stakeholders including customers, suppliers, and business partners. When these expectations emphasize sustainability, owners tend to align their intentions with such social signals. Recent findings show that social norms can motivate stronger intentions to adopt sustainable practices (Zhao et al., 2025; Minh & Cuong, 2025).

H5: Stronger subjective norms are expected to encourage greater intention among MSME owners to engage in sustainable supply chain practices.

3.6 Perceived Behavioral Control and Behavioral Intention

Perceived behavioral control reflects MSME owners' assessment of whether they have sufficient resources and operational capability to adopt SSCM practices. When owners feel capable of implementing these initiatives, they are more likely to form strong intentions to act sustainably. Prior studies consistently report a positive association between perceived control and intention to engage in green or sustainable practices (Khan et al., 2022; Yasir et al., 2023).

H6: Higher perceived behavioral control is expected to strengthen owners' intention to adopt sustainable supply chain practices.

3.7 Awareness of Consequences and Ascription of Responsibility

Greater awareness of environmental consequences encourages MSME owners to recognize how their operational decisions influence ecological outcomes. This awareness often prompts a stronger sense of accountability for preventing harmful impacts. Prior research supports this link, showing that awareness of consequences enhances individuals' perceived responsibility toward environmental issues (Winingsih et al., 2022; Setiawan et al., 2019).

H7: Greater awareness of the consequences of unsustainable behavior is expected to increase owners' sense of responsibility for environmental outcomes.

3.8 Awareness of Consequences and Personal Norm

A clear understanding of the environmental implications of business activities can lead MSME owners to develop stronger moral commitments toward responsible behavior. This shift in moral orientation reflects the internalization of personal norms. Existing evidence identifies awareness of consequences as a key antecedent of moral norm formation (Liao, 2025; Younis & Sundarakani, 2019).

H8: Higher awareness of environmental consequences is expected to contribute to stronger personal norms supporting sustainable behavior.

3.9 Ascription of Responsibility and Personal Norm

Ascription of responsibility reflects MSME owners' belief that they play an accountable role in shaping environmental outcomes. When this sense of responsibility is strong, it often promotes the development of personal norms that encourage sustainable decision-making. Prior studies confirm that responsibility attribution is closely linked with the formation of moral norms (Mamzer et al., 2021; Pyo et al., 2024).

H9: A stronger sense of responsibility for environmental impacts is expected to reinforce MSME owners' personal norms regarding sustainable practices.

3.10 Personal Norm and Behavioral Intention

Personal norms represent internalized moral commitments that guide MSME owners toward decisions aligned with their ethical perspectives. When these commitments are strong, they are more likely to translate into intentions to adopt sustainability-oriented practices. Earlier research consistently highlights personal norms as a key driver of pro-environmental intentions (Anand & Sharma, 2023; Mouro & Duarte, 2021).

H10: Stronger personal norms in favor of environmental responsibility are expected to increase owners' intention to adopt sustainable supply chain practices.

3.11 Subjective Norm and Personal Norm

External expectations conveyed through subjective norms can shape MSME owners' understanding of what is considered socially appropriate behavior. Over time, these expectations may encourage the internalization of personal moral obligations related to sustainability. Prior studies support this mechanism by showing that social norms can influence the development of personal norms in environmental contexts (Joo et al., 2024; Niu et al., 2023).

H11: Subjective norms are expected to influence the development of personal norms by shaping owners' internalization of sustainability expectations.

3.12 Awareness of Consequences and Attitude

Understanding the environmental consequences of business activities enables MSME owners to evaluate sustainability practices more positively. When owners recognize the benefits of reducing negative environmental impacts, they tend to develop more favorable attitudes toward sustainability initiatives. Empirical evidence consistently demonstrates that awareness of consequences is closely associated with pro-environmental attitudes (Green et al., 2019; Hansmann et al., 2020).

H12: Greater awareness of environmental consequences is expected to strengthen MSME owners' attitudes toward adopting sustainable practices.

The formulation of hypotheses H1 through H12 enables the development of a conceptual model that illustrates the relationships among the variables investigated in this study. The model is presented in the following figure and serves as the foundation for the subsequent empirical analysis.

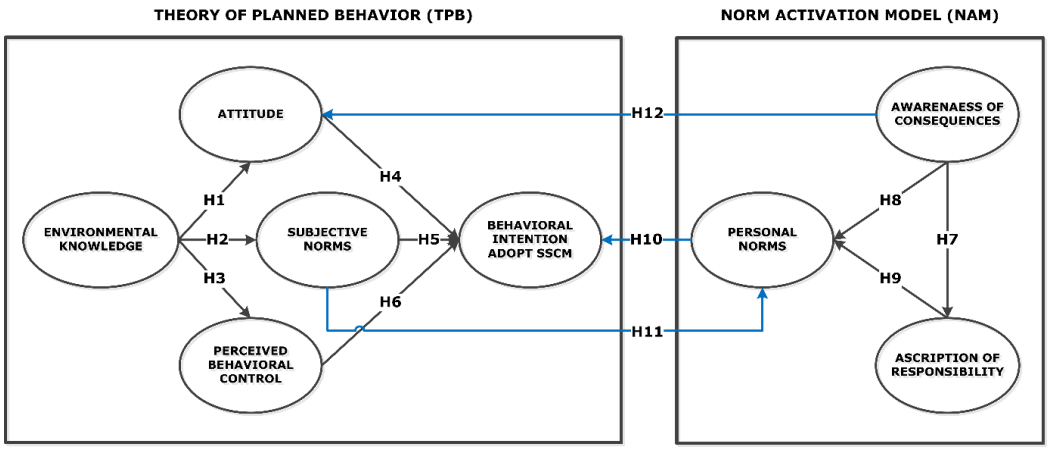


Figure 1. Research Model
Source: Developed by the authors (2025).

4 RESEARCH DESIGN AND METHODOLOGY

4.1 Sampling

This study applies a quantitative approach to integrate TPB and NAM in examining the behavioral factors influencing MSME adoption of SSCM in Indonesia. Data were collected from 219 MSME owners in Lampung Province through offline and online surveys using non-probability purposive sampling, as respondents were required to have direct decision-making authority and a complete sampling frame was unavailable.

Lampung was selected as the research site because it represents an active MSME cluster within the Sumatra–Java supply chain corridor and contains considerable social diversity. However, the focus on a single province limits generalizability because its socio-economic characteristics do not fully represent MSMEs across Indonesia.

Before analysis, the dataset was screened for missing values and outliers. Responses with excessive missing data were removed, and remaining missing values were treated using mean substitution. Outliers were examined using standardized scores and visual inspection. The final sample size satisfies established PLS-SEM requirements for models with approximately forty indicators (Hair et al., 2022).

4.2 Data Analysis

Data analysis was conducted using PLS-SEM in SmartPLS 4.0. PLS-SEM was chosen because the integrated TPB–NAM model is prediction oriented, involves multiple latent constructs, and operates with a moderate sample size under non-normal data conditions. This method is therefore more suitable than covariance-based SEM for evaluating theoretical extensions and emerging behavioral models.

Common method bias was mitigated through procedural controls, including respondent anonymity, randomized item order, and neutral wording. A full collinearity assessment using VIF values was applied as a statistical check. The reflective measurement model was evaluated using indicator reliability, composite reliability, Cronbach's alpha, AVE, and the Fornell–Larcker criterion for discriminant validity. Structural model evaluation included significance testing of path coefficients and assessment of R-squared, Q-squared, and SRMR. Predictive performance was further examined using the Cross-Validated Predictive Ability Test (CVPAT) to assess both explanatory and predictive accuracy.

4.3 Measures

All constructs in this study were modeled as reflective and measured using items adapted from validated instruments in prior research. A five-point Likert scale ranging from "strongly disagree" to "strongly agree" was used. The questionnaire was developed in English, translated into Indonesian using a back-translation procedure, and reviewed by academic experts and MSME practitioners to ensure conceptual clarity and contextual relevance.

Attitude toward the behavior was adapted from Anaman et al. (2023) and Nuangmek et al. (2018). Subjective norm was adapted from Chiang et al. (2024) and Shou et al. (2022). Perceived behavioral control followed Ramakrishna et al. (2023), while behavioral intention was adapted from

Le and Nguyen (2023). Awareness of consequences was adapted from Green et al. (2019) and Younis and Sundarakani (2019), and ascription of responsibility from Mamzer et al. (2021). Personal norm was adapted from Anand and Sharma (2023) and Mouro and Duarte (2021). Environmental knowledge was adapted from Ahmed et al. (2024) and Chen et al. (2023). Across all constructs, items captured the essential conceptual domains of each variable, such as evaluations of sustainability practices (attitude), perceived social expectations (subjective norm), perceived capability (PBC), moral obligation (personal norm), and awareness of sustainability implications (AC and AR).

The constructs and final items are shown in the Appendix.

5 RESULT

5.1 Participants

Table 1 - Demographic of participants

Characteristic	Demographic	N	%
Gender	Male	120	55%
	Female	99	45%
Age	21 - 30	75	34%
	31 - 40	70	32%
	41 - 50	50	23%
	> 50	24	11%
Education	Elementary/Junior High	40	18%
	High School	80	37%
	Bachelor's Degree	70	32%
	Master's Degree	29	13%
Business Size	Micro	65	30%
	Small	75	34%
	Medium	55	25%
	Enterprise	24	11%

Source: processed results (2025).

5.2 Collinearity Assessment (VIF)

The assessment of collinearity was carried out by examining the Variance Inflation Factor (VIF) associated with each indicator. The obtained VIF values, which ranged from 1.27 to 4.64 and remained well below the recommended upper benchmark of 5, demonstrate that multicollinearity does not pose a problem in the model. These findings indicate that the indicators operate independently from one another and can be reliably used in the subsequent evaluation of construct reliability and validity.

Table 2 - Variance Inflation Factor (VIF)

Outer Model - List	VIF	Outer Model - List	VIF	Outer Model - List	VIF	Outer Model - List	VIF
A.1	1.885	AC.1	1.843	AR.1	1.919	BI.1	1.773
A.2	1.987	AC.2	2.877	AR.2	2.297	BI.2	1.905
A.3	2.516	AC.3	4.644	AR.3	2.884	BI.3	1.565
A.4	2.456	AC.4	4.079	AR.4	2.334	BI.4	1.575
A.5	1.521	AC.5	2.827	AR.5	2.902	BI.5	1.389
EK.1	1.693	PBC.1	2.844	PN.1	2.612	SN.1	1.628
EK.2	1.506	PBC.2	1.835	PN.2	2.847	SN.2	1.945
EK.3	2.247	PBC.3	1.593	PN.3	3.077	SN.3	1.948
EK.4	2.176	PBC.4	2.188	PN.4	2.919	SN.4	2.972
EK.5	1.739	PBC.5	2.498	PN.5	1.648	SN.5	2.789

Source: processed results (2025).

5.3 Construct reliability and Convergent validity

The measurement model demonstrates adequate reliability and validity. Indicator loadings met recommended levels, and five items with loadings below 0.6 were removed. While five indicators were removed due to factor loadings < 0.6 for statistical stringency, this procedure did not compromise the content validity of the original constructs. Following Hair et al. (2022), eliminating low-loading items is permissible to improve reliability without altering the theoretical domain. The remaining indicators sufficiently represent each construct's conceptual breadth, ensuring the integrity of the integrated TPB and NAM framework remains intact. All constructs show Cronbach's alpha and composite reliability values above 0.7, confirming internal consistency. The Average Variance Extracted (AVE) values exceed 0.5 for all constructs, indicating satisfactory convergent validity. Overall, the model fulfills the required measurement criteria for subsequent hypothesis testing.

Table 3 - Construct reliability and Convergent validity

Variable	Loading Factor	CA	rho_a	CR	AVE
A	0.692-0.841	0.858	0.864	0.898	0.639
AC	0.763-0.884	0.884	0.894	0.915	0.684
AR	0.645-0.918	0.810	0.893	0.869	0.630
BI	0.821-0.897	0.891	0.894	0.925	0.754
EK	0.765-0.841	0.760	0.762	0.859	0.671
PBC	0.782-0.874	0.892	0.901	0.921	0.699
PN	0.772-0.902	0.875	0.879	0.915	0.730
SN	0.744-0.820	0.780	0.782	0.858	0.602

Source: processed results (2025).

5.4 Discriminant Validity

The model satisfies discriminant validity based on both the Fornell–Larcker criterion and the Heterotrait–Monotrait ratio (HTMT). The square roots of the AVE values for all constructs exceed their inter-construct correlations, and all HTMT values fall below the 0.90 threshold. These results confirm that the constructs are conceptually distinct. Discriminant validity outcomes are presented in Table 4 (Fornell–Larcker) and Table 5 (HTMT).

Table 4 - Fornell-Larcker criterion

	A	AC	AR	BI	EK	PBC	PN	SN
A	0,799							
AC	0,509	0,827						
AR	0,596	0,793	0,794					
BI	0,506	0,694	0,687	0,869				
EK	0,661	0,369	0,439	0,369	0,819			
PBC	0,495	0,449	0,453	0,413	0,559	0,836		
PN	0,425	0,763	0,663	0,673	0,258	0,290	0,855	
SN	0,523	0,484	0,510	0,499	0,427	0,449	0,399	0,776

Source: processed results (2025).

Table 5 - Heterotrait-monotrait ratio (HTMT)

	A	AC	AR	BI	EK	PBC	PN	SN
A								
AC	0,580							
AR	0,694	0,871						
BI	0,579	0,776	0,768					
EK	0,777	0,431	0,527	0,434				
PBC	0,560	0,508	0,535	0,459	0,662			
PN	0,491	0,863	0,732	0,761	0,304	0,332		
SN	0,636	0,577	0,629	0,597	0,532	0,532	0,478	

Source: processed results (2025).

5.5 Structural Model Assessment

The model demonstrates adequate explanatory and predictive performance. R-squared values between 0.202 and 0.655 indicate moderate to strong explanatory power, while Q^2 values above

0.35 confirm substantial predictive relevance. The SRMR value of 0.074 is below the recommended 0.08 threshold, indicating good model fit. Overall, the model effectively accounts for and predicts variance in the endogenous constructs.

Table 6 - Structural Model Assessment

	Q²predict	R-square	SRMR
A	0,507	0,475	0,074
AR	0,623	0,612	
BI	0,451	0,631	
PBC	0,303	0,288	
PN	0,579	0,655	
SN	0,174	0,202	

Source: processed results (2025).

5.6 Model Predictive Capability

Following Hair et al. (2022), the Cross-Validated Predictive Ability Test (CVPAT) was used to assess out-of-sample predictive accuracy. PLS-SEM outperforms both the Indicator Average (IA) and Linear Model (LM), as shown by negative and statistically significant loss differences ($p < 0.05$). These results indicate that PLS-SEM provides superior predictive performance and further support the overall validity of the structural model.

Table 7 - Structural Model Assessment

	PLS-SEM VS Indicator Average (IA)			PLS-SEM VS Linear Model (LM)		
	Average loss difference	t value	p value	Average loss difference	t value	p value
Attitude	-0,342	7,144	0,000	-0,054	3,369	0,001
Ascription of Responsibility	-0,439	8,570	0,000	-0,051	2,613	0,009
Behavioral Intention	-0,403	8,720	0,000	-0,052	2,359	0,019
Perceived Behavioral Control	-0,209	4,237	0,000	-0,052	2,104	0,036
Personal Norms	-0,490	9,003	0,000	-0,033	2,047	0,041
Subjective Norms	-0,076	3,739	0,000	-0,047	2,826	0,005
Attitude	-0,323	10,349	0,000	-0,048	5,410	0,000

Source: processed results (2025).

5.7 Hypotheses testing

The structural model was examined by analyzing the hypothesized relationships among the constructs. Table 8 presents the path estimates together with their p-values, which serve as the basis for determining whether each proposed relationship is statistically supported.

Table 8 - Hypotheses testing

Hypothesis		O	Std. β	t-values	p-values	Conclusion
H1	EK → A	0,547	0,048	11,496	0,000	ACCEPTED
H2	EK → SN	0,427	0,052	8,212	0,000	ACCEPTED
H3	EK → PBC	0,559	0,048	11,719	0,000	ACCEPTED
H4	A → BI	0,142	0,056	2,543	0,011	ACCEPTED
H5	SN → BI	0,167	0,045	3,754	0,000	ACCEPTED
H6	PBC → BI	0,120	0,040	3,004	0,003	ACCEPTED
H7	AC → AR	0,793	0,031	25,466	0,000	ACCEPTED
H8	AC → PN	0,636	0,061	10,476	0,000	ACCEPTED
H9	AR → PN	0,151	0,065	2,348	0,019	ACCEPTED
H10	PN → BI	0,511	0,050	10,200	0,000	ACCEPTED
H11	SN → PN	0,014	0,038	0,370	0,712	NOT ACCEPTED
H12	AC → A	0,307	0,051	6,039	0,000	ACCEPTED

Source: processed results (2025).

The evaluation of the structural model shows that environmental knowledge plays a consistent role across all three behavioral determinants. The analysis confirms that environmental knowledge is significantly associated with attitude (H1), subjective norm (H2), and perceived behavioral control (H3). Regarding the intention-related pathways, the findings demonstrate that attitude (H4), subjective norm (H5), and perceived behavioral control (H6) each contribute meaningfully to shaping owners' intentions to adopt sustainable practices.

Within the NAM domain, awareness of consequences emerges as a strong predictor of both ascription of responsibility (H7) and personal norm (H8). As expected, ascription of responsibility also shows a significant association with personal norm (H9). Personal norm, in turn, exhibits a substantial positive effect on behavioral intention (H10). Among all examined paths, subjective norm does not significantly predict personal norm, rendering H11 unsupported. Finally, the cross-model linkage between NAM and TPB receives empirical support, with awareness of consequences showing a significant positive relationship with attitude (H12).

6 DISCUSSION

The present study examines the behavioral mechanisms that influence MSMEs in adopting SSCM practices through the integration of TPB and NAM. It highlights how cognitive, social, and moral dimensions operate together in shaping sustainability intentions, particularly within small-business environments that face resource constraints such as those experienced by MSMEs in Indonesia. Using PLS-SEM, the study evaluates the hypothesized relationships within the integrated model and provides empirical evidence on the roles of knowledge, attitudes, perceived capability, and internal moral drivers in predicting SSCM adoption. These findings offer a deeper understanding of the behavioral pathways that support SSCM implementation in supply chain contexts in developing economies.

Overall, the results indicate that the behavioral dynamics of MSME owners play a critical role in shaping intentions to adopt SSCM practices. The findings show that the cognitive, social, and moral elements of TPB and NAM operate through distinct yet complementary pathways. This pattern aligns with recent studies emphasizing the importance of combining knowledge, behavioral evaluations, social expectations, and moral drivers in shaping sustainability decisions within small organizations. In the Indonesian MSME context, where firms often operate under substantial resource limitations, the results suggest that SSCM adoption is influenced more by internal psychological processes than by regulatory or structural pressures.

A notable pattern is the strong role of environmental knowledge in shaping attitudes, perceived social norms, and perceived capability among MSME owners. This pattern is consistent with the findings of Rusyani et al. (2021), Zeng et al. (2023), and Chen et al. (2023), who indicate that environmental understanding functions not only as technical information but also as a catalyst for positive sustainability evaluations and heightened sensitivity to stakeholder expectations. Knowledge also strengthens perceived behavioral control, consistent with Ahmed et al. (2024), who argue that familiarity with environmental risks and green technologies enhances operational confidence. In practice, MSMEs that understand risks related to waste, emissions, and logistical inefficiencies tend to feel more capable of implementing sustainability measures despite resource constraints. Collectively, these cognitive pathways reinforce both personal evaluations and perceived capability for progressing toward SSCM.

The results further show that attitudes, social norms, and perceived capability remain predictors of intentions to adopt SSCM. The Attitude to Behavioral Intention relationship aligns with Bosnjak et al. (2020) and Iherobiem (2023), suggesting that MSME owners view SSCM as a practically beneficial strategy. The influence of subjective norm on intention is consistent with Romano et al. (2023) and Fatima et al. (2024), indicating that expectations from customers and suppliers remain important in socially embedded local markets. Perceived behavioral control also contributes significantly, supporting Sugianto and Selamat (2022), who highlight the role of operational confidence in MSME decision making. Overall, these pathways reaffirm the TPB proposition that intention arises from evaluations of benefits, social pressures, and perceived capability, although attitude and capability appear to exert stronger influence than social pressure in the Indonesian MSME context.

In the moral domain, the relationship patterns within NAM also show strong consistency. Awareness of consequences serves as a trigger that enhances feelings of responsibility and personal norms, aligning with Ghazali et al. (2019), Esfandiar et al. (2020), and Liu et al. (2018). These studies suggest that understanding the negative impacts of operational activities encourages MSMEs to internalize sustainability as a moral obligation. Ascription of responsibility then reinforces these moral norms, as noted by Winingsih et al. (2022) and Setiawan et al. (2019). The NAM mechanisms observed in this study illustrate that moral considerations continue to motivate

intention within small-business contexts, particularly where business decisions are closely tied to local reputation and community well-being. Furthermore, personal norm emerges as a strong predictor of sustainability intention, reaffirming NAM's proposition that moral commitment can drive concrete actions within the supply chain. However, it is crucial to recognize that these moral determinants do not operate in a vacuum. In the contemporary business landscape, the internalization of ethical responsibility is increasingly intertwined with the adoption of digital platforms and Artificial Intelligence (AI). As highlighted by Sáenz De Viteri et al. (2025), the evolution of ethical frameworks in the digital age redefines how decision-makers perceive accountability. This suggests that the moral framework of MSME owners is no longer just a reflection of traditional values but is also being reshaped by the transparency and data-driven insights provided by modern technological contexts.

An important finding is the non-significant pathway from subjective norm to personal norm, which differs from the results of Saleem et al. (2021) and Pristl et al. (2020), who found that social pressure can be internalized into moral values. The divergence observed in this study suggests that MSME owners may not convert external expectations into internal moral obligations, but instead respond to them through more pragmatic intentions or actions. Factors such as financial limitations, diverse personal value systems, and highly centralized decision-making structures may hinder such internalization. These findings indicate that external social norms in MSMEs function more as behavioral prompts than as sources of moral value, which helps explain the absence of consistent personal norm formation.

The relationship between awareness of consequences and attitude also aligns with Şahin and Erkal (2017) and Ganiyu et al. (2020), both of which show that risk awareness supports more positive evaluations of sustainability. In the MSME context, this tendency appears to be shaped by direct exposure to operational issues such as waste generation, energy costs, and the deterioration of local environmental quality. This mechanism suggests that awareness of consequences influences not only moral considerations but also practical assessments, thereby strengthening readiness to adopt SSCM.

7 CONCLUSION

This study offers an integrated perspective on the behavioral mechanisms underlying MSME decisions to adopt sustainable supply chain practices by combining insights from TPB and NAM. The findings illustrate how these two frameworks operate in a mutually reinforcing manner, showing that MSME owners interpret sustainability not only in terms of perceived advantages and their ability to implement the required practices, but also through an understanding of environmental consequences and a sense of moral responsibility. The results further highlight environmental knowledge, awareness of consequences, and personal norms as central determinants of sustainability intention, indicating that MSME decision-making is shaped by owners' personal interpretations and values that they consider essential to their business operations.

One of the most notable theoretical findings is the non-significant effect of subjective norm on personal norm. The insignificant relationship between Subjective Norms (SN) and Personal Norms (PN) reveals a nuanced psychological dynamic within the Indonesian MSME context, specifically indicating a phenomenon of 'compliance without internalization'. From a cultural perspective, Indonesia's high collectivism emphasizes social harmony and the concept of saving face, or *menjaga muka*. This concept refers to the psychological and social effort to maintain public dignity and avoid embarrassment within a community, where an individual's actions are often guided by external social perceptions. Within this framework, MSME owners may fulfill environmental expectations primarily to protect their social reputation or avoid negative labeling from their peers, rather than due to a genuine shift in their internal moral convictions.

This gap reflects the specific characteristics of the Indonesian MSME ecosystem, where business survival and short-term economic stability are often prioritized over the internalization of long-term environmental ethics. Despite the presence of external normative pressures, such as the communal values of *Gotong Royong*, these social influences remain external motivators that are not yet fully integrated into the personal value system. *Gotong Royong* is a traditional Indonesian philosophy of mutual cooperation and collective responsibility, which emphasizes helping one another to achieve common goals. While this value encourages businesses to align with community welfare, it can sometimes lead to symbolic participation merely to maintain social cohesion. Consequently, a barrier emerges where externally driven norms fail to be absorbed into deep-seated moral principles. This explains why increasing stakeholder demands for sustainability do not automatically translate into a heightened sense of personal moral responsibility among MSME owners in this specific socio-economic landscape.

The study also reinforces the roles of attitude, subjective norm, and perceived behavioral control as predictors of behavioral intention, although the strength of these predictors differs from patterns typically observed in consumer settings. Perceived behavioral control and personal norms emerge as the most influential pathways, indicating that sustainability intentions among MSMEs are closely tied to perceived ability and internal moral motivation. This underscores the need for interventions that take account of MSMEs' operational constraints as well as the values that guide their decision-making processes.

From a practical standpoint, the findings indicate that MSMEs' intention to adopt SSCM is shaped primarily by their environmental knowledge, perceived capability, and moral values. This suggests that managerial interventions should focus on strengthening these elements in practical and context-specific ways. Training programs need to move beyond conceptual environmental education and toward applied learning that illustrates how sustainable decisions affect daily operations through case-based demonstrations of waste handling, supplier assessment, and resource efficiency. Such experiential formats help MSME owners develop more realistic and positive evaluations of sustainability practices.

Since perceived capability strongly influences intention, support programs should also provide operational guidance that reduces uncertainty and builds confidence. Simple implementation tools, accessible technologies, and hands-on mentoring can help MSMEs view SSCM as feasible rather than burdensome, particularly for firms with limited resources. At the same time, the central role of personal norms highlights the need to cultivate sustainability as an internal value rather than merely a response to external pressure. Peer learning groups, business community dialogues, and reflective workshops can encourage owners to reinterpret environmental issues as part of their ethical and strategic responsibilities.

These efforts can be reinforced through policy-driven incentives such as subsidies for efficiency-enhancing equipment, co-funded environmental audits, or partnerships with green logistics providers. Such mechanisms reduce operational barriers while signaling institutional support for sustainable practices. Taken together, these implications underscore the importance of integrating knowledge enrichment, capability building, value internalization, and targeted incentives so that MSMEs perceive SSCM not only as attainable but also as aligned with their long-term business interests.

This study has several limitations. Because the sample was drawn from a single province, broader regional coverage and more diverse industry representation are needed to support meaningful comparisons across contexts. Furthermore, the non-significant relationship between subjective norm and personal norm highlights the need for additional research on psychological, social, and institutional factors that may hinder the internalization of norms among MSMEs. Future studies should consider cross-country analyses, particularly among developing economies with similar MSME characteristics, to examine whether the integrative TPB–NAM model exhibits consistent patterns across cultural settings, market structures, and regulatory environments. Such efforts are essential for strengthening the generalizability of the findings and for identifying variations in behavioral mechanisms that influence SSCM adoption.

Overall, this study deepens understanding of how sustainability intentions are formed within MSMEs and offers both theoretical contributions and practical guidance to support more effective sustainability interventions in supply chain contexts.

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APPENDIX

Variable measurement

No	Variables	Indicator	Reference
1	Attitude Towards the Behaviour (A)	Perceived Value of Sustainable Practices	(Anaman *et al.*, 2023; Nuangmek *et al.*, 2018)
		Commitment to Sustainability	
		Perceived Negative Consequences of Ignoring Sustainability	
		Perceived Benefits of Sustainability for Long-Term Profitability	
		Alignment with Personal Ethical Values	
2	Subjective Norms (SN)	Support from Peers	(Chiang & Chuang, 2024; Shou *et al.*, 2022)
		Support from Customers	
		Support from Suppliers	
		Influence of Industry Associations	
		Pressure from Competitors	
3	Perceived Behavioral Control (PBC)	Ease of Implementation	(Ramakrishna *et al.*, 2023)
		Resource Availability	
		Regulatory Compliance	
		Access to Sustainable Supply Chain Technology	
		Flexibility in Adapting to Sustainability Standards	
4	Behavioral Intention to Adopt SSCM (BI)	Intention to Adopt Sustainable Practices	(Le, P. L. & Nguyen, 2023)
		Commitment to Long-Term Sustainability Goals	
		Proactive Planning for Sustainability Initiatives	
		Willingness to Invest in Sustainability	
		Expected Customer Demand for Sustainable Products	
5	Awareness of Consequences (AC)	Awareness of Environmental Consequences	(Green *et al.*, 2019; Younis & Sundarakani, 2019)
		Awareness of Social Consequences	
		Awareness of Economic Consequences	
		Awareness of Legal Risks and Liabilities	
		Awareness of Reputational Risks	
6	Ascription of	Sense of Responsibility towards	(Mamzer *et al.*, 2021)

	Responsibility (AR)	Environment	
		Sense of Responsibility towards Society	
		Sense of Responsibility towards Business	
		Ethical Obligation to Future Generations	
		Moral Accountability to Stakeholders	
7	Personal Norms PN)	Personal Norm to Adopt Sustainable Practices	(Anand & Sharma, 2023; Mouro & Duarte, 2021)
		Personal Norm to Prioritize Profit over Sustainability	
		Personal Norm to Balance Profit and Sustainability	
		Personal Commitment to Environmental Stewardship	
		Personal Value of Social Responsibility	
8	Environmental Knowledge (EK)	Understanding of Sustainable Practices	(Ahmed *et al.*, 2024; Chen *et al.*, 2023)
		Awareness of Green Technologies	
		Knowledge of Regulatory Requirements	
		Awareness of Global Environmental Issues	
		Knowledge of Circular Economy Concepts	

Source: Authors' compilation